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The News-Record's New Type Dress

WITH this, the first number of the new half-yearly volume, *Engineering News-Record* appears in a new typographical dress. By the use of Century, a type of bolder face than that formerly employed, the characteristic "grayness" of the old pages is replaced by a stronger tone. In fact, the mair object of the change was to produce a paper whose typographical make-up would, as nearly as possible, reflect the strength and virility of the men who read it. The editors will feel that their work has been well done if the *News-Record*, in its new form, makes its weekly message to engineers and contractors more inviting and forceful.

Prompt Pay for Government Contracts

THE desirability of prompt payment for contract work done for the Government in the present emergency has been recognized by both the War and the Navy Departments. Statements have been issued by the quartermaster general to the effect that action has been taken to insure prompt payment to all contractors furnishing work to the Government, and by the Navy Department to the effect that all obligations will be settled promptly and that the department will appreciate a complaint giving the facts in any case where payment may be delayed. This will not only be welcome news to many contractors, but will insure more prompt and efficient work for the Government by taking the contractor's mind off the subject of his personal credit and allowing him to devote all his energy to the work in hand. It is a wise move, and the departments are certain not to regret making it.

Refreshing Event in the Technical Year

THE convention of the American Society for Testing Materials is, without doubt, one of the definitely refreshing events in the technical year. Organized by engineers for the purpose of developing and standardizing methods of tests and for investigating the properties of materials intended for commercial and engineering use, the society has developed until now it is looked upon by engineers and the consuming public as the one source of reliable and authentic information concerning the desirable qualities of materials. This fact is not lost sight of by the manufacturers. That the meetings are attended by manufacturers to such a point that sometimes the original character of the society is lost is not to be regretted, but rather should be taken as a most healthy sign of the society's usefulness. More than one manufacturer has confessed that the sins of the commercial world, of which policy has demanded the abandonment, are being consciously atoned for by the most refreshing sort of frankness and willingness to coöperate with testing engineers and the buying public. It remains for the consumer to continue to be alert in the consideration of reports in order to preserve the proper balance on which the whole life of the society depends.

Society Meetings Should Not Be Postponed

THE record attendance at the meeting of the American Society for Testing Materials last week is proof positive of the good judgment of the Executive Committee in not yielding to the current pressure to call off all technical meetings for the period of the war. This species of hysteria has attacked several of the important technical societies whose work is vital to the business needs of the country. Such meetings as the summer session of the American Society of Civil Engineers can well be dispensed with, for they were at best vacation trips in company with congenial spirits, but an engineering society which holds meetings of so little importance to its members that it can readily put off one of them for a year may well look into the wisdom of having such meetings at all.

Saving at the Spillway and Losing Whole Dam

ANOTHER example of saving at the spillway at the cost of the dam is afforded by the washing out of the Mammoth reservoir dam in Utah last week, described on page 42. True, this dam had not been carried to its full intended height, so there was extra temptation to rely on a makeshift spillway. True also, the temptation to store more water for crops in this time of world need led to still other risks, one of which was the use of flashboards in the makeshift spillway. But all the temptations and excuses in the world will not enable anyone successfully to defy the forces of nature and engineering fundamentals. So for lack of a spillway and because of an attempt to store more water at [illegible] of an already large risk, all the water was lost, the dam was ruined, miles of railway and many railway bridges were swept away, railway traffic was suspended, coal mines had to shut down, and manufacturing industries were threatened with coal famine. Whatever the extenuating circumstances, the roaring waters have once more sounded a warning against saving at the spillway and losing the whole dam.

The Magnetic Testing of Steel

ALTHOUGH Prof. M. A. Howe pointed out to the American Society for Testing Materials last week that magnetic testing of steel products is in its infancy as yet, that is hardly a stable criticism, undeniable as its truth may be at the present moment. Perhaps neither Professor Howe nor those who offered similar remarks intended to call into question the findings of such men as Burrows, Devries, Lasier and Fahy; but the residue of the discussion was unfortunate, for there was left a distinct impression that the method is receiving overmuch emphasis, is suffering from special pleading at the hands of men too near to it to preserve a proper perspective. Now, when a method or an idea is being used in commercial practice, when success is attending its employment for the purpose of separating good from inferior products, to cast any more than a mere shade of doubt upon its broader applicability presupposes evidence pointing to definite failure in many specific instances.

This last the opponents of the one really new thing brought out at the recent convention of the society failed to do. They merely pointed out that certain classes of researches demand the old method of testing. This is not denied by the proponents of magnetic testing. They feel that in the new method there is so much of value that, even though it cannot entirely supplant the microscope and the testing machine, still there is a wide field which can be covered only by some such method as that brought out by Professor Burrows. They overlooked, too, the fact that in much engineering the testing of samples is of practically no value. To instance merely drain tile, wherein the failure of one length in place invalidates the whole job, is sufficient. Likewise, one ball in an important bearing might easily result in the destruction of an immensely costly piece of machinery. It will not do simply to laugh magnetic testing out of court. Its antagonists must accept it as an additional and highly valuable tool as yet not fully developed.

Anybody for Inspector

THE claim that anybody is qualified to inspect construction work on public contracts was put forward again—it is an old claim—in a recent small-town dispute over contract matters. The idea is one apt to be advanced by political officials, as it supports them in placing men of any kind on the inspection force.

Do such officials really believe that inspection requires no knowledge of the subject? *Engineering News-Record* asks this question with every desire to be fair. We recognize the honesty of the argument sometimes made: That mere watching is required; that the specifications set forth in detail what work is to be done, and that nothing more is required than to enforce performance by clerical process. But anyone who is even slightly familiar with engineering construction knows the fundamental error of this argument.

On construction work there are many chances for improper methods and procedure in the delivery and use of materials, backfilling trenches, mixing and placing concrete, culling bricks, etc. Apart from dishonesty or incompetence, foremen and crews may be careless and negligent, exercise bad judgment, try to speed up work or use some makeshift plan to cover an emergency defect, without considering that this will tend to produce bad work and that it may even be detrimental to the interests of their employer. It is obvious that an inspector who simply looks on without understanding what is being done or what should be done is of little use in preventing bad work, whether done intentionally or unintentionally.

Inspection is a necessary, responsible part of civil engineering work. It calls into play sound engineering judgment, based on both knowledge and experience. To undervalue its importance or its technical character constitutes not only an error likely to have bad consequences, but also it is an injustice to the many able men engaged in inspection service. Let us hope there are few, if any, engineers in this day and generation who are inclined to look down on the inspector as an unimportant hireling not worthy to be classed as a member of the profession. Let inspectors be credited with the status appropriate to their functions. It will then be a mere matter of agitation and education to get equal recognition from all public officials.

Hard Steel for Columns

NOW that the dependence of column strength on the compressive yield-point, or "hardness," of the metal is brought to notice, the question forcibly presents itself whether economy will not warrant adopting harder steel for columns. Steel of somewhat higher carbon than ordinary bridge steel, produced just as cheaply, will show a yield-point 10,000 or 15,000 lb. higher and will produce columns stronger by the same amount. The resulting economy is obvious.

How carefully this argument must be confined to compression members does not need to be specially pointed out to the structural engineer. Nothing is more definitely and vitally shown by all experience in bridge and other steel construction than the fact that due safety is dependent on the use of ductile steel. For that matter anyone, be he engineer or not, can appreciate that toughness is a primary reliance in any structure. But the critical points where tough, ductile material is required are the tension members and those connections and parts which are subjected to bending stresses and irregular deformation.

Columns under normal conditions are exposed to a service where brittleness is virtually eliminated as a danger element. Hard steel can be used in them with no decrease of safety. The advantage of high yield-point strength may be secured without the disadvantage of brittleness to detract from the gain.

It may appear like turning back the clock a long way to suggest in this day a departure from one uniform quality of structural steel and the establishment of two grades, one tough and one hard. But though the proposal may seem strange, it is likely that there would be no fatal objection raised by either steelmaker or engineer. The fabricating shop alone has good grounds for opposing the introduction of hard steel. A large increase in the amount of drilling of rivet holes would be required if extensive use were to be made of the new grade. In view of the steady extension of

drilling in regular bridge practice, however, this objection has at best only temporary force. It cannot permanently stand in the way of hard steel if the latter can carry out its promise of considerable saving of metal.

The Railroads Must Still Wait

WHEN *Engineering News-Record* a few weeks ago pointed out the new responsibility thrust by the war upon utility managers and commissions to settle grave problems quickly and correctly, a reader was prompt to give assurance that the commissions, at least, would rise to all emergencies as they came. Yet the strongest commission of them all, the Interstate Commerce Commission, at the very first opportunity, seems to have failed grievously. Asking for a 15% blanket increase in freight rates, the railroads are denied anything more than small increases in certain class rates. The commission, conducting its hearings with almost the same deliberation as characterized them before the war, and giving no decision until two days before the new schedules were to go into effect—this silence until the eleventh hour of itself involving the railroads in a large amount of unnecessary clerical labor—is unable to perceive that there is any emergency. If net earnings drop as predicted the matter can be taken up anew Oct. 28.

Perhaps the carriers took too much for granted. Possibly they did not present sufficient proof that we are at war and cannot foresee the future, that our present prosperity is on a rather precarious footing, and that the prices of everything except transportation have gone up; also that last summer the railway brotherhoods threatened a nation-wide strike unless they were granted large increases in pay, that in appeasing them with the Adamson law the President gave fairly definite assurances that the carriers would be allowed to make up the added costs by higher rates, and that these added costs became a reality six months before the date set by the carriers for the increased rates. But surely these things were all within the knowledge of the commission, and have more bearing on the equity of the case than any quantity of statistics that may have been produced.

Commissioner Harlan, who voted with the majority to prevent a deadlock, while believing the commission was falling far short, sizes the situation up clearly in a separate report. He says in part:

"This month-to-month and purely statistical view of the matter seems to me to be wholly inadequate. Nor do I regard that course as altogether safe. We are facing a much larger problem, and it must be approached in a much broader way if we are to reach a sound solution. The report of the commission states that some of the symptoms disclosed of record are unquestionably unfavorable. . . . That . . . being so, the wisdom of deferring full relief is not apparent to me."

Certainly the present unprecedented business the railroads are handling, which may end as suddenly as it began, should not be the criterion as to whether or not the railroads can earn a fair return on their fair value, and furthermore, the public owes it to them to make good the added expense of the Adamson law.

Percentage Contracts for the Navy

IN URGENT work, required for national emergency, time is the most valuable single factor. It is therefore gratifying to note that agencies of both the Army and Navy Departments have found it possible to break away from the delays incident to competitive bidding and to award contracts for construction more quickly and directly on a percentage basis.

Since the Bureau of Yards and Docks took the lead under Admiral Harris, its chief, last year by adopting a form of straight contract that made it possible for contractors to bid with more certainty and with greater assurance of fair treatment than on work handled by any but a few of the best civilian engineers, it is also gratifying to find this bureau adopting an addendum to the general provisions of its standard contract covering percentage work in a manner thoroughly in accord with the spirit of the original documents. In this addendum the items to be covered by "cost of the work" and the items of expense to be borne by the contractor out of his 10% commission are so clearly defined that there is no chance for either party to claim a misunderstanding. The document is drawn so that the contractor cannot lose unless he fails to deliver the goods. It is drawn so that the Government cannot lose through any act or claim of the contractor. This is simply and effectively accomplished by setting forth in plain language what each party is to do. The bureau assumes all risk incident to unforeseen changes of plan. The contractor has complete assurance that, if he furnishes the structures he is directed to furnish on time and completed in a satisfactory manner, the cost will be paid him by the Government.

In addition, provisions are inserted so that, in case of unusually difficult work where plant rental and overhead expense might not be compensated by the 10% fee, the contract may be drawn to include one or more such overhead charges in the cost of the work. If subcontracts are required, the general contractor must let them for a lump sum, which is then considered part of the cost of the work, but on which the general contractor is paid only a 5% fee. This covers his responsibility and expense in connection with the subcontract. The items included in the cost of the work and in the things to be covered by the 10% fee are so balanced that, while the contractor will not have to rely on a profitable general business to support the Government work he may undertake, he cannot, on the other hand, make any excessive profit on his Government contracts. He is aided in financing the work, however, by prompt monthly payments in full. The retained-percentage clause is dropped in exchange for one enabling the Government to pay the contractor in full and dismiss him at any time the work is evidently falling below the requirements contemplated in the contract.

At a time when the urgency of the situation might be held to excuse much confusion, Admiral Harris is more than ever to be congratulated on handling this percentage work in a manner that could scarcely be improved on for efficiency, even in times of peace and calm. This form of contract will save the country much money on the work of the bureau by making it possible to secure the best of service and to put work through without the delay of misunderstandings and disputes.



THE BARRACKS BUILDINGS EACH ACCOMMODATE 25 MEN. LAVATORY BUILDING CONNECTIONS IN THE FOREGROUND.

Housing the Navy Ashore

Wood Cantonments at Charleston, S. C., Planned for Units of 1000 Men—Local Contractors Pool Interests on Rush Construction

First Unit Complete in Three Weeks

PLANS for housing the new army while in training, under conditions which have necessitated a departure from the familiar tented camp, are similar in general scope to those which have confronted the navy in its present state of sudden and pronounced expansion. Circumstances are such as to necessitate a radical departure from the traditional practice of quartering naval recruits aboard receiving ships, these being entirely inadequate to accommodate the numbers of men now enlisting for the fleet. The following notes are descriptive of a cantonment designed to house not less than 5000 men at the naval station at Charleston, S. C., which has heretofore been able to quarter all recruits and casuals aboard the "Hartford," formerly Admiral Farragut's flagship, but latterly used as a receiving ship at the Charleston yard.

Advantages of the Camp Site

The site selected for the cantonment is a level sandy stretch of pineland, fairly well covered with first-growth long-leaf yellow pine. It lies partly within and partly without the limits of the naval reservation, a circumstance that has simplified the problems of water-supply, sewage disposal and illumination of the camp. It has been necessary merely to make suitable connections with the respective navy-yard services. Transportation also presents no special difficulty, as the site is on the line of the Seaboard Ry. and is connected with Charleston, some 10 miles distant, by electric railway and by highway, which is paved with Belgian block for all but a mile or so nearest the camp.

The layout of the cantonment is based on an administrative unit, or "regiment," of 1000 enlisted men of all grades including petty officers, but not including the proper complement of commissioned personnel. The entire cantonment will therefore consist of five units, or regimental camps, of which the following description represents the type plan.

For convenience of administration the regiment is divided into 10 companies, each subdivided into four sections of approximately three squads each. To be exact, 25 men compose a squad. To house a regiment, 40 small detached wooden barracks are provided, each housing a complete section. A combined mess hall and kitchen, a latrine and lavatory building, an administration building and a small building for the chief petty officers complete the unit camp.

The 40 barrack buildings are arranged on opposite sides of the latrine-lavatory building in two symmetri-

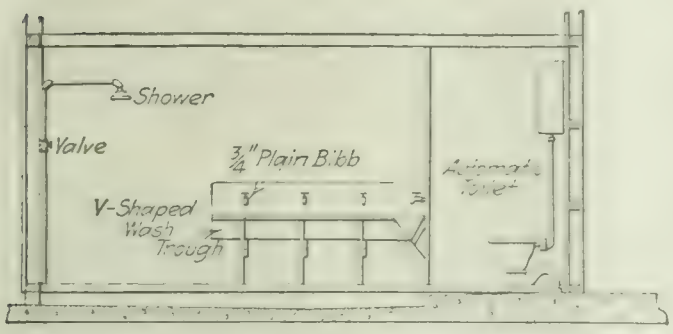


TO HOUSE A REGIMENT 40 OF THESE BARRACK BUILDINGS ARE REQUIRED.

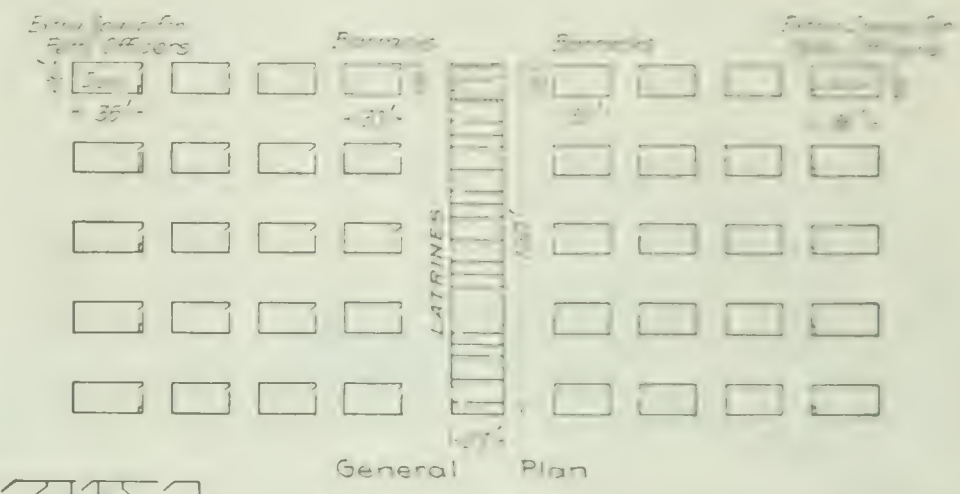
cal groups of five rows of four houses, placed end to end in each row. These houses are separated from each other by about 30 ft. in the clear. The three inner barrack buildings in each row measure 16 x 30 ft. in plan, while the outer building in each row has an additional 6 ft. in length as a concession to the petty officers, who are thus quartered on the flanks of their respective companies. A company occupies the four barracks in each row.

These small buildings are all on brick piers at least 18 in. in height above ground, and they measure 10 ft. from the bottom of the sill to the top of the wall plate. The roof is of the ordinary gable type, with a pitch of 3 in. to the foot. In either end is an ordinary slatted ventilator, or louver; and the building has but one door, which is placed in a corner in that end of the building nearest the latrine. The eaves overhang by 3 ft. No glazed windows are provided, but immediately under the eaves the walls on both sides and for the full length of the building are open to a depth of 22 in., with no provision whatever at present for closing this space.

About 1 ft. below this opening is another of the same depth, running the full length of the building on either side, but this may be closed by a series of panels, each about 6 ft. in length, hinged at the upper side. These panels are adjustable by means of a small line fastened to the lower edge of each and passing over a small sheave fastened at the outer end of a rafter, thence to a cleat placed at a convenient height on the wall. With



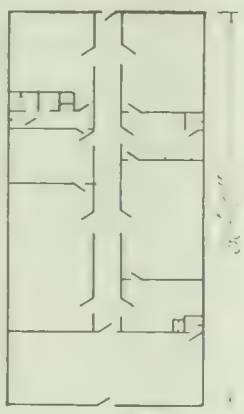
Longitudinal Section through Latrine

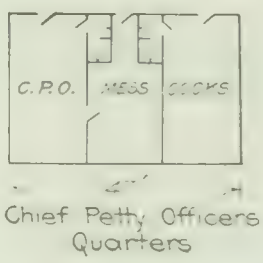


General Plan

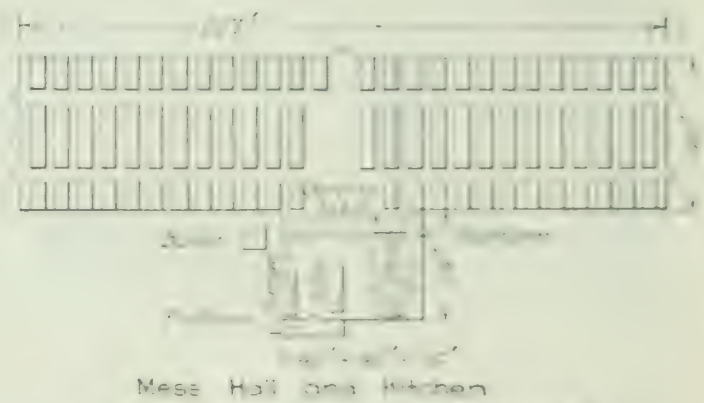


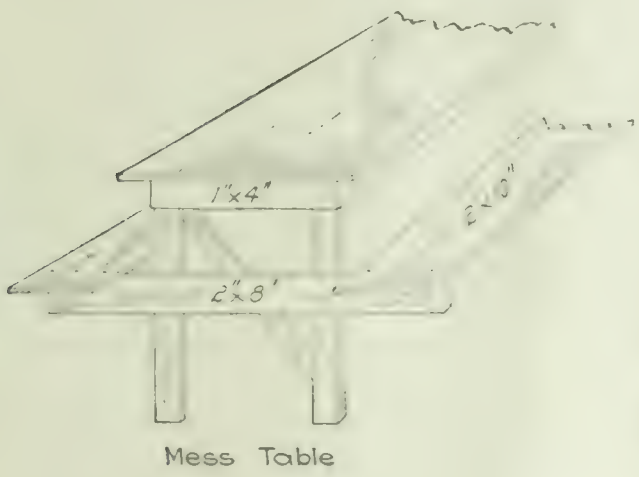
Details of Latrine


Administration Building

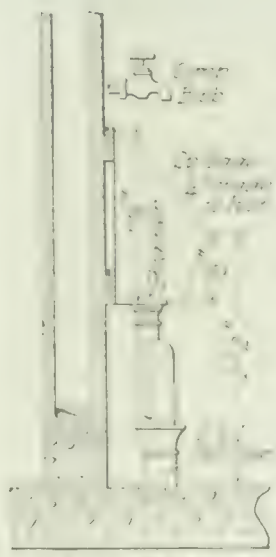


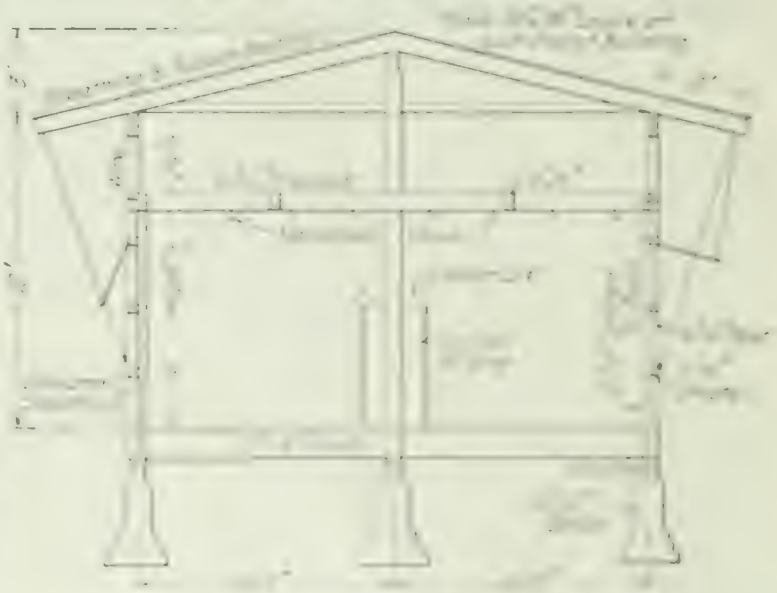
Chief Petty Officers Quarters


Mess Hall and Kitchen



Mess Table


Detail of Urinal


Transverse Section through Barracks

A FEW CONSTRUCTION DETAILS OF THE NAVY CAMP BUILDINGS AT CHARLESTON, S. C.

the approach of cold weather, both of these openings may be fitted with sash, which can be either fixed or arranged to slide on runners.

The entire building is sheathed up with a fair quality of sheathing, that on the walls being placed diagonally for greater rigidity. The roof is covered by four-ply roofing paper of good quality, and it is worthy of note that the side walls are also fully

covered by a lighter weight of high-grade roofing paper, carefully nailed on. If necessary for the preservation of this roofing material, it may be given an occasional coating of light protective paint. The ventilators in the gables, the openings in the side walls, and the doors are all screened with a good grade of galvanized screen wire, and the roofing-paper sheathing on the walls not only serves to keep out wind and driving rain, but is an absolute safeguard against flies, mosquitoes and other insect pests.

Hammocks Instead of Bunks

No cots or bunks are provided, but the interior framing is so laid out and provided with hooks or clews as to facilitate the swinging of the usual sailors' sleeping hammock. In this way is the fledging bluejacket given a "taste of the salt," while at the same time the limited floor space is kept available for use by day. The hammocks are swung from alternate crossbeams in such a way that the head of each hammock is opposite the middle of its neighbor on either side.

To provide storage for hammocks and clothing, each building contains down the center a series of lockers or narrow chests opening at the top and provided with rails in the interior, over which the hammocks and clothing are hung. In each building, at the end opposite the door, is a set of "pigeon-holes," each large enough to take a duffel-bag not too generously filled. Your true sailor is not encumbered with an excess of baggage.

Between the two groups of 50 houses and at right angles to their ridge-lines is a combined latrine, shower-bath and lavatory building 27 x 180 ft., partitioned off into 10 compartments. These compartments are again subdivided by low partitions to form a latrine and a common bathroom and washroom. One such compartment is assigned to each company, and the entrances are arranged alternately on opposite sides of the building. All of these compartments have concrete floors, pitched to drain through a proper floor-trap into the sewers. For each 100 men, eight wash-bibbs, eight showers and eight toilets are provided. The wash basin is merely a zinc-lined trough to catch the water from the eight spigots, it being expected that the men will use running water for washing, though tin basins may be supplied later if found advisable to reduce the waste of water.

In the earlier buildings, which were needed at once and for which suitable fixtures could not be had without delay, the urinal and the toilet consisted of merely a zinc-lined trough, the latter provided with suitable seats, flushed periodically by a heavy stream of water entering at one end and draining at the other. As was anticipated, objections to this primitive contrivance developed almost at once, and later buildings will be equipped with individual toilets of an efficient but economical factory type, operated in the usual manner by a spring when the weight is removed from the seat.



THE WALLS OF THE MESS HALL AND KITCHEN ARE TO BE SHEATHED WITH ROOFING PAPER AND ALL OPENINGS COVERED WITH GALVANIZED WIRE-CLOTH SCREENS

For each regiment of 1000 men a single mess hall and kitchen is erected at a suitable distance from the squad rooms and latrine building. The mess hall proper is 48 x 207 ft. in plan, with a kitchen 30 x 34 ft. opening off the middle on one side. The mess tables are of the well-known logging-camp style (seats attached) and are all 30 in. wide with seats 10 in. wide, suitably supported. There are 25 tables down the center, which will accommodate 20 men each, and 25 tables on each side to accommodate 10 men each, at the liberal rate of 2 ft. of space per man. Main aisles and passageways between tables are commodious and permit rapid service without confusion or risk of accident by collision of waiters.

The cooking equipment is virtually that of a ship's galley brought ashore and consists of eight or more steam cookers of 50 to 80 gal. capacity each and a 16-ft. coal range for roasting meat, baking and such other culinary operations as cannot be conducted by a steam cooker. The necessary steam is supplied by a 25-hp. boiler set up outside the building. Opening off the kitchen is an ice-box or refrigerator room 10 x 14 ft. in plan and about 6 ft. in height inside, built in place, with double walls of tongue-and-groove lumber, the

space between being packed with sawdust or planing-mill shavings to give proper insulation. The interior is zinc lined. Adjoining the ice-box is a storage room, also 10 x 14 ft. In the newer buildings the kitchens all have concrete floors, draining to a suitable floor-trap, which connects with the sewers.

Can Feed 1000 Men in 20 Minutes

The mess management is identical with that aboard the larger vessels of the navy, and details need not be discussed here, except to say that it differs from that of the army, where the mess unit is a company, and the company commander, assisted by a mess sergeant, is charged with the messing of his company, as well as its instruction, discipline and other multifarious details. In this navy cantonment the system will permit feeding the 1000 men in 20 min., should there be any necessity for such quick action.

On one flank of the mess hall is an administration building partitioned off into office rooms for the use of the officers, examining surgeons and others administering the cantonment. At the opposite end of the mess hall is a building for the accommodation of the chief petty officers, who assist in duties of training and administration.

In addition to the buildings above mentioned, separate quarters will be provided for the cooks; and an emergency hospital will be built, which will not only accommodate the inmates of the cantonment, but other casuals sent ashore from the fleet.

Local Contractors Pool Interests

As in the case of the other cantonments built or building, the first unit was a "hurry-up" job, without time to make any comprehensive study or to prepare plans or layout. The leading contractors of Charleston were called to the yard one morning, and the results to be obtained and the guiding principle to be followed were placed before them for consideration. Each contractor was requested to submit before nightfall a lay-out of the camp and type plan for buildings, with a bid for the construction of the first regimental camp. As a result of a conference held later between the officials of the yard and the contractors, the latter decided to pool their interests, plant and personnel. Work was virtually begun on the following day; and the first unit was complete within three weeks at a cost of about $33,000, which includes everything except the links necessary to connect the camp water-supply, sewerage and lighting systems with those of the navy yard proper. This is a per capita charge of $33 for the first 1000 men to be accommodated, but the four regimental units now building will be completed at a considerable reduction and in much less time per unit.

Cost $33 per Man

While this cost, $33 per man, appears to be rather high, it is not greatly in excess of the per capita charge for tented camps, and the comfort and security of the men against insect pests are much better in these wooden buildings than in the canvas shelters. Further, the wooden barrack has a much longer life than that of the canvas tent and has a sale value at the conclusion of the camp greatly in excess of that of canvas. In this particular cantonment the buildings are of such size as to permit their being moved bodily, and two or three can be consolidated and fitted out with verandas to form a very attractive bungalow. It is not improbable, in fact, that these wooden barracks will help to solve the problem that now confronts the navy-yard officials and the City of Charleston in respect to housing the employees of the yard during ordinary peace conditions.

The contractors on this work are the Simons-Mayrant Co., the Charleston Engineering and Contracting Co., McCrady Brothers & Cheves, and P. D. Hay. Mr. Stevenson, of the Charleston Engineering and Contracting Co., has served as general manager for the allied contractors. The work has been prosecuted under the direction of the commandant of the navy yard, Capt. B. C. Bryan, with Commander F. Morrison, captain of the yard, in immediate charge, assisted by Civil Engineer P. L. Reed, public-works officer.

Oil and Coal Costs Compared

Table Shows That One Ton of Coal Is Equivalent in Heating Value to 3.34 Barrels of Oil at 325 Pounds

One ton (2000 lb.) of coal is equivalent in practical heating value to 3.34 bbl. of oil at 325 lb. The table below compares the prices of coal and oil for equivalent cost as fuel in a boiler furnace:

Coal, per Ton (2000 Lb.)	Oil, per Bbl.		Coal, per Ton (2000 Lb.)	Oil, per Bbl.	
$5 00	$1 50	$1 661	$3 25	$0 98	$1 09
4 75	1 43	1 60	3 00	90	1 00
4 50	1 35	1 50	2 75	83	.92
4 25	1 28	1 42	2 50	75	.83
4 00	1 20	1 33	2 25	68	.75
3 75	1 13	1 25	2 00	60	.66
3 50	1 05	1 02			

* Not all costs for boiler attendance. † Assuming 10% of cost of coal in labor of firing and handling, taken as equal for oil, a conservative estimate for plants of over 300 horsepower

An interesting point to notice is that the heat value of an oil usually given is the high heat value, or heat value determined in a bomb calorimeter. The actual heat value available in a boiler furnace is less, because all fuel oil contains a considerable percentage of hydrogen, and the latent heat of the steam formed by the combustion of this hydrogen passes up the stack as waste heat.

In all the heavier grades of fuel, particularly the Mexican oils, water mixed with the oil is in the form of an emulsion and will not settle out in a tank, as it will with the lighter American crudes. This is not so much a disadvantage as it would seem other than causing a lowering of the heat value. With an oil light enough for the water to settle out of its own accord, this water will frequently accumulate in the tank and piping and go over into the burners in a slug, putting the burners out; but with heavy oil a very considerable amount of water can go through the burner with no bad effect. The writer is inclined to believe that a small quantity of water in heavy oil be an advantage in that these oils are usually heated above the boiling point of water to effect atomization, and the vaporizing of the moisture in the oil as it leaves the burner tip probably helps to atomize the oil more thoroughly.—B. S. Nelson, *Journal* of the American Society of Mechanical Engineers, June, 1917.

Plans for Army's Big Training Camps Made Public

System Perfected for Handling and Checking Rush Deliveries of Vast Quantities of Materials—Labor Pay To Be Limited

EFFECTIVELY localized responsibility is a feature of the system developed by the quartermaster general's office at Washington for handling the work of building the 16 cantonments for the National Army. The organization is under direction of a constructing quartermaster, who is aided by a military guard officer, and an engineer force working under a consulting engineer, an expert on water and sewerage problems, and, in some instances, an expert on town planning. To this organization the task of building each camp city is intrusted with full authority, under typical building plans drawn at Washington. Modification of the cantonment layout to suit the local topography is left to the local organization. Sewerage and water-supply plans are also developed locally, the typical design made at Washington being only a general guide. The road construction is not yet provided for.

Preparatory Work

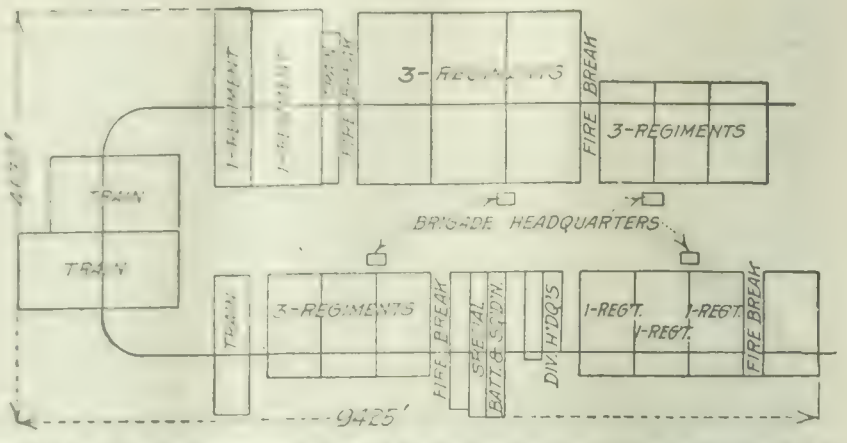
Railroad spurs or sidings must be built from the nearest main line, at railroad cost. After completion of the cantonment the railroad is not to form part of its transportation system, however, and the sidings are to be removed.

Rush delivery of materials will be secured by (1) filing copies of material-order certificates with the Car Service Committee of the American Railway Association and (2) using shippers' waybill envelopes indicating that the shipment is for Government use.

To get assured check on quantity and quality of lumber, the principal material, a double inspection is provided for this material. Inspection of quantity and quality will be made at the mill, and quantity will again be checked on receiving the lumber at the site.

The fire danger in this camp work calls for early consideration. Before any material is delivered, all brush, rubbish and dry grass must be cleared and burned for 300 ft. distant from all storage and building sites. Water casks and fire pails must be distributed and a patrol established at the start; also, signal systems and calls for the fire departments of near-by towns must be established. Later, fire companies with their own apparatus are to be organized. Smoking, fires open lights, etc., will be limited by special rules.

The rate of pay for labor shall, *as a general rule*, not exceed the union scale prevailing in the particular locality on June 1, 1917. Arrangements for working hours and overtime are at the discretion of the constructing quartermaster and the contractor. Subcontracting is not looked on with favor and will require special approval.



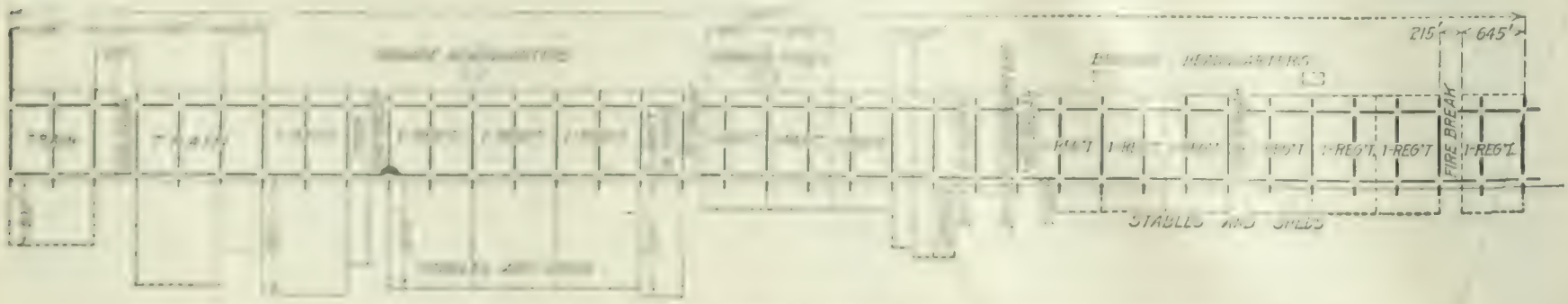
THIS IS A SUGGESTED ARRANGEMENT OF THE STANDARD CANTONMENT WHERE CONDITIONS PERMIT

The barracks for one regiment may, as soon as built, be used to house the contractor's labor forces, with restrictions as to use and subsequent cleansing and fumigation.

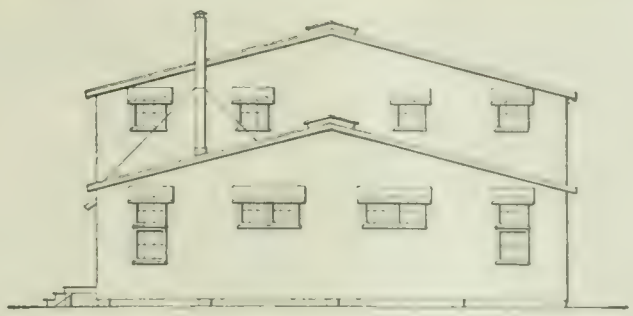
To keep the Washington headquarters in close touch with the work, each constructing quartermaster is to make a daily telegraphic report and a weekly written report, the latter reviewing the work of the week comprehensively and including graphical charts of material receipt and construction progress in the several classes of work.

A field auditor will check the orders and bills. Bill duplicates will be checked by his force on delivery of material; later the duplicate invoices are to be checked against them and finally the original invoice substituted. Very detailed routine has been established for this, for employment records, time cards and related items of the accounting work. The effect of this systematization is to render the central control at Washington as simple as practicable with work so extensive and done under such high pressure as this cantonment construction.

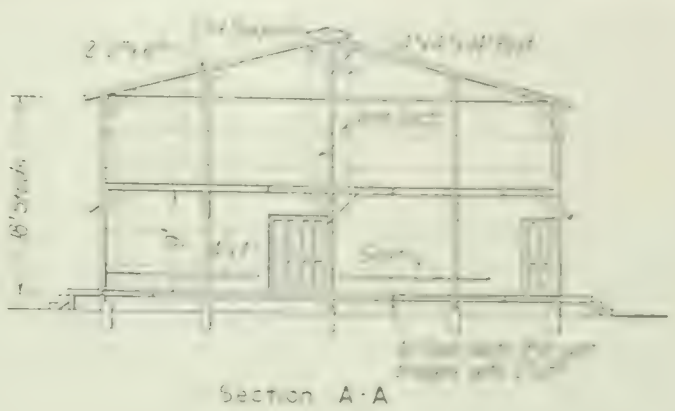
Payments to contractors are to be made about the ninth of each month regularly, and as often during the months as deliveries justify. A system of financial correspondence by telegraph has been arranged to enable Washington to supply the local office with funds daily, if required.



STANDARD LOCOMOTIVE LABELS FOR INTERSTATE LIGHT SHIPMENTS OVER THREE MILES



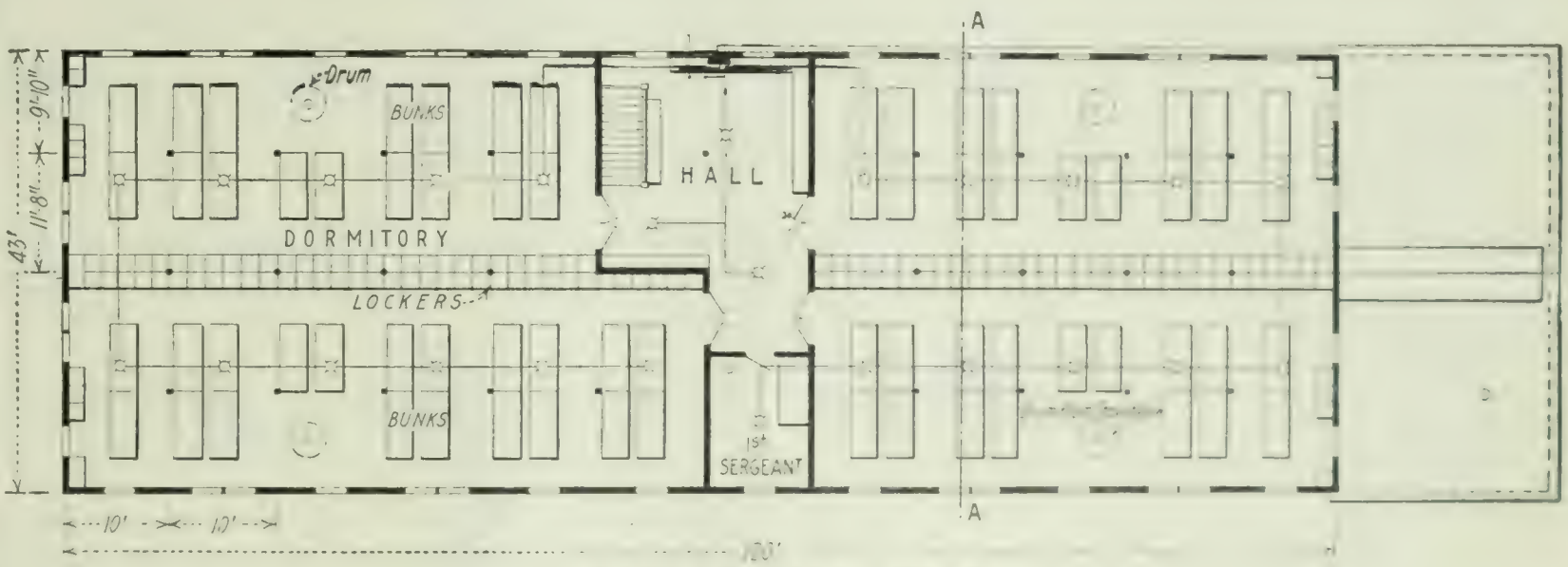
End Elevation (Kitchen End)



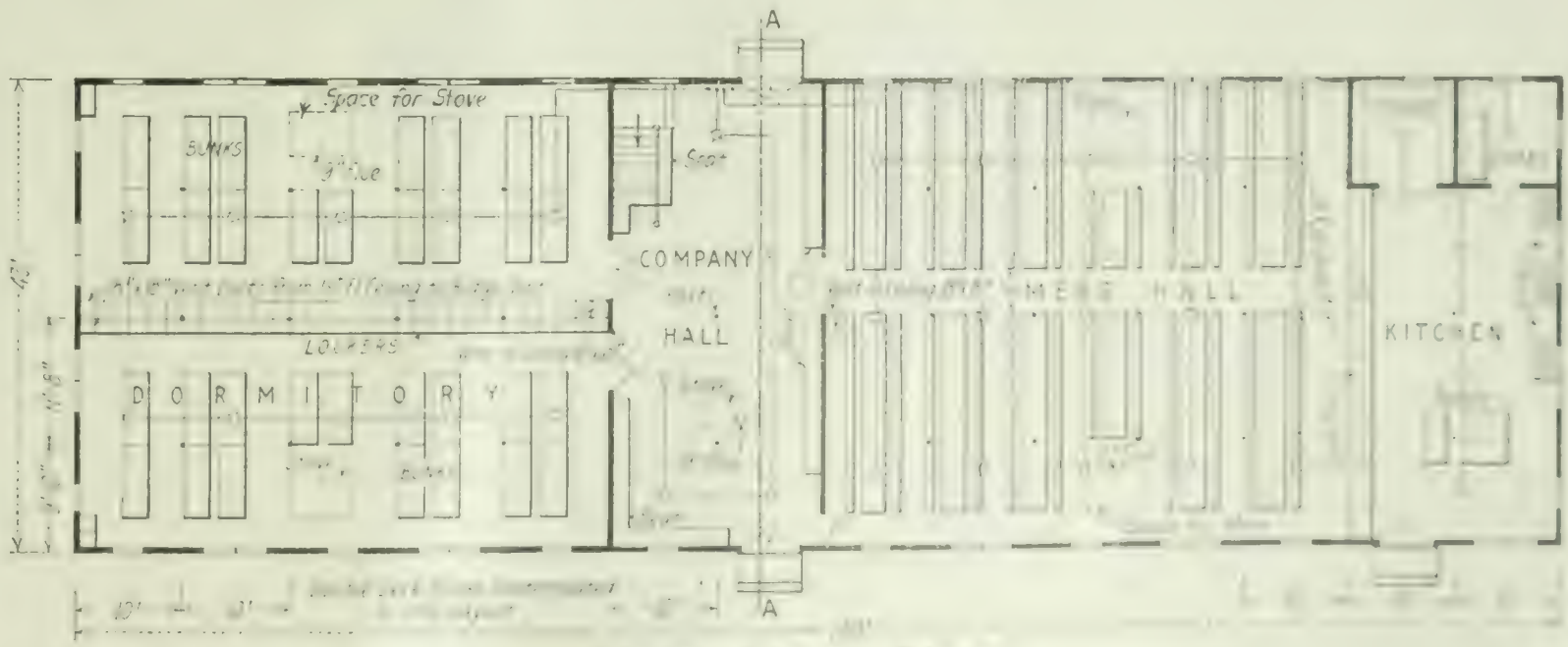
Section A-A



Front Elevation



Second Floor Plan



First Floor Plan

COMPLETE LAYOUT OF A STANDARD COMPANY [illegible] AND MAT IN THE WOODEN [illegible]

Buildings Will Be Simple Wooden Structures

The drawings herewith show typical arrangement and construction of the buildings of the cantonment. The barracks, two stories high, contain each its own kitchen and messroom. Lavatory buildings are separate.

The lines of buildings will be interrupted by 300-ft. fire breaks spaced about 2100 ft. apart. The roofs of buildings are required to be of metal or other fire-resisting material, and the side boarding must give a 15-in. clear space above ground or be carried down to the ground all round. If paint is used, it must be a cold-water paint of some fire-resisting quality. Storage buildings and the like will be metal clad. Inflammable materials will be stored in detached buildings, 150 ft. from other buildings if storing over 75 bbl. of oil. Gasoline in quantities over 15 gal. will be stored in underground tanks.

Fire stations equipped with motor fire apparatus will be provided, usually four per cantonment, or so located that no building is more than a mile away from a fire station. One fire station will be placed in or near the hospital group.

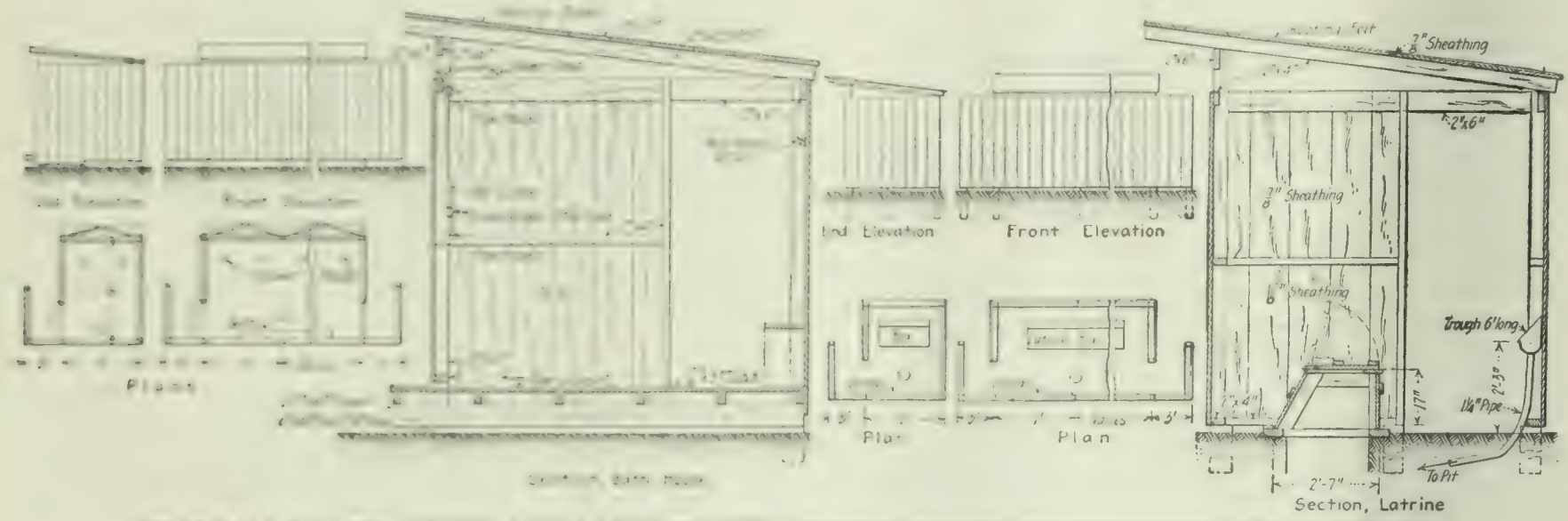
Water-Supply and Sewerage

The problems of water and sewerage will have to be worked out by the constructing quartermaster with his assisting experts. The intended supply capacity is 5[illegible] gal. per capita per day, but the one-hour supply rate must be about 150 gal. per capita per day; the normal pressure is 60 to 85 lb. per sq.in. Two 10-in. or 12-in. mains through the length of the site will be required in most cases. Wood-stave pipe of the machine-wound type is contemplated, with curves and specials of cast or wrought iron. Storage is to be provided (if minimum amount, 1,000,000 gal. capacity low-level or 300,000 gal. high-level).

The sites will be drained by open ditches. The sewer system is for sanitary sewage only. To give double assurance against entry of water into the sewers, the water pipes are to be laid in separate trenches, and the connection of specials is to be made with deep or wide sockets. All sewers are vitrified salt-glazed pipe, sizes 6 in. to 30 in., laid on gradients not less than 0.005 for 6 in. and 0.0007 for 30 in.; the joints are 1:2 cement mortar, except that deep-socket joints are calked with hemp or jute and then poured with hot compound. Deep-socket pipe is to be used in wet ground and in wooded areas. All sewers except outfalls are to have manholes at 300- to 500-ft. spacing.

The sewage is to be discharged into adjacent streams untreated, wherever possible. Where treatment is required, single-story septic tanks either wood or concrete are to be built, with gross capacity 10 gal. per capita. At Ayer (Mass.) and Wrightstown (N. J.), sand filtration may be used; in some other locations sprinkling filters are likely to be added to the tanks. Automatic chlorinating plants are called for, except where the system has sand filters.

No provision for electric wiring has been made so far. Laundries are also not in the plans; the use of civilian laundries is counted on, for the first. The barracks are to be heated by stoves in the lower story, with smoke pipes extending through the second story and the roof.



TEMPORARY BATH HOUSE AND LATRINE USED BEFORE SEWER CONNECTIONS ARE COMPLETE

To Charge Counties for Convict Labor Supplied by State of New Jersey

Upon request of Governor Edge, the State Highway Commission, New Jersey, is considering the adoption of a plan for defraying the cost of convict labor employed for county-road construction on a percentage basis between the state and different counties. Heretofore the state has been donating this class of labor for public-road work, regardless of locality, with an average expense of $1.45 a day for each man from prison, in addition to providing the apportioned state aid for the particular highway improvement, totaling 40% of the cost of construction. Calling the attention of the commission to this existing plan of state-road operation, the Governor says: "The employment of convict labor has simply been in the shape of a gift from the state to the county, meaning that in addition to giving 40% as state aid for new highways we are giving this entire cost of the use of convicts on the roads, which in my judgment is not equitable and an obligation which the state should not assume in addition." It is suggested to the commission that this arrangement for road construction be modified with a suitable and satisfactory plan allowing the state to continue to extend the 40% share of road cost, less the amount that should be credited by the county for the employment and use of the convicts.

Testing Materials Meeting Greatest in Its Twenty Years' Existence

War Conditions Have No Effect on Attendance or Interest in Specifications and Papers—General Bixby the New President—Joint Concrete Committee's Report Attacked

DESPITE war conditions and notwithstanding the fact that there were no "fighting specifications" to be ratified, the 20th annual meeting of the American Society for Testing Materials, held at Atlantic City the week of June 25, surpassed all attendance records. The total registration was 569 members and guests as against 513 for 1916, which was the previous record year. In a year when many societies are omitting their annual meetings for fear of lack of interest this is a remarkable tribute to the practical appeal of the American Society for Testing Materials, to the fact that it is a business necessity to manufacturing and consuming interests.

The war, with its immense increase in the consumption of many of the materials standardized by the Society, has not as yet reacted on specifications or committee activities, at least as reported. There were some properly veiled references to steel qualities as demanded by military authorities, vague rumors of the cessation of committee work for the period of the war and occasional comment on the effect of the war on producing or testing conditions, but for the most part it was evident that the making and improving of material specifications is proceeding in a normal and progressive manner.

Committee Work as Great as Ever

While the technical committees occupied their usual dominant position on the program, discussions of their reports were less vigorous than usual, which was due partly to the routine nature of the specifications presented but mainly to the excellent work in preparing the specifications. As has been pointed out before this year, the committees now so largely embrace the best talent on each subject and the members present at meetings have so consistently demanded approximate unanimity of committees on reports, that these reports more and more tend to approach a result acceptable to all interested. That this was true at the recent meeting is shown by the fact that of the 57 specifications and recommendations submitted, only one was rejected by the meeting. That was the specification for Wood Paving Blocks which was rejected because of irregularities in subcommittee make-up, as detailed further along in this report.

The sessions were admirably conducted by the President, A. A. Stevenson (Standard Steel Works Co., Philadelphia), with the aid of C. L. Warwick, the Assistant Secretary, who served in the absence of Prof. Edgar Marburg. Professor Marburg is recovering from a serious illness and is under physician's orders to refrain from such arduous duties as the secretarial work of the Society just before and during the convention involves. A telegram hoping for his speedy recovery was the first order of business of the convention. The evening devoted to the presidential address and the reception was amplified by a celebration of the 20th birthday of the Society, in which all the living past-presidents participated. Interest in all of the early sessions was consistently good, but toward the end the specialized subjects assigned there resulted in decidedly reduced attendance. The executive committee might well consider the better balancing of the program, with the view of preventing this gradual reduction in attendance.

A well-attended golf tournament on one afternoon was the main entertainment feature of the week.

Some Items of General Society Interest

Some matters of general interest to Society procedure were brought forward. It was decided that tentative standards, in the odd years when no Yearbook is published, shall be printed together in one binding for the members and also printed in the "Proceedings." The executive committee announced that the pressure in Washington had acted to delay the translation of the specifications announced last year, but that work was well under way and could be expected to proceed. The suggested addition of the word American to the standard portland-cement specifications was deemed not wise by the executive committee, and the specification will be named in accord with other standards of the Society. A discussion on the report of Committee C-2, transmitting the final report by the Joint Committee on Concrete and Reinforced Concrete, led to the submission and adoption of a resolution—of the meeting only—that the Executive Committee attempt the formulation of some rules governing the conduct of joint committees, both within the society and between the Society and other societies.

Financially and numerically the Society is flourishing and maintaining its gradual increase. For the ensuing year Gen. W. H. Bixby, retired U. S. A., was elected president and Prof. Edward Orton (Columbus, Ohio) the new vice president. Professor Marburg, it was announced, was continued by the executive committee as secretary-treasurer.

Fifty-Seven Specifications Submitted

There were submitted by committees 4 new standards, 31 new tentative standards, 18 revisions of standards to be published as tentative and 4 revisions of tentative standards. The new standards are Tests for Paint Thinners Other Than Turpentine, Tests for Shellac, Methods for Routine Analysis of White Pigments, all submitted by Committee D-10, and Methods for Sampling and Analysis of Creosote oil or Other Preservative Oils, by Committee D-7. The other specifications will be taken up under their subjects.

Committee A-1 on Steel presented its usual voluminous report, but with fewer vital recommendations

than is common. C. D. Young (Pennsylvania R.R.), who has been chairman for some years, resigned at the end of this year's meeting because of a change of his duties which prevent him from keeping in close touch with the progress in testing and specifications. The committee's recommended specifications were all adopted by the meeting to send to letter ballot. None were of exceptional interest or caused any controversy except the new Tentative Specifications on Tieplates and on Carbon Tool Steel. The former was objected to by Capt. R. W. Hunt (Chicago) because in his opinion it was "absolutely impracticable" and not in accordance with the practice of producer or demand of consumer. The objections to the tool-steel specification were that it was for chemical requirements only, which do not give an indication of what the service of the steel will be. The committee agreed that the specification was highly tentative, but advanced it as a desirable start. The meeting supported the committee in both instances. Other specifications of the committee related to minor changes in forgings, locomotive and automobile parts, boiler tubes, etc.

Cast Iron and Wrought Iron Have Few Changes

Committee A-3 on Cast Iron (Richard Moldenke, Watchung, N. J., chairman) had two new tentative specifications, on Cast-Iron Soil Pipe and Fittings and Railroad Malleable Iron Castings. The former has been demanded for some years and never before accomplished; the latter is in answer to increasingly urgent needs and is the forerunner of some promised analogous specifications particularly for conveyor-chain links. Two comparatively unimportant revisions on standards were also submitted.

The important work of Committee A-3 on Wrought Iron (S. V. Hunnings, Washington, D. C., chairman) was the recommendation that in the future separate specifications will be made for all wrought-iron products now classified with steel specifications in the Society standards. As a start there was offered a new Tentative Specification for Wrought-Iron Pipe—a product hitherto included in the specification for welded steel and wrought-iron pipe.

Committee A-4 on Heat Treatment of Iron and Steel submitted answers to several questions put by Committee A-1, but on motion of a member of the committee who stated that some of the committee were not in agreement with the printed answers, the report was referred back to the committee. Committee A-5 on Corrosion of Iron and Steel (S. S. Voorhees, Washington, D. C., chairman) reported the progress on its test panels of corrosion tests and the results of comparative investigations of the determination of zinc in galvanized coatings.

No New Specifications for Cement

Committee C-1 on Cement (Russell S. Greenman, Albany, chairman), which for years has been a center of interest and controversy, has settled down following the adoption last year of the Standard Specifications for Portland Cement and reported only progress. This progress is toward the preparation of standard compression tests and of specifications for natural cement. Committee C-9 on Concrete and Concrete Aggregates (S. E. Thompson, Boston, chairman) while not presenting any specifications, submitted two very valuable and progressive recommendations. The first comprised suggested methods for making and testing field specimens of concrete and reduces to a practical working basis the technique of a comparatively new but very useful testing procedure. The methods are not submitted as final but rather as suggestions based on the limited available information. The second part of the report is given over to suggested calorimetric tests for organic impurities in sand, a unique and workable test developed recently in the Lewis Institute in Chicago.

Joint Committee on Concrete Criticized

The other concrete committee—C-2 on Reinforced Concrete (F. E. Turneaure, chairman)—submitted the Final Report of the Joint Committee on Concrete and Reinforced Concrete, "which is the result of the joint efforts of its own members and of the representatives of other societies appointed for the same purpose." The Secretary, R. L. Humphrey, announced that the committee now had under consideration the preparation of specifications for reinforced concrete, using the Joint Committee report as a basis, that report being distinctly stated not to be a specification. The committee intends to invite its colleague committees on the Joint Committee to join in this work. After two written discussions on minor points, the Joint Committee's report was attacked by R. J. Wig (U. S. Bureau of Standards) as an altogether too optimistic document from the construction and wear viewpoint. Mr. Wig offered no criticism of the design features of the report, but he contended that the sections on methods and adaptability of reinforced concrete did not take account of many of the known deficiencies in concrete and in consequence failed to present a true exposition of its qualities and possibilities. Such members of the committee as admitted Mr. Wig's premises claimed that the information on which he based his criticism was more recent than the report, which is dated July 1, 1916.

Little attempt was made to discuss the criticisms themselves, however, as controversy over the disposition of the report soon arose. An attempt was made first to accept none of the report, and later only that part relating to design, but representations that a Joint Committee report—particularly one which has been in public circulation for five months—could not be treated so cavalierly, overcame whatever opposition there was to the report itself, and it was accepted as a report of Committee C-2 and ordered printed, with the request that Mr. Wig specify his criticisms in a written discussion. The controversy, however, led to the recommendation on joint committees noted earlier.

Clay and Cement Sewer Pipe Separate

Committee C-4 on Clay and Cement Sewer Pipe (Rudolph Hering, New York, chairman) had meetings subsequent to the preprinting of its report, at which some changes in the four specifications presented this year were made. At these meetings there evidently had been an effort made to combine in one specification the two now separately presented for Clay Sewer Pipe and Cement Concrete Sewer Pipe respectively. The action of the committee is somewhat obscure and was not cleared up at the society meeting. The result seems to be, however, that the two specifica-

tions are to be submitted separately to letter ballot but that the committee considers that they ought to be united. Two further tentative specifications were proposed and accepted by the meeting—for Recommended Practice for Laying Sewer Pipe and for Required Crushing Strengths of Pipe To Carry Loads for Ditch Filling, the latter being changed in title from that appearing in the preprint.

Committee C-5 on Fireproofing (Ira H. Woolson, New York City, chairman) presented the standard time-temperature curve for testing already brought before the National Fire Protection Association, as noted in *Engineering News-Record*, May 31, 1917, p. 435, and amended the present Standard Test for Fireproof Floor Construction and for Fireproof Partition Construction in accordance with this curve and to meet the views of a joint conference which has been held by those societies interested in fire protection.

New Tentative Specifications for Masons' Lime were presented by Committee C-7 (J. S. MacGregor, New York City, chairman). These are to take the place of the present lime specifications in so far as structural lime use is concerned. It is hoped in the coming year to make new specifications for agricultural and chemical uses of lime. Some very elaborate tests of hollow tile construction, tests which give good base figures from which to figure the strength of walls of this material, were part of the report of Committee C-10 on Hollow Building Tile (L. H. Provine, chairman). No new specifications were submitted.

Wood Block Specification Irregular

The one specification of any sort which was not accepted by the meeting—and hence will not go to letter ballot for approval—was that on Wooden Paving Block submitted by Committee D-7 on Timber (Herman von Schrenk, St. Louis, chairman). This specification stated to be the joint production of representatives of various societies, is the same as was adopted by the American Wood Preservers Association in January, 1917, but has been amended (to avoid a recent patent) from the specification adopted September, 1916, by the American Society of Municipal Improvements and received, January, 1917, by the American Society of Civil Engineers. The specification was presented to Committee D-7 by its subcommittee IV and was voted on by the main committee as follows: Affirmative, 25; negative, 2; not voting, 7.

Discussions submitted to the meeting of the Society objected strenuously to the specification, mainly on the ground that it promoted a monopoly, inasmuch as only one producer could meet the specification. This claim did not reach refutation because it was submitted that the subcommittee making the report was made up of five producers to one consumer, in contravention to the rules on regulation of committees. President Stevenson, who was in the chair, thereupon ruled that the specification—and all of the report emanating from this subcommittee—would have to be thrown out unless the meeting by a majority vote waived the regulation. The vote was put and the waiver defeated, whereupon the chairman ruled out this part of the report.

A second part of the committee's report related to the amendment of the Tentative Methods for Sampling and Analysis of Cresote Oil, for which a nine-tenths vote of those present was asked so that these specifications could legally be submitted to letter ballot as standards. With the addition to the title of the words "Or Other Preservative Oils" this specification was accepted by unanimous vote so that it now goes to the letter ballot as a standard.

Dampproofing vs. Waterproofing

In the discussion of the report of Committee D-8 on Waterproofing (W. A. Aiken, New York, chairman) some disagreement among members of the committee present at the meeting as to the use of the terms "dampproofing" and "waterproofing," delayed progress for a while, but finally the four specifications submitted were approved, with changes of title in cases, so that they now are to be submitted as tentative specifications on "Asphalt for Use in Dampproofing and Waterproofing," "Primer for Use with Asphalt for Dampproofing and Waterproofing," "Coal-Tar Pitch for Use in Dampproofing and Waterproofing" and "Creosote Oil for Priming Coat with Coal-Tar Pitch for Dampproofing and Waterproofing."

Committee D-4 on Road Materials (Logan W. Page, Washington, D. C., chairman) contributed three tentative specifications on toughness of rock, tests for specific gravity of coarse aggregate and methods for distillation of bituminous material for road treatment, as well as some new definitions of terms used in road building.

The following committees submitted specifications dealing with specialized branches of their subjects: B-2 on Non-Ferrous Metals and Alloys, C-8 on Refractories, D-1 on Preservative Coatings, D-2 on Lubricants, D-9 on Electric Insulation, D-11 on Rubber Products and D-10 on Shipping Containers. All were approved by the meeting. Committees C-6 on Drain Tile, D-13 on Textiles and E-3 on Pipe Threads presented progress reports but no specifications. Committee E-4 on Magnification Scales for Micrographs established tentative standards for microphotographic work. Committee E-1 on Methods of Test changed the Standard Methods of Testing so that the speed of testing is no longer noted as inconsequential, but it is restricted within certain stated limits.

Although 29 papers were on the program and most of them were read, in abstract, by the authors, the discussion developed little of additional interest. A number of the papers are abstracted on another page of this issue.

Illinois Has $7,000,000 for Roads

For roadwork in Illinois this year there will be more than $7,000,000 available, according to a statement by S. E. Bradt, secretary of the State Highway Commission. This amount appropriated by the legislature includes $1,326,000 to meet the Federal allotment and $1,200,000 for state-aid work, while there is an unexpected balance of $1,174,000, making $3,700,000 in all. The Federal Government will grant $1,326,000, and the several counties must make appropriations aggregating the sum of the unexpected balance and the state-aid appropriation. The grand total is $2,400,000. A new law in Illinois makes a considerable increase in license fees for automobiles, and the amount raised in this way will swell the state's appropriation for roads.

Materials and Methods of Tests Discussed at Annual Convention

Wide Range of Subjects Presented at Last Week's Meeting of the American Society for Testing Materials, at Atlantic City — Abstracts of Some of the Papers Given Below

The following are abstracts of papers presented last week at the annual meeting of the American Society for Testing Materials held in Atlantic City, N. J.:

What Controls Rock Toughness?

The variation in results noted in tests made on duplicate samples by several laboratories led F. H. Jackson, Jr., to investigate the effect of controllable variables on the toughness test for rock. Employing the Page impact testing machine, he found that it is extremely necessary to watch the direction of drilling with reference to possible planes of weakness in the material, variations in the character of the rock from point to point in the quarry, and slight variations in the diameter and height of the specimen.

Grain Size in Ingot Iron

B. J. McAdam, Jr., described some observations and experiments on "Admiralty metal" and on cold-wrought ingot iron. After a preliminary treatment to produce a small grain size, which was then followed by a varying reduction in thickness and annealing at different temperatures, he found that ingot iron has a "recrystallization range" of temperature extending from about 900° to 1475° F. In this range, the grain size for any definite amount of previous deformation seems to be independent of the temperature and to depend only on the amount of deformation. The smaller the deformation, however, the higher the temperature necessary to produce recrystallization.

A Method of Comparing Different Cement-Lime Mortars

Warren E. Emley, of the United States Bureau of Standards, has investigated the properties of a number of variations in cement- and lime-content mortars and prepared diagrams by which the relative properties of different kinds of mortars may be determined, using the familiar triaxial diagram. Four methods of proportioning mortars are first graphically represented on triaxial diagrams laid out on tracing-cloth sheets. These four methods give the determination of the percentage of lime by (1) weight of cement added, (2) weight of cement substituted, (3) volume of cement added and (4) volume of cement substituted. Then 45 mortars of varying proportions were each tested to determine the following properties: Percentage of water for normal consistency, soundness, time of set, yield, cost per cubic foot of mortar, compressive strength at 7 days in air, 6 months in air, 6 months in water, and tensile strength 6 months in air and 6 months in water. Using the same triaxial diagrams, these tests were plotted for each property investigated, and contour lines were drawn on the diagram indicating the position of any variation of percentage of the three ingredients (cement, lime and sand) for each of the properties.

To determine the relative values of any number of different mixtures, the position of the mixture is marked on the proper tracing-cloth diagram and the location of that point noted by superposition of the tracing on each of the contour diagrams.

Aggregates for Road Concrete a Measure of Road Strength

On the assumption that the two main causes of deterioration of concrete in roads are the wearing action of traffic and the cracking of the concrete due to its lack of tensile strength, J. P. Nash, of the University of Texas, made tests on concrete of different aggregates in order to determine the resistance to abrasion and the tensile strength in large sections. The abrasive tests were made by measuring the loss on the inside of an annular ring subjected to the battering of the cast-iron cubes of an ordinary rattler. The tension tests were made on briquets of 25-sq.in. section shaped like the standard 1-in. briquet. Concretes of different types of aggregate and different mixtures were used.

The general conclusions are that uniformity of wear is obtained when the mortar and the coarse aggregate wear equally, and for this condition crushed limestone or limestone gravel had better be used. Coarse aggregate should be limited in size to about 1½ in.; but when a hard tough stone is employed, the size should be limited to about 1 in. and the cement content increased. There seems to be no difference in the tensile strength of concrete made of crushed stone or of gravel. The wearing quality of the stone is somewhat superior. It is questionable if a richer mix than 1:2:4 is economical with crushed limestone of the ordinary hardness. The use of more cement tends to contraction cracks that offset any gain in tensile strength. Crushed slag, when hard and uniform, should be satisfactory as a concrete-road aggregate.

High-Silica Portland Cement

In the construction of the Ebro dam, near Barcelona, Spain, lack of near-by commercial cement mills required the construction of a mill near the dam. The rock here proved to be so high in silica that several experts reported that it would be impossible to make cement of the material available. The construction managers, however, proceeded to construct a two-rotary, dry-process plant, electrically equipped throughout, with a nominal capacity of 1500 bbl. per day. The cement produced had about 26.45% of silica, as against 22%, the normal average of an American cement.

A description of the cement is given by A. W. K. Billings, of the Ebro Irrigation Power Co., Barcelona. He found that it set within the usual time, but hardened

very slowly, and that it was uniformly sound and under the autoclave test always gave satisfactory results. The strength at 1, 7 and 28 days was frequently less than that required by standard specifications, but at later periods the curve rose above the standard requirements. Concrete cut from the dam in cubes in some instances reached 6200 lb. per sq.in. in compression.

In the manufacture of the high-silica cement, the temperature required in the kiln is considerably higher than for average cement. More fuel is required and the cost of maintenance of the kiln lining is greater. The increased coal consumption amounts to about 6% of the weight of the cement. Mr. Billings concludes that for purely commercial competition with near-by mills such cement would be at a considerable disadvantage, as it would also be in ordinary reinforced-concrete work where quick hardening is necessary. For mass concrete work where high ultimate strength is useful, such cement might prove profitable.

What Effect Has Consistency on Concrete Strength?

L. N. Edwards, supervising engineer of bridges, Toronto, Can., reported a rather extensive series of tests investigating the effects of grading of sand and consistency of mix upon the strength of plain and reinforced concrete. The tests were made upon (1) cylinders in which twelve sands of predetermined gradings were used as fine aggregates; (2) cylinders and reinforced-concrete beams in the preparation of which five consistencies of mix were used; and (3) cylinders in which time of mixing was from ¼ to 2 min. The conclusions agree with those of later similar investigations.

In brief, they are that the common visual examination test of sand is unreliable, that the volumetric method of proportioning is impracticable and unscientific, that the value of a sand for concrete can be determined by testing concrete made from that sand, that the strength of concrete increases with the time of mixing at least up to 2 min., that excess water decreases strength, that there is no definite relation between the compressive strength of mortar cubes and of concrete produced from the same sand.

Two parts of Mr. Edwards' conclusions, in detail, are as follows:

"The excess water in an oversaturated concrete necessarily occupies space and thereby bulks up the mass. By reason of its high surface tension, it forms water globules which, although somewhat affected by the weight of the concrete, are nevertheless distributed throughout the mortar component and are accumulated underneath the particles of the sand and stone aggregates and the reinforcing steel. By evaporation, this excess water ultimately disappears, leaving a considerable volume of water voids and cavities which constitute an extremely important factor in the strength and reliability of the concrete.

"The critical failure of reinforced concrete depends upon the intensity of the bond existing between the concrete and the steel reinforcement. Concrete containing an excess of water not only develops less surface contact with the steel on account of the resulting increase in the volume of water voids and cavities; but in addition, the excessive laitance produced by the water tends to accumulate around the reinforcement, thus contributing materially to a decrease in strength. This condition becomes further aggravated by reason of the tendency of the laitance to become less resistant with age."

Void Theory of Concrete Mixtures Amplified To Include Costs

In a paper presented at the convention of the American Society for Testing Materials two years ago, J. A. Kitts laid down the principle that the best concrete mixture from the point of view both of strength and economy is one in which the voids in the sand approach being filled by the cement and the voids in the coarse aggregate by the mortar. Following up this theory, particularly in regard to economy, he has analyzed a number of reported tests, and has deduced certain conclusions, which he reported at this year's meeting of the society.

The main results for concrete may be stated as follows: For economical proportions the volume of cement should be equal to or greater than the volume of voids in the sand, but not to exceed a multiple of 1.5; and the volume of mortar should be equal to or greater than the volume of voids in the coarse aggregate, but not to exceed a multiple of 1.5. The economy factor expresses the relative efficiencies of concrete mixtures and may be determined by the equation

$$\text{Economy factor} = \frac{\text{Compressive strength}}{C = \frac{P_c}{P}C_c + \frac{P_s}{P}C_s + \frac{P_r}{P}C_r} \times \text{yield}$$

where P_c, P_s, P_r equal volumetric proportions and C_c, C_s and C_r the costs in dollars per cubic yard of cement, sand and rock respectively. The yield is based on the volume of the coarse aggregate as unity.

Concrete Slabs Prove Stronger After Excess Water Is Rolled Out

The method used in Macon, Ga., of finishing concrete roads—that is, by rolling the fairly wet concrete with a light roller to force the excess water out—was tested in the laboratory of the Lewis Institute and reported by A. N. Johnson, of the Portland Cement Association. The concretes used were of the following consistency: Dry (finished with wood float in the ordinary way); wet (finished with wood float in the ordinary way); and wet (finished by means of a roller). The dry-consistency slabs were as stiff as could be easily handled, much different from those usually found in concrete-road work where conditions require a fairly wet mix. All slabs were made and tested in flexure.

Four slabs of wet consistency, finished by hand, had an average modulus of rupture of 308 lb. per sq.in. Four slabs finished with the roller had an average modulus of rupture of 369 lb. per sq.in., an increase of 20%. The slabs made of a stiff mixture—that is, of a medium consistency—give an average modulus of 340 lb. per sq.in.; that is, they are stronger than those of a wet consistency finished in the same manner, but the wet-consistency slabs finished with the roller are stronger than those of medium consistency, showing an in-

crease of nearly 10%. Mr. Johnson concludes that the tests show that by roller manipulation the supposedly necessary wet mixture may be made perfectly satisfactory for road use. The rate of application of load affects the compressive strength of the concrete under test.

Specific Gravity of Fine Aggregate Definitely Determined

Specifications for fine aggregate for concrete generally call for a determination of the specific gravity of the material. This is required to be the apparent specific gravity—that is, the specific gravity of the mass of the aggregate, including the air spaces or voids. Difficulty has been found in determining this, and A. S. Rea, testing engineer of the State Highway Department of Ohio, has recently devised a method which is successfully used by that department.

A sample of the aggregate is placed in a graduated cylinder and a small amount of kerosene poured over the grains, of sufficient quantity to saturate the grains and allow for a slight excess. The cylinder is vigorously shaken until all the grains appear to be coated with kerosene. A measured quantity of water is then introduced into the cylinder, and it is again shaken, the excess of kerosene being brought to the surface. The line of demarcation can be read between the two liquids. From the dry weight of the aggregate and the volume of the liquid displaced, the apparent specific gravity of the aggregate can be calculated. This method is based on the principle that the pores in the grains will be filled up with the kerosene, preventing any water entering there. The water measured will then be accurate.

Some New Testing Devices

By using a wedge-shaped test piece in a special air bath, J. A. Capp and F. A. Hull obtained, in addition to the melting point, several valuable indications of the changes in condition of the material throughout the temperature range below the melting point. They have found this method particularly interesting when examining materials that must be used under condition of stress.

The alternating torsion testing machine described last year by D. J. McAdam, Jr., has been improved by the insertion of a helical spring between the test specimen and the reciprocating arm. The spring automatically increases the angle of torsion of the test specimen as the specimen yields, thus keeping the torsional moment nearly constant until just before the specimen breaks.

At What Speed Should Concrete Tests Be Made?

In compression tests of concrete, the rate of application of load has an important influence on the strength. A series of tests made by D. A. Abrams of the Structural Materials Research Laboratory, Lewis Institute, Chicago, shows some results along this line. For rich mixtures (1:5 and 1:3) tested at the age of 28 days, the strength when loaded at 0.15 in. per min. was 14 to 20% higher than when loaded at 0.006 in. per min. When part of the load is applied at a fast speed and the remainder at a slow speed, the ultimate strength is not changed, even though as much as 88% of the total load be applied at the fast speed. Knowing the approximate strength of the specimen, it will greatly expedite the work of testing and involve no sacrifice in accuracy if we apply, say, 50 to 75% of the ultimate load at a fast speed before changing to slow speed. A machine speed that gives a shortening of the test piece of 0.01 to 0.02 in. per min. per ft. of length is recommended as a standard rate for compression tests of concrete.

Saybolt vs. Engler Viscosimeter

The usual methods of obtaining absolute viscosity by a translation of Saybolt and Engler figures through the equation of Ubbeholde are called into question by Winslow H. Herschel, who shows that, since the critical velocity of water through the short tube of these viscosimeters is greater than 800 times the kinematic viscosity divided by the diameter of the tube, an additional correction factor should be applied. He intimates that there is a need for scientific purposes of a self-contained, portable and durable long-tube viscosimeter by means of which absolute viscosity may be measured directly.

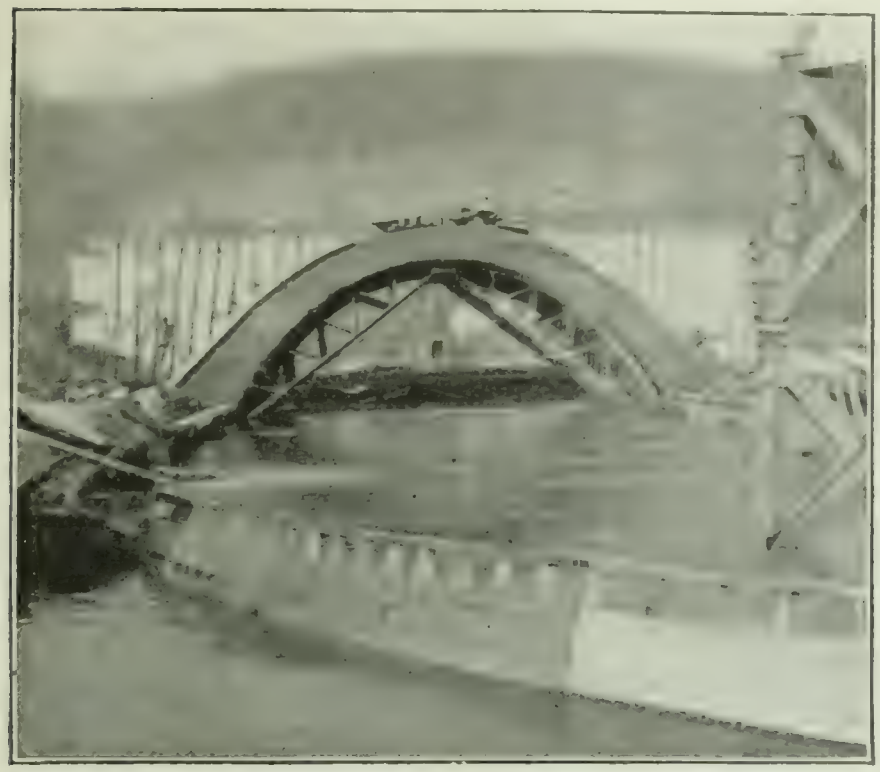
The use of the Engler viscosimeter for the purposes of determining the consistency of heavy road oils is questioned by Prévost Hubbard and F. P. Pritchard, who have found that bitumens having a penetration too high to be determined on the penetrometer, and a viscosity too great to be determined on the viscosimeter at normal temperatures, may at the necessary abnormal temperatures show an identity of consistency which will disappear when more normal temperatures are employed. To fill the gap between the penetrometer and the viscosimeter, they have designed a new form of consistency tester. It is an aluminum plunger to the top of which is attached an aluminum retarding disk. The settling of this through the bitumen contained in a specially designed water bath gives a very satisfactory measure of the consistency of the bitumen in service.

Finding the Yield Point in Steel by a Semi-Autographic Method

In the testing laboratory at the University of Illinois, H. F. Moore has been successfully determining the proportional limit of material with a testing rig that is semi-autographic in its nature and is applicable to rapid speed of the machine. It has been used in two forms, one of which takes two men to operate, while the other allows the whole testing and recording of operations to be carried on by one man. Essentially, it consists of a cylindrical record that is moved circumferentially by hand control and vertically travels automatically proportionately to the travel of the poise of the machine. The operator controls the circumferential motion by a ratchet wheel, moved at regular intervals as noted on an extensometer attached to the testing piece. The resulting record is a stepped curve on which the horizontal steps represent successive fixed elongations and the vertical steps definite loads.

Covered Concrete Channel for Creek at Steel Plant

Built with Dragline and Floating Mixer Plants—Concrete Delivered by Rail and Chute—Forms Rolled Around Curve



MAN SHOWS SIZE OF HUGE CULVERT

IN BUILDING about 1000 ft. of covered creek channel, in three sections, to divert Peters Creek where it flows into the Monongahela River at the north end of the Clairton (Penn.) works of the Carnegie Steel Co., the contractor placed the concrete with floating mixing plants in the river, partly by direct spouting and partly by carrying it to the forms in industrial cars. The work was handled with one dragline, two whirler derricks, a floating dredge and a piledriver for the excavation and foundation work. One concrete plant placed the two sections farthest from the river and then assisted a second plant to finish the river section. The first mixer boat, equipped with a short steel tower, delivered concrete to an industrial railroad, which distributed it to be placed by the whirlers. The second plant, which completed the outer end of the river section, was operated by spouting direct to place.

The large, heavy arch sections were constructed with inside forms of the contractor's design and manufacture, which were moved around curves as easily as on a tangent.

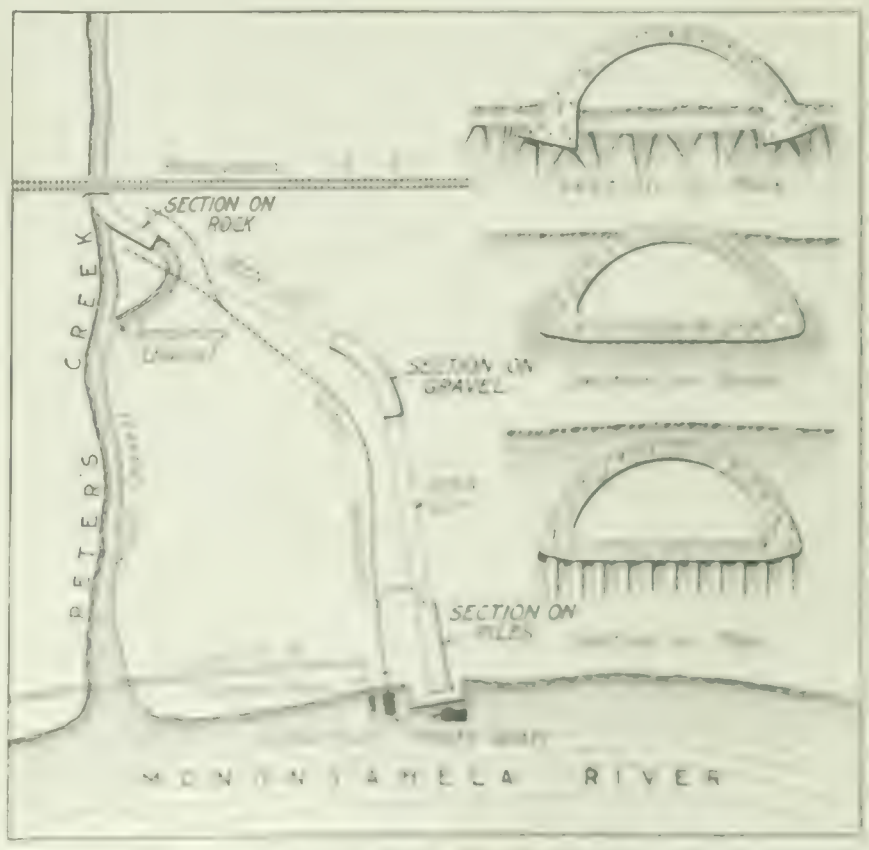
Creek Under Site for Coke Plant

The plant, between the Pennsylvania R.R. and the river, is situated on an alluvial deposit that varies from 20 to 50 ft. in depth from the surface to rock. Across the northern end of the site, where large extensions to the coke-making capacity of the plant are to be located, runs Peters Creek. As this entire area is to be filled to a higher level, it was decided to construct a covered channel for the creek. In order to reduce the cost of the work, the new channel was relocated. Since sections of the new creek tunnel will be subjected to heavy loads from large structures, two gaps were left in the tunnel where future buildings will be erected over the new line of the creek. These gaps will remain as open channels until the slag fill has been carried to full height on each side of them, after which pile or other foundations for the permanent structures can be constructed and the covered channel and fill completed.

The old creek channel ran almost at right angles to the axis of the property, from a double-barreled stone culvert beneath the Pennsylvania R.R. line to the river. To get away from this channel and make construction easier, the new line of the creek curves away from the culvert sharply, pursues a straight course until the first open channel section is passed, curves back toward the river in the second concrete section, passes through a second open space, and reaches the river through a third covered channel, supported on piles.

Construction of Bypass Avoided

The flow of the creek was not disturbed by the construction of the first section, as it has no floor or invert. The arch is supported on side walls, which are carried down to rock 10 or 12 ft. below the creek surface. These walls on each side of the arch were constructed to a level above the spring line in four sections in steel cofferdams. One dam would be driven, excavated and concreted at a time, permitting the creek to take its course around the outside of the sheeting. At the completion of this operation the creek was flowing between the concrete side walls to the downstream end of the first section, where it was thrown back into the old channel through a temporary ditch. When this section of the new open channel is dredged, part of the excavation will be used to dam this ditch. This portion of the work was handled by setting up a large stiff-leg derrick on each side of the tunnel. After the section of the arch next to the railroad culvert had been placed, it would have been necessary to move the derricks in order to complete the second half of the arch away from the tracks. This was not done, however. The dragline, having gone as far as possible with the excavation of the open channel below, was rolled forward between the tun-

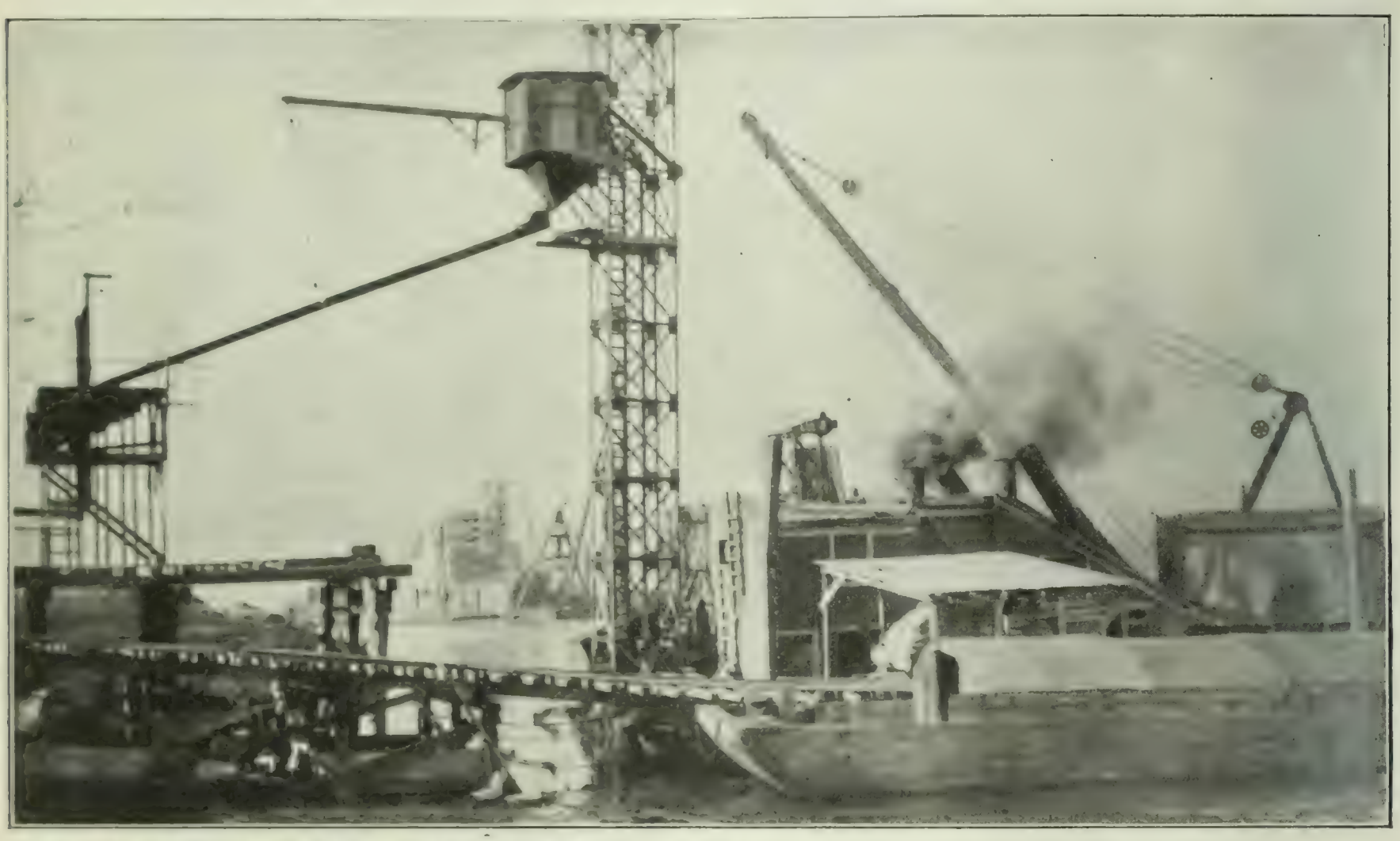


nel and the railroad tracks and used to complete the second portion of the arch, which it accomplished in two moves.

The inside forms, carried by three-hinged arch ribs, were moved on rollers on stringers supported by piles or posts just inside these side walls. The forms were raised on wooden wedges when in place, and were lowered several inches to clear in moving. As the arch ribs were not connected to each other except by the lagging, they could readily be set so as to pass around a curve. The same lagging could be used for both the curved and the straight sections. The outside forms were in slabs, secured to the inside forms with tie-rods to resist the pressure of the concrete. Universal form clamps were used, making it possible to get along with all rods of one length, the thickness of the arch varying considerably.

The excavation for the new channel was begun last fall, at the same time the coffer-dams for the side walls on the section next to the railroad were begun and the piledriving for the river section started. The middle section, however, being supported by a concrete invert resting on gravel, was naturally ready for concrete some time in advance of the more difficult sections. It was accordingly completed and backfilled before the section next to the railroad was done or the work of concreting the river section had started. Similarly, the river section, which required the driving of 3700 piles with a floating rig and the subsequent closing and pumping of a box coffer-dam in the Monongahela River, took longer to prepare for concrete than the section next to the railroad. Consequently, all the other concrete work had been finished by the time the river section was ready for pouring the invert.

The work extended for about a third of a mile. It was cheapest to receive gravel and sand by water and to distribute concrete by a narrow-gage line at ground level. Accordingly, a floating concrete plant with a short steel tower, a 1-yd. mixer and a whirler derrick mounted on the rear end was moored to the bank just upstream from the mouth of the new channel, and a section of chute was rigged to a hopper over the end of the narrow-gage line. Two dinkeys, each pushing a platform car carrying four 1-yd. concrete buckets, were operated on this road. The buckets were picked up by the derricks, or whirlers, and dumped directly into the form, except for the middle section. Here, during the winter, heavy rains had caused the cut to cave until it was necessary to locate the whirler so far from the forms that it could reach only to the center of the channel. To pour the invert and side walls in this section, a tower surmounted by hoppers into which the bucket could be dumped was moved along the center line of the work by the whirler and used to spout concrete to the far side of the excavation.



CEMENT RECEIVED BY RAIL, GRAVEL BY WATER, AT FLOATING CONCRETE PLANT ADAPTED TO "LAND" JOB WITH ECONOMY

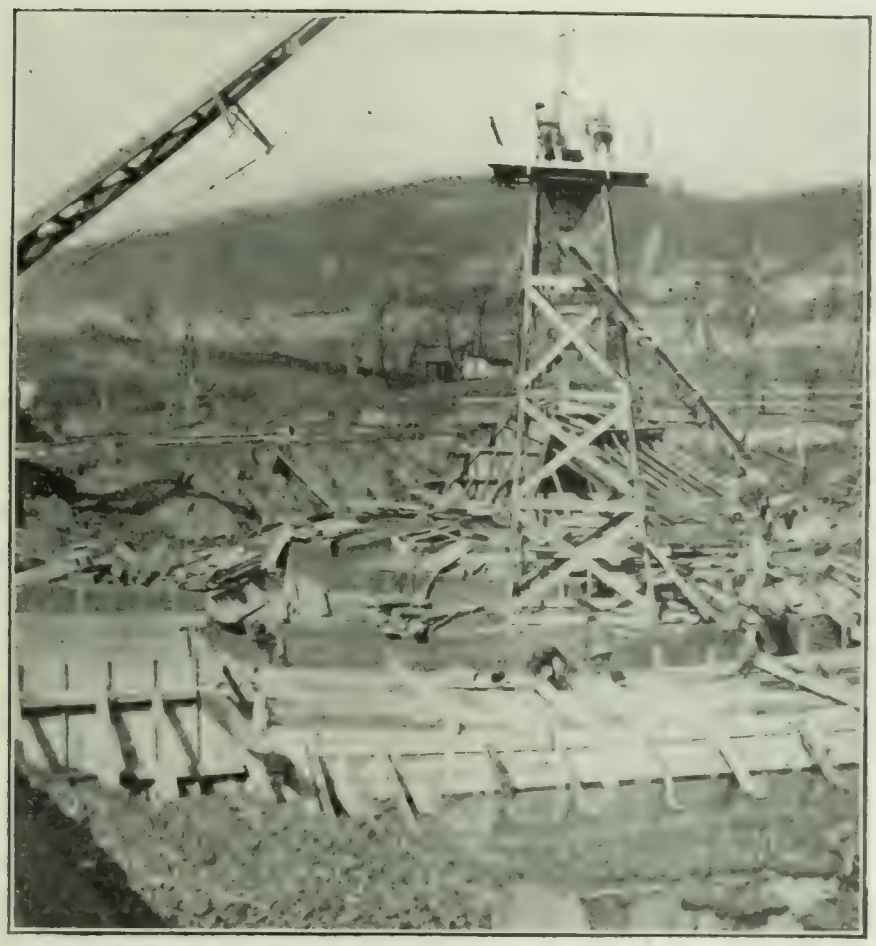
River Plant Solves Supply of Concrete Materials

Sand and gravel, dredged from the river, were unloaded directly into bins on the mixer boat. Cement was received by rail, and run on a spur track to the bank at the mixing plant. Here it was unloaded to one of a pair of platform cars running down an inclined bridge to the deck of a scow alongside the mixer boat. One of these cars was fastened to each end of a wire rope passing around a sheave at the head of the bridge, and the loaded car pulled the empty car up. From the small scow the bags were shot down a plank slide to the deck of the mixer boat. The cement was used at this level,

the mixer having a power loader and being set directly on the deck. This arrangement also permitted the construction of large sand and gravel bins without making the boat topheavy. The tower bucket descended into a pocket below the deck in front of the mixer.

Two Plants To Finish Last Section

The second mixing plant, brought up to complete the outer end of the last, or river, section, is provided with a much higher tower than the first, but mounts no derrick, being supplied by a derrick boat. Moored outside the



CONCRETE DISTRIBUTED FROM TOWER

box coffer around the end of the section, it can spout directly all the concrete for the 270 ft. of the tunnel nearest the river. The concrete in the rear part of this section will be mixed by the other plant, transported by the dinkeys and placed by one of the whirlers.

Caving Banks Require Handling of Extra Material

The dragline machine excavated the middle concrete section and the better part of the open channel section farthest from the river, working toward the railroad, which brought it in position to finish the concrete work at this point, as noted above. It then completed the open channel section. One of the whirlers concreted and backfilled the central concrete section, made the cut for the second open channel section, helped a floating grab-bucket dredge with the river section and finally was carried down inside the cut for this section on top of the piles to clean out material that slid in from the banks. This section required the deepest cut on the work, and the whirler, working the floor of it, could not reach out to dump material. On this account a central hopper and a small inclined hoist up one side of the cut were installed to hoist out and dispose of the dirt in these slides. The hopper was located where the machine could reach most of the slides to be removed without getting out of its range. The other whirler did most of the unloading of piling and plant and placed some of the concrete in the river section.

The dragline was designed by the contractor and is similar to the whirlers used by the same firm. They were described on p. 506 of *Engineering News* for Sept. 9, 1915. However, the machine installed at Clairton is much heavier. It handles a 1½-yd. bucket.

The work described, which has required about 25,000 yd. of concrete, is being completed for the Carnegie Steel Co. by the Dravo Contracting Co. under the direction of J. J. Nolan, secretary, with W. H. Horton in charge as superintendent. For the Carnegie Steel Co. the construction is being supervised by C. V. Wykoff, chief field engineer of the Clairton works.

Meters Cut Water Waste and Help Home Gardening

By Walter P. Schwabe

President, Thompsonville Water Co., Thompsonville, Conn.

The introduction of meters has enabled the Thompsonville Water Co., of Thompsonville, Conn., to reduce its water consumption materially and to encourage home gardening by offering special rates for water.

The property of the company was taken over by its present owners about three years ago. At that time there was considerable complaint on account of inadequacy of pressure and also a shortage of water. Consumers were forbidden to use hose for sprinkling, and the town was obliged to discontinue the sprinkling of streets. The output at the time sometimes ran as high as a million gallons a day.

On taking over the property the present owners made improvements; that is, installed a 500,000-gal. elevated tank, raised the pressure over the entire system 30 lb., put in larger feed mains and immediately metered the entire system. About 1800 meters are now in use. The maximum daily output has been reduced to between five and six hundred thousand gallons.

We are therefore enabled to encourage the use of water in connection with the home-gardening movement and to that end are advertising in the local paper that water for gardening will be supplied at 20c. per 1000 gallons.

Deepest American Drill Hole

A diamond-drill hole in Sussex County, New Jersey, 4920 ft. deep, has recently been completed by the contract drilling forces of the Sullivan Machinery Co. A 2-in. diameter core was removed to a depth of 1600 ft., beyond which tols removing a 1⅜ in. core were used to the completion of the hole. When the depth of 4900 ft. was reached, the long line of rods required for drilling weighed 13 tons, and it took 8 hours' steady work for hoisting them out, replacing them and resuming drilling. It is said that the hole showed no deviation from the perpendicular. It required 20 months to complete the hole, which is 1700 ft. deeper than the deepest previous hole of which there is any record in North America. Only three or four diamond-drill holes have been put down in this country, it is said, exceeding 3000 ft. in depth.

Diagrams Facilitate Design of Concrete Retaining Walls

Two Standard Types of Wall Considered, One Without Surcharge and the Other with Surcharge of Cooper's E-55 Live-Loading

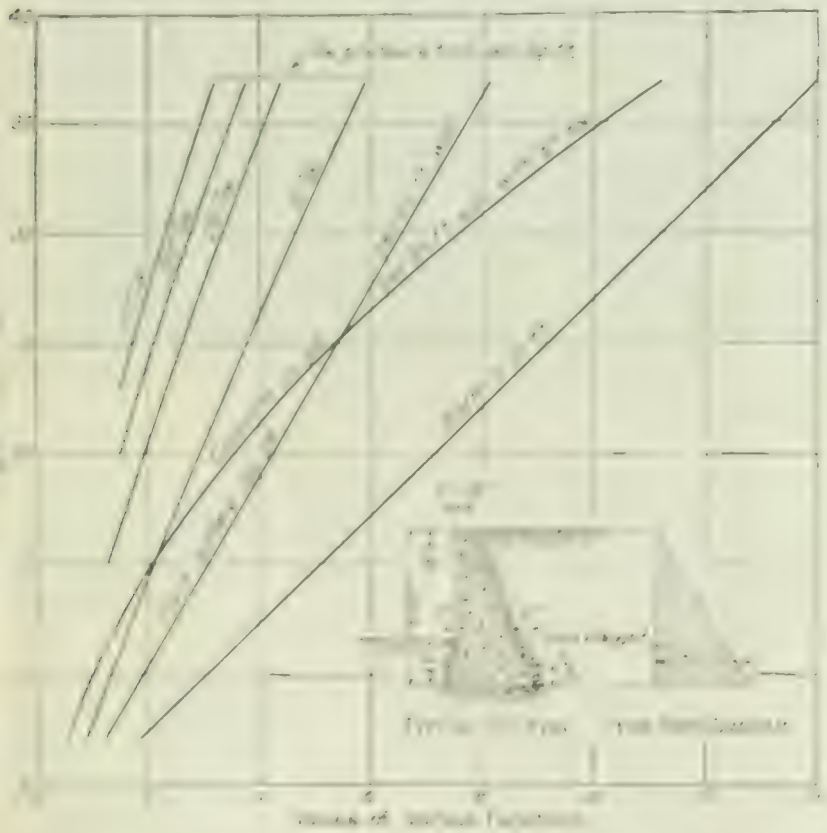
By SOMERS H. SMITH

Structural Designer, Chicago, Milwaukee & St. Paul Railway, Chicago, Ill.

IN THE *Engineering Record* of Nov. 4, 1916, p. 564, there appeared an article by T. A. Smith giving formulas for width of base of gravity retaining walls to eliminate tedious cut-and-try methods of solution. The writer has been using diagrams in solving these problems for some time and believes that for railroad work, municipal work, etc., where the assumptions and types of wall are more or less standardized, the diagrams are simpler and more convenient than formulas. For the purpose of illustration two cases will be considered—(1) that of a gravity wall without subcharge, and (2) that of a gravity wall with railroad surcharge of Cooper's E-55 loading, with center line of track 8 ft. 6 in. from the face of the coping.

Gravity Wall Without Surcharge

1. A gravity retaining wall of the type shown in Fig. which is safe against overturning, will also be safe against sliding and crushing the masonry, and with a



suitable toe may be built upon any ordinary foundation. We may then assume a minimum factor of safety against overturning and find the widths of the base for various heights. Assuming that the slope of repose of the filling is 1½ to 1, the horizontal pressure on a vertical plane is, according to Rankine, 0.286 of the vertical pressure. Earth has been taken at 100 lb. per cu.ft., and concrete at 150 lb. per cubic foot.

The diagram, Fig. 1, gives the width of the base of the neatwork for a factor of safety against overturning of exactly 2. Using a minimum footing projection of 6 in. at the toe and 1 ft. at the heel, the entire wall always has a factor greater than 2. The maximum compressive stress in the concrete is 90 lb. per sq.in., and the wall will be on the verge of sliding when the coefficient of friction is about 0.3.

Soil pressures for various assumed lengths of toe are also given in the diagram, as well as the quantities per linear foot of wall for estimating purposes.

Gravity Wall with Surcharge

2. The dead-load for the case of a surcharge wall is considered the same as in case 1. The live-load has been taken as 11,000 lb. per lin.ft. of track, distributed from

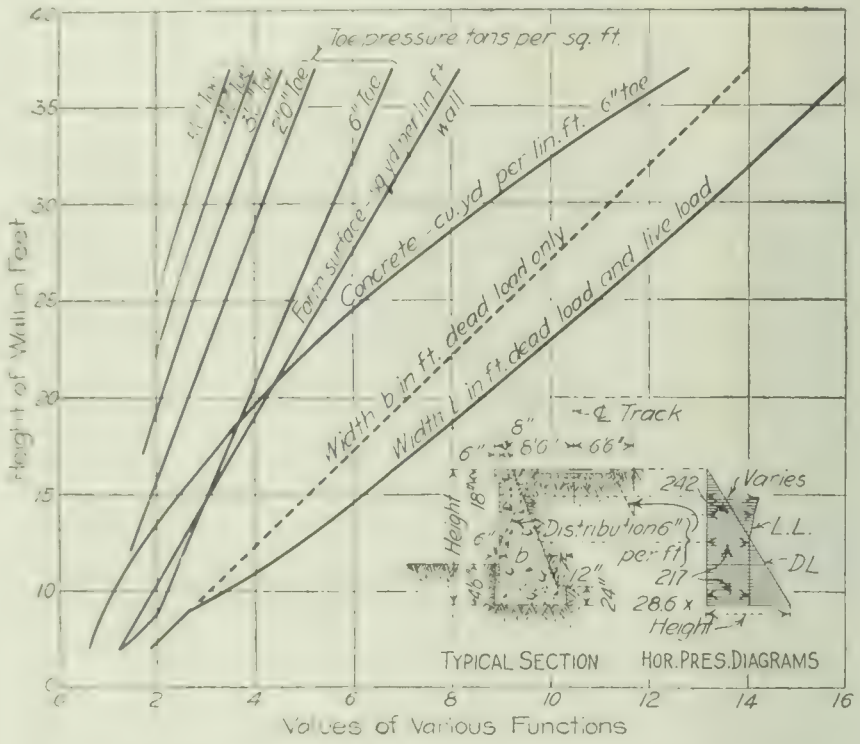


FIG. 2. DIMENSIONS AND QUANTITIES—WALLS WITH SURCHARGE

the base of rail and end of tie as shown in Fig. 2, the limits of the distribution being the face of the wall and a line 6 ft. 6 in. from the center line of the track midway between tracks, assuming a second track 13 ft. from the first. The ratio of horizontal to vertical live-load pressure has been taken the same as for the dead-load. The portion of the live-load pressure uniformly distributed over the width b has been assumed as adding to the weight and stability of the neatwork, while for the entire wall the width $b + 1$ has been used. No distribution has been considered beyond the plane of the face of the wall, no matter what the length of the toe might be.

The horizontal-pressure diagrams are shown in Fig. 2, and the widths of the base of the neatwork for dead-load and live-load are plotted on the diagram, as are also the values for dead-load only. The factor of safety against overturning for the neatwork is exactly 2. The maximum compression in the concrete is 103 lb. per sq.in., and the wall will be on the verge of sliding when the coefficient of friction is about 0.3, as before. The maximum soil pressures under the toe for various lengths of toe, and the quantities per linear foot of wall, are also given in the diagram, Fig. 2.

The maximum case for railroad loading would occur with a locomotive on a track 6 ft. 6 in. from the face of the coping, assuming this to be the minimum allowable clearance, while the minimum case would occur when there was no live-load. For heights less than

about 9 ft. the live-load does not increase the width of the base, merely adding to the crushing stress and the soil pressure. The limiting values for the height of wall have been selected so as to make the diagram general for all heights likely to be encountered. It is not intended, however, to indicate that gravity walls of the extreme heights shown could be economically built. For estimating purposes, the quantities for the higher walls would be on the safe side.

With a set of these diagrams for the various types of wall commonly used, a design can be made in a very short time; and where there is much of this class of work, the time saved amply repays for the time spent in preparing the diagrams.

Do Water Filters Make Watershed Ownership Unnecessary?

On This Question Hinges a Water-Rate Case in California Involving a Valuation of $4,000,000

THE Peoples Water Co. has been recently reorganized into the East Bay Water Co., which institution supplies the towns on the east side of San Francisco Bay from Richmond to San Leandro, including Oakland, Alameda and Berkeley, Calif. The water partly comes from deep wells at Alvarado and Fitchburg. About 60,000,000 gal. daily at present are derived from a large storage reservoir on San Leandro Creek, known as Lake Chabot, above which there are 42 square miles of drainage area. The San Pablo dam is now being built on San Pablo Creek. It has 32 square miles of tributary watershed. The East Bay Water Co. owns 50% of these drainage areas. Certain other small drainage basins are held in reserve for future development.

In a hearing before the California Railroad Commission for the purpose of fixing rates, it was recommended by the hydraulic engineers of the commission and by the representatives of Oakland and Berkeley that about $4,000,000 worth of these watershed lands should be excluded from the portion of the property that was deemed used and useful. The contention of the water company was that these lands were necessary for the prevention of the pollution of the water at its source, notwithstanding the fact that the water was held in long storage, filtered and chlorinated.

What Other Cities Are Doing

Very extensive inquiries were made by the company throughout the cities of the United States that obtained their water from surface supplies; and while a number, such as New Orleans, Washington and Philadelphia, are practically compelled to obtain their supplies from large rivers the watersheds of which they cannot control and where they are of necessity compelled to rely on filtration, the great majority of the towns, where it is feasible, are seeking what they call "upland sources," the drainage basins of which they are endeavoring to acquire and rigidly protect. Many of these towns, such as Providence, R. I., are buying watershed lands, notwithstanding their plans call for filtration and long storage.

All of the towns did not answer the inquiry. Answers were obtained from 75 cities outside of California. Of these 61 owned drainage-basin lands ranging from a few per cent. to the total area; 5 do not have storage, but divert their water from large rivers or lakes; 46 consider it important to own drainage-basin lands, and 24 towns were indefinite as to their policy. In California, out of some 50 replies received from the circular letter, all but 3 considered watershed lands important to supplement the protection of the water-supply. Local conditions affected somewhat these places, so as to afford unusual circumstances.

Practice in Western America

It is distinctly the practice of Western America, where possible, to obtain water-supplies from timbered or brush-covered hill or mountain country. The City of Portland, both by purchase and by act of Congress, has acquired practically all the watershed lands in Bull Run Creek, located in a national reserve that furnishes its water-supply. It has obtained an act of Congress making it a misdemeanor punishable by a fine not to exceed $500 even to trespass on this watershed.

The Marin Municipal Water District, north of San Francisco Bay, which is just building its system, has acquired by purchase all the lands, amounting to 11,500 acres tributary to its water-supply.

The case of the City of Santa Barbara is typical. A forest reserve has been created to protect the headwaters of the Santa Ynez River above the diversion point, and in addition the city has purchased some 4000 acres of private lands to complete the protection of its watersheds.

The question of the retention of the watershed land of the East Bay Water Co. has now been submitted to the Railroad Commission, and the decision is awaited with great interest.

The engineers for the company were George Wilhelm, engineer and manager of the company, F. C. Herrmann, George C. Whipple, J. B. Lippincott and William Mulholland. The Railroad Commission was represented by R. W. Hawley. J. H. Dockweiler represented the City of Oakland. The State Board of Health was represented by its chief engineer, C. G. Gillespie, who took the position that these lands were not essential for the protection of the water-supply, and by the president, who subsequently testified that the board would protest against their disposal if it was attempted.

Filtration Costs at Washington

The water-purification plant of Washington, D. C., was operated at a cost of $6.26 per 1,000,000 gal. of water filtered for the year ending June 30, 1916. The average daily consumption was 51,910,000 gal., or a per capita daily consumption of 145 gal. The average bacterial count of the raw water was 5540 per c.c. and of the treated water 15 per c.c. The turbidity was reduced from 238 in the raw water to 0 in the filtered water. Detailed results for a series of years both as regards labor and material cost and various physical operations of the plant, as well as total bacteria and B. coli removed, are given in a small pamphlet report on the maintenance and repair of the Washington aqueduct and filtration plant by C. A. F. Flagler, Lieutenant-Colonel, Corps of Engineers, U. S. A., in charge. E. D. Hardy is superintendent of the filtration plant.

Dallas Builds Imhoff Sewage Works Fed by Concrete Pressure Line

Little Leakage Through Expansion Joints Every Length—Carry Groundwater at Disposal Plant in Rock Channels Under Finished Tank Bottoms—Each Steel Form Section Used Twelve Times

By RICHARD GOULD
Resident Engineer for James H. Fuertes, Consulting Engineer, New York City

A CONCRETE pressure line nearly 3 miles long, with exceptionally tight joints, carries the sewage of Dallas, Tex., from the pumping station to the sewage-disposal plant of constant-velocity grit chamber and Imhoff tanks. The abundant supply of groundwater in the gravel over the rock at the plant site was drained to the center under the concrete floor, the holes for pump suctions being grouted when the work was completed. The plant was under construction for two years prior to being put into operation in January. It serves 135,000 people, including 11,000 residents outside the city limits.

The Trinity River flows through the city. Formerly, all the sewage of Dallas was discharged directly into it through seven outlets. The river also receives the sewage from Fort Worth and other smaller cities. Its flow is ordinarily sluggish, and sometimes in dry weather there is little dilution of the sewage. Because of this offensive condition, steps were taken to remove the sewage from the river some time before the passage of the present stream-pollution act, and the following plan was carried out:

Intercepting sewers, 15 to 51 in. in diameter, were constructed in the lowlands adjoining the river, to intercept the flow in the existing trunk sewers and to carry it to a pumping station centrally located at Cadiz St. on the east bank of the river. The sewers up to 24 in. in diameter are of vitrified and cast-iron pipe, and aggregate 6¾ miles in length. The larger sewers, comprising 7706 ft., are of concrete pipe. The intercepting sewers in Oak Cliff, which is the portion of Dallas lying west of the river, lead to a point opposite the Cadiz St. pumping station, the sewage being siphoned under the river through four lines of cast-iron pipe. The sewage from the entire city, with the exception of that from a small area at the extreme southern portion, flows to the Cadiz St. pumping station by gravity. Thence it is pumped a distance of 14,744 ft. down the river to the disposal works. The static lift is 42 ft.

Automatic Bypass on Pump Suctions

The three pumping units consist of Worthington centrifugal pumps, each connected by rope drive to a Fleming-Harrisburg noncondensing engine. The rated capacities are 4,500,000 gal., 7,000,000 gal. and 11,000,000 gal. daily respectively. Steam at 150 lb. is supplied from two 150-hp. Stirling boilers.

In advance of the pumps are two bar screens of 1-in. opening, each fitted with an apron at its base. For cleaning, they are hoisted to a screen room, where a Coffin hydraulic sewage press is provided for pressing the screenings. The resulting cake is burned under the boilers.

No storage is provided in the suction well, but the suction of the pumps is kept sealed by means of a bypass operated automatically. This is accomplished by running a 12-in. line closed by a hydraulic valve from the force main to the bottom of the suction well. The valve is actuated by city water pressure controlled by a fourway valve connected to a float in the suction well. A compensating motion connected with the stem of the hydraulic valve insures smooth opening and closing. An indicator in the engine room shows the level of the sewage in the suction well, so that the bypass is only brought into action when the warning of the indicator is neglected.

Each of the pumping units is provided with a Lockett rate-of-flow indicator. This instrument is connected to two points in a cast-iron increaser. The difference of static head between the points is shown by water columns in two adjacent glass tubes. A calibrated scale placed between the tops of the two water columns indicates the discharge of the pump.

Force Main Tight

The 36-in. force main from the pumping station to the disposal works passes under the Trinity River, being laid in the same trench with the Oak Cliff sewer siphons. The first 476 ft. of the line is of cast iron. From the west bank of the river the main is of reinforced concrete, 14,268 ft. in length, subjected to a working head up to 60 ft. The pipe, which was manufactured and laid by the Lock Joint Pipe Co., is 4 in. thick, of 1: 1½: 2¼ concrete, made in sections 8 ft. long. The reinforcement varies according to the pressure to which it is subjected, ½-in. bars 4 in. c. to c. being used for the maximum pressure and No. 31 wire mesh for the minimum pressure. All joints are expansion joints, and each is made water-tight by a continuous copper band molded into the spigot end of the pipe and grouted to the joint reinforcement projecting from the hub end of the adjoining pipe, but the spigot was painted to prevent adhesion of the grout. Contraction occurs at this point, and motion is taken up in a crimp provided in the copper band. A recess 4 in. wide and $\frac{3}{16}$ in. deep was made on the inside of the pipe at the contraction joint. This recess was plastered full with neat cement reground to pass a 200-mesh sieve.

A test for leakage, made with filtered water up to the maximum pumping head, showed a total leakage for the concrete pipe of 17,700 gal. per day, or 6550 gal. per day per mile. The engineers attribute this low leakage to the great care by the contractor.

SEWAGE PLANT AT DALLAS, TEX., WHICH WAS PUT IN OPERATION LAST JANUARY, AFTER A TWO-YEAR CONSTRUCTION PERIOD

Fig. 1—Six rows of two Imhoff tanks each

Fig. 2—Steel forms still on brace walls in sludge compartments

Fig. 3—Grit chambers, [illegible] before [illegible]

[illegible] channels

[illegible]

The disposal works built at this time consist of a grit chamber, 12 Imhoff tanks, a sludge-drying bed and a discharge conduit. The grit chamber is 100 ft. long and is divided into three parallel sections. Its cross-section is such that, combined with the hydraulics of the channel leading to the tanks, the velocity of the sewage in the chamber varies but slightly, despite a considerable variation in the sewage flow.

The channels leading to the Imhoff tanks were designed for a maximum flow of 22,000,000 gal. daily, and it was expected that the present average sewage flow would be about 11,000,000 gal. daily. During the past year, however, the city water-supply has been completely metered and the water consumption thereby reduced 50%. This has affected the sewage flow, so that only 5,500,000 gal. daily reaches the disposal works.

Tanks' One-Way Flow

The Imhoff tanks are of the rectangular horizontal-flow type and have a combined capacity in the settling chamber of 1,312,000 gal. and a sludge-storage capacity of 440,000 gal. The settling chamber of each tank is 45 x 33 ft. in plan, and the sludge chamber is 29 x 19 ft. The tanks are 33 ft. deep. The sewage is divided into 12 parts, each part flowing through one tank. There is but one sludge compartment to each tank, and therefore no provision is made for reversing the sewage flow. Devices for agitating the sewage with fresh water are provided. Sludge is to be withdrawn through 8-in. pipes leading to a central open sludge channel and thence through a 12-in. pipe by gravity to the sludge bed. The slopes of the bottoms of the sedimentation chambers are 1.36 on 1. The flattest slope in the sludge chamber is 1 on 2.25.

The sludge bed is 141 x 145 ft. in plan. It has 14 in. of graded sand and gravel underdrained by 3-in. vitrified pipe laid with open joints 4 ft. c. to c. Sludge is distributed over the bed through seven concrete channels, each carrying a track on which run small dump-cars used to remove the dried sludge.

Clarified sewage from the tanks unites at a central point and passes over a weir into the discharge conduit and thence to the river. A continuous automatic record of the sewage flow is kept. The discharge conduit consists of 300 ft. of 24-in. pipe and 2042 ft. of 36 x 48-in. monolithic concrete sewer.

The complete plans call also for six acres of sprinkling filter followed by secondary settling tanks of the Imhoff type, but funds for this work were not available, as the city's bond limit (at the time of issuing the sewage-disposal bonds) limited the amount of the issue. The plant as constructed is built with provision made for the addition of the final treatment.

Lead Groundwater Into Cofferdam

Due to the material encountered on the site, there were several interesting features in the construction of the Imhoff tank. The bottoms of the tanks were sunk about 3 ft. into rock, over which was from 3 to 4 ft. of gravel grading off to a mixture of fine sand and clay. An abundant supply of groundwater normally stood 8 to 10 ft. above the rock. The entire site of the tanks was excavated with wheel scrapers about 17 ft. above the rock. The excavation for the 12 sludge wells, each 21 ft. 8 in. by 31 ft. 8 in., outside dimensions, was done inside of solid sheeting by means of a movable derrick using ⅝-yd. buckets. Groundwater was handled by means of three pulsometers supplied by a single boiler. One of these was operated continuously in a well outside the limits of the tanks, in an effort to lower the groundwater somewhat. The other two were operated nearly continuously in the various tanks as was necessary. When excavated to the subgrade of the tanks, channels were cut into the rock entirely around the foot of the sheeting and to the center of each tank, in order to collect the water at one point. These channels were covered, and a concrete tank bottom was poured. A hole was left in the center of the concrete bottom to receive the suction of a pulsometer, which was kept in operation until the concrete was carried above groundwater level. When the concrete was sufficiently hardened, the pulsometer was removed and the groundwater allowed to seek its level. The hole in the bottom was then carefully packed full of neat cement. In only one of the 12 tanks was it necessary to try a second time in order to secure a tight plug.

Forms Used Twelve Times

Each section of the Blaw forms was used 12 times with the exception of one section where a duplicate form was necessary to expedite the work. Forming was shifted from one tank to another by means of blocks and overhead cables. Concrete was mixed in a ⅝-yd. Smith mixer and was distributed over the work by means of an 80-ft. tower and chutes.

The Roach, Manigan Paving Co., of Fort Worth, had the contract for the pumping station, the cast-iron portion of the force main and part of the intercepting system; the General Construction Co., of Fort Worth, also had part of this system. The Lock Joint Pipe Co. laid the concrete portion of the force main as subcontractor to Bailey, Reeder & Co., of Mobile, who built the disposal plant and discharge conduit. The mechanical equipment of the pumping station was supplied by A. M. Lockett & Co., of New Orleans.

Costs of the various structures are as follows: Intercepting sewer, $217,303; pumping station, $93,962; force main, $95,865; disposal works, $96,245; discharge conduit, $13,109; land and right-of-way, $16,831; bond expenses, $1298; engineering, etc., $36,962; total, $571,575. Some detailed costs of the disposal plant are as follows: Imhoff tanks, $68,647; sludge bed, $17,957; grit chamber, $2030; influent channel, $547; water-supply and buildings, $4435; miscellaneous, $2629.

James H. Fuertes, of New York City, was the consulting engineer and drew up the plans and specifications. The works were constructed under the supervision of Hal Moseley, city engineer.

Tunnel Brickwork in Service After Sixty Years

Of four tunnels in the Blue Ridge Mountains on the Chesapeake & Ohio Ry., constructed between 1850 and 1858, three are lined with brick to horseshoe outline. As recently described by J. P. Nelson in a monograph on these tunnels, the brick arch is just as originally constructed. The total length of lining is about 2700 feet.

Reconstruction Executed Safely of Complicated Elevated Railway

Replace Three-Track Structure to New Grade and Track Alignment—Work Done One Span at a Time

BY GEORGE D. FRIED
New York City

A SPECIALLY difficult section of the rebuilding of the Broadway (Brooklyn) elevated railway to convert it to three tracks was encountered at a point near East New York station, where the new bents came intermediate to the old bents, and in addition the new structure was higher than the old by amounts of 2½ to 7 ft. The old tracks on the entire Broadway line are spaced too close to permit of inserting the third track between them without spreading. These several complications required a most carefully planned system of procedure to do the work systematically and without danger—traffic having to be maintained both on the elevated railway and on the street surface throughout the entire work.

The difference in track alignment and in bent location is shown by the plan. The difference in elevation, not there indicated, was taken care of as the first step by jacking the old structure in successive stages of from 3 to 6 in. at each bent, giving a maximum grade during the operation of less than 2%, until the whole section was raised to the new elevation.

The jacking was done by lifting the column-and-cross-girder bents with the specially designed jacking wagon illustrated in *Engineering News-Record*, Apr. 26, 1917, p. 221. To jack a bent, two wagons were used, one at either end of the cross-girder, the 14 x 14 jacking post coming in the position indicated in the drawing; after blocking the post up to the cross-girder and blocking the trucks up from the street to free the wheels, the entire bent was easily raised. The column shoes as they lifted from the masonry footing were wedged up, to keep all live-load off the jacks. Neither jacking nor releasing the jacks was ever attempted under trains, so that working conditions were always kept as safe as possible.

This work was done with Norton 100-ton self-releasing screw jacks. The load of 5 tons necessary to release was obtained by raising the structure at each point about 1 in. higher than the desired amount.

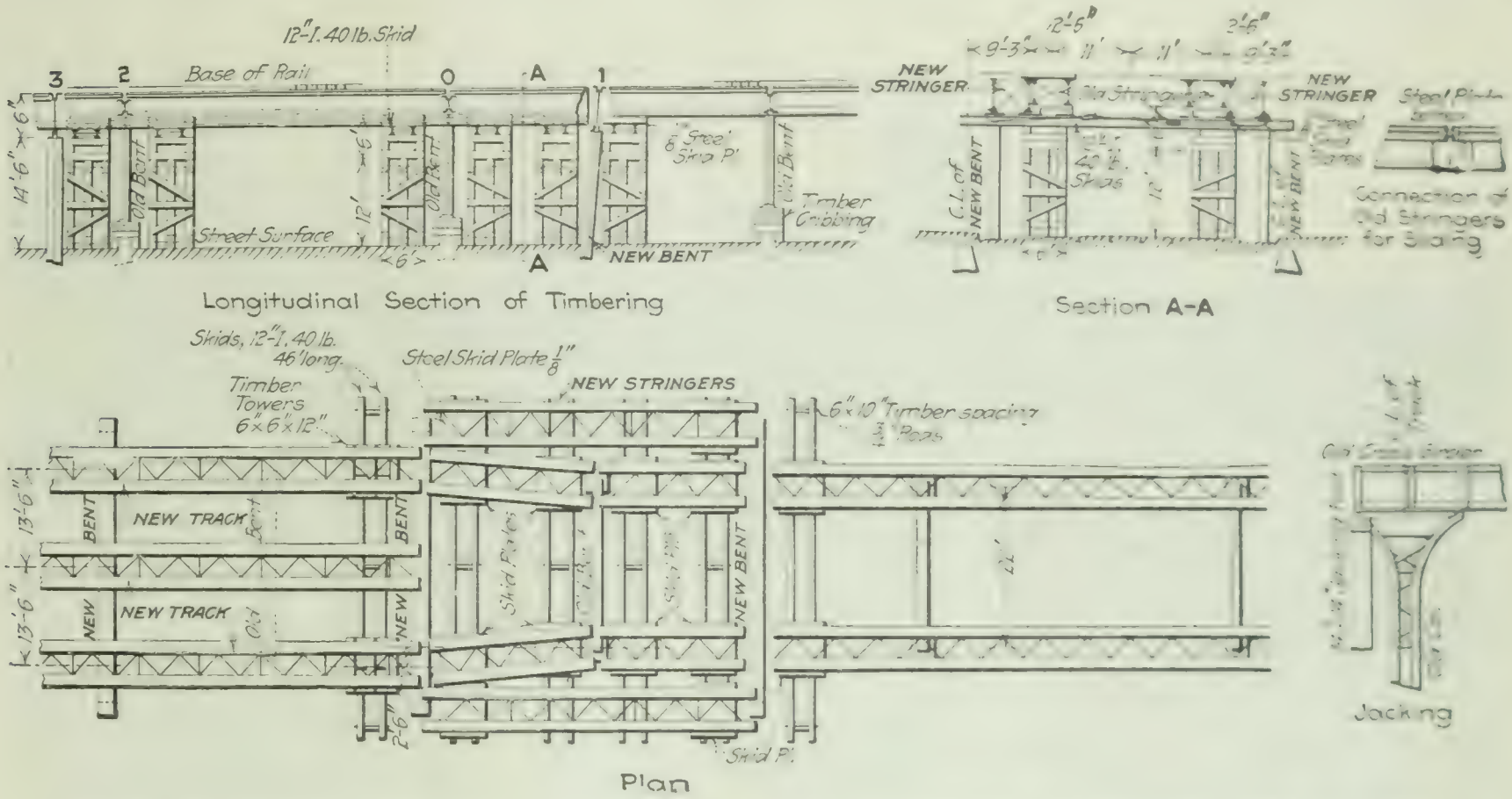
OLD STRINGERS CUT TO ALLOW SETTING THE NEW BENTS

Timber towers 12 ft. high were built under the old stringers on either side of the old bents. These towers were 6 ft. square, built of 12 x 12's with 3 x 12 diagonals. A 6-ft. clearance from top of tower to bottom of stringer allowed for placing blocking and a transverse skid consisting of two 12-in. 40-lb. I-beams 46 ft. long, spaced 3 ft. apart by wooden spreader blocks. A 1-in. steel skid plate set on top of this skid, well greased, made ready for sliding the stringers over as was necessary at the later stages of procedure.

To make place for the new bents, it was necessary to cut through the old stringers. This was done by burning between bents. The new columns and cross-girder were raised, bolted up, and the bent tipped about 18 in. away from its true position to insure clearance for the new stringers during the sliding operation.

The new stringers, whose final position overlaps that of the old stringers, were set outside of the old stringers but close up to them, as indicated in the cross-section. The lateral bracing of the new stringers was completely riveted so as to make the span ready for moving and for taking traffic immediately after moving.

The old columns and cross-girders were now removed and the gap in each longitudinal girder (its ends resting on the timber towers) was bridged by a steel plate bolted



WORK PROGRESSED FROM LEFT TO RIGHT, ALL SLIDING OF STRINGER SPANS BEING DONE AT NIGHT

to the bottom flange, so that the two parts would move together in sliding. Narrow clearance between the timber towers, and the presence of the overhead trolley wires of the street-car tracks, made the steel removal slow work.

Moving was done at night, the old stringers and the new span being moved together. For this purpose, two three-sheave lines, one at each end of the new span, were fastened between chains hooked to the lower flange of the outside new stringers. After midnight, the contractor was given the privilege of single-tracking the traffic. On the track that was put out of service, the rail-and-tie floor was lifted clear of the stringers by derrick car, and two hoisting engines hauled in on the sliding falls. As precaution against any movement of the opposite track, its stringers were wedged against the stiffeners of the new cross-girders at each end of the new span.

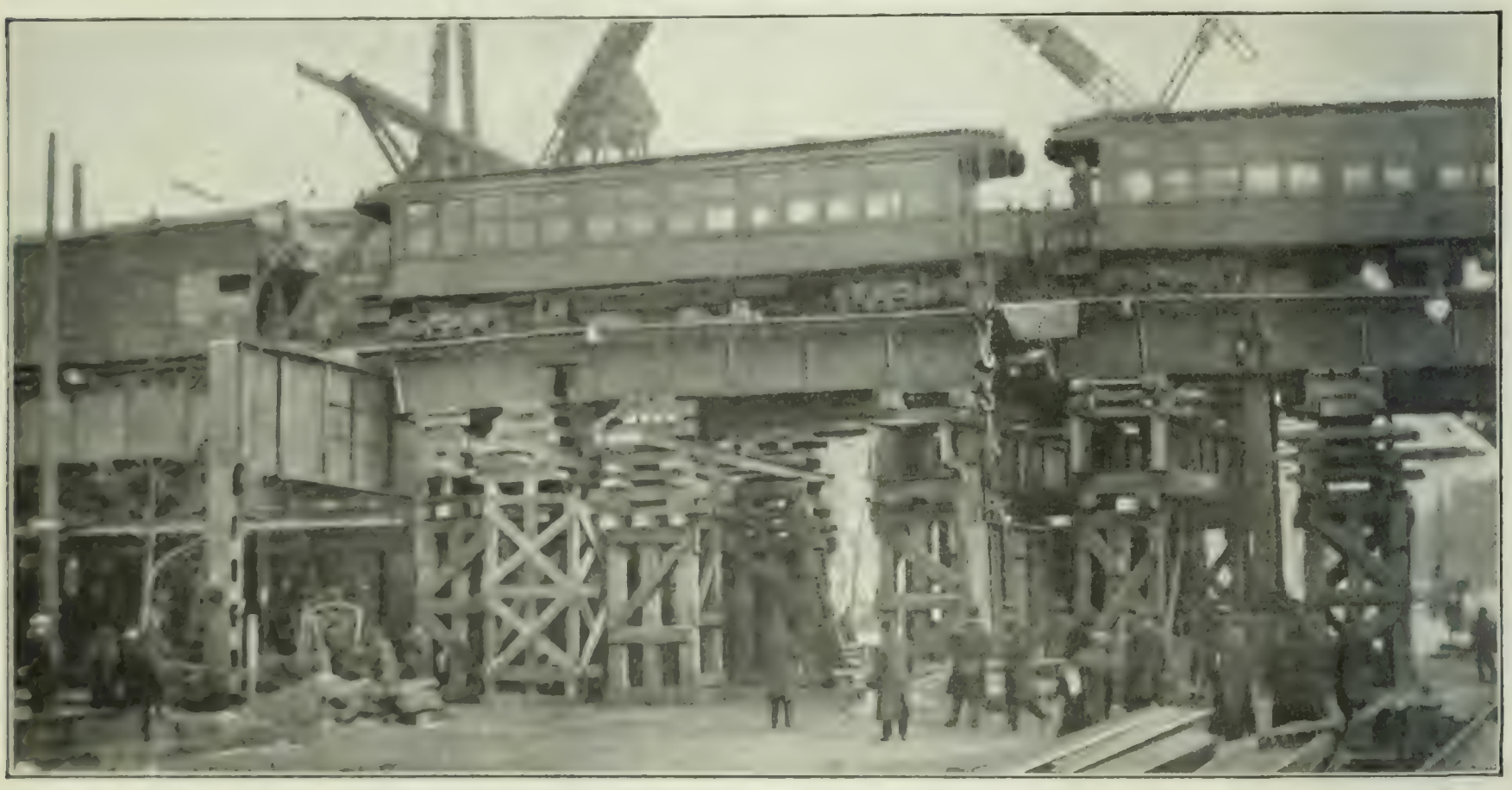
Sliding the stringers over to place, a distance of about 6 ft., took usually about 3 to 5 minutes. Then the shoring was again carefully examined, and after dropping the track floor down onto the new stringers, the shifted track could take traffic and the opposite track be put out of service and its stringers moved similarly.

After both tracks were in their final position, the stringers of the middle (express) tracks were set, the new transverse bent was pulled over to plumb, and the stringers securely bolted to it.

Temporary track conditions always existed in the span adjacent to a completed span, because here the track had to be swung 2½ ft. to bring it from the 13-ft. spacing of the old tracks to the 18-ft. spacing of the new tracks. To make this possible, just after a set of stringers was slid to final position the forward ends of the old track stringers in the span just ahead were slid over by steamboat ratchets, and the track lined up to match.

In all shifting of tracks the gage was never disturbed, as the tie spikes were never removed. The track was raised entire and shifted to the temporary or new final position by jacks and crowbars. The time consumed in this work was minimized by burning off the heads of the tie hook bolts under the stringer flanges, instead of unbolting.

This method of working was carried through successfully and rapidly. The contractor averaged two spans a week. The work was done in charge of A. J. Fearing, Division Engineer of the New York Municipal Railway Corporation, and was handled directly by Henry D. Mason, Superintendent for the Crenshaw Engineering and Construction Co., Inc.



OLD SPANS BURKED AT NEW BENTS IN ERECTING THROUGH-TRACK STRUCTURE THROUGH AND AROUND OLD ELEVATED WITHOUT DISTURBING TRAFFIC

Oil-Lease Suit Delayed Filling of Reservoir

The spring rains for the first time filled the new Mahoning River regulating reservoir at Milton, west of Youngstown, Ohio. In February, water was coming along fast enough to fill the reservoir, but because of a suit over oil leases at the upper end of the basin the water was held down to about 7 ft. from the spillway by manipulating the four sluice gates. At one time, however, the four gates failed to keep the water down, and the level rose to 4 ft. from the spillway crest with all gates open. Freezing weather checked the flow of the stream, and the water dropped again. The oil company secured a verdict of $1 against the city; thereupon the reservoir was allowed to fill, water flowing over the crest on Mar. 9. Frank M. Lillie, city engineer of Youngstown, who is in charge of the reservoir, states that there is no leakage, except some small amount at the expansion joints of the concrete spillway, and this leakage is decreasing. He says that there was no leakage whatever through the earth embankment that forms the main part of the dam.

Lumber Man Discusses Army-Camp Construction

R. S. Kellogg Tells of Speedy Work Done at Several Sites and Outlines Features of Government Specifications

HOW wood will enter into the Government's war preparations was explained at the World's Salesmanship Congress in Detroit recently by R. S. Kellogg, Secretary of the National Lumber Manufacturers' Association. He said, in part:

"An example of the speedy construction possible with wood is that of the building of the quarters for the Reserve Officers' Training Camp at Fort Sheridan during the first 10 days in May. The contract was awarded to the construction company in Chicago, on Saturday evening, Apr. 28. About noon on Sunday, Apr. 29, the order for the material, amounting to a total of some 1,400,000 ft., was placed. During the afternoon five motor-truck loads of lumber were dispatched to Fort Sheridan to provide quarters for the working force engaged on the job. At 5 o'clock in the evening a train of 50 empty cars was on track in the yards of the lumber company. The entire train was loaded with 1,400,000 ft. on Apr. 30, out of the stock of Northern, Southern and Western lumber carried on hand. The contract called for all dressed lumber. The most remarkable part of the operation, therefore, was that 400,000 ft. of the shipment was run through the planing mills of the lumber company and also loaded on cars in the same day.

Job Finished in 10 Days

"The trainload of lumber was delivered at Fort Sheridan on Tuesday morning, May 1. The construction company had its force on the ground equipped with gasoline saws and all other devices for quick work. Ohio National Guard engineers staked out the streets and buildings. The job was finished May 10, in just 10 working days, using only one shift per day. The largest number of men employed on the job at one time was 785.

"Here is the list of structures built complete, ready for occupancy: 42 barracks, 20 x 126 ft. each; 21 mess buildings, 20 x 110 ft. each, equipped with tables and benches built in regular logging-camp style; 21 lavatory buildings, 16 x 63 ft. equipped with toilets, shower baths, etc.; 1 post exchange building, 20 x 30 ft.; 1 telephone exchange building, 20 x 33 feet.

"Quick work of the same character has been done at Fort Benjamin Harrison, Ind., at Fort Oglethorpe, Ga., and other points. At Fort Oglethorpe 136 buildings were erected in 12 days (see *Engineering News-Record*, May 31, p. 468 and June 7, p. 506).

"The Government is planning for mobilization camps throughout the United States, to take care of the new army of one million men. Many of the buildings will be one-story structures of considerable length, although some of two stories are also planned. They will be of plain construction, but of modern type, with the most improved sanitary arrangements. They are expected to be the cleanest, best-arranged and most up-to-date barracks the world has yet seen provided for any army.

"There will be many cantonments. Arrangements are being made to use the kinds of timber most available in each locality. The Committee on Lumber of the Advisory Commission to the Council of National Defense has worked out specifications for the species and grades best adapted to each region—making these specifications interchangeable so as to permit either the purchase direct from the manufacturers or the use of accumulated yard stocks in the hands of distributors, as may be determined.

Lumber Estimate Involves Big Figures

"The estimate, based upon War Department plans, amounts to a total of 13,519,334 ft. for the construction of a standard camp to care for an infantry division of 25,000 men. There are 61 items in the specifications, some of the larger quantities of which, for example, are 1,249,848 ft. of 2 x 4 in., 8 to 16 ft. SISIE (smooth 1 side, 1 edge) for studs and girts; 318,790 ft. 2 x 6 in., 10 ft. (8, 12 or 16 ft. accepted) SISIE for floor joists; 213,132 ft. 2 x 6 in., 14 ft. rough for sills (double); 1,050,562 ft. 6-, 8-, 10- or 12-in. siding SIS, 8 to 20 ft.; 3,021,092 ft., 6- to 12-in., SIS random lengths for roofing and subfloors; and 1,696,764 ft. 3- to 6-in. random-length flooring. Each standard cantonment will also require 22,000 No. 2 stock sash of six or nine lights and 6000 Nos. 1 and 2 stock doors.

Specifications Interchangeable

"As an example of the way in which the specifications have been made interchangeable for different regions, the dimension stuff for studs and girts may consist of merchantable spruce framing in New England; No. 2 common hemlock in New York and Pennsylvania; North Carolina pine along the Atlantic Coast to Georgia; No. 2 common Southern yellow pine or cypress in the Gulf States; No. 2 common hemlock, Norway pine or tamarack in the Lake States; No. 2 common fir or hemlock on the North Pacific Coast; No. 1 common Douglas fir or larch in the Inland Empire; No. 2 Douglas fir, Western hemlock or merchantable redwood in California, or sound and square edge yellow poplar or chestnut in the hardwood regions. In siding, the specifications permit No. 2 merchantable spruce boards in New England; No. 1 common hemlock in New York and Pennsylvania; No. 4 North Carolina pine along the South Atlantic Coast; No. 2 common Southern yellow pine or cypress in the Gulf States; No. 1 common hemlock, Norway pine or tamarack in the Lake States; No. 1 common fir or hemlock on the North Pacific Coast; No. 2 common Western or Idaho white pine, fir, larch or spruce in the Inland Empire; No. 2 common Western white pine, or No. 1 common Douglas and white fir or merchantable redwood in California; sound and square edge yellow poplar and chestnut in the hardwood regions.

Lumber Committee's Recommendations

"In the detailed schedule for these materials, the Lumber Committee made the following recommendations:

"1. That all cantonments built north of the thirty-fifth degree of latitude be double-floored and sheathed in accordance with the alternative items listed, with a cheap grade of waterproof building paper between the

ing and flooring, and between sheathing and outside finish respectively. This is regarded as essential to the health of the troops in winter and as an economy in reduction of heating costs.

"2. That in any event, 4- or 6-in. D and M siding, laid vertical, be substituted as far as obtainable for the boards and battens called for by the specifications. This is in the interest of a lighter and neater surface finish.

"3. That in the same latitudes and for the same reasons triple-ply composition roofing, or a cheap grade of shingles (namely, 4-in. sound butts in the Lake States or standard A grade in the Pacific Northwest) be used for surface roofing.

"4. That for durability and service, No. 3 hardwood strips be used for surface flooring wherever obtainable; also that hardwood threshold be used at exterior doors.

"5. That ground posts, except cedar, redwood or cypress, be given a brush coat of creosote.

"6. That a standard specification as to size and spacing of nails be incorporated in all contracts for the building of cantonments."

Record Construction on San Francisco Office Building

A Pacific Coast record is claimed for the rapid progress that has been made on the Southern Pacific office building now being erected on lower Market St. in San Francisco. The building is 10 stories high and has a total of 378,000 sq.ft. of floor space. The first pile was driven in the foundations on Sept. 1, 1916; the first steelwork was put in place on Dec. 4; the last pile was driven Jan. 15, 1917, and the steel frame was completed Mar. 15. On May 1 the structure was closed in and 70% complete, practically all of the brickwork having been finished. The building is to be ready for occupancy Sept. 1.

Interest attaches to the work because of the carrying of such heavy weights on soft foundation. The structure is located on filled ground, and in the foundations were placed 2600 piles, some of which were 135 ft. long. A specially constructed 10-ton steam hammer was built to handle these piles. The specially constructed piledriver was described in *Engineering News* of Sept. 14, 1916, p. 509.

Part of the first floor and all of the building above the second floor will be occupied by the Southern Pacific Co. The freight auditing department will be accommodated in a single room that has 36,000 sq.ft. of floor surface and is 750 ft. long. It is not planned to open the windows in this room, as a ventilating system that will provide ample changes of air has been installed.

The equipment includes steam-heating system, sprinkler system for fire protection, and vacuum lines for cleaning purposes. One hundred and thirty thousand square feet of glass is on order, and the pneumatic tubing system will require about six miles of tubing. The water supply, except that used for drinking purposes, will be provided by a well now being sunk on the premises.

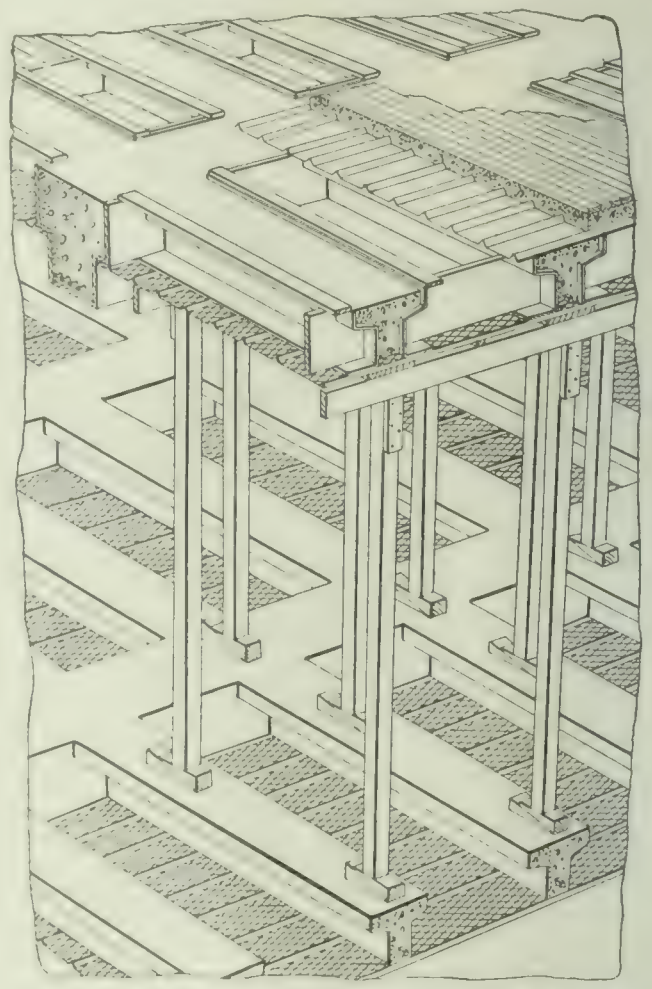
Contract for the foundations was held by the Healey-Tibbetts Construction Co. The general contractor is the Lindgren Construction Co. J. Q. Barlow is assistant chief engineer of the Southern Pacific Co.: G. B. Herington is in immediate charge of the work.

Special Forms Permit Light T-Beam Concrete Floor System

Pressed Metal Forms When Removed Upward Leave T-Beams on Which Cinder Concrete Floor Is Placed

IN THE new building now being erected for the Federal Trade Commission at 15th and K Sts., N. W., Washington, D. C., a new type of reinforced-concrete floor has been placed at what the designers claim to be a considerable saving in weight and hence in cost over any other fireproof floor of equal strength. The design is controlled by patents held by the T-Beam Engineering Co., of Washington.

The floor consists of rows of small concrete beams or joists of T-shape poured monolithically with their supporting beams or girders between forms made up of spacing members or boxes of wood and cores of bent sheet metal. The accompanying perspective shows the general layout of the system, which may be used either on steel-frame or on reinforced-concrete buildings. The new building at Washington is of reinforced concrete.



PERSPECTIVE OF LAYOUT OF SYSTEM

Construction Details

In building the floor, a line of struts is placed in each lower T-beam and capped with plank that serve as beam bottoms. On these plank as joists is then laid expanded or ribbed metal that forms a ceiling base. Then metal forms bent to the shape of one side of the T-beam are placed over each plank and held in position by properly cut brace boards between beams and by stiffener planks along the top. In the T-form thus made, the proper reinforcing is placed and the concrete poured to make the T-beam.

When these beams have set, the bracing boards are knocked out and the beam metal forms released to be

taken upward and used on the next floor above. The beams are then overlaid with another sheet of expanded metal, and the usual cinder concrete floor is placed. For the upper (floor) layer a fireproof board could be used in place of expanded metal.

In the Washington building the beams are 28 in. c. to c. with stem 6 in. deep and 4 in. wide and with flange 11½ in. wide and 2½ in. deep. This leaves a 17-in. open-



FORMS AS RELEASED FOR NEXT FLOOR

ing between flanges, which is spanned by the 3½-in. cinder-concrete floor unreinforced except for the expanded-metal base. The metal forms are of No. 24 gage sheet iron and were turned out to proper shape by a local tinsmith.

The basement columns of the building were poured Mar. 11, 1917, and the last of the roof concrete was placed May 19, 1917, the 12 floors and roof, all 35 x 103 ft. in plan, being completed in that time. This allows about 4.3 working days per floor.



STRUTS CAPPED WITH PLANK CARRY FORMS



LAYING EXPANDED METAL FOR FLOOR

The building was designed by B. Stanley Simmons, architect, and is being built by the Michael A. Weller Construction Co., both of Washington.

Condensation Under Various Types of Roofs Shown by Tests

Determine Relative Effectiveness of Various Materials —Curves Show Relative Humidity That May Be Carried

A SERIES of experiments to determine the relative effectiveness of various types of roofs in preventing the formation of condensation upon their under surface has been conducted by F. P. Sheldon & Son, engineers and architects, of Providence, R. I. The results were reported in some detail at the recent meeting of the National Association of Cotton Manufacturers by A. N. Sheldon, of the firm. The tests have especial interest because of their relation to the decay of wood roofs due to moisture conditions following condensation.

Tests Made on Small Box

The tests were made on a prototype of an actual building, consisting of a box about 4½ ft. square and 20 in. deep, so constructed as to receive as one face a roof specimen 3 x 4 ft. in plan and so arranged as to permit interior variation and observation of moisture and temperature conditions.

Each sample roof was tested under three different conditions of heat-head to obtain results corresponding to outside temperatures of about 20° F., 0° F and —20° F. for a given inside temperature of 70° F. in each case. Formation of condensation on the under side of the roof was noted, occurring of course when the dewpoint of the air within increased and became equal to or higher than the temperature of the surface in question.

These tests embrace concrete and plank roofs with various types of insulation, and a curve was plotted on the three temperature points noted, relative humidities being used as abscissas, and heat-head, or temperature difference, as ordinates. The curves obtained for various sample roofs are shown herewith. Since they are based on 70° F. dry-bulb temperature, the corresponding outside temperatures, as well as heat-heads, are also shown as ordinates. Each full-line curve represents

some particular roof, and from it may be read directly the relative humidities at which, for any given temperature, these tests show that condensation can be expected to take place.

All curves are prolonged through a common origin, which is a theoretical point based on 0° heat-head; that is, if the temperature of the air on both sides of a roof of any material is the same, condensation will not occur until 100% relative humidity is reached. Starting from this point, two interesting theoretical curves may be drawn, as indicated by dotted lines. They constitute the limiting curves between which all materials whatsoever, from the most perfect conductor of heat to the most perfect insulator, must fall. The first, which is a vertical at the extreme right, is the line of the perfect insulator. It is purely theoretical and illustrates that, if it were possible to obtain such an insulator, 100% relative humidity could be carried at any difference in temperature between the outer and inner surfaces, because there would be no flow of heat and consequently no temperature gradient within the material; that is, the surface temperatures would be exactly the same as the air with which they are in contact.

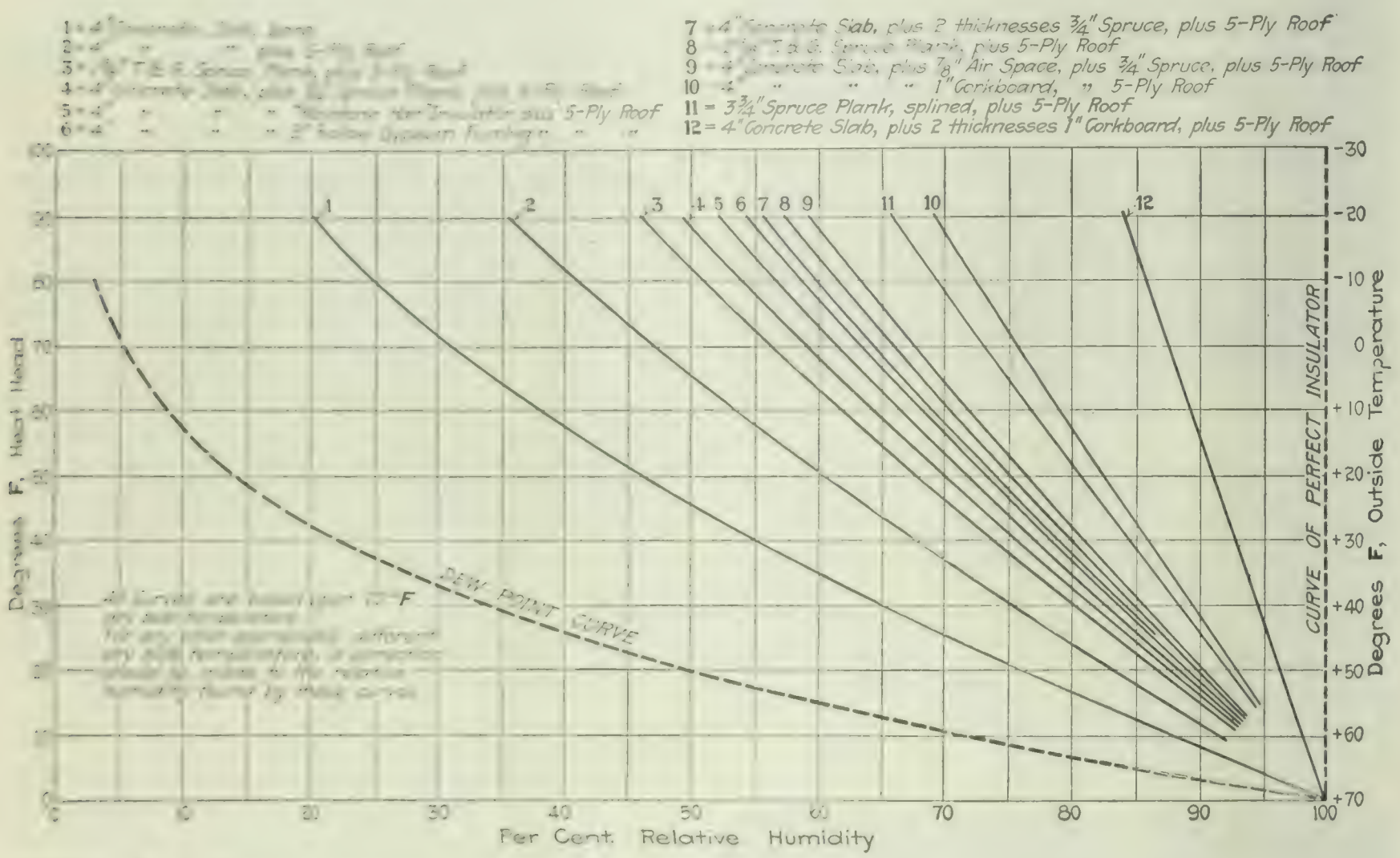
The second curve at the extreme left is designated the "dewpoint curve" and represents the depression of the dewpoint (based on a dry-bulb temperature of 70° F.) for various relative humidities from 3 to 100%. This curve is also purely theoretical and illustrates that the poorest insulator will carry somewhat greater relative humidities than those indicated.

Wood Roofs Let Warm Moist Air Through Cracks

It should be noted that all these curves have reference to the particular relative humidity at which condensation will take place on the *under side* of roofs. With regard to wood roofs, there is another important consideration that must be taken into account; namely, the cracks between the plank afford a more or less direct channel by which the warm moist air in the room below may reach the under side of the roofing paper. Since the standard five- or six-ply tar and gravel roof is a poor insulator of heat, the temperature of its under surface is consequently but slightly warmer than that of its top surface. This results in a chilling of the air that comes in contact with it and the formation of condensation if the cooling is carried on beyond the dewpoint.

In buildings where artificial humidification is resorted to, or where the humidity is naturally high, Mr. Sheldon pointed out that this fact means nothing more nor less than that the first ply of roofing on the average roof of this type in this climate is wet during the greater part of the heating season. In a new building, moisture may not be evident until some time after erection, due to the hygroscopic property of the roof plank, the wood itself absorbing the condensation, if the deposition of the latter, on account of poor air circulation through the cracks, is not too rapid. But on a roof having wide cracks, condensation is certain to come sooner or later if the warm humid air of the room below comes in contact with the roofing paper. For this reason the top surface of the roof plank may be seeped with moisture, regardless of whether or not any condensation is present on the under surface.

Again, if cracks between the plank are so wide as to allow moderately free circulation of air, condensation often accumulates so rapidly as to run down the edges of the plank to the room below, manifesting itself in a line of drops at the cracks between the plank.



CURVES SHOW RELATIVE HUMIDITY THAT MAY BE CARRIED WITHOUT CONDENSATION BY DIFFERENT ROOFS

Mr. Sheldon says that this condensation is doubtless the direct cause for so much trouble being experienced at the present time with decaying wood roofs. If the temperature of the under side of the roof plank coincides with or is lower than the dewpoint for the particular humidity and temperature existing, there will be condensation upon this under surface and throughout the thickness of the plank; that is, in the cracks between the plank up to the under side of the roofing paper.

On the other hand, if the temperature of the under side of the roof plank is above the dewpoint, no condensation will be deposited here; but it may occur from the under side of the roofing paper down to a point somewhere within the interior of the plank, depending upon the heat gradient and the relative humidity. The presence of this moisture, due to the second cause—that is, within the roof plank—is a most active agency in providing the proper conditions for the development and rapid spread of disease throughout the roof. The prevention of condensation on the under side of the roof plank, while eliminating a nuisance in manufacturing, may not appreciably lessen the possibilities for decay.

It has been suggested that enough protection could be added in the form of more wood or other insulating material to the top of the roof to raise the temperature of the upper side of the plank to such a point as to prevent all condensation. And then, if data were made available by the forest pathologists as to the limiting conditions of relative humidity that various kinds of wood and different grades of the same wood can resist indefinitely without developing fungi, this information could be used in selecting the roof plank.

Condensation Thought Not Preventable

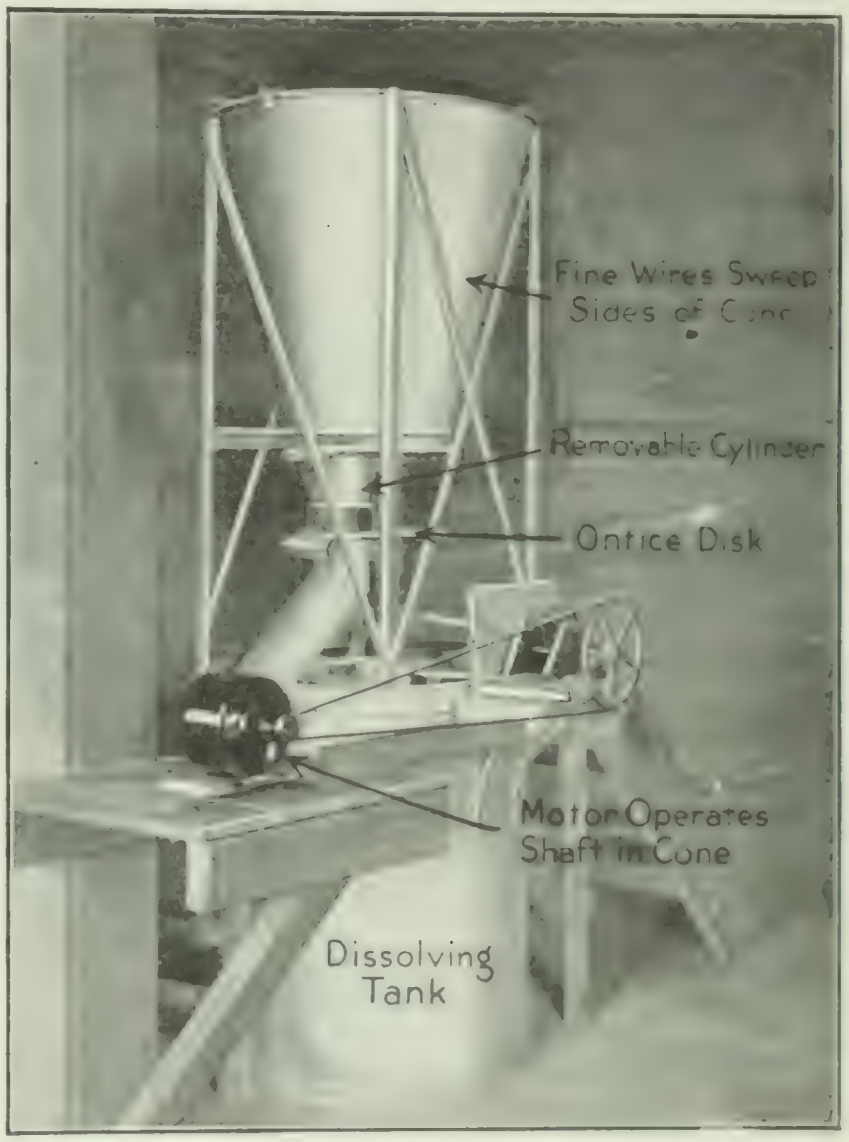
Invaluable as the above data on wood would be for use in the design of building interiors, such as beams, columns, floors, etc., Mr. Sheldon thinks that his experiments, confirmed by theory, indicate that the prevention of condensation on the top side of roof plank is impracticable for several reasons. First, the insulation would necessarily be so complete as to make the expense unwarranted. Also, if plank were used for this extra insulation, they should be antiseptically treated against rot, whereas it will be seen below that a fully satisfactory result will be attained at much less expense by the treatment of the roof plank only. Again, even if condensation within the area in question was prevented by this means, there would still be no certainty that plank selected as suitable for the room conditions would not rot, for the reason that the top side of these roof plank would be several degrees lower than the room temperature. This would result of course in a higher relative humidity than that existing in the room below, and consequently plank that might be suitable to resist decay under room conditions would not be so resistant under the actual conditions.

According to Mr. Sheldon, the successful solution of the problem of the design of wood roofs resolves itself into two requirements: The roof should be made thick enough, according to the accompanying curves, to prevent the occurrence of condensation upon its under surface. Secondly, it should be protected against decay, by proper preservative treatment.

Bottle-Tight Basin with Circular Baffles Withstands Ice

Simple Construction Methods Prove Successful—In Operation of Plant New Dry-Lime Feeder Is Developed

A CIRCULAR 3,000,000-gal. reinforced-concrete concentrically baffled reservoir at Bedford, Ind., has remained bottle-tight since construction three years ago. Although the reservoir is reinforced near the top for ice pressure, the water-department employees cut the ice the first winter, but for the last two winters no attention has been paid to this operating detail and no trouble has developed. This basin and a chlorinating outfit comprise the purification works for treating the turbid White River water for this city of 10,000 people. As a similar process has been proposed for the training camp at Fort Benjamin Harrison, Ind., a description of the reservoir and its construction is here outlined.



DRY LIME FEEDS INTO REMOVABLE MEASURING CYLINDER

The reservoir is located halfway up the bluff from the river to the city, to which water is delivered by motor-driven multistage centrifugal pumps under a total head in the two lifts of 525 ft. The 20-in. suction line, 660 ft. long, leads from a submerged concrete intake to a pump pit excavated in the rock to a depth of 8 ft., so as to be safe from the 26-ft. rise in the river at flood time. The present 3,000,000-gal. horizontal unit is being duplicated.

The circular wall of the reservoir is 160 ft. in diameter, 12 in. thick at the top, 26 in. at the base and 14

ft. deep to the floor, which is of spherical shape, giving a depth of 26 ft. at the center. The wall is reinforced for bursting and against temperature and unusual stresses. The 4½-in. floor was laid with ½-in. reinforcing bars two ways on the easily shaped clay. The two concentric baffles of 40- and 100-ft. diameter and 6-in. thickness are reinforced horizontally with ½-in. bars spaced 6 in. and vertically every 4 ft. with ⅜-in. bars.

Construction Methods Simple

Construction of the reservoir was by a local contractor who did not have elaborate equipment. In consequence the wall was built in seven sections, the end of the forms being removed after six to eight hours and the fresh concrete roughed with a pick. The concrete consisted of 1 part cement to 2 parts of sand carefully prepared from a fine and coarse grade, and 4 parts of broken stone passing a 1½-in. mesh. The material that went into the concrete was checked by weight by the inspector and was held in the mixer at least one minute after sufficient water was applied to give a pasty concrete that would roll or crawl down the chute into the wheelbarrows. Care was taken to spade the concrete in the forms by a special spade of ½-in. metal 5 in. wide and 5 ft. long with a handle of pipe welded to the blade.

The vertical reinforcing was held in the footing, and the horizontal bars were extended through the end gates to form sufficient laps for the following section.

Regardless of the number of vertical joints and absence of special waterproofing, the reservoir when tested proved practically bottle-tight. The tests were specially severe, as the original specifications called for the continuous deposition of concrete and were only modified when the contractor gave bond to guarantee tightness under his piecemeal method of construction. On filling with water, no leaks were discernible on the walls, and after deducting for evaporation the drop was inappreciable after five days. Then, by order of the engineer, water was turned into the trench outside of the wall, so as to be able to detect more easily any perceptible leaks. This pressure from the outside disclosed two small damp areas. When the water was let out of the trench, the areas opposite were painted with asphalt; and subsequent test indicated that the small pores had been closed.

Operation Satisfactory

In operation, the incoming water, dosed with lime and iron, discharges inside of the inner concentric baffle behind two back-and-forth baffles, giving a rapid flow and mixing. Then the velocity is decreased to less than 1 ft. per sec., and most of the sediment settles within inner concentric baffle, from which it is removed, without draining the basin, by opening the central blow-off and admitting water under pressure through a pipe laid alongside the foot of the baffle wall. The water issues in jets from a series of short ½-in. pipes screwed into tees in the main supply line. These small pipes are turned down at an angle of 30° and bent to discharge in the same tangential direction as the flow of the water. When the water is at its worst and the turbidity ranges up to 3000 parts per million, the sludge is blown off for from 10 to 20 min. each day. At other times, once a week is sufficient. So little sediment settles in the second and third concentric space that the whole floor is cleaned but once or twice a year.

Every two weeks, samples are tested by the analysts of the State Board of Health with results comparable in excellence to filtered supplies. The turbidity of the supply delivered to the consumer rarely exceeds 10 parts per million.

Dry Feeder for Hydrated Lime

An ingenious dry feeder for hydrated lime has been developed at this plant after experiments with several screw arrangements which are used in the handling of flour. The scheme consists of a conical lime-supply box in which is a revolving vertical shaft carrying narrow blades at top and bottom with fine wires connecting the ends to sweep the sides of the cone, thus preventing any arch action in the lime. The lower blade sweeps over the bottom, in which is an orifice feeding directly into a removable cylinder. The lower end of the cylinder is covered by a large disk revolved periodically by a timing clock. An opening in the disk permits the charge to fall into a mixing tank. Adjustment is easily made by putting in different-sized cylinders or varying the interval on the timing clock.

Experiments with agitators in the mixing tank finally led to the adoption of a 6-in. propeller set 4 in. above the bottom of the sloping sides. The incoming water plays in a jet against the propeller and rising after being thoroughly mixed, overflows at the top.

The basin and other improvements to the Bedford water-works were designed and installed under the general direction of C. H. Hurd, consulting engineer, Indianapolis, with J. W. Malott superintendent in charge.



CONCENTRICALLY BAFFLED BASIN AT BEDFORD RETAINS MOST OF SEDIMENT IN CENTRAL COMPARTMENT

Status of Welland Ship Canal

About $13,000,000 of the total estimated cost of $50,000,000 has been spent to date on the Welland Ship Canal. The work has been suspended on account of the war.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Land Drainage Affected by High Prices

Sir—I have read with interest in your issue of June 7, the editorial "Land Drainage Needs Pushing," and I quite fully agree with you that it does; but it seems that there is more possibility of land drainage ceasing entirely than of its being extended.

The prices for fuel, wire rope, labor and food are making it almost impossible for contractors to carry on this work at a reasonable figure. The prices within the last two years have been about 10c. per cu.yd. for ditch work and 12 or 13c. for levee work. Now, however, the price is far in excess of this. I note that the Mississippi River Commission has just rejected a bid on the Sny Island drainage district, where the contractor bid 61c. per cubic yard.

I am very fully of the opinion that we need a drainage act similar to the reclamation act, under the terms of which the arid lands of the West have been reclaimed. Certainly these wet and overflowed lands, so close to the center of population and so close to transportation, should be reclaimed promptly. E. T. PERKINS.

Chicago, Ill.

Treating Packing-House Sewage

Sir—Please publish a correction to an article which appeared in your issue of May 31, entitled "Marked Advance in Treating Sewage from Packing Houses," written by G. B. Zimmele. In conclusion No. 5, Mr. Zimmele stated: "The effluent is stable and so well purified that it is reused in the packing house like ordinary water." We do not reuse this water in the packing house in any manner whatsoever.

In conclusion No. 6, Mr. Zimmele says: "The problem of dewatering the sludge has been solved, at least for packing-house sludge, and the process patented." In this connection it would be well to say that this acid treatment gives better results with Fort Worth sludge than with sludge produced in other sections.

G. L. NOBLE,
Assistant Superintendent, Armour & Co.

Chicago, Ill.

Will Engineering Council Secure Coöperation of Engineers

Sir—I have read with considerable interest the letter from C. E. Drayer in your issue of May 3, also the suggestions for amendment to the by-laws of the United Engineering Societies. I was also present as a delegate at the third annual conference of the Committee on Engineering Coöperation, which conference adopted a set of resolutions intended to pave the way for more cooperation and united effort of all the various engineering societies throughout the country. At this conference there was presented in a paper the suggestion of organizing a new society, to be known as the "Engineering Civic Federation."

All these moves show beyond doubt that the engineers throughout the country feel the need of more unified action on the part of the profession as a whole. If this need is as universally felt as I believe it is, there can also be no doubt that it will eventually result in the success of one of these coöperative movements; and to be of lasting benefit, the successful movement must be of such nature that it will benefit *all* engineers, reaching those who are *not* members of certain societies as well as those who are. Such a movement must in some way or other reach out a helping hand to our draftsmen, levelmen, instrumentmen, etc., for among these are our future engineers and leaders in the profession. Every reader of this letter has been numbered in those ranks.

In the writer's opinion, there are three main essentials in the organization of that movement which will ultimately succeed: (1) Democratic representation and control; (2) a responsive and responsible central government; (3) a liberal policy toward local units in the management of their local affairs (home rule).

1. Democratic Representation and Control—By this is meant that each and every member of the profession who definitely allies himself with his profession and its members should have as direct a voice as possible in the government of the profession. To state this a little more in detail, the central governing body of whatever crystallizes from this movement must be composed of members who have been selected in such a manner as to give each and every member a direct voice in their selection. The more stepping stones placed between the members and the governing board the farther you get from a democracy.

2. A Responsive and Responsible Central Government—This is of course an absolute essential for the success of any organization or movement. If any such movement is to be democratic, if it is going to serve the needs of the profession and result in real coöperation, it must be governed by a body of men who will respond to the needs and desires of those who compose the organization. Besides being able to respond readily to the needs of the various units composing the organization, this governing body must be clothed with powers sufficient to give it true and efficient responsibility.

3. A liberal policy toward the local units in the management of their local affairs may be considered as a safety valve which will some day save the entire movement or organization from destruction (from within).

Does any movement so far started provide these essentials?

There are really two movements on foot at present which provide for coöperation of existing engineering societies—namely, the Engineering Council of the United Engineering Societies, and the Committee on Engineering Coöperation.

In discussing the recommendations for establishing the Engineering Council of the United Engineering Societies, I must admit that I am an outsider endeavoring to look in, but at the same time sincerely hoping that those on the inside are endeavoring to look out and see the needs of that part of the profession not represented within. In the first place, the Engineering Council is recommended in order to provide for convenient coöperation between the four Founder Societies for the purpose of consideration of questions of general interest to engineers and to the public. . . . This is a broad

and necessary field, we must all admit, but one which is to be handled only by the four Founder Societies, representing perhaps 40% of the profession.

We further find that "the trustees of the United Engineering Societies may elect to membership in the Engineering Council other national engineering or technical societies . . . provided their nomination . . . have the unanimous approval of the governing bodies of the four Founder Societies." This shuts out all hopes of the 60% not now represented of *ever* being represented in a coöperative movement "for the proper consideration of questions of general interest to engineers (themselves), unless they join some *national* society.

It is far from my intention to criticize in any way the four Founder Societies for entering into any form of movement they desire, but would it not be better in launching such a movement that they also make provisions for including those societies in excess of that of these local societies? Would this not result in far more benefit to the entire engineering profession, and *therefore* to the four Founder Societies?

The Committee on Engineering Coöperation at its third annual conference passed a resolution asking the national societies to "create machinery necessary to provide for a general permanent body made up of representatives of the various national, state and local engineering organizations. . . ."

It furthers appears to me that the General Committee which framed the outline of the Engineering Council departed quite radically from the principles of both democracy and home rule when it provided that "each Founder Society shall have five representatives upon the council, and such representatives shall be designated by the governing body of such society." Why should the council endeavor to dictate the method by which each society should choose its delegates? Should not each society be free to choose its delegates or representatives according to its own pleasure? The tenth paragraph of resolution A passed by the Committee on Engineering Coöperation states, "A conference of representatives from each engineering organization . . . ," leaving the method of choosing those delegates to the various organizations themselves.

In conclusion, I fully realize that I have only mentioned those points in the formation of the proposed Engineering Council which to me seem not to be desirable. I have done this because I feel the good points will stay without special comment, and not because I feel there are no good points. To be a success and of real service, this coöperative movement must be a broad one; it must be one which will reach a majority of the profession and not confine itself to the national societies representing but a minority. It will require much thought and labor in working out details, but if properly launched and equipped will be of immeasurable value.

J. C. PINNEY,
Superintendent Bridges and Public Buildings,
Milwaukee, Wis. Department of Public Works.

How To Guard Against Overstressed Counters

Sir—The interview on "Tendencies in Bridge Construction," published in *Engineering News-Record* of June 14, p. 541, is a departure in scientific journalism and gives a live interest to a bone-dry subject. The article holds the attention of the reader from beginning to end.

The continued increase of railroad-bridge loading and the constant renewal of bridges, which are scrapped for no other reason than overloading, have very properly received much attention. In 1890 the Erie R.R. was designing bridges for an engine concentration of 24,000 lb., and at that time I was instructed by C. W. Buchholz, chief engineer, to select an engine loading which would "cover all future possible increases." To this end, after extended study and consultation with locomotive designers, I recommended a loading which seemed at that time to cover the purpose and which corresponded to the present E-35 engine. This, when compared with the E-24 then in use by the road, seemed so extreme that it was only after most urgent insistence that the increase was adopted.

This proved to be only the beginning of the increased loadings, and within 10 years the specified loads exceeded those of 1890 by nearly 100%. These changes led to improved methods of proportioning, to the careful study of impact and to increased allowable stresses and finally, where the bridges in early years were scrapped when the strains exceeded 15,000 lb. per sq.in., they were later, with allowance for impact, permitted to reach 20,000 lb. per sq.in. or even more.

But now again we are on the threshold of another step of progress. In the examination of overloaded bridges we find the first overstrain in the counter members of trusses. The strain of main members may be well within safe limits, yet the counters will have passed the danger point and the bridge must be patched or scrapped on that account.

It does not require much argument to show that these bridges are still being designed under a wrong premise. In 1890 the allowable strain for combined dead-load and live-load was 8000 lb. per sq.in., to cover impact and other "factors of ignorance." When provision was made for impact this allowable strain was increased to 16,000 pounds.

Yet these same bridges we are now beginning to scrap when the strains reach 20,000 lb., and the defect is usually found in the counter members.

It was to avoid these conditions that the author, in a paper "Specifications for Bridges and Subways" (*Trans.* Am. Soc. C. E., Vol. LXXV, p. 325), suggested that, instead of designing with an allowable strain which could be increased in service, we should at once use that increased strain and at the same time use an increased load which we could anticipate would produce that strain; that is, if we anticipate an increase of 25% in allowable strain before the bridge is scrapped, we should design with an increase of 25% in the assumed loading, which we might term a "contingent increase." This would make the proper provision for anticipated increase in counter members. Where a bridge is required for engine E-40 with 10,000 lb. allowable strain, we should make the calculations for E-50 with 20,000 lb. allowable strain; or where engine E-60 with 16,000 lb. is required, we should proportion for E-75 with 20,000 lb. allowable strain. This will build a more economical and a better-proportioned bridge.

HENRY B. SEAMAN,
New York City. Consulting Engineer.

SOCIETY SERVICE

A Section Dealing with the Results of Teamwork by Technical Men

IT HAS been noticeable that engineering organizations of the West with radically different purposes have recently accomplished much along the same line—namely, an increase in the scope and responsibility of the engineer. In order to secure some definite idea of this movement, *Engineering News-Record* has made a canvass of Pacific Coast organizations, asking about the aims and recent accomplishments of each. The following review of the situation is presented:

PROGRESS IN CALIFORNIA

The San Francisco Association of Members, Am. Soc. C. E., in addition to the usual meetings and inspection trips, has undertaken the preparation of a report suggesting improvement of civil-service laws, has coöperated with the Industrial-Accident Commission in the form of building-construction safety orders, has successfully fought a legislative act intended to impose upon engineers the necessity of obtaining an architect's license before designing or constructing buildings and has assisted in an industrial and professional survey of the state in conjunction with the War Department.

The Southern California Association of Members, Am. Soc. C. E., considers it within its province to "participate in and exercise its influence when an expression of engineering views will contribute to the general public welfare." In connection with other work of this sort it has been active in framing a bill for a proper regulation of court procedure as to expert witnesses. This has been directed toward "raising the present status of expert witnesses from unenviable notoriety to one of honor, and to the better attainment of the ends of justice."

THREE AIMS IN VIEW

This society works on the policy that engineering knowledge is advanced less by formal papers than it is by talks from notes, illustrated by lantern-slide projections, of methods of construction and the handling of equipment. In this manner the subject is visualized and impressed more effectively, at the same time that it encourages discussion. This society works toward a threefold end: (1) To bring the members together and thus (2) encourage the interchange of engineering knowledge and engineering experience and ideas, and (3) to facilitate active participation in public affairs in so far as these come within the province of the engineer.

The Engineers and Architects Association of Southern California is still the largest organization of its kind on the coast, having over 300 members. Although many of these have joined national organizations, they have not left the ranks of this local society. It is open to engineers and architects of all branches without requiring high attainments in their several professions. The result is that a considerable part of the membership consists of younger men, and the plan of operation of the organization is laid out to benefit a membership with widely divergent interests.

The association emphasizes the difference between keeping out of politics and shirking action in those public matters that affect the engineer. Thus its committees, which have been regularly at work on all legislation affecting engineering or architecture and building construction, have enabled the association to see that engineers had adequate representation in such matters. The organization believes in the advantages of informal association such as is gained on inspection trips, and many of its meetings are "in the field."

Los Angeles has a joint committee of technical societies consisting of four resident members from each of the seven technical societies—namely, American Chemical Society, American Institute of Architects, American Institute of Electrical Engineers, American Institute of Mining Engineers, American Society of Civil Engineers, American Society of Mechanical Engineers, and Engineers and Architects Association of Southern California.

ASSOCIATION ACTIVITY IN THE NORTHWEST

The Oregon Society of Engineers has established a monthly bulletin for circulation among its membership, calculated to bring the members closer together. An employment department under the direction of the secretary has come to be generally known among employers and has been the means of helping members to find jobs in a most satisfactory way.

The Seattle Association of Members, Am. Soc. C. E., has been working actively for some time on the policy that the local association in western territory must be made the active energizing unit of the parent society, and work has been directed toward strengthening the status of the association along the lines of this ideal. During the past year this association assisted in organizing the Associated Engineering Societies of Seattle. It also used its influence successfully in securing the passage by the legislature of a state water code, as well as securing the defeat of an architect's license bill that included a clause inimical to the engineer.

It is notable that every one of the Pacific Coast engineering organizations has recognized that it is in a position to do much toward preparing inventories of resources that the Government might wish to utilize in war times and in many other ways to assist in preparatory measures. For example, the Seattle association, with a membership of only 90, has two members on the Naval Consulting Board, four majors and two captains in the Officers' Reserve Corps and two members with the Canadian contingent at the front. One-quarter of the membership had volunteered for service shortly after the declaration of war.

St. Paul Meters 64% of Water-Supply

The City of St. Paul, Minn., with 272,000 population (214,000 consumers), has 64.15% of its water-supply metered. The consumption is 55 gal. per day per inhabitant, or 70 gal. per consumer. The annual report of the Water Commissioners states that the city furnishes about 60% of the water. The remainder is from artesian wells, which mainly supply what would otherwise be large consumers. These individual services have no connection with the city's water-works system and are not included in its statistics.

THE ENGINEER IN FIELD AND OFFICE

A DEPARTMENT DEVOTED TO DETAILS OF THE DAY'S WORK

Willow Root Stops Water Main

By Gale S. Strout
San Francisco, Calif.

THE accompanying view shows two sections of the root of an ordinary willow. These are sections from a single root 21 ft. long that was removed from a 10-in. water pipe. The smaller of the two is the parent root and is ½ in. in diameter at the point at which it entered the pipe. Three feet inside of the pipe it completely filled and blocked the passage for a distance of 4 ft., at which point it tapered down slowly to a single hairlike feeder at the end.



WHAT WILLOW ROOT DID

This root represents the growth of but one year. The pipe was thoroughly cleaned at this point a year ago, and a hole left in the pipe at that time was the entrance of this trouble maker. The root was taken from a 10-in. collecting main in the system of the Petaluma Power and Water Co. by the company's superintendent, F. D. Ellsworth.

Automobiles Facilitate Survey Work

THE value of the automobile as a substitute for team outfits in increasing the efficiency of the engineer force on surveys for large construction work is dealt with in the June number of the *Reclamation Record* by O. T. Reedy, construction engineer, United States Reclamation Service. The work was the Laramie unit of the North Platte irrigation project in Wyoming. It included the construction of 42 miles of main canal and the advance location and cross-sectioning for a 20-mile extension. Four automobiles are now operated; while their primary service has been for supervisory work, all of them have been used more or less on survey work.

In one instance, a field party had charge of about 11 miles of heavy canal construction, including two siphons and two tunnels 2700 ft. and 2150 ft. long. Their work increased until it was evident that a second party would be required, as the men often had to do their surface work by day and a considerable part of the tunnel work by night. Analysis showed that 30 to 50% of the time was spent in going from job to job and that the one party could handle all the work if provided with a car to reduce this lost time. This was done and proved entirely satisfactory.

The cost of an automobile delivered is given by Mr. Reedy as $403, and $459 for a team, spring wagon and harness. The saving was about $497, as the car took the place of two team outfits, which were then transferred to construction work. There was also the saving of the salaries of one engineering party—at least $230 per month. The cost of operation of the four automobiles and of team outfits at four camps on the work is given in Table I.

The monthly expense for three months of car G in survey work exclusively was $37.55, distributed as shown in Table II. This was in the winter, which accounts for a considerable increase in the expense. For supervisory work it was possible to select the milder days, but for survey work the car had to be in service daily, practically regardless of road and weather conditions, on account of the requirements for giving line and grade in the several tunnel headings. The survey cars also traveled over the most difficult roads on the work, aside from their condition due to winter weather. The cars on supervisory work traveled over these same roads, but also over fairly good roads, so that their average expense was less.

In Mr. Reedy's opinion the cost for automobile G for the nine-month period (Table I) in which it served for both supervision and survey work is about the average for an automobile used exclusively on survey work the year round and on the average roads on this job. He points out that while this is the highest monthly cost for any automobile, it is lower than the lowest team cost. The team of Box Elder camp is more nearly comparable with that of automobile G, and there the average cost was $36.60, or 30% more than for the automobile. However, this camp had been established only three months. Probably its team cost would be reduced later to that of Cherry Creek camp, or $30.12, which is a little less than 7% more than for the automobile.

Cost of Camp Installation Decreased

In connection with the above figures it must be considered that the capacity of the survey party, especially on construction work, is increased 50 to 80% by the use of the automobile. The cost of camp installation and equipment is correspondingly decreased, fewer camps being required. At least one team is required for each large camp, but only incidentally for survey work. In the three-month period of Table II, there were only two days in which the weather prevented the car from running and on these days the men preferred to walk to the tunnel work rather than try to get through with a team.

The most unfavorable conditions for the automobile in survey work are those of transportation across undeveloped country. Such conditions were experienced when orders were received to rush certain advance location surveys. This was in the middle of winter, and it was necessary to carry on the work from such camps as were already established. Teams were out of the question, as even at the start 50% of the time would be consumed in going to and from work, and this percentage would increase until there was no working time. Three automobiles were used, and the work was pushed rapidly in spite of the adverse conditions. It was found that even under such circum-

stances the automobile is more advantageous and at least as economical as the team outfits.

TABLE I. COST OF AUTOMOBILE AND TEAM SERVICE ON SURVEY AND CONSTRUCTION WORK

	Months of Cost Record	Average Cost of Maintenance per Month	Character of Service
Automobiles:			
F	11	$25.50	95% supervision, 5% survey
G	9	28.20	60% supervision, 40% survey
H	9	19.75	85% supervision, 15% survey
L	1	10.69	100% supervision (220 miles)
Teams:			
Port Laramie	16	$29.34	40% survey, 60% construction and general
Cherry Creek	8	30.12	70% survey, 30% general
London Flats	13	46.26	60% survey, 40% construction and general
Box Elder	4	36.60	90% survey, 10% general

TABLE II. OPERATING COST OF AUTOMOBILE G

Month	Miles Run	Unit Cost per Mile: Gasoline	Lubrication	Repairs	Supplies	Total Unit Cost	Total Monthly Cost
Nov., 1916	466	3.1c.	0.5c.	1.0c.	4.2c.	8.8c.	$41.00
Dec., 1916	431	3.2c.	0.5c.	1.5c.	1.1c.	6.3c.	27.10
Jan., 1917	550	3.3c.	0.2c.	1.4c.	3.2c.	8.1c.	44.55
Average	....	.....	.....	.....	.....	.....	$37.55

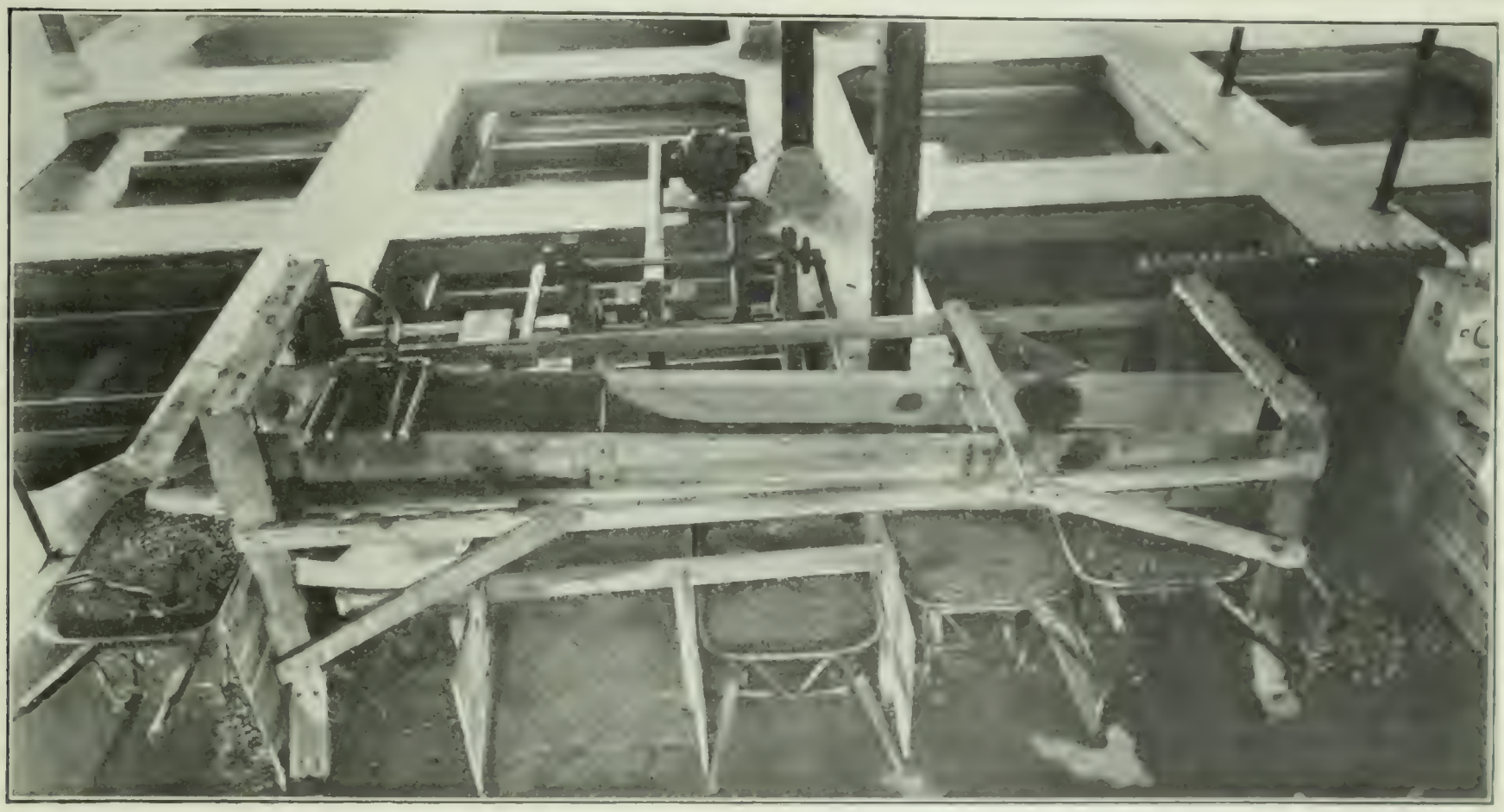
tion, the sheets still to be driven were sharpened to a chisel edge, by burning with the flame. The interlocks near the point were cut away on a slant, 4 to 6 in. back, and then the edge (3 to 10 in. wide) was burned to a bevel on the concave side of the sheeting, as sketched here. This expedient, devised by H. H. Fisher, Superintendent of Construction for the company, proved entirely successful.

Size Gravel in Home-Made Shaker

FOR resizing the gravel removed from the mechanical water filters at Grand Rapids, Mich., last winter, a home-made shaker operating on wet material was constructed at a cost of $37 for material by men regularly employed at the plant.

In 1914-15 the screens separating the gravel from the sand were removed, and the thickness of the gravel layers was increased to a point where they alone would be stable against the upward force of the wash water. This increased the bulk of the gravel to be handled subsequent to overhauling threefold or fourfold. Formerly, it was necessary to spread out the gravel to dry on the filter gallery floors and later work it by hand through a series of screens 2 ft. square. The screens were shaken back and forth over saw-horses fastened parallel to one another, the whole material pile being worked over for each grade of gravel separated.

With the added volume this method became too laborious, so the motor-driven shaker screen pictured was built. It is made entirely of wood put together with bolts, the 2 x 14-ft. screen frame being supported by four hanger bolts. The feed end is raised 15 in. and made adjustable by turnbuckles in the hanger bolts. Horizontal pipe guides keep the screen box in alignment as the entire [illegible] box sidewise through wooden



HOME-MADE MOTOR-DRIVEN FILTER GRAVEL SCREENING OUTFIT COST $37

Steel Sheeting Sharpened Makes Easier Driving

HARD driving and the presence of various obstructions in the river bottom complicated some deep sheet-pile cofferdam construction of the Louisville Gas and Electric Co. The intake and discharge tunnels for the company's power house extension, near the foot of N. 3rd St., are being constructed in open trench, within a single-wall cofferdam of steel sheeting driven to a maximum penetration of 65 ft. Arch-web sheeting of Lackawanna type, 14 in. wide, is used. About half the length of the cofferdam is in the open water, up to 25-ft. depth. Both the land and the water portions encountered numerous obstructions—boulders, buried logs, old boat hulls, a large brick-and-stone sewer, and the like. Even in clear soil (clay and fine sand) the driving often was very hard, and the tops of the piles became battered and distorted. To get easier penetra-

pulleys and crank disks at the rate of 130 to 140 r.p.m. The reduction was 1:2:5 or 1:3:5 and the power consumed by the 10-hp. motor did not exceed three horsepower.

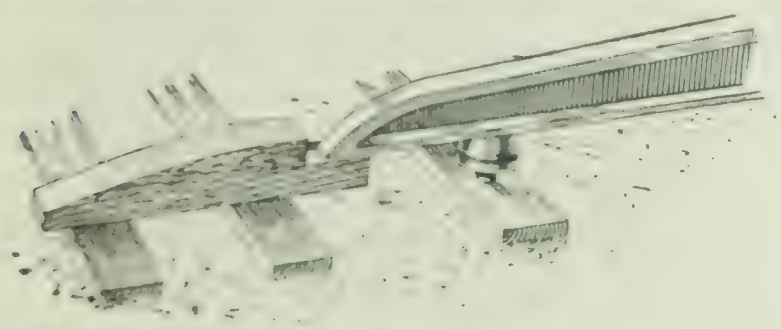
The sand and gravel mixture, shoveled into the feed end, passes first under the washing rig, consisting of four 1-in. perforated wash pipes supplied from a hose so as to provide the proper flexibility while the machine is in motion.

As the gravel passed down the screen box, it was found that the work was done in the first 6 in. of each screen. Five men are required to operate and keep the machine going at full speed, the gravel being taken from the filter, washed, graded and piled.

The machine was constructed by the men regularly employed at the plant, and the cost noted is exclusive of labor and cost of extra wiring for the spare motor used. The time saved over the former method is estimated at 85% , according to Walter A. Sperry, chief chemist, under whose direction the work was done.

Wood Block Guards Third-Rail End

TROUBLE is sometimes caused by faulty third-rail shoes getting below end approaches and thus breaking the insulators and tearing up the rail. The accompanying sketch shows how this is prevented on one railway property by a wooden block placed in front of a third-rail approach and securely nailed to the ties.



GUARD TO PREVENT THIRD-RAIL SHOES FROM GETTING UNDER THE RAIL

Sufficient clearance is left between the ends of the block and the rail to allow for the expansion of the latter. It has been found that no real harm results if the block accidentally comes in contact with the rail since the leakage is small even in wet weather.

Adopt Standard Screen Scale for Testing Sieves

AS A result of a two-year study of the question of a standard screen scale, a conference was called at the Bureau of Standards of representatives of various committees of the American Society for Testing Materials, the American Society of Civil Engineers, the American Institute of Mining Engineers, the American Foundrymen's Association, the Mining and Metallurgical Society of America, the American Water-Works Association, the American Institute of Metals, the United States Geological Survey, the United States Bureau of Mines, the United States Office of Public Roads and Rural Engineering and the United States Bureau of Standards; there were present also representatives of a number of private firms engaged in industries in which sieves are used, and likewise representatives of the firms in this country manufacturing wire cloth and sieves.

The conference, after considering the various screen scales either proposed or now in use, adopted as a standard screen scale that given in the accompanying table, and recommends that it be adopted generally by scientific, technical and engineering societies and committees and by branches of national, state and municipal governments as a part of their specifications for materials and methods employed; also, that it be used by private firms who have need of standard sieves for carrying out their work.

The sieve having an opening of 1 mm. is the basic one, and the sieves above and below this in the series are related to it by using in general the square root of two, or 1.4142, or the fourth root of two, or 1.1892, as the ratio of the width of one opening to the next smaller opening. The first ratio is used for openings between 1 mm. and 8 mm., while the fourth root of two is used as the ratio of openings below 1 mm., to give more sieves in that part of the scale. The sieves of this series have been designated by the width of the opening in millimeters, as a 1.41-mm. sieve or a 0.36-mm. sieve.

The Bureau of Standards announces that it will test sieves of this series to determine whether they conform to specifications given below. This test will consist of the examination of the mesh of both the warp and shoot wires of the cloth to ascertain whether it comes within the allowed tolerance, and also measurements of the diameter of wires in each direction to determine the average diameter, and a measurement of any large openings to ascertain whether they exceed the limit given in the specifications. The sieve will be omitted to discover any imperfections that may seriously affect its value.

A fee of $2 per sieve will be charged for the test of a singly submitted sieve. For from two to nine sieves submitted at one time, the fee will be $1.50 per sieve, and for lots of ten or more the fee will be $1 per sieve. Only half of the above fees will be charged for such sieves as may be rejected for exceeding the tolerances of mesh, in which case the wire diameter will not be measured.

BASIC SIEVE OPENING IS 1 MM.

Sieve	Opening	Mesh	Wire Diam.	Ratio Wire Diam. to Opening	Tolerances Mesh	Tolerances Diam.
8-mm	8 00	1 0	2.00	0 25	±0.01	±0.08
5 66-mm	5.66	1.4	1.48	0 26	±0.01	±0.08
4-mm	4 00	2.0	1.00	0.25	±0.02	±0.05
2.83-mm	2.83	2.75	0.81	0 29	±0.02	±0.05
2-mm	2 00	3.9	0.56	0 28	±0.04	±0.05
1.41-mm	1 41	5.0	0.59	0.42	±0.08	±0.025
1-mm	1 00	7 0	0.43	0 43	±0.15	±0.020
0.85-mm	0 85	8 0	0.40	0 47	±0.2	±0.015
0 71-mm	0 71	9 0	0.40	0 56	±0.3	±0.012
0.59-mm	0 59	10 0	0.41	0.69	±0.4	±0.012
0 5-mm	0 50	12 0	0.33	0 66	±0 4	±0 012
0 42-mm	0 42	14.0	0.29	0 69	±0 6	±0.010
0 36-mm	0 36	16 0	0.26	0.72	±0.6	±0.010
0 29-mm	0 29	20 0	0.21	0 72	±0.8	±0 010
0 25-mm	0 25	23.0	0.185	0 74	±1 0	±0.008
0.21-mm	0 21	27.0	0.16	0 76	±1 0	±0 008
0 17-mm	0 17	31 0	0 15	0 88	±1 0	±0 008
0 14-mm	0 14	39 0	0 116	0 83	±1.0	±0.008
0.125-mm	0 125	47 0	0 089	0 71	±1 5	±0.008
0.105-mm	0 105	59 0	0 064	0 61	±2 0	±0 008
0 088-mm	0 088	67 0	0 061	0 69	±2 5	±0 005
0.074-mm	0 074	79 0	0.053	0 72	±3 0	±0.005
0 062-mm	0 062	98 0	0 040	0 65	±3.5	±0 005
0 052-mm	0 052	110 0	0 039	0 72	±4 0	±0 004
0 044-mm	0 044	127 0	0 035	0 80	±5 0	±0.004

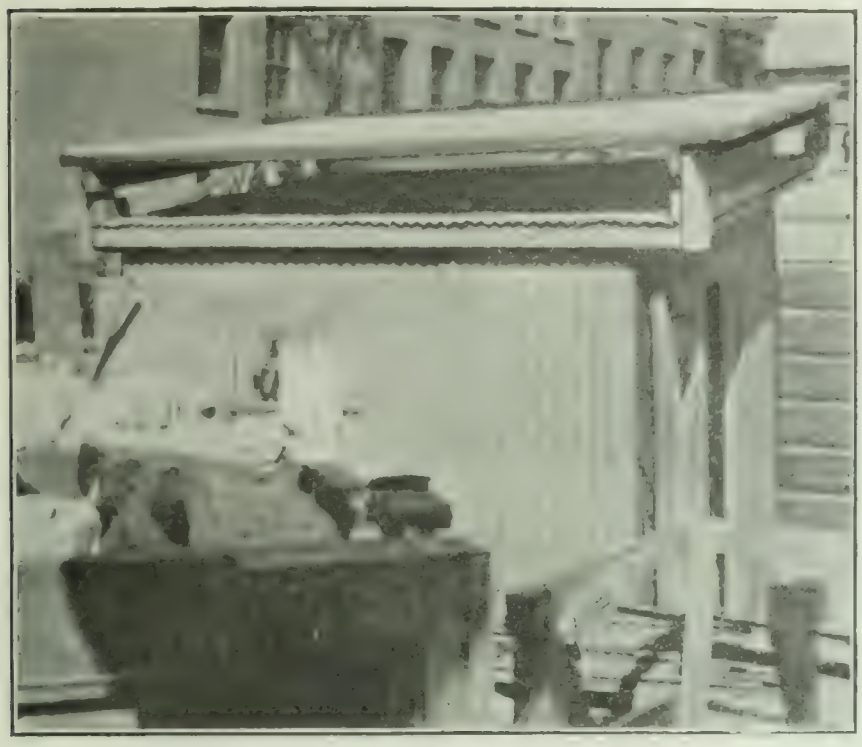
HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Wood Roof Above Iron Reduces Temperature of Corrugated Office

By Frederick B. Spencer
Engineer in Charge, Smith, Hauser & MacIsaac, Inc., New York City

PORTABLE houses of corrugated sheet metal are prone to get hot under a summer sun. In the one shown in the photograph this tendency is greatly reduced by the construction of a wooden roof 12 in. above the steel one. The construction, which is said to be common in India, keeps the sun off the metal and also provides a circulation of air above the lower roof. The



WOOD TOP ROOF KEEPS BUILDING COOL

second roof consists merely of 1-in. rough boards and is not water-tight.

The building shown is in use by Smith, Hauser & MacIsaac, Inc., in constructing a 20-story office building at the corner of John and William Sts., in New York City.

Concrete Road Laid in Freezing Weather at Slight Extra Cost

By F. E. Semon
City Engineer, Port Angeles, Wash.

BY REPLACING wet and frozen material in the subgrade with dry sand and gravel and covering the finished work where necessary with canvas and sand, the writer was able to complete in a satisfactory manner last winter a concrete road under construction by the city, which the taxpayers were anxious to have the use of during muddy winter weather. While the work was in progress, the thermometer often went to 26 deg. Fahrenheit.

The contract, awarded by the City Council in September, 1916, called for the completion within five months of 13,000 sq.yd. of concrete pavement 6 in. thick and 14 ft. wide. The writer took charge of the work during the first week in October, by which time the contractor had partly completed the grading and almost finished the drainage system. The pavement, laid in one course, was to be constructed under specifications recommended by the Cement Manufacturers' Association. The first paving was laid about Oct. 21, but from the first to the middle of November, rain practically suspended the work. Favorable weather succeeded, during which concreting was continued until December, when a cold spell, during which the thermometer went 6 deg. below freezing every night, occurred. Although the contractor was anxious to proceed, the writer did not think the safeguards that he proposed to supply for his contract price were sufficient and suspended the work.

2000 Yards Laid in January

However, a demand arose on the part of property owners to have the pavement finished so that those using the road would not be compelled to travel in a mud lane all winter, and on this account the city administration was willing to take some risk in putting the work through. The contractor was accordingly notified that the city would pay for extra work necessary to put the subgrade in condition and provide for extra covering required to protect the concrete from frost and cold. Proceeding on this basis, 2000 sq.yd. of concrete were laid during January, when the thermometer ranged from 25 deg. F. during the night to 44 deg. in daytime. All frozen ground was picked up and scaled off, the subgrade being backfilled with sand and gravel from the sea beach. Only enough subgrade was prepared at a time in this way for one day's run. The gravel used was broken up, if frozen into chunks, and all ice removed. Especial attention was paid to keeping water from the subgrade. Where necessary, it was drained into holes outside the curb and dipped out.

Since the subgrade was in a cut of 1 to 2 ft., the soil, a sandy loam, was easily turned into mud. To make certain of securing uniform bearing consistency and at the same time not to relax watch on the mixing of concrete, two inspectors were employed, one of whom gave his entire attention to the mixer. The contractor's men also maintained a close watch to see that no frozen material reached the mixer. Concreting was stopped early each day and the entire crew employed in covering the work.

Spread Canvas Before Concrete Set

Some trouble was experienced at first because the cool weather retarded the setting of the concrete so that the usual method of finishing could not be employed. This difficulty was overcome by using the "quaking" method. The fresh concrete was first "quaked" on the surface with a wood float attached to a long handle. If any wet spots appeared after the concrete had stood for a short while, they were removed by applying dry-mixed

sand and cement, patting down the spot until the whole mass was of the same consistency and floating it off evenly. This method proved very satisfactory. As soon as the spots had been removed in this way, the slab would be covered with a canvas for protection. Some of the slabs poured during the forenoon would usually be hard enough to be covered with fine beach sand.

Should the temperature seem likely to go below 26 deg., the canvas on the other slabs would also be carefully spread over with a thin coat of sand. This was leveled so that no depressions would be made in the green concrete. During the next day, should the weather be favorable, the canvas would be removed and the remainder of the previous day's work covered with fine sand. This sand was always kept damp and during the coolest nights the frost did not crust it to a greater depth than ¼ in.

The pavement was not opened to traffic for 30 days. When spring came and it was possible to compare the concrete placed in this way with that completed early in the fall under favorable conditions, there was no difference apparent, except in the finish. Those slabs on which canvas had been placed before the concrete was quite set are slightly ridged and present a mottled appearance. The method of finishing, however, appears to have benefited the slab.

As to the cost of preparing the subgrade and applying the covering, the beach sand was delivered on the work for $1 per yd., and the preparation of the base cost about 6c. per sq.yd. It was not always necessary to replace the entire surface with gravel. In one instance the base was thawed with a steam hose from the mixer. In a few spots the ground was not completely replaced or thawed before placing concrete, but no harmful results have been observed since.

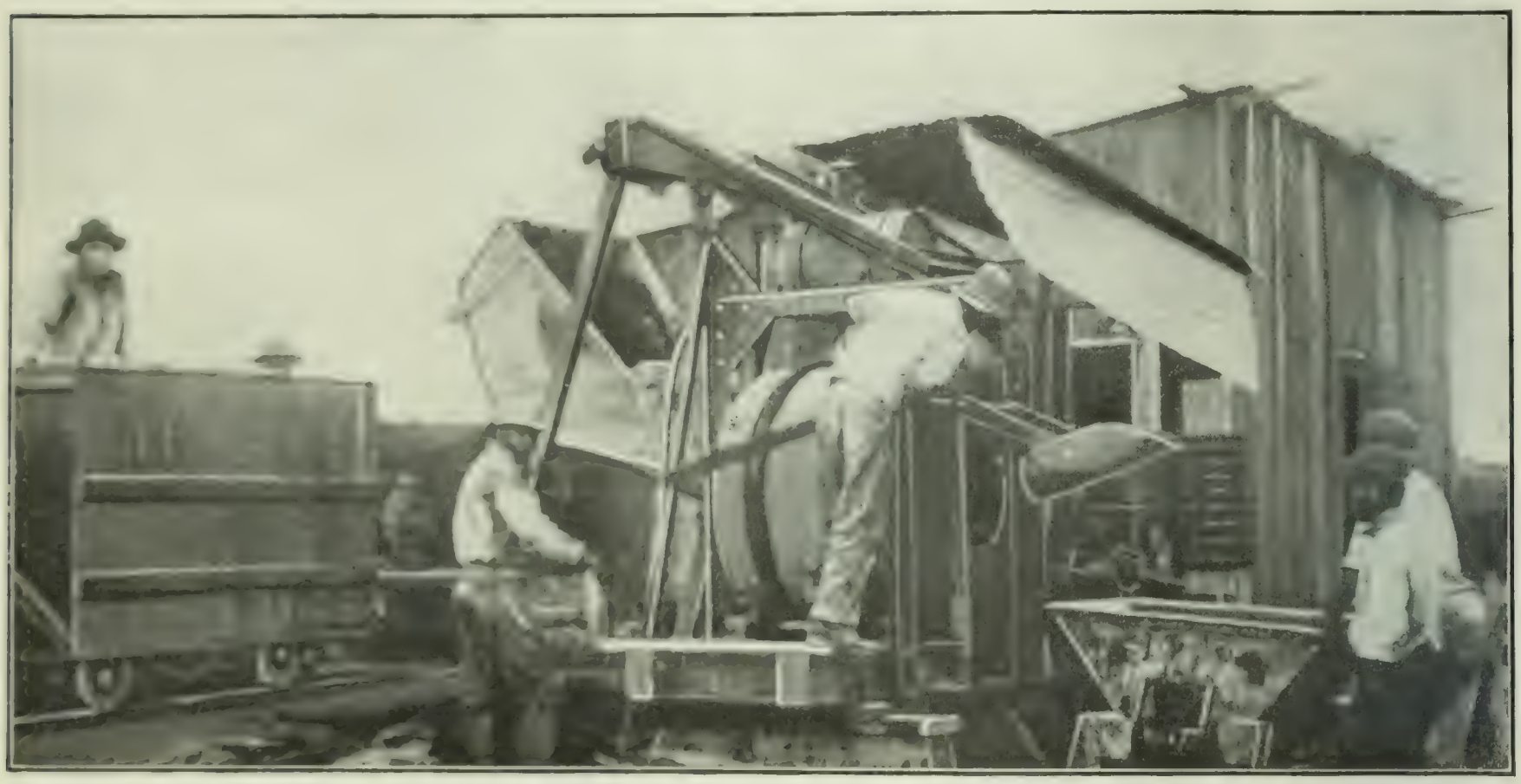
The experience on this road indicates that, if circumstances demand it, concrete pavement can be laid at small extra cost in frosty weather.

Three-Batch Measuring Cars Supply Mixer from Gondolas

By J. C. Foss, Jr.
Civil Engineer, Hilo, Hawaii, T. H.

EIGHT of the cars shown in the photograph were used recently for supplying a concrete mixer from railway cars in such a way as to keep the unloading gang busy, even when concreting was interrupted. Each car holds three complete charges for the mixer, there being six compartments, three for sand and three for stone. As shown in the photograph, a sand and a stone compartment are dumped together into the loading hopper of the mixer, while the cement, brought up on a platform car, is handled separately. The mixer can be operated to capacity, as there is less delay for switching with each car containing material for three successive charges. By having eight of these cars, sufficient capacity was provided to keep the unloading crew busy shoveling out of the railway cars long enough to cover any short delay at the mixer without having to throw material on the ground.

The track on which these cars were operated was 20-in. gage. The car frames and bodies were of wood, the trip doors to the compartments being hinged at the top.



MEASURING CARS HOLD THREE BATCHES, REDUCING SWITCHING, AND EIGHT OF THEM FURNISH RESERVOIR THAT PREVENTS DELAYS IN UNLOADING

Good Roads Reduce Horse Population

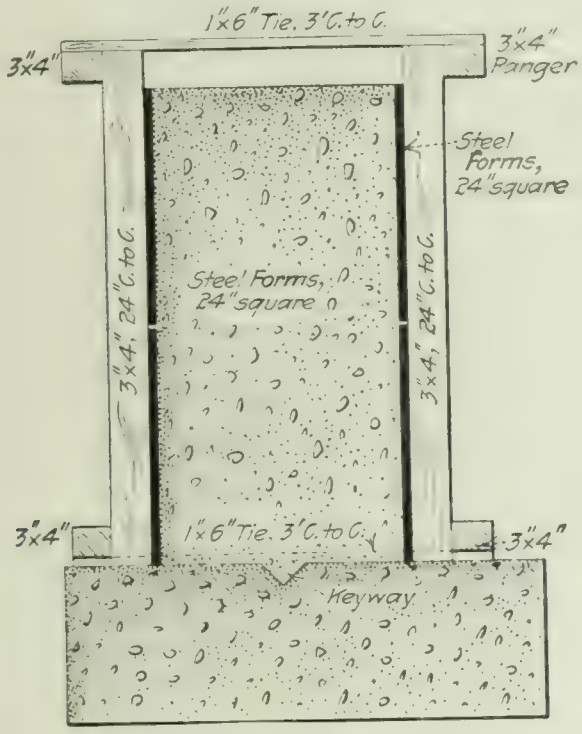
Despite the growth in population and increased areas under cultivation, the horse population of Los Angeles County is now less than one-half as much as in 1900. The automobiles and motor trucks have increased from 6 to 79,146. The 47,000 horses in the county in 1900 were valued at $5,000,000. In 1910 the drop in number was to 31,000, and in the ensuing six years to 20,000. The present automobile valuation is nearly $100,000,000. Excellent road conditions are considered largely responsible for the above figures.

Ladder Clamps Save Time on Concrete Forms for Low Wall

By J. G. Grossman
Fort Edwards, N. Y.

An EASILY erected and removed wall form that has been found very efficient by the writer is made by supporting Blaw form plates in the manner shown in the sketch. The form can also be made entirely of wood.

After the footing pad was concreted, two long 3 x 4-in. strips were fastened together by spiking 1 x 6-in. ties to them, like the rounds of a ladder. The whole thing was turned upside down and spiked in place to the concrete below, after which the 3 x 4-in. studs shown were erected with the 2-ft. square form plates inside them. These studs were held in place by a second ladder made just like the first one and slipped over the top.



FORM DOES NOT NEED WIRING, AND CAN BE REMOVED QUICKLY

In order to strike the form, it was only necessary to remove the top ladder, loosen the studs and take them and the plates out. Only enough pins are used in the steel plates to keep them in place during erection. No wiring is necessary with this form.

Lengthwise Rollers Under Piledriver Made Room on Street

THE ROUND piles for sheeting the excavations for the subway approaches to the Detroit-Superior bridge in Cleveland were driven by two machines whose rollers, instead of being at right angles to the long axis of the bed, were parallel to it. As the piles were all driven near the curb, the usual long cross-rollers could not have been employed without blocking the sidewalk or sticking out into the street. For the same reason, the long axis of the driver was parallel to the row of piles being driven, and little sidewise motion was required. Sliding a piledriver on top of rollers is somewhat speedier than rolling it, as it requires a less complicated hitch with the pile line and no effort on the part of the crew.

With these considerations in view, the roller saddles on these machines were turned around and the rolls, made of 10-in. pipe, placed under the machine lengthwise. This arrangement, shown in the photograph, also saved a little time by simplifying the blocking required for moving the machines. At the time work started, it was not possible to get any 10-in. pipe in Cleveland, and



SLIDING PREFERRED TO ROLLING IN MOVING TRACK

C. S. Smith, in charge of the work for the Bates & Rogers Construction Co., the contractor, was obliged to content himself with making rolls of short lengths which were on hand. These lengths are spliced with 4-ft. wood plugs. With these rolls, in moving backward it was possible to take off a piece of pipe in front of the driver and put it on again behind. However, this took more time than jerking the rolls through with the pile line, and the latter method was always used where possible.

Deficit Last Year for Government-Owned Canadian Railways

A net deficit of $1,179,867 resulted from the operation of the Canadian Government railways during the year ended Mar. 31, according to the annual statement of Frank Cochrane, Minister of Railways and Canals. The gross earnings were $23,465,565. The Government mileage was 4063. The figures compare with net earnings of $576,806 for the previous year, on gross earnings of $18,373,867. They do not, of course, take into account the fixed charges or the taxes for which private companies would be liable, nor do they cover interest on the investment. The Intercolonial Ry., with 1562 miles and gross earnings of $16,902,290, had net earnings of $1,137,713, which sum, it is stated, will be absorbed by the equipment-renewal account. The National Transcontinental Ry., with 2009 miles, suffered a net deficit of $1,[illegible] on $5,916,550 gross earnings, as compared with a deficit of $652,141 on $3,758,387 gross earnings for the previous year.

NEWS OF THE WEEK

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELD

Railroads Lose Plea for Higher Freight Rates

Commerce Board Sees No Emergency in 1916-17 Figures—Allows Eastern Roads Class Increases

The 15% advance in freight rates sought by railroads, to take effect the first of this month, has been denied them by the Interstate Commerce Commission. By a decision rendered June 29, the commission disallows any general percentage increase, concluding that the actual figures for the ten months begun July 1, 1916, show no condition of emergency, so far as the Western and Southern roads are concerned, sufficient to justify any general increase. The condition with the Eastern roads is held to be somewhat different, and these roads are permitted to make a general increase in class rates, equivalent, it is estimated, to 8 or 10 per cent.

The report contains an analysis of the earnings and expenses of the carriers for the ten months ended Apr. 30. Figures are given indicating net income on property investment of 6.64, 5.26 and 5.43% for the Eastern, Southern and Western districts respectively during 1916, and 4.89, 6.45 and 6.21% respectively, estimated, for the first four months of 1917. The commission concedes that there have been large increases in the costs of supplies, but points to a wide divergence between carriers and protestants, and between the carriers themselves, as the amount of these increases in percentages. The commission holds, that "the aggregate of the increased expenses thus imposed cannot be predicted with any satisfactory degree of certainty," and concludes that "we prefer to confine our forecast to the basis of actual experience for the ten months from July 1, 1916." Through the medium of the carriers' monthly reports the commission expects to be able to meet any changed conditions.

Four members of the commission, Messrs. Hall, Clark, Daniels and Harlan, rendered the decision. Commissioner Harlan, however, concurred only to secure affirmative results. In a separate report he decries the month-to-month statistical view of the matter, and declares in favor of full relief for the carriers. Commissioner Meyer is opposed to any increase to the Eastern roads, while Commissioner McChord thinks the issue is one of governmental policy, for Congress to determine, rather than one of the reasonableness of rates. The seventh member of the commission was the late Judson C. Clements.

Earth-Dam Failure in Utah Causes $2,000,000 Loss

Makeshift Spillway Never Came Into Use—Concrete Heart-Wall Retarded Flood—Railway Track and Bridges Washed Out

By Telegraph from H. Kleinschmidt
Consulting Engineer, Salt Lake City

The dam forming the Mammoth reservoir of the Price River Irrigation Co., six miles west of Scofield, Utah, failed June 24 and 25. The maximum flood crest, estimated at 20 ft., destroyed the Scofield branch of the Denver & Rio Grande R.R. from Hale to Scofield (six miles), and most of the main line of the same railroad from Colton to Price (25 miles), including 10 steel bridges. It is expected that the railroad will be out of service three weeks or more. The enforced shutting down of coal mines makes a shortage of coal that threatens the manufacturing industries of Utah. The direct property damage to the flood caused by the dam failure is estimated at $2,000,000 and will fall mostly on the railroad. Owing to the ample warning afforded by the slowness of the destruction of the dam, there was no loss of life except of one spectator, whose automobile backed into the flood.

The dam was located on Gooseberry Creek, 20 miles above its junction with Price River at Colton. It stored about 11,000 acre-feet of water to irrigate land southwest of Price.

Design for 100-Ft. Height

The dam was of earth, with a reinforced-concrete heart-wall. It was designed for a height of 100 ft., but construction was stopped at 70 ft., with a top width of 150 ft. The heart-wall was at the center of the dam, founded on bedrock. It was 2 ft. thick, buttressed on each side every 25 ft. and reinforced vertically with ½-in. rods 12 in. c. to c. The horizontal reinforcement was carried up for only 12 ft. from the base of the heart-wall.

In the fall of 1916, after the dam as described had been in use a few years, the heart-wall was raised 5 ft. The earth embankment on the upstream side of the heart-wall sloped upward in the upstream direction from a level 4 ft. below the top of the heart-wall for a horizontal distance of 80 ft., where it terminated in a small earth dike with a crest 3 ft. above the top of the heart-wall. On the downstream side of the core wall the top of the earth embankment was 10 ft. below the top of the heart-wall.

In place of an adequate spillway, there was a temporary wooden flume across the north end of the dam. This flume was 9½ ft. wide and 2½ ft. deep, with a 6½-ft. drop at the lower side of the heart-wall. The upper end of this flume ended in the north dike, without using walls or cutoff. Flashboards in the upper end of the flume held the water in the reservoir at an elevation 3 ft. below the crest of the earth dike, or just on a level with the top of the heart-wall.

First Break Near Flume

The break in the dam began between noon and 3 p.m., June 24, while the watchman was at dinner. Undoubtedly it started in the earth dike at the head of the flume. The depression between the dike and the heart-wall was nearly filled with water, the water mark on the wall, 9 in. below the top, corresponding with the high-water mark of the reservoir.

A section of the heart-wall 40 ft. long, near the center of the dam, broke out along the junction plane of the addition made last fall. The wall was probably weakened by expansion cracks. The heart-wall retarded the washout, so the final collapse came 30 hours after the first break.

The reservoir outlet tower rising from the foot of the upstream slope was unfinished. The top of the concrete was below the level of the water in the reservoir, but wooden forms projecting above the water surface allowed only a small flow into the tower. The only access to the tower was by raft. When help arrived two hours after the initial break, the outlet gates in the tower could not be opened.

The tower concrete outlet culvert beneath the dam and 100 ft. of heart-wall at the south end of the dam are intact, but the remainder of the dam is practically wrecked for its entire length of about 500 feet.

The failure was due to holding water too close to the top of the small dike on the upper half of the embankment and to the inadequate protection of the upper end of the flume designed to serve as a spillway. No water flowed through the spillway before the break.

The examination on which the foregoing report is based was made in company with George F. McGonagle, state engineer of Utah.

[The dam and the irrigation project of which it was a part were described in the *Engineering Record* for Dec. 28, 1912, p. 724.—Editor.]

Details of Contracts for Cantonments Given

Simplicity of Agreement Should Secure Greatest Speed at Lowest Cost

The urgency of quick construction is indicated in an early paragraph of the contract for the construction of the National Army Cantonments wherein the contractor agrees to "do all things necessary for the construction and completion of the work." The Government's interests are safeguarded by a clause permitting its representatives to terminate the contract at will, but it is not expected that there will be any serious differences of opinion between the Government and any of the firms chosen for the work, who are given every possible help and incentive to provide the best homes for the new troops which it is practicable to give in the time available for the work.

REIMBURSEMENTS PROMISED

The Government promises to reimburse the contractor on the following items for which he makes an outlay:

1. All labor, materials and machinery necessary for the work. No departure from the standard rate of wages in the locality may be made without the consent of the Government's representatives.
2. All subcontracts.
3. Rental for construction equipment hired or owned by the contractor at rates fixed in detail on the contract. The rates may be judged from the daily rental of $5 permitted for the use of an automobile.
4. Transporting, setting up, and dismantling such equipment.
5. Transportation of field forces engaged in the work.
6. Salaries of resident engineers, superintendents, timekeepers, foremen, or other men in the contractor's field office.
7. Buildings, field office supplies, equipment, commissary department, and hospital expenses required during construction.
8. Insurance and bonding expenses, uninsured losses and expenses incidental to the work and approved by the Government's representatives.
9. Fees, deposits, royalties and similar necessary expenses.
10. Transportation, traveling and hotel expenses of contractor's employees actually incurred in the work.

HAS SOUGHT FLEXIBILITY

In order that all low rates accessible to the Government in the matter of materials and other items of expenditures may be utilized, the Government may pay any or all freight charges incurred in obtaining material and machinery. Through this arrangement, advantage could be taken of the specially low rates which the Government obtains from land-grant railroads.

Freight charges on hauls over 500 miles must be specially approved in every case by the Government's representative. The title to all work in progress or completed is in the United States and all materials and machinery for which the contractor is to be paid, under clause 1 of the preceding classification of expenses, belong to the United States as soon as accepted in writing by its representative.

PROFIT LIMITED TO $250,000

The contractor is to furnish a bond for $250,000. His profit and overhead expenses must come from an additional payment made by the Government and amounting to 6 per cent. of his expenses as enumerated above in cases where the work costs over $3,500,000 and running up to 10 per cent. if the total is under $100,000. The total amount of this percentage payment will in no case be allowed to run over $250,000, no matter how high the total cost of the work may be.

The value of any construction equipment furnished by the Government is not included as a part of the cost of the work when determining the contractor's percentage, nor any uninsured fire or liability losses which the Government may pay to him under clause 8, nor any payments by the Government for freight, nor any of his overhead expenses. The contract fixes his compensation on the cost of work done by subcontract at 5 per cent. and on the reconstruction of damaged work not over 7 per cent.

PROVISION FOR MONTHLY PAYMENTS

Provision is made for monthly payments for actual expenses approved by the Government's representatives who have access at all times to the accounts kept by the contractor. This puts the minimum strain on the contractor's financial resources while giving the Government a complete check on the accuracy and propriety of every item before payment is made on it.

Steel Market More Uncertain from Now On

Situation Regarding Price Fixed by Defense Board for Coal Has Deep Significance for Construction Field

According to the statement of the U. S. Chamber of Commerce, within a short time no steel will be available for construction work not necessary for national existence. The prices during the past month have shown more and more erratic tendencies, and many more quotations must be regarded as merely nominal. It will be useless, in all probability, to contract for future deliveries of steel products, as unless intended for industries or facilities necessary to the war, the contracts will probably have to be cancelled. Even in May steadily rising prices, increasing transportation difficulties and the seriousness of the labor situation had resulted in a heavy falling off in building permits, not only from the active month of May, 1916, but from the preceding months of this year. With the announcement, therefore, that steel for ordinary building construction is likely to be exceedingly scarce, the general construction of office buildings and similar structures will hardly be expected to increase.

With other building materials, however, the situation is less serious. By the first of June the special railroad board, aided by normal slackening of commercial demand, had succeeded in reducing the indicated car shortage more than 30% to 105,126 cars. Although the consumption of cement is increasing and the demand will undoubtedly continue to grow because of the difficulty of securing steel for ordinary construction, some factors, of which the improving car situation is one and the recent reduction announced in the price of coal is another, indicate that the cost of producing and marketing cement may diminish. If the price agreed on by the council of national defense is allowed to stand, the cost of producing brick, tile and other construction materials as well as cement in which fuel is a considerable item of expense, will undoubtedly be reduced. If, on the other hand, the views expressed by some cabinet members, that the Government should squeeze the coal operators down to the lowest possible price, with the presumption that the deficit must be made up in higher prices to the general public, should prevail, the price of coal to these industries supplying construction materials will probably be forced to dangerous levels, and further damage done by increasing the cost of work. The injustice and probable grave consequences of levying this type of tax, an inevitable corollary to the price-fixing proposition as advanced in certain quarters, was discussed editorially last week in connection with efforts directed to force the price of steel on Government orders to an arbitrary level, which those most conversant with conditions believed to be below the cost of production.

General business, as measured by bank clearings, foreign trade and other indications, continues even more active than last year. While interest rates will, of course, tend to increase from now on, the situation should favor developing all the engineering construction that the labor and material supply can take care of. The recent decision of the Interstate Commerce Commission denying the railroads a general 15% increase in freight will doubtless have a depressing effect on the railroads, though the granting of class increases and the disposition of the commission to reconsider the subject at any time the financial position of the roads should be adversely affected, affords some encouragement. While no railroad construction at present prices is likely to develop, except in the case of urgently needed work, there may be a good many improvements which will

fall in this class in the way of extra track and terminal facilities.

From present indications, the increasing demand for freight highways and for adequate roads to assist in crop transportation is well recognized, and states and other governmental bodies apparently intend to push road construction to the full extent of the funds available. There is plenty of money in the country to finance the war without hampering needed road and municipal work, and it is to be hoped that the coming Government loans will be taken, even more extensively than the present one, out of the earnings of the public, leaving the banks and long-established financial agencies relatively free to furnish the money needed by states, municipalities and various industrial corporations.

Permit Maximum Diversion of Niagara Falls Water

The Senate and the House of Representatives have agreed to the conference report on the bill permitting the present maximum diversion of 20,000 ft. of water on the American side of Niagara Falls and it was rushed to the White House and signed late Saturday by President Wilson so that it might become law before midnight of June 30, the date when the old authorization expired.

The measure carries with it an appropriation of $25,000 for expenses of an investigation to be made by the War Department.

Covers a Period of One Year

Those in charge of the measure explained to the President that but for the legislation just enacted, which is for the period of one year, 50,000 hp. would have been cut off on the American side of the Falls. It was pointed out in behalf of the power interests that although 20,000 cu.ft. of water per second has been, and is now again permitted to be diverted, only 19,000 cu.ft. has been used.

It is expected that the War Department will make its investigation at once, probably through the officer of General Black, Chief of Engineers. The Secretary of War is to send the surveys made to Congress "as soon as possible," and he is to continue to issue temporary permits until July 1, 1918, as authorized by Congress last January.

St. Louis Hesitates on Paving

The City of St. Louis, Mo., is proceeding cautiously with its paving program. Much of the work, aside from main thoroughfares, is being held back. In some cases a referendum of the property owners is being taken to learn their views on the continuance of the work in the face of rising prices. Brick pavement on a 6-in. concrete base, which cost $1.80 per sq.yd. in 1915, is now costing the city $2.35. Sheet asphalt has increased in cost from $1.85 to $2.30 per square yard.

Philadelphia Ready To Build First Sewage-Works Unit

Calls for Bids on Northeast Treatment Plant, Comprising Thirty-Two Two-Story Tanks

The publication in this issue of an advertisement inviting proposals for the construction of the Northeast sewage-treatment works at Philadelphia marks an important step in the carrying out of a comprehensive plan for the collection, treatment and disposal of sewage which was recommended in the report made by the Bureau of Surveys early in 1915. The report advised that the first available funds should be expended in the acquisition of land for the sites of works and for an intercepting sewer system and treatment works for the drainage area of Frankford Creek, which is now grossly polluted and enters the Delaware River about 4¼ miles below Torresdale, where the large water filters are located.

Citizens Vote For Loan Bills

In the summer of 1915 the City Councils authorized and appropriated $500,000 toward the construction of the Frankford Creek intercepting sewer, of which 2.6 miles are now under contract and partly completed. At an election last summer, the citizens of Philadelphia voted in favor of loan bills aggregating about $115,000,000, which included $3,200,000 toward the sewage-disposal project. Under that authority land was acquired for the sites of the Northeast and the Southwest sewage-treatment works, contracts were made for a large grit chamber, and the Northeast works will now be built.

These works will consist of 32 horizontal-flow rectangular two-story sedimentation tanks and 80 sludge-drying beds, together with grading and such appurtenant works as influent and effluent sewers.

Much Metal Eliminated

As far as was practical, the contract drawings show that metalwork has been omitted, such as the sludge pipes, railings, metal gates, weirs and similar parts. Where metal parts such as stop plank grooves must be embedded in the concrete, they are included in this contract.

Contract No. 20 will comprise principally excavation of the site and construction of the reinforced-concrete tanks and sewers and the sludge beds. It appears to be the intent of the officials to proceed with the construction by beginning work which contractors can handle easiest under present conditions and later to invite proposals for installing the necessary metalwork to complete the works.

Scrap Iron Brings $60 Ton

The City of Cleveland received a record-breaking price for scrap iron June 11. Twelve tons, sold by the Water Department, brought $60 a ton.

Springfield Trade Show Is Well Attended

More Than 200 Manufacturers, Export Interests, Selling Agencies and Banks Were Represented

For the eight days ended June 30 the well-equipped exhibition buildings of the Eastern States Exposition of Springfield, Mass., housed an industrial display. More than 200 manufacturers, selling agencies, banks and export interests were represented at the first annual Industrial Exposition and Export Conference.

The export conference opened June 25 with the "Paper Day" sessions; it included 11 other group gatherings. The list of topics will suggest the wide range of industrial activities covered: "Paper," "Textiles," "Export Financing," "Leather and Rubber Goods," "Reaching Foreign Customers," "Latin America," "Metals and Machinery," "Practical Exporting," "Office Appliances," "Transportation and Shipping," "Russia and the Far East," "Chemicals and Drugs."

Three hundred manufacturers and executives attended the opening session, and at no subsequent gathering was the attendance below 100, except at two of the morning meetings. "Metal Day" turned out the largest number of conference visitors.

Speaking to the subject of "Metal Fittings in Overseas Markets," A. W. Gilbert, president of the Chapman Valve Manufacturing Co., said: "We are receiving orders from France at this time. This we attribute to present war conditions in Europe, but investigations made since the war began convinces us that with an American owned merchant marine and under conditions of peace and with banking facilities friendly to American manufacturers, we can compete with any prices that we are aware of at this time and which prevailed previous to war conditions and where shipments had to be made into other countries by our foreign competitors." He instanced several occasions in which foreign competition had been successfully met

Postpone Date of Bidding on 18-Mile Shandaken Tunnel

The Board of Water Supply of the City of New York has postponed from July 17 to Sept. 11, the date for the opening of bids on the Shandaken Tunnel, the 18-mile bore which will connect the Schoharie watershed with the Esopus, which is now supplying a large quantity of water to New York through the Catskill aqueduct. This is one of the biggest of the Catskill contracts and while no definite estimate of the cost can be given now, guesses by those familiar with the work have been above the $10,000,000 mark. The postponement will allow contractors who have undertaken rush work for the Government to adjust their organizations to the new conditions before bidding on new work.

Contracts for 176 Ships and Hulls Have Been Let

General Goethals Summarizes Work of Emergency Fleet Corporation Up to June 26

The United States Shipping Board, Emergency Fleet Corporation, through its General Manager, Major. Gen. George W. Goethals, announces that the following contracts for the construction of merchant vessels have been executed:

Merrill-Stevens Company, Jacksonville, Fla., 12 wooden cargo-carrying steamers complete, 4 cargo-carrying all steel ships complete.

Los Angeles Shipbuilding & Dry Dock Company, P. O. Box 68, Long Beach, Calif. 8 cargo-carrying all steel ships complete.

G. M. Standifer Construction Corporation, Northwestern Bank Bldg., Portland, Oregon. 10 wooden cargo-carrying steamers complete.

Peninsular Shipbuilding Company, Portland, Oregon. 4 wooden cargo vessels complete.

Sloan Shipyards Corporation, Seattle, Wash. 16 wooden cargo-carrying steamers complete; first steamer to be delivered Jan. 31, 1918; two in February, 1918; four in March, 1918; two in April, 1918; two in May, 1918; two in June, 1918; two in July, 1918.

Grays Harbor Motor Ship Corporation, Aberdeen, Wash. 4 wooden hulls. First hull to be delivered Jan. 15, 1918; second Feb. 15, 1918; third March 15, 1918; fourth April 15, 1918.

Coast Shipbuilding Company, Portland, Oregon. 4 wooden hulls. First hull to be delivered Jan. 1, 1918; second March 1, 1918; third May 1, 1918; fourth July 1, 1918.

Edward F. Terry & Henry L. Brittian, 60 Broadway, New York City. Works, Moss Point, Mississippi. 20 composite cargo carrying steamers complete. First steamer to be delivered Feb. 1, 1918, and the remaining 19 within next ten months.

Skinner & Eddy Corporation, Seattle, Washington. 6 steel cargo carrying steamers complete. First two steamers to be delivered within five months from date of arrival of keel plates, and of the remaining number of steamers the building of the second two steamers shall be commenced immediately after the completion of the first two steamers and shall be delivered within five months after the laying of the keels, and the building of the remaining two steamers shall be commenced immediately after the completion of the second two steamers and shall be delivered within five months after the laying of the keels.

Sanderson & Porter, 52 William Street, New York City. Works: Willapa Harbor. 10 wooden hulls; first hull to be delivered on April 1, 1918, and one hull every fifteen days thereafter, ending Aug. 30, 1918.

The Maryland Ship Building Company, Lexington Bldg., Baltimore, Md. Works: Sollars Point, Maryland. 6 wooden hulls; first hull to be delivered April 30, 1918, and one hull to be delivered on the last day of each succeeding month, ending Sept. 30, 1918.

Seattle Construction and Dry Dock Co., Seattle, Washington. 10 steel cargo-carrying steamers complete; first and second steamers to be delivered in June 1918; third in July, 1918; fourth and fifth in August, 1918; sixth in Sept. 1918; seventh and eighth in Oct. 1918; ninth in Nov. 1918; tenth in Dec. 1918.

The Foundation Company, Woolworth Building, New York City. Works: Newark, N. J. 10 wooden hulls. First hull to be delivered Mar. 1, 1918; the remaining hulls to be delivered one every 15 days thereafter, so that the last hull will be delivered on or before Aug. 15, 1918.

Groton Iron Works, 50 Broad Street, New York City. Works: Noank, Conn. 12 wooden hulls. First hull to be delivered five months after receipt of lumber for keels; remainder average of one hull every two weeks thereafter but all by Sept. 15, 1918.

Ship Construction and Trading Company, 50 Broadway, New York City. Works: Stonington, Conn. 2 wooden hulls. First hull to be delivered on or before February 12, 1918; second on or before Mar. 12, 1918.

Moore & Scott Iron Works, San Francisco, Calif. (works, Oakland, Calif.)—Ten complete steel cargo-carrying steamers. Deliveries: First and second in February, 1918; third, in March, 1918; fourth and fifth, in June, 1918; sixth, in August, 1918; seventh and eighth, in October, 1918; ninth and tenth, in November, 1918.

Portland Ship Ceiling Co., 130 Commercial Street, Portland, Me.—Four wooden hulls. Deliveries: Feb. 1, 1918; Mar. 15, 1918; May 1, 1918; June 15, 1918, respectively.

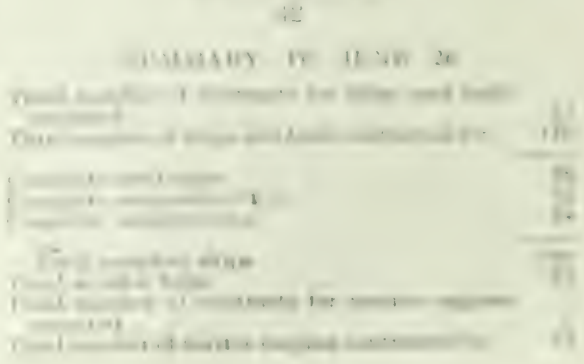
Universal Shipbuilding Co., 25 Broad Street, New York City (works, Houston Ship Canal, Harris County, Tex.)—Twelve wooden hulls. Deliveries: First and second, seven months after completion of the ways; third and fourth, eight months after completing ways; fifth and sixth, nine months after completing ways; seventh and eighth, 10 months after completing ways; ninth and tenth, 11 months after completing ways; eleventh and twelfth, 12 months after completing ways.

McBride & Law, Beaumont, Tex.—Four wooden hulls. Deliveries: First hull on or before Mar. 1, 1918; second hull on Apr. 1, 1918; third hull on May 1, 1918; fourth hull on June 1, 1918.

Newcomb Life Boat Co., Hampton, Va.—Four complete wooden cargo-carrying steamers. Deliveries: First steamer by Jan. 15, 1918; balance, one steamer every 60 days thereafter, so that last steamer will be delivered on or before July 16, 1918.

In addition to the foregoing contracts the following contract for the construction of marine engines is announced:

Ellicott Machine Corporation, Baltimore, Md.—Twelve vertical triple expansion marine engines, size



Take Jamestown Exposition Site for Naval Station

President Wilson has issued a proclamation taking over the old Jamestown Exposition site on Hampton Roads, about 440 acres, upon which is to be built, at a cost of $2,800,000, what will probably be the greatest of all the United States naval stations. The sum of $1,200,000 is for the ground, and the remainder, $1,600,000, will be used in developing the site.

The work will be begun at once. A great series of coast artillery batteries, electrically operated, will be constructed, as well as piers, store-houses, oil-fuel storage, training stations, etc. The Government, under the proclamation, takes over all the rights and properties on the site of railways, electric light, power, telephone, telegraph, cable, water and sewer companies. All owners of property or persons residing or doing business on the tract have been notified to vacate by Aug. 1. The property is placed in charge of the Secretary of the Navy, and Rear Admiral Harris, chief of the bureau of yards and docks, Paymaster General McGowan, in conjunction probably with General Weaver, chief of coast of artillery of the army, will undertake the work of developing the station as rapidly as possible.

Concrete Heart-Wall Saves Most of Earth Dam in Oregon

The concreted heart-wall of an earth dam near Baker, Ore., appears to have saved the dam from being completely washed out on June 28. A portion of the crest reported as 40 ft. long went out, lowering the level of Lake Killamaque 10 ft., shutting down the power plant of the Eastern Oregon Light and Power Co., which supplies Baker and Haines, destroying several buildings at Rock Creek, washing out or filling up irrigation ditches, drowning live stock, but causing no loss of human life. It is said that the water level at the time of the failure was considerably below former levels and that the dam may have been injured by ice last winter or perhaps dynamited maliciously. A local investigation is being made.

Municipal River Terminals Building in St. Paul

Shortage of Coal Last Winter Forces Action in Attempt To Revive River Traffic

St. Paul has begun the construction of municipal river terminal facilities for handling coal and iron ore under plans prepared by City Engineer O. Claussen. Fifty thousand dollars has been appropriated for the first unit and the plant will be ready to unload coal and reload barges with iron ore by August 10.

Arrangements have been made with the United States Government for a fleet of 24 steel barges of one thousand tons capacity each and the necessary towboats. Southern Illinois coal will be loaded at St. Louis by the Southern Coal, Coke & Mining Company and the returning barges with iron ore, brought into St. Paul over the Northern Pacific Railroad from the Cuyuna Range, for the Mississippi Valley Iron Company at St. Louis.

For several years St. Paul has talked of the revival of river traffic but no definite steps have been taken until the present time. The shortage of coal last winter and the present car shortage and general uncertainty in transportation matters excited a new interest in the possibilities of river transportation and resulted in the present definite arrangements for giving it a trial.

St. Louis Public Service Board Receives New City Plan

The City Plan Commission of St. Louis presented to the Board of Public Service on June 12 a report on the major street system of the city. The report points out the defects of the rectangular system which in some parts of the city divide traffic to such an extent that every street is a thoroughfare. It points out the favorable situation with respect to certain diagonal arteries now existing. It recommends the completion of the proceedings for widening Washington Avenue from Jefferson Avenue to Grand Avenue; of widening of Olive Street from Fourteenth Street to Channing Avenue, these two with Locust Street to give three main east and west thoroughfares.

DEFERRED PAYMENTS RECOMMENDED

The report recommends a revision of the plan for opening Twelfth Street as the connection to the southwestern system and recommends a plan for opening Twelfth Street to connect with the northwestern system. It also recommends a revision of procedure which would permit of deferred payments for benefits assessed on street openings of this kind and for improvement of the street so opened in order that the property may not be overburdened with taxes until it reached burdened with taxes until such a time as it may have reached the expected development.

Many Standard Parts in New Military Truck

A long step forward in interchangeability of motor-truck parts has been effected through conferences concerning the specifications for the desired 70,000 military trucks. Representatives of the Society of Automotive Engineers, Quartermaster General's office and War Department Transport Board studied the matter together. As a result of a two days' conference early in June of representatives of engineers, transmission and truck manufacturers with the Advisory Commission of the Council of National Defense, a decision was reached that the engines and transmissions to be used in many of the military trucks will be interchangeable. This action will not only facilitate the putting of the necessary number of trucks into service, but will decrease greatly the problems connected with the replacement of parts and the making of emergency repairs in the field.

Texas Has Good-Roads Convention

Highway development and reclamation were the keynotes of a joint meeting held at Mineral Wells, Tex., June 19 to 23, by the Texas Good-Roads Association, the Fort Worth and El Paso Highway Association, the Dallas and Texarkana Highway Association and the Texas Reclamation and Conservation Association. While most of the papers and addresses were of a promotional character, there were the following dealing more or less with technical matters: "Sand-Clay Road Construction," by George D. Marshall, of Forrest, Ark.; "Coöperation Between State Highway and County Engineers," by George A. Duren, state highway engineer of Texas; "Economy in Bridge Construction," by F. E. Hesse, of Dallas, Tex.; "The Kind of Gravel To Use in Building Roads," by R. J. Potts, of Waco, Tex., "Reclamation of Overflowed Lands," by C. S. Fowler, of San Antonio, Tex., and "Roads I Have Built," by J. D. Meriwether, engineer of the Fort Worth and El Paso Highway. Prospects for state highway work in Texas are considered to be promising.

Appointments for Connecticut Board of Health Made

The membership of the new Connecticut State Board of Health as recently announced by Governor Holcomb is as follows:

John T. Black, M. D., who was secretary of the old board, to be Commissioner of Health and Chairman of the Public Health Commission; J. Frederick Jackson, C. E., New Haven, reappointed to serve until 1919; E. K. Root, M. D., Hartford, to serve until 1923; Lewis Sperry, Esq., Hartford, to serve until 1923; W. H. Brown, M. D., Bridgeport, to serve until 1921; C. E. A. Winslow, M. S., New Haven, to serve until 1921; and James A. Newlands, B. S., Hartford, to serve until 1919.

PERSONAL NOTES

L. T. JESSUP, drainage engineer, Department of Agriculture, has been transferred from the Denver office to North Yakima, Wash., where he will have charge of drainage investigations on the United States Reclamation Service project, succeeding W. A. KELLY, who is in Wyoming on department investigation.

W. H. SCHWARTZ, former county engineer of Clarke County, Washington, has been appointed city engineer of Vancouver, Washington.

CLYDE MEYERS, of Pullman, Wash., was recently appointed city engineer of Pullman.

CHARLES F. D. HENRY, county engineer of Pacific County, Washington, has been appointed city engineer of South Bend.

BAMLET KENT has retired from Federal service after 22 years with the United States Engineer Office to become district manager in Detroit for the Duluth-Superior Dredging Company.

M. M. MOORE, formerly with the machine-tool department of Gaston, Williams & Wigmore, Inc., New York, is now associated with the sales department of John W. Thorne & Co., Inc., with headquarters at 165 Broadway, New York.

G. C. BUSH has left the Buick Motor Co., where he was employed as plant engineer in charge of maintenance, construction and power transmission, and is at present with the American Zinc Co. of Tennessee as engineer of maintenance and construction, assisting R. L. BAGBY, chief engineer.

G. S. VAN NATTA is at present with Hess & Skinner, of Dallas, Texas, as resident engineer on highway construction for Donley County. Hess & Skinner are consulting engineers on the work, Mr. Van Natta acting as resident engineer in direct charge.

C. A. HOGENTOGLER has been granted a year's leave of absence from the faculty of the University of Iowa and is engineer and supervisor for the borough of Columbia, Penn., on roadwork. Mr. Hogentogler has been at various times employed by Ritter-Conley Manufacturing Co. (Pittsburgh), Barber & Ross (Washington, D. C.), Pennsylvania Steel Co. (Steelton, Penn.), and as assistant in civil engineering, Pennsylvania State College.

PROF. GEORGE C. WHIPPLE, head of the sanitary engineering department at Harvard University and member of the firm of Hazen, Whipple & Fuller, of New York City, left for Russia last week as a member of the American Red Cross Mission. "It is going to be the most interesting work

I have ever undertaken," said Prof. Whipple on the eve of his departure.

S. T. WELLMAN, upon whom the Cleveland Engineering Society conferred the honor of honorary membership, is best known as the inventor of the openhearth charging machine and for his adaptation of the electromagnet to the handling of pig iron and scrap steel. This work was done during his connection with the Otis Steel Works in Cleveland, with which concern he became connected in 1873. He also has to his credit the construction of the first openhearth furnace which proved to be a commercial success in the United States. Previous to this time he had been connected with Singer, Nimick & Co., for whom he built crucible steel melting furnaces, at later times doing similar work for the Chrome Steel Works in Brooklyn, N. Y. At various times he has been president of steel companies and engineering firms—at the present time being chairman of the Wellman, Seaver, Morgan Co. Mr. Wellman is a past president of the American Society of Mechanical Engineers and the Cleveland Engineering Society.

ALVAH HORTON SABIN, consulting chemist of the National Lead Co. and lecturer at New York University, was given the degree of Doctor of Science by Bowdoin College June 21. From 1876 to 1879 Professor Sabin was professor of chemistry at Ripon College, designing and erecting the laboratory and astronomical observatory. From 1880 to 1886 he was professor of chemistry at the University of Vermont, and was president and manager of the American Milk Sugar Co. from 1885 to 1886, designing and building factories and refineries for the manufacture of milk of sugar under a process developed by himself. Professor Sabin is author of "Technology of Paint and Varnish," a second edition of which has just been issued.

FRANK H. SIMMOND has resigned as safety engineer with the Travelers Insurance Co., to accept an appointment as junior engineer with the United States Reclamation Service, and is now located with the Fort Laramie unit of the North Platte River project, with headquarters at Kiawa Camp, Mitchell, Nebraska.

ERWIN HARSCH, who until recently has been instructor in civil engineering at the University of Tennessee, recently resigned to take a position as junior engineer in the United States Engineering Department and is employed on a survey of the Arkansas River from Little Rock to the mouth, working under HENRY FOX, junior engineer, and under the supervision of LIEUT. COL. G. P. HOWELL, United States Corps of Engineers.

A. E. BERRY, formerly with James, Loudon & Hertzberg, consulting engineers at Toronto, is at present sanitary engineer with the Ontario Provincial Board of Health at its experimental station in Toronto.

GEN. WILLIAM H. BIXBY, who was elected President of the American Society for Testing Materials at the recent convention held in Atlantic City, was born in Charlestown, Mass., in 1849. A student for two years at the Massachusetts Institute of Technology, he was appointed to West Point and graduated from there in 1873.

Elected President of the American Society for Testing Materials



GENERAL WILLIAM H. BIXBY

Serving as assistant professor of engineering at West Point from 1875 to 1879, he graduated from the French Government School of Bridges and Highways in 1881 and became lecturer on coast defenses at the U. S. Naval War College in 1887. Sent by the Government to attend the French army maneuvers of 1880, he also examined and reported upon iron fortifications in Europe in 1881 and 1882. General Bixby has been in charge of U. S. River and Harbor Improvements in many states and has been in charge of lighthouse construction at many coast points. From 1905 to 1908 he was division engineer of the Northwestern and Western United States, and from 1908 to 1910 he was President of the Mississippi River Commission, being made chief of engineers, U. S. A. in 1910, retiring in 1913. On the outbreak of the war, General Bixby was ordered to resume duty, being placed in charge of the U. S. river and harbor improvements of the Kansas City district, with headquarters in Kansas City, but under a recent date his headquarters have been transferred to St. Louis. General Bixby is a member of the American Society of Civil Engineers, the American Society of Mechanical Engineers, the British Institution of Civil Engineers, the French Society of Civil Engineers, the U. S. Naval Institute, the U. S. Military Service Institution, and the British Association for the Advancement of Society. He was President of the Philadelphia Congress of the International Association of Navigation Congresses in 1912, and a member of the Executive Committee of the Pan-American Scientific Congress in 1915.

E. G. TEGTMEIR, former deputy county engineer, Snohomish County, Washington, has been appointed city engineer of that city.

F. L. HARGETT, formerly assistant resident engineer in charge of road improvements at Monroe, La., has been made superintendent of roads and bridges of Bowie County, Texas, with headquarters at Boston, Texas.

E. R. GRAY, formerly deputy city engineer of Hamilton, Ont., has been appointed city engineer of that town, having under his charge the waterworks and sewage-disposal plants.

B. E. MITCHEL has succeeded H. JOHNSTON as city engineer of Kitchener, Ont.

GEORGE MCKNIGHT recently resigned as city engineer of Fredericton, New Brunswick.

JOSEPH RICHARDSON has recently opened an office for general marine-engineering practice at 11 Broadway, New York City. Mr. Richardson will undertake marine survey work, the repair of vessels, the design and construction of shipbuilding plants and the design and construction of mechanical equipment for both vessels and plant.

BEARDSLEY LAWRENCE, formerly with J. B. Byrne, contracting engineer, of Boston, has opened an office as consulting engineer, at Wiscasset, Maine.

GEORGE BALLANTYNE has been selected to act as supervising engineer on the construction of a branch line from Niles to San Jose for the Western Pacific Railway.

G. W. WHITEZELL, having completed the erection of a three-story factory building for the Pennsylvania Salt Manufacturing Co., is again acting as superintendent for Schutz, Schreiner & Clyde Co., on the erection of a five-story office building in Pittsburgh.

E. E. THUM has resigned as assistant professor of metallurgy in the University of Cincinnati and is now associate editor of *Metallurgical and Chemical Engineering*. Previous to Mr. Thum's connection with the University of Cincinnati he was engineer in charge of construction at various smelting plants of the Anaconda Mining Company.

EDWARD C. SEIBERT has resigned as instructor in civil engineering at Pennsylvania State College and has accepted a commission as assistant civil engineer, United States Navy.

JOHN P. KELLY, formerly the senior member of the contracting firm of Kelly & Wheeler, Buffalo, N. Y., has formed the Kelly Engineering Corporation, with principal offices at Buffalo.

N. Y., and has at present the contract for installing the water-supply system for the borough of Rhinetown, Pennsylvania.

C.-E. A. WINSLOW, Professor of Public Health, Yale Medical School, New Haven, Conn., has gone to Russia as a member of a Red Cross Commission, which will make a study of the needs of Russia as related to relief work.

GUSTAVE C. OLSEN has returned to the American Bridge Co. at Gary after having spent some time with the Baltimore & Ohio R.R. and with the Carnegie Steel Co. on the checking and fabricating of steelwork.

A. R. MCARTHUR, resident engineer of the American Sheet and Tin Plate Co. at Gary, Ind., has been appointed a member of the School Board of that city.

KARL W. BOCK has been appointed manager of the Walter A. Zelnicker Supply Co., St. Louis.

H. G. MCCORMICK has resigned as United States assistant engineer, Second Cincinnati (Ohio) District, and has entered the contracting business with the firm of Shipplett-McCormick Co., Inc., formerly the Shipplett Concrete Co., specializing in heavy concrete masonry. Mr. McCormick has been, for the last five years, in charge of lock and dam construction on the Kentucky River for the United States Government.

J. T. BARTRUG has been appointed chief engineer of highways of Lincoln County, West Virginia. Mr. Bartrug will maintain offices at Huntington.

JAMES NISBET HAZLEHURST, consulting municipal engineer, who has been working as chairman of the examining board appointed by the War Department to pass on the physical conditions of the cantonments sites of the Department of the Southeast, has been issued a commission as major, Engineer Section, United States Army Reserve Corps, and has been ordered into active service with headquarters at Atlanta, Georgia.

J. A. KITTS has recently accepted a position with the Great Western Power Co., San Francisco, and is at present in charge of construction on transmission lines. Mr. Kitts was formerly construction engineer on the Panama Canal, having charge of the precise setting of all machinery, lock gates and the construction of the electric towing railway at the Gatun lock. He recently completed the Spanish Peak Lumber Co.'s aërial tramway, on which he was field engineer for the American Steel and Wire Company.

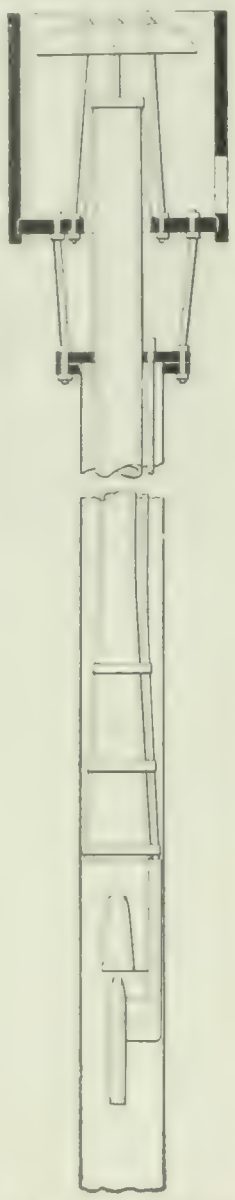
MAJOR E. J. DENT has assumed charge of the Seattle, Wash., Engineering District, relieving LIEUT.-COL. J. B. CAVANAUGH, Corps of Engineers, who was assigned to command the Eighth Reserve Engineer Regiment. Major Dent's duties include the fortification and river and harbor work along the coast of Washington.

Appliances and Materials

Air-Lift Foot Piece Increases Duty of Pump

A new combination of foot piece and delivery pipe for air-lift pumps is being made by the Talbot Air Lift Co., 18 South Seventh St., Philadelphia, and sold under guarantee to increase the water delivered per cubic foot of air by at least 50%. Actual tests are cited to show that the increased duty has averaged 100%.

The air-lift pump in its unmodified form dates back to the latter part of the eighteenth century, when it was proposed by Loescher, of Freiberg. Its first practical application in the United States was made in 1886. It merely consisted of a vertical pipe with its lower end submerged in a well and a smaller pipe delivering air into the bottom of it. The water became mixed with air and this light mixture consequently was raised above the height of the surrounding water. The additional aspirations created by the special design of the Talbot air lift lends additional advantages to this type of pump.



HAS NOVEL FOOT PIECE

The design is shown in the accompanying sketch. A hood is placed above the main nozzle to give a second aspiration; the shape of the bottom length of the delivery pipe is such that a third aspiration is effected. The delivery line is built up of wood staves and is tapered to keep the velocity constant as the water rises and the air expands.

High-Boiling Wood Preserver Made in America

Since 1914 the German supply of a high-boiling creosote wood preservative has been shut off. The Kettle River Co. now announces that it has installed stills to provide a coal-tar distillate above 300° C. to take the place of the former foreign product used for wood blocks, tank and brush treatments and marketed under the name of "C-P Wood Preserver." The new trade-mark is "K-R Wood Preserver," and it is claimed to have the same degree of toxicity and to pass the United States Signal Service and United States Navy specifications.

Boiler Compound Coats Metal

A new boiler compound that cannot clog steam pipes or cause other troubles traceable to the use of acids has recently been put on the market by the Boiler-Kote Co., of 343 South Dearborn St., Chicago. Neither have any vegetable products been used in the composition of this material, and therefore the claim is made that the formation of boiler crusts, which consist essentially of carbonate of lime, is not promoted. The product is a concentrated mineral solution that when introduced into a boiler, spreads itself evenly over the sheets, flues and tubes, coating them with a very thin glaze. To this glaze or film the scale cannot adhere. If a crust has formed, the solution passes through cracks in the deposit and, being raised to a high temperature on meeting the metal, forms an expanding deposit that forces the scale away and leaves a coating that will prevent more scale from forming. That portion of "Boiler-Kote" which does not attach itself to the metal passes off in the form of a harmless and odorless gas.

Circular Slide Rule for Figuring Reinforced-Concrete Slabs

A handy calculator for designing reinforced-concrete slabs, beams and girders of every description and for calculating the structural qualities of various kinds of wood has recently been put on the market by Kolesch & Co., New York City. In designing, the calculator simplifies the estimation of the size of reinforced-concrete plain and T-beams, the thickness of reinforced-concrete slabs, the reinforcement for plain and T-shaped concrete beams, the reinforcement for concrete slabs, the sizes of various kinds of wooden beams and the thickness of various kinds of wooden planks and boards.

In addition to the above it is equally useful in checking the safe load that any beam or slab of known size or span will carry, and for comparing the relative sizes of plain and T concrete beams. This requires no change of the disk's setting. The effect that the action of built-in beams of one span, as well as the continuous action of several spans, will have is easily determined; and a comparison of the relative size of concrete shapes with those of various kinds of wood is easily made. For ordinary multiplying and dividing, such as is carried on on the ordinary slide rule, this rule has the additional advantage that the result is pointed off.

All computations for concrete are based upon the Joint Committee recommendations, using the straight-line formula. The price of the rule complete with directions is $2.

A Consolidation of Engineering News and Engineering Record

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Decapitated Engineers Win in State Supreme Court

POLITICAL chicanery in Boston has been hit another blow—a blow that will hearten engineers elsewhere to stand up for their rights and for each other. The State Supreme Court has upheld the decision of the lower court that certain engineers in the Department of Public Works were not removed in good faith on Jan. 22, 1916, but under "a mere evasion of the statute." Most of the seventeen men discharged for political reasons were put back in one office or another months ago. Frank A. McInness, Bliss W. Robinson and Storrs L. Durkee, and the leaders of the engineering profession in Boston who backed them, deserve the thanks of all engineers for fighting this matter out on its merits to a successful issue. The incident affords a fine example of professional spirit and engineering coöperation.

Check Bad Manners at Conventions

IT IS much to be regretted that gentlemen lose their tempers. When, in addition, they indulge in personalities—as occurred at the sixth session of the recent American Society for Testing Materials convention—not only is nothing gained, but so thorough a basis of misunderstanding is established that the chances of progress are palpably blocked. To use the word "salesman" in an invidious manner, and in contrast to styling one's self a "testing engineer," is unpardonable. Some day chairmen not only will appreciate this and promptly insist upon a withdrawal of such remarks, but will demand an instant and complete apology, not only to the person attacked, but to the convention. If people cannot restrain themselves when angered, if they cannot comport themselves with decency and respect for their audience and opponents, they should be denied the privilege of the floor.

Mammoth Dam Failure Due to Lax State Control

THE failure of the Mammoth dam in Utah the last week in June rests in the final analysis upon the State of Utah. The legislature recognized the duty of the state to see that dams were so designed that they would not be a menace to life and property, but either the law was faulty in its provisions for enforcement of the rules it laid down or else the administrative arm of the state has woefully failed to see that the law was lived up to. The detailed report on the failure printed on page 52 shows that years ago plans for a dam at the site of the now ruined structure were filed with the state engineer and approved by him, but that the dam as built did not follow the plans. The report also shows that in 1914 other plans for this same dam were filed with the state engineer, but that those plans were never approved. It is not for us to fix the blame for such a course of events, but the present state government of Utah should lose no time in doing so and in providing against a repetition of the recent accident.

"As Usual the Innocent Were the Chief Sufferers"

SO SAYS Mr. Kleinschmidt in his report on the Mammoth dam failure, mentioned in the preceding paragraph. An irrigation company breaks the state law and engineering laws and rules of common sense and prudence. It brings heavy losses on itself but far heavier, it appears, on other companies, on various individuals and on a large section of the public deprived of railway facilities and of coal for industrial use. It is a nice question to decide what punishment should be meted out, and on whom, for these losses suffered by the innocent. Should it be money damages, and if so how much? Should there be punishment of persons, and if so how should it be distributed among officials of the company on the one hand and lax state officials on the other? Or are the people of Utah chiefly to blame for lack of sound legislation or for not holding their chosen officials responsible for the enforcement of such laws as existed? These questions are of wide interest, since Utah is by no means the only state where such accidents have happened or are likely to happen at any moment.

Waterwheel Wear May Be Determinative

THERE has been much discussion in recent years as to the relative desirability of reaction and impulse waterwheels under high heads. Two of the chief elements in the discussion are efficiency and wear. These are interdependent, of course; the initial efficiency may be seriously reduced by wear. In discussing the question at a recent convention on the Pacific Coast two installations were described which probably represent the widest extremes of wear thus far compared. One engi-

neer cited the reaction wheels in a plant where 18,500-hp. runners operate under 420-ft. effective head. The wear on these runners is so low, he said, that although the wheels have operated continuously it has been unnecessary for two years at a time to so much as open the turbine casings. Testimony of the opposite kind was furnished by the story of certain reaction runners designed to operate under 400-ft. head. After six months of operation the efficiency of these runners had dropped 60% on account of excessive wear. Obviously then, making sure of the qualities of the water may be fundamentally important. Whether or not the water is found to be free from particles in suspension, the design of the runners must be correct if erosion is to be prevented; and in addition there is the possibility of chemical effect. This chemical danger may be rare, but in a case fully reported elsewhere in this issue it caused the shutdown of a waterpower plant. Hydraulic engineers may need to make studies in water chemistry before selecting their power-plant wheels.

Should the Interstate Commerce Commission Be Remodeled?

DOES the Interstate Commerce Commission need a thorough overhauling? Three times in the last six years, as the *Railway Age Gazette* pointed out last week, the commission has had before it applications for general freight-rate increases. Each time it has denied them, on the ground that prospects were not so bad as pictured by the railroads. After both of the other decisions, in 1911 and in 1914, conditions did prove as serious as the railroads had predicted. The situation was aggravated this year, in the case just decided, by two facts—that we are in an emergency and need all the help we can get from the railroads, and that the opposition to increases, so strong hitherto, was wavering. Yet five of the six living commissioners failed to take the broad view urged by the sixth.

Better things, in times gone by, have been looked for and obtained from some of the able men who constitute the commission. Does the academic spirit now pervade the commission's sanctum to such an extent that its members lose the faculty of taking a large view of the whole railroad problem? Railroad development has been backward for several years, backward because railroad credit has been poor. This condition is not merely a future possibility, to be warded off in due time if things become as bad as the railroads predict. It is a fact and has been for five years, and business has suffered.

The country needs a commission that will set diligently to work to remedy the situation, even at the risk of giving the railroads a shade too much in case of doubt. The railroads cannot undertake comprehensive development of terminals, trackage and equipment on the strength of a few months of abnormal business, and that comprehensive development is needed more than ever before. The emergency is here, and the Interstate Commerce Commission must meet it or give way to a reorganization.

Despite Camp Impressions the Army Does Need Engineers

IN INDIA, at least in the India of the young Kipling, "single men in barracks don't grow into plaster saints." In this day and country, what with the Y. M. C. A., and the movie, and the bone-dry law, the single men are not likely to be the cause of trouble. It is the married man with his visions of family neglected and business disrupted who becomes the problem of the training camp, though his morals be above suspicion. It is one of this class whose letter, which is printed on another page of this issue, is the cause of the explanation of the Government's use for engineers in the war. To such a man camp life has no appeal. Singing by chorus is only an occasional relaxation of his college reunion, and the constant company of men obviously and joyously a dozen years his junior becomes decidedly uncongenial. His nerves fray under the gregariousness of camp life, and his mind soon seeks explanation of methods and manners which to the younger man are all a part of the new game and as such do not require explanation.

It would be unfortunate if any considerable number of engineers, either in training for commissions in the Engineers Reserve of the new army or contemplating such training, were to get themselves into the state of mind indicated by the letter, because it seems so apparent that the correspondent's complaint, partly explainable by temperamental difficulties which are to be expected, is also due to lack of information with which he should have been supplied, and which incidentally it is the purpose of the explanation printed in this issue to furnish.

Criticisms of the Government's methods of training its temporary military engineers are permissible, though it must be said that no one has such expert knowledge of how such training should be conducted as the officers of the army themselves. The fact remains that the Government will have pressing need for engineers of all sorts in the campaign which inevitably lies ahead of the army in France. Mistakes will undoubtedly occur and individuals will probably suffer from neglect and mistreatment, for the War Department today is probably the busiest organization in the whole world. Busy and, what is more, hastily enlarged organizations are bound to make mistakes, but the department is doing its best to sort out the engineering talent offered it so that each man will fit into his proper niche.

The department has announced that it wants all kinds of engineers. It remains, then, for those who have volunteered and who do not seem to be fitted to their proper place, to take up direct with Washington, through proper military channels, of course, where they are parts of military organizations, their disposition for future use. Once their preliminary, and to the military mind necessary, training is accomplished, they may be sure that their talents will be disposed of to the best use of the Government.

What Is Delaying the Fabricated - Steel Ships?

The plans have been ready for many days, but General Goethals is still waiting for authority to let contracts for vessels to be built with structural shapes. The decision as to policy is overdue. Construction must start.

FOR many days the plans for rapidly building ships of structural steel have been ready, but we hear of no contracts for them being let. The steel ships ordered are of the older types. On the other hand, there has been a revival of the strange stories about wooden ships, which would be amusing if the shipping situation were not so serious. Yet the situation is of elementary simplicity.

Wooden steamships have been built in large numbers in this country, but not large ships for transatlantic service capable of sufficient speed for the present requirements. This is not saying such ships cannot be built; they can be. When the first large wooden ships were designed to meet the present emergency, investigation showed that they would not have sufficient torsional strength. Two were built in Canada. Before they sailed, they developed weakness; they never reached port and their fate is unknown. No useful purpose was served in sending such ships to sea. Proper designs were prepared, and about 210 wooden ships are being built for the Government. They will be found seaworthy, if constructed honestly.

These wooden ships are of little value except for emergency use. They are very costly per ton of cargo capacity and will be very costly in operation. As means of meeting an emergency they are justifiable, if nothing better can be found. That the need for them is not yet serious in the eyes of Great Britain is shown by the fact that shipyards in eastern Canada, able to build these ships, receive no orders from the British authorities and have been asking for American contracts, although every yard in any part of the world that will take a British order for a steel ship can get it instantly. This common talk about Great Britain building wooden ships if the United States does not is misleading; a few wooden ships are under construction for British service in the Pacific, but the British authorities know well that the wooden ships are practically worthless for transatlantic use except under emergency conditions, which they manifestly consider are not imminent or they would have ordered such ships from the Canadian yards ready to build them.

The energetic publicity in favor of wooden-ship building lays great stress on an alleged dearth of steel and an abundance of lumber. Such statements are so misleading as to deserve the strongest condemnation. An hour's ride from Washington, at Quantico, Va., the construction of marine barracks has been delayed by inability to secure prompt deliveries of low grades of lumber much less difficult to obtain than the clear stuff required in shipbuilding. Although the Coöperative Committee on Lumber of the Advisory Commission of the Council of National Defense has been in existence for months, there are difficulties in obtaining lumber for Government work just as trying as those in obtaining other supplies. The only difference between the lumber and steel situations today seems to be that the executive departments at Washington have not yet stopped contracting for lumber in order to discuss prices, as they have stopped contracts for steelwork. Just why the building of wooden ships of an experimental nature at exorbitant prices at any terms the builder proposed has been considered good business policy and building steel ships at very moderate prices and of demonstrated serviceability has been called bad business is beyond our insight.

General Goethals was ordered to Washington some months ago to build ships. It was a wise appointment, because the American people had confidence in him. They knew that, although the Panama Canal cost far more than it was originally estimated to cost, this was due to the unexpectedly great extent of the work. The unit costs, the prices per cubic yard of excavation and such items, were within the estimates of the International Commission of Consulting Engineers which fixed the general plan for that undertaking. Before he was appointed as the nation's shipbuilder, it was common talk that there were very fine contracts to be had for wooden ships; and the wail that went up shortly after he took charge and stopped some of them is proof of the truth of this rumor. Since he has been in Washington, he has developed plans for good wooden ships and let contracts for them. They will be built rapidly. But he has also let contracts for as many steel ships as builders will undertake, which will also be built rapidly and are worth far more than wooden ships, and has been waiting for authority to build steel ships with structural shapes, which will be equally as good as the standard type and can also be built rapidly. These steel ships will be good for something five years hence, while the wooden ships will be of little value.

General Goethals is popularly regarded as the greatest builder in the country, an economical builder; but if his method for the simultaneous rapid and economical building of the best types of wooden and steel ships does not appeal to the administration, it ought to permit him to retire again to private life, where his services are in great demand. What he has tried to do was to build as quickly as possible at reasonable prices all the steel ships the American yards can produce and as many wooden ships in addition as are needed to make up the fleet required to meet existing conditions. The former plan was to build nothing but wooden ships of an untried type, not approved by some experienced naval architects, of no value after the war, and so experimental in their nature that, in spite of all rumors to the contrary, nobody was willing to build them under any satisfactory guarantee as to their efficiency.

Defiance of Statute and Engineering Law Wrecked Mammoth Dam

Original Plans and Specifications Approved by State Engineer Not Followed—Too High Water Level Under Makeshift Conditions of Construction and Operation

By H. S. KLEINSCHMIDT
Consulting Engineer, Salt Lake, Utah

THE failure of the Mammoth reservoir dam in Utah on June 24 and 25, resulting in the loss of the structure and a large volume of water stored for irrigation and in large property and other losses to the Denver & Rio Grande R.R., coal-mining companies and others, was due to violation of state legislation that resulted in makeshift construction. It was also due to careless operation.

The Mammoth reservoir is owned by the Price River Irrigation Co. It is located in the central part of Utah, in the Wasatch Mountains, six miles west of Scofield. Its altitude is 8500 ft. The watershed is about 20 square miles, reaching an altitude of 9750 ft. The reservoir held about 11,000 acre-feet of water at the time of failure. The stored water was used to supplement the low-water flow of Price River during the summer, for the irrigation of lands southwest of Price.

The average annual precipitation at Scofield, at an altitude of 7500 ft., is between 18 and 19 in. Snow frequently lies to a depth of 10 ft. on the level in this region at the end of the snowfall season in April.

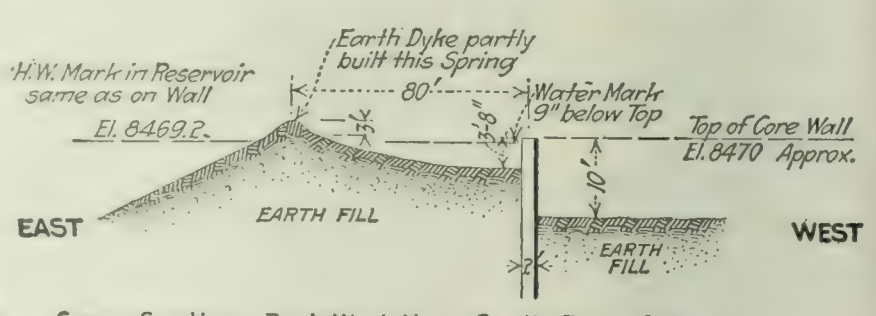
The dam was an earth-fill structure, with a concrete heart wall founded on bedrock, exposed in the stream bed and sides of the canyon. Bedrock is sandstone lying in strata sloping slightly downstream. Between the strata is either shale or clay.

The original plans and specifications, filed some years ago, and approved by the state engineer, had not been followed in any particular. After work had progressed along entirely different lines in violation of the state law requiring the approval of plans for dams still other plans were filed in the office of the state engineer, but the revised plans have never been approved.

Dam Raised Piecemeal from Time to Time

At the time of failure, the dam had been built to an elevation of about 70 ft. above stream bed. It was 160 ft. wide on top, with a concrete heart wall along the axis. The top of the earth-fill on the downstream side of the wall was at an elevation 10 ft. below the top of the wall, and on the upstream side 3½ to 4 ft. below the top of the wall. The fill on the upstream side of the wall sloped upward from the wall to an elevation the same as the top of the wall at a point 80 ft. distant, where a narrow dike of earth had been thrown up with crest 3 ft. above the top of the wall. Part of this dike was built about two weeks before the failure. The dam had been raised from time to time to meet the demands as the project on which the stored water was used developed. The last raise, of 5 ft., was made in the fall of 1916, at which time the heart wall and the earth-fill on the upstream side of the wall were raised. The fill on the downstream side of the wall had not been raised. The lower portion of the fill had been sluiced in, the remainder having been placed by wagons and scrapers and compacted with a heavy corrugated-iron roller.

The earth composing the fill is a clay loam. Some parts of the fill remaining show a very dense hard fill,



Cross-Section, East-West Near South End of Dam

FIG. 2

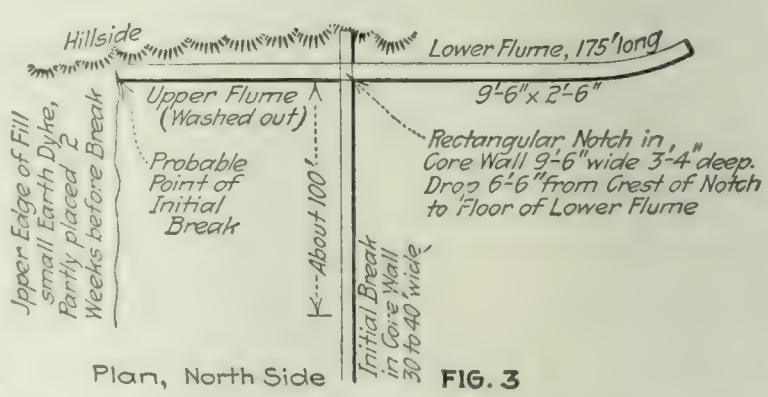


FIG. 3

SKETCHES VISUALIZE THE CAUSES OF FAILURE

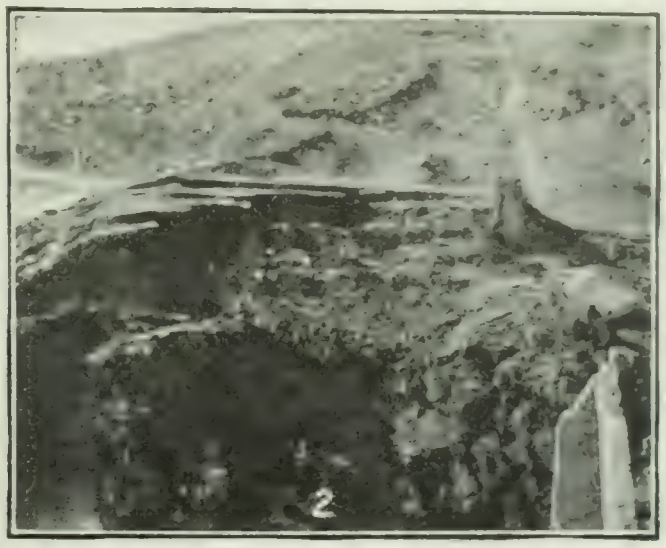
Relative levels of water in reservoir, heart wall, earth embankment above and below heart wall at time of break are shown in section and location of flume and initial break in plan

but the major portion shows the earth to lack cohesion, being very friable, having broken off and slipped during and after the washout as though only recently placed, fractured parts being very loose and crumbly.

The concrete heart wall was founded on bedrock, was joined to bedrock on both abutments and was about 450 t. long. It was 2 ft. thick, buttressed at intervals of 25 ft. on both faces. The buttresses were 2 ft. thick, 2 ft. long at the elevation to which the heart wall had been completed, sloping to 9 ft. long at the base. They were without reinforcement and were not tied by reinforcement to the wall or foundation. The plans call for vertical reinforcement of the heart wall near the upstream face with horizontal reinforcement also. Standing portions of the wall show ½- and ⅝-in. rods vertically at the center of the wall projecting above the top of the wall. One portion of the base also shows similar rods, and horizontal rods up to an elevation 12 ft. above the base, but none above. Some broken pieces show no reinforcement whatever. It appears, therefore, that









1. LOOKING AT RUINED DAM FROM BELOW

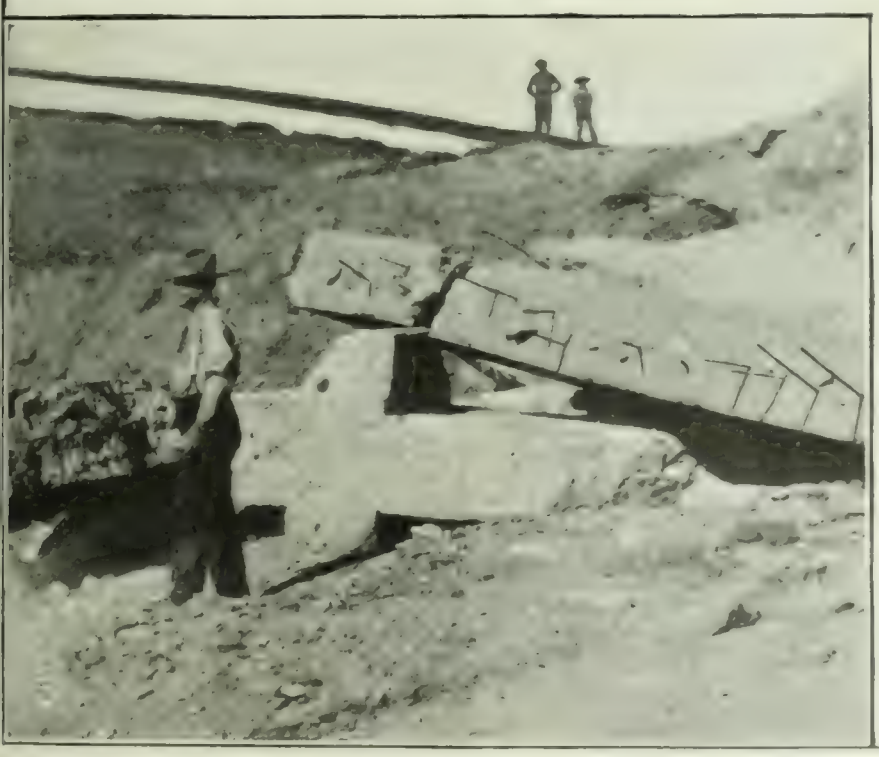
2. LOOKING SOUTH ALONG DAM AND HEART-WALL

3. TIPS OF MAN'S FINGERS ARE AT WATER MARK ON HEART-WALL

4. UNFINISHED OUTLET TOWER STANDS UNHARMED

5. REINFORCEMENT SHOWN IN SECTION OF HEART-WALL ADDED IN 1916

6. LOOKING EAST THROUGH LOWER PORTION OF FLUME





STORY OF THE FAILURE OF THE MAMMOTH RESERVOIR DAM IN UTAH AS TOLD BY THE CAMERA

the plans were not carefully followed. Intended for a seepage cutoff wall, its design, and more especially its construction, made it depend almost entirely upon the support of the earth-fill on either side for stability.

Small Makeshift Wood Flume for Spillway

No permanent spillway had been built. On the north side a wooden flume 9½ ft. wide and 2½ ft. deep was built along the junction of the fill and the hillside. This butted against the lower side of the heart wall, in which a rectangular notch of about the same dimensions was left. When the addition of 5 ft. to the heart wall was made in 1916, the flume on the downstream side of the wall was left in place, so that there was a drop from the crest of the notch to the floor of the flume of 6½ ft. On the upstream side of the heart wall a similar flume was built extending to the upper edge of the fill and terminating in the small earth dike. The floor of this flume at its upper, or east, end is said to have been from 4 to 5 ft. below the crest of the earth dike. No wing walls or cutoff walls had been built. The floor rested on mudsills, and the sides were supported by timbers that had been driven into the fill. Three 6-in. plank flashboards had been put in at the head of the flume, and water was being held 14 in. above the floor of the flume, or, according to the caretaker, 3 ft. below the top of the earth dike. No water was flowing through the flume, the inflow into the reservoir being handled through the outlet tower.

Incomplete Outlet Tower Proved Useless

The outlet tower is circular, 6 ft. inside diameter, of reinforced concrete. It is provided with four 12-in. inside diameter mud sluices at the bottom, with gates operated by screw lifts from the top of the tower. Eighteen one-fourth bend cast-iron inlets 12 in. inside diameter are located in a spiral around the tower. Their openings point upward, with round cast-iron covers, operated each independently by chains, cables or ropes from the top of the tower. No foot-bridge or adequate operating platform had been built, access being had by means of a lumber raft. The top of the tower had not been carried up as high as water was being held in the reservoir, the caretaker stating that water was from 4 to 5 ft. above the finished concrete. The tower connects with an arched concrete outlet culvert through the dam, 5 ft. wide, 4 ft. high to arch springing line, the arch having a 2½-ft. radius. The tower and culvert remained intact, about one-half of the culvert being exposed on its lower end. Two of the mud sluices and three of the inlets near the top of the dam were open. Lumber forms projected above the top of the concrete at the top of the tower, and on top of this was a mass of timbers to which the pulleys carrying the ropes and cables for operating the inlets to the tower were fastened. Some water was finding its way through the forms into the tower.

Watchman's and Caretaker's Accounts of Break

The history of the break, as given by the watchman and caretaker, is that at noon, June 24, the watchman being alone at the dam, everything was apparently in its usual condition, and water in the reservoir had not risen in the previous 24 hours. The watchman went to dinner about ¼ mile away, remaining 2 to 2½ hours. On his return, water was flowing through the earth dike at the upper end of the dam, at the north side, southwesterly across the earth-fill and out through a gap in the concrete heart wall, 30 to 40 ft. wide, which had broken out about 100 ft. south of the north end of the dam. This section appeared to have broken off to a depth of about 5 ft., probably along last year's junction plane.

It is the writer's opinion that this assumption is not correct. It is impossible that less than 4 ft. of water could have caused the breaking off of the wall at a depth of 5 ft. The break must have occurred near the level of the top of the earth-fill on the downstream side of the wall.

No Help at Hand

The watchman immediately summoned help by telephone, but the remoteness of the dam prevented any assistance arriving in time to be of use. It is certain that, under the conditions that prevailed, no human agency could have saved the dam. When the caretaker arrived by horseback about two hours after being notified, he made his way on the raft to the outlet tower and attempted to tear away the wooden forms projecting above the concrete, so as to allow a greater flow of water into the tower. He was only partly successful. The various ropes and cables for opening the inlets to the tower could not be operated, and there was nothing to be done but watch the dam crumble away. The rush of water through the break washed out the fill on the downstream side of the wall, and with it from time to time sections of the wall, until finally, more than 24 hours later, the main break occurred and the major portion of the water was released.

Probable Cause of the Dam Failure

Evidence and testimony point to the break having occurred in one way only, as follows: Water found its way around or under the upper end of the flume, which had not been properly bedded and protected in the earth dike at the upper end of the fill. This water filled the depression between the dike and the heart wall. Water marks on the upstream face of the heart wall show 9 in. below the top on the south end and 7 in. below the top at the north end. This mark corresponds to the high-water mark of the reservoir on the slopes above the dam. This water saturated the earth-fill sufficiently to overturn or push out by sliding a portion of the heart wall. Scour marks on the earth-fill under the lower flume just below the heart wall show that water pouring through the notch had deeply scoured the fill. This may have been a contributing cause to the failure of the heart wall.

Early reports laid the break to an unusual volume of water from melting snow entering the reservoir. This cannot have been the cause. The watchman's testimony is that the reservoir level had remained stationary for 24 hours previous to the break, and the high-water mark in the reservoir shows that the upper dike was not overtopped. Neither had there been any wind to scour out the fill.

It is also reported that there was a stream of about ½ sec.-ft. volume issuing from the hillside about midheight of the dam, just below the lower end of the lower

flume, which ceased after the destruction of the dam. This was reported a week after the break and after the writer's examination. This is given no weight as connected with the failure of the dam except that if water from the reservoir was finding its way around the north end of the dam, it may have partly saturated the fill on the upstream side of the heart wall and helped cause overturning of the wall.

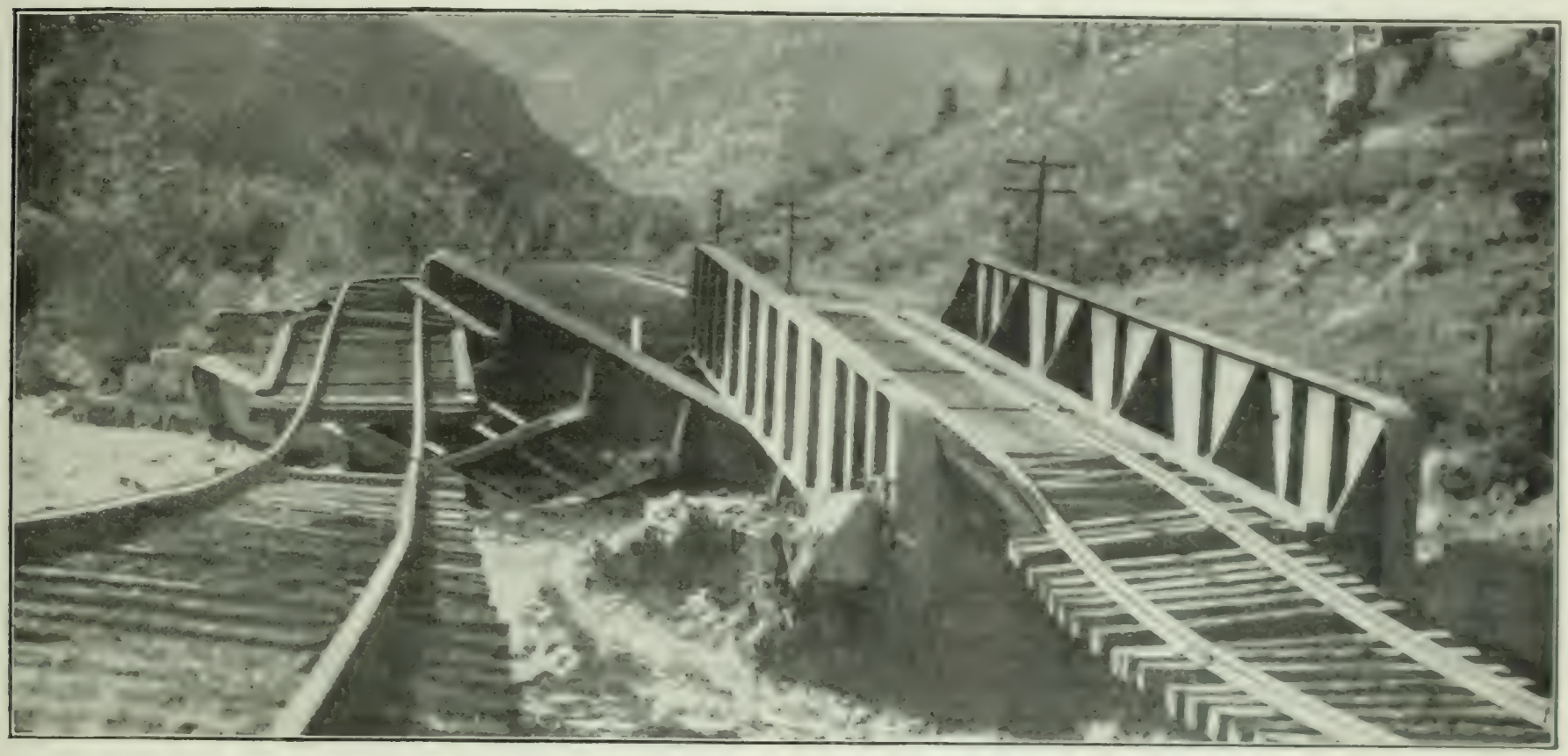
The disaster can be attributed only to utter carelessness in the lack of an adequate spillway and in the flimsy construction of what was intended for a spillway, together with the unsafe height to which water was held in the reservoir against the earth-fill forming the crest of the earth dam.

The unfinished condition and design of the outlet tower formed a contributing cause. The very temporary makeshift provisions for controlling the inlets to the tower made it impossible to operate them. In opening, it is necessary to lift the full weight of the water standing over the covers to unseat them. This, with the arrangements at hand, made it impossible to open any but those near the top in any event. The caretaker also states that, when several of these outlets have been opened, the water falling into the tower creates such an excessive vibration that it is considered dangerous to open any more. This feature had been commented on previously in a report to the state engineer on the adequacy of the construction. Thus, the tower afforded no means in an emergency of letting out quickly a large volume. This is not the function of such an outlet, but a set of several large gates near the bottom of the tower with screw-lift stems and an operating platform adequate and easy of access would have afforded this extra emergency outlet.

Had the spillway been deep and wide enough, properly protected, with means for the quick removal of the flashboards, the calamity would most certainly not have happened. A spillway 20 ft. wide, 4 ft. deep, with floor 10 ft. below the crest of the fill, should have been provided.

Damage to Denver & Rio Grande Railroad

Water from the reservoir joins the Price River about 20 miles below the dam at Colton. Between this point and Hale, 11 miles above, the Scofield branch of the Denver & Rio Grande R.R. was entirely destroyed. From Colton to Helper many miles of the main line were destroyed, practically all bridges being wholly or partly washed out. At Castle Gate the depot was washed away. The bottom of Price Canyon is thickly lined with houses near the various towns, mostly homes of coal miners. There was ample warning of the impending disaster after the initial break, and they were able to move all their effects. Otherwise, a very heavy loss of life would have resulted. As it was, only one death occurred, that of a young woman sightseer whose automobile backed into the flood.



TWO OF THE DENVER & RIO GRANDE RAILROAD BRIDGES HIT BY THE FLOOD WATERS FROM MAMMOTH DAM FAILURE

These were 85-ft. bridges. The east pier of one was washed out and of the other cracked and twisted from foundations when flood cut a new river channel

Coal Mines Shut Down and Industries Threatened

The destruction of the railroad caused the practical shutdown of all the coal mines in the district, which is the leading coal-producing section of the West, the Denver & Rio Grande R.R. being the only outlet. Unless a very speedy opening of the road is effected, a coal shortage will shut down all the large industries of the state, since the amount in storage is estimated at less than two weeks' supply. This feature is particularly unfortunate. The shortage of cars for various reasons has rendered it impossible for the railroad to supply even the summer demand for coal in some sections; and in addition it had been hoped to store large quantities during the summer to guard against a repetition of last winter's experience, when unusually severe weather and other conditions made it

impossible for small users and outlying communities to obtain coal at all.

The loss to crops to be served from the reservoir is problematical. The diversion dam for turning water from the Price River into the canals is intact. The natural flow of the river will be greater than usual this summer on account of the snow which still lies in considerable amounts on the mountain watersheds. This, with offers of water from other sources, makes the outlook favorable for no great crop loss.

Railroad officials hope to have the road open for nominal traffic by the middle of July, but it will take many months to get the railroad in good shape.

Eloquent Warning Against Lax Operating Methods

The disaster is an eloquent warning against lax methods in the operation of structures that at best have elements of danger against which every possible precaution should be taken. State officials all over the United States should renew and increase their vigilance and insist that the laws governing the construction and operation of reservoir dams be rigidly enforced. The Price River Irrigation Co., at whose door the failure must be laid, is the least loser. The innocent parties, as usual, are the chief sufferers.

The examination on which this report is based was made in company with George F. McGonagle, state engineer of Utah, and J. L. Rhead, of the state engineer's office. The writer acknowledges assistance rendered by them, including photographs and drawings furnished.

City Planning Commission Proposed

A City Planning Commission for Cincinnati, Ohio, has been provided by the Charter Commission in one of its sections for a proposed new city charter. The Planning Commission is to consist of seven members, and the charter provides an annual appropriation of $30,000 for the years 1918, 1919 and 1920, and thereafter appropriation of funds is to be made by the council. The powers and duties of the commission will be to make plans and maps of the whole or any part of the city, or any land outside of the city which bears a relation to the general planning scheme of the city. The maps and plans are to show the recommendations of the commission for new streets, alleys, viaducts, bridges, subways, parkways, playgrounds and any other public grounds or public improvements, also the removal, relocation, widening or extension of existing public works. Power is also given the commission to control, preserve and care for historical landmarks and decide upon the location of works of art and statuary belonging to the city.

Mineral Water and Barometric Levels Synchronize at Saratoga Springs

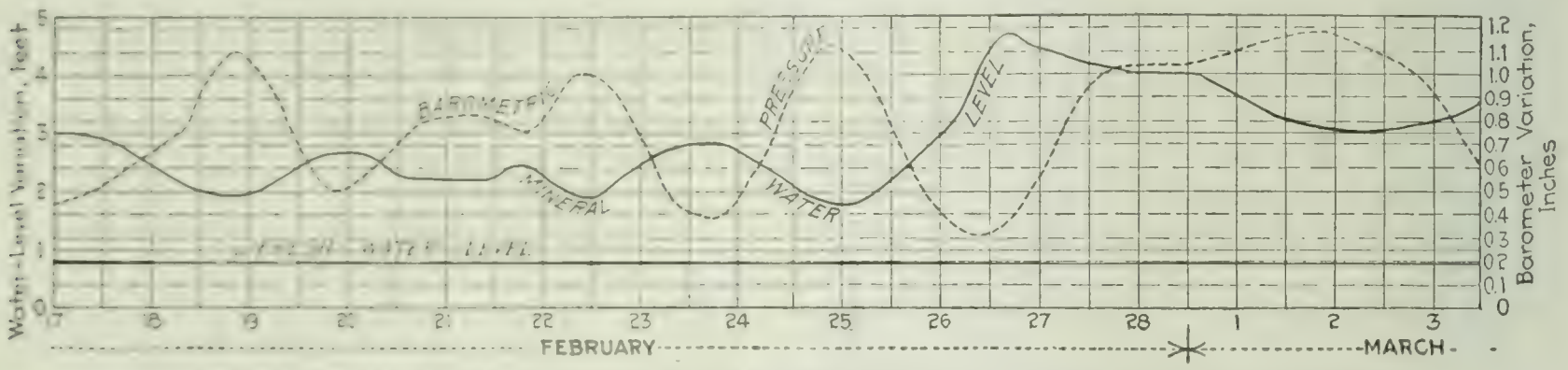
By Charles G. Anthony
Chief Engineer, Saratoga Springs Reservation

Of particular interest to hydraulic engineers is the dual water system underlying the City of Saratoga Springs, one a reservoir of pure soft water, the other a reservoir of strongly carbonated mineral water.

The state geologist has shown the following section of the strata at Saratoga Springs, from above downward: 75 ft. drift sand and gravel; 25 ft. clay; 100 ft. gravel; 300 ft. shales and slate; 500 ft. limestone; 400 ft. sandstone; ancient gneiss and metamorphic rock.

Above the clay the pure soft water is found, while below the clay the mineral water is found—weak mineral water in the shales, strong mineral water in the limestones and sandstones.

There are 122 mineral springs and wells on the state reservation, ranging in depths from 125 to 1006 ft.



LEVEL OF SARATOGA SPRINGS MINERAL WELLS FLUCTUATES WITH BAROMETER

These wells all extend below the clay and all yield mineral water of varying mineralization.

Above the clay 75 wells were opened ranging in depth from 20 to 40 ft., all yielding pure sweet water. As the reservation contains 540 acres, we have one well on every 2½ acres of land or an ideal system of bore holes from which to study the two water systems.

The mineral water comes to the surface with a temperature of between 50 and 54° F. (10 to 12° deg. C). It is interesting to note that the temperatures are appreciably higher in the summer than in the winter, the waters being 2° F. warmer in August than in April. The specific gravity of the water will vary with the amount of dissolved solids, ranging from a minimum of 1.0034 to a maximum of 1.0123.

The waters are alkaline saline, or saline, and nearly all contain enough iron to be classed as chalybeate. The mineral waters are all naturally carbonated, the average rate of CO_2 gas to water being about 4½ to 1. There is a constant stream of mineralized water flowing from the southwest to the northeast. It is a current of living water, gathering strength as it flows slowly through the rocks, until with its vitalizing charge of carbon dioxide gas it issues clear and sparkling to the surface. This reservoir of mineral water follows none of the laws of percolating waters. Its movement is entirely independent of the fresh percolatory water above. It is not uncommon to see the mineral-water horizon rise while the fresh-water horizon lowers. Sometimes the two horizons move in synchronism, but always the movement of the mineral-water horizon is many times greater than that of the fresh-water horizon.

The peculiar ebb and flow of the mineral-water system, while noticed for years, has never been satisfactorily explained until recently. Many observers attribute the ebb and flow to the attraction of the moon. It was noticed by men operating the natural carbonic acid gas plants that invariably greater quantities of gas were received in the gasometer whenever there was a south wind blowing.

The curves on page 56, showing mineral-water level, fresh-water level and barometric pressures, prove conclusively that the fluctuation or rise and fall in the mineral-water level is due to barometric pressure alone. The solubility of carbonic acid gas varies directly as the pressure up to about six atmospheres pressure, when the law ceases to hold. A high barometric pressure holds a given quantity of gas in solution. A low barometric pressure releases a given quantity of gas and permits it to appear as a bubble where it occupies space and immediately displays an equal volume of water and causes the mineral-water level to rise. An increased barometric pressure drives this gas back into solution where it occupies no volume, the bubble disappears and the mineral-water levels falls.

It is seen from the curve that the fresh-water level shows no variation over a period of two weeks, while the mineral water shows a fluctuation of 2.8 feet.

A Letter Answered:

Does the Army Need Engineers as Officers?

This is the case of a candidate for a commission in the Engineer Officers' Reserve Corps who has become discouraged at the outlook, as viewed from the barracks of a training camp. His statement that "there is no apparent use for the experienced engineer in the Army Corps of Engineers" is one which should not be allowed to pass without comment. *Engineering News-Record* quotes below the main portions of the letter from its correspondent and presents, in rebuttal, a discussion based upon information secured from an authoritative source. Brief editorial comment appears on another page.

A LETTER from an engineer in training for a commission in the Engineer Reserve Corps of the Army, received by *Engineering News-Record*, is a complaint, good natured enough in places, but nevertheless a complaint that the prospects of his being of service to his country in the capacity for which he was urged to volunteer are very small. This journal has been able to maintain close contact with the development of the military situation as it affects engineers and takes this opportunity to describe the present situation as it sees it, and to dispel misapprehension into which the correspondent, typical of many others, has been led.

Impressions of Camp

The important extracts from the letter follow:

"Sir—I am a volunteer in training for an officer's commission, Engineer Corps, United States Army, in a Far Western camp. I am a middle-aged man, with wife and children dependent upon me; an engineer in a specialized line, with extended experience and able to handle men—qualifications pointed out by the recruiting circulars as most important for those applying for commissions. My income in civil life supported my family in comfort, but not in excessive luxury. In other words, my entering the service entailed considerable financial sacrifice. On points aside from money, I have had to leave my family, in a manner, to the tender mercies of friends and the less tender advice of relatives.

"In joining, I intended to apply for a captaincy. I found, however, that the Government, when making the examinations, had candidates agree to an appointment of next lower rank than that aimed at, if the desired rank could not be obtained. To put it frankly, it was impossible for me to support my family on the salary of a first lieutenant. I was willing to give all of my time and experience to the Government at a captain's pay, but I could not see my way clear to do it for less. Therefore, I applied for a majority, hoping to get a captaincy.

"*I came into the service as a duty, and because I thought, from the circulars urging engineers to join the officers' training corps, that my experience might help.* I find in the camp a number of other engineers, well known in the profession, of moderate incomes but uncommon ability, who, like myself, have sacrificed much in order to 'do their bit.'

"A few days ago, we were pleasantly surprised by having a regular-army instructor tell us that all commissions already given, and the rank applied for, meant nothing. On completion of our course of training, the Government would consider everything, and even those with reserve commissions might expect to be reduced in rank.

"Now there were some in the engineering division who were seriously affected by this news. One able engineer stated frankly that in offering his services he had applied for a commission where his income would support his family, that anything less than this was impossible; and that, if he had to take a chance of a subordinate position, it would be best for him to withdraw at once. This he has done.

No Use for the Experienced Engineer

"But to return to the main point, which is that there is no apparent use for the experienced engineer in the Army Corps of Engineers. There you have it. 'Engineer' in civil life means one thing. 'Engineer' in military life has only one similarity to it. It is spelled the same. They do not need experienced engineers in the Engineering Corps.

"Of course, we were old enough so that we should have investigated more thoroughly. When the call went out, 'Uncle Sam needs experienced engineers!' we ungrammatically said, 'That's me!' jumped up and said, 'Present, Uncle!' and here we are. We should have inquired whether he wanted electrical engineers, hoisting engineers, civil engineers, stationary engineers, or what breed. The fact is that engineers are not needed in 'The Engineers' except for ranks of major or better, and we have enough prospective majors and generals in this one camp to beat the world. I say with absolute conviction that, for the ranks of second lieutenant, for lieutenant and captain, a first-class labor foreman is the proper man. He may not shine as brightly as a college graduate when he gets to Piccadilly or the Champs Elysées, but I conceive of this war as a great big contract—a 'job,' not a society event.

"Now please, Mr. Editor, do not get the idea that we are quitters, that we hesitate to dig trenches under fire, that powder explosions make us faint. We will go through hell for Uncle Sam if he can use us for the purposes for which he called us—as engineers. But in justice to those who may join in the future, why not let the technical men of the country know that the word 'engineer' in the army means nothing at all like what it means in civil life? Why not endeavor, with your great influence, to get jobs for engineers where engineers are needed?"

Two Points of Complaint

There are two distinct points of complaint in the letter: (1) The volunteers are apt to be offered lower positions than those for which they applied; (2) experienced engineers are not wanted in military work. Authoritative replies to both points may be made as follows:

In regard to possible reduction in rank, the correspondent is entirely misinformed. The War Department's policy at the time of the opening of the camps was as follows, and this policy is still in force:

A. Reserve Engineer Officers, actually commissioned, were ordered to the camps with the grade of their commission.

B. Those who had passed a local board and had been recommended to the War Department for commission by the Chief of Engineers were requested to attend the camps and were informed that their commissions would be issued as soon as possible and that upon acceptance of them they would be ordered to active duty in the grade in which commissioned.

C. Men who had passed a local board, but whose papers had not yet been acted upon by the Chief of Engineers, were requested to attend the camps and were informed that, if their application was approved by the Chief of Engineers, they would be commissioned and ordered to active duty as soon as possible.

There are a few men at each camp whose applications were made so late as to prevent any local examination. These men were admitted with the express proviso that their prospective rank would be affected by their proved qualities in camp; but those men rated by an examining board will be given the recommended rank unless they show decided disqualifications, in which case they probably will not be commissioned at all. No commissions once given will be revoked except for cause, nor will reductions in rank be made. It is quite possible, however, that defects in temperament, ability or aptitude disclosed in camp may be so great as to lead the department not to assign an already commissioned man to active duty, or at least to hold him in reserve until something to fit his qualifications develops.

Two Classes of Officers

In regard to the correspondent's second point, it is necessary first to explain that Engineer Reserve Officers have been classified as A and B. The intention of these classifications is to discriminate between service combatant troops—namely, the pioneer regiment attached to infantry divisions (Class A)—and the wide field of engineering activity carried on in the rear of the fighting troops (Class B).

This second service comprises two classes, service with line-of-communication troops, and engineering staff duty at the base and on lines of communication. Service with troops may be with railway-operating regiments, railway-construction and maintenance-of-way regiments, railway shop organization, roadbuilding battalions, second-line fortification battalions, topographical sections, water-supply units, logging and lumbering units, building-construction units or work companies, made up of common labor. For service abroad all such engineer organizations will be formed on a military basis, the men being enlisted and uniformed, and it is absolutely necessary that the engineers in charge of the work to be performed by them should have as thorough a knowledge of military methods as can possibly be given them in the short time available. They must know how to maneuver their commands in moving from place to place, to entrain them and detrain them in an orderly manner, to make and break camp, and to requisition and obtain equipment and supplies.

The engineering staff duty will consist largely in superintending the work of several units or in the making of special investigations and reports for general headquarters and in inspection of engineering work.

The work of line-of-communication units may take them into the areas immediately behind the armies, and they are not entirely free from the dangers of campaign.

The War Department has waived minor physical defects in the cases of applicants desiring Class B service, but has endeavored to recommend only those who are reasonably fit for field service.

It is realized that there are at training camps some very able engineers in special lines of work, who, either by experience or temperament, are unfitted for duty with troops, but who will be of the greatest service on special staff duty. It is the intention of the department to make every possible use of such men in their special fields.

Field Organization

Our forces in France will consist of men in the trenches and in the zone of advance engaged in active fighting, but behind these men there will be a fanlike formation reaching back to the ports where land all supplies and men. This vast fan will be one of the greatest engineering organizations on earth, comprising railways, both large and small, roads, water transport, water-supply, electric-light and power lines, factories,

warehouses, everything in fact that in peace comes under the expert supervision of the civilian engineer. All of this organization must be manned by army men, and it is mainly for the officering of such commands that the Engineer Officers' Reserve is being formed. The members of this corps will serve as the reservoir from which the many diverse jobs behind the lines must be filled. There will be a place for nearly every kind of engineer, for there will be nearly every kind of work.

Scope of Instruction

It is the function of the training camp to instruct the prospective officer in the rudiments of purely military engineering—in the duties of both the line and the engineer troops at the firing line—partly because, if the war lasts, many of these men will take up that work, but mainly to give them some idea of military discipline and organization, since they must become a part of such an organization. By far the greater number of the reserve engineer officers, however, will be assigned to duties compatible with their talents and civil-life training.

For the direction of such work by military units, obviously the engineer and not the labor foreman will be needed in the grade of lieutenant and above. The labor foreman's military place is the counterpart of his old place in civil life—as the highly important noncommissioned officer all the way from the corporal to top sergeant and master engineer. It is considered essential that all the officers in this new corps of engineers should have some intimate contact with and knowledge of military life and methods. In no way are the common soldiers' burdens better learned than in the first six weeks of work laid out in our training camps. In no way is the necessity better seen for careful discharge of administrative duties by company officers in order that the men may be properly housed and fed, kept well and contented.

It seems clear to this journal that the misapprehension of our correspondent is due, in part, to the very evident lack of acquaintance with the details of our military functions, in part to the fact that the officers' training camp was in its introductory stage when the letter was written, and in part to a lack of tact on the part of the instructors in presenting some phases of the work. It is hoped that the explanations given will clear the minds of any men already in or contemplating entering a training camp for engineer officers.

Reforesting Water-Supply Land on Catskill System

Advantages of Reforesting Outlined—Available Varieties Named—Over 2,000,000 Conifers Planted Around Ashokan and Kensico Reservoirs

By Fred F. Moore
Designing Engineer, Board of Water-Supply, City of New York

FORESTRY, more particularly reforestation of denuded areas, offers a profitable and pleasant field of endeavor to those responsible for our public water-supplies. The sponge of a few inches to a foot or more in depth on the surface of forest lands steadies the run-off and prevents turbidity and the silting of reservoirs from soil erosion. Temperature and air movement, two factors having a strong influence upon evaporation, are also affected favorably by forests. Forest trees, as a whole, take up much less water than cultivated crops, including grass lands. It has been estimated that conifers take up only one-tenth as much as deciduous trees. The mat of needles under an evergreen growth keeps frost out of the ground and permits penetration of rain water.

Best Trees for Watersheds

Conifer trees are by far the best cover for water-supply areas. An evergreen forest makes a pleasing picture at all seasons, and there are varieties of these trees well adapted to most situations and conditions. Until very recently the white pine has been a great favorite for general planting, as it has a pleasing habit of growth and adapts itself to wide variations of soil condition. The white and other five-leaved pines have recently been seriously attacked by the so-called "blister rust," a fungus bark disease whose host is the black current and gooseberry. To control this situation, New York and near-by states have passed, or are contemplating, legislation prohibiting the propagation of white and other five-leaved pines.



THESE CONIFERS AT THE ASHOKAN RESERVOIR WERE NATURAL SEEDLINGS TRANSPLANTED INTO AND CULTIVATED IN THE BOARD'S NURSERY BEFORE BEING PLACED IN FINAL POSITION

The red pine is a good substitute for the white and is valuable for general planting. It is picturesque even on poor soils, and on richer soils it has a vigorous and superb growth of long, deep-green needles. Scotch pine adapts itself readily to many soils and will withstand severe wind exposure, but should not be planted in the shade. Austrian pine, a hardy, rapid grower, adapted to exposed positions and poor soils, has particularly effective plumes of heavy branches. Pitch pine and bull pine are also useful varieties of the pine group. Norway spruce (the spruce of Europe) is a very rapid grower, extremely hardy, can be planted in the shade and is well adapted to exposed positions. The native white spruce, an attractive tree, has also proved especially valuable for watershed planting, as it is

hardy and adapts itself to both wet and dry soils. Colorado blue spruce, the bluest of the white or blue spruces, which gives a rare tint in color combinations and furnishes a strong contrast with the darker evergreens, is one of the hardiest of the spruces. Concolor fir, second only to Colorado blue spruce for color contrasts, adapts itself to many soils and exposures. Arbor vitæ is particularly useful for close hedge planting on reservoir margins near the high-water line, as, when so employed, it will prevent the leaves of deciduous growths from blowing into the water. Hemlock, attractive at all seasons, particularly good for ornamental planting in conspicuous locations, is hardy and will thrive in the shade.

Reforestation Along Catskill Aqueduct

In connection with reforestation the Board of Water-Supply of the City of New York has planted more than two million small conifers around and near the Ashokan and Kensico reservoirs, besides many thousands of trees in ornamental planting along the Catskill Aqueduct and on other lands. This work has been done partly by contract and partly by the board's own forces. The situation at this time with reference to the Ashokan reservoir lands is about as follows:

	Acres	Total Acres
[illegible]	500	
[illegible]	375	
Open land yet to be improved	225	1,100
[illegible]	100	
Standing forest improved	3,000	
[illegible]	1,800	4,900
Forest lands	6,000	
Open land, including highways, railroad, etc.	754	
Total land area	6,754	
Area of water surface at high line of Ashokan reservoir	8,500	
Total taking		15,254

The present forest land is covered with so-called second-growth white oak, rock oak, red maple, sugar maple, hemlock and white pine. The chestnut growth is being removed on account of mortality from fungus diseases. Plantings have been for the most part of Norway spruce, arbor vitæ and of Scotch, red, white, Austrian, jack and bull pines.

907 Acres Planted at Kensico

At the Kensico reservoir 907 acres have been planted, of which about 400 were by contract. Of the total, 170 acres are underplantings of existing forest growths.

For the most part these plantings have been made with three- and four-year-old stock, spaced about 6 ft. apart each way. This requires about 1250 transplants per acre. The cost of the transplants in place is from $25 to $50 per acre, depending upon local conditions.

With minor exceptions, plantings by the board's forces have been of transplants raised in its own nurseries, either from seed or from seedlings obtained from the State Conservation Commission and from commercial nurseries. Excellent stock has thus been obtained, which is immediately available at all times when plantings may be done. The establishment of nurseries may be justified whenever areas to be covered are at all extensive and suitable soil and other conditions are obtainable.

Charles Strauss is president of the Board of Water-Supply. Charles N. Chadwick and John F. Galvin are the other two commissioners. J. Waldo Smith is chief engineer.

Materials and Tests

Abstracts of Papers Presented at the Convention of the American Society for Testing Materials, June 26 to 29

THE following abstracts of papers presented at the twentieth annual meeting of the American Society for Testing Materials, June 26 to 29, supplement those published last week:

Can the Properties of Steel Products Be Determined by Magnetic Analysis?

A group of investigators has for some years been working on the possibility of establishing an exact correspondence between the magnetic and mechanical properties of steel. Among these, Charles W. Burrows, United States Bureau of Standards, has taken a leading part. In a paper entitled "Some Applications of Magnetic Analysis to the Study of Steel Products," Mr. Burrows outlines the present state of knowledge regarding these investigations. He outlines some of the actual accomplishments toward the solution of the problem of commercially testing steel by magnetic methods.

The principle involved is that many, if not all, of the mechanical properties of steel are directly proportional to certain other magnetic qualities. Mr. Burrows says the "art of magnetic analysis consists in the determination of the magnetic characteristics, or better, a small number of magnetic characteristics, and from these observations making estimations of the mechanical properties." It can be seen that if this can be worked out practically there is a great field for commercial testing. Routine tests are now made on actual samples, and the sample is, as a rule, destroyed. Such tests, Mr. Burrows says, are vicarious, destructive, local and qualitative. These include the mechanical, chemical and microscopic analyses of steel which form the basis for customary specifications in testing. If large-sized pieces of metal can be investigated magnetically and the mechanical properties determined thereby, there is a great saving in effort and time and material. Mr. Burrows outlines some of the detailed methods of making the tests and notes that this work has been carried on in the investigation of rails and tools, particularly of razor blades. He is very hopeful of the future of the tests.

Preliminary Tests of Heat-Insulating Properties and Fire-Resistive Material

The United States Bureau of Standards is about to make tests on the fire-resistive properties of structural units. As a preliminary to these tests, the bureau has recently completed some experiments on the conductivity and heat-insulating properties of certain materials generally used in fire-resistive construction. These tests were reported by W. A. Hull, of the bureau. The tests were made on 8 x 16-in. cylinders of different materials, which were placed in a furnace and subjected to temperatures running up to 927° C. in 1½ hours and kept there for 2 hours, giving an exposure of 3½ hours at an average temperature of approximately 700° C. These cylinders were perforated with holes at different distances from the surface, so that the penetration of heat could be read by thermocouples.

Tests were made on clay, such as is used in the manufacture of hollow-tile fireproofing; concrete, including two proportions of a number of aggregates; gypsums, including three manufacturers' specimens prepared from mixtures differing in kind of filler and in ratio of plaster to water, one specimen of lime mortar and one specimen of some unnamed new material. The results, as stated by Mr. Hull, are in brief as follows:

The tests indicate that there is not a very great difference, among concretes from the aggregates commonly used, in respect to the protection that would be afforded to steel reinforcement embedded in concrete near the surface, assuming that the concrete protection does not come off and expose the reinforcement. It would not be wise to draw conclusions on that point from this work. As to protection of steel members, the insulating properties of the denser clays are indicated to be inferior to the more porous clays and to the concrete. It is to be noted in this connection that this work deals exclusively with solid materials, and it is not attempted to draw comparisons between hollow blocks or tile of one material and the solid mass of another. The more porous clays compare fairly well with the concrete. Gravel concrete gives particularly unfavorable indications, following in general the theory laid down by Ira H. Woolson in the recent Far Rockaway building case. There is strong evidence that some gravels, at any rate, are distinctly inferior for concrete for fire-resistive construction. Cinder concretes are apparently to be viewed with suspicion, especially if the cinders contain much combustible material. Gypsums make good heat-retarding records, but are very soft and weak after tests.

Some New Facts About Brass and Copper

The extensive failures of wrought brasses or bronzes observed in the work of the Board of Water-Supply, New York City, led in many cases to the substitution of steel for the previously used material. Alfred D. Flinn and Ernst Jonson, of the board, called attention to the fact that failures have occurred in cast as well as in wrought metals. They point out that the service strength of brass and bronze is dependent not on the ultimate strength, but on the yield point, and recommend that the testing load should be applied in increments separated by intervals of 5 min. Further, since service strength is not indicated by the yield point, but by the difference between the initial stress and the yield point, initial stresses should be measured by suitable methods and limited by the specifications. The practice of "burning-in" defects in brass castings frequently leaves initial stresses of such magnitude as to cause local failure of the casting. This should be guarded against by annealing. An elongation requirement should be incorporated in every specification to guard against excessive oxidation.

The common belief that hard-drawn copper wire possesses a "skin" of considerable thickness which is of greater hardness and tensile strength than the remainder of the section led E. H. Pierce to make a rather extended investigation on this point. Various samples of hard-drawn copper wire were tested for Brinell hardness, both at the surface and at various points in the cross-section, with the conclusion that the hard-drawn copper wire is equally affected throughout its mass by the cold-drawing process.

Various methods are employed to test sheet brass, such as the determination of the tensile strength, the scleroscope reading and the Brinell indication. In addition to this, there is the more recently introduced ductility, or cupping, test, for which purpose two machines are made—one the Erichsen, which is quite commonly standard in Europe and used in a number of places in this country; and a machine of about the same general characteristics made by Olsen, of Philadelphia. C. H. Davis made tests upon identical or adjacent pieces of sheet brass which were specially gaged and rolled, using each of these methods, and gave complete data for one of the brasses to illustrate the method employed and to show the comparative value and limits of each method of testing. The scleroscope and Brinell were found to be unsatisfactory on thin metal. The Brinell test is satisfactory and comparative on thick metal, and the scleroscope, Brinell and tensile-strength tests do not vary appreciably with the thickness of the metal. As the result of his experiments, Mr. Davis announces that both manufacturer and consumer may safely use the ductility, or cupping, test for thin metal, and the Brinell test for thicker metal.

Many Misconceptions Persist

From a manufacturer's point of view it is extremely unfortunate that many misconceptions as to the value of certain processes and indications should persist, especially since it is well known to the manufacturer that these indications are incorrect to a degree that will condemn much excellent metal and result in a higher cost of the product to the consumer. W. Reuben Webster, general superintendent of the Bridgeport Brass Co., presented data to combat the idea that interior surface defects on brass condenser tubes are a cause of corrosion, and that there is no inferiority in material reduced in a single pass as compared to that reduced by several passes. In the first paper, he pointed out that it is a fact that evidences of surface defects can be largely removed by a treatment that will detract from the resistance of the tube to corrosion, while on the other hand the same defects are rendered more highly visible by treatment that tends very materially to increase the resistance of the tubing to destruction. On the second point he found some evidence that led to a belief that material reduced by multiple drafts is more unevenly strained than is the case with the single draft metal, although on this point only partial investigation has been made.

The quantity of tin on tinned copper wire can be readily determined by an electrolytic method, the apparatus used in this test being described by George G. Grower, who shows that the determination occupies only a few minutes and can be directly indicated by the volumetric indications of a gas voltameter, obviating the necessity of any weighing. This test does not, however, reveal imperfections in the tin coating as plainly as some of the sulphide tests. Since it is mainly the bare spots or flaws in the tinning which expose the copper to the attacks of the sulphur in the rubber insulating material, it is not the amount of tin on the wire, but rather its continuity, which is of greatest importance.

Drive 3776 Concrete Piles in 30 Days for Navy

Words "Rush Work for the Government" Prove Open Sesame to Resources of Material Supply Firms, Work Being Organized as if by Magic

THE Navy Department needed greatly increased storage facilities at its Brooklyn yard and needed them immediately. Plans were made for a $1,000,000 reinforced-concrete warehouse 180 x 360 ft. in plan, to rest on 3600 concrete piles. The Turner Construction Co. was asked to undertake the completion of the warehouse within 7½ months of the date of authorization. The rapid-progress schedule laid out to accomplish this feat gave the Raymond Concrete Pile Co., which was requested by the general contractor to drive the piles for a lump sum with $200 a day liquidated damages and no bonus, less than 50 days, or up to June 10 last, to complete its work. At a time when steel, concrete materials, transportation and labor were at a greater premium than in many years, this company bettered its own promise by finishing the piledriving in 30 days' elapsed time, though the number and average penetration of the piles considerably exceeded the figures contemplated.

Though the work was organized in advance on paper, the contractors were of course unable to place orders for material, ship plant to the work or take any definite steps until the Navy Department, Bureau of Yards and Decks, had authorized proceeding with construction, and the waiting contracts could be signed. This was finally consummated on the morning of Apr. 26 last. From 10:30 on that Thursday morning, when the New York office of the Raymond company received word that the contract was closed, until noon its telephone wires were busy. Within a few hours six cars of bin-tested cement, meeting the navy's specifications, were being loaded at a New Jersey mill; scows of sand and gravel were being loaded for the job at a Long Island plant; two complete driver rigs were en route from the contractor's yard; and out in Youngstown, Ohio, six cars standing ready loaded with pile shells had pulled out of the yard of the firm's Youngstown plant. Meantime, superintendent, office men, foremen and piledriver crews, all waiting in the New York district, had been reached by wire or telephone and ordered to report for work at the job next morning.

The manner of securing the cement is typical of the way in which the supply firms and transportation companies were approached. The Vulcanite Cement Co., on being asked for instant shipment of a large order of tested cement, inquired why, what and wherefore, reminding the contractor of the present state of the market. Its representative was told in a few words that the work was for the navy and that the navy was in a hurry.

"All right," came back over the wire. "Your cement will leave here today."

This coöperation was helped along by the publication in the May 3 issue of *Engineering News-Record* of an advertisement announcing at the same time the names of the firms who were doing their part toward carrying out the contract and the unusual progress re-



Circles show plan of each footing, interior figure indicating the number of piles in footing. Where circles are dotted, piles in the footing indicated were driven by the driver which followed the course indicated by the nearest dotted line. The remaining footings, indicated by full circles, were driven by the other machine.

ZIGZAGGING ACROSS THE YARD, ALL EIGHT DRIVERS WERE ABLE TO KEEP AT WORK, FINISHING ALMOST SIMULTANEOUSLY

quired. On the completion of the contract, these firms were thanked in a second advertisement announcing that this schedule had been considerably bettered.

Lose No Time in Starting Work

On Monday morning, Apr. 30, the fourth day after the signing of the contract, the superintendent, from the temporary office already erected at the work, called the firm's main office on the telephone. The instrument had been installed Saturday on a special order from "headquarters" of the New York Telephone Co.



MACHINES WORKED THIRTY DAYS WITHOUT INTERMISSION, EXCEPT FOR SUNDAYS, DRIVING 3776 PILES

He reported that his foremen were driving piles with the two rigs which had reached the work the previous Friday, that barges of sand and gravel were moored to the dock and that six cars of approved cement stood on the siding. He was told that they would have six cars containing additional pile shells within 24 hours.

Small wonder! In addition to the tracer in the New York office, three men were on the road between New York and Youngstown to see that those cars came through. They reached the job Tuesday morning. Meanwhile, the third piledriver had arrived and been unloaded, and on the following Thursday a fourth rig was received and put to work. From then until May 26 the four machines never stopped, except on Sundays. When the final count was taken, it was found that, instead of the 3600 piles contemplated, 3776 had been driven, the penetration of which averaged 22.85 ft. as against 18 ft. expected, and that for each driver crew and each 8-hour shift an average of 21 piles had been driven and concreted.

Labor Troubles Begin Early

Before the last piledriver rig had started to work, trouble developed with the concrete laborers' union. A demand for a wage increase that was not sanctioned by the Building Trades Council resulted in a break between this union and the council and the contractors, which tied up this work as well as much other construction in New York City.

It had been accepted as a foregone conclusion for months that the New York labor market was squeezed dry. No one else would have thought of attempting to get right in the city the 200 men needed to carry on concreting for three shifts a day. The Raymond company, however, called up several labor agencies and inserted an advertisement in six New York papers, offering work at the union wage scale and mentioning that the contract was for the Navy Department. The advertisements appeared on Wednesday night and Thursday morning. Before noon Thursday more than 300 men had applied at the job, and thereafter there was no difficulty with mixing and placing concrete.

Drivers Zigzag Across Lot

The piledrivers used by the contractor are steel-frame turntable machines, equipped with two-drum hoists and No. 1 Raymond steam hammers. They travel on a nest of rollers under the base of the turntable. A timber runway has to be laid for them. This type of rig is considered the most rapid ever developed, and this in spite of the fact that Raymond piles are more difficult to drive, on account of the process involved, than wood piles. The core on which the shells are assembled before driving weighs about 8800 lb. and, furthermore, must be withdrawn after each pile is driven. A record for the number of piles driven in a single shift, which it is thought has never been approached under similar conditions, was established in 1916, when one of these machines drove 119 twenty-foot piles in 10 hours at the plant of the Chevrolet Motor Co. in Flint, Michigan.

As will be seen from the accompanying layout sketch, the first two rigs started at the north side of the building in the center, each one taking two rows of footings as it moved across the site. Each machine then took a diagonal course to the second aisle over between footings, and carried two rows back to the side of the building from which it had started. In the meantime the third and fourth drivers had started in the same

aisles, moving in the opposite direction. The four machines then zigzagged back and forth, crossing each other's paths several times, as shown on the drawing, until the ends of the site had been reached and the last footings driven. This arrangement was considerably better than taking the drivers through the site parallel



FOUR HAMMERS GOING AT ONCE ON RUSH WORK

to the long axis of the building, as it kept all four machines working simultaneously for a greater proportion of the time.

Motor Trucks Again to the Front

Each piledriver was followed around the lot by a portable concrete mixer with its own crew. These mixers, like the piledrivers, were operated three shifts a day. They were supplied with sand and gravel from the dock by one motor truck, which was able to keep them all running. The cement and the shells for the piles were distributed by a horse truck loaded by hand from cars or storage. The sand and gravel, on the other hand, were unloaded by a derrick at the dock. This derrick was operated by the material supply company, using a hoisting engine mounted on a small float, tied up to the dock for the job. The sand and gravel were shoveled into buckets on the barges by laborers. The motor truck, as well as the horse truck, was obliged to work only one 8-hour shift a day.

In spite of the rush nature of the work, the law forbidding Sunday labor was not suspended. This would ordinarily mean on a contract working three 8-hour shifts a day that some of the gangs would be better off than others, either by reason of working in daylight or by reason of getting in more hours every week. To take care of this, the job ran 12 hours on Saturday instead of 16, and each of the three shifts worked for 4 hours, instead of two of them working for 8 hours. Every Monday morning the shifts were moved one 8-hour period ahead, so that the night and day work was evenly divided.

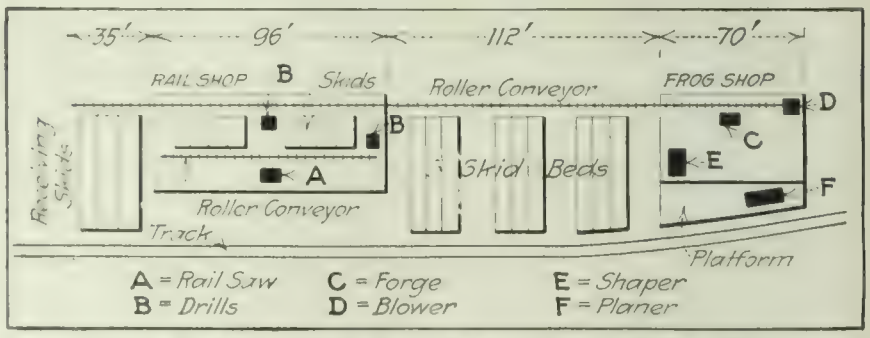
For the Raymond Concrete Pile Co. the work has been in charge of H. A. Christie, superintendent, who is credited with the excellent organization of the work at the site, which resulted in such rapid progress. The entire building is being constructed under the direction of the Bureau of Yards and Docks of the Navy Department, of which Admiral F. R. Harris is chief.

Worn Rails Reclaimed for Branch Lines and Side Tracks

Chicago Great Western Has Plant at Oelwein Where Battered Ends Are Cropped and New Bolt Holes Made

ECONOMY in the use of steel rails in these days of high prices is being effected on the Chicago Great Western R.R. by taking rails removed from main track on account of worn or battered ends, and passing them through a rail-reclaiming plant to make them suitable for use on branch lines and side tracks. This plant was built in 1916 at the railway company's shops at Oelwein, Iowa. Particulars have been furnished by G. M. Crownover, superintendent of motive power.

The arrangement is shown in the accompanying plan. At the left is a large skid rack where the worn rails are delivered. Here they are inspected and marked, all rails for track being cut to a uniform length. The rail passes to a shop 96 x 40 ft., where a roller conveyor



THIS PLANT FITS OLD RAILS FOR RELAYING AND FOR MAKING FROGS

feeds it to a heavy high-speed cold saw. The leading end is cropped, and the rail is then run past the saw to have the rear end cropped. It is afterward shifted to a skid bed serving a pair of three-spindle drills, which form the new bolt holes.

Another roller conveyor carries the finished rails to three skid beds for storage in the yard. This conveyor also delivers rails to the frog shop, where they are sawed to the lengths required for frogs and crossings. This shop, 35 x 70 ft., has a planer, a shaper and a blacksmith forge and blower. Electric power is used, with a motor for each machine.

The buildings are of simple wood-frame construction. The rail shop has roof trusses spanning its entire width (40 ft.) and giving a clear height of 14 ft. Its posts and trusses are spaced 12 ft. c. to c., with intermediate rafters 3 ft. c. to c. The frog shop has side and center posts for its width of 55 ft., with posts spaced 17½ ft. longitudinally, and roof trusses 5 ft. 10 in. on centers.

Standard Bridge Floors of Concrete Slabs on Steel Beams

Weights, Bending Moments and Costs Computed for Usual Specifications—Live-Load a 15-Ton Road Roller

By William Snaith

CONCRETE floors on highway bridges are a sufficiently recent development to make of value any data on the design of the steel floor system to support them. Even the latest works on the subject discuss wooden floors exhaustively, but contain little information as to the stringers and floor-beams for concrete floors. It is the intention of the writer to supply this deficiency by the diagrams here given for standard clear widths of roadway varying from 14 to 20 ft. and for panel lengths from 6 to 35 ft. The economical panel length for concrete floors, when the floor only is considered apart from the trusses, will appear from inspection of a cost chart presented herewith.

Usual Standard Specifications Adopted

All the floor systems investigated have been designed to meet the usual standard specifications as to construction. The dead-load D is taken to include the weight of the concrete slab, the supporting steel and two handrails each weighing 200 lb. per lin.ft. The live-load L is either a 15-ton road roller or a uniform load of 100 lb. per sq.ft., whichever gives the greatest stresses. The roller is assumed to consist of two back wheels with 20-in. face and 5-ft. center to center and of one front wheel with 40-in. face, the axles being 10 ft. center to center and the load on each of the three wheels being 10,000 pounds.

The effect of impact is calculated from the formula:

$$Impact = \frac{L_2}{2(D + L)}$$

This impact formula will give uniformly better results than a straight percentage of the live-load or a formula based only on live-load and panel length.

Calculations Simplified by Assumptions

The calculations have been simplified by several assumptions that err on the side of safety and are only slightly in error.

The maximum bending moment has been assumed to equal the sum of the maximum live-load and dead-load moments. The dead-load per lineal foot per stringer has been taken in round figures at the nearest multiple of 25 above the actual. The live-load from the roller loading on the side stringers is taken in even thousands of pounds.

The weight of each wheel is assumed to act at a point in stringer and floor-beam calculations. In stringer calculations the slab is assumed not to be continuous.

The theoretical length of floor-beam or distance between center lines of trusses is assumed to be 2 ft. greater than the clear width of roadway.

Design of Concrete Slab

The depth of concrete floor slabs is one-twelfth of the maximum span between stringers, with a wearing surface of 3 in. of concrete. An asphalt wearing surface or creosoted wood block on sand will give approximately the same loading. Earth fill to a depth of 4 in. would do so also, but this depth is insufficient. To increase the earth fill to about 9 in. average depth will increase the total stresses in stringers and floor-beams by about 15%.

The total width of slab has been taken to be 1 ft. wider than the clear width of roadway, to allow for a wagon guard on the curb 6 in. high on each side.

Design of Middle Stringers

The dead-load on the middle stringer of course includes the weight of the slab and stringer. For maximum live-load stresses the 15-ton roller only need be considered. For 35-ft. span and 5-ft. spacing this gives greater stresses than a uniform live-load of 165 lb. per square foot.

For a roller of the dimensions and weight assumed, and for spans up to 17.1 ft., the maximum bending moment will occur under one wheel when it is at the center of the span. For spans beyond 17.1 ft. the roller is assumed to be slewed slightly on the bridge, so that one back wheel and the front wheel come directly over the stringer. The maximum bending moment then occurs under the wheel, which has traveled 2 ft. 6 in. beyond the center of the span. The value of the maximum bending moment in foot-pounds when one stringer is assumed to sustain the whole load is given by the formula:

$$M_{max} = W\left(\frac{l}{2} - 5 - \frac{12.5}{l}\right)$$

where W is weight of one wheel and l is the panel length, or span, of the stringer.

The maximum end reaction R is

$$R_{max} = W + W\left(\frac{l - 10}{l}\right)$$

the last term vanishing for spans less than 10 feet.

Design of Side Stringers

The side stringers are designed for a dead-load consisting of one-half the slab between the side and nearest middle stringer, all the slab and curb overhanging, the stringer itself and a handrail assumed to weigh 200 lb. per linear foot.

The roller will produce the maximum live-load stresses in the side stringers when the front wheel and one back wheel are just touching the curb. The portion of each wheel to be supported by the side stringers will be different for different distances of the stringers from the curb. Values for these loadings were carefully calculated for each of the floor systems considered.

Design of Floor-Beams

The dead-load on the floor-beam is conveniently calculated from the stringer reactions, the amount of excess due to increasing the actual figures into round numbers being more than sufficient to account for the weight of the floor-beam itself.

The maximum bending moment due to the live-load occurs with the two back wheels on the floor-beam under the wheel which is 1 ft. 3 in. from the center of the span. The front wheel at the same time is on the center line

of the bridge. For panel lengths less than 10 ft. the front wheel is not considered, and for those over 20 ft. the uniform load of 100 lb. per sq.ft. will give greater values, in general, but in the latter case it is necessary to make the calculations for both conditions.

For the maximum end reaction the roller is placed with the front wheel and one back wheel near the curb and the two back wheels directly over the floor-beam. When the panel length exceeds 20 ft., it is advisable also to calculate the results for uniform loading.

Floor-System Details

The particulars of the floor systems considered are given in the table on page 67. The values given for the dead-load per lineal foot on the stringers are based on actual calculations made for panel lengths of 11, 19, 30 and 35 feet.

The maximum bending moments on the stringers are shown by the curves in Fig. 1. The maximum bending moments for the usual stock sizes of I-beams have also been indicated, and these sizes were adopted in calculating the total weight of the steel in each system. From these curves the stringers used for any span of the standard floor systems can be read directly. Where heavier than standard rolled sections are available, the necessary interpolation is a simple matter.

The maximum bending moments and end reactions of the floor-beams are given by the curves in Figs. 2 and 3. The section moduli required for a unit stress of 16,000 lb. per sq.in. are shown in Fig. 2, and the maximum bending moments on the usual stock I-beams and a selected line of plate girders are also indicated. From the curves in Figs. 2 and 3 the floor-beams for any span up to 35 ft. can be obtained. Fig. 3 can also be used to obtain maximum panel loads for truss bridges.

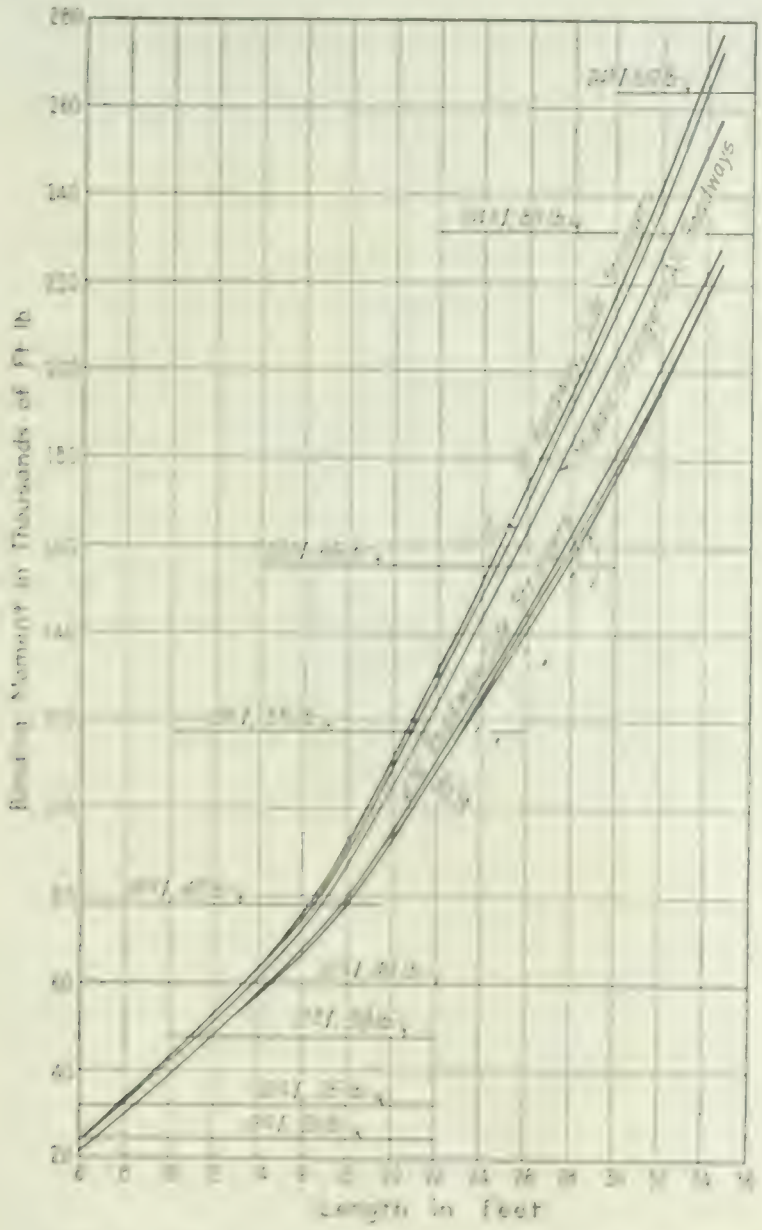


FIG. 1. BENDING MOMENTS FOR STRINGERS

Average Cost Curves

Average prices for steel beams in place in bridge floors and for concrete in place were assumed, and the total cost of one bay (slab, curb, stringers and floor-beam) was calculated. These values were divided by the area of floor supported (nominal width multiplied by panel length), and the results were expressed in curves, Fig. 4.

Owing to the use of commercial sizes and abrupt changes in loading, when, for example, the whole roller is taken into account instead of only two back wheels, or when the uniform live-load replaces the roller load in the calculations, these curves are not smooth and actually cross over one another. It is not to be understood that the figures represent actual probable costs; they

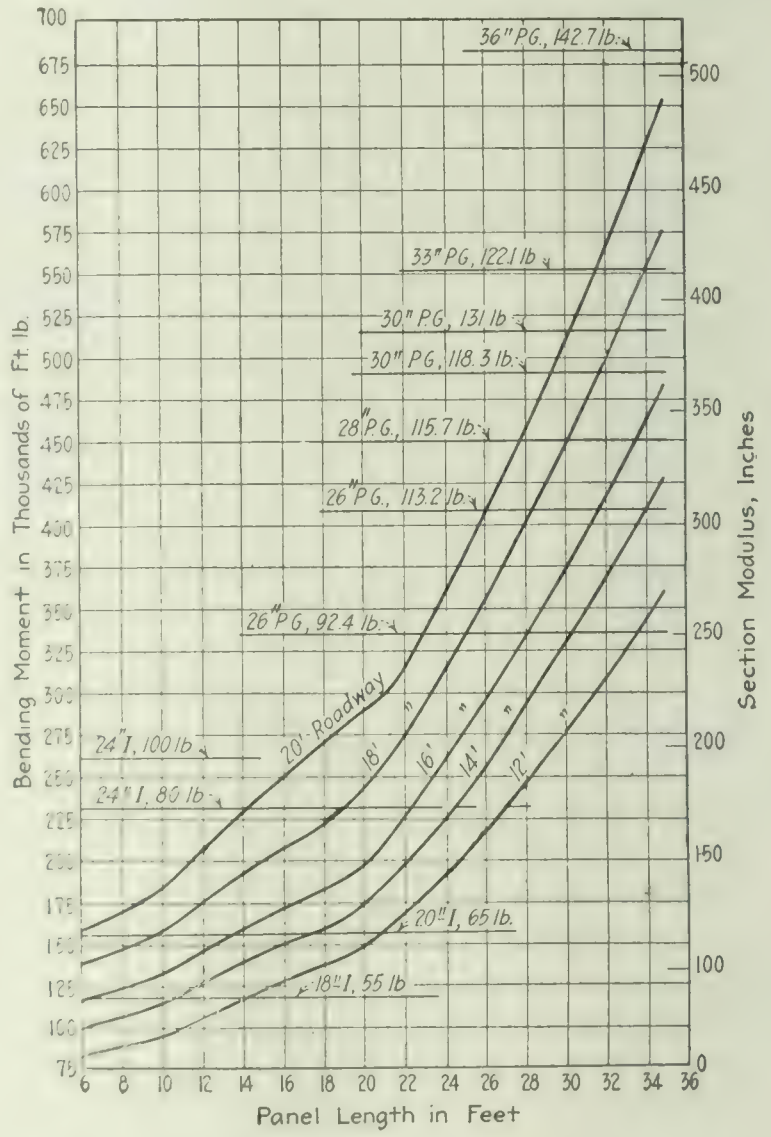


FIG. 2. BENDING MOMENTS FOR FLOOR-BEAMS

are approximate only and will be affected by changes in cost of materials and locality. However, they are of value for purposes of comparison and clearly indicate the economic panel length when the floor systems only are considered.

Alternative floor systems were carefully calculated by the same methods as those adopted and proved to be more expensive in every case. An interesting comparison was made in the case of the 16-ft. roadway system. Five systems were investigated out with various thicknesses of slab and were plotted similarly to Fig. 4. The four-stringer system shows a notable economy at all spans. The seven-stringer system is almost as economi-

cal at 10-ft. panel length as the four-stringer system and least so at 35-ft. panel length. Exactly the reverse is true of the six-stringer system. The way in which the curves crossed one another would show that no general statement would be warranted that the fewer the stringers the greater the economy. Each case must be settled on its merits.

The amounts of the errors due to the various assumptions were carefully investigated. They are inconsider-

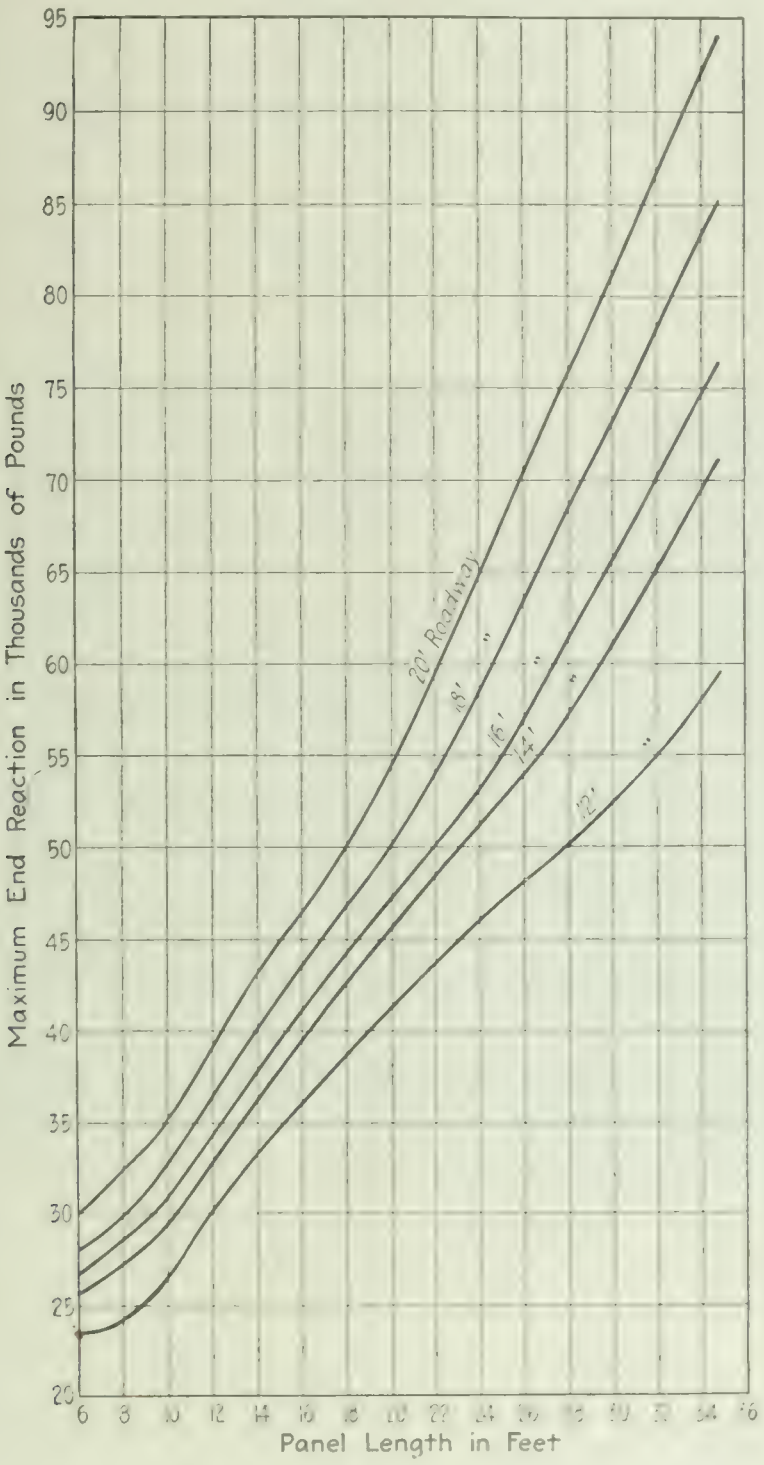


FIG. 3. END REACTIONS FOR FLOOR-BEAMS

able and invariably on the side of safety. The expression of the dead-load figures in multiples of 25 lb. will not in any case involve an error of more than 1% in the total, and the effect of the round figures adopted for the roller loadings on the side stringers does not

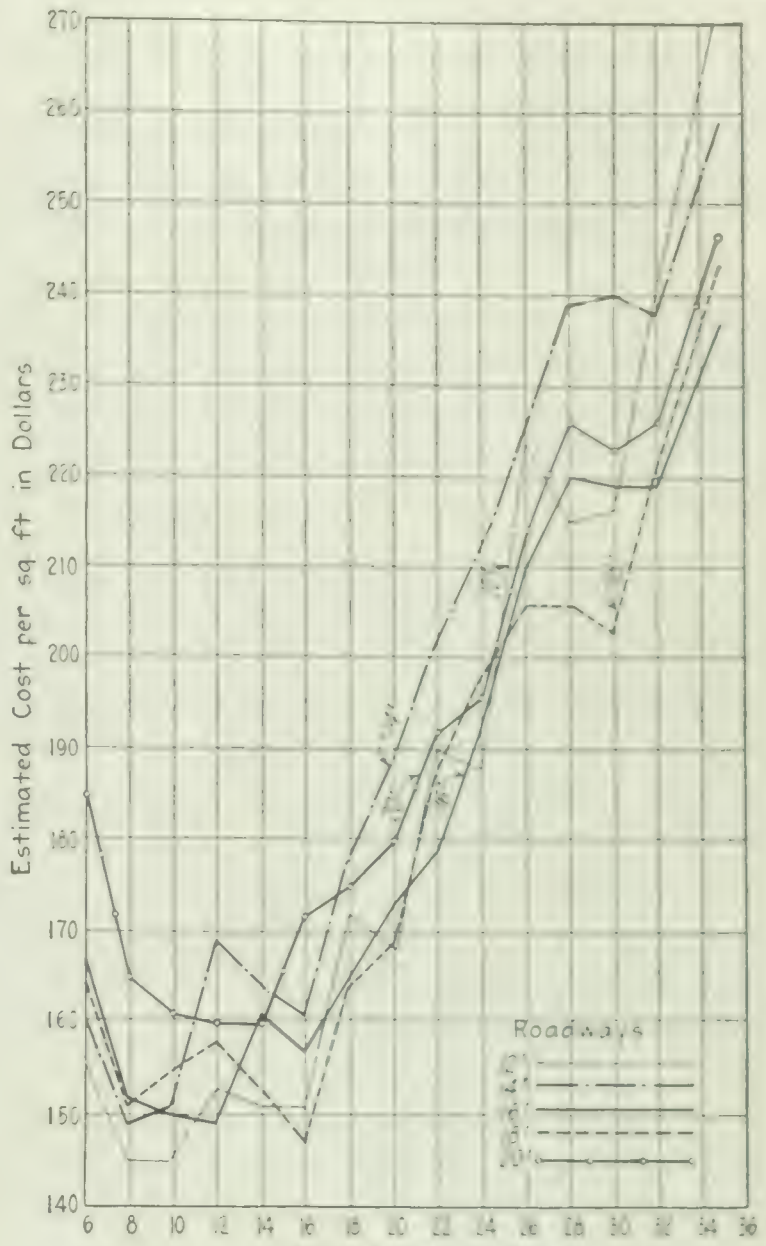


FIG. 4 ESTIMATED COSTS OF FLOORS PER SQUARE FOOT
Includes floor-beams, stringers, slab and curb

exceed the actual loadings by more than 4% of the total results at 35-ft. panel lengths. The sum of the three errors above will hardly amount to 4% for panel lengths less than 20 ft. and not more than 6% at 35 ft. in any instance.

Hudson Bay Railway Nearing Completion

Rails have been laid on all but 92 miles of the 424-mile Hudson Bay Ry. in Canada, states Frank Cochrane, Minister of Railways and Canals, in his annual report for the year ended Mar. 31. The part remaining is that between the second Nelson River crossing and Port Nelson. All but 11 miles of this section has been graded, and it is stated rails will be laid to Port Nelson this year. Of the estimated cost of $26,000,000 for the railway and the harbor, $18,175,000 has been spent. Work on the harbor has been slowed down because of the war conditions.

PARTICULARS OF FLOOR SYSTEMS CONSIDERED IN ANALYSIS OF STRESSES

	Dimensions of Square Floor Systems					Dimensions of Rectangular Floor Systems					
Clear width of roadway, in ft	12	14	16	18	20	12	14	16	18	20	18
Number of stringers	3	4	4	5	5	4	5	6	7	7	7
Thickness of slab, in in	8	8	8	8	8	8	8	7	6	8	8
Spacing of middle stringers, in ft	5	5	5	5	5	5	5	4	5	2	5
Distance middle to side stringers, in ft. and in	5 0	3 9	5-0	4-6	5-0	5-0	4-3	4-3	4-3	4-3	5-0
Distance side stringers to end of floor-beam, in ft. and in	2 0	1 9	1-6	1-3	1-6	0 9	0-7	0-7	0 9	0-9	1-3
Dead-load in lb. per lin.ft. on middle stringers:											
Panels 6 ft. to 19 ft	550	550	550	550	550	550	550	400	275	400	550
Panels 20 ft. to 35 ft	575	575	575	575	575	575	575	400	275	400	575
Dead-load in lb. per lin.ft. on side stringers:											
Panels 6 ft. to 19 ft	275	400	550	550	550	300	475	400	350	275	350
Panels 20 ft. to 35 ft	300	425	600	650	650	325	500	400	350	275	375

Army Training Camps Have Definite Curriculum for Engineer Officers

Courses Aim To Train Candidates in Their Duties as Instructors, Managers and Leaders

THE instruction now being given in the various army officers' training camps follows as definitely planned courses as are to be found in any college. The prescribed studies for engineer officers are summarized below:

Organized Like Regulars

At first, each camp was organized as one provisional training regiment, subdivided into 15 companies. At the close of the first period of instruction the engineer companies were removed to special engineer training camps, and the remaining companies were reorganized as infantry, cavalry and artillery units.

The ordinary regimental, company, troop and battery records, reports, rations, etc., are used so far as possible. Regular-army officers assigned to each company as instructors are in full charge, regardless of rank with respect to reserve officers. However, they are relieved from administrative work as far as possible except as to its supervision. All records, rosters, etc., are prepared by designated reserve officers and candidates as a part of their instruction. All in attendance are cautioned that, except for the purpose of maintaining discipline and order, all must forget rank, and live and work on equal terms.

Living the Common Soldier's Life

The courses of instruction are based on the work done in the United States Service Schools at Fort Leavenworth, Kan., and on the experience of foreign armies during the past three years. The first requisite is thoroughness and precision in fundamentals and details of military movements. The prescribed courses are designed to teach as thoroughly as possible in the short time available the duties of an officer as (1) an instructor, (2) a manager and (3) a leader.

The duties as *instructor* are taught by subjecting the future officers to the same drills and individual training that they in turn must give to their future commands, with the same rigid discipline and attention to details that they must exact. The training as *manager* is secured by subjecting the men to the same mode of life that will obtain with respect to their future commands, supplementing this with instruction in the proper method of supplying, messing, administering and disciplining organizations, and providing for health, sanitation, comfort and welfare. The instruction as *leader* is given by illustrating the tactical employment of troops and by giving each man an opportunity for practice in tactical leadership as corporal, sergeant, lieutenant, captain and major.

All Men Must Take Courses

Regardless of age or grade, all men in attendance at the camps are required to take the prescribed courses, except those men designated as assistant instructors in particular subjects and except that engineer officers who have not volunteered to serve with combat elements (the Class B group) are not required to complete the courses laid down for pioneer troops.

The schedules are based on a minimum day of ten hours, five in the morning, three in the afternoon and two in the evening on all days except Saturday and Sunday. Saturday is used for bringing up to requirement work that has been interrupted by weather and unforeseen conditions, for vaccinations, examinations, tests, etc.

The work of the day begins with roll-call formation (reveille) at 5:30, breakfast at 6 and first instruction at 7. Dinner comes at 12:15 usually. Afternoon instruction begins at 1:30 or 1 and lasts to 4:30 or 5. Retreat formation, at about 6, is followed by supper. Evening study lasts from 7 to 9; lights are out at 9:30 or 9:45. The hours are varied more or less from week to week as the demands for the time of the men may require.

Special Attention to Military Engineering

In regard to the course for engineer officers, it should be noted that it is expected that the men being trained are qualified as civilian engineers, but practically untrained as soldiers, so that purely military subjects must not be curtailed to give them instruction in fields in which they are proficient or can grasp readily without interference with duties of command. For this reason the engineer training in camp has been confined to the theory and practice of military engineering to the extent that it is a specialty and not merely the application of civil-engineering practice. Advantage has been seized of the opportunity to enable these engineer officers to gain familiarity with field firing and other infantry work that has an important bearing on the tactical application of military engineering.

The subject given in the schedule as "Engineers in War; Military Engineering" is the general subject covered in lectures, and includes the duties of engineer troops in the theater of operations, the direction of engineer operations, the application of reconnaissance, bridging, roadbuilding, fortifications, castrametation, demolitions, care of animals, railroad and other special work, and the training of engineer troops.

FIRST PERIOD FOR ALL ARMS (5 WEEKS)

	Approximate Hours
[illegible] organization and equipment	8
[illegible]	10
Physical drill ("setting-up exercises")	12
Infantry drill	50
[illegible] and bayonet	20
[illegible]	22
[illegible]	64
Study hours	50
	186

SECOND PERIOD—PIONEER ENGINEERS (8 WEEKS)

	Approximate Hours
[illegible] and equipment of engineer troops	6
[illegible] military engineering	25
[illegible] employment of military engineering	25
[illegible]	8
[illegible] and road repair	16
[illegible]	32
[illegible] and [illegible]	5
Trench warfare	15
[illegible]	3
[illegible]	4
[illegible] and sanitation	13
[illegible]	10
[illegible] drill	10
[illegible] pistol and machine gun	55
[illegible] reading	10
[illegible]	65
Study hours	40
	342

Maneuvers—4 days.

From Mixer to Forms at a Mile a Minute

Pneumatic Method Used for Delivering Concrete 4000 Feet in Twin Peaks Tunnel at San Francisco

THE work of lining the Twin Peaks tunnel with concrete has been expedited by using the pneumatic method for delivering the mix, as well as collapsible steel forms designed especially for this work. The forms, which were described on p. 273 of the *Engineering Record* for Feb. 26, 1916, have made it possible to carry out the work so that both walls and the ceiling slab could be poured simultaneously. The wall footings were poured first; and after the walls and ceiling slab were poured, the arch was put in in a third operation. Where an invert was required, it was poured in a fourth operation.



SPACE ABOVE CEILING SLAB IN THE TWIN PEAKS TUNNEL IS FOR VENTILATION

Concreting was carried on from both ends of the tunnel, the air for all operations being compressed at the central power plant at Laguna Honda station. This compressor plant consisted of two 750-cu.ft. and one 1100-cu.ft. two-stage compressors run by two 100-hp. and one 150-hp. motors respectively. From this plant air was conveyed to the east portal through a 6-in. pipe, 7000 ft. long, and delivered into a cylindrical receiver or balancing reservoir, 6 x 10 ft. in size.

Mixing Without a Mixer

From this receiver the air passed through a 4-in. pipe to the mixing chamber, located underground and just above the ceiling slab of the tunnel. This chamber was a steel cylinder 3 ft. in diameter and 5 ft. high, with a conical bottom terminating in an 8-in. elbow leading to the delivery pipe. The materials were admitted to this mixing chamber from a charging hopper immediately above the mixer, where the aggregate was measured, all the materials coming into the hopper by gravity flow from bunkers above.

A crew of three men was stationed at the mixing chamber, two operating the chutes leading into the measuring hopper and one man operating the levers admitting charges to the mixing chamber and controlling the compressed air.

When the dry batch was ready in the hopper, a door in the top of the mixing chamber was opened and the charge dropped in together with a measured quantity of water. The charging door was then closed by the air-operated piston, and a valve admitted compressed air through two 2-in. pipes at the back of the elbow below the mixing chamber. These pipes directed their jets horizontally into the elbow and on into the delivery pipe, their function being to mix the batch and start it along the delivery line. Immediately after admitting air at the back of the elbow the main valve was opened, letting air in through four 2-in. pipes at the top of the mixing chamber. This put a pressure directly behind the batch and kept it moving through the line.

Experience in Pneumatic Delivery

After some experience with the long delivery line, it was found that the air supply could be conserved by getting about three batches into the line before keeping the pressure on long enough to send the concrete clear through to the point of delivery. Under this method a batch was put into the mixing chamber and then advanced a distance of several hundred feet in the delivery pipe by the pressure from the main air line. The pressure was then cut off and another batch admitted in the same way. After the third batch had been put in the line, the air pressure was kept on until the pressure gage on the delivery line approached zero, indicating that the charge had been delivered at the far end.

The average speed of a single charge going through the line was reported as about a mile a minute. The speed of operation of the system was found to depend upon the length of the pipe line and the skill of the operator. The usual rate, using 16-cu.ft. batches, varied from 70 batches per hour at 300 ft. to 30 batches at 4000 ft. Efficiency of the system was found to be largely dependent upon the operator. A careless operator might easily cause a plug in the line that would take some time to clear.

If the charge is delivered at the high rate of speed at which it is transmitted, it strikes a very considerable blow at the point of delivery. To take up this shock and wear, a hopper with renewable steel plates was secured to the tunnel timbers opposite the end of the delivery pipe. After expending its force on these baffle-plates the concrete flowed in gravity chutes into the forms. By cutting off the air pressure at the proper moment the operator could deliver the batch without the shock that accompanies delivery under full pressure. In the case of the arch, where gravity flow was not possible, concrete was shot directly into place, lengths of pipe being removed from the end of the line as the space was filled.

From one end the delivery pipe was laid on a 3% downgrade, and from the other end the line ran up a 3% grade until the elevation above the mixing chamber was 111 ft. The delivery of concrete on the upgrade required more air, but involved only a small part of the trouble with clogging that occurred on the downgrade. The operators expressed an opinion that this difference was due to the tendency of wet concrete to flow downgrade. On the downgrade delivery the action of gravity would tend to spread the batch and let the air pass over it, while in the upgrade delivery gravity acted on the batch in one direction and air pressure in the other, thus tending to hold the charge together.

Except for the elbow immediately under the mixing chamber, there were practically no bends or angles in the pipe. The pipe used was 8-in. steel casing in 12- and 20-ft. lengths with flanged joints. It is notable that a large percentage of the wear occurred at joints. As leaks appeared, indicating worn spots in the pipe, patches were clamped on until such time as the leakage became excessive. If the hole occurred at the joint, a short section would be cut off and the end of the pipe heated and again flanged so that it could be put back in service.

The total concrete required per linear foot of tunnel varied with the design of the cross-section from 5.6 to 8 cu.yd. The total quantity handled by the pneumatic process was about 65,000 cu.yd. The concrete mix used was 1 : 2¼ : 5½, the sand being well graded and the gravel being ¼ to 1½ in. in size. The batch consisted of two sacks of cement, 4.5 cu.ft. of sand and 11 cu.ft. of gravel, the water used being sufficient to make a fairly wet mix. With the cement, 8 lb. of hydrated lime per 100 lb. of cement was added. It was found to constitute an excellent lubricant and is believed to have been a factor in attaining the record distance of 4000 ft. for "shooting" concrete by means of compressed air.

The Twin Peaks tunnel was constructed under the supervision of M. M. O'Shaughnessy, city engineer of San Francisco, the contract being held by the firm of R. C. Storrie & Co.

Unusual Location of Tanks Obviates Pumping at Sewage Filters

Clarification at Head of Outfall Gives Low Self-Cleansing Velocity and Saves Grade—Horizontal-Flow Primary Filters of Coke Make High Rate of Sand Filtration Possible

By G. EVERETT HILL
Vice President and Chief Engineer City-Wastes Disposal Co., and Consulting Engineer, New York City



THE CLARIFIED SEWAGE PASSES THROUGH HORIZONTAL COKE FILTERS, A DOSING CHAMBER AND INTERMITTENT SAND FILTERS

WITHHOLDING sewage solids in one-story digestion tanks at centers of population made possible, in a long gravity outfall sewer through a flat valley, a grade, self-cleansing and yet so low that head was gained sufficient to force the sewage through two sets of filters, though pumping at first seemed inevitable.

Topography Creates a Problem

Southington, Conn., an iron- and steel-working community with a population of 4500, lies on both banks of the Quinnipiac River, a tributary of Long Island Sound, about 22 miles north of New Haven. The borough is scarcely half a mile wide, but nearly three miles long. The side hills, flanking the river, give ample grade for most of the lateral sewers. But the valley itself, the zone of densest population, is very flat. The river (normal flow at Southington about 27 cu.ft. per sec.) has a fall, within the borough, of only 0.143%. A 15-in. sewer laid with such a grade would barely develop a self-cleansing velocity, with nothing to spare for earth cover at the upper end of the valley or for use in disposal works at the lower end. But even the comfort that a flat-grade 15-in. sewer could give was denied, so far as the northernmost third of the town was concerned; for the flow of sewage from that section will, for many years, be barely sufficient to produce a depth that will buoy normal sewage solids in a 12-in. pipe. The difficulty was increased by the presence of two dams within the borough, causing slack water and consequent high-level ground saturation for 4900 ft., or 37% of the entire distance.

The surveys showed conclusively that a main sewer, of size properly proportioned to the volume of sewage produced, laid on a grade that would make it self-cleansing and starting at the northern end of the town far enough below ground to make house connections possible, could not be brought to any available point of disposal at an elevation far enough above the surface of the river to permit gravity flow through a disposal plant and gravity discharge of the effluent into the river. It was possible of course to maintain depth of flow in a large-sized flat-grade main sewer by admitting river water at its upper end, but this would have added very seriously to the size of the disposal plant and to the costs of construction and maintenance.

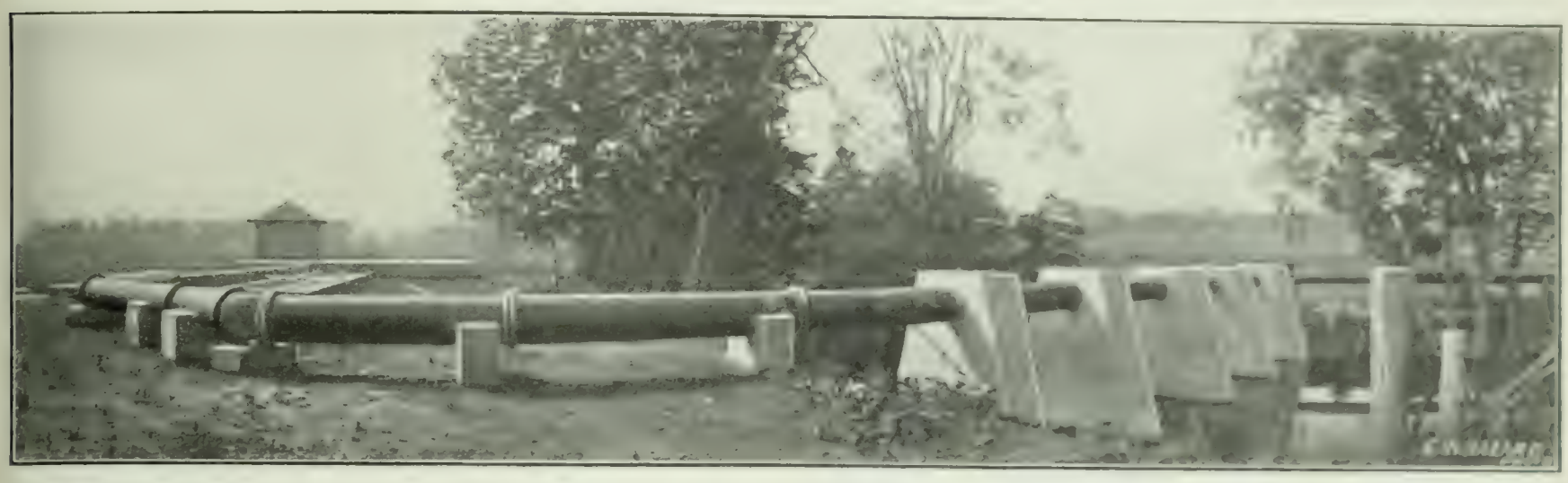
Fortunately, the term that seemed the stumbling-block in this case, "self-cleansing velocity," is relative. It means simply a velocity that will sweep on continuously any solids that, without it, might become stranded and obstruct the flow. If there be no solids, *any* velocity, no matter how low, is a self-cleansing velocity. And so the solution lay in the elimination of the solids that compelled the velocity that demanded the grade that threatened to eat up the available fall.

The borough, therefore, was divided into two districts. At a central point in each an underground digestion tank was built, with comparatively short, and consequently shallow, sewers coming to it from *all* directions. The northern tank is near the main railroad station and just across the track from a large tool factory. The southern tank is in the yard of another factory and close to the main street and to the Plantsville railroad station of Southington. The effluent outlet from the northern tank is an 18-in. pipe, laid with a grade of but 0.05% close to the edge of the river and below the level of the upper mill-pond. It receives no accessions until it reaches Plantsville, 2600 ft. farther down the valley, where the effluent from the southern tank enters. From this point it continues for 5300 ft. as a 20-in. pipe, laid with the same 0.05% fall, to the disposal field, where it arrives nearly 8 ft. above the normal level of the river, sufficiently high to provide for gravity flow through and from the purification plant. In other words, by withholding the solids locally and making the main sewer an effluent outfall, 7900 ft. of the total distance was traversed with a loss in elevation of only 1 ft. in 2000.

At the northern end of the borough, 675 ft. of 12-in. main sewer was laid with a grade of 0.13⅓%, but this line is flushed copiously and strongly by a high-level flush tank (fitted with an 8-in. siphon), which collects and discharges periodically 2000 gal. of sewage from a large school. All other sewers, carrying solids as well as liquids, are laid with grades that will develop a velocity of at least 1.6 ft. per sec.

Light-Grade Effluent Conduit Keeps Clean

Some doubt was felt about the ability of the light-grade effluent line to keep itself free from filamentous secondary growths; but 16 months of operation have proved that this fear was groundless. The pipe has never been cleaned artificially. Some growth can be found in it, but this is always dislodged and carried out before it attains any considerable thickness—¼ in. seems to be the maximum.



THE TANK EFFLUENT OUTFALL SEWER ARRIVES AT THE FILTERS NEARLY 8 FEET ABOVE THE RIVER LEVEL

The total length of sewers constructed as a first unit is 13.2 miles. All lateral sewers, save a few which are to be extended, are fitted with 350-gal. flush tanks (Miller siphons), set to discharge daily. Vitrified clay sewers in wet ground were jointed with "Filtite." The 18-in. effluent outlet, on the bank of the upper mill-pond and below its water level, was built of cast-iron pipe with leaded joints. The river is crossed at seven points: Four times by inverted siphons, on raw-sewage lines; and three times, as the effluent main approaches the disposal beds, by cast-iron pipe, on reinforced and ice-armored concrete piers, laid on uninterrupted grade and safely above flood-level.

One-Story Digestion Tanks of Special Design

The ultimate daily flow of sewage (from 21.4 miles of sewers) was estimated as 2,400,000 gal. This included an allowance of 64,000 gal. for groundwater infiltration. The actual leakage is less than 40% of this. Of the total flow, 70% will come from area tributary to the northern digestion tanks and 30% from area draining to the southern tanks. The first unit of disposal, estimated as sufficient for five years, provides for a daily flow of 500,000 gal. The disposal plant, as planned, includes:

The digestion tanks are single-story underground concrete structures, roofed with steel and concrete, with a working depth of 9 ft. The inlets which can be individually closed by plug valves or controlled by concentric choke-rings, are placed and spaced so that the incoming sewage is discharged horizontally, below water surface and scum, against the rear-end wall of the tank, which checks the velocity and diffuses the liquid over the entire vertical cross-section of the tank's contents. The average period of detention within the tank is 6 hours, and the average rate of horizontal flow to the outlet end is 1.3 in. per min. As the tanks are built with diverging side walls, the rate of travel becomes slower and slower, so that, at the outlet end, minute flocculent particles that would be carried out by the average velocity have opportunity to settle. Near the outlet end, the liquid passes under a single baffle wall, dipping to the plane of greatest clarity between the sludge and scum, and then escapes into an outlet channel by creeping over a weir wall, as long as the tank is wide, in a sheet so thin that it will not float such occasional masses of sludge as are buoyed to the surface beyond the baffle.

Horizontal-Flow Coke Primary Filters

Before application to the sand beds, the tank effluent passes transversely through horizontal-flow streaming filters of foundry coke. Each bed is 28 ft. long, 4 ft. thick and 5 ft. deep (20.7 cu.yd.), held between two sieve-like walls of hollow brick laid as headers, with a feed channel at one side of the bed, an effluent channel at the other and proper gates for controlling or reversing the flow, or for draining each filter to the special sand filters used as sludge beds. These primary filters are designed merely as strainers. They effect very little improvement in the liquid as measured either by chemical or bacteriological tests, for the passage is too rapid for any save mechanical action; but the rough coke will withhold certain semiliquid, gelatinous, albuminous materials that escape freely from the digestion tanks because they have practically the same specific gravity as water, but which diminish seriously the capacity and efficiency of sand beds by coating the surface with deposits more or less impervious to both water and air. Eight of these streaming filters are included in the first unit of construction. They are used in alternation, two or three at a time, while the others are draining, aërating and consuming, in part, the impurities retained in a previous period of service.

Automatically Controlled Dosing Chambers

The effluent from the primary filters passes into a flush tank with two chambers, one holding 12,800 gal., for use alone while house connections were few, and the other with an additional capacity of 9275 gal. As the head needed for the operation of siphons was not available, automatic alternate discharge through two outlet pipes was secured by a mechanical valve system, controlled by floats, designed and built by the Pacific Flush Tank Co. A system of distributing chambers allows for the delivery, by either pipe, to any one or any group of the sand filters.

Six sand beds, each 27 in. deep, with a combined effective area of 1.54 acres, were included in the first unit of construction, having a nominal daily capacity of 500,000 gal. Land, 9.2 acres in all, was secured for future extensions. Local sand was used, under inspection and test that required an effective size of at least 0.28 mm. and a uniformity coefficient not greater than 3.5. The entire area of sand beds was underdrained with agricultural tile, ventilated at heads and junctions by vertical standpipes. The main underdrains, on their way to the river, pass through a masonry flood-lock so constructed that unusual rise of water in the river will form an air-bind in a trapped pipe and prevent any setting back of muddy river water into the underdrains of the disposal plant.

The disposal site, with a frontage of 692 ft., abuts upon the main highway, which carries the trolley traffic from New Haven, Waterbury, Meriden and New Britain. It has been neatly fenced, graded, terraced, grassed, planted and tended. Passing strangers not infrequently call each other's attention to "the park."

The system was built by the Berardino & Tomassetti Construction Co., of Meriden, under the supervision of the City-Wastes Disposal Co., of New York, the designing engineer. The cost of construction was $129,503. The total cost, including land purchases, engineering and legal and office expenses, was $149,944.

Fifteen Months' Performance

The conditions, after 15 months of operation, are as follows: Connections include 228 houses, 4 schools and 1 large factory. Total flow in 24 hours ranges from 200,000 to 250,000 gallons.

The digestion tanks have never been cleaned. The chamber of the northern tank first used contains at its inlet end 6 in. of sludge and 11 in. of scum. The second chamber (in use three months) has accumulated at its inlet end 2½ in. of sludge and 7 in. of scum. Neither chamber has any measurable depth of sludge or scum at the outlet end.

The digestion tank of the southern district (only one chamber in use) contains at its inlet end very little sludge (perhaps an inch) and 3½ in. of scum. The outlet end shows neither sludge nor scum. The effluent from both is satisfactory.

Three primary filters are in use daily, while five are drained and aërating. None of these filters has been cleaned, but a gradual increase of head needed to drive the sewage through indicates that the coke must soon be forked over and washed. The excellence of the work these filters are doing is evidenced by the performance of the sand beds

One Bed at a Time Takes Care of Flow

One sand bed at a time has always proved able to care for the entire daily flow, though the rate of application occasionally has exceeded 900,000 gal. per acre per day. Save when the outlet is closed by river flood, all standing water disappears from the beds in from 5 to 15 min. after the termination of the flush-tank discharge. The only raking given the sand beds consists in the occasional replacing and releveling of sand moved by the force of the flush. In warm weather, each bed is used but one day in the cycle of rotation. In winter, each bed is used for three consecutive days. The sludge beds are cleaned after each application by raking off the

deposits, which have first been allowed to drain and dry. No sand has been removed by scraping.

Southington possesses no facilities for chemical and bacteriological tests. The last report on the Southington plant from the state laboratory at Middletown showed the following, all data being expressed in parts per million:

	Sewage	Effluent	Percentage of Removal
Turbidity	20 0	0 0	100
Organic nitrogen	28 70	4 92	82
Nitrates	0 0	12 0	
Oxygen consumed	144 0	2 2	98
Chlorine	12.0	12.0	

No renewals or repairs were necessary in 1916. Operating expenses for the year were $1465, or 33c. per head of population.

Texas Constitutional Amendment Would Promote Land and Hydraulic Interests

The encouragement of drainage, irrigation, flood control and water-power development in Texas is the purpose of a constitutional amendment which the state legislature has ordered to be submitted for public vote in August, 1917. At present, the issue of bonds for drainage, levee or irrigation districts is limited to 25% of the assessed value of the lands to be benefited. Such lands (wet, arid or liable to overflow by floods) are necessarily assessed at very low rates, so that the bond issue is usually quite inadequate for carrying out the necessary work for reclamation or protection. In some cases this limitation has been avoided by the landowners of a district agreeing to the assessment of the lands at their estimated value after the construction of the improvement works. This is unsatisfactory, however, and it is thought that investors might question its validity. The proposed amendment provides for the organization of reclamation and conservation districts (according to physical and not political boundaries). If the property owners of the district adopt the project for the necessary works (reservoirs, levees, dams, drainage ditches, hydro-electric plants, etc.), the legislature will authorize the issue of bonds sufficient for construction and maintenance of these works. It will also authorize the collection of taxes sufficient for interest and to create a sinking fund for paying off the bonds. The indebtedness, if the amendment goes through, will be a lien upon the property assessed.

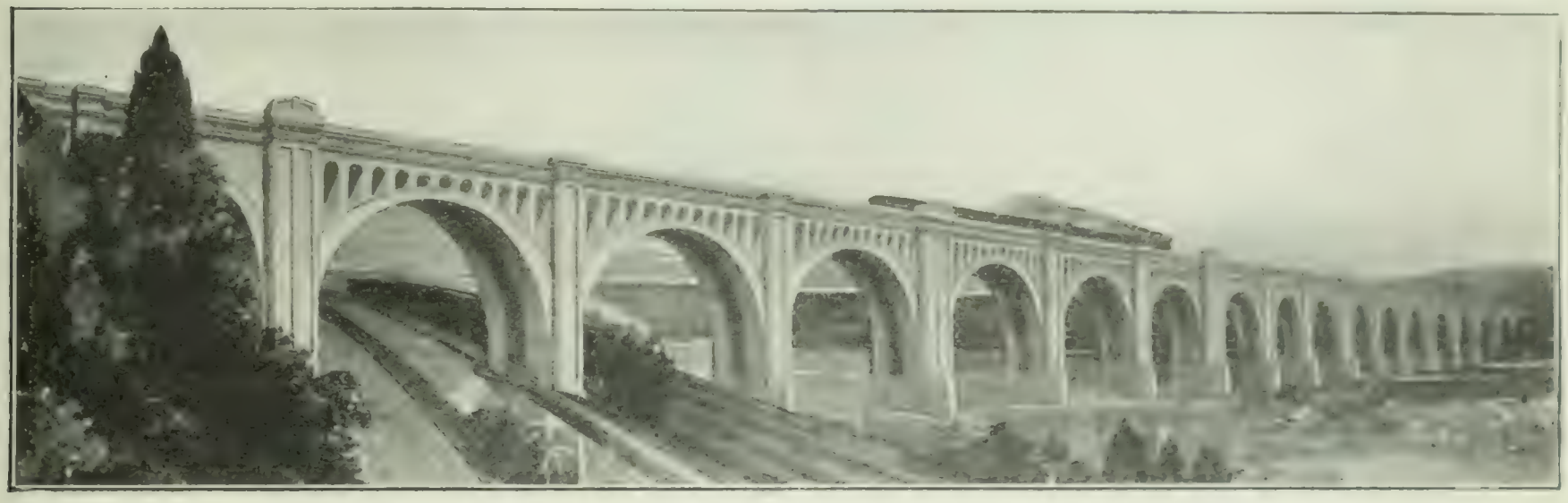
Bids for Concrete Arch Viaduct Less Than for Steel Design

James River Bridge at Richmond, Va., Illustrates Advantages of Concrete Over Steel Railroad Bridges

By H. G. Perring
Member of Firm, J. E. Greiner & Company, Baltimore, Md.

Of particular interest in illustrating the comparative costs, at present-day prices, of concrete and of steel bridges of the viaduct type is the bridge now being constructed over the James River at Richmond, Va. Owing to the low cost of the concrete aggregates, furnished by the railroad, the bid for a concrete arch viaduct 2278 ft. long was nearly $15,000 less than for an alternate steel design of plate girders and steel towers on concrete pedestals.

Late in 1916, plans were prepared for a bridge to replace the present single-track steel structure at the Belt Line crossing of the James River in Richmond by the Richmond, Fredericksburg & Potomac R.R. and the Atlantic Coast Line R.R., joint owners. The present structure, built in 1889, proving inadequate for the increasing traffic demands, a new double-track structure is being built parallel to and 30 ft. upstream from the old bridge. The new structure is designed for the equivalent of Cooper's E-60 loading.



ADOPTED DESIGN FOR JAMES RIVER BRIDGE, RICHMOND, COMPARED FAVORABLY IN COST WITH STEEL VIADUCT

Alternate Designs Furnished

The river bed is of granite, and a solid foundation is secured with comparatively little excavation. The maximum river stage is 11 ft. above mean water, while at times a large part of the river bed is exposed. This location seemed well suited to concrete arch construction, but alternate designs were made by the consulting engineers for a concrete arch bridge and also for a steel viaduct with plate-girder spans, supported on steel towers resting on concrete piers.

Bids were invited and received for both designs on Jan. 25, 1917. A comparison of the lowest bids is as follows:

These prices are based upon a very low cost for aggregates, as the railroad company agreed to furnish sand and gravel for concrete at 60c. per cubic yard.

Comparison of Costs

The prevailing commercial prices per cubic yard of these aggregates at Richmond were $1.05 for sand and $1.20 for gravel. The concrete arch bridge contains 41,400 cu.yd. of concrete and the steel structure 3350 cu.yd. In order to make a comparison of figures that could have been expected had the contractors furnished sand and gravel at market prices, there should be added to the above totals $30,900 for the concrete arch design and $2530 for the steel design, thus making the comparison as follows: Concrete arch, $508,674; steel viaduct, $494,965.

This in general may be taken as a fair comparison of the relative costs of the highest types of design, as exemplified in a concrete bridge with its beautiful lines and the advantages of ballasted track, low maintenance and long life, as against a plain and less satisfactory design in steel with open floor, higher maintenance and shorter life. The contract was awarded for the concrete arch bridge, which is now under construction.

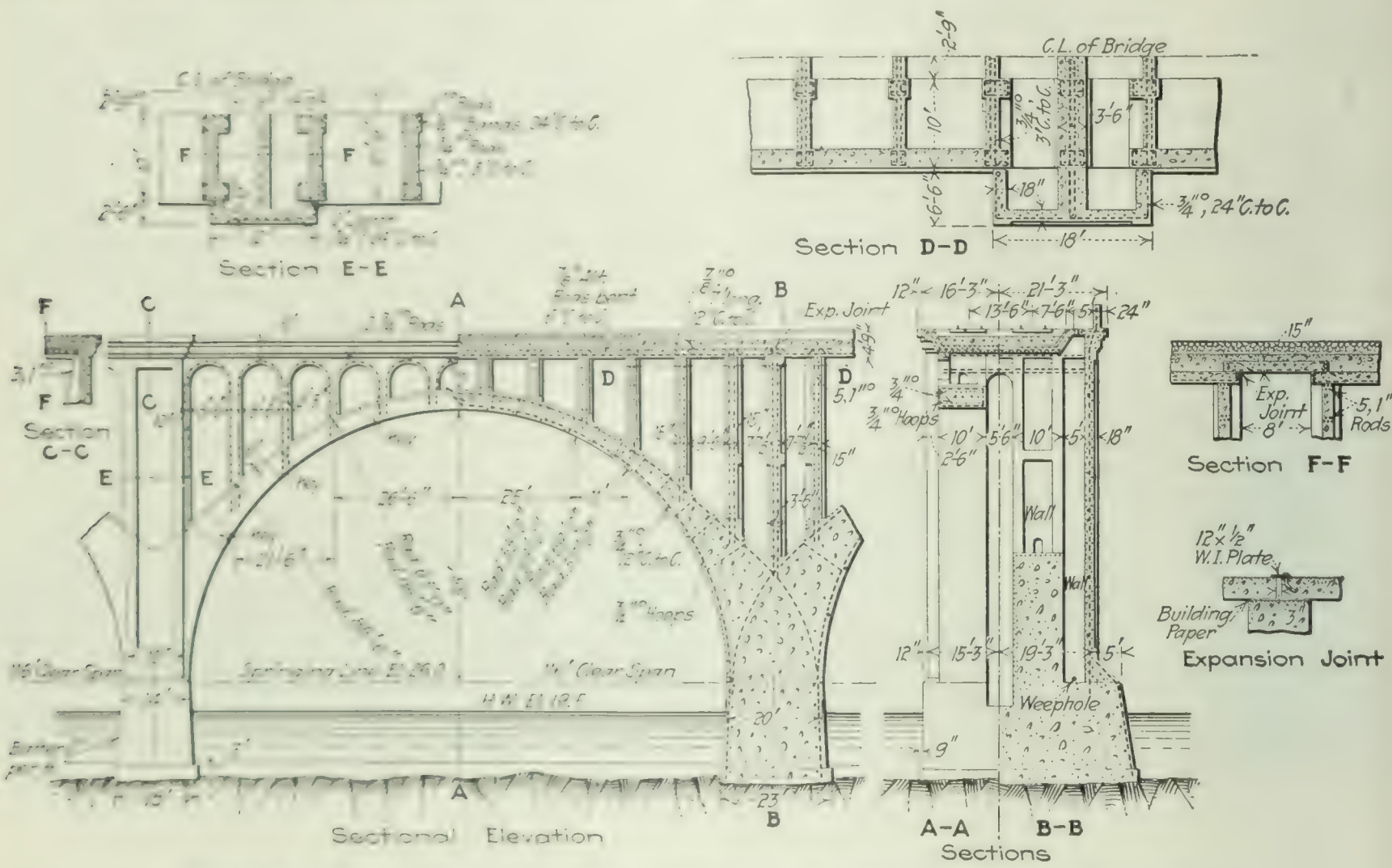
General Dimensions of Arch Design

The concrete design provides for a bridge 32 ft. 6 in. wide and 2278 ft. long, including abutments. The base of rail is at elevation 100 above the river level, which is taken as datum. There are twelve arches of 116 ft. clear span and 58 ft. rise, three arches of 122 ft. clear span and 58 ft. rise, three arches of 60 ft. clear span and 30 ft. rise, and 70 ft. of abutment approaches. The main-span piers are 14 ft. thick at springings, with an abutment pier 20 ft. thick for each group of three arches. The abutment and the 60-ft. arches have solid earth-filled spandrels, while the main arches are of open spandrel design with slab floor system. The main arches spring from elevation 21 and are full centered.

Concealed expansion joints are provided for the structure above the arches at each pier throughout the bridge. No hand rail is used, but refuge bays 5 ft. wide are provided over each abutment pier on both sides of the bridge. The upper part of each pier has a pediment which, together with the refuge bay treatment, breaks the straight line of the coping, giving a pleasing artistic effect.

All surfaces of the concrete are reinforced to prevent face cracking, and the reinforcement of the whole structure is in accordance with the standard specifications of the engineers, allowing 16,000 lb. per sq.in. tension in steel and 650 lb. per sq.in. maximum compression in the concrete. Exposed surfaces are given a spade finish, secured by using dressed-lumber forms and spading the concrete during placing to secure a dense mixture of mortar near the form surface. All arches and walls are provided with drainage and are waterproofed on the inside with a bituminous membrane.

The contract is being executed by W. W. Boxley & Co., of Roanoke, Va. J. E. Greiner & Co. are the consulting engineers in charge of the design and construction and are represented on the work by E. W. Stearns, resident engineer. S. B. Rice is engineer, maintenance-of-way, and E. M. Hastings, resident engineer of the Richmond, Fredericksburg & Potomac R.R. J. E. Willoughby is chief engineer of the Atlantic Coast Line Railroad.



DETAILS OF TYPICAL 116-FOOT ARCH DESIGNED FOR COOPER'S E-60 LIVE-LOADING

Interlocking Blocks Tied Together Make Concrete Chimney

System Common in Europe Is Used for First Time on This Continent in Canadian Pacific Yards at Toronto

By W. S. Winters
Toronto, Canada

A SPECIAL type of block concrete chimney, quite common in European construction but hitherto unknown on this side of the ocean, has been completed for the Canadian Pacific Ry. in its yards at East Toronto, Canada. The chimney was built according to the Monoyer system, in which the shaft is made up of segmental concrete blocks, each block being one side of the octagonal chimney section. The blocks are furthermore of special design in that they are provided with a hook at the end which, overlapping the blocks on the adjoining side, forms not only a vertical opening for the vertical reinforcement, but also an ornamental corner which adds to the architectural appearance of the chimney. Each block is reinforced in itself, but the reinforcement of the chimney consists in the vertical rods placed in the corner chambers which are incased in the concrete filled into these chambers after the blocks are in place, and also in horizontal banding reinforcement made up of rods set into grooves at each block joint.

The base of the chimney is a solid concrete slab but the subfoundation is somewhat out of the ordinary in that it consists of circumferential concrete retaining walls of gravity section, with an earth fill in the middle capped with a concrete floor. One of the details in Fig. 1 shows this plainly. Out of these annular base rings project vertical rods which are tied into the vertical reinforcing of the chimney proper.

The blocks are made in metal forms, shown also in the detail in Fig. 1. These forms consists of three parts. Parts 1 and 2 are bolted together and part 3 placed at a distance to insure the proper thickness of the block,

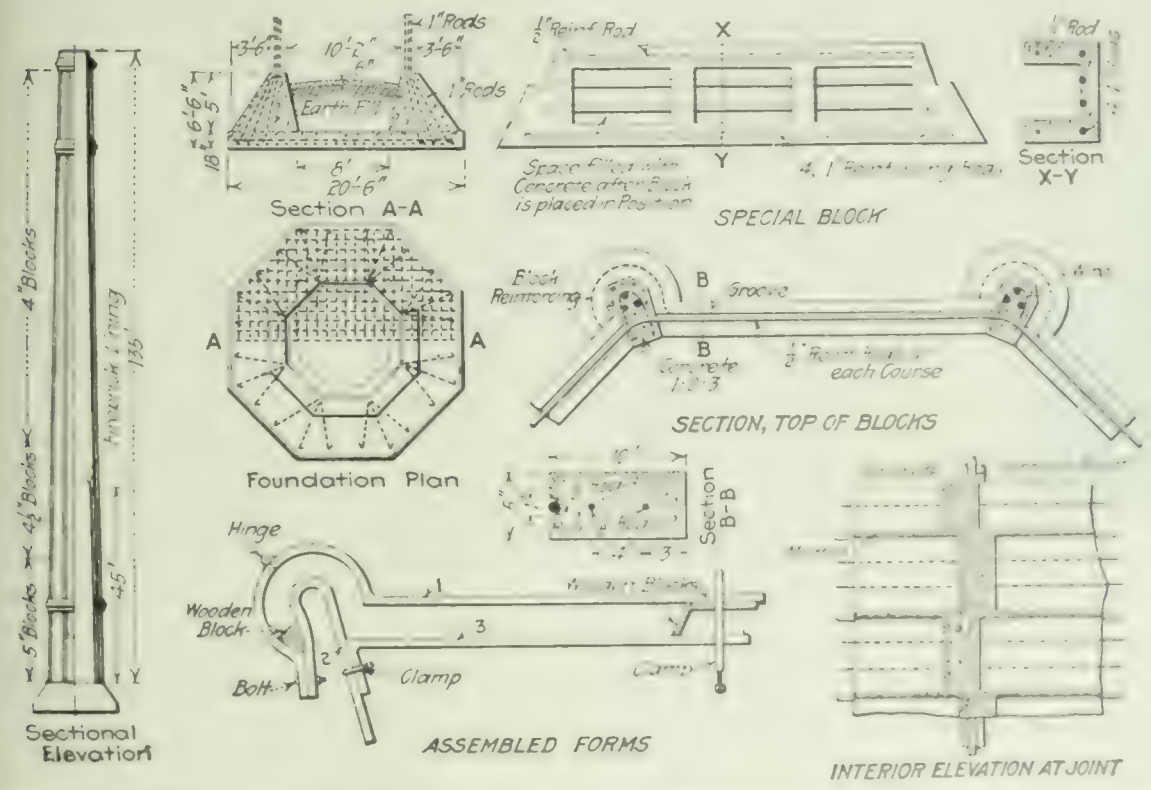


FIG. 1. MONNOYER TYPE CONCRETE BLOCK CHIMNEY USED ON CANADIAN PACIFIC RY. WORK IN TORONTO, CANADA



FIG. 2. THE BLOCKS WERE READILY PILED UP IN NEARBY YARDS

and fastened to the others by means of two clamps, one at the top and one at the bottom. Wooden blocks are then put in to give the required length, and the two other parts are secured together by a large clamp. A wooden block is also placed in the nose of the hook, giving a flat surface there. These forms are adjustable, and make blocks of all sizes. In the Canadian chimney, for instance, the blocks required are noted in dimension and number in the table on p. 76.

The blocks are cast on the job. In the Canadian chimney three men turned out in the neighborhood of 65 blocks daily. When the forms were set up, a 2 in. face of a 1:2 mortar was pressed against the face of the forms with the hand, then 3 in. of 1:2:3 concrete, mixed quite dry, was rammed into the form. a horizontal reinforcing rod placed, 3 in. more of concrete and another rod placed, and then the block carried up to the top of the form. A ½-in. layer of the concrete is then scraped off the top of the form, and a layer of mortar substituted. A groove 1 in. wide and ½ in. deep is then made along the upper surface of the block to provide a place for the horizontal reinforcing rods in the chimney. The blocks are allowed to stand for a couple of days, are then piled in rows (Fig. 2) and left for ten days to two weeks before using.

Some blocks are made with a hook on the right and others with a hook on the left. On the Canadian chimney, two courses of ornamental special blocks, of the design shown also in Fig. 1, were used. These are wider than the general blocks and have a series of rolls which may be noted in the detail, which are filled with concrete when the block is put in place.

How the Blocks Are Placed

In placing the blocks in the chimney they were carried up in courses. The horizontal rods were placed in the grooves, and the concrete filling in the corner joints along with the block courses, each alternate row having the hooks on the opposite side of the preceding row and each hook being placed over the hook immediately below it. After about five courses were laid up

from the ground, a scaffold was erected on the inside of the chimney, from which the blocks were hoisted. A gasoline engine placed outside the chimney was used for this operation, and openings were left in the foundation to enable the cable to pass through. The blocks were carried to an opening left in the ground level for the purpose of cleaning out the chimney, and then attached to the cable. This method of hoisting blocks and concrete was continued until the chimney was completed. Two masons and five helpers laid nine courses daily, or about 72 blocks, and the work progressed very systematically because of the absence of any delay on account

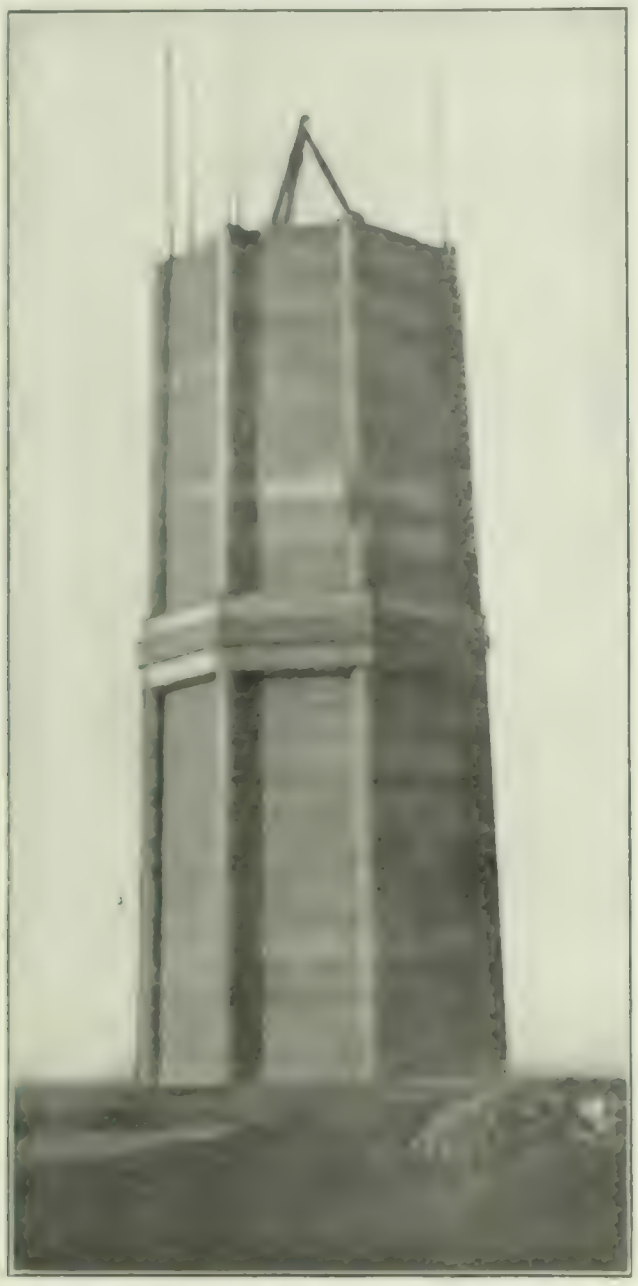


FIG. 3. LOWER PART OF CHIMNEY SHOWS ANNULAR BLOCKS AND SPECIAL COPING BLOCKS

of weather conditions. The men could make blocks under sheds at any time.

The Canadian chimney was 135 ft. high, had an inside top diameter of 5 ft. 6 in., and an inside bottom diameter of 10 ft. 2 in. It was lined on the inside with 4 in. of firebrick set in fire clay, carried up to a height of 45 ft. from the foundation. It cost in the neighborhood of $3000. The work was done by the firm of Ed. Pelletier & Sons, of Quebec, who have the rights for Canada and the United States. The writer was superintendent of construction for the Canadian Pacific Ry.

FILL OF BLOCKS

Diameter	Length		Quantity	
In.	Ft.	In.	Left	Right
5	4	5	40	32
5	4	1	24	24
5	3	11	40	40
4½	3	9	40	40
4½	3	7	40	40
4½	3	5½	40	40
4	3	4	40	40
4	3	2	40	40
4	3	0	40	40
4	2	10½	40	40
4	2	8	40	40
4	2	6½	40	40
4	2	4	32	24
4	2	3	40	40
4	2	1	32	32
			568	552
Total			1120	

Distribution of Pumpage in Force Mains and Laterals

Chart Illustrating Flow-Distribution Survey Made by Pitometers at St. Louis Water-Works Will Repay Study

By F. L. Bock
Formerly Assistant Engineer in Charge Distribution Section, Water Division, St. Louis, Mo.

THE accompanying chart illustrates a method of showing the flow in pump lines and laterals of a water-works pipe distributing system. It was devised by the writer to summarize the results of a flow-distribution survey by pitometers.

The survey was conducted in St. Louis during the summer of 1916 on the pump lines of the Baden pumping station, which pumps water at 125 lb. pressure to reach the higher elevations and supplies about 40% of the entire consumption. This survey was intended to serve two purposes: (1) To show the distribution of flow and (2) to determine the friction loss in various sections of the four 36-in. force mains as they radiate from the station. For the latter purpose it was expedient to treat each line by sections and to select the observation points as far apart as possible so as to secure the pressure losses over long stretches of pipe; but so arranged as not to interrupt service from the laterals off the section under test, when they are closed. The results of the friction-flow tests are incomplete and are omitted here.

PUMP LINE NO. 8, WITH TWO BRANCHES

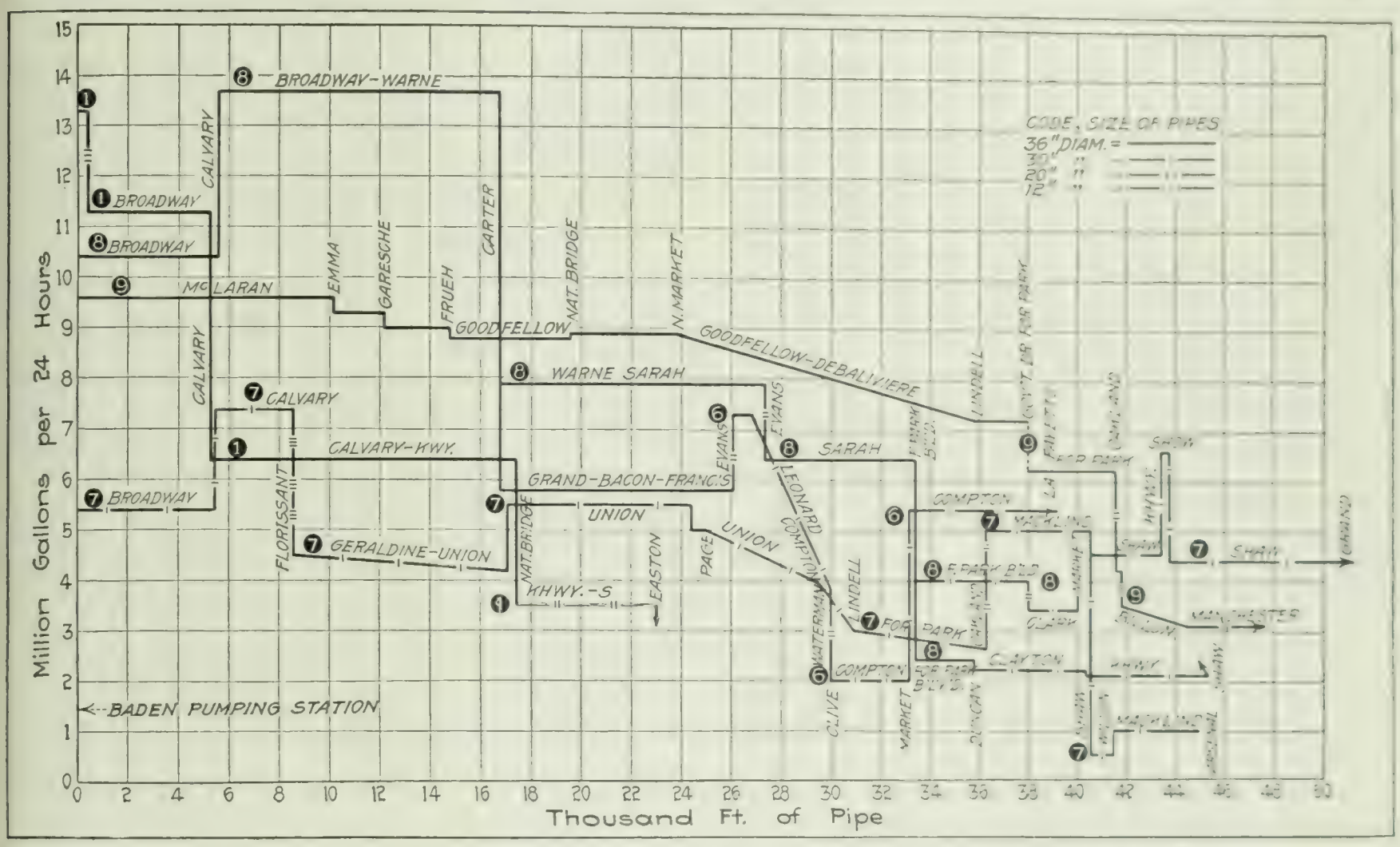
Pipe Diameter, In.	Distance, Thousand Ft. of Pipe	Flow, Million Gal. per Day	Route of Line or Location of Branch or Lateral
36	0.0 to 5.6	10.4	Along Broadway to Calvary
36	5.6 to 5.6	+3.3	Lateral at Calvary
36	5.6 to 16.8	13.7	Along Broadway and Warne to Carter
36	16.8 to 16.8	—5.8	Branch at Carter along Carter, Grand, etc.*
36	16.8 to 27.4	7 9	Along Warne and Sarah to Evans
20	27.4 to 27 4	—1.5	Lateral at Evans†
36	27.4 to 33.4	6.4	Along Sarah to Forest Park Boulevard
30	33.4 to 33.4	—4.0	Branch at Forest Park along Forest Park, Clark and Market*
36	33.4 to 35.8	2.4	Along Forest Park and Boyle to Duncan
12	35.8 to 35.8	—0.2	Lateral at Duncan
30	35.8 to 40.4	2.2	Along Shaw to Kingshighway
12	40.4 to 40.4	—0 1	Lateral at Kingshighway
30	40.4 to 45.3	2 1	Along Kingshighway to Shaw
36	16 8 to 26.1	5.8	Along Carter, Grand, Bacon, Francis to Evans*
20	26.1 to 26.1	+1.5	Lateral at Evans†
36	26.1 to 26.8	7.3	Along Francis, etc., to Leonard
X	26.8 to 30.0	—3.5	Several laterals along Leonard, Compton to Olive
20	30.0 to 30.0	—1.8	Lateral at Olive
30	30.0 to 33.2	2 0	Along Compton to Market
30	33.2 to 33.2	+3.4	Branch at Market‡
30	33.2 to 38.8	5.4	Along Compton to Lafayette
30	33.4 to 38 0	4 0	Along Forest Park and Clark to Theresa*
20	38.0 to 38.0	—0.6	Lateral at Theresa
30	38 0 to 40.0	3.4	Along Clark and Market to Compton‡

* Branches as distinguished from laterals—being 30 in. and over, much longer and equal in importance to pump lines. † Another point where main line runs into branch (*). ‡ Point where second (*) branch runs into first (*) branch.
The flow added to or deducted from main-line flow through branches and laterals is indicated by positive or negative sign, so that adding or subtracting the branch or lateral flow from the previous main-line flow gives the succeeding value of main pump-line flow.

The observations for each section consisted of flow and pressure records at each end and midway for check and were continuous over a four-day period. The first two days gave the normal flow conditions, of which the flow records supplied the data for the accompanying chart, while the records of the last two days were secured with all laterals closed, so that the flow would be the same throughout the section under test.

The table on the preceding page will illustrate in a brief way the intended manner of following one of these lines in the chart.

This chart, constructed some months ago, shows a total of 38.7 million gallons leaving the Baden station each day, which quantity is practically identical with the average daily pumping from the Baden station of 38.8 millions for the fiscal year just ended Apr. 1, 1917.



DAILY FLOW THROUGH BADEN FORCE MAINS, ST. LOUIS WATER-WORKS—WATER-WORKS PROPORTIONED TO DAILY CONSUMPTION OF 100,000,000 GAL.

Since this survey extended over the summer months, a period of considerable daily variation in pumping, it was necessary to adopt some method to reduce the daily-flow records to a common basis for charting. For simplicity it was assumed that the daily flow at any point along a pump line was proportional to the total daily consumption. The average daily consumption for the entire city during the past year was 98 million gallons, but for convenience of comparison with other yearly averages all flows were reduced to a basis of 100 millions total. For instance, a day's flow of 11 millions recorded at some point when the total consumption for that day was 110 millions would be multiplied by the ratio (100 divided by 110), giving a value of 10 millions for charting in place of 11 as recorded.

The appended chart is formed by plotting as ordinates the daily flow (reduced as described) at various points along the pump line and as abscissas the length of pipe measured from the pumping station to the corresponding points. The pipe sizes of the various pump lines and the larger branches and laterals in the various sections are represented by a code of lines. The streets along which the pump lines and branches extend are given horizontally over the code lines, and those locating the laterals are given on the vertical code lines representing the larger laterals.

This scheme is not expected to give nearly the accuracy that the foregoing results indicate, but is presented as an approximation close enough for practical use to design changes in piping systems.

Asphalt Industry Prosperous

Statistics just completed under the supervision of J. D. Northrop, of the United States Geological Survey, Department of the Interior, indicate that for the year 1916 the quantity of natural asphalt, including bituminous rock, grahamite, gilsonite, wurtzilite, and the natural paraffin, ozokerite, produced and sold at mines and quarries in the United States was 98,477 short tons, a gain of 22,726 tons, or 30% in quantity compared with 1915. Ozokerite from domestic sources reappeared in the statistics of production for the first time since 1907. The quantity of manufactured asphalt produced in 1916 from crude petroleum of domestic origin increased only 3½% as compared with that produced in 1915, and the quantity of similar material manufactured in this country from Mexican petroleum increased 47% as a consequence of which the net gain over production in 1915 was nearly 20%. California led all other states in the production of manufactured asphalt, its output from 16 refineries in 1916 amounting to 257,930 short tons.

Dragline Makes Heavy Railroad Cut Through Cleveland

Four-Track Depressed Roadbed of the Nickel Plate, Planned as Hydraulic Excavation, Is Being Graded in Two Sections by a Machine Having an Output of 300 Cubic Yards per Hour

WORKING across streets and electric-car lines and beneath overhead wires—conditions usually considered unfavorable to such operations—a 5-yd. dragline excavator is making a 750,000-yd. cut 13,000 ft. long through the southwestern part of Cleveland for the New York, Chicago & St. Louis (Nickel Plate) R.R. Temporary bridges are put in behind the machine, car tracks will be detoured, and one or two short sections will be skipped and excavated from tracks on the floor of the cut. To be of four-track width, a cut is first being excavated only for the two north tracks, loading cars on the surface on a temporary track next the existing main. When the tracks in the cut are in operation, the south portion will be taken out, loading trains on the lower level. The dragline offers the advantages of a large output, more than 300 yd. an hour, combined with ability to load on either level, which permits trains to be switched past it in loading.

Hydraulic Method First Proposed

The cut extends from Walworth Run, a deep valley at the east end, to West 96th St. and Detroit Ave. The maximum cut is near the middle of the section, a depth of about 25 ft. being removed at West 65th St. Of the 26 streets which crossed the railroad at grade within this distance, one-half, including two streets with electric-car lines, will be carried across the cut on bridges, the rest of the crossings being abandoned.

It was at first planned to make the excavation by sluicing with a hydraulic giant, beginning at the east end and washing the material into Walworth Run. However, sufficient water to carry out such operations could not be secured except from the city, and the city would be unable to furnish it until the completion of its new intake and filter plant. On this account the work was delayed until the railroad changed hands, and it became desirable to use the dirt excavated from this cut in large fills being made on the east side of the city instead of wasting it in the valley. As it thus became necessary to load the excavation into cars, the choice for excavating equipment fell on the dragline.

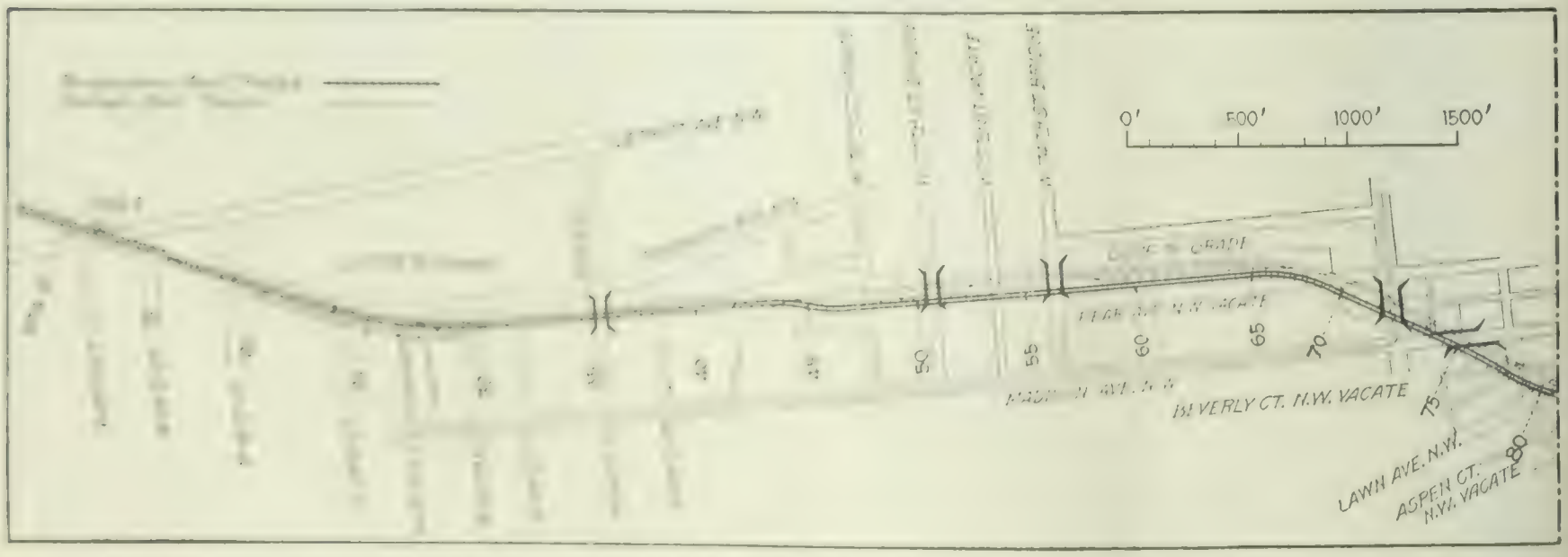
Work Well Adapted to Dragline

This machine is said to possess numerous advantages for the work in hand. Since it could readily load at the original ground surface, using an extra track on the old right-of-way, it was possible to handle a long train of dump-cars past the machine with no delay for loading. This could not be done of course in supplying cars to a steam shovel on the floor of the cut working against the face. Because it was necessary to pass two lines of street-car tracks, a shovel of sufficient size to load cars on the bank from the floor of the cut could not have been carried through from one end to the other without dismantling.

As all of the excavation was disposed of east of the work, to have made the cut from both ends would have doubled the excavating equipment required and increased the length of the haul, probably necessitating extra locomotives. Working directly on the surface, the dragline excavator moves over street intersections and car tracks without any delay. Equipped with a 5-yd. bucket, it has a very large output, and it is an easy matter to give it a continuous supply of empty cars. On one occasion it loaded 209 cars averaging 15½ yd. place measurement in 11½ hours.

20-Car Dump Trains

About 80 dump-cars are used, handled in 20-car trains. Five locomotives belonging to the contractor and one or two of the railroad's are employed, some of the grades on the temporary track at the dumps



BEING CUT THROUGH CITY MAINLY BY EXCAVATING EQUIPMENT USED HERETOFORE ONLY IN

requiring pusher service. Although most of the excavation is being carried to the east side, about 150,000 yd. is being used to make a fill for the city along the line of Walworth Ave. south of the work at its east end.

In order not to interfere with operation or to occupy more right-of-way than needed for the new cut, the north side of the right-of-way was excavated first to make a two-track cut, shifting the existing tracks to the extreme south of the right-of-way where this was necessary over the west part of the line. The dragline averages about two and a half 30-ft. moves a day on this cut. All cross-streets are being shut off as the machine reaches them, temporary bridges of timber being constructed across the first cut at those streets where permanent bridges are not to be located.

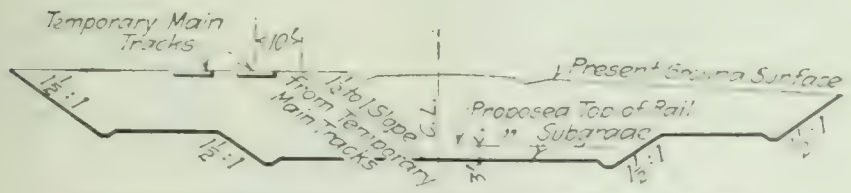
Small Section Left for Steam Shovel

The machine was taken past 58th St. and this temporary bridge constructed, with the intention of delivering the Lorain Ave. car tracks across it and closing Lorain Ave. itself until the cut past it had been completed. It was not possible, however, to secure the special track equipment required in time to make this shift, and it was necessary to skip this section with the dragline, leaving about 12,000 yd. to be taken out by steam shovel. Later, when this track equipment arrived and traffic was diverted to the 58th St. bridge, the steam shovel was started down to working level from an incline on the south side of the cut. About five separate cuts, loading first on the ground surface, next in the first cut, then on the lower level, will be required to work through the section.

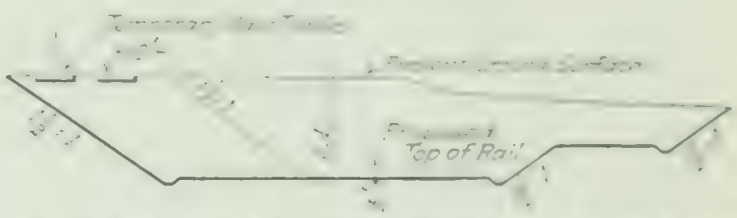
With West 65th St., however, it was not possible to detour the car tracks, and the machine was moved across this street, leaving this spot to be excavated later from the floor of the cut. A detour is now being built so that this section can be excavated. This work will have to be done with clamshell buckets, working from both the original level and the floor of the cut, because of two large water mains which it is necessary to keep in service.

Only two other places on the entire line had to be so left. One of them was where some overhead wires that could not be moved interfered with operating the big machine. The small amount of excavation left here was cleaned up by a locomotive crane with a grab bucket on the floor of the cut. The other place was on the approach grade at the extreme east end of the cut, which was excavated by a steam shovel.

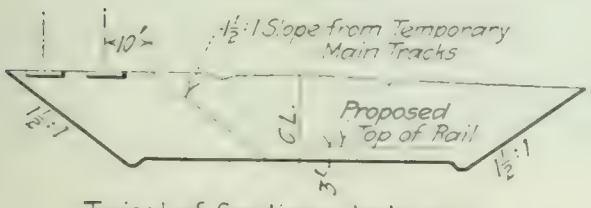
The crossing at West 65th St. was the only one, however, where pipe lines were supported during construction, although there are a water main and a sewer at nearly every intersection. The only other unusual construction was required at West 55th St., where a 4 x 5-ft. brick sewer was reconstructed in tunnel 40 ft. below the surface. This sewer, constructed from Walworth Ave. to the low level, will be carried as far west as West 85th St. and as far east as West 42nd St., intercepting all the sanitary sewers between. When the tunnel reached the southerly side of the right-of-way in 55th St., a cave-in occurred, and the remaining length is being completed in open cut. This made it necessary to drive 40-ft. piles to carry the two present main-line tracks at this point.



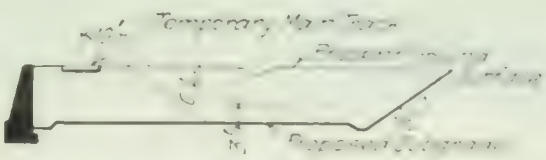
Typical of Sections between Stations 41+70 & 50+50



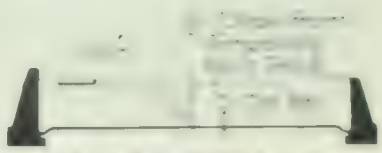
Typical of Sections between Stations 58 & 71, 112 & 119+50



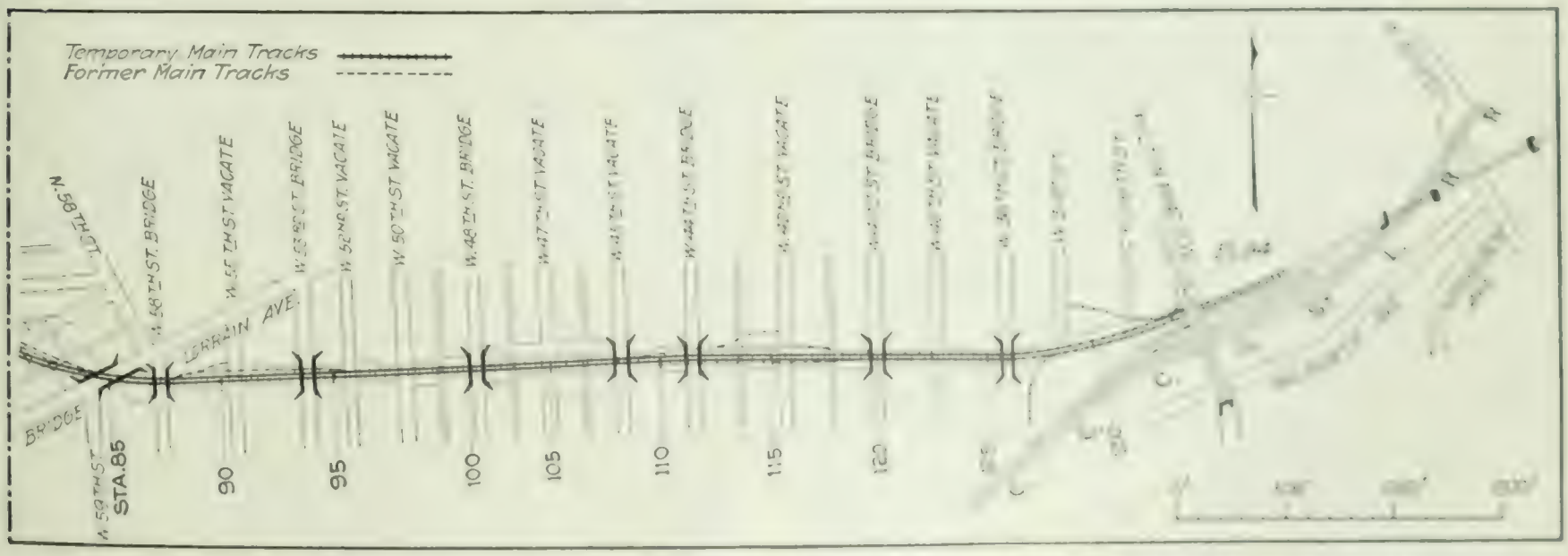
Typical of Sections between Stations 15 & 17+50, 22+50 & 28, 34 & 36+70, 50+50 & 58, 71 & 112, 119+50 & 139



Typical of Sections between Stations 28 & 29+50, 32 & 34, 36+20 & 36+25



Typical of Sections between Stations 0+00 & 0+20, 0+40 & 12+00



OPEN COUNTRY, STREETS BEING SHUT OFF ONE BY ONE AND DIVERTED BEHIND THE DRAGLINE

After reaching the west end of the work, the dragline will move over to the south side of the right-of-way and take out the remainder of the cut, proceeding east. As work progresses on the first part of the cut, the tracks for the new main line are being laid and ballasted, and traffic will be diverted to them before the second part of the excavation is begun. The old main-line tracks will be taken up and the disposal trains loaded on the south track in the cut. The process of shutting off and restoring the streets will be followed out in the inverse order described above, except that permanent structures will be built instead of timber ones.

Masonry Just Started

A start has already been made on the masonry for these crossings along the north side of the first cut.



FLOOR OF CUT WOULD HAVE BEEN TOO SOFT FOR STEAM SHOVELS—DRAGLINE DIGS 300 YARDS AN HOUR

The first street retaining walls built were concreted with a track mixer operated on a short spur built across to the work, but it is expected that a track mixing plant will be put in operation from the floor of the cut later.

The excavation with the dragline, including the operation of the dirt trains and the handling of the extra track required, is being done under contract by the Walsh Construction Co. All the other work, including the permanent track laying, the excavation carried on with the locomotive crane and steam shovel, and the bridge work and other work necessitated by cutting off the streets, is being done by forces of the Nickel Plate R.R., for which W. J. Bergen, assistant to E. E. Hart, chief engineer of the New York, Chicago and St. Louis R.R. is in charge of all grade separation work in Cleveland. A. C. Harvey, field engineer, is in charge of the improvement for the railroad.

Gives Eight Objects of Engineer's License Law

Prof. Clarence T. Johnson, in Michigan Technic, Holds That Reasonable Law Would Benefit Profession and Public

There are at least eight "objects of a reasonable and just law for licensing engineers," according to a recent article by Prof. Clarence T. Johnson in the *Michigan Technic*. These objects, with special comment on the eight, are as follows: "(1) To lay a foundation upon which a civil-engineering profession may rest; (2) to have a public record of the training and experience of each civil engineer who is entitled to practice within the state; (3) to protect every practitioner who is of value to the community in which he lives; (4) to provide a complete list of the civil engineers engaged in practice within the state; (5) to bring all of these men together in one body in so far as their support may be needed on any question concerning their profession or public business of a civil-engineering kind; (6) to arouse their general interest in matters of government; (7) to enable them to lend general support to the engineering administration of the state; and (8) to gradually obtain control of all work in the field of the civil engineer.

"The object last stated may appear of trivial importance or it may seem to embrace something of selfishness. This is not the case. No profession can develop to the point where it enjoys general respect until it is in position to control the field it is presumed to occupy. This respect cannot be developed until the practice of civil engineering is so regulated as to insure the realization of the objects enumerated above."

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Cannot Make Shipmen of Ordinary Carpenters Overnight

Sir—In these days when shipbuilding is to the forefront and so many engineering concerns are taking up this line, it might be well to sound a note of warning, particularly in the matter of wooden ships.

While the field of industrial engineering admits of a large degree of standardization, the building of a wooden ship has always demanded and always must call for a large amount of skilled, experienced labor. The supply of such labor on the Atlantic Coast is limited, and in consequence grave danger of loss is incurred by concerns taking over lump-sum contracts for wooden vessels, as a large proportion of the work on such vessels cannot be machined.

To all such concerns I would say, "Make sure your skilled labor is available and make ample allowance for the increased wages you will have to pay."

Do not for an instant imagine that you can turn ordinary carpenters into shipmen overnight.

J. W. RICHARDSON,
Superintendent of Ship Alterations and Repairs.
New York City.

Military-Road Promotion Censured

Sir—It was a great satisfaction to read your vigorous editorial of June 7, entitled "Military Strategy and the Good Roads Propaganda." I have come directly in contact with a local outcropping of this movement. Some little time ago I received a letter from one who subscribes himself as secretary of "The Pacific Coast Defense League," asking me to give him a letter in support of the aims of the league, which he could "use in presenting our plan before Congress."

The letter very naïvely stated that the sole purpose of this high-sounding organization was the "construction of a military road from the Canadian to the Mexican border." Some of the chief promoters of the project propose that the route lie practically all the way along the immediate coast line. Your sarcastic exposure of the stupidity of such a scheme, as a military measure, is none too strongly put. Your remark that rail transportation is "infinitely cheaper and more efficient than the highway" is especially pertinent to the present case. But of course, matters of this sort are a subject of entire indifference to the promoters of the project, who are not at all concerned about the defense of this coast, but want a fine automobile excursion route over this great distance opened up and built at the expense of the Government.

The hopeless feature of all these movements is seen in the low grade of patriotism which they disclose. Men of business standing put themselves behind local schemes under the false pretense of military necessity and seek to take advantage of the present high tension of public feeling to commit the Government to policies that it could never be induced to adopt in less strenuous times. It should be the duty of the directors of the public press and of the level-headed molders of public opinion, unmercifully to expose and denounce these selfish and unpatriotic efforts to bleed the Government for local interest when it is already carrying as great a burden as it can bear. Your timely editorial sets an excellent example in this respect.

H. M. CHITTENDEN,
Seattle, Wash. Brigadier General, U. S. A. (Ret.).

The Rewards of Public Service

Sir—I have just read with considerable regret, in a recent issue, of the resignation of William H. Connell as Chief of the Bureau of Highways of Philadelphia. Having had opportunity to know something of the results accomplished in that city by Mr. Connell and having also had personal experience of what seems to be the probable fate of anyone who attempts, while serving under an elected head, to try to secure in a public organization something like the efficiency demanded in a private one, I can appreciate as strongly as any the setback which his severance from the Philadelphia government will effect in the slow attempt to bring our municipal highway departments out of politics. Two years ago, the advances which Commissioner Rourke was making to bring the Public Works Department of Boston out of the mire of politics came to a similar untimely end. Our municipal public service is the poorer by the loss of these men.

As long as conditions in our municipalities make it possible to so hamper engineers in executive authority that competent men will not stay, or while (as has been within my own experience) irrespective of the value of the services rendered, they find it desirable to move on to provide a place for deserving relatives, or because they do not control as many votes as others, there will be little but academic interest in a great deal of the discussion that crops up from to time in engineering papers and at our numerous conventions as to the best type of organization for engineering public work.

New York City. HENRY WELLES DURHAM.

Claims Hydrated Lime Permits Detection of Undermixed Concrete

Sir—I am much interested in Mr. Harrison's letter on the consistency of concrete, in *Engineering News-Record* of June 7, 1917, p. 516, and cannot help but agree with him in many of his statements. He states, however, that undermixing and the use of hydrated lime are poor practice. It is not my intention to defend undermixing, because this must be considered poor practice whether the mixture contains lime or not and should be discouraged at every opportunity. The inference may be drawn from Mr. Harrison's conclusion that the use of hydrated lime will permit the concrete to be undermixed with less possibility of detection than when lime is not used. This, however, does not work out in actual practice, as certain engineers are specifying and using hydrated lime for no other reason than quickly detecting undermixing.

Hydrated lime is a very white material and, unless given a reasonable amount of mixing, the mixture as it

comes from the mixer will show white streaks so the inspector can quickly determine at a glance whether or not the concrete has received a reasonable amount of mixing. This, therefore, gives hydrated lime an added advantage.

When small percentages of hydrated lime are used in concrete mixtures, the consistency is greatly improved, as the lime introduces so-called lubrication into the mixture which causes it to flow freely through the spouts, or from carts, with a minimum quantity of mixing water. The question of using excess water is one that does not enter the contractor's mind until such time as he finds that the concrete will not flow freely or cannot be easily spaded. In other words, if he finds that the mixture cannot be placed most economically, he then begins to add excess water, which, of course, tends to decrease rapidly the strength of the resulting concrete as a result of segregation.

By eliminating the cause for the use of excess water through the introduction of plasticity into the mixture, hydrated lime improves the consistency by having concrete most economically placed and with maximum strength.

It is not, however, the idea of this letter to convey the impression that small percentages of hydrated lime will correct the shortcomings of undermixing or other conditions arising as a result of poor workmanship.

NORMAN G. HOUGH,
Manager, Hydrated Lime Bureau.

Pittsburgh, Penn.

Automobile Operating Costs

Sir—I note with interest the table of automobile operation costs printed on page 439 of the May 31 issue of the *News-Record*. This table is worthy of comment in a number of particulars, but especially on account of the fact that a wrong impression of the Ford car is likely to be created by these statistics.

Thus, it is interesting to note that a depreciation charge of only $95 is made against a Hupp, that has run 3000 miles, whereas a Ford, driven about twice as far, but worth less than half as much, is charged up with a depreciation of $160.30. Now this is absurdly more than the actual depreciation on a Ford, if judged on a mileage basis; for it assumes that a Ford will run only about 20,000 miles, when, as a matter of fact, it will, with ordinary care, run at least four or five times that far.

On the other hand, if the depreciation shown was based on sale value at the time the depreciation was estimated, the figure for the Ford is about correct, while the figure for the Hupp, on this basis, is at least $200 too low.

The depreciation per mile is, of course, equally in error. Depreciation on a Buick that has run 37,403 miles (no present value given) is figured at $0.0203 per mile, while the depreciation per mile for the Ford is given at $0.0256 and for the Hupp at $0.0323. But the Ford costs only about half as much as the Buick and less than half as much as the Hupp. Moreover, the long service life of the Ford cars is universally recognized. Therefore, to assert such a depreciation per mile for the Ford can be possible only where the car is abused, in which case the figures are not representative and should not, in justice to the Ford car, be printed without a statement to that effect.

Another matter that, if true, shows wonderfully poor management of the Ford car is the relative cost per mile for casings, which is here recorded as practically the same for Buick, Ford and Hupp cars. The Ford car is so much lighter than the 1916 Hupp that the very suggestion of equal tire cost on these two cars is ridiculous.

A similar charge might be leveled at the "total cost per mile" figures, which show a cost of only $0.01 more for the Hupp than for the Ford. This could only be true where a Ford is so poorly handled that costs shown are wholly unrepresentative.

These comments are principally based on comparisons of the Ford cars and the Hupp cars, because the writer is thoroughly familiar with these machines. Both are good machines, and both have their legitimate fields; but to present figures as authentic which pretend to show that a Ford car will cost almost as much per mile run as a Hupp only serves to throw question on every figure presented.

The accumulation of cost data is a valuable thing—if it produces facts—but when it produces a conclusion that operating a Ford car costs about as much as operating a Hupp, either the cost records should be quietly removed from the premises or else the garage foreman should be fired before dark.

J. L. HARRISON,
Civil Engineer.

Falls Church, Va.

Women Draftsmen

Sir—Referring to C. E. Newell's letter published in *Engineering News-Record* of May 31, p. 469, and Joseph Webb's letter appearing in the issue of June 14, p. 564, Mr. Newell's letter would be more convincing if he would explain just why it is that, if "a large percentage of this work is purely a matter of routine" and if "it would take no lengthy or elaborate preparation" for the ladies to qualify as draftsmen, a man is expected to have a technical education before being able to hold down a drawing board.

Mr. Webb's comparison of the relative standing of engineers and day laborers would seem to indicate that in his opinion the duties of a civil engineer require about the same qualifications as those of a day laborer.

There seems to be but one conclusion to draw from these letters (assuming that these gentlemen have given us their honest opinions), and that is that their training and experience have not been such as to qualify them to be competent judges of the compensation due those engaged in engineering work.

Kansas City, Mo. ——— ———.

Sir—Permit me to make the following answer in your columns to the letter by C. E. Newell, Southern Ry. Co., May 31, and Joseph Webb, Chesapeake & Ohio Ry., June 14, on the subject of women draftsmen.

It appears from the advertisement quoted in Mr. Webb's letter that he is comparing engineers and draftsmen to Italian or Mexican track laborers, for such alone can be obtained today at a salary of $3 per day. I can hardly conclude that he is conversant with the present condition of the labor and materials market and the cost of living.

Is the gentleman aware of the time and cost of education a technically skilled draftsman or engineer re-

quires to place himself in the field ready for the abuse and misuse by a professionally uneducated employer, that he compares him to a railway-track laborer whose sole cost of education is a bare daily existence and whose intelligence amounts to the more or less skillful use of the pick and shovel?

And gentlemen, you ask for a cheaper class of labor to do your engineering. I cannot conceive of such a statement as emanating from engineers. Are you aware that the United States engineer of today must design and construct with due regard to public safety, which is his initial duty to the people, his profession and himself, and that this end, which is true economy, can be arrived at only through a higher grade of office and field help? ——— ———.

Chicago, Ill.

[We intentionally omit the signatures from these two letters. We believe that, if their authors will read Mr. Webb's letter again, they will perceive that it was written entirely in irony and will be glad that we have withheld their names. Evidently, Mr. Webb is as much disturbed as they are at the prospect of having women supplant men at the drawing board and beat down the prices for such work. His comparison of engineers and day laborers, if our interpretation is correct, is set forth in scorn. It is not that he counts the two classes of only equal value, but that, alas, many employers do!

At the same time it is possible to entertain Mr. Newell's original suggestion without belittling the engineering profession. Perhaps it was unfair to the women to imply that the only reason they could qualify as draftsmen is that the work is mostly routine. Certain it is that much work in a large drafting office, particularly a railroad office, could be done by persons without technical training. Probably the reason employers prefer candidates with technical educations is that they want them to develop to something more than draftsmen. Women can serve as draftsmen, with no great future ahead of them, and still fare as well as in most lines open to them. When untrained men—and this does not apply at all to the occasional man who by sheer ability and diligence gets to the front without a technical education—once get into engineering service and do the elementary work as well as the college man, humanity demands that they be boosted along to a certain point; and there they halt, thus impeding better-trained men. The employing of women draftsmen would, we suspect, keep such men out of the service entirely and thereby help and not hinder young men with real engineering possibilities.—Editor.]

Bituminous Foundations for Sheet Asphalt Surfaces

Sir—Referring to the article "Bituminous Foundations for Sheet Asphalt Surfaces," by Mr. Kirschbraun, in *Engineering News-Record* for June 21, p. 591, I submit the following statement:

The writer has supervised the construction of a considerable area of street pavement, largely sheet asphalt, and has observed the action under traffic for several years of these and other pavements of similar character. In some cases a concrete base was used; in others, the base was of macadam or crushed stone. My experience and observation have demonstrated conclusively that a good cement-concrete base is more satisfactory than a less rigid or more elastic one.

In this city several streets were paved about eight years ago with bituminous material upon a macadam or crushed-stone base. Since the expiration of the five-year guarantee period the city has had to maintain these pavements, and we have gained considerable insight concerning the characteristics of pavements under various conditions.

On College St., where there is much traffic with heavy trucks, the pavement foundation is of old macadam. In patching this pavement two years ago we first used the city steam roller to compact the new work, but soon had to discontinue rolling. We found that the old pavement adjacent to the patch would work up and down as the roller moved, showing a yielding foundation. Since then we have made patches on this street without rolling, but the old pavement is full of bumps and depressions, due to settlement under traffic.

The recently paved streets here are of sheet asphalt upon a cement-concrete base; they are mainly in residential sections. The pavement is 7 in. in total thickness, with 4 in. of cement-concrete base, 1 in. of binder course and 2 in. of sheet asphalt. This pavement has been laid about 3½ years; it has a good surface, remarkably free from cracks or worn places.

Some of the suburban streets that were paved about seven years ago are of asphaltic concrete upon a cement-concrete base. Most of these pavements have cracked badly. These cracks are attributed to two causes: First, a deficiency of asphaltic cement in the mixture and, second, lack of sufficient traffic to keep the surface "ironed out."

Another suburban street with the same kind of pavement has developed transverse cracks at intervals of from 30 to 40 ft. for a long stretch. This condition is attributed to joints in the cement-concrete base; the joints are said to have been purposely made during construction. The cracks are stated to be directly over the joints. No explanation has been given as to why joints were made in the base.

In the writer's experience the following features have been found to be of advantage in a cement-concrete base: (1) Firm, unyielding foundation, acting as a bridge over soft spots in the sub-base; (2) freedom from injury by water or dampness.

A base of asphaltic concrete may be better than one of macadam or broken stone; it would, in my opinion, be inferior both in strength and durability to one of cement concrete. Water will in time soften and disintegrate an asphalt mixture, while it has the opposite effect on cement concrete.

With regard to the pounding or hammering by heavy traffic on an asphalt pavement upon a rigid base, any pavement will be injured and worn by traffic. Asphalt pavements will in time acquire a wavy, uneven surface under traffic, with any kind of foundation. When laid upon a cement-concrete base, they should have a good binder course next to the concrete. We have an asphaltic pavement upon a street with a 6% grade; it has a cement-concrete base. This pavement has been down for several years; it has a good surface and does not show signs of creeping on the grade. S. H. Lea,

Charlotte, N. C. City Engineer.

THE ENGINEER IN FIELD AND OFFICE

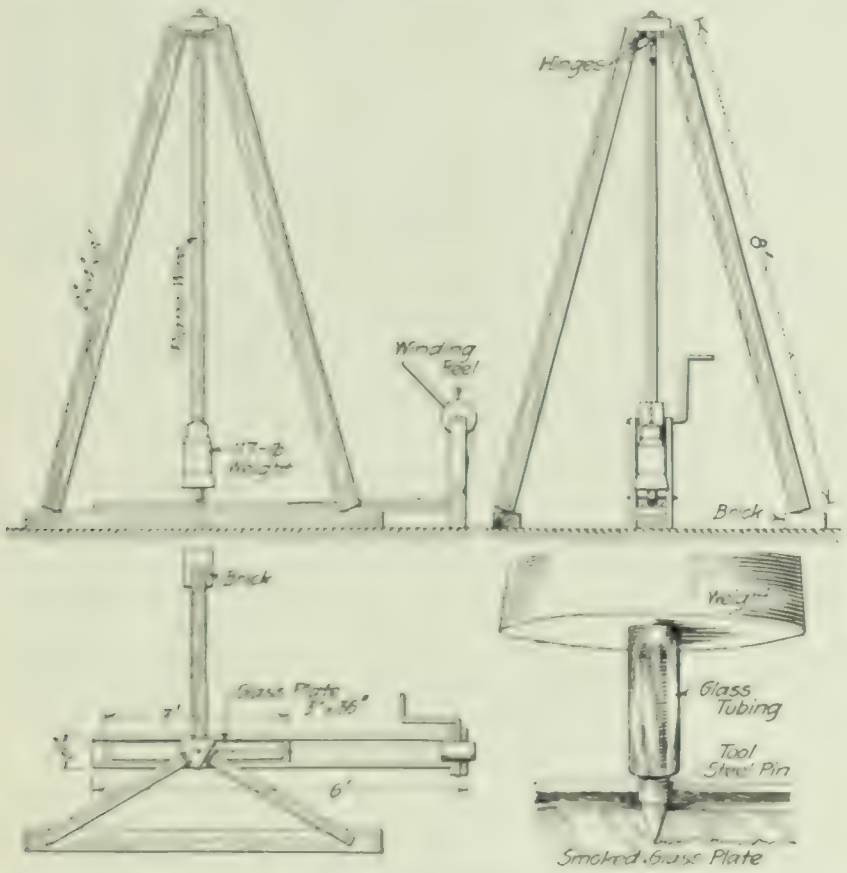
A DEPARTMENT DEVOTED TO DETAILS OF THE DAY'S WORK

Home-Made Seismograph Measures Vibration of Buildings

By S. R. Jones
Structural Engineer, J. G. White Engineering Corporation

THE measurements of vibrations occurring in industrial plants while machinery is in operation may be determined with a fair degree of approximation and with a precision certainly fine enough for engineering purposes by means of the very simple seismograph illustrated in the accompanying drawing.

The writer recently determined the severity of vibrations in a power plant with this apparatus and obtained very satisfactory results. The construction in detail



WEIGHT HUNG FROM WOODEN TRIPOD INDICATES VIBRATIONS OF BUILDING

is as follows: 2 x 4 timbers are fastened together at their tops by a triangular wooden block. Suspended from this block by means of a piece of piano wire swings a plummet of approximately 120 lb. weight. At the bottom of the weight is attached a piece of gage-glass tubing in which a stylus of small-diameter tool steel is fitted. This stylus must be so accurately fitted that, with a lubricating film of oil between it and the glass tubing, there is no lateral play. The vertical motion, however, is perfectly free. A trough is placed underneath the weight and directly on the structure, the vibration of which it is desired to measure. This trough, consisting of a board 6 ft. long by 6 in. wide with strips of wood on either side, contains a slide about 3 ft. long by 4 in. wide, which can be drawn along slowly by means of a winding reel. To this slide is attached a strip of smoked glass.

The weight, suspended by the fine flexible wire, has sufficient inertia to be unaffected by rapid vibration, and it therefore remains steady, while the smoked-glass plate underneath moves synchronously with the vibrations of the building. The effect is that of a fixed marker writing upon a moving surface. The curves obtained represent the result of two motions—that of the vibration, causing the plate to move back and forth across its main axis, and the forward movement caused by the progress of the smoked glass drawn along by the reeling device.

It is well to take the curves over periods of at least four minutes in order to register extremes that might occur due to any synchronism of the machines in the power plant.

To Keep the Back Flag Plumb

By E. P. Arneson
San Antonio, Tex.

IN MISCELLANEOUS surveying it is often necessary to leave a flag for a backsight without having the luxury of a back flagman to support it. Nine out of ten surveyors' helpers cannot plant a flag plumb. A ridiculously simple method for doing so with accuracy consists in setting the flag firmly in the ground where desired, picking up a handful of pebbles and letting one drop from the hand held near the top of the pole in the plane of backsight, then pushing the flag in the proper direction until a pebble strikes the ground near the center of the pole. The flag will then be cut squarely by the vertical hair of the instrument.

Right-of-Way Computations in Valuation Work Simplified by Table

By N. L. Sanow
Rochester, N. Y.

MANY short-cuts have been devised during the course of the computations necessary for obtaining the various right-of-way distances and data required on the maps that the railroads must submit to the Interstate Commerce Commission for the Federal valuation. The accompanying table, based upon a constant, saves considerable time. It is called the "Logarithmic Difference" table, as it is composed of the differences of two logarithms.

In computing the right-of-way distances on curves, where the stationing is measured along the center line, the distances are necessarily first measured along the center line and are then proportioned to the radii of the property lines. The formula for this proportioning is $D/D' = R/R'$, where D and D' are the distances along the right-of way and center line respectively, and R and R' the radii of the right-of-way and center-line curves. Then $D = RD'/R'$.

In most cases the measuring base is the center line of the right-of-way strip or else can be easily referred

thereto. Again, in most cases the width from center line to right-of-way line is one of five different widths—30, 33, 50, 75 or 100 feet.

Now for any one of these given widths R/R' is a constant. This constant is the base on which the table of logarithmic differences is founded. The constant is obtained by subtracting the logarithm of the center-line radius from that of the right-of-way radius for the outside curve, and the reverse operation for the inside curve. Thus for a width of 33 ft. on a 4° 45′ curve,

$$\begin{aligned} \text{Log } R + 33 &= \log 1{,}239.57 = 3.0932711 \\ \text{Log } R &= \log 1{,}206.57 = 3.0815526 \\ \text{Log difference } R+33,\ 4°\ 45' \text{ curve} &= 0.0117186 \end{aligned}$$

The incorporation of such a table simplifies the steps greatly. Instead of having to look up two logarithms and then subtract one from the other, you merely pick from a small table the log difference corresponding to the degree of the curve and half the width of the right-of-way; and this is either added to or subtracted from the logarithm of the computed distance on the center line, depending upon whether the right-of-way line is on the outside or the inside of the curve.

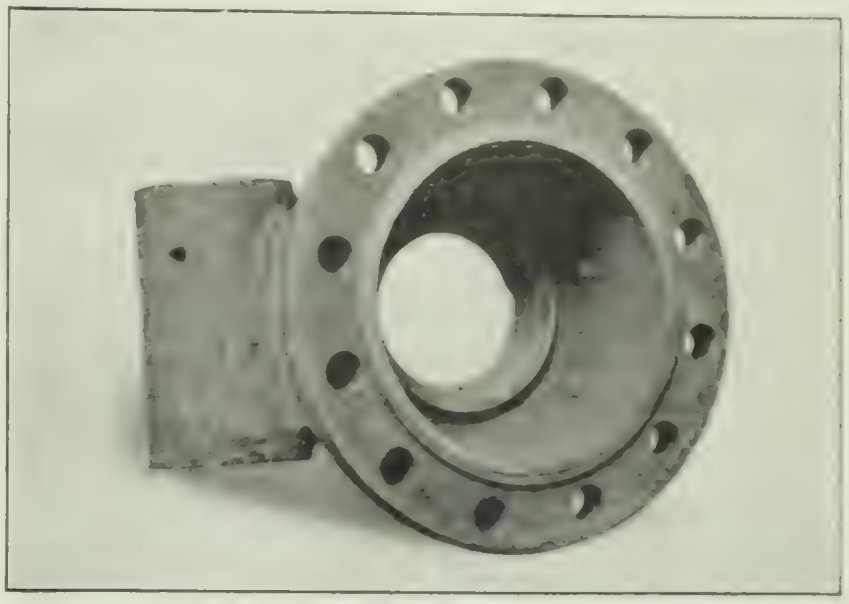
Thus, the distance on the center line is 254.90. The degree of curve is 4° 45′; width, 33 ft. each side of the center line. These are the two processes compared:

Old Method	Log-Difference Method
Log $R+33 = 3.0932711$	
Log $254.9 = 2.4063698$	
5.4996409	Log $254.9 = 2.4063698$
Log $R = 3.0815525$	Log difference 4° 45′, $R+33 = 0.0117186$
Log $x = 2.4180884$	Log $x = 2.4180884$
	$x = 261.787$

The table can be used to good advantage in various other problems, such as those involving property lines intersecting curved rights-of-way, wherever the ratio of the radii of center line and right-of-way line figures.

Steel Waterwheel Casting Suffers from Chemical Wear

THE Aomori Electric Co., which operates a 2000-kw. hydro-electric plant in Japan, drives its generators with impulse wheels controlled by needle nozzles. The nozzle tips, which are of cast steel, are fitted with



STEEL WORN—BRONZE UNAFFECTED

bronze inserts placed to provide a wearing surface at the orifice and the points where the needle approaches the casting. A most notable example of chemical action in the erosion of waterwheel parts appears in one of these castings, recently returned to San Francisco for replacement.

In this eroded part the steel has been worn away behind the entire circumference of the bronze insert to a depth of ¾ to 1½ in., and this wear extends in lessening degree back to the connection between the casting and

TABLE OF LOGARITHMIC DIFFERENCES

D	R+30	R—30	R+33	R—33	R+50	R—50	R+75	R—75	R+100	R—100
0° 30′	0.0011355	0.0011385	0.0012489	0.0012525	0.0018909	0.0018991	0.0028332	0.0028517	0.0037734	[illegible]
45′	0.0017016	0.0017088	0.0018714	0.0018800	0.0028327	0.0028523	0.0042424	0.0042852	0.0056475	[illegible]
1° 0′	0.0022680	0.0022799	0.0024942	0.0025085	0.0037735	0.0038065	0.0056480	0.0057223	0.0075144	[illegible]
15′	0.0028331	0.0028518	0.0031154	0.0031380	0.0047116	0.0047634	0.0070484	0.0071648	0.0093727	[illegible]
30′	0.0033976	0.0034242	0.0037359	0.0037682	0.0056479	0.0057222	0.0084445	[illegible]	0.0112232	[illegible]
45′	0.0039612	0.0039976	0.0043553	0.0043994	0.0065820	0.0066832	0.0098360	0.0100639	0.0130657	0.0134710
2° 0′	0.0045241	0.0045717	0.0049739	0.0050315	0.0075142	0.0076464	0.0112230	0.0115207	0.0149005	[illegible]
15′	0.0050863	0.0051464	0.0055916	0.0056644	0.0084443	0.0086115	0.0126055	0.0129823	0.0167274	0.0173974
30′	0.0056475	0.0057220	0.0062084	0.0062984	0.0093723	0.0095790	0.0139836	0.0144888	0.0185465	0.0193740
45′	0.0062082	0.0062982	0.0068242	0.0069331	0.0102983	0.0105484	0.0153573	0.0159202	0.0203580	[illegible]
3° 0′	0.0067680	0.0068753	0.0074391	0.0075688	0.0112222	0.0115200	0.0167264	0.0173966	0.0221618	0.0233538
15′	0.0073272	0.0074530	0.0080532	0.0082054	0.0121442	0.0124937	0.0180914	0.0188779	0.0239581	0.0253574
30′	0.0078856	0.0080315	0.0086663	0.0088428	0.0130642	0.0134695	0.0194518	0.0203642	0.0257468	0.0273700
45′	0.0084432	0.0086106	0.0092786	0.0094811	0.0139822	0.0144474	0.0208081	0.0218554	0.0275283	[illegible]
4° 0′	0.0090000	0.0091906	0.0098898	0.0101204	0.0148981	0.0154274	0.0221597	0.0233517	[illegible]	0.0314232
15′	0.0095562	0.0097712	0.0105003	0.0107605	0.0158121	0.0164096	0.0235074	0.0248530	0.0310686	[illegible]
30′	0.0101116	0.0103526	0.0111099	0.0114015	0.0167241	0.0173939	0.0248507	[illegible]	[illegible]	0.0355138
45′	0.0106662	0.0109348	0.0117186	0.0120435	0.0176342	0.0183806	[illegible]	0.0278711	0.0345802	[illegible]
5° 0′	0.0112200	0.0115176	0.0123262	0.0126863	0.0185421	0.0193692	0.0273246	0.0293877	[illegible]	[illegible]
15′	0.0117731	0.0121011	0.0129331	0.0133300	0.0194482	0.0203600	0.0288552	[illegible]	[illegible]	[illegible]
30′	0.0123254	0.0126855	0.0135390	0.0139747	0.0203522	0.0213531	0.0301815	[illegible]	[illegible]	[illegible]
45′	0.0128770	0.0132704	0.0141439	0.0146200	0.0212543	0.0223481	0.0315037	[illegible]	[illegible]	[illegible]
6° 0′	0.0134277	0.0138562	0.0147480	0.0152664	0.0221543	0.0233455	0.0328216	[illegible]	0.0432331	[illegible]
15′	0.0139778	0.0144429	0.0153512	0.0159139	0.0230525	0.0243450	0.0341355	[illegible]	[illegible]	[illegible]
30′	0.0145270	0.0150299	0.0159534	0.0165619	0.0239486	0.0253468	0.0354452	[illegible]	0.0466454	[illegible]
45′	0.0150756	0.0156178	0.0165547	0.0172110	0.0248429	0.0263507	[illegible]	[illegible]	0.0483412	[illegible]
7° 0′	0.0156234	0.0162065	0.0171553	0.0178609	0.0257353	0.0273569	0.0380527	[illegible]	0.0500305	[illegible]
15′	0.0161704	0.0167960	0.0177549	0.0185119	0.0266257	[illegible]	0.0393504	[illegible]	0.0517129	[illegible]
30′	0.0167166	0.0173859	0.0183534	0.0191634	0.0275140	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
45′	0.0172620	0.0179766	0.0189510	0.0198158	0.0284002	0.0303881	0.0429329	[illegible]	0.0550567	[illegible]
8° 0′	0.0178068	0.0185683	0.0195480	0.0204695	0.0292849	0.0314033	0.0432186	0.0479997	[illegible]	[illegible]
15′	0.0183509	0.0191606	0.0201441	0.0211240	0.0301677	[illegible]	0.0445005	[illegible]	0.0583753	0.0674583
30′	0.0188938	0.0197534	0.0207388	0.0217790	0.0310480	0.0334397	0.0457774	[illegible]	[illegible]	[illegible]
45′	0.0194362	0.0203470	0.0213328	0.0224351	0.0319266	0.0344613	[illegible]	0.0527748	[illegible]	0.0718946
9° 0′	0.0199781	0.0209417	0.0219263	0.0230925	0.0328039	[illegible]	0.0483212	[illegible]	[illegible]	[illegible]
30′	0.0210591	0.0221326	0.0231100	0.0244091	0.0345518	0.0375401	0.0508487	[illegible]	[illegible]	0.0786349
10° 0′	0.0221367	0.0233260	0.0242895	0.0257290	[illegible]	0.0396030	[illegible]	[illegible]	0.0697828	[illegible]
30′	0.0232116	0.0245226	0.0254660	0.0270528	0.0380243	0.0416757	[illegible]	[illegible]	0.0729857	[illegible]
11° 0′	0.0242835	0.0257222	0.0266388	0.0283802	0.0397495	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
30′	0.0253521	0.0269244	0.0278078	0.0297110	0.0414670	[illegible]	[illegible]	[illegible]	0.0793175	[illegible]
12° 0′	0.0264176	0.0281292	0.0289731	0.0310450	0.0431768	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
30′	0.0274800	0.0293368	0.0301347	0.0323825	0.0448791	[illegible]	[illegible]	0.0774297	0.0855518	[illegible]
13° 0′	0.0285398	0.0305479	0.0312932	0.0337243	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
30′	0.0296955	0.0317608	0.0324471	0.0350685	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14° 0′	0.0306487	0.0329768	0.0335988	0.0364165	0.0499418	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

the nozzle body. Proof that this cutting away of the metal was due to chemical action entirely, and not to wear, was found in the condition of the bronze insert. As soon as the steel was worn away, the inner edge of the bronze insert, which was quite sharp, stood out unprotected directly in the line of water flow; but it did not suffer the slightest wear and still retains its sharp edge, although the steel originally supporting it was cut away around the entire circumference.

The casting was in service about four months, when the wear became so excessive that renewal was necessary. When the casting was received, samples of the water were not available in San Francisco; and as no one at the plant had been able to make tests, it was not known just what the chemical was that caused the action. The remedy, however, obviously consisted in making the entire casting of bronze, and this plan was accordingly followed. Later on, an analysis of the water was reported, which showed a content of about 100 mg. of SO_4 per liter.

The hydraulic equipment was designed and built by the Pelton Water Wheel Co., of San Francisco.

Motor-Driven Pump Circulates Constant-Temperature Water

ONE of the most troublesome details in making penetrations and ductility tests of asphalt is that of maintaining the water of immersion at exactly 25° C. Numerous experimenters having demonstrated the effect of even a few degrees departure from the standard temperature, much time is ordinarily spent on initially bringing the bath to the proper thermometer indications, but always with the certainty that it will not remain at this temperature unless the room happens to be at the same point. The trouble of continually adding cold or hot water is not only a distraction, but also extremely difficult of manipulation.

The illustration shows an arrangement of a ductility machine of the type developed in the Office of Public Roads, a New York State penetrometer and an Eimer & Amend water thermostat as used in the Municipal Testing Laboratory of the City of St. Louis, Edgar P. Withrow, engineer in charge, and the Standard Laboratory of New York City. Water is drawn from the thermostat by the centrifugal pump shown in the lower left-hand corner. The pump is driven by a ½-hp. moter under speed control.

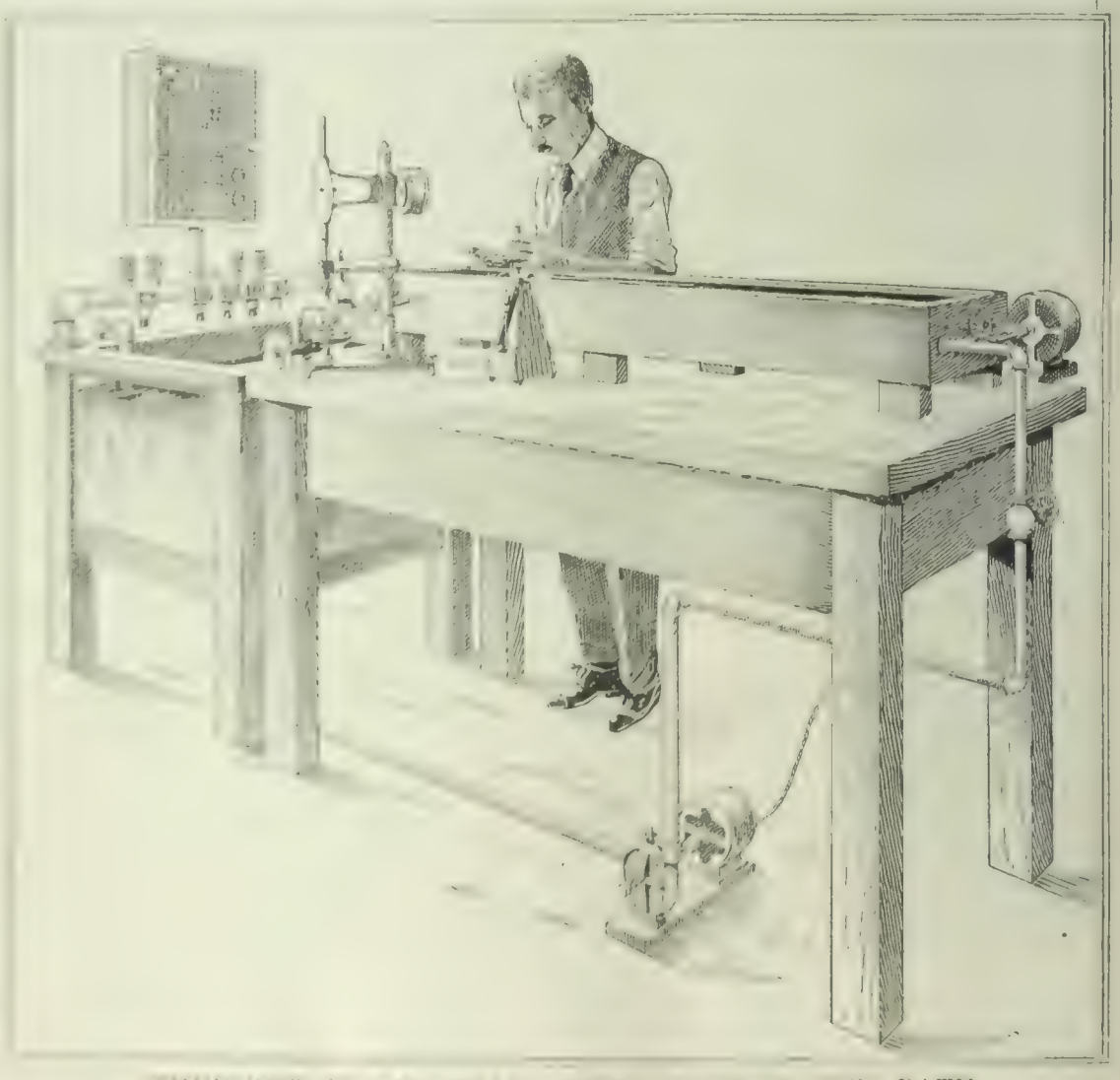
Forced by the pump, the water enters the ductility tank at the back end, near which point is located a valve by means of which the flow of water may be regulated so that its velocity will not interfere with the continuity of the test piece when it is drawn out to some length. The water flows then to the water bath of the penetrometer, the excess spilling into the thermostat —some of it having been bypassed directly to the water thermostat.

The water thermostat, being under very definite control, can be left running continually. Unless the room temperature is widely different from that of the temperature desired in the water baths, the heat lost or gained in the piping from the thermostat to the point of demand is slight. However, allowance for temperature loss or gain is easily made by an adjustment in the thermostat. Use has shown that this arrangement keeps the test baths at a practically constant temperature, not tolerating a variation of over 1° C. from entrance to exit.

Gas Calorimeter Tables of the Bureau of Standards

THE numerous requests for a brief and concise set of operating directions for a gas calorimeter, and for a convenient set of correction tables, have resulted in the publication by the Bureau of Standards of a circular entitled "Gas Calorimeter Tables." This may be regarded as a supplement to Bureau Circular No. 48, "Standard Methods of Gas Testing." The correction tables are arranged in a sequence most convenient for use in connection with the proposed record sheet.

The record forms for calorimeter tests which are shown in the circular have been used for some time and have been found to be complete and convenient. It is hoped that these forms will be adopted wherever possible, so that there will be greater uniformity in operating methods and the records used. The bureau is willing to lend the original plates for preparation of electrotypes for these blanks to any one desiring to print them.



THERMOSTAT AND SMALL PUMP KEEP WATER BATH AT CONSTANT TEMPERATURE

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

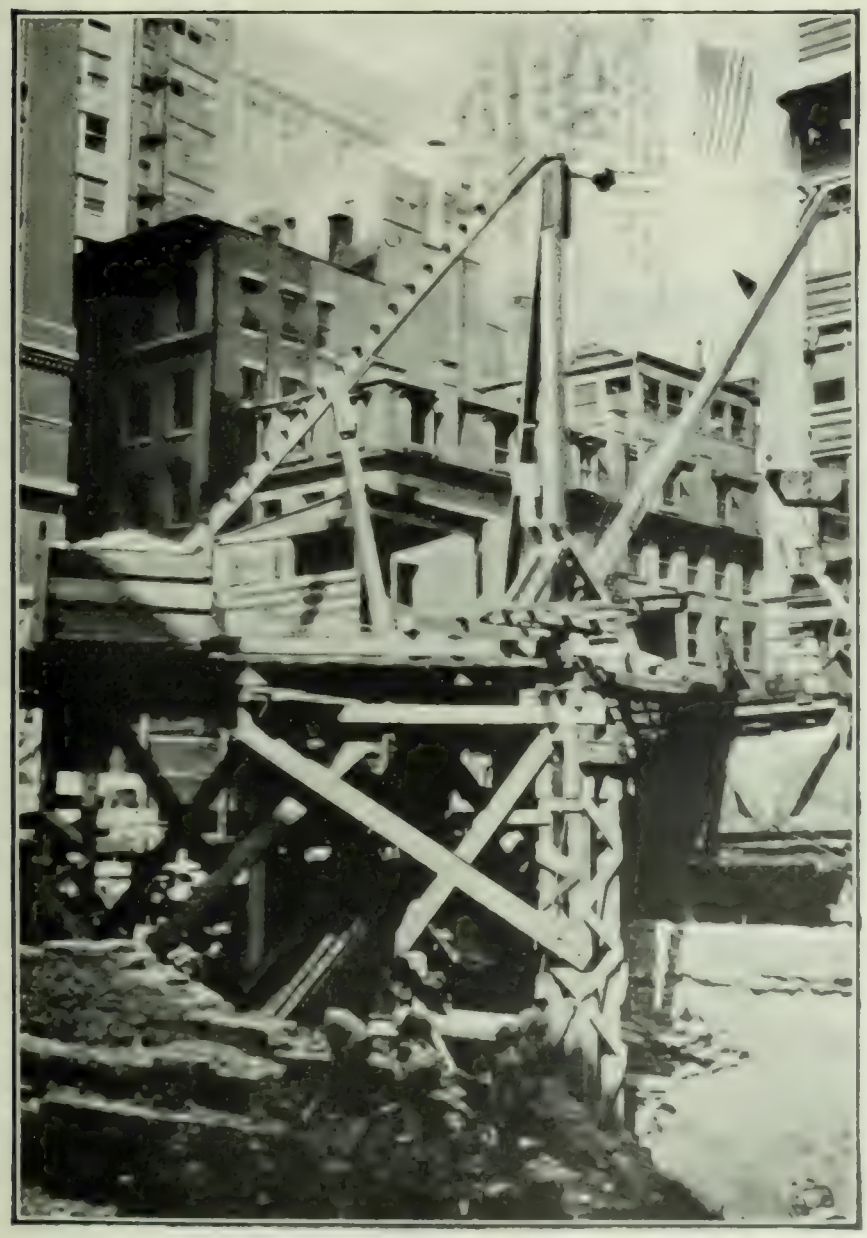
Sink Pits for Derrick Towers in Advance of Basement Excavation

By Frederick B. Spencer
Engineer in Charge, Smith, Hauser & MacIsaac, Inc., New York City

IN CONSTRUCTING the foundation for a 20-story building at William and John Sts., New York City, one derrick, which it was necessary to set up before excavation was begun and to continue using during and after the completion of the excavation, was set on timber towers placed in pits dug before the excavation was started.

The photograph below shows the towers uncovered part way to the bottom by the general excavation. The posts of these towers are 10 x 10's 40 ft. long, two under each deadman, four under the hoist and four under the mast. All were placed so as not to interfere with the foundation work. The derrick, which has a capacity of 10 tons, has been used entirely in handling dirt, dumping into a 50-yd. loading hopper over the street.

The work on the building mentioned is being carried out by Smith, Hauser & MacIsaac, Incorporated.



DERRICK SET ON TIMBER TOWERS



LINE OF SHOES, TRACK AND BLOCKING UNDER EACH GUNWALE

Move 1000-Ton Barge a Mile in 60 Days on High Blocking

A ONE-THOUSAND-TON barge that had been beached in a heavy gale was recently raised and moved one mile across rough ground and two swamps on two lines of rollers by a Seattle contractor. The barge, which grounded seven miles south of Copalis, Wash., on Mar. 20 last, was in use in hauling supplies for the Government railway in Alaska, by the Columbia Barge Co., of Seattle. It could not be pulled off or launched where it lay, because of the surf; hence, the necessity for moving it to a bay where it could be launched again in sheltered water.

The work was begun by placing 200 jacks under the barge, which weighed 1000 tons, and raising it so that shoes, blockings and rollers could be placed under each gunwale. Twenty shoes carrying the barge on transverse timbers were used. The 8-in. oak rollers under the shoes rolled on 10 x 12-in. track timbers, resting on a line of cribbing under each side of the barge. The barge was pulled straight ahead, turned toward the bay after it had traveled two or three lengths, and carried straight across the peninsula. Power for pulling was furnished by the donkey aboard the barge, about 2000 ft. of 1½-in. rope being used in the tackle. Cuts had to be made at a number of places, and at others the blocking at times was as high as 10 ft. from the ground. One swamp 500 ft. wide and another 200 ft. across were traversed during the trip. It took exactly 60 days to



MANY CUTS FOR THE TRACK TIMBER HAD TO BE MADE. AT POINTS CRIBBING 10 FEET HIGH WAS USED

move the barge and launch it in the bay on the opposite side of the peninsula. The work was done by Curtis Brothers, of Seattle.

Turn Touring Car Into Traveling Compressor for Cement Gun

THE photograph below shows a pleasure car converted into a portable compressor unit and used by the Reid-Waples Co., of Philadelphia, for operating a cement gun. The unit, which is said by this contracting company to be the most efficient portable compressor that it has ever had, consists of a Pierce-Arrow chassis with the original six-cylinder motor, the original transmission and a two-cylinder air compressor. It was built under the supervision of the company's men after searching the market for a portable compressor unit suitable to its business. The original clutch is retained, which allows the motor to run free from the compressor. When air is desired, the clutch pedal is thrown out and the original gear shift brought into play, which permits using three speeds of the engine in compressing air and increases the efficiency of the unit according to the demands made by the extent and character of the work under way.



COMPRESSOR DRIVEN BY AUTOMOBILE ENGINE STATED TO BE MOST EFFICIENT PORTABLE AIR UNIT

Dumping Trestle on Rollers Keeps Teams Hauling Tunnel Spoil on Move

BY MOUNTING a dumping trestle, 160 ft. long, on house rollers, teams hauling spoil from the shafts of a sewer tunnel lose no time at the dump end of the trip. The work is at Evanston, Ill., for the Sanitary District of Chicago. Up to 300 loads are hauled in a night of 16 hours, with an average of 200 loads. Much of the spoil, used as fill along the lake front, is of slippery clay, miry when wet, but the trestle rests on leveled material after it has settled, paralleling the shore line.

The trestle consist of two inclines, 75 and 60 ft. long for the upgrade and downgrade respectively, and a 25-ft. level section 9½ ft. above the ground surface. It is made up of 5-ft. bents with all members (hard maple) bolted together so that the 14,500 ft. of timber may be salvaged. The lower chord is an 8 x 12-in. timber, and the uprights are 4 x 6 in., suitably braced. The dump wagons discharge through a trap above a metal-lined chute at right angles to the trestle.

This chute is lubricated evenly by water from a perforated 1¼-in. pipe. A hose was used at first, but did not furnish enough water or an even supply. When the material has piled up against the chute, two men in 10 min. move it 10 ft. forward (along the shore) by means of a winch and four-part tackle with cable attached to a deadman.

Along the lake side for 30 ft. down each incline and for the level portion, a blind of 1-in. boards 5 ft. high was built so that the horses would not become frightened in the event that spray from high seas reached the structure.

Tony Ziegenfelder, superintendent for George W. Jackson, in charge of the work for the Nash-Dowdle Co., built the trestle in five days with the aid of four carpenters and one laborer.

Get at Lost Drill 60 Feet Down by Burning Rope Out of the Way



BURNING OFF ROPE FROM LOST DRILL BIT

A NOVEL method of recovering a lost drill stem is reported by H. S. Carpenter, of Billmyer, Penn. During operation the drill rope broke when the stem was about 60 ft. down, and a loose flat stone apparently fell right on top of the coiled rope and prevented reaching it with a spear in the usual manner. Kerosene was then poured into the hole, and a piece of ½-in. pipe, attached to the air line, was lowered over the rope as shown in the sketch. A piece of waste was then ignited, dropped down the hole and the air turned on. The accelerated flame soon burned off the rope, and the stone slipped down beside the stem, permitting the easy recovery of the bit with the usual fishing tools.

Autos and Motor Trucks Outnumber Horses

The daily travel on the 14 roads leading into Milwaukee has been counted, from April to November, and the results show that the automobile has supplanted horses on all but two of these thoroughfares. Taking all the roads together, the average daily travel comprised 7372 automobiles, 740 motor trucks and 4334 teams, a total of 12,446 vehicles.



WAGONS DUMP INTO SLUICEWAY AT [illegible]

NEWS OF THE WEEK

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

Los Angeles Will Permit Use of Concrete Sewer Pipe

Outcome of Protracted Struggle Between Vitrified Clay and Cement Interests

EDITORIAL CORRESPONDENCE

The Council of the City of Los Angeles, Calif., has just adopted specifications for the construction of sanitary sewers within the city which permit the use of concrete sewer pipe. The specifications require the pipe to be mechanically tamped and fed, the aggregates to be carefully selected and graded, and proportioned one part of cement to three of aggregates. The tests require 15 lb. hydrostatic pressure held for 5 min. without percolation, a 30-lb. fracture test and a 5% absorption test. These tests are similar to but more severe than those recommended this year by Committee "C4" of the American Society for Testing Materials. There are no provisions in the specifications for hydrostatic or absorption tests for the vitrified pipe.

The adoption of these specifications is the outcome of a protracted controversy between the vitrified clay products interests in the city and the manufacturers of cement pipe. The Board of Public Works adopted these specifications over a year ago and they were transmitted to the city engineer for his approval. The Board of Public Works held public hearings at which testimony was received as to the quality and durability of cement pipe for use in sewers. The matter dragged on with no definite action until finally it was brought to a climax by appeal to the Council. The city engineer submitted a report strongly condemning the use of cement pipe for sewer purposes. The Efficiency Commission of the city advocated its use, and the Board of Public Works, while nominally approving it, was more or less noncommittal. The City Council then reviewed the whole case and finally adopted the specifications.

Emergency Fleet Corporation Buys First Lot of Lumber

The Emergency Fleet Corporation has purchased its first installment of 10,000,000 ft. of lumber under its contract with the Coos Bay Lumber Company.

This contract provided for the sale of 30 units of fir timber for vessels of the Ferris type, the lumber to be delivered on the dock at Marshfield, Ore., for $30 per thousand. There was a 40-mile rail haul behind the final delivery of the lumber.

To Command Tenth Reserve Engineer Regiment



LIEUT. COL. JAMES A. WOODRUFF

THE "forest regiment," designated the Tenth Reserve Engineers by the War Department, will convert available timber behind the battle lines in France into the railroad ties, trench timbers, mine props, bridge timbers, lumber and cordwood needed in the military operations of the British army. The work may, it is stated, fall within the danger zone and will be done largely in sprout forests of oak, beech, hornbeam and other hardwoods, with some stands of pine. The timber is small in comparison with most American forests, much of it being from 8 to 12 in. in diameter. These forests resemble the woodlots of southern New England, and the operations will be similar to portable sawmill logging and tie cutting in Massachusetts, Connecticut, Maryland and Virginia.

Railroad Will Begin $500,000 Water Terminal at Mobile

A $500,000 first unit for a water terminal for the Gulf, Mobile & Northern R.R. at Mobile, Ala., will be started soon. The unit will consist of a pier and slip large enough for several ships, and a series of warehouses. In all, there is to be 4000 lin.ft. of berthing space and 2000 lin.ft. of warehouses, some of which will be five or six stories high. Another unit to double the capacity of the terminal and also 2000 lin.ft. of lumber docks are contemplated.

United Engineering Council To Aid Government

Joint Committee Appointed from Civil, Mining, Mechanical and Electrical Groups

To aid the Government to get engineers and to utilize to the fullest the ability of its members, the United Engineering Society has appointed a council of twenty-four engineers. The society, which includes the American Society of Civil Engineers, the American Institute of Mining Engineers, the American Society of Mechanical Engineers and the American Institute of Electrical Engineers, made this announcement June 29. The personnel of the council is:

Civil — J. F. Stevens, George F. Swain, F. H. Newell, Alexander C. Humphreys, F. D. Galloway.

Mining—S. J. Jennings, B. B. Lawrence, J. Park Channing, Edwin Ludlow.

Mechanical—I. N. Hollis, Charles Whiting Baker, John H. Barr, A. M. Greene, Jr., D. S. Jacobus.

Electrical—H. W. Buck, E. W. Rice, N. A. Carle, P. Junkersfeld, C. E. Skinner.

United Society—Clemens Herschel, B. B. Thayer, I. E. Moultrop, Calvert Townley.

The Government was notified of the creation of the committee, and H. W. Buck, A. M. Greene, Jr., and Edmund B. Kirky were appointed to find the best method of coöperation.

All Construction Records Broken at Rantoul Flying Field

Howard E. Coffin, chairman of the Aircraft Production Board, on returning from an inspection tour of the aviation training fields, said:

"The construction work on Chanute Field at Rantoul, Illinois, has broken all records. A half-million dollars' worth of buildings have been put up practically within a month. They form a village a mile long, and the speed with which they have virtually sprung out of the ground has been deeply impressive. A few weeks ago the big mile-square space was simply a collection of cornfields.

"The explanation for the speed with which the work has been done is the spirit which has filled the men engaged in it. Union men and nonunion men are working side by side in the effort to advance the national interest. There are 2000 men on the job, and there has not been a disagreement or row of any kind since it started."

Building Restrictions for Portland Under Study

Code with Use and Height Limitations Being Considered by Council and Engineers

EDITORIAL CORRESPONDENCE

The City Council of Portland is holding a series of public hearings upon a new building code, which has been prepared by the committee appointed by the Council some two years ago. This suggested code is very complete and explicit in its provisions, and while it has aroused some opposition from realty and material interests, the general opinion among local architects and engineers is that it should be adopted with very few alterations.

Coincident with the completion of this code there is a renewal of interest in the subject of city zoning and the limitation of building heights and occupancy. On the evening of June 28, the Oregon Society of Engineers held a meeting which was addressed by a number of architects and others. The reports of New York and other city commissions who have reported on the subject were reviewed. It was pointed out that Portland was particularly in need of measures limiting heights of buildings, on account of local conditions, the narrow streets and the prevalence of cloudy weather.

Some four years ago Portland received the report of a city-planning committee. This committee had prepared plans and drawings of an elaborately ideal city arrangement with civic and industrial centers, parkways and boulevards. The plan involved an excessive expenditure, and there have been only scattering attempts to carry out any of its features. In contrast the present proposed zoning of the city is very practical. The limitation of building heights has been a success elsewhere, and aside from those adversely affected receives little opposition. The limitation of occupancy and restriction of certain industries to definite zones has been adjudicated in other places, notably Los Angeles, where a Supreme Court decision made restriction of occupancy permissible under the police powers inherent in the city government.

Friendly Suit Clears Oregon Road Bond Question

In an opinion written by Justice Moore, the Supreme Court of Oregon held that the Board of Control is legally authorized to issue bonds under the Bean-Barrett law, to match Federal appropriations for highway construction, and issued a writ of mandamus commanding it to issue the bonds, totaling $491,967.11, to match a like sum now available from the Government.

The decision was the result of a friendly mandamus proceeding instituted by the State Highway Commission against the Board of Control, to compel the latter to issue bonds.

Stops Ship Building Information

As a war measure, the Government has found it necessary to adopt the policy of discouraging, in every reasonable way, the publication and dissemination of information in regard to merchant-marine ship construction that might aid or influence the military plans of the enemy, in the present emergency.

To conform to this policy, the United States Shipping Board Emergency Fleet Corporation hereafter will not be able to give out for publication, or other use, any information relating to the number, size and character of vessels under contract, the place where they are being built and by whom, and the percentage of completion, date of final completion, etc.

Mississippi River Dam at St. Paul Is Formally Opened

The St. Paul-Minneapolis lock, Mississippi River Dam No. 1, was formally opened July 3 by the passage of the Government boat "Dandelion" through the lock with a party of officials and citizens of the two cities, guests of Col. Edward H. Schulz, United States Engineers, under whom the project was completed. The lock has a lift of 30 ft. and, until such time as additional operating machinery is installed, the lock will be operated between 8 a.m. and 4 p.m. for boats not exceeding 36-ft. beam, although the lock is designed for boats of 78-ft. beam.

Municipal Improvements Convention Postponed for War Reasons

At the last meeting of the executive committee of the American Society for Municipal Improvements, it was decided to postpone for perhaps a year the convention which had been scheduled for Nov. 12 to 16, this year, in New Orleans. So many of the members of the society have enlisted in the army that it was felt that not only would the attendance be small, but that the unusual burdens which those remaining at their work would have to carry would make a good attendance at the convention extremely improbable.

Offer Business Men Assistance in Choosing Technical Advisers

Having made a success of the service clearing-house department, which is of help to the engineer primarily, the American Association of Engineers now proposes to establish a similar service to furnish business men with information concerning consulting engineers. A register, free to the public, is to be maintained of civil, electrical, mechanical, paving, sanitary, chemical, appraisal, public-utility, ceramic and irrigation engineers.

National Guard Cantonments Soon Under Way

Tented Cities as Carefully Considered as More Permanent Camps—All But Two Are Located

Steps are now being taken to build 16 cities of tents to receive the National Guardsmen who will be called to the colors soon. It will not take so long to make them ready for the troops, and for this reason the work on them has been held back until the wooden cities were planned and put under contract. The location of two of them has not yet been fixed, but it is expected that a decision will be reached in a few days. The sites already determined are: Fort Worth, Tex.; Fort Sill, Okla.; Deming, N. M.; Waco, Tex.; Houston, Tex.; Linda Vista, Calif.; Greenville, S. C.; Augusta, Ga.; Macon, Ga.; Montgomery, Ala.; Anniston, Ala.; Fayetteville, N. C.; Palo Alto, Calif., and Spartanburg, S. C.

SIMILAR TO WOODEN CAMPS

These camps will be laid out to accommodate approximately 35,000 men in each, and possibly as many as 10,000 horses and mules. They will be built by the same methods that are followed in the case of the wooden camps and under the direction of the same officer, Col. I. W. Littell, of the Quartermaster Corps, who must construct the water and sewerage works and erect wooden kitchens, mess halls, hospitals, storehouses and many other structures for which tents are undesirable. Fortunately, the task will be somewhat simplified by the fact that the designs prepared for the National Army camps can be used for the National Guard camps.

A number of the leading specialists of the country have been coöperating in the general plans for the sanitary and water-supply features, which will be in every respect the equal of those for the National Army cantonments.

Littell Explains Method of Paying Cantonment Contractors

Col. I. W. Littell, Quartermaster Corps, who is in charge of cantonment construction, in a letter sent to the General Munitions Board in reply to reported delays between the forwarding of invoices for materials shipped on Government order and the date of payment therefor, states:

"It is the intention of the cantonment division to pay contractors for the National Army cantonments daily, covering material inspected and accepted and to which the United States takes title; weekly, for the purpose of their payrolls; and monthly, on the ninth of the month, for all other bills not settled for in the daily payments.

"Under this very liberal provision it is not understood how there can be much delay in payments or that it will necessitate contractors on this work securing financial assistance due to delay in payment."

FORT DOUGLAS—FIRST REGULAR ARMY CANTONMENT TO



ACCEPTED BY THE GOVERNMENT JUNE 26, HAVING BEEN MADE

Commissions Signed for Officers of First Illinois Engineers

Engineers heading the First Regiment, Illinois Engineers, National Guard, have been informed that commissions as follows have been signed:

Colonel, Henry A. Allen; lieutenant colonel, Gordon Strong; captains, Walter Henry Allen, B. C. Allen, Dwight Guilfoil, Jay A. Rossiter, Walter Roth; senior first lieutenants, Ralph C. Harris, John J. O'Connor, Al H. Sheffield, John K. Thompson; junior first lieutenants, F. H. Cobb, H. L. Laughlin, L. J. Hughes, Harry L. Hudson; second lieutenants, John H. Jacobsen, D. A. Tomlinson, C. A. Waterhouse, Walter H. Wood.

Chattanooga Soon To Have Electro-Metallurgical Plant

Actual manufacture of ferro-alloys will probably begin in October at the old plant of the Southern Steel Works in Chattanooga, which has been taken over by the Southern Ferro-Alloy Co. Hydro-electric power will be obtained from the Tennessee Power Co., 3000 hp. having been contracted for. The first product of the new company will probably be ferro-silicon, 50% or higher. The plant of the old steel company is fairly well adapted to the new purpose, but three months will be necessary for its remodeling and for the installation of machinery, which was designed by the Fitz-Gerald Laboratories, of Niagara Falls, New York.

Give Summer Course in Concrete at University of Chicago

Although the University of Chicago gives no engineering courses, it has seen fit to put on a course of lectures on concrete, open without charge to all interested. They are given by engineers and teachers familiar with the industry. Some of the subjects are as follows: Materials, proportioning, molds, reinforcing principles, calculations, surfaces and curing. The course ends July 23.

Stevens Reports on Railroads to Russian Government

M. Stephanoff, temporary Minister of Trade and Industry of the new Russian republic, on July 4 received John F. Stevens and the other members of the American Railroad Commission. The commission later issued a report of the result of its inspection of the Russian railroads, together with recommendations for reforms. It declares that the commission considers that Russian railroads have an excellent technical personnel, and that many roads have a good practical system of management. The first necessary reform affects the traffic system and involves the employment of more powerful locomotives and of freight cars of larger carrying capacity.

Workshops Must Be Built

The construction of workshops at Vladivostok for the putting together of locomotives imported from the United States is necessary and in all repair shops work must continue uninterruptedly 24 hours a day, thus enabling a reduction in the percentage of locomotives out of use.

Chairman Stevens sent a cablegram to Washington, requesting that the construction of locomotives and cars be undertaken at once. The order, it is said, will require the increase of America's credit to Russia by $375,000,000. In giving this order the commission was guided by the desire to afford Russia all possible support in the common cause. The commission is still engaged in considering the question of the supply of raw material, rails and machinery for the Russian roads.

Form Russian Society of Engineers

A Russian Society of Engineers has been formed in Chicago to furnish information to the many engineers going to Russia at the present time and to assist in picking out engineers who are to be sent there to aid in handling the many problems of the war.

Aviation Activities at Dayton

The new 3300-acre aviation field at Dayton is near the old Wright brothers camp, where so many Canadian flyers were trained. H. C. Wright, city water superintendent, is putting in two 400-gal.-per-min. triplex well pumps in stations 3500 ft. apart, connected by 5 miles of 6- and 8-in. cast-iron pipe. Over a mile of pipe has been laid, at a cost to date of less than 7c. per ft. An Austin trencher and eight men constitute the crew. The camp will have 24 hangars, each to house eight airplanes, and the accompanying barracks, shops, steam-heating plants, etc. It is expected that 1,000,000 yd. of earth will have been moved in the grading operations by Sept. 1. A gravel pit for concrete for the hangar floors has been opened in a standing wheatfield. Capt. C. J. Warring is the officer in charge, and S. S. King, of Dayton, is the contractor.

Engineers' Club Building Under Way

Other activities in Dayton, which a representative of *Engineering News-Record* found in a day's tour of the city, are as follows: The brick walls of the new engineers' club building are rising rapidly. In Dayton View, Durax paving is being laid on a 7% grade, and downtown on Third St. 20,000 yd. will soon be down. City Manager Waite says the street intersections paved two years ago, when the American Society of Municipal Improvements met in Dayton, have shown no appreciable wear. The city expects to do as much paving as in former years, but is finding some difficulty in getting bids. The low municipal dam, to make slack water for a city recreation park, was submerged in a recent mild flood, but is about half completed.

Water-works extensions for 1917, as outlined in a report made by Leonard Metcalf in April, include a 10,000,000-gal. centrifugal emergency pump at Tate's Hill, which has not yet been ordered, and 1500 tons of cast-iron mains already contracted for. The Domestic Engineering Co. has turned over its newly completed factory buildings.

BE COMPLETED IS PROTOTYPE OF NATIONAL ARMY CITIES



READY FOR OCCUPANCY 26 DAYS AFTER THE CONTRACT WAS LET

Commission To Purchase Material for Rebuilding France

The French *Journal Officiel* has published an order of the Minister of the Interior, constituting a committee of 15 members, to be known as the "Commission Consultative des Marchés et des Stocks," the duty of which will be to study administrative and technical questions in reference to contracts for purchasing stocks of provisional houses and materials for provisional and final reconstruction work in invaded districts of France. The committee will also take charge of and oversee stocks of houses and material furnished. Monsieur Ogier, Conseiller d'Etat, Directeur du Contrôle et de la Comptabilité, Ministère de l'Intérieur, Paris, has been named president of the committee.

California Commission To Consider Los Angeles Union Terminal

A union passenger and freight railroad terminal in Los Angeles will be considered by the California Railroad Commission on July 24. The Supreme Court of the state recently gave the commission undisputed jurisdiction over railroad crossings, both within and without incorporated municipalities. This jurisdiction had been opposed by the Los Angeles city attorney, who claimed that while the commission had complete authority over union terminals in Los Angeles it did not have control of grade crossings within that city.

The decision has eliminated the opposition, and the commission has promptly laid plans for complete investigation of the demands which are being made for the consolidation of Los Angeles railroad terminals. The case carries with it both freight and passenger service, includes all steam roads entering Los Angeles, and the question of how crossings shall be protected throughout the city. The commission is asked to require the railroad companies to build a union terminal and to reconstruct their tracks running to and from the terminal so as to eliminate grade crossings, which are the cause of death and injury.

Must Reinstate Boston Engineers Decapitated in 1916

The full bench of the Supreme Court of Massachusetts has upheld the lower court in declaring that the attempt made on Jan. 22, 1916, to abolish a number of offices in the Public Works Department of Boston was an evasion of the law and that the men must be reinstated. The decision was rendered on an appeal by Edward F. Murphy, commissioner of public works of Boston, against the order of the lower court for the reinstatement of Frank A. McInness, division engineer of sewer and water service; Bliss W. Robinson, superintendent of main drainage, and Storrs L. Durkee, supervisor of permits. These and 14 other men in the same department were decapitated under the guise of abolishing various offices. The three men named brought action for reinstatement. They were backed by a number of the leading engineers of Boston, including F. P. Stearns. The decision just rendered deals almost wholly with various technical points. It concludes as follows: "Because the findings of fact are conclusive and final, no question of law is before us and the exceptions must be overruled."

The names, positions and salaries of the 17 decapitated men were published in *Engineering News* of Jan. 27, 1916, page 291, and editorial comment appeared on page 193 of the same issue.

Navy Camp Contracts Let

The Bureau of Yards and Docks, Navy Department, on July 3 awarded contracts for construction work on the training camp at the Hampton Roads naval base, as follows:

John B. Wilson, Richmond, Va., and Carolina Wood Products Co., Asheville, N. C., camp for 5000 men, each contractor to build half of the camp; Richardson Co., Norfolk, Va., reconstruction of buildings now on properties; Newport Engineering and Contracting Co., Newport News, Va., building of the hospital.

Dallas Has Good Construction Program Under Way

Actual and contemplated construction in Dallas, Tex., includes several large undertakings. After long negotiations with the Texas & Pacific Ry., tracks on one of the principal downtown streets will shortly be removed and a large industrial district created. The Missouri, Kansas & Texas Ry. grade-elimination work is nearing realization.

In the building line the foundations for the $1,000,000 structure for the American Exchange National Bank are under way. Eight stories are being added to the Chamber of Commerce Building. Butler Brothers are doubling their capacity and the work will shortly be completed. The Adolphus Hotel is adding a 12-story annex, and the Morten Investment Co. is erecting a 10-story hotel near the recently completed Union Terminal Station.

Shortly $2,000,000 will be spent on the Dallas Street Railway and Light Co., and one interurban will be built, either from Dallas to Terrell or to Greenville.

Assessment for Street Paving Need Not Be Uniform

The Minnesota Supreme Court has upheld the city in its plan of assessment for Marshall Ave., Minneapolis, paving. A portion of the street has a street-car line on it, and the company paved the part of the street occupied by its tracks. The property owners along the car line were assessed $5.50 a front foot and, where there was no car line, $8.20 a front foot for creosoted wood block, all put in under one order. The property owners paying the higher rate brought suit, maintaining that the assessment should be uniform along the entire length of the street. Quoting from the decision: "Street-car tracks and the operation of cars circumscribe the use of the street. The situation is much the same in principle as it would be if one portion of the street between curbs were wider than another." The street railway company paved its part of the street.

Chicago Street and Sewer Construction Is Normal

Report Indicates Usual Amount of Municipal Improvements Is Under Way

Contractors on municipal work in Chicago have taken at least the usual amount of work. Thirty-two sewer contracts aggregating $79,000 have been let for prices about 20% higher than two years ago, but the work is going ahead. Forty-four more, involving $203,000, are ready to let. This is the beginning. It is normal in amount; last year totaled 200 jobs and $1,600,000. Normally the Board of Local Improvements allows 20% for profit and discounting of paper. At present the engineers are adding approximately 10% additional

LET CONTRACTS BY SPECIAL EXPEDIENTS

They are not finding it easy to let contracts and are using several expedients. For instance, contracts are being grouped in districts and by classes of excavation encountered, such as sand, rock, clay and machine work, so that the contractor will save moving expense. For the next letting fourteen smaller jobs have been so grouped. Then designs are being amended carefully to eliminate anything not absolutely necessary. The labor situation is not so serious as it might be. Trenchmen are being recruited from the ranks of the hod carriers, cellar excavators, etc., the excavators' unions controlling all of these men and permitting the switch to the conduit work.

The most reassuring fact is that new work is being planned as usual. Last week a $535,000 system known as the Augusta Street system, was put into Council and should come to the contract stage by fall or early next spring. The $500,000 Crawford Avenue sewer may be out of the courts with good luck and ready for letting within a month. Surveys are going ahead on the widening of Ogden Avenue, a proposed diagonal 90-ft. driveway from the North to the West Side, 2 miles long, through built-up territory, from Lincoln Park to Randolph Street. The immense double-deck boulevard link project over the river, so long held up in the courts, is expected to be out within 60 days. The engineers are confident contracts on foundations can be let by early fall.

City bridge work is progressing satisfactorily. At Wells St. and Franklin-Orleans, the contractors are assembling material on the ground.

Small water-pipe extensions will be curtailed on account of the cessation of small building. It will probably reach 70 miles however. This pipe is laid by day labor and the pipe, 10,000 tons of small and 5000 of large, was purchased last year at $35. The department expects this supply to be sufficient for the season and little of the larger sizes will be laid.

No diminution is expected in the regular $5,000,000 to $6,000,000 paving schedule. Nearly 200 contracts have already been let at eight lettings aggregating $3,300,000 and work on the 55 miles of "left over" from last season is being pushed.

The contracts for 19 miles of asphaltic concrete on a concrete base on Higgins Road in Cook County will probably be executed with the Commonwealth Improvement Co. by the time this is printed. The company has placed a subcontract for Koppel equipment for 8½ miles of narrow-gage railroad and necessary dump cars for handling aggregate.

The Illinois Central Railroad Co. last week called for bids on the reconstruction of eight grade crossings in Hyde Park, aggregating about $500,000. Work by Bates & Rogers on five in Woodlawn is 80% done. Bids were asked of Chicago contractors last week on a dam in Franklin County by the U. S. Fuel Co., subsidiary of the U. S. Steel Corporation.

Work is progressing at full pressure on the Pennsylvania freight station, two Montgomery-Ward buildings, the Field Museum, several skyscrapers in the Loop, additions to the Inland Steel Co. plant, and the huge new development by the Mark Manufacturing Co. at Indiana Harbor, in addition to numerous smaller industrial plants in the city and lake towns to the south.

Pacific Coast Fuel-Oil Situation Becomes Critical

At a hearing before the California Railroad Commission in San Francisco, W. R. Scott, general manager of the Southern Pacific R.R., stated that trains would have to be discontinued on the Southern Pacific lines within 30 to 90 days unless the oil situation is speedily relieved. The railroad company is applying for a 15% increase in interstate freight rates, and in connection with the increased price of oil from 70c. last year to $1.50 at present, it was brought out that the Southern Pacific R.R. consumes about 44,000 bbl. per day. Of this amount about 26,000 bbl. are furnished by the Kern Trading and Oil Co., a subsidiary corporation, and the remainder has to be purchased in the open market.

FAIL TO LOCATE COAL SUPPLY

Mr. Scott said that the Southern Pacific had endeavored to meet the oil shortage by searching for coal supplies, with the idea of converting one or more divisions from oil to coal, but that the company had failed to locate any coal supply sufficient to warrant consideration on this basis.

With regard to the reserve supply of oil held by the company, Mr. Scott said: "Ninety days is the maximum time which the Southern Pacific can continue to handle its business under present conditions. At the rate we are drawing on the oil storage at present, it will be exhausted in 60 days unless we can buy more than heretofore in the open market."

ENGINEERING SOCIETIES

The Engineers Club of Seattle was addressed by R. M. Dyer, president of the Pacific Northwest Society of Engineers, on June 28. The subject of Mr. Dyer's talk was "Wooden-Ship Construction."

The Oregon Society of Engineers, Portland, Ore., discussed the enactment of "zoning ordinances" at a recent meeting.

The Albany Society of Civil Engineers held its annual outing Saturday afternoon, July 7, inspecting the plant of the Rensselaer Quarry Co., at Brainard, New York.

The Engineers Club of San Francisco was addressed by Lieut. J. B. Howell, U. S. N., retired, on "Submarines" at its weekly luncheon talk, June 21.

The Connecticut Society of Civil Engineers will meet at Charter Oak Hall, New Haven, Conn., co-jointly with the local members of the American Society of Civil Engineers. Charles A. Ellis, professor of structural engineering at the University of Illinois, will deliver an illustrated talk on the Quebec Bridge.

PERSONAL NOTES

S. U. HOOPER has been appointed assistant superintendent of the Toledo division of the Cincinnati, Hamilton & Dayton Ry., with headquarters at Toledo, Ohio, succeeding E. W. HOFFMAN, promoted.

JOHN MEEHAN, Burlington, Wash., has been appointed engineer of that city.

GEORGE GERHARD has been appointed city engineer of Anacortes, Washington.

LEE F. DILLON has received a leave of absence from his position as inspector in the bridge department of the Illinois Central Railway Co. and has been certified for a commission as second lieutenant in the Engineer Reserve Corps, now stationed at Fort Leavenworth, Kansas.

ROBERT F. OLDS has resigned from his position with the Austin Co., Philadelphia, and is now superintendent of construction, United States Engineer Corps, in the Wilmington, Del., office.

S. G. SWIGART, consulting civil and hydraulic engineer, has reopened an office in Akron, Ohio, having closed his office in Missoula, Mont. Mr. Swigart was connected with railroad and municipal work in Ohio and California in 1890. As consulting engineer in

Akron, Ohio, he located and built several of the early suburban electric railroads in that vicinity. From 1897 to 1901 he was in private practice in Cleveland, Ohio, mainly on suburban and interurban railroad location and construction, sewage construction and sewage-disposal works. In 1907 Mr. Swigart engaged in consulting practice at Fort Collins, Colo., during which time he designed and supervised the construction of several irrigation projects, including the Halligan dam, and from 1912 to 1916 he was irrigation manager of the Flathead project, United States Reclamation Service, with headquarters at St. Ignatius, Montana.

RAYMOND MATTHEW, for the past six months assistant engineer in the office of CHARLES H. LEE, consulting engineer, Los Angeles, Calif., has accepted the position of assistant engineer with the Idaho Irrigation Co., Richfield, Idaho.

E. S. BORGQUIST, who for the past two years has been with the United States Reclamation Service on the Strawberry Dam project, and who for the four years before that was with the Utah State Engineering Department, has been appointed water commissioner by the United States court to have jurisdiction over the irrigation system of the Lake Fork and Umpah Rivers in the Umpah Basin district. The district comprises an area of 100,000 acres of irrigated land, and its affairs are now in court, the United States Indian Service being the plaintiff.

FARLEY GANNETT, of Gannett, Seelye & Fleming, consulting engineers, Harrisburg, Penn., has been appointed an arbitrator to set the value of the Huntingdon Water Supply Co. plant and property. This company supplies the City of Huntingdon, Penn., and the value of the property is to be set by a board of five, at least two of whom must be engineers, for the purpose of determining the price at which the municipality shall purchase the property. THEODORE E. SEELYE, one of Mr. Gannett's partners, was on June 13 commissioned a captain of engineers, United States Army Reserve Corps.

SAMUEL LINDSEY NICHOLSON, who has been sales manager of the Westinghouse Electric and Manufacturing Co. since 1909, has been promoted to the position of assistant to the vice president, with headquarters at East Pittsburgh, Pennsylvania.

ARTHUR B. MCGEE has resigned as instructor in mathematics and surveying at Throop College of Technology, Pasadena, Calif., to take a position in the division engineer's office, Pittsburgh division, Pennsylvania Railroad Co., with headquarters at Pittsburgh.

CHARLES CARROLL BROWN has severed his editorial and business connection with *Municipal Engineering*. Mr. Brown began writing for the Question Department of that journal and also occasional articles in 1896, extending his work until in 1901 he took charge of the editorial department. Having acquired an interest in the company, he became vice president and treasurer of the Engineering Publishing Co., successor to the Municipal Engineering Co. For a time Mr. Brown was general manager of the new company.

E. W. SAWYER is now engaged in general contracting at No. 3 Gerard Road, Harrow, London, England, devoting his time to the design and manufacture of various war equipment for the allied governments. Mr. Sawyer gained much of his experience on Western American railroads and was for some time construction engineer for the Federal Telegraph Co., of San Francisco, and in that connection constructed several important radio stations on the Pacific Coast. He was in charge of the Canadian interests of the Universal Radio Syndicate, Ltd., of London, in 1913, and at that time built the transatlantic radio station at Newcastle, N. B., remaining as manager of that property until his departure for London in 1916.

WALTER W. MARR has been reappointed chief highway engineer of the Illinois State Highway Department as reorganized under the new civil administrative code.

FRED J. POSTEL, consulting engineer, of Chicago, has been appointed supervising engineer in the new Illinois State Department of Public Works.

WALTER A. SHAW, the engineer member of the Illinois State Public Utilities Commission, retains his position under the reorganization of the civil administrative code, which went into effect July 1. The salaries of the members have been reduced from $10,000 to $7000 per year.

RUDOLPH W. VAN NORDEN, consulting engineer specializing in hydro-electric power-plant design, has removed his offices to the Alaska Commercial Building, San Francisco, California.

THE L. B. STILLWELL ENGINEERING CORPORATION has been recently organized to design and construct steam and hydro-electric, electric, lighting, railway and power plants; electric transmission, electrification of railroads, steel rolling stock, railroad terminals, steam-heating plants and general engineering construction work. The officers of the corporation are: Lewis B. Stillwell, president; H. St. Clair Putnam, vice president and general manager; Hugh Hazelton, vice president; and W. Everitt Rundle, secretary and treasurer. The principal offices of the corporation will be at 100 Broadway, New York City.

T. J. WILKERSON has resigned as division engineer of the Department of Public Works, City of Pittsburgh, to accept the position of chief engineer with the Penn Bridge Co., of Beaver Falls, Penn. Since his graduation from Missouri State University in 1890, Mr. Wilkerson has been with several companies in designing, detailing and contracting for bridges, finally going with the Carnegie Steel Co., with which concern he remained until it was taken over by the American Bridge Co. In 1909 he was appoined assistant engineer and then in 1912 division engineer of the Department of Public Works, Pittsburgh, being in charge of designing, constructing and maintenance of all city bridges.

COL. W. H. HEUER, for many years a member of the California Débris Commission, in charge of rivers and harbors on the Pacific Coast, has been appointed division engineer for the War Department in California. Colonel Heuer had retired from Government service to engage in private practice in 1907, but again offered his services to the Government at the outbreak of the war.

HARRY W. KENNEY, who has been designing and estimating railroad structures for the Baltimore & Ohio R.R., has accepted a position with the Bureau of Yards and Docks, Navy Department, Washington, as draftsman on the design of structures pertaining to navy yards.

HARRY F. HARRIS, who for the past six months has been engineer of Mercer County, New Jersey, has resigned from this position to engage in private practice.

PERCY CUPPER, assistant state engineer of Oregon, has been made secretary of the Desert Land Board to succeed JOSEPH MCALISTER, who recently resigned to join the engineer regiment in camp at American Lake, Wash. Mr. Cupper will continue as assistant state engineer.

T. J. WRIGHT, until recently engineer of Benton County, Washington, has resigned and has opened offices in Seattle to engage in general consulting engineering.

W. D. CLARKE, formerly with the State Highway Commission of Oregon, has been named by the Public Service Commission to succeed E. E. MORELAND, resigned, as railway engineer for the commission.

WILLIAM CAMPBELL, professor of metallurgy, Columbia University, New York, is now serving as consulting metallographer at the New York navy yard.

NEIL W. FRENCH, formerly in charge of design and engineering for the Standard Reinforced Concrete Co., of Indianapolis, has recently taken charge of the same line of work for the Farris Bridge Co., of Charleston, West Virginia.

O. M. BUTLER, assistant district forester of the United States Forest Service, Albuquerque, N. M., has been appointed assistant director of the Forest Products Laboratory, Madison, Wis., and has assumed his new duties. Mr. Butler has been engaged in forest service work for ten years, principally in the West, where he was at different

times assistant forester in various districts.

FRANK E. WILMOT, who has been connected with the Bureau of Lands, Manila, P. I., as chief of survey, has entered the services of the National Coal Co. as assistant to the chief engineer and will leave Manila in charge of a party to make explorations and preliminary surveys for a railroad, wharves and coal lands in the Southern Islands of the Philippine group.

OBITUARY

PROF. HERBERT L. WARREN, head of the department of architecture, Harvard University, died suddenly June 27, at the age of 60 years. Professor Warren was born in Manchester, England, and studied at Owens College there and later at the Massachusetts Institute of Technology, joining the Harvard faculty in 1893. From 1886 to 1887 he was on the staff of the *Sanitary Engineer*, the predecessor of the *Engineering Record*. At the time of his death Professor Warren was a member of the firm of Warren & Smith. As a fellow of the American Institute of Architects, of which he was a director for three years, and as a member of the American Academy of Arts and Sciences, Professor Warren was much identified with the architectural development of the United States.

ZACHARY TAYLOR HERNDON died at Akron, Ohio, June 25, at the age of 71 years. Fifty years in the practice of his profession, mostly on surveys and construction of railroads, Mr. Herndon served as chief engineer during the building of many roads in the Western and Middle Western States.

R. J. MOSCRIP, civil engineer, died July 1 in Nashville, Tenn., at the age of 74 years. Up to within a few weeks of his death, Mr. Moscrip was actively engaged in his professional work. At various times connected with the Union Pacific and Missouri Pacific R.R., he was chief engineer of the Nashville & Knoxville R.R., now the Tennessee Central.

JUDSON C. CLEMENTS, a member of the Interstate Commerce Commission, died June 18 at his residence in Washington, D. C. Mr. Clements had been connected with the commission for 25 years.

JOSEPH V. KUNZE, vice president of the Pelton Water Wheel Co. and manager of its Atlantic department during the past 24 years, died in Brooklyn on June 27.

GEORGE WISHART CREIGHTON, for over ten years general superintendent of the Eastern Pennsylvania Division of the Pennsylvania R.R., died in Philadelphia June 2. Mr. Creighton entered the service of the Pennsylvania Railroad Co. in 1879 as rodman under Camille F. D'Invilliers, and later held the position of supervisor and superintendent of various divisions and sections of the Pennsylvania R.R. system, in 1899 being made general superintendent of the Philadelphia & Erie division and the North Central Ry. Upon the creation of the Eastern Pennsylvania division in 1907, Mr. Creighton became general superintendent, with headquarters at Altoona, Penn., holding this office until his death.

JOHN M. RUNKLE, for many years a contractor in Seattle, Wash., died in that city June 16. Born in Mercer, Penn., Mr. Runkle came to Washington in 1889.

WILLIAM A. STEVENSON, who has been the active head of the Norwood Engineering Co. since its organization, died June 7 in Florence, Mass., at the age of 57 years.

MELVIN RANDOLPH VAN KEUREN, civil engineer, died at Eatontown, N. J., on June 30, at the age of 62. Mr. Van Keuren studied engineering at Hasbrouck Institute, Jersey City, and completed his course at Cooper Institute, New York. For several years he was assistant in the engineering department of Jersey City. He later became resident engineer for the Pittsburgh, New Castle & Lake Erie R.R. He was afterward chief engineer of the Pittsburgh, Marion & Chicago R.R., and later built the Knoxville & New River R.R., becoming its chief engineer and president.

JAMES WHITFIELD WOOD died at his home in Easton, Penn., June 24, at the age of 72 years. Born in 1845, Mr. Wood was early connected with journalism, but in 1871 became connected with the Delaware Rolling Mills, and in 1873 formed the partnership of Tippett & Wood, boiler makers and iron-work construction, finally developing a business of building water towers, standpipes and tanks for railroads and municipalities. In 1886 Mr. Wood became president of the concern, which position he held until 1903, at that time retiring from active participation in business.

Engineer Officers' Reserve Corps Assignments

The following-named officers of the Engineer Officers' Reserve Corps are assigned to active duty and will comply with the following orders, issued under recent date:

First Lieuts. James W. Maitland, Paul McLoud and William T. Rossell, Jr., are assigned to the First Engineers, National Army, and will report to their regimental commander, Fort Totten, New York.

Second Lieut. John J. Callahan is assigned to the Second Engineers, National Army, and will report to his regimental commander, St. Louis, Missouri.

Capt. William L. Post and First Lieuts. Ernest D. Collamer, David E. Hayes and James H. Hustis, Jr., are assigned to the Fourth Engineers, National Army, and will report to their regimental commander, Boston, Massachusetts.

Capt. Clarence S. Coe and Second Lieuts. Harry G. Halleck and Robert L. James are assigned to the Seventh Engineers, National Army, and will report to their regimental commander, Atlanta, Georgia.

Capts. Clarence R. Rogers and Edward B. Whitman and First Lieuts. Alba B. Johnson, Jr., and William H. Stevens are assigned to the Ninth Engineers, National Army, and will report to their regimental commander, Philadelphia, Pennsylvania.

Second Lieut. Charles G. Brown, Jr., is discharged from his enlistment at the Engineer training camp, Washington Barracks, D. C., and assigned to the Ninth Engineers, National Army. He will proceed to Philadelphia, Penn., and report to his regimental commander.

Second Lieut. Barret Montfort is discharged from his enlistment at the citizens' training camp, Fort Benjamin Harrison, Ind., and assigned to the Sixth Engineers, National Army. He will report to his regimental commander, Washington, District of Columbia.

First Lieut. Schuyler M. Smith is discharged from his enlistment at the engineer training camp, Fort Leavenworth, Kan., and assigned to the Second Engineers, National Army. He will proceed to St. Louis, Mo., and report to his regimental commander.

Capt. Charles L. Joly is assigned to the First Engineers, National Army, and will report to his regimental commander, Fort Totten, New York.

Capt. Charles C. Cragin and Lieuts. Donald E. Rhivers and Walter C. Sadler are assigned to the Eighth Engineers, National Army, and will report to their regimental commander, American Lake, Washington.

First Lieut. Conway R. Howard is assigned to the Seventh Engineers, National Army, and will report to his regimental commander, Atlanta, Georgia.

First Lieut. James S. Hawley is assigned to the Fourth Engineers, National Army, and will report to his regimental commander, Boston, Massachusetts.

Second Lieuts. William E. Haberlaw and James W. Kern, Jr., are assigned to the Third Engineers, National Army, and will report to their regimental commander, Chicago, Illinois.

Capt. Joseph Caccavajo, Engineer Officers' Reserve Corps, is assigned to active duty and will proceed to American University, D. C., and report to the commanding officer, engineer training camp at that place, for duty and instruction.

First Lieut. Lawrence B. Glasgow, Engineer Officers' Reserve Corps, is relieved from his present duties and assigned to the First Regiment of Engineers. He will proceed to Washington Barracks, D. C., and report to his regimental commander.

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Clearing Away Doubts Will Steady Construction

THE week's developments clear away some of the doubts that have tended to block construction. The conflict of opinion on shipbuilding appears to have been settled in the main, with the decision to go into steel ship production on a large scale. This means that most of our plate-rolling capacity will be needed for Government use, and along with it some structural-shape capacity—since special ship shapes, it is rumored, are to be very largely eliminated from the ship designs. At the same time a conference between Government authorities and the heads of the steel industry brought specific assurance that the Government will get all the steel it needs, a fact that really could admit of no doubt. At present, then, we know definitely that private use of steel will be curtailed considerably. The work of engineers will adjust itself accordingly, the more promptly now that doubts are cleared. The big problem remaining is the settlement of prices, on the one hand, and deliveries and priority, on the other. This problem still furnishes ample room for worry.

Narrow Rivers Make Poor Lake Terminals

SMALL rivers emptying into the Great Lakes made splendid shipping ports for the commerce of earlier days, but they do not serve modern shipping efficiently or even safely. Long-standing custom prevents their being abolished summarily. Otherwise they would long since have ceased to be used as ports. Now, millions of dollars are invested along the river wharves. Chicago and Cleveland have made a courageous beginning in developing lake-front terminals. New emphasis is laid on the necessity of modernization by an accident in the Milwaukee River harbor two weeks ago. The overhang of a steamer being towed out through the winding river collided with the supports of an elevated water tank standing close to the wharf line, and the tank falling upon the vessel crushed nearly a score of lives out of existence. The sad occurrence is a solemn and direct warning to Milwaukee that it must proceed at once toward developing a lake-front shipping terminal. Its river is no longer adequate to serve as a harbor and for many years past has been notoriously inadequate. Auxiliary circumstances of the accident, such as the peculiar construction of the steamer involved—the whaleback "Christopher Columbus," with its high and long overhang—and the position of the tank close up to the front of the bulkhead, although the laws prescribe several feet of clearance width, merely emphasize the force of the main teaching that the narrow, crooked rivers of the Great Lakes should be abandoned as ports for large vessels just as speedily as possible. Their usefulness as terminal basins is over.

Cast-Iron Pipe Again to the Front

A LIVELY discussion of cast-iron pipe specifications occupies six pages of this issue. It will appeal to those interested in cast-iron pipe, or in specifications for that and other materials, or in the psychology of committees composed of manufacturers and users of a given material which is to be standardized. The letters beginning on page 109 speak for the various parties in interest. Editorial tailnotes to the letters answer, so far as answer is necessary, various allegations by the pipe manufacturers based on apparent misunderstanding by them of the editorial comment in our issue of May 31, 1917. We did not go into the merits or demerits of the proposed changes in the specifications. We reported and attempted to interpret what happened at the Richmond convention. We deprecated the attempt to block revision and suppress the tentative draft. If we had little to say for the manufacturers' side it was because they said little for themselves at Richmond and because that little was aimed against publicity. Now that the manufacturers come forward with their side of the case we gladly give space to it—and to a rejoinder from the pipe-user or engineer members of the committee.

One Further Step of Progress Needed

IT WOULD be a pity if after six years' committee service, and after representatives of the committees of the American and New England Water-Works Associations had at last got together and blended two "standard" specifications for cast-iron pipe into one, the work should come to naught. This does not mean that the "tentative draft" must be adopted as it stands. The very label it bears presupposes discussion, modification—compromise, if need be. We are optimistic enough to hope that the two elements will get together on a basis of mutual concession; or if that prove impossible then that clear-cut majority and minority re-

ports will be presented, each embracing a single standard specification, common to both associations. If a compromise specification or majority and minority specifications cannot be framed between now and mid-September, the New England Water-Works Association may be forced to a decision on a "deadlock by courtesy" situation. What it will do is an interesting subject for speculation, but one which should not be left to speculation alone. Wise action is imperative.

Grade vs. Distance

THE practical application of railway economics is illustrated by an article elsewhere in this issue. In the case cited, the traffic capacity of a division is to be increased by reducing the ruling grade 50% at the expense of increasing the distance nearly 33% and greatly increasing the curvature. This will eliminate the former necessity of breaking up trains for operation over the heavy grade, and will thus make an important reduction in the number of trains required to handle the tonnage.

Besides reducing adverse grades, the improvement will give a double-track section. The new line will be used for the heavy eastbound traffic, while the old line will continue in use for the lighter westbound traffic (downgrade) and also for passenger traffic on account of the towns along this line. A similar case, on a larger scale, was the reduction of grade from 4.4% to 2.2% on the Canadian Pacific Ry. a few years ago. This was in such mountainous country that spiral tunnels had to be introduced to obtain the necessary development in distance.

Line-revision of this kind is the opposite of much improvement that has been done on light-grade lines in the way of reducing curvature (and distance) by straightening the original alignment. But for its purpose of cheap freight movement, it is just as clear an instance of basing improvements on true economic principles.

Build Roads!

COMMUNITY-CONNECTING road building must not stop. These roads are the basis of the additional transportation capacity required to meet commercial needs. In a few localities an anomalous condition has arisen in the transportation problem. Embargoes have been placed on the hauling of materials for roads which when constructed would relieve the very congestion complained of and provide the additional commercial carrying capacity so much desired. The clamorings of road politicians for construction, but in "my district," were never so completely answered, for through routes and direct connections between important business centers were never so much in demand. With the thousands of trucks ordered by the Government and still other thousands commandeered by commercial interests to augment rail deliveries, roads must be built quickly over which the equipment is to operate.

Akron, Ohio, tied up with a package-freight embargo, was able to break it by fleets of motor trucks reaching out in a radius of 20 miles to fourteen shipping points. Now, every evening motor trucks in large number and on schedule time start for Cleveland. A New York drug firm makes weekly deliveries in Boston and Philadelphia with trucks and trailers. Cleveland manufacturers have put on regular motor-truck service to bring in castings from foundries 20 and 30 miles away. A steam-shovel company in Lorain gets material by truck from Cleveland and has made deliveries to Elyria and Oberlin when freight service was unobtainable. A rubber-goods company with factories in Ohio and Connecticut is trying out a truck-and-trailer service between these two states, having found the delivery of tires from Akron to Detroit by the same means feasible. A rubber-heel company in Elyria states that it is obliged to use trucks for getting raw material from Akron and in getting the heels away from the factory—in this case putting the shipment on such a railroad that the goods will not require transfer. The moving of household goods between Chicago and Milwaukee by truck is an established business, and a 1200-mile driveaway delivery of nine trucks from Hartford, Wis., to Baltimore, Md., is not considered novel. An Elyria canning company is hauling 5- and 6-ton loads to Cleveland jobbers on regular schedule, giving much better and quicker service than the railroads, although it is somewhat more costly.

The Iowa Council of National Defense has called on the State Highway Commission to quicken rather than slacken road-building energies. Nothing, it holds, should be permitted to retard the good-roads work unless it should be inability to secure the necessary workers. Iowa needs nothing else so much as good roads.

In Connecticut the railroads have had an embargo on certain classes of freight for many months at a time. Motor-truck deliveries have made possible business which would otherwise have been at a standstill. State Highway Commissioner Bennett states that motor-truck transportation business has developed tremendously in the last year. He is building sheet-asphalt pavements on a 6-in. concrete base on country roads.

This is no time for state officials to halt road-building activities, particularly on intercity connections. The transportation congestion, which the three Middle-West state governors have recently attempted to alleviate by their proclamations halting road construction, needs strong curative measures, and road construction is one of the largest factors in the solution of the problem. The legislators of Illinois have faith in the idea, for they have recently passed a $60,000,000 bond issue for a 4400-mile comprehensive system.

Costs are high, but when will they be lower? Let the engineer raise his estimates if necessary, the material men be moderate in their price advances lest they kill the business entirely, and the contractor develop more efficient methods and utilize machines to replace men to the limit. To the man with vision the need is far greater than the price. In war time it is the accomplishment itself that counts.

Call in the Men Who Know

MUCH has been said and little of a tangible nature has so far been accomplished by official Washington in the way of effectively fixing the prices of important materials. It is said that Cabinet secretaries have forced low prices by threatening to commandeer plants. The President himself has issued a lengthy proclamation to the manufacturers of the country exhorting them to refrain from "putting up the price." While it is now the apparent intention to settle the entire matter out of hand on the basis of the findings of the Federal Trade Commission, the public, especially that part of it interested in engineering construction, is still forced to cool its heels in a state of uncertainty.

Should the Government seize a controlling quantity of any material, such as steel, at a price far below the market, other consumers would have to make up the difference in higher prices forced by an excessive demand. Should it attempt, by legislation, or even possibly by agreement, to fix a maximum price for the entire market, the whole movement might be found unconstitutional and void. Should the Government take it out in talk and pay substantially the normal market price, all conditions point to a continued gradual rise.

However, the effect of the recent backing and filling has been most harmful. The public must know at once where it stands. If we are to be unconstitutionally taxed in order that the budget of some Federal department may make an excellent showing, let us be informed of it and make our plans accordingly. If maximum prices to everyone are to be fixed at such a level as to throw out of business part of the capacity of some important industries because that part can produce only at high prices, we should know that also, in order that our consumption might be curtailed before it is too late. Should the entire agitation be destined to end in a fizzle, we should know that immediately in order that plans for necessary work may go ahead without further needless interruption.

The administration must recognize that the economic side of this subject is much more important than the political. President Wilson's proclamation hardly scratches the subject. In times like the present when money is plentiful (there is now in circulation in this country $45.50 per capita in currency as compared with $35 in 1914), when business is active, general demand extraordinarily large, and when to these conditions is added a Government demand for $7,000,000,000 of material a year, it is useless to expect to hold down prices by appealing to the patriotism of producers. Producers have little to do with the matter. If the entire consuming public of every commodity on the market in this country could be reached, could be convinced, and could be induced actually to curtail its consumption, demand might be brought within the compass of possible production and one economic cause for price increases thus removed. To state this proposition is to indicate its impossibility, and perhaps it was this realization that led the President to appeal to the manufacturers.

Another error made by those in authority in this connection consists of attempting to tell the public that the present price increases are actually measured by the indicated increase in terms of currency. The total gold stock of this country exceeds by more than a billion and a quarter dollars the stock at the outbreak of the war. Currency inflation from this source alone is sufficient to send the apparent price of materials soaring. Of course, this condition might be remedied to a great extent by getting hold of most of this stock of gold and putting it under lock and key in the vaults of the Treasury Department. However, the Federal Reserve Board has been attempting to do just this thing for eighteen months, and judging from the continued rise in prices, it has not met with vast success.

Another economic consideration which some Washington proponents of price fixing are prone to disregard is the fact that the earnings of a given business are not constant in volume over a long period of years. Profits diminish to the vanishing point in many industries during a period of depression and are brought up to a fair average level by a higher margin when demand is good. Should any action taken now result in shearing some of the industries of the country of the extra margin of income which should serve to establish the surplus they will sorely need during the depression that is bound to follow, incalculable harm might be done to industry.

Of course, on the other hand, no one has any sympathy with a group of men who are determined to squeeze the last possible penny of profit out of a situation which might put the country at their mercy. However, while such undoubtedly exist, it is believed that they constitute a small minority.

The sharp complaint of a consumer, printed on another page, intimates how feelings have been roused by the price-history of recent months. But at the same time it utters a warning also against Governmental inactivity. The Administration's attitude, perhaps, as presented on page 106, gives encouraging hopes.

Everything points to the wisdom of calling on the expert advice of business itself, rather than depending exclusively on the findings of any Government agency. Only the men who have been producing steel, copper and other commodities for years know the course of these industries over so much as one full credit cycle, and can predict the probable effect after the war of any prices that may be agreed upon now. Even the biggest of these men cannot marshal all of the facts and figures necessary to form such conclusions without calling in subordinates and producing masses of records. It is useless to expect that Government accountants, after a necessarily brief investigation, could reach a safe conclusion on such matters. The attitude on the part of certain Congressmen and Cabinet officers that all business men are thieves and that their statements and opinions must be considered as distorted in the light of their own selfish interests will have to be abandoned. The men who really know must be called in and given a fair opportunity. Get together!

Improved Major-Street Plan for St. Louis Proposed by City Plan Commission

Lack of Planning Has Resulted in Disjointed Narrow Main-Traffic Streets, with Weak Radial System—Widening and Minor Extensions Proposed—Argument Reinforced by Striking Maps

BY HAROLD BARTHOLOMEW
Engineer, City Plan Commission, St. Louis, Mo.

IN APRIL, 1916, the City Plan Commission of St. Louis adopted a program for preparing a comprehensive city plan that included special studies of streets, transit, transportation, districting, recreation, housing and grouping of public buildings. It was estimated that to complete each of the special studies and then to correlate them into a comprehensive plan would require about three years. The study of streets has been completed, and substantial progress has been made with several of the other projects.

The "major-street plan" furnishes many interesting points respecting improper or inadequate street layout. The plan also reveals most clearly the relation of the street to all the other components of a city plan and demonstrates the necessity of a carefully prepared and closely followed comprehensive plan in any rational form of city maintenance or city growth.

The failure to recognize and differentiate the various classes of streets in most cities is almost incredible. In St. Louis, for instance, it is estimated that 75% of the streets are 60 ft. wide, an insufficient width for a heavy traffic street and of too great width for less intensive residential purposes when a considerable setback line is used so extensively as in St. Louis. Fig. 1 shows the very promiscuous platting of streets over 60 ft. wide in St. Louis, which indicates not only haphazard development, but poor traffic facilities and much economic waste. Fig. 2 shows a proposed major-street plan designed to lessen existing deficiencies.

In Kansas City, a city of unusual topography, virtually all the streets are perfectly straight with scarcely the semblance of even a radial thoroughfare anywhere. Numerous other cities offer conditions equally absurd and unwarranted.

In general, the streets of St. Louis quite naturally divide themselves into three groups, as follows: Radial thoroughfares; crosstown thoroughfares; minor residential or industrial streets. No hard and fast rule for standardizing streets can be adopted, but for purposes of establishing some fixed plan, the above classification has served to good purpose in St. Louis. It might or might not apply elsewhere.

The use of 60-ft. streets in St. Louis has made it extremely difficult to provide adequate capacity for all the normal demands of traffic. Yet, under certain conditions, the 60-ft. street has proved itself capable of carrying a tremendous volume of traffic. Locust St., the heaviest traffic street in St. Louis, is but 60 ft. wide,



FIG. 1. THE GREATEST MAJOR STREET PLAN OF ST. LOUIS, AS DEVELOPED BY INDIVIDUAL LAND SUBDIVIDERS, ILLUSTRATES COMPLETE ABSENCE OF PLANNING, WITH CONSEQUENT WHOLLY INADEQUATE FACILITIES FOR TRAFFIC MOVEMENT

The streets shown are all those in the city having widths of more than 60 ft. They represent 15 per cent. of the total street length of St. Louis



FIG. 2. MOST OF THE NECESSARY CHANGES TO PROVIDE THE PROPOSED MAJOR STREET PLAN ARE FOR WIDENING EXISTING STREETS

The changes would be largely in the outlying districts where their accomplishment would not be difficult

yet it carries over 1400 vehicles per hour during the evening rush hours. Until recently there was a 36-ft. roadway with two sidewalks of 12 ft. each. In March of this year, the roadway width was increased to 42 ft. by setting back the curb 3 ft. on either side. This permits three lines of moving vehicles in the direction of greatest traffic movement. The sidewalks, of 9 ft. each, would now be inadequate if there was any amount of pedestrian traffic, which there is not. There are no trolley tracks.

Few streets will ever have so great a volume of traffic. This is an evidence that heavy traffic streets need not always be exceptionally wide. In fact, several streets of small width in a zone of heavy traffic movement are more to be desired than one street of excessive width, since to diffuse traffic facilitates handling and, what is still more important, helps to diffuse property values.

Where trolley cars must also be provided for, as is most often necessary on major traffic streets, increased width is necessary. The following standards for widths of major streets were adopted (see also Fig. 3):

GENERAL STANDARDS FOR WIDTH OF MAJOR STREETS

Without trolleys:
60 ft. minimum; 2 sidewalks, 28 ft.; 4 vehicles, 32 ft.
80 ft. where possible; 2 sidewalks, 32 ft.; 6 vehicles, 48 ft.
With trolleys:
80 ft. minimum; 2 sidewalks, 28 ft.; 4 vehicles, 32 ft.; 2 trolleys, 20 ft.
98 ft. where possible; 2 sidewalks, 30 ft.; 6 vehicles, 48 ft.; 2 trolleys, 20 ft

Where it was found inadvisable to recommend the widening of a major street that would be unable to meet the demands of traffic, the alternative of providing two such streets was adopted, one for trolley cars and heavy slow-moving vehicles and one for fast vehicles only.

To determine the character and extent of traffic movement on the streets of St. Louis, a detailed traffic census was made in April and May, 1916, each period of observation covering 11 continuous hours, from 8 a.m. to 7 p.m. Counts were made on typical weekdays, not including Saturdays or Sundays.

This census disclosed numerous interesting and valuable facts, which can be summarized in part as follows: Horse-drawn traffic is not concentrated on particular streets or in particular sections; automobile traffic is greatly concentrated on certain routes offering least obstruction to through travel and having smooth surface pavements; there is need for more uniform distribution of eastbound and westbound traffic; and there is need for better approaches to the business district from north and south.

Of 323,869 vehicles counted at 245 points on 84 different streets, the number and character of vehicles and their percentage of the whole were as follows:

	Number	
Horse-drawn	102,168	31.5
Passenger automobiles	169,365	52.4
Motor trucks	52,336	16.1
Total...	323,869	100.0

The total flow of daily traffic is shown graphically by Fig. 4. This includes all automobiles, horse-drawn

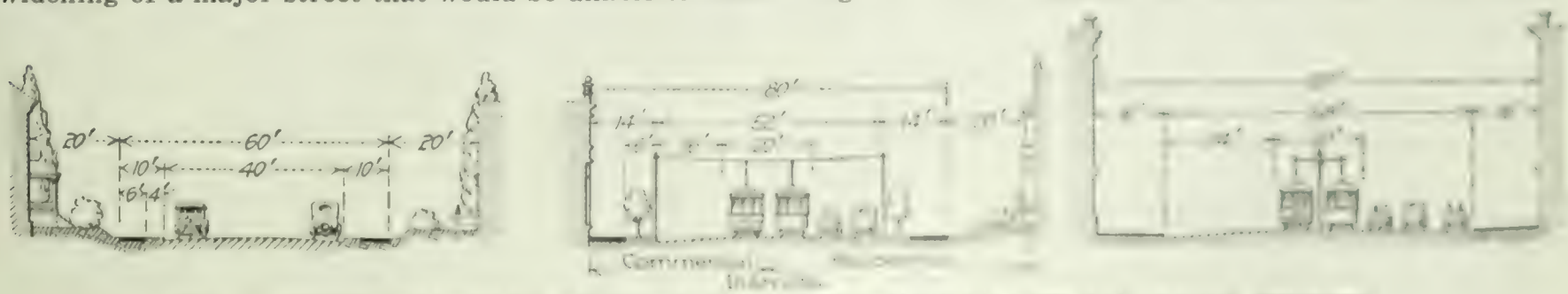


FIG. 3. THREE STANDARD SECTIONS HAVE BEEN WORKED OUT FOR MAJOR STREETS

vehicles and trolley cars. An interesting result of the traffic census is shown by comparing the movement of automobile traffic with the movement of horse-drawn traffic, shown graphically by Figs. 5 and 6. It will be seen that the great volume of automobile traffic is con-



FIG. 4. THE RELATIVE VOLUMES OF TOTAL TRAFFIC ON ST. LOUIS STREETS ARE INDICATED BY THE WIDTHS OF LINES

Note: (1) Lack of continuous routes north and south and (2) the large proportion of travel to and from the west. Horse-drawn vehicles, automobiles and trolley cars are included. Count made at 238 observation points, from 8 a.m. to 7 p.m., June 8, 1916

fined almost exclusively to a few streets. The horse-drawn traffic is quite diffused, showing lack of concentration at any point.

The natural conclusion from this comparison is that the change in traffic conditions in large cities is even more pronounced than is generally realized. Horse-drawn traffic is largely oblivious of routes, of grades and of pavements. Automobile traffic, on the contrary, seeks a through route and a smooth pavement where there is little resistance to quick movement. The automobile, in fact, will travel considerably out of its way to secure these advantages.

The business district is the principal objective of all traffic. Since this district is in the extreme eastern central part of the city, there are three means of approach—from the north, the west and the south. The following table shows the character and percentage of all traffic entering and leaving the business district according to its direction:

TRAFFIC ENTERING AND LEAVING BUSINESS DISTRICT

	Vehicles Number	%	Street Cars Number	%
[illegible]	7,421	19	1,676	18
[illegible]	19,578	51	4,260	47
[illegible]	11,335	30	3,105	35
[illegible]	38,334	100	9,041	100

The similarity in percentage of vehicular and street-car traffic entering and leaving the business district from the various directions is indicative of the fact that both classes of traffic find accommodation in the same directions and in a general way use the same thoroughfares. Some of the traffic entering and leaving the business district from the west eventually goes either north or south, as shown by Fig. 4.

The distribution of population by districts in St. Louis is approximately as follows:

ESTIMATED DISTRIBUTION OF POPULATION: 1910 CENSUS

	Population	%
[illegible]	210,007	30
[illegible]	217,113	32
[illegible]	259,889	38
Total	687,029	100

Comparing this with the percentage of traffic entering and leaving the business district from the same general direction, it is quite evident that traffic facilities are not at all proportional to the distribution of population—a further justification for principal street connections to these districts.

PERCENTAGES BY DISTRICTS OF POPULATION AND TRAFFIC

	Traffic Entering Business District	% of Total Population
North	30	30
West	51	32
South	19	38
Total	100	100

Radial Thoroughfares

Practically no new radial thoroughfares have been considered necessary. All changes recommended (Fig. 7) in the present very nearly complete system of radial thoroughfares were for increased width and some few extensions. In but one or two instances was a width of less than 80 ft. considered sufficient for a radial thoroughfare.

The presence of the Union Station, the large freight depots and the levee steamboat landings, all in close proximity to the business district, emphasizes the importance of completing the system of radial thoroughfares.

Rectangular Thoroughfares

Since the rectangular street plan has been used so widely in St. Louis, the matter of providing an adequate number of crosstown thoroughfares is not difficult. The greatest changes necessary will be for increased width in many places, the removal of many irregularities, and some extensions or an occasional new

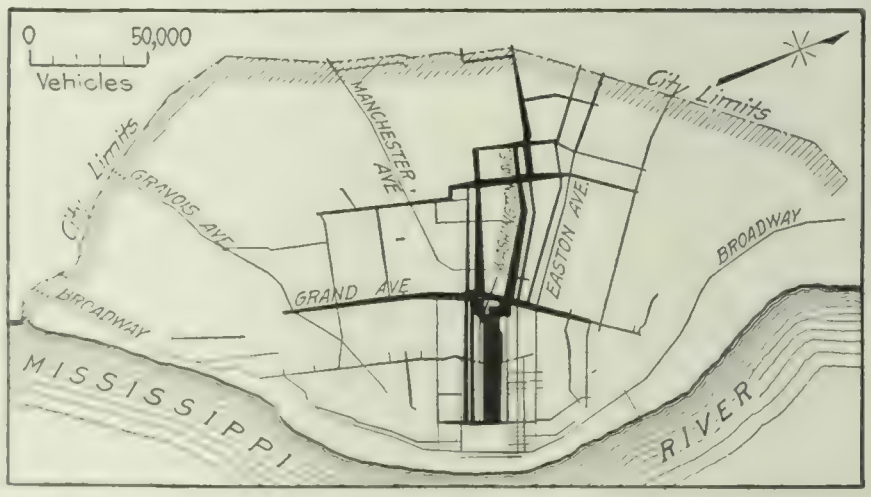


FIG. 5. THE TOTAL DAILY FLOW OF AUTOMOBILE TRAFFIC CONCENTRATES ON A FEW THOROUGHFARES
Count made at 238 observation points, June 19, 1916, from 8 a.m. to 7 p.m.

street. A principal deficiency that usually results from following too closely the rectangular street plan is irregularity, or the offsets which break the continuity of a street at its intersection with intervening streets.

At the busiest part of Grand Ave., the heaviest north and south traffic street, there is but one direct crossing for four most important streets. Fig. 8 shows the manner in which it is proposed to overcome the irregularities. Each will cost many thousand dollars. Direct crossings could have been made at no additional cost in the original plan.

The business district of St. Louis is at the extreme eastern edge of the city. It is considerably removed from the actual physical center of St. Louis, as shown

by Fig. 7. During the past 40 or 50 years the business district has shifted several times. Its center was originally on Market St. east of Broadway, later on Broadway near Franklin Ave., then near Broadway and Olive, while today Washington Ave. is the most active street in the business district.

The great growth of the city westward has induced a westward movement of the business district. While

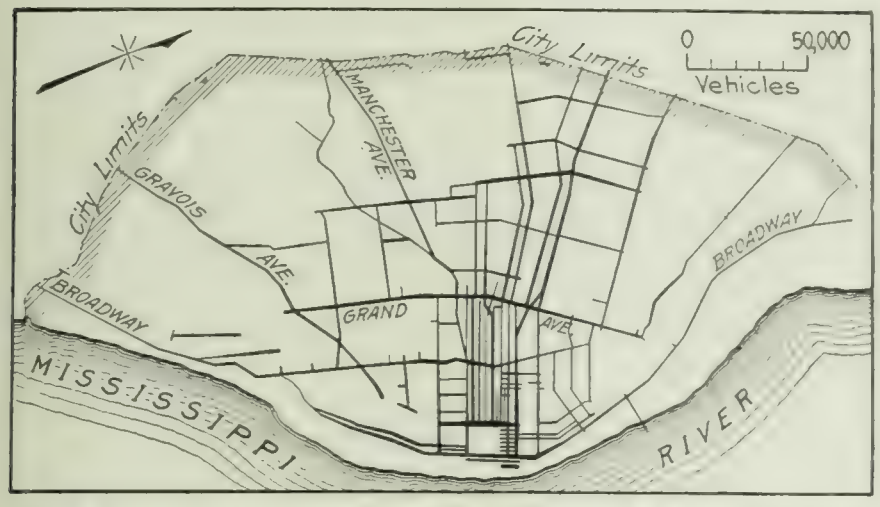


FIG. 6. HORSE-DRAWN VEHICLES AND MOTOR TRUCKS, IN TERMS OF TOTAL DAILY FLOW, SHOW LITTLE CONCENTRATION ON ANY STREET

Count made at 238 observation points, July 25, 1916

the movement has not yet become pronounced, a considerable subsidiary small business center, or more particularly small business and large amusement center, has developed at Grand Ave. and Olive St., fully two miles to the west. This latter point is more nearly the actual physical center of St. Louis. It is not considered probable that the actual business center will ever remove far westward, however, since the development in later years of several towns east of the Mississippi River now makes the present business district of St. Louis the physical center of the metropolitan district.

In order to help stabilize the business district and yet provide room for expansion, the major-street plan anticipates the development of four thoroughfares as boundaries to the business district—4th St., Market St., 12th St. and Washington Ave. The quadrangle thus formed has an area of approximately 0.2 square mile. It does not inflexibly fix the boundaries of the business

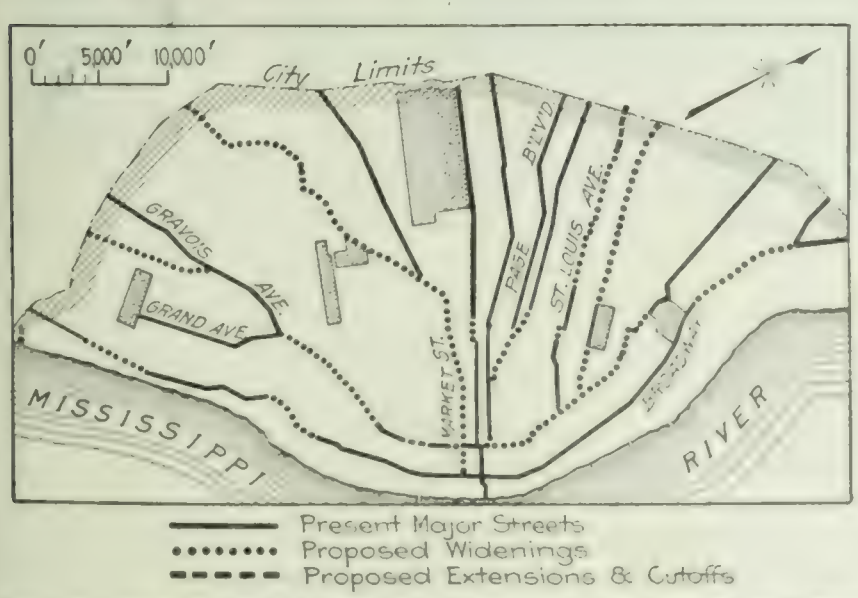


FIG. 7. THE RADIAL STREET SYSTEM CENTERS IN THE BUSINESS DISTRICT NEAR THE WATER FRONT

Proposed street widenings are shown. The Mississippi River makes a considerable bow at St. Louis. Consequently the business district, which has always remained near the original site of the town, is considerably removed from the physical center; but it is at the physical center of the metropolitan district

district, but will encourage a more uniform development with opportunities for eventual expansion to the north and west. Under the bounding streets will probably come a future rapid-transit loop.

Of interest in the preparation of the major-street plan is the fact that no provision has been made for the operation of interurban lines on the street surface. It is the aim to separate the interurban lines entirely from the transit system and, so far as possible, keep them on private rights-of-way.

Importance of a Major-Street Plan

The obvious advantages of a major-street plan are:

1. It simplifies future work. Whenever an extensive street extension or widening becomes necessary, it can be made in accordance with a well-defined generally accepted plan.

2. It will be a means of great economy in the transit and transportation problems. As improvements in the major-street plan are made, certain rerouting of the transit lines can be made, which will reduce the time and the cost of operation. St. Louis is the largest city in the country having surface transit only. It is not yet in a position to construct rapid-transit lines. By carefully executing the major-street plan, good service can be provided without the necessity of heavy expenditures for rapid-transit lines within the next few years. When rapid-transit lines are needed, it will be possible

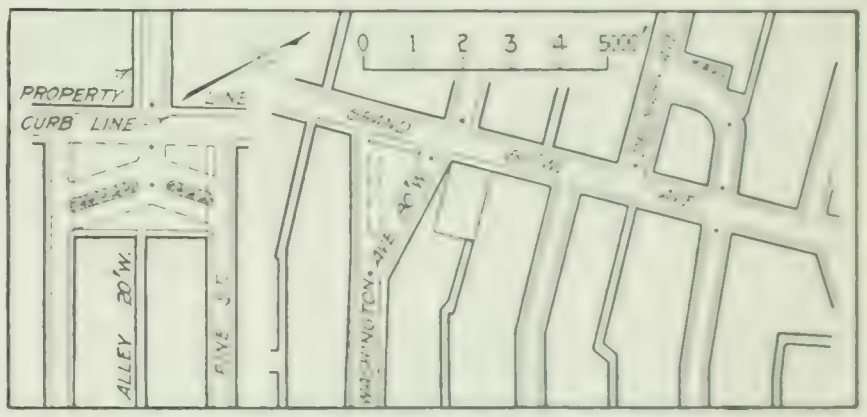


FIG. 8. CONSIDERABLE TRAFFIC CONGESTION WOULD BE ELIMINATED BY PROPOSED CUTOFFS AT GRAND AVE.

The streets beyond Grand Ave. were laid out privately without regard to the street plan of the city

to construct them to better advantage and greatly reduce the cost.

3. It encourages much more economic city maintenance. The major streets will gradually develop as the principal channels of travel. They will consequently reduce the miscellaneous movement of traffic on minor streets. On these minor streets, then, considerable expense can be avoided by reducing the width of the roadway and by laying, in many instances, pavements of considerably less cost. On 17.4 miles of streets to be improved in 1917, the standards for major-traffic streets will be adopted, while the roadways of minor streets, where possible, are being reduced from 36 to 26 ft. in width and less expensive paving laid. The remaining width of 10 ft. is being devoted to grass or shrubs.

To discourage traffic on minor streets means greater privacy and hence greater stability of values and development. While this is the object of all districting restrictions, it is believed that the logical development of the streets as herewith suggested will materially help to accomplish the desired results. Districting restrictions can then be invoked to assure the desired results.

Four miles of city streets are annually cleared of poles and wires by ordinance. A program for 20 miles of streets to be cleared in the next five years is being prepared. All the streets cleared will be major-traffic streets. It is also hoped that a standard system of lighting can gradually be installed on all the major streets.

Serious attention has been given to the methods and means of executing the major-street plan in the easiest and most economical manner. A uniform method for arriving at the amount of cost to be paid by the city and by assessment, quite similar to that adopted in New York, has been suggested. The city's share will be increased in proportion to the increase of street width. A more logical manner of determining the benefit district has also been recommended, the principle followed being that, in general, all property on or adjacent to thoroughfares which have been given more direct connections to various other parts of the city shall be included in the benefit district. By so doing, the benefit district is enlarged and the assessments are more equitably distributed in accordance with the benefit derived.

As to methods of payment, the most important recommendation is that for large improvements the city be permitted to issue special bonds for completing the entire project at once. These bonds would not be included in the regular debt limit, but should be special bonds, the collateral for which would be the tax bills issued for the improvement. Benefit assessments could be paid if desirable, in installments covering a period of from 10 to 20 years, the first payment to be deferred for 5 years in order that an owner may actually begin to derive benefit from the improvement by the time the payment falls due.

At the next session of the legislature the passage of the following laws will be sought to secure the necessary authority for completing the major-street plan: (1) Establishment of building lines; (2) the creation of permanent assessment boards; (3) approval of all land subdivisions; (4) constitutional amendment granting power of excess condemnation; (5) constitutional amendment permitting the establishment of streets on the city plan; (6) a law authorizing the creation of county plan commissions; (7) a law authorizing the creation of city plan commissions in small cities.

Locomotive Cranes Erect Cantilever Bridge Over Ohio River

Suspended Span Swung on May 10 Practically Completed Construction by Method Applied for First Time to Big Cantilever Span—Single-Track Structure Is 1120 Feet Long

By J. L. DE VOU
Division Erecting Manager, American Bridge Co., Pittsburgh, Penn.



FIG. 1. SWINGING OF CANTILEVER BRIDGE BY LOCOMOTIVE CRANES APPROACHING CLOSURE

A FORWARD step in the development of bridge-erecting methods was recorded when on May 10 the suspended span of the new cantilever bridge across the Ohio River at Steubenville, Ohio, was swung. This single-track steel bridge 1120 ft. long and 110 ft. deep over the main piers was erected complete by two locomotive cranes operating on a central track placed as the erection progressed. Another special feature of the construction which marks a departure from common methods is seen in the use of hydraulic jacks instead of wedges and screws for the final adjustment in swinging the suspended span for closure. The erection features were carefully considered by designer and detailers and included special pins for eye-bar top chords and spacing of the trusses 30 ft. apart in order to allow complete reversal of the erecting cranes and the necessary space for a temporary material track.

This structure is being built for the Ohio-West Virginia Bridge Co., a subsidiary of the Labelle Iron Works, of Steubenville, and connects the new byproducts coke plant on the West Virginia side of the river with the furnaces and mills on the Ohio side. It is a single-track railroad bridge with a plate-girder approach at each end. The cantilever bridge has a total length of 1120 ft., made up of two anchor arms of 230 ft. each, two cantilever arms of 180 ft. each and a sus-

pended span of 300 ft. The distance center to center of tower piers is 660 ft. The weight of the steel, exclusive of approaches, is 4088 tons.

The bridge is interesting principally because the American Bridge Co., contractor for the superstructure, used locomotive cranes exclusively in its erection, and it is believed to be the first cantilever bridge erected entirely with this kind of equipment. Two standard erecting cranes, equipped with booms 110 ft. in length, were operated from each end of the bridge.

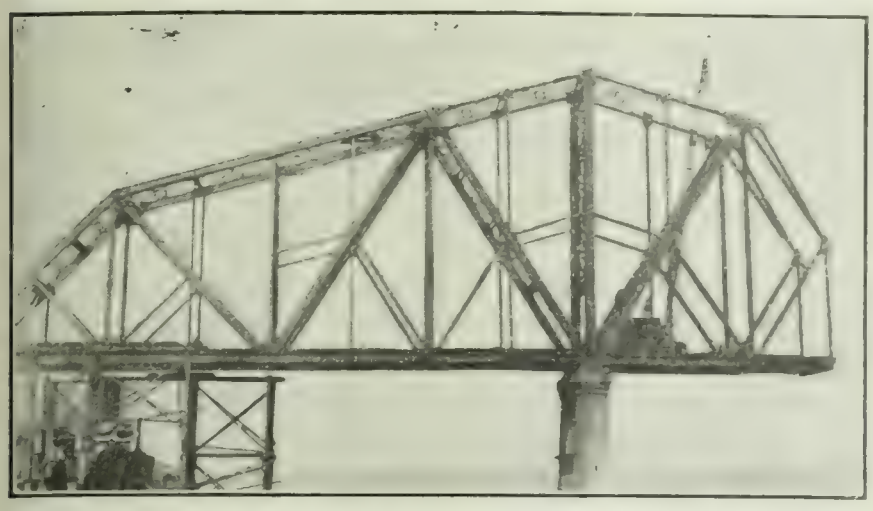


FIG. 2. EYE-BARS M_{11} L_{12} FOLDED BACK IN FIRST POSITION

The maximum depth of truss is 110 ft. center to center of chords. The width of the bridge is 30 ft. center to center of trusses. This width was enough to permit the use of a temporary material track beside the track that carried the crane laid in the center of the bridge. The material track was supported on stringers that will carry a footwalk in the completed structure. This width was also sufficient to let the cranes turn completely around for the purpose of erecting the top laterals and sway bracing behind them.

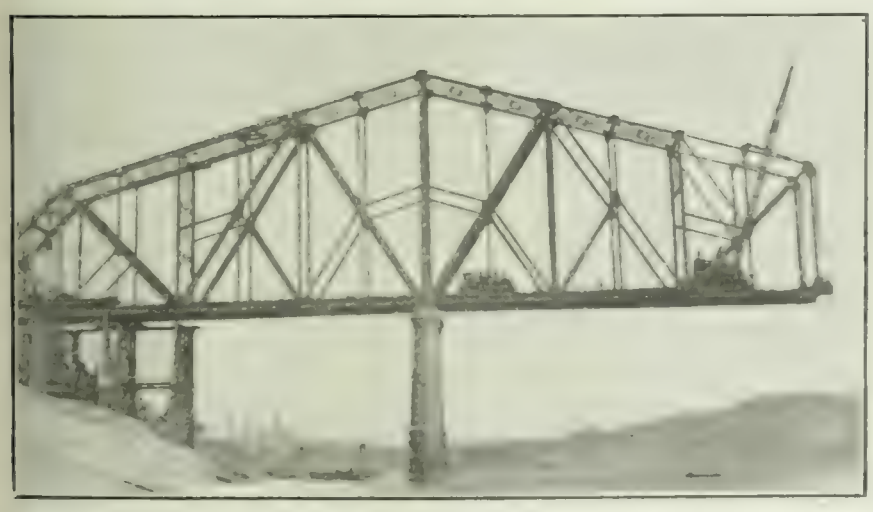


FIG. 3. EYE-BARS U_{11} U_{15} IN FIRST ERECTION POSITION

The design was made with the proposed method of erection in view, and the weights of all members were kept within the capacity of the cranes. While the erection could have been accomplished more rapidly and at less cost if the top chord of the cantilever arm had been a built-up, riveted member, the difference in weight and in shop costs threw the balance in favor of eye-bars. But since erecting with a single boom demands that each member shall be capable of being supported in place at once, so that the crane may cut loose from it and be free to handle the next piece, the designer was careful not only to keep to a minimum the number of members connected by any one pin, but also to make the arrangement of the pin joints such that the members could be set in place and supported before the pin was driven. For this purpose small lug angles were provided where necessary to hold the eye-bars in place.

At some points where two sets of bars come together, it was necessary to drive the pin after the first set of bars was placed, in order to enable the cantilever to carry the crane in the new position it must take before placing the second set. This condition occurred at *U*10, *U*12, *M*11 and *U*14. At *M*11 the two sets of bars were erected with the *M*11 *L*12 bars folded back almost parallel with the *U*10 *M*11 bars, and the pin was driven. After the trusses were sufficiently articulated (see Fig 2) to permit the crane to move forward to the required position for setting the heavy bottom chord *L*10 *L*12, the *M*11 L12 bars were rotated about the pin into their proper position.

A similar method was used at *U*12 and *U*14. In Fig. 3 the *U*14 *U*15 bars may be seen folded back above the

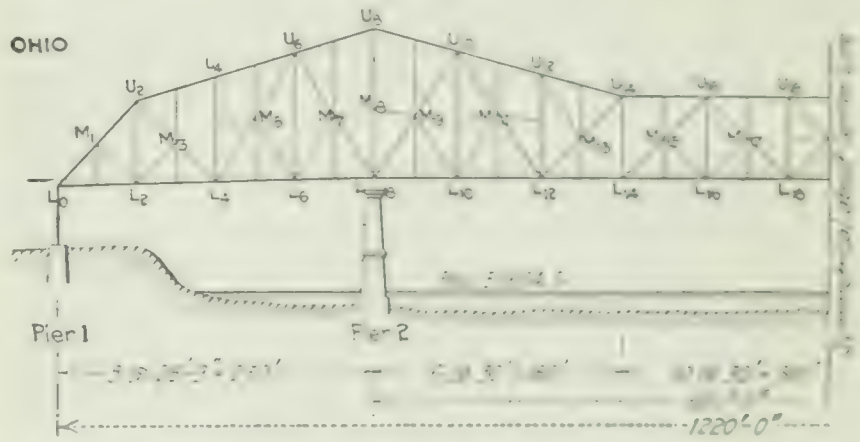


FIG. 4 HALF-ELEVATION OF STEUBENVILLE BRIDGE

*U*13 *U*14 bars. Because of the great height of truss at *U*10 the boom was not long enough to rotate the bars, so at this point separate pins were provided for each set of bars.

Hydraulic Jacks Used for Closure

The use of hydraulic jacks instead of wedges and screws for the final adjustment incidental to swinging the suspended span is also believed to be new, and proved to be quite satisfactory.

The anchor arms were erected on wooden falsework; and owing to the urgent necessity for completion of the bridge as early as possible the erectors were obliged, though at grave risk, to go into the river with their falsework at the worst season of the year. The falsework fortunately withstood three floods, two of which were accompanied by running ice. The erection of the cantilever arm began in the week ended Mar. 3 on the West Virginia end and in the week ended Mar. 24 on the Ohio end. The suspended span was erected as a cantilever from each end in the usual way until swung on May 10.

The bridge was designed, fabricated and erected under the direction of Albert Ludlus, consulting engineer. For the American Bridge Co., Richard Khuen is general manager of erection, and James L. deVou is division manager.

High Prices and Excessive Profits in the Consumer's View

In a strong newspaper article, the skyrocket price situation is sketched graphically by Zenas W. Carter, Commissioner of Associated Metal Lath Manufacturers, Cleveland, Ohio. Extracts below are quoted from "The Annalist."

The problem at issue is determining priority. The question of apportionment or rationing is just as vital in steel as in bread. Price-fixing entails rationing. Shall it be done by the government? Mr. Carter proposes "a mammoth mass convention of business men" to discuss prices and, presumably, settle apportionments.

The statements by President Wilson on July 12 should help to check the growing unrest among manufacturers over price conditions of raw materials. It has looked to the manufacturer and to the public so much like a "grab-while-you-can-and-what-you-can" price movement that resentment was growing into open protest. Note the accompanying table showing prices and fluctuations on iron, coal, coke and steel products during the four years of this war!

Manufacturers, business men generally and the public are becoming used to price increases, but an over-night doubling and trebling of prices already high was simply astounding. Topping that with reports of huge earnings in raw-material divisions of trade—unreasonable percentages of profit for steel mills, coal and iron producers and water carriers—was it not high time that President Wilson took a hand to stabilize business?

If warfatted business is permitted to use its position to gouge out profits from the public through competitive upward bids for material they control, the eventual result, almost in hazy distant view now, could not possibly be less than social revolution of the baser sort, even though it was morally justifiable.

It is not reasonable to presume that vehicle and implement and hardware and structural material and all commercial manufacturing utilizing steel, for instance, can pay from two to four times normal value for materials, then fabricate them, and sell the product to consumers at any price which it is possible for the consumer to pay, so long as the wages of that consumer have only been increased from 15 to 25% at best.

And, why should it be reasonable to suppose that the steel or coal industries, for instance, should have the millions of profits they show by their own records and monthly statements that they are making, and other lines of business be hanging on by their fingernails trying to keep their organizations partially intact, when, by the table of prices, anyone may read the fact that it is *our* (our, mind you, all of America) war which has caused our government (us, as a group of individuals) to require so much of their material that they are in a position to demand enormous profits from the public (us) on the balance.

Because of this just demand for price protection for manufacturing industry and the public, the President has outlined a program of *one price to all*, which is protective only and not in any degree confiscatory.

To put the plan of the President into practical operation and at once allay the present fearsome unrest of manufacturing organizations, due to the unreasonable and the unrestrained jumps in the prices of so many items of raw materials and necessities, it would certainly be an auspicious time for the business men and the manufacturers and their organizations and associations to call a National Convention at some central point in the United States.

It is quite possible a large majority of the citizens of the United States could live, and comfortably, without making many new purchases of anything whatsoever but food and fuel for probably one entire year; but at the end of that year it would be absolutely necessary to replenish clothing and household necessities and many other things. These must be fabricated therefore, and during the year—this year—so they will be ready for use next year. Can our manufacturing plants then be closed? Assuredly not! Price and material adjustments will have to be made.

This is a tremendously big country. It has resources almost unlimited. It has millions of people who must continue to live in the United States. They will have needs as well as our army abroad. It is therefore wisdom to give heed to this fact even amid our preparations for war. To give heed to it will increase confidence. Increased confidence will make us strong. Strength will win our war for us.

Let this be the keying stone on which a mammoth mass convention of business men shall meet. Courage to face fair prices, courage to meet changed market and manufacturing conditions, courage to face disrupted forces, courage to handle every problem we have to solve in this war, will come if men meet and tell openly what they are willing to do—what they can do—and what they are and have been doing. Their presence at a mass convention will strengthen their confidence in themselves as well as in their fellowmen.

Without such a group discussion of prices and conditions will it be possible for the investigators for the Federal Trade Commission to evenly distribute or even begin to give even a small portion of the relief that industry must have before Jan. 1, 1918?

PRICES AND FLUCTUATIONS ON STEEL AND IRON

	1914		1915		1916		1917	
	1/1	7/1	1/1	7/1	1/1	7/1	1/1	7/1
Old Range Bess..	3.75	3.75	3.75	3.75	4.45	4.45	5.95	5.95
Old Range Non-Bess.....	3.00	3.00	3.00	3.00	3.70	3.70	5.20	5.20
Iron ore Mesabi Bess.....	3.50	3.50	3.45	3.45	4.20	4.20	5.70	5.70
Iron ore Mesabi Non-Bess.....	2.85	2.85	2.80	2.80	3.55	3.55	5.05	5.05
Coal.....	1.15	1.15	1.15	1.05	1.05	1.23	1.23	4.00
Coke.....	2.48	2.30	2.10	2.25	3.90	3.30	9.50	13.00
							Basic Valley Furnace	
Pig iron composition.....	13.492	13.52	13.07	13.125	18.69	18.585	30.50	50.00
							Bessemer Pittsburgh	
							35.95	55.95
Ignot iron.....	2.55	2.50	2.50	2.45	3.30	3.60	5.20	8.70
Slabs.....	20.00	20.00	20.00	22.00	35.00	42.00	60.00	105.00
Billets O. H....	20.00	19.50	19.00	22.40	35.50	44.50	60.00	100.00
Sheets.....	1.85	1.80	1.80	1.75	2.60	2.90	4.50	8.00
Bars.....	1.20	1.15	1.10	1.25	1.85	2.50	3.00	4.50
Bands.....	1.20	1.15	1.10	1.25	1.85	2.50	3.25	5.25
Hoops.....	1.25	1.25	1.25	1.30	2.05	2.75	3.25	5.25
Hat wire.....	3.05	2.50	2.50	2.50	4.00	6.50	7.00	9.00
Wire rods.....	25.50	24.50	25.00	25.00	40.00	50.00	70.00	95.00
Wire.....	1.35	1.30	1.30	1.35	1.95	2.45	2.95	3.95

Iron ore, f.o.b. Lake Erie Dock; Coke, f.o.b. Furnace; Pig iron, f.o.b. Valley; Ingot iron, f.o.b. Youngstown; Balance, f.o.b. Pittsburgh; Coal, f.o.b. Mines—our contract prices.

Above are current prices, almost entirely as published in issue of "The Iron Age" nearest the dates given.

A Washington Inquiry:

Problems in National Price-Fixing

Officials Admit Dissatisfaction at Attempted Haphazard Price Dictation—Interferences in Purchasing May Lead to Government Purchasing Agency—Priority Difficulties—Study Costs

DEVELOPMENTS in Washington the past week forecast that the administration is definitely committing itself to a policy of fixing prices which shall be the same for the Government and for private industry, in connection with purchases made for both, on account of the country's stupendous war activities. A special investigation made by a correspondent of *Engineering News-Record* in Washington brings to light various interesting conditions.

The price-fixing movement has been much debated in Congress in connection with the committees of the Council of National Defense. Also, important statements concerning it have been made public during the past week, by President Wilson and by Secretary Lane of the Interior Department. There has been much dissatisfaction at the manner in which prices for some materials have been fixed for the Government, at the same time leaving up in the air the question of the prices to be paid by private industry for the same materials.

Some of the highest officials in Washington, who consented to analyze the situation for *Engineering News-Record*, point out that there has never in the history of the country been such a demand as at present for basic raw materials, that the Government takes large amounts of the available supplies, and that men in private industry who must have these materials are obliged to go into the markets and get them no matter what prices they may be obliged to pay. Their statements also showed that the reports of great complications and interferences in the general purchases which are being reported in private industry are true.

New Purchase Agencies Are To Be Created

The result will be, from the best information obtainable, that there will be a reorganization of the Government's price-fixing, purchasing and priority agencies. The effort will be to make the present purchasing agencies, particularly the committees of the Council of National Defense, more responsive and more responsible. In particular, governmental leaders at Washington want some participation of governmental agencies, or a governmental agency, in the letting of contracts for the Government. In all likelihood, it may be stated upon high authority, this participation will be that of the Federal Trade Commission. On the other hand, it may be that the President himself, through a small group of men closely associated with him, or, possibly, an individual, may exercise this participation.

Arguments are reaching President Wilson that the present arrangements for purchasing for the Government are far too split up, and that it is necessary to have one strong man in charge of all buying, including determination of apportionment and priority. It is pointed out in Washington that the Priority Committee, numbering half a dozen men, is trying to do the work that about three hundred men ought to do, so great is its volume. In the case of coal alone, between fifty and one hundred telegrams appealing for priority are being received in Washington each day.

Whether the reorganization of the Government's price fixing, purchasing and priority agencies will provide for participation by the Federal Trade Commission or by some individual or group of men especially designated and close to the President, to represent him, remains an open question, and must remain so until Congress completes its proposed legislation in regard to the committees of the National Defense Council, now in the so-called food bill. However, President Wilson will doubtless not consent to eliminating the services of these high-class business men, to whom, he feels, the country owes a great debt for what they have performed in the way of mobilizing industrial resources so far. It is seriously doubted that he will accept any proposal from Congress that slaps at these men. Notwithstanding his statement of a few days ago that there shall be no "blood profits" during the war, it is pointed out that he has urged in a letter to the Senate Agricultural Committee that there shall be no provision in the food bill which would strike at the Council committees.

Operating on Government Account?

Whatever the machinery of the reorganization, the Federal Trade Commission is now preparing for it. There is a distinct tendency in government at Washington now toward the idea of operating on Government account. The Government may yet say to industry, "You run your industry, but as to elements of cost, distribution, and profits, *we* will control." Something of this tendency was seen in the recent report of the Federal Trade Commission to Congress, based upon which a bill has since been introduced in Congress, providing for a pooling arrangement to operate mines and railroads.

It is perhaps not realized that the Federal Trade Commission is now investigating the costs of steel; the subsidiary products of steel; lumber; aluminum; wire nails; bituminous and anthracite coal; zinc; copper; and lead. As one official in Washington expressed it to the correspondent of the *Engineering News-Record*, "there isn't much left in the way of basic materials to investigate." The steel costs are now being completed and the results will be made public in a few weeks. What is to happen then is not yet known.

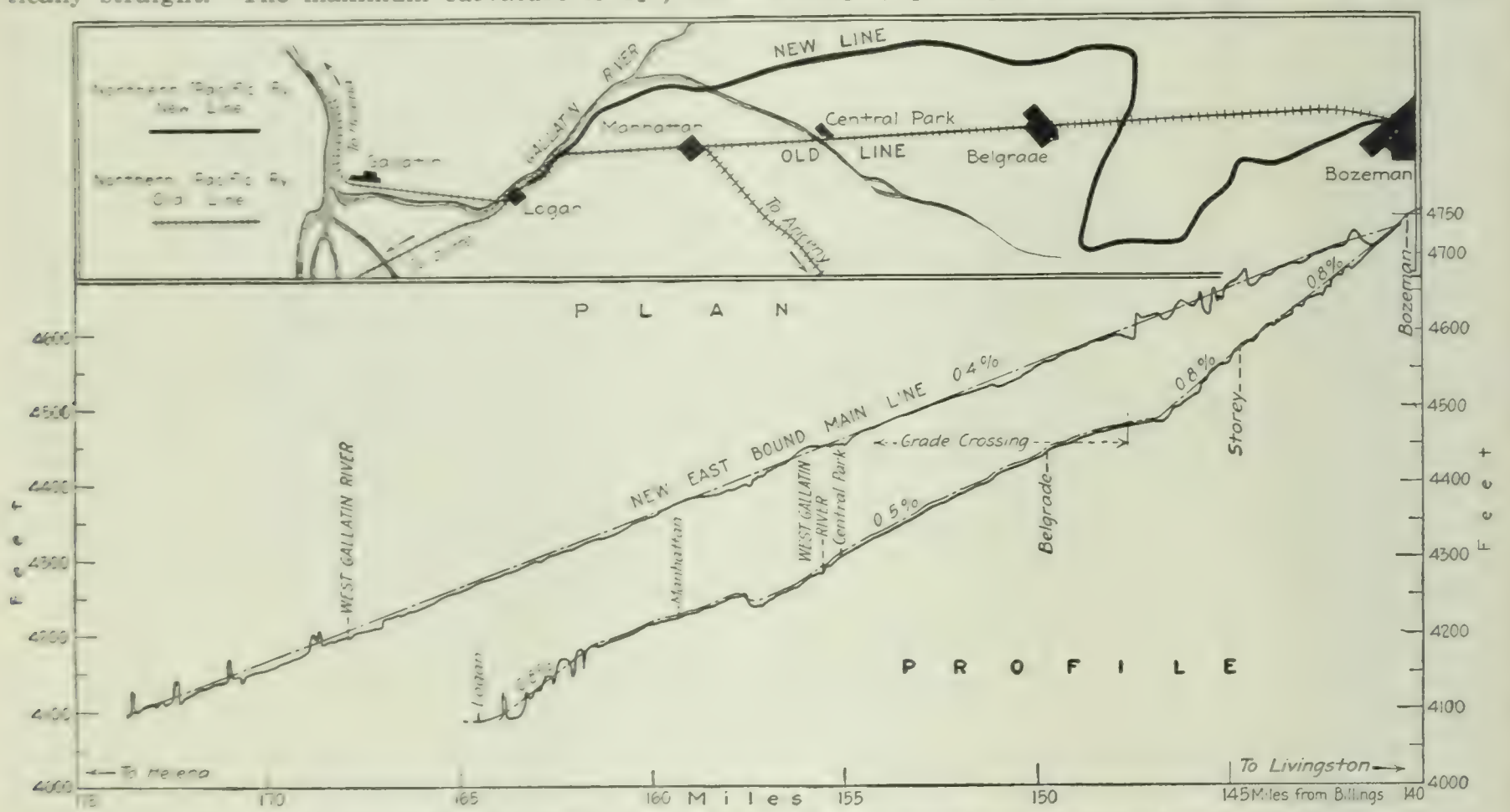
The principal use of the data so gathered would be in price-fixing. Then, on top of that, too, comes the question of abnormal profits, or, rather, the possibility of halting them.

These are radical ideas; but these are radical times England has been all through the same stages.

Seven Miles of Line Added To Reduce Grade

Northern Pacific, on Second-Track Work in Montana, Builds New Line with Ruling Gradient 0.4 Instead of 0.8 Per Cent

TO FACILITATE the movement of its heavy eastbound freight traffic on the Montana division, the Northern Pacific Ry. is building a second line between Logan and Bozeman, Mont., which will have a maximum grade of only 0.4% as against 0.8% on the old line. The latter will continue in use as the westbound track. The easier grade is obtained by developing the line in a curved location so that its length is 33 miles as compared with 24 miles for the old line, which is practically straight. The maximum curvature is 4½°, and the 0.4% grade, which is practically continuous, is compensated at the rate of 0.04% per degree of curve. The situation is shown clearly by the accompanying plan and profiles.



NEW LINE SACRIFICES PRESENT GOOD ALIGNMENT, BUT CUTS OPPOSING GRADE IN HALF

On the 123-mile Montana division, between Helena and Livingston, the eastbound traffic is now handled as far as Logan (74 miles) on the basis of a maximum grade of 0.4%. From Logan to Bozeman (24 miles) the ruling grade is 0.8%, and from Bozeman to Muir (13 miles) it is 1.9%, this latter being operated as a pusher grade. Beyond this there is a descending grade to Livingston (12 miles) with a maximum of 1.8%. At present the standard eastbound trains are reduced from 2375 tons to 1567 tons at Logan, the excess tonnage being handled in extra trains to Livingston.

Traffic Capacity To Be Much Increased

The new low-grade line will permit the operation of standard-tonnage trains through from Helena to Livingston, using pushers (of greater power than those now in service) on the 1.9% grade up to Muir. This arrangement will not only increase the traffic capacity of the division very materially, but will eliminate about 963 turn-around extra trains per annum, now required to handle the excess tonnage between Logan and Bozeman.

The grading is light. Except for a few comparatively small rock cuts, the work consists chiefly of earth embankments, the material for which is obtained from side borrow pits. The only steel bridge—across the Gallatin River—will have four 75-ft. through plate-girder spans. The district through which the line passes is thoroughly irrigated, so that a large number of waterway openings are required. These are reinforced-concrete structures.

The work is under the direction of H. E. Stevens, chief engineer of the Northern Pacific Ry., and S. J. Bratager, principal assistant engineer. E. L. Dorsett, assistant engineer, is in direct charge of the construction. The general contractor for grading and structures is Martin Woldson, of Spokane, Wash. The estimated cost is about $1,500,000, and it is expected to have the line ready for operation in the fall.

Western Wood-Stave Pipe Field Active

Previous to the war, the first cost of wood-stave pipe lines was much below the cost of corresponding steel lines. At present, in addition to the fact that war conditions have increased the price of steel pipe to 30% more than the cost of corresponding wood-stave lines, there is also the difficulty of obtaining prompt deliveries. Consequently, the use of steel pipe in the irrigation and mining field, for example, has dwindled to near the vanishing point. On a recent contract in which an order for $80,000 worth of wood-stave pipe was placed with a California firm, steel-pipe manufacturers refused to bid. This was an irrigation job such as those on which both materials have been heretofore used.

Cast-Iron Pipe Specification Controversy

Manufacturer Members of American Water-Works Association Committee Protest and User Members Reply

Letters from N. F. S. Russell and Walter Wood are answered by John H. Gregory, F. A. Barbour, W. H. Randall and Edward E. Wall—William E. Clow joins discussion

Russell Declares: Editorial Unfair—American Specifications in Almost Universal Use—Change to Uniform Outside Diameter Would Be Costly and Troublesome.

Sir—As a representative of the manufacturers of cast-iron pipe, on the committee of the American Water-Works Association for the revision of cast-iron pipe specifications, I regard as very unfair the editorial note in your issue of May 31, 1917, and believe that the same was written without a thorough investigation of the subject on the part of your editorial staff, in that it presents only one side of the question.

The cast-iron pipe manufacturers on this committee were told by the engineering members of the committee that the standard outside diameter for all classes of the same size of pipe was the *sine qua non* of the revised specifications, and that unless the makers were prepared to agree to it there was no use of going further with the revision.

It was a question—and is still a question in the minds of the cast-iron pipe manufacturers—whether the engineering members of the committee, in their attitude on the standard outside diameter, correctly represented the feelings of the association at large; in that each city of this country has adopted for its distribution system some one class or other of the American or New England specifications. In this adoption of a class, they automatically have a standard outside diameter for their own distribution system; and the proposed change to a uniform outside diameter for each pipe size would at once cause trouble in many cities and towns, through forcing upon them the adoption of a new or different standard from the uniform outside diameters they have been using so satisfactorily.

American Specifications Almost Universal in North America

Further, in reference to the two standard specifications, may I state, as the manufacturers stated to the committee, the specifications of the American Water-Works Association are almost universal in their adoption. They do not differ materially from the New England and are the standard adopted by the Canadian Society of Civil Engineers, so that they are universal in the North American continent. I can say that over 90% of the cast-iron bell-and-spigot water pipe in this country is manufactured and sold under these American specifications. With this almost universal adoption of these specifications, including of course the tables of dimensions, does the supposition of the manufacturers that these specifications adequately meet the needs of the users of cast-iron bell-and-spigot water pipe, and therefore the question that a change in the specifications should be submitted to the association, justify the remark in your editorial—"the absurdity of such request is equalled only by its audacity."

The manufacturers on this committee, with the full concurrence of all makers, tried to point out to the engineering members not only the manufacturing difficulties entailed by the adoption of a single outside diameter for each size, but also the fact that it would cost a great many thousands of dollars—outlay for the new equipment, changes in plant, etc.—and that it would greatly increase the chance of loss in manufacture because it would increase the use of manual labor and decrease the machine operations; whereas the cast-iron pipe manufacturers have been working to decrease the factor of loss always involved in the use of manual labor.

The engineering members of the committee asked for estimates of the cost involved in making these changes of equipment, etc., but such estimates, under present conditions, could not be made with any reasonable degree of accuracy.

The other proposed changes in the specifications were discussed, but it was the feeling of the manufacturers that—as they were told bluntly by the engineering members of the committee that unless they would agree to the standard outside diameter of all classes of the same size pipe it was useless to go on with the revision of the specifications—any discussion of the other points was profitless.

Radical Change to Uniform Outside Diameter Commercially Impracticable

A comparison of the tables of dimensions of the New England and American and Canadian specifications will show that the proposed radical change to a standard outside diameter for the same size of pipe is not a part of either specifications, which are practically identical as to outside diameters falling under different classes of each size; nor is it a part of any foreign specifications, with the possible exception of those used in Germany.

Is it fair, therefore, in your editorial, to put the cast-iron pipe manufacturers in the position of obstructionists because they object to the making of large capital expenditures and upsetting the processes of manufacture which comply with all present standard specifications, upon a demand which they regard commercially impracticable and tool does not at all represent the desires of the members of the American Water-Works Association, as a whole?

May I ask that you give this presentation of the manufacturers' side of the question as wide publicity as you have already given to the other side.

N. F. S. RUSSELL,
General Sales Manager,
United States Cast-Iron Pipe and Foundry Co.
Philadelphia, Penn

Wood Urges: Cast-Iron Pipe Sold on Close Margin To Compete with Substitutes—No Deadlock in Committee—Objections to Proposed Uniform Outside Diameter, Chemical Composition Requirements and Relation Between Bending Moments and Flexure in Test Bars.

Sir—I thank you for the reprint from your issue of May 17 in which you speak of the recent convention of the American Water-Works Association at Richmond. We are especially interested in what you say regarding specifications for cast-iron pipe. I have also read your editorial in your issue of May 31 on the same subject of pipe specifications.

Many may think I am somewhat self-sufficient, in what I am saying below, but it does not seem to me wise to let a large subject of this kind get tangled up with careless expressions.

CAST-IRON PIPE SOLD ON CLOSE MARGIN OF COST

The facts are that cast-iron pipe has to be sold on a very close margin of cost, in order to compete with the many substitutes that are offered, the original cost of which is very often misleading to buyers who do not give full consideration to their inefficiency and lack of durability. Notwithstanding all this, users of cast-iron pipe are entitled to have tendered them material made carefully and accurately, so as to insure a good workable product. There are, of course, instances where special contingencies have to be met and special provisions devised to overcome them. This is the province of every great engineer. The normal needs of everyday practice do not require such elaborations or expensive preparation.

There is no "deadlock" between the manufacturers and the engineers. The engineers can issue any specification for any particular requirements they desire, but the manufacturers feel that it would be an injustice to force upon the everyday user of pipe the extra expense of the refinements that might be found necessary in special cases. The manufacturers must insist that the sale of their product is not crippled by unnecessary processes which lead to no definite result—such as are incorporated in the proposed specifications In self defence, they must insist upon a good "work-a-day" basis.

Your paper speaks of three points upon which discussion has largely centered:

DISCUSSION CENTERS ON THREE POINTS

1. *Uniform Outside Diameter for all Classes of Pipe*—No practical man will, for a moment, suggest that it is desirable to work to a uniform outside diameter for 60-in. pipe. On the other hand, it is very desirable that the normal variation of weights in 6-in. pipe shall be so adjusted that each different weight will couple with standard fittings. The only question over which any issue can be made is what diameter between 6 and 60 should be chosen as the dividing line. For many years 12 in. and under has been this dividing line, and dimensions of fittings for all sizes, 12 in. and under, are so arranged that they are adaptable either for light or heavy pipe. The question, therefore, resolves itself into this:

Shall 12 in. be now given up as the dividing line between interchangeability and the individuality of diameter?

2. *The Chemical Composition of Iron*—This is largely a question of geography, adding thereto the thickness of the shell of the pipe. Most excellent pipe is made from iron that manufacturers upon the Delaware River would consider most peculiar and most unusual. Analyses of the metal do not determine, except within the very broadest limits, the value of pipe. The worth of a pipe is determined by its ability to stand hydraulic pressure and not by moderate variations of percentages of metalloids. We refer to this point as being a "geographical" one, because the different analyses of pig iron that is used for making entirely satisfactory pipes (all the way from Russia through America to China) depend upon the character and variation of ores found in the different countries.

3. *The Relation Between Bending Moment and Flexure in Test Bars*—This is something about which even the most experienced know, as yet, very little. Hence, it is dangerous to put into specifications for daily use any thoughts and anticipations that are not fully understood or developed.

So much for the various points you bring up. There should be no "deadlock" on the part of engineers and everyday buyers. Each should have what best suits their requirements.

In conclusion: Let everyday buyers have a guaranteed and satisfactory quality of pipe, such as they have secured for years under the American Water-Works specifications. This is the question that should come up for discussion in the association. Further, no engineer should be limited in making peculiar requirements, even if they cost money. But such requirements, needed for special cases, should not be worked into general specifications and increase for the everyday user the cost of a material that is already satisfactory, and who wants simply a good article that will stand *hydraulic* pressure.

WALTER WOOD.
Philadelphia, Penn.

The Editor Remarks in Passing: That he Knew Both Sides of the Case—That "Absurd," "Audacious" and "Deadlock" were used advisedly—and that the Engineer Members will do their Own Talking.

[The editorial note referred to in both the foregoing letters was written with full knowledge of the report presented at Richmond and the ensuing discussion. We characterized as absurd and audacious, not any objections the manufacturers may have to the tentative

draft of cast-iron pipe specifications, but the proposal to suppress the draft and ask the members to vote in the dark, by letter ballot, on whether they wanted the specifications changed when for six years the association has maintained a committee for the express purpose of revision. Mr. Wood says there is no deadlock in the committee. We characterized the condition as "deadlock by courtesy," since the four engineer or pipe-consumer members have long waited on the two manufacturer members of the committee. So much for our own part. The portions of the letters by Messrs. Russell and Wood that relate to the work and attitude of the two elements in the committee we leave to the engineer or pipe-consumer members of the committee, Messrs. Gregory, Barbour, Randall and Wall, whose joint communication on the subject appears below.—Editor.]

The Four Consumer Members Present "Some Facts": No Attempt To Force Specifications on Manufacturers—History of Efforts To Get Makers To Coöperate—Uniform Outside Diameters Once Urged by Manufacturers—What Would Changes Cost?

Sir—We thank you for bringing to our attention the foregoing letters of Messrs. Russell and Wood. While the undersigned, who are referred to by Mr. Russell as the "engineering members" (of the American Water-Works Association Committee on Revision of Standard Specifications for Cast-Iron Water Pipe and Special Castings), have no desire or intention of entering into a controversy through the columns of your paper, there are some facts which your readers should have before them when considering the letters above referred to.

It may be well to say right here that the uniform outside diameter was by no means the only important point discussed at the conferences over these proposed specifications. And it may further be said, with reference to uniform outside diameters, that the indications were that the cost of securing the same would be nominal, to say nothing of the fact that the manufacturers formerly urged the adoption of uniform outside diameters.

The preliminary draft of proposed new standard specifications, which was submitted to the manufacturers for their consideration, was printed in *Engineering News-Record*, May 31, 1917, and is therefore available to all who may be interested in the subject.

No Attempt To Force Specifications on Makers

With reference to these specifications, it should be stated most emphatically that they were *tentative* only, and in our communications to the manufacturers this was emphasized. In other words, the committee has never taken the attitude of attempting to force anything on the manufacturers. The committee, in response to what it believed to be the intention of the association in appointing it, adopted the uniform outside diameter. Then it went a step farther and added a relation between flexure and breaking load. Then, it undertook to add to the specifications the chemical characteristics of the metal, and finally it incorporated a specification for improved coating. These were the principal changes.

In this work of drafting a new standard specification the ideas mentioned above, as well as others of minor importance, were put up for discussion, and not a letter has been written to the manufacturers which has any other significance than an expression of the desire of the committee to obtain the necessary information from the manufacturers which would prove whether these ideas—taking into account cost and workability—were practicable.

History of Attempt To Get Makers To Coöperate

The history of our attempt to get the manufacturers to coöperate with us and give us the benefit of their experience will be of interest.

On May 7, 1916, the preliminary draft of the proposed new specifications was sent to the manufacturers, and from the letter accompanying the same the following paragraphs are quoted:

"The inclosed specifications for cast-iron water pipe and fittings, prepared by a joint committee formed from the committees of the American and New England Water-Works Associations, is a preliminary draft of proposed new standard specifications and is sent you for your criticism and discussion."

"It is the intention of the joint committee to hold a meeting in New York within a few months, and to invite manufacturers to appear and present in person their discussion of the inclosed specifications, or if attendance is not possible, to submit such discussion in writing at this meeting, notice of the time of which will be given thirty days in advance of the date finally chosen."

"It is to be understood, however, that the present draft is altogether tentative, that the minds of the committee are open, and that this draft is now sent you for your discussion and criticism, with the hope that finally a standard specification may be developed, acceptable throughout this continent, at least, to the users and to the manufacturers of pipe, and which will become effective at such time in the future as will reasonably allow for any necessary changes in foundry equipment."

Manufacturers Unanimous for No Change

Subsequent to the sending out of the tentative specifications, the following letter, dated June 5, 1916, and signed by the manufacturers and addressed to the chairman, was received:

"The revision of the A. W.-W. A. specifications submitted by your committee has been carefully considered by all makers of cast-iron pipe, who now have the honor to report that in their opinion the specifications submitted are not practical from the standpoint of the maker—that the A. W.-W. A. specifications adopted May 12, 1908, have been complied with by all makers, at an enormous cost in fixed capital, and the pipe made under these specifications has proved satisfactory for the purpose for which it is intended, and all makers are unanimous in their firm decision to continue producing under the A. W.-W. A. specifications now in general use."

Notwithstanding the apparent attitude of the manufacturers, we felt that they would still comply with our

request for their discussion and criticism of the tentative specifications. Accordingly, on Nov. 23, 1916, an invitation was sent to the manufacturers to meet the joint committee (of the A. W.-W. A. and N. E. W.-W. A.) in New York on Dec. 14, 1916. Such a meeting was held, on the date mentioned, at which representatives of the manufacturers, as well as members of the committee, were present.

Makers Requested To Discuss Draft in Detail

At this meeting there was much discussion (the stenographic report covers 128 typewritten pages), especially of the proposal to adopt a uniform outside diameter and of the feasibility of specifying the chemical quality of the metal. It became evident that the manufacturers, as represented at the meeting, were opposed to the revision of the present specifications, for various reasons, including the expense incident to changes in present equipment, increased manufacturing difficulties, and the belief that the present specifications were good enough. In order that the statements of the manufacturers as to the effect of the proposed changes on cost of production and on the technic of manufacturing might be supported by definite figures and arguments, the following motion was unanimously carried, there being seven members of the two water-works associations' committees and six representatives of the manufacturers present at the meeting:

"Moved, that the manufacturers be requested to consider the tentative specifications for cast-iron pipe as prepared and submitted to the manufacturers under date of May 7, 1916, and report to the committee at a meeting to be held on Mar. 15, 1917, the result of their deliberations, with such modifications of the specifications, paragraph by paragraph, as may seem to them desirable, together with their reasons therefor."

Makers Decline Further Discussion

It was the understanding of those present that the manufacturers would discuss in detail the tentative revised specifications, and would present in writing at the meeting to be held on Mar. 15, 1917, the results of their deliberations.

When the date of this meeting approached, it was found that the manufacturers were not prepared to submit any detailed discussion of the tentative draft of specifications. No meeting was held, but the following letter from the manufacturers, dated Mar. 30, 1917, and signed by Walter Wood and N. F. S. Russell, was received by the chairman of the committee:

"Referring to the request of the committee that the manufacturers should again study the tentative specifications submitted by the joint committees of the American Water-Works and New England Water-Works Association, and if necessary to propose their own specifications:

"We beg to state that this question has been fully discussed at three meetings of the manufacturers, and it is the unanimous opinion that there are no essential changes, at the present, necessary in the specifications of the American Water-Works Association, adopted May 12, 1908.

"These specifications are not ideal, but for practically ten years have proved fairly satisfactory to both user and manufacturer, as evidenced by their almost universal adoption.

"We would, therefore, respectfully suggest that the specifications of the American Water-Works Association, as now drafted, remain unchanged."

The preceding letter makes evident the position of the manufacturers and the fact that they not only will not agree to any changes in the present specifications until forced to do so by the demand of the consumers, and will not even coöperate with the committee to the extent of furnishing detailed reasons and figures in support of their objections to the proposed revision.

A report was then made by the committee to the American Water-Works Association at the convention held in Richmond in May, 1917, at which the conditions of affairs was brought to the attention of the association.

Specifications Not To Go Into Effect for Years

With reference to the time when the proposed specifications should go into effect, should they be adopted with or without changes, we recognized the existing abnormal conditions in the country, and in our report to the convention we stated that "it is not proposed these specifications should go into effect for a number of years"; and the representatives of the manufacturers are well aware that all along we have been of the opinion that revised specifications should not become effective until some time in the future, as stated in our letter to the manufacturers dated May 7, 1916.

As bearing on one phase of the matters under discussion—namely, the cost involved in having a uniform outside diameter—Mr. Russell, at an early meeting of the committee, in response to the question of cost, estimated the investment necessary to make the changes needed, and when this was figured into tonnage per year it amounted to less than 5c. per ton. The estimate, made on the moment, was probably only a very rough one. The committee has subsequently endeavored to obtain accurate figures from the manufacturers, which unquestionably are at their command, and which, also unquestionably, the manufacturers have simply refused to furnish.

Makers Once Urged Uniform Outside Diameters

As bearing on the matter of uniform outside diameters, the following quotation from a letter dated Dec. 1, 1913, and written by L. R. Lemoine, President, United States Cast-Iron Pipe and Foundry Co., to D. Long Miller, Louisville, Ky., a former member of the A. W.-W. A. committee, and forwarded by Mr. Miller to the chairman on Jan. 5, 1914, is of especial interest. Mr. Lemoine is discussing some of the early work of the committee and especially a memorandum in which uniform outside diameters were proposed, as well as discussing the American and New England Water-Works Association's specifications. Mr. Lemoine says:

"These New England specifications, by the way, were adopted Sept. 10, 1902. Prior to the adoption of these first standard dimensions, the manufacturers represented at the conferences with the committee of the New England association urged uniform outside diameters for the several classes of pipe for each nominal inside diameter. This ideal was then overruled by the

engineers, resulting first in the New England standard dimensions and later in the American tables. Since then, the manufacturers have made up fixtures for pipe as thus specified. To change now would involve large outlays for new equipment which the manufacturers listed above [a list of ten manufacturers was given], including this company, are not prepared to make. At the moment, it is not necessary to go into the details of these changes."

Here we have, then, a statement from one of the largest manufacturers of cast-iron pipe that a uniform outside diameter for the several classes of pipe for each nominal inside diameter is ideal and that its adoption was urged by the manufacturers as long ago as 1902, but that the engineers, then in charge of drafting the specifications, turned the proposition down at that time. In fairness to the undersigned it should be stated that none of us was connected with the writing of the original specifications of either the American or New England Water-Works Associations.

How Much Would the Proposed Changes Cost?

That the manufacturers have installed equipment to turn out pipe in accordance with the present American and New England specifications is not denied, and that it will cost money to make changes so as to turn out pipe with a uniform outside diameter for all classes of pipe of the same nominal size is admitted. What we want to know is how much will it cost to make these changes and go back to the ideal urged by manufacturers 15 years ago. The manufacturers can tell us, and we've asked them to, but they won't.

With all of the above before the readers of *Engineering News-Record* we are perfectly willing to leave them to form their own judgment as to whether the engineering members of the American Water-Works Association Committee have been unreasonable or not.

John H. Gregory,
Consulting Engineer, New York City.
F. A. Barbour,
Consulting Engineer, Boston, Mass.
W. H. Randall,
Superintendent of Maintenance and Distribution,
Toronto, Ont.
Edward E. Wall,
Water Commissioner, St. Louis, Mo.

Mr. Clow's Letter Comes Just in Time To Give Manufacturers Another Inning—Hits Hard at Editor and Engineers—Cost of Changes Discussed—Are Pipe Makers Audacious Obstructionists or Have They Broader Viewpoint Than Engineers?—A Last Shot at Substitutes for Cast-Iron Pipe.

Sir—I have been accustomed to look upon the articles in *Engineering News-Record* as authoritative. Your editorial in the issue of May 31 can only be characterized as grossly misleading and absolutely unfair, and unless admitted I shall not believe it was written by your editor or even seen by him, for it is an absolutely false statement.

The demands made on the manufacturers are in part absolutely impracticable. Cast-iron pipe as made has given better satisfaction in use than any other material. Its life is unknown—its record stands now for over 250 years of constant service. No substitute for cast-iron pipe has a record for good service of even 25 years..

Cast-iron pipe is now, and always has been, sold at an unreasonably low price based on pig-iron cost and conversion. Some engineers, who are most loudly clamoring for changes that could not be complied with in any pipe shop now in existence in this country, will accept a substitute for cast-iron pipe which is obtainable at the lowest cost and recommend its use to a council that seldom knows the difference in actual value between the only conductor tried and not found wanting and the substitute, which has, so far, always failed.

Never since cast-iron pipe was made has it been so carefully manufactured as now. The makers maintain at their works expensive laboratories where they employ good chemists. Iron is bought on analysis and rechecked when received. All of this is new—it is not 25 years since the first chemist was employed by a cast-iron pipe maker.

Old Specifications Cost Makers a Million

The American Water-Works Association specifications cost the makers of cast-iron pipe at the very least one million dollars—covering necessary changes to comply therewith—and today, to satisfy the wish of a few men, we are asked to discard a part of this equipment and spend another fortune, and are *told* we can add it onto the price.

A few engineers insist that the essential feature of the new specifications is the adoption of a uniform diameter of all classes of pipe of the same size. In the first place, this would mean that standards established for years would be changed. Every city in the country has standardized on the class of pipe of the different sizes which they must use. Under the new specifications this would be greatly complicated and secure no greater uniformity than is now obtained.

Would Cost Each Plant a Quarter Million

Next figure the cost of the necessary change. The equipment to produce pipe in any modern plant cannot be made today for under a quarter of a million dollars. The new specifications mean that a large part of this equipment must be scrapped to attain an end that will in no way improve conditions, will in no way increase efficiency of cast-iron pipe for the use for which it is intended—namely, to conduct water and gases underground.

To develop the greatest efficiency in producing cast-iron pipe has required years of patient study by manufacturers—to produce the best pipe possible—with the lowest labor expenditure and the lowest total cost.

To comply with these new requirements this work would go for nothing—the manufacturer would have to start all over again on a problem which would necessarily require more labor and therefore greater cost to obtain a product which would in no way be an improvement over what we now have.

Why should you write such an uncalled-for article with only one side of the question before you? Why

did you not ask for the makers' side if you cared to enter the controversy? Are the makers simply audacious obstructionists or have they not tried to look at the matter from perhaps a broader viewpoint than a few technical engineers, who at times mistake the use of cast-iron pipe and imagine that they are drawing the specifications and inspecting rifles instead of water pipe?

I write feelingly on this subject, for we have had an eminent man with a reputation inspect our pipe and measure it with a micrometer gage. The experience with this highly educated man, who never had seen the inside of a pipe shop, cost this company many thousands of dollars.

I am sure 90% of all users of cast-iron pipe are well satisfied with the product they receive—the best cast-iron pipe ever made in this country, suitable in every respect for the uses for which it was intended. And why should 90% be burdened because men who specify 10%—but do not pay for it—want to add materially to the cost of production without adding anything whatever to its value for its probable use as a conductor of water and gas?

Do you not believe that *Engineering News-Record* owes it to the manufacturers of cast-iron pipe to give as wide publicity to their side of the question as has been given by your article in the issue of May 31? We sincerely trust you will do so.

You will please pardon my delay in writing this letter. Unusual conditions have prevented, but my intentions—like those of the engineers who are clamoring for this change—are good.

MISERABLE GOOD-FOR-NOTHING SUBSTITUTES

One other thought for you. Do you realize that there is not one single trade paper in the United States that has the nerve to come out and condemn substitutes, the use of which has ruined corporations and impoverished communities? Do you realize that not one of them dare, or do you in your paper, give records of such cities as Hammond, Ind., where the entire water-works was laid with steel pipe and all of it had to be torn up and replaced with the only known conductor of water and gas that has a life justifying its use by any community? I say to you that when you have a commodity suitable for the purposes for which it is intended, lasting, in absolute tests and use, for over 250 years and still good, there is little fault to be found with it; and your best service to the country and to the people is in not condemning the tried and not-found-wanting commodity but, rather, the substitute that is foisted upon an unsuspecting public whose money is wasted and where few people profit. Millions upon millions of the people's money have been wasted on miserable good-for-nothing substitutes, advocated by engineers and guaranteed by them. Before you again condemn cast-iron pipe search the entire world and see if you can locate any losses occasioned by its use that are in any way comparable to the vast fortunes that have been lost by the use of substitutes.

I trust that hereafter your columns will be fairer to the manufacturer, who is struggling at all times to perfect his product, rather than so one-sidedly favor the man who does not spend his own money, whose education is theoretical and not practical, and give fair credit where credit is due.

W. E. CLOW,
Chicago, Ill. President, James B. Clow & Sons.

The Editor Has the Last Word: He Assumes Full Responsibility, States His Object and Declares It Achieved in Unhoped-for Measure.

[Neither the office boy, the printers' devil nor anyone else but the editor wrote the editorial in question. No one asked the editor to write it, or to write or to print anything on the subject, or knew in advance of publication that the editorial note and the tentative draft of specifications were to appear in our columns.

In printing what we did we had but a single purpose. Our object was, not to take one side or the other on the merits of the proposed specifications, but merely to give publicity to them and to the committee "deadlock by courtesy"—and to do it while the subject was fresh.

That object has been achieved in even larger measure than we had hoped—especially by means of the foregoing letters representing both sides of the case.—Editor.]

Inspect Six-Mile Tunnel by Automobile

In the past the inspection of the Gunnison tunnel by the United States Reclamation Service engineers for the reading of gages, etc., has been a trying day's work on account of the long hike and necessity of carrying ladders and blueprints. Early in April the cross-ties were completely removed from the tunnel for the first time and the rails laid against the side of the tunnel. Fred D. Pyle, project manager, and L. J. Foster, office engineer, states the *Reclamation Record,* decided to make the trip by automobile. It was a muddy, sloppy day, and some difficulty was found in lowering the car into the Portal cut. However, the going was good after entering the tunnel, and the trip through was made in 65 min., notwithstanding engine trouble due to splashing water and damp atmosphere. The machine was turned at River Portal without leaving the tunnel, so that a 12-mile run was made under the mountain. On Apr. 27 another trip was made by the project manager and J. H. Fertig, construction engineer, in 38 min. going to River Portal, and 48 min. back to West Portal. The river gates leaked considerably, and the run was made in 4 to 16 in. of water. The maximum speed attained was 12 miles per hour. No engine difficulties were encountered this time. These trips demonstrated the practicability of using an automobile for inspection work on automatic gages, minor maintenance work and transportation of supplies to gate tenders at River Portal.

Metropolitan Traffic Density in War Areas

The density of traffic on Fifth Ave., New York City, is equaled, if not actually surpassed, by that which exists over a wide area on the French front. There the traffic includes passenger cars, ambulances, quartermaster trucks, ammunition trucks, artillery tractors, special apparatus for engineer and signal corps, motorcycles and half a dozen other types of vehicle.

Build Army Aviation Camp Near Detroit

Contractor Converts Trees Cleared from Site Into Plank Roads—100 Men Hired Daily To Keep Up Force

TURNING a square mile of land at Lake St. Clair, 30 miles north of Detroit, into an army aviation field and cantonment has required a variety of construction work carried on with speed and proper coordination. A hundred new men are hired every day to maintain the working force of 1000, because of unsettled labor conditions. To build roads across soft ground for delivering construction materials, sawmills were set up on part of the site which required clearing, and the trees were sawed into plank and slabs for roadmaking.



PORTABLE SAWMILLS CONVERT STANDING TIMBER INTO PLANK AND SLABS FOR TEMPORARY ROADS

Cantonment Two-Thirds of a Mile Long

Part of the 700 acres selected for the camp site was a wooded flat bordering the lake. It had to be cleared of trees, and underdrained. A dike and a dredged ditch were required in this work. The cantonment proper, a small wooden city covering an area 600 x 3500 ft. down the center of the reservation, had to be provided with water, sewer and lighting systems and with paved streets. For the camp alone, 4,500,000 ft. of lumber was needed.

Until a railroad track could be built 3½ miles to the work from Mt. Clemens, all material received by rail was brought down the Clinton River on barges to the site. Some of the materials were brought by lake steamer; but because of shoal water offshore, these cargoes also were lightered to the camp.

To distribute the lumber and supplies by team proved difficult because of the marshy ground, and a caterpillar tractor, hauling two or three wagons at a time, was soon at work. Even this mired, and temporary roads became an immediate necessity.

A tent logging camp had been established to clear and stump 13 acres of large timber on the site; and as green timber is perfectly good material for plank roads, the contractor solved his difficulty by setting up two sawmills with a capacity of 14,000 to 16,000 ft. a day and converted the standing timber into road metal. The timber, practically all of which is of logging size, is cut down in the usual way, and the logs are dragged to one of the sawmills by team. The planks, slabs and sawdust produced are all used in making roads. The planks are laid flat without covering, alternate sections of planks and slabs being placed. The slabs are covered with the sawdust to produce a more even surface. The stumps on the land cleared are being removed with dynamite.

The ditches for the underdrainage are being constructed as the building work progresses, and hand labor has been employed so far. A sanitary sewer system discharging into a sump from which sewage will be pumped into the lake is required, and the single valve filter through which the water-supply for the permanent camp will pass from the lake has already been installed to furnish water for the construction camp. The concrete required for this work and for a large number of small footings is being mixed in five portable 10-cu.ft. mixers.

Construction Gangs Drawn from Contractor's Organization

The general contractor for the camp was able to secure a good crew of Michigan lumbermen who have stuck by the job. For constructing the camp buildings, the carpenter forces of this company, trained in



FIVE SMALL MIXERS USED FOR SCATTERED CONCRETE YARDAGE IN FOOTINGS FOR CAMP 3500 FEET LONG

reinforced-concrete formwork, were available and have acquitted themselves well. A competent highway organization has also been assembled for the paving work. The chief trouble with the labor, therefore, was in securing common workmen, who, according to the contractor, come and go at the rate of 10% of the total force employed each day. Hundreds of men come out to the job from Detroit and never go to work. Negro, foreign and American labor is employed.

Some of the skilled and unskilled workmen living in the vicinity prefer to travel back and forth to work every morning in spite of a 5-mile walk to the nearest car line, but most of the force is housed at the job. The lumbermen are cared for in a tent camp, while a temporary construction camp has been built for the other men. As the size of the force increased and the first of the permanent camp buildings were erected, temporary bunks were installed in them for the use of the contractor's forces. The main mess kitchen at the site employs 40 to 50 men to serve three meals a day.



EVEN SAWDUST UTILIZED ON PLANK ROADS

Two 10-hour shifts were started as soon as possible, the entire camp site being lighted by a double line of 600-cp. electric lamps put up by the Detroit Edison Co. on poles 150 ft. apart.

The officer in charge of work for the Government is Capt. H. R. Eyerick. Albert Kahn, of Detroit, is consulting architect on the work, while the construction is being carried out by the Walbridge-Aldinger Co. Mr. Walbridge and J. H. Ryan, purchasing agent for the company, make their headquarters at the camp. Under their direction, E. Winters is superintendent of construction.

How Are Vertical Loads Distributed Through Earth-Fills?

Tests Made by Office of Public Roads and Rural Engineering Give Method of Finding Spread of Concentrated Load

IN A paper presented to the American Society for Testing Materials at the recent Atlantic City meeting, A. T. Goldbeck, of the United States Office of Public Roads and Rural Engineering, outlined some tests where the distribution of vertical loads through sand-fills up to the depth of 5 ft. was measured by readings on sensitive gages, and as a result certain tentative figures for the distribution of such loads were arrived at. For larger range of depths and fill material, further tests will have to be made.

The apparatus consisted of a bin in the bottom of which were placed, at measured intervals, a number of cells which communicated to outside gages and which by an air-pressure device gave fairly exact readings of the pressure produced at each cell. The device was described by Mr. Goldbeck at the 1916 meeting of the society. A bearing block made of a circular plate, in one case 8 in. in diameter and in another 13½ in., was placed on top of a varied depth of fill, and a measured load was applied to the block. Measurements of pressure were then taken through the cells placed at the distributed points below the fill. Data were recorded by diagrams of which a typical one is shown in Fig. 1.

In applying such curves to practical design, Mr. Goldbeck makes the following recommendations:

It is very common practice at the present time to assume that a wheel load acts over a definite area on top of the fill, that the pressure is transmitted with uniform intensity to the slab and that it acts over an area determined by an assumed angle of spread from the top

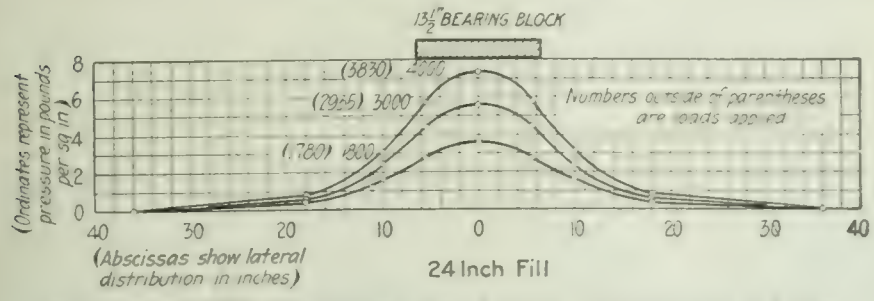


FIG. 1. DISTRIBUTION OF LOAD THROUGH DAMP SAND-FILL

of the fill. This assumption of uniform intensity is of course wrong, as shown by these pressure measurements, but forms a convenient means of calculation, provided the correct intensity and area of pressure are assumed. In order to make use of the curves of pressure for practical calculations of bending moment, it would be well to know the location of the center of gravity of the half-volume of the figure generated by revolving the curve about its central axis. The distance from

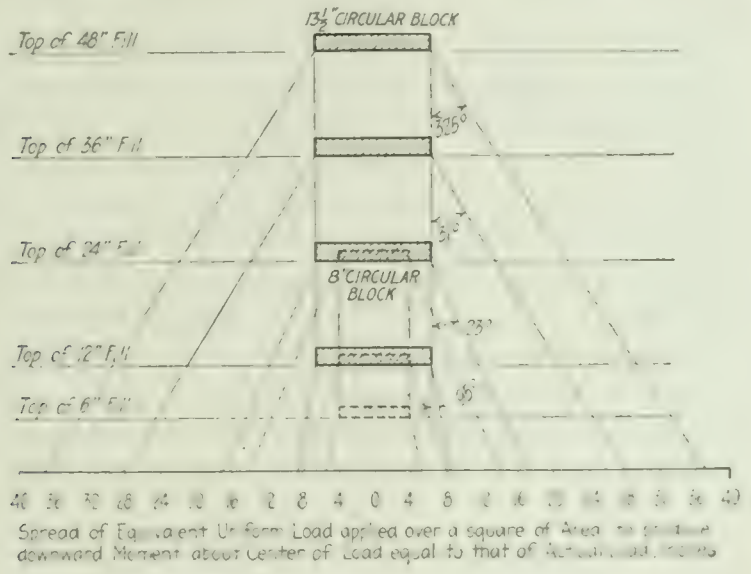


FIG. 2. LOADS IN TERMS OF EQUIVALENT UNIFORM LOADS

the center of gravity to the center of the curve, multiplied by one-half the total load, is the moment about the wheel load of the distributed pressure to either side of that load. The centers of gravity of these half-volumes

TABLE I. LOCATION OF CENTER OF GRAVITY OF HALF OF PRESSURE ON SLAB WITH RESPECT TO CENTER OF LOAD

Depth of Fill, In.	Load, Lb.	8-In. Block Center of Gravity to Center of Load, In.	Load, Lb.	13½-In. Block Center of Gravity to Center of Load, In.
6	1,400	2 6		
12	1,200	3 6	1,800	4 4
			5,000	4 2
24	1,400	7 0	1,800	10 5
			4,000	8 4
36	1,400	16 8	1,800	16 0
			5,000	14 0
48			5,000	18 5

for the maximum loads applied to the various depths of fill have been calculated and are shown in Table I.

If for the convenience of the designer, the pressure at the bottom of the fill is considered uniform and acts over a square of area, the sides of each of these areas will be equal to the values in the last column of Table I multiplied by four. The sides of the squares of areas thus obtained are somewhat different for the highest and lowest loads applied and may be tabulated as in Table II.

The results in Table II, for the high loads only, are shown graphically in Fig. 2. In calculating the bending moment in a slab, the designer, instead of using the

TABLE II. EQUIVALENT SQUARE AREA

Depth of Fill, In.	Load on 8-In. Block, Lb.	Length of Side of Square of Equivalent Uniform Pressure Area, In. 8-In. Block	13½-In. Block	Load on 13½-In. Block, Lb.
6	1,400	10 4		
12	1,200	14 4	17 6	1,800
			16 8	5,000
24	1,400	28 0	42 0	1,800
			33 6	4,000
36	1,400	67.2	64 0	1,800
			56 0	5,000
48	.....		74 0	5,000
60	.....			

varying intensity of the load, as it is shown to exist in the pressure measurements, may consider the same total pressure applied over a square of area whose side is given in Table II or as shown in Fig. 2.

Good Construction Record in Casting Concrete Piles

With Half-Yard Mixer Construction Crew Pours 2000 Linear Feet of Piling in an 8-Hour Day

IN PLANNING the construction of piers 31 and 33 on the San Francisco waterfront, 1293 concrete piles ranging in length up to 90 ft. were required. The contract was awarded with a bonus and penalty clause attached, and the contractor made every effort to organize the work in such way that the maximum rate of progress could be maintained.

The space available for casting and storing the piles measured about 85 x 900 ft., and the construction-scheme layout provided for pouring one layer of piles on top of the other up to a height of four tiers. There



MAKING UP CAGES OF THE FOURTH TIER

was sufficient time for curing, so that the age difference between the bottom and the top layers would be immaterial when the time came to remove the piles from the casting yard and drive them.

The casting yard was laid out with the mixer plant about midway. Sand and gravel from barges were de-

livered by grab bucket into the bunkers, and cement was delivered in freight-cars on a siding adjacent to the mixer. From the mixer a plank runway 8 ft. wide was built to accommodate the 6-cu.ft. hand buggies. To deliver the concrete, these buggies traveled a maximum of 500 ft., averaging about 300 ft. for the entire job.

Making Up the Cages

The reinforcing steel used in each pile was assembled on the longitudinal rods suspended from gantries immediately over the section of forms being built up. The cages for the 90-ft. piles were supported at four points by chain blocks arranged to travel transversely across the forms. After assembling the cage, the crew of four, one at each supporting chain block, moved it along the gantries and placed it in the form.

The plan of construction was to build the forms tier upon tier as the work advanced, using the ends and sides of forms repeatedly for successive tiers. The side forms on each pile were separated by wooden spacers placed every 2 ft., which could be pulled out when the



WITH THIS DEVICE SPACERS WERE PULLED FROM BETWEEN FORMS

forms were to be removed, thus taking the strain off the side forms and allowing them to be lifted easily.

These spacers were pulled out by means of a pair of flat-jawed tongs operated by a long lever. The jaws of the tongs were made to grip by means of a steel cable, one arm of which ran around a wheel on the other arm and thence over the end of a lever. Ordinarily, two men operated this device, one to adjust the tongs and tap the spacer free with hammer, if necessary, while the other operated the lever. After the forms had been removed from each tier of piles and had been soaked with water at frequent intervals for seven days, another tier of piles was poured on top.

Labor and Materials

For pouring concrete, the usual crew consisted of one man operating the mixer, thirteen concrete men, six laborers and one finisher. In addition to this, a carpenters' crew required to keep the formwork ahead of the concrete gang varied from two to six carpenters and two to eight laborers working under the direction of one foreman. It was found that the crew of housesmiths who could make up the reinforcing cages to best advantage consisted of about thirteen men and one foreman. The usual day's work for this crew was about 18 to 22 cages, 82 to 72 ft. in length.



THE SPACE AVAILABLE FOR CASTING AND STORING THE PILES MEASURED ABOUT 85 X 900 FEET

There were also men unloading cement and a stationary engineer operating the grab bucket unloading sand and gravel. However, form carpenters were used on about half-time only, and of course materials were delivered to the mixer plant only as required. With this construction layout served by a ½-cu.yd. Ransome mixer, the crew poured in an 8-hour day from 1700 to 2000 lin.ft. of piles 18 or 20 in. square.

After 37½ working days the contractor reported 532 piles completed, having a total length of 42,051 lin.ft. Of this number, 338 were 20 in. square and had a total length of 27,540 ft., and 194 were 18 in. square with a total length of 14,511 ft., thus making the approximate total yardage placed in 37½ working days 4015 cubic yards.

During the latter part of the work, there will not be the rush construction on pouring which has thus far been carried out, because while the piles now cast are being driven there will be ample time for those to be required later to set the specified length of time. The rule is not to remove forms until the seventh day and to drive piles only after they have set for 45 days.

The work is being done for the California State Board of Harbor Commissioners, Frank G. White, chief engineer. The general contract for the construction of the piers is held by Healy-Tibbitts Construction Co.

Maryland Limits Weight on Tires

The State of Maryland has limited the weight per inch of tire for truck traffic to 650 lb. On a few of the roads specifically named, the limit is placed at 750, and on others at 800 pounds.

Monumental Portal Completed at Approach of Manhattan Bridge

Colonnade of Cut and Sculptured Granite on Center of Plaza at Manhattan End of New York's Latest Suspension Bridge

WHAT is probably the most elaborate and certainly the most expensive bridge portal in the country is now approaching completion at the west, or Manhattan, end of the Manhattan suspension bridge across the East River, New York City. The Manhattan bridge is not new. It was started in 1901 and was opened early in 1910. It was not until the first part of 1913, however, that any work was begun on the monumental approaches to the bridge. The Brooklyn approach is now completed. The Manhattan approach is completed in so far as the main structure is concerned, but work is now under way on the construction of the bridge trolley station and entrance at the south end of the plaza.

Manhattan bridge reaches street level in the Borough of Manhattan near the corner of Canal St. and the Bowery. There was set aside at this junction an approximate rectangle about 400 x 750 ft. in plan, all of which is devoted to the approach and treated as an architectural and landscape unit, the adjoining streets being shifted in some few places to meet the design requirements of the approach plaza.

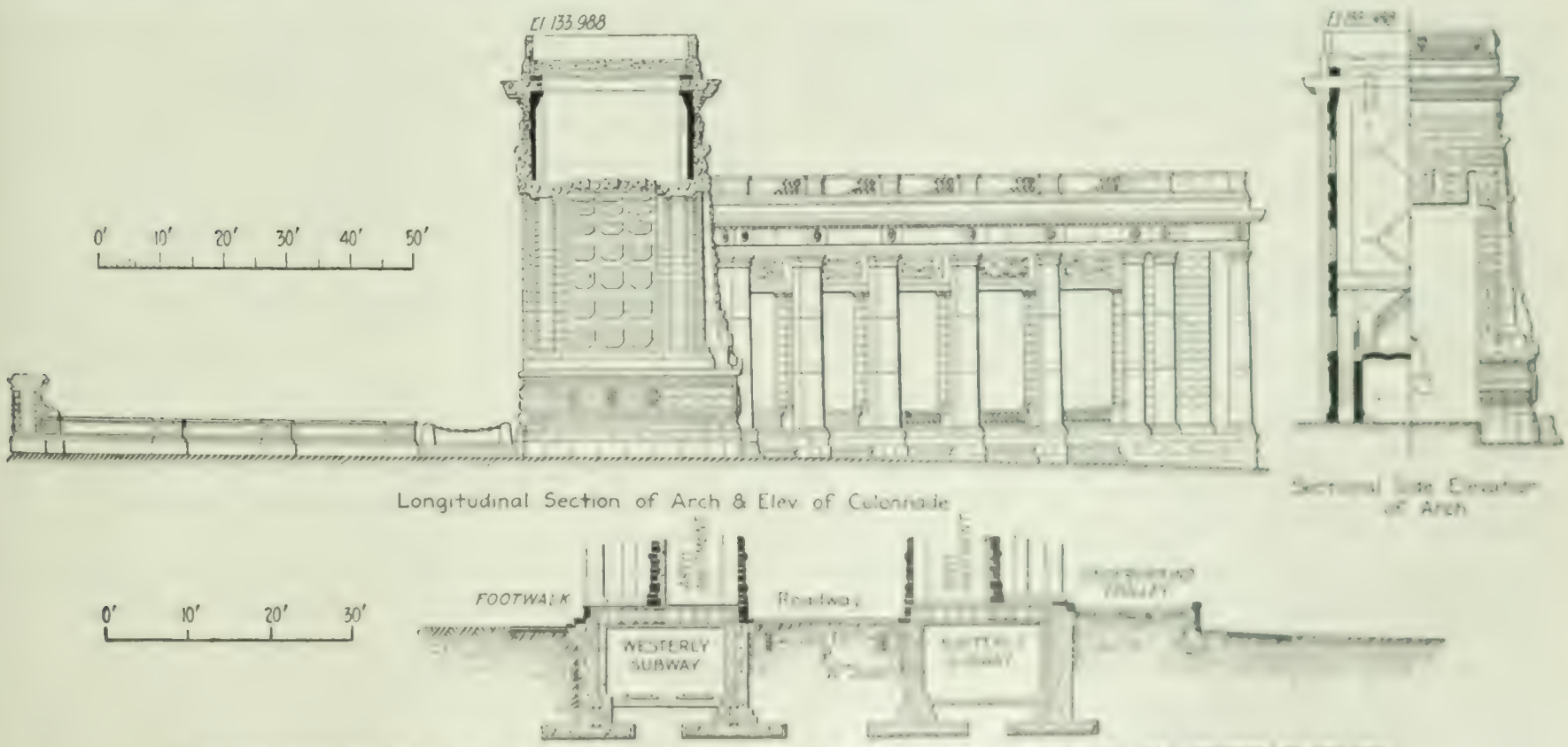
Granite Arch the Central Feature

The central feature of the approach is a monumental granite arch with an elliptical colonnade. Between the arms of the colonnade and under the arch passes the main vehicle roadway of the bridge. To the north of the colonnade the through surface cars turn to reach the northern roadway of the bridge, while to the south of the granite structure—that is, in the extreme southerly corner of the approach plaza—is located a terminal for the bridge trolley system, whose tracks cross on the southerly roadway of the bridge. On either side of the colonnade the area is highly parked and terraced, and retained above the level of the adjoining streets by an ornamental granite retaining wall. The footwalks, which are on the extreme north and south of the bridge, are approached from either directly south of the southerly colonnade or from the extreme edges of the plaza.

The arch and the colonnade structure are founded on natural earth and on the prepared roof structure of the



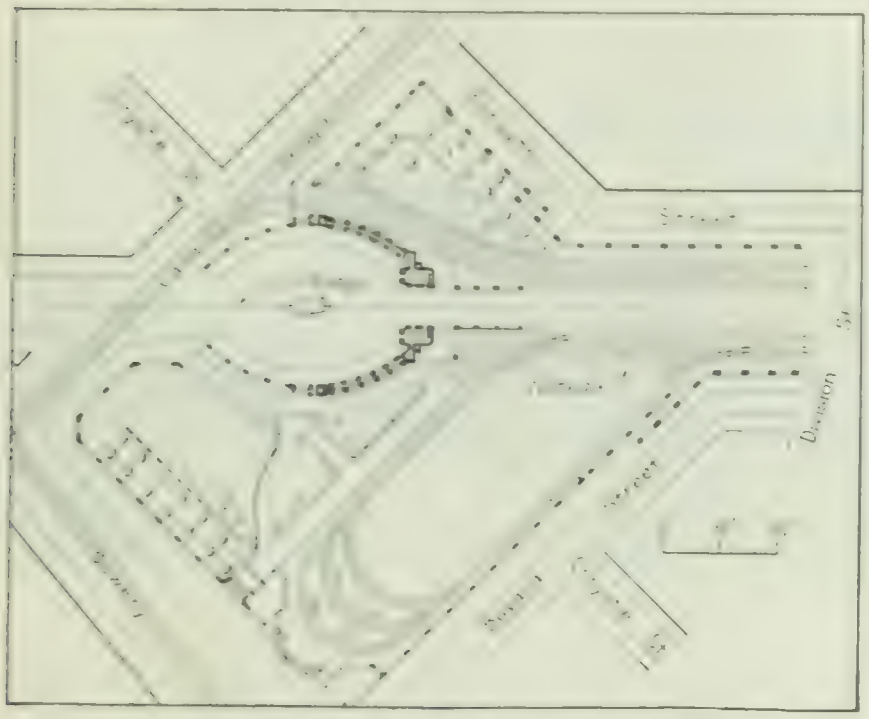
A CLASSIC MONUMENT ON NEW YORK'S EAST SIDE LEADS TO THE MANHATTAN BRIDGE ACROSS THE EAST RIVER



MANHATTAN BRIDGE PORTAL OF ORNAMENTAL MASONRY FOUNDED ON SUBWAY ROOF

and was made up of heavy plate girders spanning concrete retaining walls and themselves incased in concrete.

The main arch is of the monumental arch type made familiar by the Washington arch on lower Fifth Ave., New York, and the Arc de Triomphe in Paris. It is Center St. subway, which comes up under the portal to reach the center roadway of the bridge. The subway was designed to carry the load of the masonry portals



PORTAL IN CENTER OF PLAZA LAYOUT

about 70 ft. high, with an arch opening rising to 40 ft. from the roadway surface, the arch itself being a 36-ft. semicircle. The showing faces are of highly ornamental granite masonry, and the arch rib is of cut granite block backed for stability loading near the haunches with mass concrete. The interior of the arch otherwise is hollow, except for two reinforced-concrete floors and a reinforced-concrete roof, making the whole structure available for storehouse purposes.

The colonnade is made up of classic columns connected by the usual cornice structure. In the two faces of the arch piers and in the space above the arch proper are figures of symbolic and historical interest sculptured in granite. Those on the piers were designed and carved by C. A. Heber. The main frieze is the work of C. C. Rumsey.

All of the decorative stone is from the Hallowell granite quarries in Maine. It was cut to the smallest detail at the quarry and shipped by boat directly to New York. Very little finishing work was done by the stonecutters at the site, and due to the careful work by the contractor, not a single stone was broken or seriously marred in the erection process. This is quite remarkable because of the highly decorative character of a number of the stone pieces, particularly in the cornice of the colonnade and in the soffit of the arch ring. Exceptionally careful work had to be done at the latter place because of the protruding stems of the rosettes, which had to rest directly on the wood lagging of the arch falsework. Practically the whole colonnade and arch were erected from one working platform about the center of the elliptical approach. On this platform were located the derricks, which covered to all practical purposes the stoneworking area.

There are in the colonnade arch and retaining walls about 3700 cu.yd. of ornamental granite and about 1900 yd. of backing granite, together with 1000 tons of structural steel used in reinforcing the arches and foundations. The total cost of the approach structures will run close to $1,000,000. The ornamental granite work cost the city about $100 per cubic yard.

The approach to this bridge was designed by the Department of Plants and Structures of the City of New York; F. J. H. Kracke, commissioner, and E. A. Byrne, acting chief engineer. The architects responsible for the artistic designs and supervision of the approach were Carrère & Hastings, of New York City. The work was done by the P. T. Cox Co., of New York City, under the supervision of J. R. Geoghan, resident engineer.

Help Drain Irrigated Land

Small Wells Relieve Pressure in Substrata—Water Rises To Reach Tile Drains in Soil Underlain by Shale

RISING wells or boreholes sunk below the level of tile drains may materially assist the drainage of irrigated lands that are underlain by shale. This applies particularly to such lands in the Rocky Mountain States, where the water in the shale is under pressure and where methods employed in other sections of the country have not proved successful. Deep tile drains are required, not less than 6 ft., and as much as 8 ft. deep in many cases. The depth to the water-carrying strata, however, is much too great for ditching; and as pressure conditions exist in these strata, the sinking of wells permits the water to rise into the drains.

Owing to the character of flow in shale ground, the area of influence of a relief well is not large, and from two to six wells per 100 ft. of trench may be necessary. Their maximum depth is usually 20 ft. below the drains, and in general the flow is encountered at a depth of about 15 ft. In most cases a 2-in. hole is sufficient to care for the water.

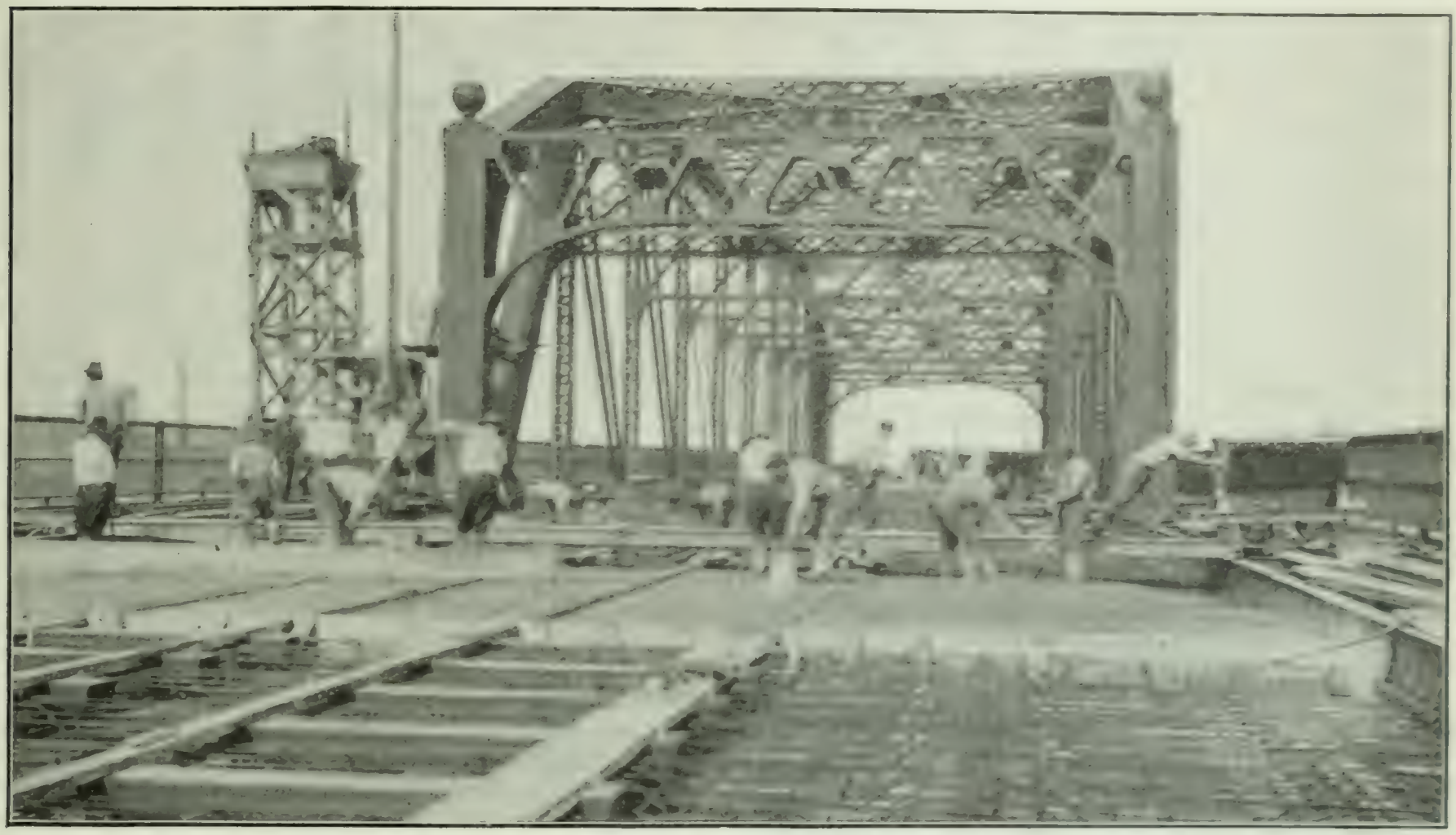
The well should be located near the end of a tile, and one end of the tile then chipped so as to leave a 2-in. hole over the well. If the banks will not stand and the wells must be driven as the tile-laying progresses, the well should be a few inches to one side of the drain and connected to the hole in the latter by placing a half-tile over the well. If the well is directly under the tile, it is likely to be closed by sediment washing into it, especially if the flow is weak.

The cost of boring the wells averages about 5c. per lin.ft. to a depth of 8 to 16 ft. below the trench, or as high as 10c. per ft. for depths of 16 to 25 ft., especially if hard material necessitates drilling. This cost represents an average of 2c. per ft. of drain. The trenching, tile laying and backfilling of drains 6 to 7 ft. deep amount to from 12 to 25c. per ft. (or 14 to 27c., including the wells). These prices are exclusive of the cost of the tile. The cost per acre is high, owing to the frequency of drains in soil of this kind; it ranges from $13 to $100 per acre. The above particulars are from a paper on "The Drainage of Irrigated Shale Land," by Dalton G. Miller and L. T. Jessup, in Bulletin No. 502 of the U. S. Department of Agriculture.

Wide Roadway of Cleveland Bridge Concreted Cheaply

Form Travelers Hung from Stringers—Concrete Delivered on Track Loop Formed by Bridge Over Roadway

A NUMBER of economical methods have been developed in concreting the base for the roadway and sidewalks of the Clark Ave. viaduct in Cleveland. About 5260 ft. long, with a 40-ft. roadway containing two street-car tracks and an 8-ft. sidewalk on either side, the concrete deck of this bridge is supported by steel floor-beams and stringers, the sidewalks being carried by brackets on the ends of the floor-beams. There are railroad lines on which materials could be delivered beneath the viaduct on either side of the Cuyahoga River. The problem was, then, to put a concrete deck on a steel skeleton at a height, for the greater portion of its length, of 70 ft. or more from the ground, the best locations for a concrete plant being on the ground and it being further impossible to get at the forms from above after the concrete had been placed.

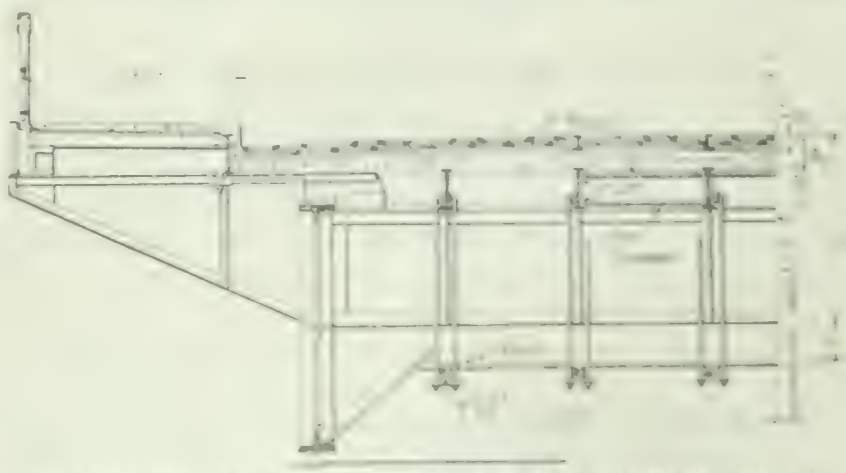


BRIDGE AND CAR SYSTEM PLACE ROADWAY SECTION NEAR FIRST CONCRETE PLANT

Roadway Concreted First

A concrete plant with a hoisting tower reaching the level of the bridge and discharging into a hopper feeding cars on an industrial track was set up at the railroad track on the east side of the river. This installation was used to concrete that end of the bridge, then was moved across the river to the railroad on the other side and used to finish the work. The plant included bins for charging the mixer, which were loaded by a clamshell derrick. The 40-ft. roadway was concreted first, leaving the sidewalk steel open. Upon this on either side of the roadway was laid 2-ft. gage industrial track on which 1-yd. Koppel cars were operated. These lines of track were connected just beyond the concrete tower by a 180-deg. curve and were connected at the point of concreting by a trussed bridge spanning the roadway.

Each end of this bridge rolled on two wheels traveling on the I-beam at the curb. The space between this point and the industrial track resting on the sidewalk framing was bridged at either end by a pair of rails, resting on the main bridge and on the inner edge of a turntable, as shown in the photograph. These turntables and the track sections on either of them resemble the track equipment used by street-railway companies in putting in a temporary turnout. The entire arrangement rested on top of the rails of the industrial track, and the concrete cars rode up on it wherever it might



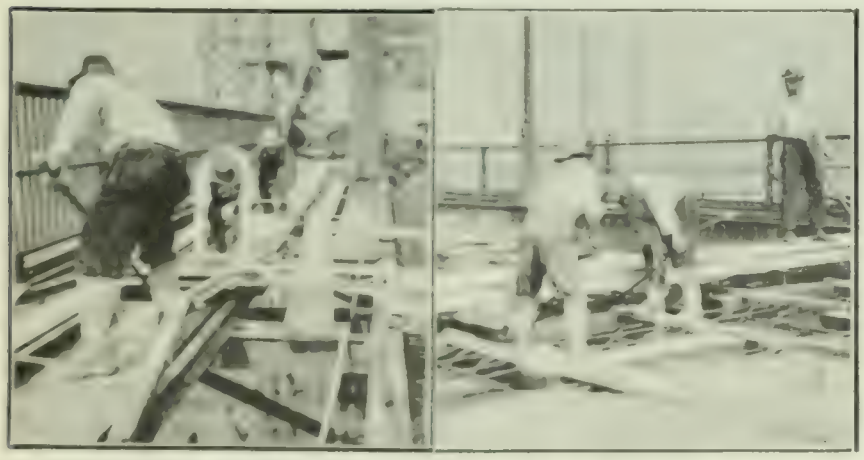
be placed along the track. With this arrangement it was a simple matter to roll the bridge along as the concreting progressed. The turntables were kept even with it by being barred along the top of the industrial track.

In this way, with a low labor cost for maintaining and shifting the track, practically every batch of concrete was dumped directly in place.

Swinging Staging Used for Formwork

A double row of wooden ties, beveled on the sides and ends, were laid small face down and spaced with 15-in. plank to form pockets and grooves in which the ties and rails of the street-railway tracks will be placed. These ties were kept well oiled and had an eye-bolt at each end for removing them from the concrete after it had set. However, forms of the same shape made from 1-in. plank covered with sheet iron were substituted before the contract was finished and were found to work much better.

As the viaduct was at a considerable height from the ground, the matter of staging for the workmen wrecking the forms under the roadway and sidewalks presented quite a problem. Some form of staging swung from the steelwork at once suggested itself; but because of the peculiar construction of the floor system, with the stringers resting on top of the floor-beams, such staging was difficult to arrange so that it could be moved along readily. This was finally managed successfully by suspending a traveling platform from four sets of hangers. These hangers, passing through 6 x 8-in. timbers, parallel to the bridge, on which the staging was laid, were fastened at their upper ends to small wheeled trucks rolling on the lower flanges of the stringers. The floor of the platform was about a foot below the bottom of the floorbeams. When the platform traveled up to a



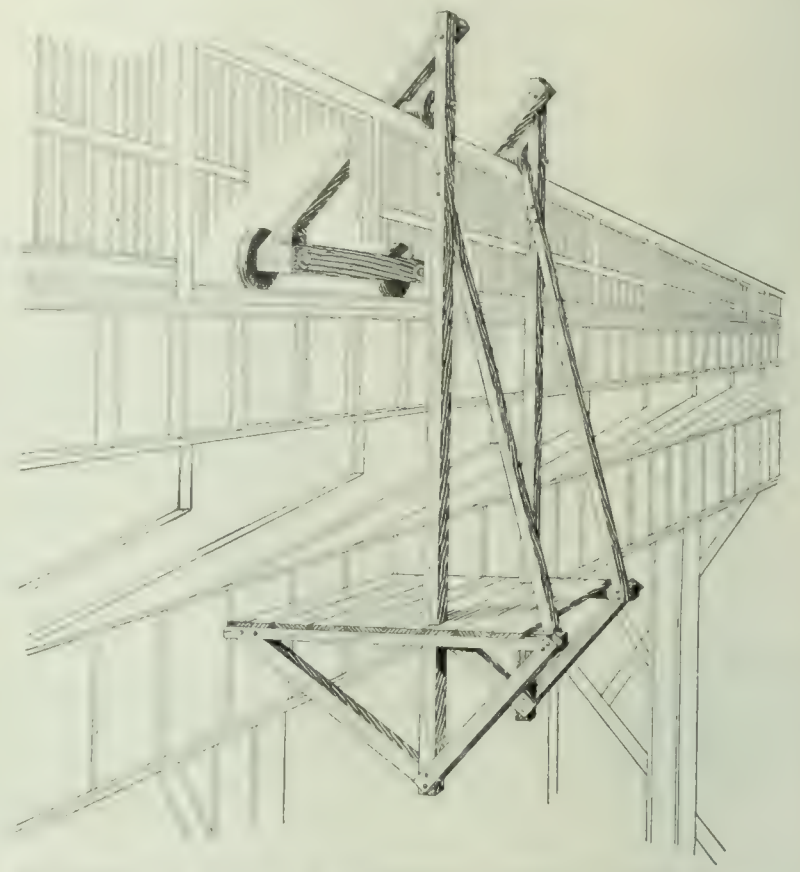
BRIDGE ROLLED ON RAIL-GROOVE PLANK AND CURB BEAMS

floorbeam, the front set of hangers was taken down, the platform shoved ahead and the front hangers replaced on the far side of the floorbeam. The next row of hangers was then taken out, the platform moved ahead and the hangers replaced in the same way, and so on until the platform had moved past the floorbeam.

Pass Form Slabs Through Hole in Tie Pocket

The platform itself, about 25 ft. square, consisted of 2-in. planking supported on the 6 x 8's mentioned, one of which was placed directly beneath each of the six lines of the stringers. This construction left a 5-ft. open space on each side between the girders that carried the floorbeams and the edge of the platform, so that the workmen could get on it from the under side. As the forms were not removed till the concrete was seven days old, openings in the slab were provided through which to pass the sections by leaving a 7 x 14-in. hole in the bottom of a tie pocket in every other panel.

Two panels of forms are removed at a time, stacked on the platform till the traveler reaches the opening, passed through and carried ahead to be reërected. With this platform about 800 lin.ft. of formwork was provided, which was enough to keep well ahead of the con-



SIDEWALK FORM PLATFORM HUNG OVER RAIL

crete. The forms themselves were flat slabs of 2-in. plank about 4 ft. 9 in. wide, fitting between the stringers. They were supported by small struts and blocks from the lower flanges of the stringers. The blocks, at the bottom, were held apart by pipe spreaders. The forms were concreted in sections about 75 ft. long, containing 80 yd., a 1-yd. mixer being used.

Portable Mi er for Sidewalks

A one-bag batch portable gasoline-driven mixer, operated on the deck of the roadway and supplied with materials by motor truck, is being used in laying the concrete sidewalks. The forms for these sidewalks are erected from the roadway and taken down from travelers, which are cantilevered out over the bridge railing. These travelers roll on the finished sidewalk, and the way in which the platforms are suspended from them is shown in the sketch.

The bridge is being completed for the City of Cleveland under the direction of Frederick D. Richards, bridge engineer, and A. B. Cook, constructing engineer, of the Department of Public Service.

San Diego's Water-Supply Guarded

Owing to the unsettled state of affairs since the declaration of war and realizing the seriousness of disaster to the water system of San Diego, Calif., F. M. Lockwood, manager of the Operating Department, has deemed it necessary to provide guards. An average of twenty men daily have been stationed at various points in the system. The expense of this protection, according to Mr. Lockwood, is $2000 per month.

Graduate Conferences with Leading Engineers Successful

Plan at Yale of Having Men in Practice Talk Over Methods with Small Classes Helps Men, Students and School

SUCCESS has attended the conference courses for graduate civil-engineering students held during the past year at Sheffield Scientific School, according to the report of J. C. Tracy, professor of civil engineering, to the director of the school.

The plan, outlined in the 1915-16 report of the president of Yale University, was to bring together the graduate students of civil engineering for a series of five to eight conferences with a member of the faculty of the school and a successful engineer practicing in each branch of civil engineering, these engineers being appointed by the Yale Corporation. The distinctive feature of the plan is the conducting of each course as an open series of discussions, not as a lecture course. The topics discussed at these conferences were of course carefully outlined in advance by the professor and the specialist conducting each course. The essential engineering principles brought out at each conference were subsequently discussed in the classroom and applied to practical problems.

The course for the highway engineers was conducted by Professor Farnham and C. J. Bennett, state highway commissioner of Connecticut, while that in sanitary engineering was planned and carried out by Professor Barney, Allen Hazen and George W. Fuller, the last two being consulting engineers in New York City. Courses in railway engineering, by Professor Barney and F. Lavis, of New York; in structural engineering, by Professor Bishop and O. E. Hovey, assistant chief engineer of the American Bridge Co.; in masonry and concrete, by Suttie and James B. French, of New York City. A course in general engineering, in which Nicholas S. Hill, Mansfield Merriman, Clarence Blakeslee and others conducted conferences, was also held. In addition to the specialist who helped to plan each course, other prominent engineers, many of them graduates of the school, held individual conferences on phases of each subject with which they were especially familiar.

Graduate Students May Not Specialize

As the 12 graduate students who took this course were not permitted to specialize, the broad general training thus acquired is thought to have given them a thorough grounding in the principles that govern the solution of problems met in actual practice, and especially in the economic considerations that enter into engineering work.

It is believed that the conference courses benefit the faculty as well as the students through contact with the leading engineers, including alumni who contribute their services. The conferences bring out the best and most recent examples of engineering practice in design, give the much needed emphasis to the practical economic considerations involved, and increase the confidence of the students in the instruction of the regular faculty by showing them that successful engineers practice the very things that have been urged as of first importance in the classroom. Much good has also resulted to the school from the closer contact into which its graduates, the other engineers interested in the course, and the faculty have been drawn.

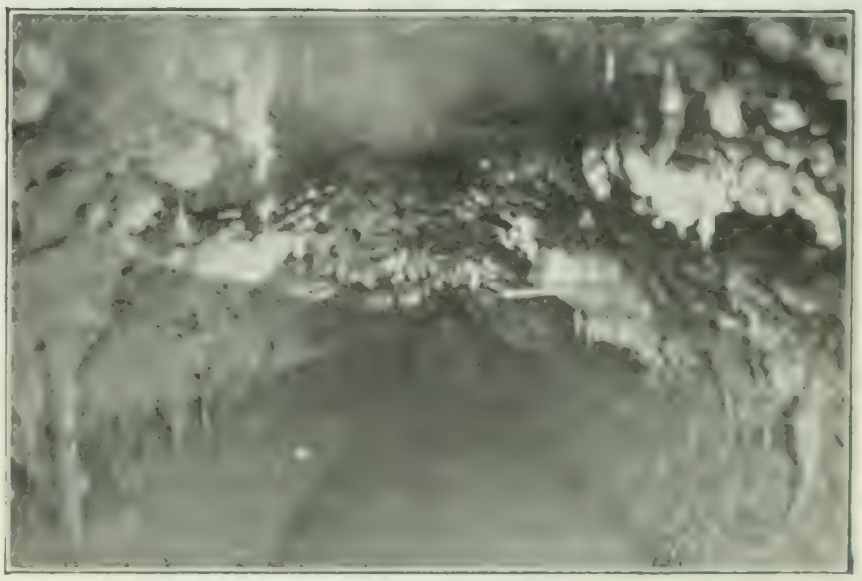
LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Deposits in Tidal-Water Sewers

Sir—The notes on "Tidal-Water Sewer Outlets," by A. G. Dalzell, engineer of sewers, Vancouver, B. C., printed in *Engineering News-Record* of June 1, p. 516, mention the collection of grease that occurs on the arch of sewers periodically flooded by the tide. Similar deposits were observed by me in inspections made in 1910 for the Metropolitan Sewerage Commission of New York City in the tide-locked sewers of Manhattan and mentioned in the report of the commission of that year. In the Jefferson St. sewer it measured a foot in thickness at one point and for about 600 ft. from the outlet averaged about 6 inches.

The material constituted a regular growth, apparently starting from numerous foci and coalescing, and was covered with a tenacious coat of mycelium which



GREASE AND ORGANIC GROWTHS PARTLY FILLED THIS NEW YORK SEWER

prevented erosion. A sample that I had on my desk showed a rather granular structure, whitish in color, but containing black specks—possibly of coal—and numerous small worms. The odor was moldy, but not offensive, probably due to the activity of the contained organisms. A sample examined by Dr. Payne B. Parsons under the microscope showed "large numbers of protozoa, chiefly the paramecium, large numbers of mold hyphæ and yeast cells, wood and other fibers, threads of wool and cotton, hair, feather barbs, seeds of wheat and oats, paper, glumes, striated muscle tissue, etc." From the surface "rootlike processes of (the) leptomitus extended deep down into the substance of the deposit." The bulk of the material, however, was composed of insoluble soaps and fats, and a bacteriological examination showed 12.5 million bac-

teria and 2 million molds per gram. The weight was reduced 70% by drying.

Suspended from the above deposits were the delicate lace-like pendants of mold which Mr. Dalzell has found in such abundance in the Vancouver sewers.

The result of such growths is of course a material reduction in the capacity of the sewer, so that in extreme cases their removal would appear to be worth the cost. In Manhattan their occurrence was not general, but it is conceivable that, with the increasing demand for grease due to the war, the recovery of grease might offset the cost of removal where it has attained a thickness of several inches in a large sewer.

The prevention and handling of sludge deposits in these low flat sewers is, as Mr. Dalzell says, "difficult and unpleasant work, the difficulty being greater in old sewers because no provision has been made for the entry of suitable apparatus."

An interesting example of some old sewers where such troubles have been experienced is found in Charleston, S. C., where several years ago I happened to ob-



THESE TIDAL DRAINS AT CHARLESTON, S. C., ARE CLEANED EVERY TWO YEARS

serve the operation of sludge removal from a sewer that was said to be without any slope. According to a recent letter from J. H. Dingle, city engineer, a system of "tidal drains," shown in the accompanying drawing, were built about the year 1856, running across the city between the Ashley and the Cooper Rivers. These drains were in cross-section 3 ft. square, surmounted by a semicircular arch, with the floor uniformly 1.8 ft. above mean low water. The tidal range is 5 ft., so that these sewers are surcharged at every high tide. It was believed, when the sewers were built, that by opening tide gates, placed at the outlets, at low tide the deposits would be flushed out, but this was not found to be the case, so that a general cleaning is necessary every two years.

This is accomplished by drawing two small platform cars toward one manhole from the next manhole on each side. Each car is loaded by two men who follow it through the sewer. On reaching the central manhole each car is hoisted out and dumped.

In cities of such low, flat topography as Charleston the choice is necessarily one between pumping the sewage and the removal of deposits.

KENNETH ALLEN,
New York City. Engineer of Sewage Disposal.

Track Material for American Engineers

Sir—The excellent suggestions contained in G. P. DeWolf's letter, in the June 21 issue of *Engineering News-Record*, p. 613, call attention to methods by which many serious delays may be avoided in the emergency trackwork which our men will doubtless be called on to perform in the rear of the European battlefields. The points brought out are so valuable that a further discussion might be of interest.

It occurs to the writer that a consideration of some of the difficulties encountered by railway men in the United States might indicate troubles that may be expected in the foreign service. For instance, how many delays have been occasioned by the breaking prematurely of packages of bolts and spikes, by the difficulty in transporting 200-lb. kegs of these necessary articles by hand over broken ground, by failure properly to match up angle bars which are manufactured for use in pairs, and from many other avoidable causes?

The following departure from ordinary American practice is suggested as making for a saving in confusion and delays:

If splice bars are manufactured to be used in pairs, each pair should be well fastened together by soft wire.

Bolts and nuts should be put up in uniform packages of 100 lb. each, so that they may be handled and carried for reasonable distances by one ordinary laborer. All nuts should be run well up on the bolt, so that the number of loose nuts in each package may be reduced to a minimum. All packages should be sufficiently substantial to insure against breakage in transit and reshipment. Such materials will doubtless be rehandled from five to twenty times, but the reduction in weight per package should reduce the number of breakages as well as facilitate the handling at the point of use.

Track spikes should also be put up in smaller packages (of a distinctive type).

The advantage of proper packing is appreciated by every engineer who has had an opportunity of comparing shipments made by American and European manufacturers to foreign points. It is the rule rather than the exception that American goods reach their distination in wrecked and dilapidated crates and containers, and one is fortunate if the shipment is usable after it arrives.

In considering conditions that may govern railroad repairs and construction in Europe, the engineer who is unacquainted with such work in connection with the operation of an army might well compare it with one long combination of problems that are met in our local work in connection with wrecks and washouts. There should not be the confusion that one occasionally sees at a railroad wreck, but there will be emergencies, the necessity of doing with what you can get rather than with what you would like, and the most urgent need for speed. There should be no lack of labor; but unless the greatest care and foresight are exercised, there may often be delays through lack of, and improper assortments of, material.

The same principles of standardization suggested by Mr. DeWolf in regard to track materials should also be applied to bridge material, and, so far as possible, to rolling stock. Fortunately for the present emergency, most European railways are constructed to the same

standard gage used in the United States, although every man who expects service in countries using the metric system should familiarize himself with that system to such an extent that he may use it readily. In order that the engineer's fund of experience gained in this country may be quickly available at all times, he should be able to translate readily from the metric to English standards; for while he will learn to figure the metric system with almost no effort, he will still think in his old standards, and without the ability to translate quickly he will be led into errors of judgment. It will take the average man longer to learn really to think in terms of a new system of measurement than to learn to speak a new language.

ARTHUR M. SHAW,
New Orleans. Consulting Engineer.

Develop Niagara by International Agreement

Sir—I see that the Hon. H. R. Flood, chairman of the Foreign Relations Committee of the House of Representatives, has introduced a resolution to permit taking 20,000 cu.ft. of water per second from above the Niagara Falls (as an experiment until July 1, 1918) for power development. There are also several concerns which desire to divert water from above the falls and others from above the rapids below the falls. In each case the concern would return the water to the Niagara River below the lower rapids, in order to take advantage of the 300-ft. head.

This will not only destroy the beauty of the present falls and the rapids below, but will create a very dangerous condition indeed, for to carry out these plans will be equivalent to committing suicide.

The reason for this effect must be plain to anyone who knows the Niagara River well—for rapids always mean shallow water—and the Niagara rapids, as all others, are formed by rocks projecting above or near the surface, as can easily be seen from the shore. The rapidly flowing water striking these rocks is hurled up into the air, forming the magnificent spectacle we know so well. There are so many of these rocks that the flow of the river (220,000 cu.ft. per sec.) is only barely sufficient to carry away the ice, of which an enormous amount passes over the falls every spring.

The various projects want to divert 50% or more of the flow from the rapids through new channels (canals and tunnels); and if they are allowed to do this, then the remainder of the water flowing through the Gorge (in which the rapids are) will not be enough to carry off the ice, which will at once cause an ice jam.

This ice bridge or jam is liable to be a hundred feet or more in height and will result in the destruction of all the existing power plants at the falls; for when the jam breaks, all the new power plants below the ice jam will be carried away. All power development in the Niagara River would cease for a year or two. This can easily be understood by those who saw the jam, a few years ago, which lasted for eight hours and, in breaking, stripped the banks to a height of 20 to 40 ft. for miles down—destroying wharves, etc., at Queenston and Lewiston.

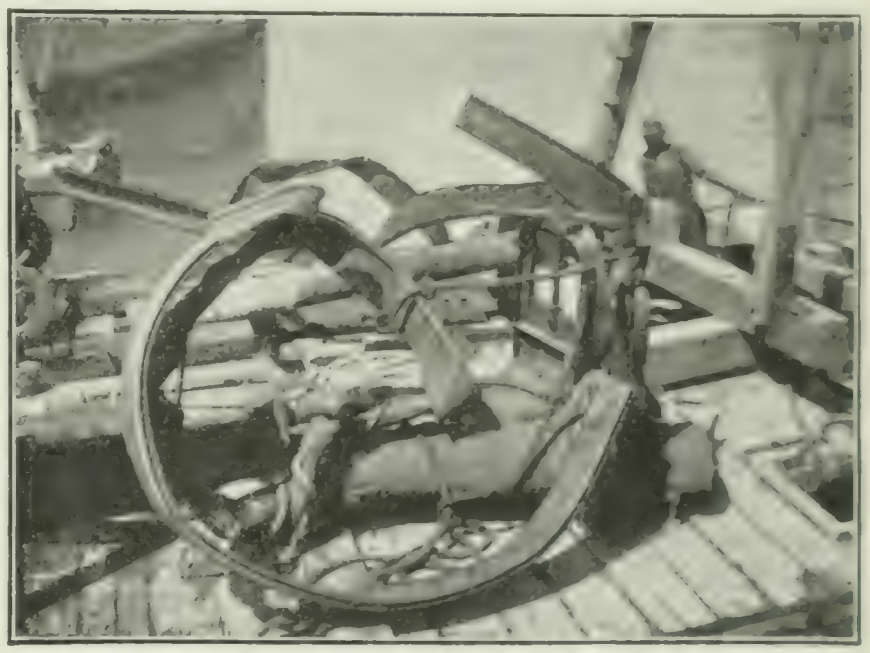
The Niagara River should be developed to give the maximum amount of power at minimum cost and at the same time to preserve the beauty of the falls. This result can only be obtained by an international agreement in which the entire question should be treated as a unit—not as a "crazy quilt" patchwork. Otherwise, the consumer pays the bill.

T. KENNARD THOMSON,
New York City. Consulting Engineer.

Dredge Cutter Twists Steel Piling

Sir—The accompanying photograph showing twisted steel piling has been sent to us by the Lord Young Engineering Co., which is operating one of our suction dredges in Honolulu.

The piling was twisted by the cutter on the suction dredge. This cutter and ladder were made exceptionally strong for handling live coral in that neighborhood, but we had no idea it would play such havoc with the steel piling. The dredge is electrically operated, and the motor driving the cutter is mounted on the ladder and swings with it, thus eliminating the necessity for universal couplings, which is necessary when the motor is placed on the deck of the dredge.



STEEL PILING TWISTED BY DREDGE CUTTER

GEORGE L. HURST,
Manager, Dredging Department,
San Francisco. Union Iron Works Co.

Minnesota Water-Filtration Plants

Sir—In the tabulation entitled "Water-Filtration Plants in the United States and Canada in 1917," published in *Engineering News-Record* for May 24, 1917, p. 408, Minnesota is included as one of the states. We keep a very exact record in this office of the water-purification plants now operating in Minnesota, and our record is somewhat at variance with that given in the table.

Our records show six municipal and one privately-owned filtration plants supplying a total population of 326,306 and having a capacity of 66,000,000 gal. a day. Of these totals, the Minneapolis plant supplies a population of 301,408 and has a capacity of 60,000,000 gal. The other six places are Breckenridge, Chisholm, Crookston, East Grand Forks, Ely and Gilbert.

Minneapolis, Minn. H. A. WHITTAKER,
Director Minnesota State Board of Health.

ENGINEERING LITERATURE

A REVIEW OF BOOKS AND A LISTING OF NEW PUBLICATIONS

Writing a Technical Report

Analysis of Successful Reports Points the Way—Keeps Reader in Mind—Elements of Report—The Appendix

By William Green

Teacher of Report Writing, Massachusetts Institute of Technology

THE man who must write a technical report is often at a loss. Even though he is sure that through his past experience and recent investigation he is fitted to treat some phase of a subject, he feels that because he is not a practiced writer he cannot successfully convey his information.

He therefore seeks to write by the method to be acquired most quickly; and since he knows of good technical reports which have been produced by others who, like him, must have had small opportunity to practice writing, he very often decides that there must be a trick to report writing. Almost everyone who has to write reports goes through the state of being sure that somewhere there is a device which can be used like a general formula, in which one has only to substitute particular values. Search reveals no such device. It is a fact, however, that good reports are being written by those who have obtained all their practice from writing business letters, and an analysis should bring out methods by which others who have like equipment can produce successful technical reports.

Consider the Reader

The purpose of this discussion is to show that *the selection of material, its arrangement and the manner in which it is presented are determined through consideration of the reader and his peculiar need of information regarding a definite subject.* It is only thus that a report can be made both adequate and concise.

A technical report differs from other forms of exposition in that invariably it is not the writer, but the reader, who has suggested the subject. Before the maker of a technical report begins his writing, the reader has asked for information on definite phases of a definite subject; he may have suggested the scope of the investigation, and he has indicated to what degree he wishes the writer to make recommendations. The writer has been asked a definite question; his reply is a technical report.

The technical report must always contain the following material, usually in the arrangement here given. It must be noted that in many reports parts shown as coordinate in the outline are very different in the space required for their treatment.

A. The report proper: (1) The question—(a) occasion for the report; (b) scope of the report. (2) Methods used in the investigation. (3) The reply to the question.

B. The appendix.

The report proper must stand as a unit. While it is a reply to one who has asked a definite question, it must be so written that the report will be useful not only at the time it is received by him, but also at any future time when the related phases of the question are not so clearly in mind. Moreover, while its chief end is to furnish information to someone whose interest has caused him to ask for it, it must not fail to give the information in such a way that it can be used by others. To accomplish these ends, the writer must record the question (1). To do this, he should show the occasion for the report (a). Here there must be a pointed reference to the order and, if any exist, to the formal appropriation that led to the undertaking of the report, and to all subsequent related orders and memoranda. Then there should appear a statement of the scope of the report (b). This must be an exact definition of the subject treated. The exact statement of this subject can usually best be accomplished by quotations from the request for the report. Often the field to be covered can be made more clear by pointing out closely related phases of the subject that have been purposely left out of the discussion. A statement of the methods used in the investigation (2) is important, for newly discovered information may at any time affect the value of the conclusion reached in a given report. It is therefore of the utmost importance that the author should state explicitly what methods he used.

After the brief introduction described above, the report proper takes up the reply to the question (3). This is the main body of the report.

Keep the Reader in Mind

The peculiar needs of the reader determine for the writer what topics he should include in his report and what he should omit. Even if the writer has exactly the information his reader requires and has no misapprehension as to the subject he is expected to cover, his report can be effective only in so far as he knows his reader and keeps in mind his needs. Unless the reader is known to the writer, the latter may fail to be adequate by excluding necessary information; or he may fail to be concise by giving information that is not needed, as when definitions are supplied to one who is familiar with technical terms. Even when he knows his reader's needs, the writer may neglect to keep them clearly in mind. Often when a layman has asked an expert for information, the specialist's enthusiasm leads him into writing a report that could be useful only to another specialist. A report is written not only on a definite phase of a subject, but also to a definite person. No report can be effective where the reader's needs do not govern the selection of the subject matter.

Moreover, the style of the report is controlled by the writer's relation to the reader. To carry its message most quickly and forcefully, the report must be concise. Sometimes a report should take the form of a flat state-

ment. Amplification and substantiation must be included in such a report; but they are placed there, not so much for the reader's attention, as because there they may be most conveniently kept as a matter of record. On the other hand, a method of presentation so concise should be used only when the recognized authority of the writer is unquestioned, and even then, only when a full understanding of the reasoning would require on the reader's part more study than is warranted by his interest. In all other cases the man who wishes to write an adequate report must tell the whole story, and he must tell it in a way that can be fully understood by him to whom the writer is reporting. Yet here again the reader's knowledge of technical expressions and symbols determines how concise the report may be. When technical terms are mutually understood, definitions are tedious; and when there is no doubt that a plotted curve will convey information—that it can be "read"—pages of exposition may often be eliminated. Through careful study of the reader it is possible to adopt for each report a suitable style.

Function of Appendix

Granting that a division of the material to be presented in the report proper and the appendix is wise, we must assure ourselves that each is so written that it fulfills its part. In the report proper we must be as direct and as concise as will be allowed by the reader's ability to follow our treatment. Since we have the appendix, we may by conveniently placed references to it refer the reader to any explanations or substantiations. In the reply to the question the reader can thus be given a direct route. If his inability to understand, or his unwillingness to accept a statement without supporting data requires a deviation, he of his own volition turns aside from the direct path. No other thing so tends to make a report effective and useful as a reply to the question which logically and as briefly as may be leads the reader straight through to the answer of his question.

But the report must be a complete discussion of the phase of the subject it is treating. Therefore, it must substantiate its thesis, and there must be no doubt that all of its statements are understood. Material necessary to fulfill these conditions is placed in the appendix. There should appear in the appendix all important original data gathered for the report. Any general information that in the opinion of the writer may be inaccessible and needful to the reader should be given fully, and there should appear exact information as to where subjects like that of the report, or related phases of the subject, may be consulted.

Reviews and Notes

Handy Volume on Trench Warfare

TRENCH WARFARE: A Manual for Officers and Men—By J. S. Smith, Second Lieutenant with the British Expeditionary Force. New York: E. P. Dutton & Co. Cloth; 4 x 6 in.; pp. 144; illustrated. $1.50 net.

Lieutenant Smith has prepared a handy volume which will greatly interest the 50,000 odd officers of the new American army units. The contents of the book will be no novelty to them by the time they are assigned to troops, for the trench-work instruction given and to be given covers a somewhat broader field in greater detail and thoroughness. But the book will be of great assistance as the nucleus of each new officer's notes on training camp lectures, demonstrations and practice. Engineer officers particularly can profit by Lieutenant Smith's book for naturally it relates more to the construction, maintenance and equipment of trenches and trench accessories than to their tactical and strategic employment.

Trench siting is the first topic and here the practice disclosed is at variance with the common American idea that protective works should not follow hedges, tree rows, etc. The excuse is that the development of artillery fire has made ranging by trial shots so easy that prominent marks are not needed, while the natural growths may protect working parties and hinder aërial reconnaissance.

Construction features are next described—traverses, revetments, dugouts, latrines, dumps. The highly important subject of obstacles and entanglements is dismissed with a few pages—which will be regretted in view of the author's chances for observation and the attention being given to it by American engineer officers. The construction of several hand bombs is described and the organization of bombing parties—"mopping up" squads—but the author offers little on rifle grenades.

Gas warfare has an important place in the book. Particularly interesting are the directions for counteracting effects of gas and preventing asphyxiation when the men have no gas masks. Toward the end of the book are miscellaneous notes on the duties of men and officers in trench warfare.

The casual reader might infer from the author's introduction, describing the creation of a trench line from Switzerland to the sea, that something radically new had been done in connecting rifle pits, but the works all differ little from those described for years in army engineer manuals.

From a British Viewpoint

Reviewed by R. Fleming

American Bridge Co., New York City

THE CALCULATIONS FOR STEEL-FRAME STRUCTURES Designed to Comply with the Requirements of the London County Council (General Powers) Act 1909, with Notes on the Application of Theory to Practical Design—By Walter Cyril Cocking, M.C.I., M. J. Inst. E., Reinforced Concrete and Structural Engineer; Lecturer in Drawing and Design at Structural Steelwork at the London County Council School of Building. New York: D. Van Nostrand Co. London: Scott Greenwood & Son. [The Broadway Series of Engineering Handbooks.] Cloth, 5 x 8 in., 158 pp., illustrated, 6 folding plates. $2.75 net.

The text of this book is written from a British viewpoint and is intended to comply with the London Building Code, the structural-steel requirements of which are reprinted in the beginning of the book. Fifty pages at the close set forth in detail the calculations for the steel frame of a five-story London warehouse. The intervening pages treat of the usual subjects—bending moments, shearing stresses, beams, columns—which necessarily enter into a work of this kind.

The numbering of the various formulas by giving each the number of the page on which it first occurs,

with a distinctive letter, is a unique feature and especially convenient for reference. The numerical examples throughout the book are numbered consecutively. A tabulation in alphabetical order of the symbols used would have been a further help to the reader.

The author states that the book is written to meet the needs of structural draftsmen and others who do not possess a knowledge of higher mathematics and the calculus. Algebra and trigonometry is the extent of mathematical knowledge presupposed.

It is against the implication that a knowledge of the calculus is not really needed by a designer of steel structures that the reviewer wishes to protest. Why do so many engineers and draftsmen fear the calculus as children fear the dark? Nine-tenths of the problems involving the calculus that the structural engineer is likely to meet can be solved by formulas derived from the successive differentiation and integration of X^n. Mr. Cocking's methods of obtaining deflections and shearing stresses are ingenious, but a knowledge of the calculus is necessary to a general treatment of the subject; and an engineer who can use it will not be satisfied with the limited range of special cases. As Goodman truly says in "Mechanics Applied to Engineering": "Not one engineer in a thousand ever requires to make use of any mathematics beyond an elementary knowledge of the calculus, but anyone who wishes to get beyond the kindergarten stage of the principles that underlie engineering work must have an elementary knowledge. The labor spent in acquiring sufficient knowledge of the calculus to enable him to solve practically all the problems he is likely to come across, can be acquired in a fraction of the time that he would have to spend in dodging it by some roundabout process."

In the chapter on "Stresses in Lattice-Frame Structures," the author uses Ritter's method of sections to determine stresses in roof trusses. He thinks this preferable to the graphical method. The reviewer differs. The stresses in the example given can be found in much less time by drawing stress diagrams in accordance with the teaching of any American textbook. Moreover, the closing of the stress diagram is a check not obtained by analytical methods.

The reviewer has no wish to minimize the many excellent features of the book, but he thinks that an engineer or draftsman with only a mastery of the book and the little knowledge it presupposes is not sufficiently equipped to design steel-frame structures other than those of the simplest kind.

Electrical Testing

ELECTRICAL MEASUREMENTS IN PRACTICE. By F. Malcolm Farmer, Chief Engineer, Electrical Testing Laboratories, New York. McGraw-Hill Book Co. Cloth, 6 x 9 in., pp. [illegible]. $4.

The particular audience addressed by Mr. Farmer is of course largely composed of electrical engineers. But his book is of considerable use in the libraries of a larger group of engineers, particularly those dealing with hydro-electric work, because ultimately the performance of their generating and transmission installations have to be tested by well-tried instruments and practices of the electrical test laboratory, more or less modified to suit field conditions. The author is the head of one of the best-known commercial testing staffs in the country, and throughout the book the topics are presented from the practical standpoint of the tester. Descriptions of instruments and methods of employment alternate. The sections on power and energy measurements and on maximum-demand and curve-drawing instruments are of conspicuous merit.

Valuation of Railways

Reviewed by M. P. PARET

St. Charles, La.; Late Valuation Engineer, Interstate Commerce Commission

RAILWAY ESTIMATES, DESIGN, QUANTITIES AND COSTS—By F. Lavis, M. Am. Soc. C. E., Special Lecturer Railway Engineering, Yale University. First edition. New York: McGraw-Hill Book Co. Cloth; 6 x 9 in.; pp. 608; 99 illustrations and folding plates. $5.

The author states in his preface that the purpose or object of his book is the presentation, for the use of engineers, of data serviceable for estimating the value or cost of proposed or existing railroads. The book is more than a development of Chapter 8 of the author's "Railway Location, Surveys and Estimates." It is an expansion of that chapter and a setting forth of the timely subject matter in a manner that carries weight and impresses the reader with the author's broad and practical knowledge of the subject. The book contains some new things and presents others in a new and practical way.

Very wisely, the author frequently cautions the reader against misdirected use or application of data, figures or deductions. To use such data as support for an estimate of a certain line of railroad calls for a personal knowledge of conditions on the lines from which figures are quoted or used as support.

Why did not the author expand the little he says about land or right-of-way into a chapter? The requirements in this day and country for almost any line of railroad in the way of land or right-of-way, station grounds, terminals, etc., run into much more money than do many of the other elements of cost, relating to which considerable space is given.

In Chapter 1, "Preliminary Estimates Previous to Surveys," the statement is made that it is possible for an experienced engineer or contractor to ride over a proposed route and estimate within about 10% the cost of grading and bridging. This seems much too general a statement to be made or accepted without qualification. What is meant by riding over a proposed route? A proposed route when ridden over is liable to be at many points far from where a survey may place it. The reviewer is of the opinion that to estimate the cost of grading and bridgework within 10% by riding over a line in advance of surveys, such a line must be in very easy country and that the riding over must embrace quite a complete reconnoissance which would develop controlling features, or be in a country adjacent to other highways that would indicate the nature and extent of classification, drainage openings, etc.

A variation of 10% between the estimated cost of such work after survey and the determined cost of actual construction would not ruin the reputation of an experienced engineer, but luck would figure as largely as experience if the guess came within 10% of actuality.

Under "Contingencies" the author recommends that an allowance of 15% be added to grading and bridging

when estimates are made previous to construction, presumably after the information derived from detailed surveys is available. How much should be added for contingencies to an estimate made after a ride over the route?

It is a pleasure to note that the author, in handling Chapters 3 to 11 inclusive—the principal classified cost elements—has, as is his custom, confined himself to the practical illustrative essentials and avoided wordy expansions of irrelevant features.

One would have been glad to find in the text three or four chapters instead of three or four pages on the subject of electrical operation and electrification of steam roads.

Consistent use of this book cannot fail to be of service and support to any railroad engineer.

Treatise on Water Purification

Reviewed by ROBERT SPURR WESTON

Consulting Engineer, Boston, Mass.

WATER PURIFICATION—By Joseph W. Ellms, Member American Society of Civil Engineers, American Chemical Society, American Public Health Association and New England Water-Works Association. New York and London: McGraw-Hill Book Co. Cloth; 6 x 9 in.; pp. 485; 150 illustrations. $5 net.

The author's 25 years' experience, beginning in the laboratory of the Massachusetts State Board of Health and extending through many years at the Louisville and Cincinnati water-works and elsewhere, has qualified him for his well-performed task of writing a treatise on water purification.

The book begins very logically with water in its relation to public health and comfort. Next, the various means of purification are discussed, and progress in filter construction—particularly, rapid sand filters—is described. The methods of storing and applying chemicals are treated, and there is a chapter on power-plant and miscellaneous equipment. The work also contains chapters relating to the cost of construction and operation of rapid sand filters and on the technic of filtration, including rates, loss of head, washing, coagulation and disinfection. Two chapters are devoted to the removal of dissolved mineral matter and one to the control of water-purification processes. The appendix contains two articles by C. N. Miller, in one of which the flow of water through rapid sand filters is discussed mathematically, and in the other there is given a formula for computing the discharging capacity of filter wash-water troughs. In the appendix are 12 tables useful to operators of water-purification plants.

As a whole, the book impresses one with its sincerity of purpose and reliability of data. It will be of invaluable assistance to the designer and operator of water-purification plants. A large part of the work is the result of the author's own experience. The remainder consists of quotations from published articles, for which there are references, mostly American, at the end of each chapter. Much of the material is new, and the illustrations are modern. The reviewer, however, finds no mention of the hydraulic method for restoring sand to slow filters, in use at Washington and Pittsburgh, where the method of spreading by hand has been abandoned.

Particularly valuable are the data relating to the details of rapid sand filters, in the development of which Mr. Ellms has played an important part. It is hoped, however, that in future editions the double-bottom type of filter represented by the Erie, Penn., plant will be described and illustrated, and that an illustration of the Wheeler filter bottom will be taken from practice.

Engineers will find of great use the descriptions of purification plants—particularly those of the details, such as controllers, gages, meters, hydraulic valves, automatic scales, chemical feeders, auxiliary machinery, etc. The use of the book would be greatly facilitated if the index were amplified.

Blast-Furnace Design and Construction

Reviewed by CHARLES E. LEHR

Chief Engineer, Bethlehem Steel Co., South Bethlehem, Penn.

BLAST-FURNACE CONSTRUCTION IN AMERICA—By J. E. Johnson, Jr. New York: McGraw-Hill Book Co. Cloth; 6 x 9 in.; pp. xi + 415; 247 illustrations. $4

Engineers and furnace men engaged in building and rebuilding blast furnaces will be benefited by reading Mr. Johnson's book. It treats the construction of plant and equipment, from the handling of raw materials to the finished product.

A broad and comprehensive knowledge of construction methods and design and of what has proved best in practice is displayed by the author, who, unlike a great many writers, does not hesitate to state what in his opinion is the best method or equipment for the work required to be done. The chapter on distribution of stock in the furnace proper is well worth the price of the book, as probably more troubles in blast-furnace operation are traceable to poor distribution than to all others combined.

The chapter on washing and cleaning gas could well have been enlarged in scope, so as to present the best types of such equipment in more detail as a guide to point the way for designers and operating men, as this phase of blast-furnace operation is not generally given the importance is deserves. This statement applies with equal force to the chapter on boiler plant, with particular reference to burners for blast-furnace gas. It should be gratifying to the busy man that practically all historical and obsolete methods and equipment for the production of iron have been left out of the book, and the reader is introduced, by successive steps, to recent practice in use at the larger and more modern plants.

In general, the book is a valuable contribution to the literature of the subject and bespeaks no little study and investigation by the author. The intention to amplify this work by another on blast-furnace operation will be awaited with interest by the producers of pig iron and allied products.

English View of Depreciation

While there is still, unfortunately, plenty for us in America to learn about depreciation and kindred subjects we have been plunged so deeply into the subject of valuation, such definite schools of reasoning have been established and the legal aspects have so much bearing, that it seems hardly possible that we can look

to England or any other foreign country for light. The volume in question deals mainly with industrial plants and the wastage of sale value. There is discussion of the various well-known methods of accounting for depreciation, but the subject is set forth as clearly in American books, in which the examples are in terms of dollars and not of the confusing English pounds. American industrial engineers and accountants might derive some useful ideas from the book, but valuation engineers in general will get little help from it.

Power Plants and Refrigeration

Reviewed by D. D. KIMBALL

Of Richard D. Kimball Co., New York City

MECHANICAL EQUIPMENT OF BUILDINGS.—A Reference Book for Engineers and Architects.—By Louis A. Harding, M. Am. Soc. M. E., Chief Engineer John W. Cowper & Co., Buffalo, N. Y., and Arthur C. Willard, Assistant Professor of Heating and Ventilation, University of Illinois. Vol. II, Power Plants and Refrigeration. New York: John Wiley & Sons. Flexible binding; 7 x 10 in.; pp. 757; illustrated. $5.

The present, or second, volume of this work admirably supplements the first volume, "Heating and Ventilation," noticed by the reviewer on page 602 of the *Engineering News-Record* for June 21, 1917. The authors intended the book to serve for reference and also for practical use in the designing room. It will fulfill the first purpose much better than the second, being too cumbersome and too theoretical or technical to be of real practical service in the drafting room. As a reference book and a textbook for students it should be most valuable. The free use of manufacturers' data adds much to the usefulness of this volume.

The text covers the subjects of fuels, combustion, boiler construction and equipment, chimneys, draft apparatus, engines, turbines, condensers, piping and other equipment, also refrigeration.

There are several forms of boilers largely used by heating engineers not referred to in this volume or the preceding one. To the student, at least, both volumes would be of greater value if they offered suggestions as to where different forms of the same apparatus—boilers, etc.—might best be used.

Illustrations, tables and charts are generously given in a most interesting and helpful form. Good printing, good paper and a fine flexible binding lend charm to the book. Every engineer and student interested in power-plant work will find this volume a desirable acquisition.

Major Activities of the Modern City

MUNICIPAL FUNCTIONS.—By Herman G. James, A. B., Ph. D., Associate Professor of Government, Director of the Bureau of Municipal Research and Reference, University of Texas. New York and London: D. Appleton & Co. [National Municipal League Series.] Cloth, 5 x 8 in., pp. 376. $2 net.

It is a promising sige of widespread early improvement in the way our cities meet the manifold needs of their citizens to have made available so comprehensive a survey of muncipal activities as is this book and to have it come from a southwestern university. The fact that the volume is designed "for use as a textbook in college classes in municipal government" is another sign of promise.

Among the main topics of the book are public health, city planning, public works, utilities, municipal ownership and municipal finance. The fundamentals of these and the other municipal services discussed are clearly set forth, ways and means are outlined, and some of the corresponding administrative problems are presented.

In the chapters on health and public works, the author has kept clearer of the usual pitfalls that threaten the professor of government than have some of his predecessors. The paragraphs on water and on sewage treatment contain a number of misconceptions or misstatements that may do no particular harm but might well be corrected in a later edition. Examples are calling the activated-sludge process an "improvement of the septic tank process"; stating that "natural oxidation can meanwhile do a good deal toward purifying the effluent by dilution"; and asserting that broad irrigation "involves no treatment of the sewage, but merely discharging it in a place where it will not be offensive."

These are minor defects in a volume which contains a large amount of correct information on supplying city needs and much sound doctrine on municipal policies and administration presented in convincing and readable form.

A Brief for Municipal Ownership

MUNICIPAL OWNERSHIP: A Brief Survey of the Extent, Rapid Growth and the Success of Municipal Ownership Throughout the World, Presenting the Arguments Against Private Ownership, the Failure of Regulation and the Advantages of Municipal Ownership.—By Carl D. Thompson. New York: B. W. Huebsch. Cloth; 5 x 8 in.; pp. 114; $1 net.

The author has produced a readable brief for municipal ownership—as thoroughly one-sided as a lawyer's brief but more open to attack. Some, if not most, of the statistical and other data are old and some are taken third hand. An instance, possibly one of the worst, may be given. Among the many citations from the late Prof. Frank Parsons' "The City for the People," a book published more than 15 years ago, is one to the effect that the rates charged by privately owned water-works *are* 43 per cent. higher than those charged by publicly owned works.

Professor Parsons cited as his authority "The Manual of American Water-Works," published in 1890. The author of the present volume is therefore using figures more than a quarter century old. Moreover, he says "the rates charged by private plants taking the United States as a whole, are," etc., from which the uninformed reader would infer that he was being given not only current data but data for all the water-works of the country, whereas Mr. Thompson had before him Professor Parsons' statement that the original figures were published in 1890 and related to "318 public and 430 private water-works."

Massachusetts State Board of Health

STATE SANITATION: A Review of the Work of the Massachusetts State Board of Health—By George Chandler Whipple, Professor of Sanitary Engineering in Harvard University and the Massachusetts Institute of Technology; Member of the Public Health Council, Massachusetts State Department of Health. Vol. 1. Cambridge, Mass.: Harvard University Press. Cloth; 6 x 9 in.; pp. 387; 11 plates and 8 text illustrations. $2.50.

In sketching the history of the Massachusetts State Board of Health for nearly half a century, drawing word pictures of the leading members and officers of the board, and presenting abstracts of the most notable of the board's publications, Professor Whipple is render-

ing a notable service. The pleasurable task he is doing so well is one for which he is well qualified through long acquaintance with members of the board and of its staff and through service on the Massachusetts Public Health Council since 1914.

The present volume, which is the first of three to be devoted to the subject, is in two parts. Part I, first sketches the early history of public health work in Massachusetts to the beginning of the board in 1869. It then outlines the history and the work of the board and its divisions, including the world-famous Lawrence Experiment Station for the study of water purification and sewage treatment and the engineering work of the board. There is also a chapter of biographical sketches; a chapter on the State Department of Health, 1914-16, and one on state sanitation in general.

Part II is an able condensation of the lengthy "Report of the Massachusetts Sanitary Commission of Massachusetts" which under the leadership of Lemuel Shattuck worked out a detailed plan for a "sanitary survey" of the state—really a scheme for state and local health work. This report, published in 1850, recommended that the proposed State Board of Health include in its membership "a civil engineer" and "a chemist or natural philosopher," thus with prophetic vision forecasting the brilliant and efficient work that was to be done in Massachusetts by engineers, chemists and biologists.

A Really Practical Mechanics

Reviewed by J. P. J. WILLIAMS

First Assistant Engineer, Concrete Steel Engineering Co., New York City

APPLIED MECHANICS—By Alfred P. Poorman, Assistant Professor of Applied Mechanics, Purdue University. New York: McGraw-Hill Book Co. Cloth; 6 x 9 in.; pp. 244; 321 figures in text. $2.

This latest text on the fundamental subject of applied mechanics for engineering students shows the logical improvement in books of this class which would be expected as a result of the marked tendency in recent years toward the commonsense interpretation and exposition of principles in terms of engineering problems. The book is a fine example of effective, interest-arousing presentation through the use of illustrations and problems that should appeal to the student. It is in strong contrast with the older types, in which such problems as those dealing with frictionless beads strung on a wire between the earth and the moon were solemnly presented by the writer or teacher of mechanics. Instead of dealing with abstract principles, the strong psychological appeal of a single engineering problem is used. The statements of principles are concise and clear and are followed by good examples solved with explanations. Each chapter contains a wealth of practical problems, with answers, which should arouse any ambitious student to his keenest efforts. The coördination of algebraic and graphic solutions is another excellent feature of the plan of presentation.

Some of the principles in which many graduates are especially weak have been given exceptionally clear and satisfactory treatment. Computations for centroid and moment of inertia, the discussion of so-called two-force and three-force members, the chapters on friction, combined translation and rotation work and energy, impulse, momentum and impact are all worthy of special praise, particularly as regards the exceptionally well-chosen examples and problems selected for illustration in terms of the future engineering experience of the student.

The typographical work, the drawings and reproductions are also distinctly superior to previous standards. The use of bold-face type for important formulas and of italics to emphasize vital principles should prove a great aid to the student. While practicing engineers would hardly find such a book of direct value unless needed to clear up hazy conceptions, it undoubtedly will be hailed as a most effective tool by teachers of mechanics who are attempting to create clear, permanent and definite conceptions in the minds of their engineering students.

PUBLICATIONS RECEIVED

ORGANIZATION IN ACCIDENT PREVENTION.—By Sydney Whitmore Ashe, B.S., E.E., Chairman, Committee on Safety and Health, National Association of Corporation Schools; Member, Educational Committee, and Secretary of Foundry Section, National Safety Council; Author "Electric Railways," Etc.; Head Educational and Welfare Department, Pittsfield Works of the General Electric Co. New York and London: McGraw-Hill Book Co., Inc. Cloth; 6 x 9 in.; pp. 130; illustrated. $1.50 net.

Based on educational "experiences in organizing safety work." Deals, among other things, with accidents that may be reduced by education; emergency hospitals and first-aid work; accident relationships.

OXYACETYLENE WELDING PRACTICE: A Practical Presentation of the Modern Processes of Welding, Cutting and Lead Burning, with Special Attention to Welding Technique for Steel, Cast Iron, Aluminum, Copper and Brass.—By Robert J. Kehl, Jun. Am. Soc. M. E. Chicago, Ill.: American Technical Society. Cloth; 6 x 8 in.; pp. 102; illustrated. $1.

The subtitle indicates the comprehensive and practical character of the book. The examples are "from the automobile industry, because in that field almost every class of welding is covered."

STRENGTH OF MATERIALS.—By James E. Boyd, Professor of Mechanics, Ohio State University. New York: McGraw-Hill Book Co., Inc. Cloth; 6 x 9 in.; pp. 380; 254 figures in the text. $3.

To this edition the author has added sections on "the method of area moments for deriving equations of the elastic line of beam," on curved beams and hooks, and on theories of failure. In an extended notice of the first edition ("Engineering News," Mar. 14, 1912, page 506), the reviewer commended the book for the use of engineers as well as for the classroom.

BRITISH COLUMBIA HYDROMETRIC SURVEY FOR 1915—Ottawa, Ont.; Dominion Water-Power Branch. Paper; 6 x 9 in.; pp. 446; illustrated.

CLAUDIUS CROZET: His Story of the Four Tunnels in the Blue Ridge Region of Virginia on The Chesapeake and Ohio Railway. Constructed 1849-1858—Compiled by James Pryce Nelson, Valuation Engineer, Chesapeake and Ohio Railway System. Richmond, Va.: The Author. Paper; 6 x 9 in.; pp. 13; illustrated.

TECHNICAL BOOK WRITING—By J. A. L. Waddell, Consulting Engineer. Reprinted from the Bulletin of the Society for the Promotion of Engineering Education, Vol. 7, No. 3, 1916. Kansas City, Mo.: The Author. Paper; 6 x 9 in.; pp. 48

TOPOGRAPHICAL DRAWING—By Edwin R. Stuart, Professor of Drawing, United States Military Academy. New York: McGraw-Hill Book Co., Inc. 6 x 9 in.; pp. 119. $2 net

ROHRNETZBERECHNUNGEN IN DER HEIZ- UND LÜFTUNGSTECHNIK—By Dr. techn. Karl Brabbée, Professor in the Berlin Technical High School. Berlin: Julius Springer. Cloth; 8 x 11 in.; pp. 50.

SMOLEY'S PARALLEL TABLES OF SLOPES AND RISES In Combination with Diagrams of Slopes and Rises and Other Tables—For Bridge and Structural Engineers, Draftsmen, Checkers, Templet Makers, Builders, and Vocational Schools. By Constantine K. Smoley, Author of Parallel Tables of Logarithms and Squares of the U. S. Civil Engineer's Handbook, Etc. New York: McGraw-Hill Book Co., Inc. Leather; 5 x 7 in.; pp. 200; illustrated. $1.50.

NATIONAL FOREIGN TRADE CONVENTION 1917—New York: The Secretary, India House, Hanover Square. Cloth; 6 x 9 in.; pp. 587

NEW YORK PUBLIC SERVICE COMMISSION: Report for 1915—Volume 2, Abstracts of Reports of Corporations Electrical, Gas, Telegraph, Telephone, Steam. 6th; 8 x 12 in.; pp. 448.

OHIO ENGINEERING SOCIETY: PROCEEDINGS FOR 1917—Sandusky, Ohio: John Layer, Secretary. Paper; 6 x 9 in.; pp. 148; illustrated.

[illegible] AND SPECIAL LAWS OF KANSAS, 1917—Topeka, Kan.: State Railway Commission. Paper; 6 x 9 in.; pp. 45.

THE ENGINEER IN FIELD AND OFFICE

A DEPARTMENT DEVOTED TO DETAILS OF THE DAY'S WORK

Quarrying Marble by Modern Methods

By E. L. Thomas
Knoxville, Tenn.

TWO innovations in the practice of marble quarrying—the use of mechanical steel sharpeners and light hammer drills mounted on quarry bars and tripods—have increased the output and lowered the labor cost at two quarries in the Knoxville marble district. The Grey Eagle Marble Co. and the Appalachian Marble Co. produce 4000 to 5000 cu.ft. per month, using Sullivan hammer drills and a channeler.

Sharpening straight or diagonal bits by hand requires 10 to 15 min. per bit, as compared with 4 min. by machine; but the chief advantage of mechanically formed bits is uniformity. When once the correct bit has been determined for a given stone, the shape can be maintained without deviation, resulting in much longer service before resharpening. The sharpener has increased the cutting speed of the channeler by 15%.

With hand hammer and plug drills, $\frac{7}{8}$-in. hollow steel is used with hexagon section and 6-point rose bits. The starting gage is $1\frac{1}{2}$ in., with $\frac{1}{16}$-in. drop per 24-in. length. Holes are drilled 14 ft. deep. After heating, one of these bits can be formed in 15 sec., the shank (with collar) in 10 sec., as against 10 min. for bits and 20 min. for shanks when the work is done by hand. The two steel dies form practically a perfect bit, with sharp regular points and ample clearance.

Quarry Bar Work with Hammer Drills

Light (40-lb.) hammer drills mounted on quarry bars have done 100% better work at the Appalachian quarry than the piston drills they supplanted. The view shows



THIS OUTFIT REPLACES SIX PISTON DRILLS CALLING FOR TWO MEN EACH

a shelf of this quarry, on which are two bars each mounting two drills. The bars are 10 ft. long and carry the cradle, or shell, and feed-screw mounting in which the drills are secured by two hinge-clamps. Horizontal or vertical holes are drilled with equal facility.

The four drills require four runners and one helper, and the outfit replaces six piston drills calling for two men each. The officers of the two quarries furnished this information.

Land Survey Data Made Available for Ready Reference in the Field

By L. G. Hicks
City Engineer, Rosenburg, Ore.

THE engineer engaged in land surveying is often handicapped in the field by finding that he has not secured enough notes to cover the work to be done or by finding corners described by the notes at hand destroyed, together with the witness trees, and that a starting point some distance away must be sought. Again, the surveyor will often find other bearing trees than those described in the Government records; and unless he has the notes for these trees, they are worthless.

The writer in his practice in southern Oregon has developed a method of keeping all survey notes obtainable according to townships. These are in such shape that when called into the field he has all of the recorded as well as almost all of the private survey notes.

Survey Memoranda Kept in Special Portfolios

First copies of complete section notes, giving all topography, are secured for each township in which work is likely to be done. By having the topography, a tedious search for a corner is often done away with, as a reference measurement can be made from some stream or ridge. These section notes are written on specially printed blanks, each $8\frac{1}{2}$ x 11 in. and ruled as shown. After being copied, all sheets are carefully checked.

To describe corners reëstablished or reset, the writer has prepared typewritten blanks, for section, quarter-section and donation-land claim corners. These are filled out whenever the writer, or his assistants, resets or establishes a corner.

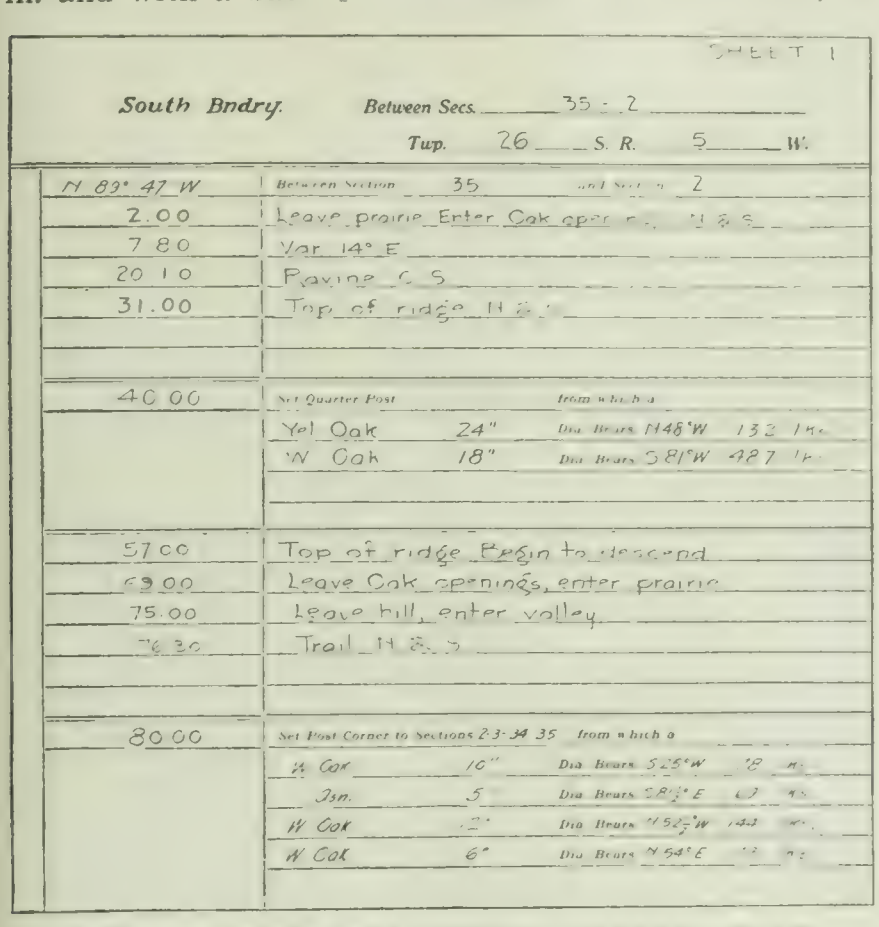
From the county surveyor's records a copy is made of any descriptions of corners established. This search of records is kept uptodate, and the data are transferred to the township portfolio as soon as recorded. All reset corner sheets are filed according to township and range.

Copies of all of the donation-land claim notes for each township are secured, and these are bound along with the section and other notes in the same portfolio.

Whenever a section or a claim is subdivided, a record is made on a sheet giving character of corners and all courses and distances. This gives the surveyor working in that township a ready reference to the work already done and many times saves a great deal of work that might be a duplicate of some already surveyed.

The newspapers are watched; and whenever descriptions are published for Torrens registration work, or other land descriptions are given, they are clipped out and pasted to blank sheets and filed in the proper township portfolio.

All of the above data for a township are bound in covers made of heavy drawing paper cut to a size 9 x 12 in. and with a back ¼ in. in width. On this cover, at


SHEET 1

South Bndry. Between Secs. 35 - 2

Twp. 26 S. R. 5 W.

N 89° 47 W	Between Section 35 and Section 2
2.00	Leave prairie Enter Oak oper[illegible] N & S
7 80	Var 14° E
20 10	Paving C S
31.00	Top of ridge N & S
40 00	Set Quarter Post from which a
	Yel Oak 24" Dia. Bears N48°W 133 lks
	W Oak 18" Dia. Bears S81°W 427 lks
57 00	Top of ridge Begin to descend
63 00	Leave Oak openings, enter prairie
75.00	Leave hill, enter valley
76 30	Trail N & S
80.00	Set Post Corner to Sections 23-34 35 from which a
	W Oak 10" Dia. Bears S25°W 18 lks
	Asn. 5 Dia. Bears S8½°E 67 lks
	W Oak 2" Dia. Bears N52½°W 144 lks
	W Oak 6" Dia. Bears N54°E 13 lks

PRINTED FORM FOR SECTION SURVEY NOTES

the top, are printed in large letters the township and range numbers.

In practically all of the Western States, small lithographs of each township, about 6 in. square, can be obtained, and one for the proper township and range is cut down to a minimum size and pasted on the portfolio cover below the title. This plat shows the streams, sections and donation-land claims and acts as a key map for the surveyor.

To facilitate the work of securing a meridian, either by means of a solar instrument or by a direct observation, the writer figures the latitude of each tier of sections in the township; and this is written on the right-hand side of the cover map, each latitude opposite the section line for which it was computed. The longitude for the nearest 10′ is also shown in its correct position on the plat.

A portfolio of the size described can be easily folded in the middle and held with two rubber bands, so as to be carried in the surveyor's pocket.

By having with him the portfolio of notes for the township in which he is called to work, the surveyor has as complete a record as it is possible to have to enable him to reset or establish corners. He also has other data of work done that will be of great value. With these notes he can go from one job to another in the same township without first having to send or go to the office for further notes.

If surveyors in the same locality could be induced to exchange notes of surveys, all data on reset corners or subdivision work could be kept up to date, and each one would have the data in shape for field reference.

Bureau of Standards Corrects the Average Normal Eye

In scientific paper No. 299, issued by the Bureau of Standards, is recorded an attempt to approximate the results of the average normal eye with typical color differences by using a large number of observers. Comparison of light of different colors is supposed to be based on an eye which is both average and normal, and in this paper a comparison between the results obtained by a flicker photometer and by an equality-of-brightness photometer is detailed.

Through the use of the Ives-Kingsbury test solutions, the results obtained on the flicker photometer by a

Times Have Changed Some for Engineers

REGULATIONS

OF THE

ENGINEER'S DEPARTMENT

OF THE

Sacket's Harbor and Saratoga Rail-Road Company.

1.—Every man in this department must be at his post on the work from 7 A M until 6 P M, with the exception of one hour for dinner between the hours of 12 M and 3 P. M

2.—Every man when called upon to go on to the line, or to do office work, or other business relating to the road, by the Resident Engineer, or his superior in command, at any hour before or after the aforementioned hours, will be expected to obey, and go cheerfully and promptly at the time notified—and do as directed

3.—Every man in this department will board himself and pay his own board but when in the woods camped, the Company will furnish provisions and a cook, for which each man will be charged $10 per month

4.—No man will be allowed to contract any small bills, and leave the same unpaid to the injury and discredit of others in

11.—Every Resident Engineer [illegible] manner in which the work is [illegible] may arise as to the same [illegible] prove instrumentally [illegible] Chief Engineer and Division Engineer under whom he acts, that the same may be rectified [illegible]

12.—Every Resident Engineer [illegible] delays upon his work for [illegible] property—and will be expected [illegible] from his superiors, with promptness and dispatch.

13.—The Chief Draughtsman [illegible] all the assistants [illegible] the acts of the other [illegible] he is required [illegible]

ENGINEERS in railroad service who feel that their conditions of service are not all that they might be will perhaps find some comfort in knowing that there has been some improvement in the status of even railroad civil engineers since 1854. On the left is a reproduction of part of a sheet of 16 rules issued July 25, 1854, by the chief engineer of the Sacket Harbor & Saratoga R.R. Others of the rules are of a more technical nature. For example, No. 8 states, in part, more forcefully than grammatically, "Every Resident Engineer will not allow any excavations on any part of his division before the cross-sections are made." The six-month rule is a warning that violation of any of the other fifteen will be considered sufficient cause for discharge.

small number of observers can be corrected so as to give normal values with a high degree of accuracy. It was found that on the average, equality-of-brightness measurements also vary in proportion to the test ratio, but erratic variations often overshadow the systematic differences. For sources having relatively high intensity in the blue, flicker values tend to fall below those obtained on the usual standard photometers, but the difference is comparable in magnitude with the uncertainty of the latter values.

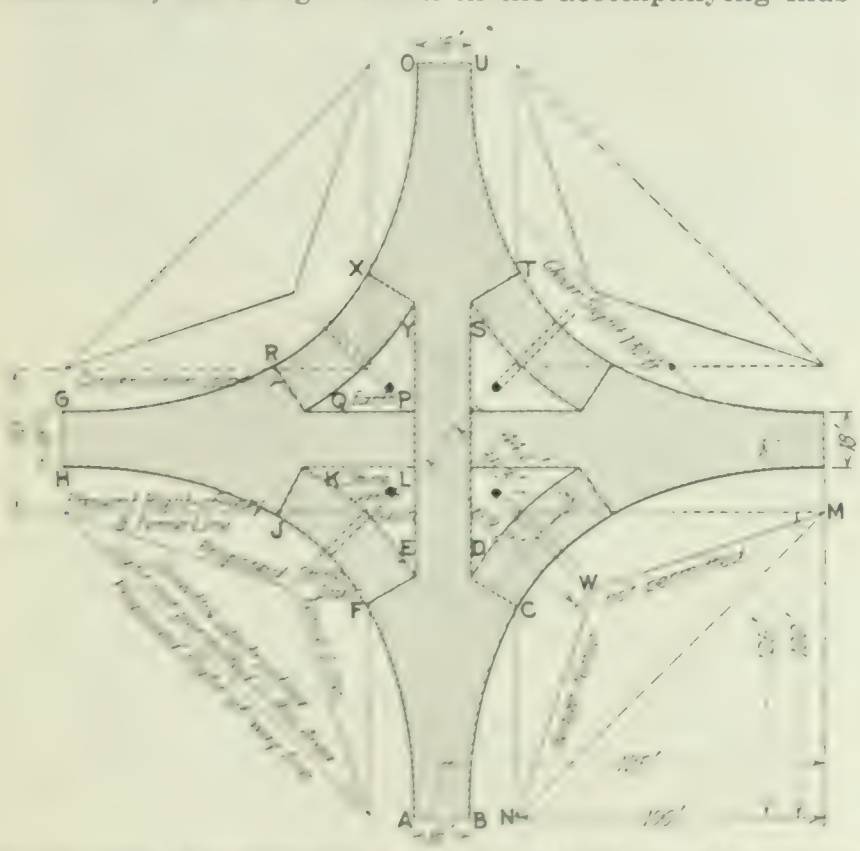
The publication in which this matter is described is entitled "An Average Eye for Heterochromatic Photometry, and a Comparison of a Flicker and Equality-of-Brightness Photometer," and may be secured by addressing a request to the Bureau of Standards, Washington, D. C.

A Modern Intersection Designed for Paved Highways

By H. E. Bilger

Road Engineer, Illinois State Highway Department, Springfield, Ill.

IT IS appreciated by automobile drivers that the loss of momentum and time due to slowing down to turn a 90° corner within the limits of a 50-ft. highway is about equivalent to that required to travel some 1500 ft. on a tangent of similar grade. Another difficulty with the usually designed intersection is the lack of sufficient clear-sight to enable the driver to realize the approach of a motor on an intersecting road. To overcome these difficulties, the design shown in the accompanying illus-



PROPOSED INTERSECTION GIVES 132-FT. CLEAR-SIGHT

tration has been put forward; and as may be seen, within the limits of the proposed highway the clear-sight is 132 ft., though in reality it would be much more than this if the regulations concerning vegetation were enforced.

While the total area of pavements in the proposed design is 1703.6 sq.yd., only 739.6 of this is necessary for the curve connection shown, the remaining 954 sq.yd. constituting 482 lin.ft. of main-line pavement, 18 ft. wide. Pavements 18 ft. wide being ample for two lines of motor traffic at high speed, they need not be made still wider on curves where speed is necessarily reduced. Likewise, there would seem to be no good reason for widening 10-ft. pavements on curves; 15- or 16-ft. pavements, however, should be widened to 18 ft.

Brick and concrete pavements are generally crowned 2 in. The preservation of this crown at the intersection would prove objectionable, so it should be reduced at the intersection to about ½ in. and tapered out to the full crown in a distance of about 10 ft. in each direction.

Sections like *G, H, J, K, L, P, Q, R* should be built monolithic with the usual convexity of surface at *J, K*, although *J* is depressed. Areas like *H, J, K* will come out warped surfaces easily built by an experienced contractor. The 10 construction joints shown should be nothing more than planes of cleavage. Sections like *K, E, F, J*, which are built last, have their corner elevations fixed by the main pavement. The usual convexity of surface is preserved, therefore, and the inner edge *F, J* is depressed to meet the required elevation.

In areas like *K, L, E* the surface of the ground should be kept about 1 in. below that of the surface of the pavement adjacent. The catchbasins and drains will keep the ground dry.

Dump Road Drags Before Pulling Across Railroad Crossings

MEN operating road drags should dump their drags or unhook one end of the drag chain and pull the drag endwise whenever a railroad crossing must be crossed, according to the "Bulletin" of the Iowa State Highway Commission. Railroad men are complaining that this precaution is not being taken. They have appealed to the commission to do all in its power to get dragmen to watch this point. Pulling the drag across the tracks in the usual manner leaves the space between the rails and the planking on each side filled with dirt and small stones. Each passing train packs this material down, and the next dragging fills the space again. This continues with every dragging; and if a good-sized hard hand-stone becomes packed in this space, there is the best possible situation developed for a derailment. Derailments of hand cars and motor cars are of almost daily occurrence because they are not heavy enough to crush the dirt and stone sufficiently to allow the wheels to retain a safe hold on the rails. There have been many derailments of trains traceable to this cause, but so far, no serious wrecks.

Measure Transparency of Paper and Tracing Cloth

IN RESPONSE to the demands of several Government departments and of dealers in tracing cloth, the United States Bureau of Standards has developed and adopted a standard method for specifying the transparency of paper and tracing cloth. It has issued circular No. 63 stating definitely the form of the specification, explaining its significance, describing the apparatus and method of test, giving general information and instructions to applicants and including a schedule of fees for tests. Copies of the circular may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5c. each.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Use Ice Scraper To Clean Concrete from Wheelbarrows

AN ORDINARY sidewalk ice scraper, with the handle sawed off to convenient length, is proving a useful tool on track-elevation work being carried out for



TOOL USED FOR CLEANING ICE FROM SIDEWALKS IS ADAPTED TO CONCRETE WORK

the Illinois Central R.R., in Chicago, by the Bates & Rogers Construction Co. The scraper is used by the man at the form in emptying wheelbarrows, and is stated to be much more convenient for this purpose than a hoe and much lighter than a shovel. The usefulness of the straight blade in line with the handle is shown in the photograph, where it is evident that the motion of the concrete in sliding out of the wheelbarrow is nearly vertical. The tool can be handled quickly in cleaning out the last of the concrete.

Plows and Scrapers Dig Sewer Trench When Labor Runs Short

BY M. H. DOYNE
Engineer, Oklahoma Belt Ry., Oklahoma City, Okla.

TRENCHES for a great length of 12-in. vitrified-pipe sewer, required in connection with some new pens in the Oklahoma National Stockyards, were recently dug with plows and scrapers when sufficient labor to dig them by hand could not be secured.

When a start was made on the trenches, which averaged about 3 ft. in depth, excavating by hand, it developed that the labor available would never be able to complete them in the tough gumbo soil encountered within the required length of time. It was therefore decided to plow the ditches. A plow drawn by two horses soon accomplished the work of about 20 men in a few days. The dirt was removed by going over the trenches with a scraper after plowing them up. It is true that they were dug considerably wider than necessary, but it is thought that the method is much cheaper than the usual way of digging sewer trenches.

Driver Boat Rakes Mud from Under Pier with Big Hoe

BY GEORGE M. VAN DUZER
Jersey City, N. J.

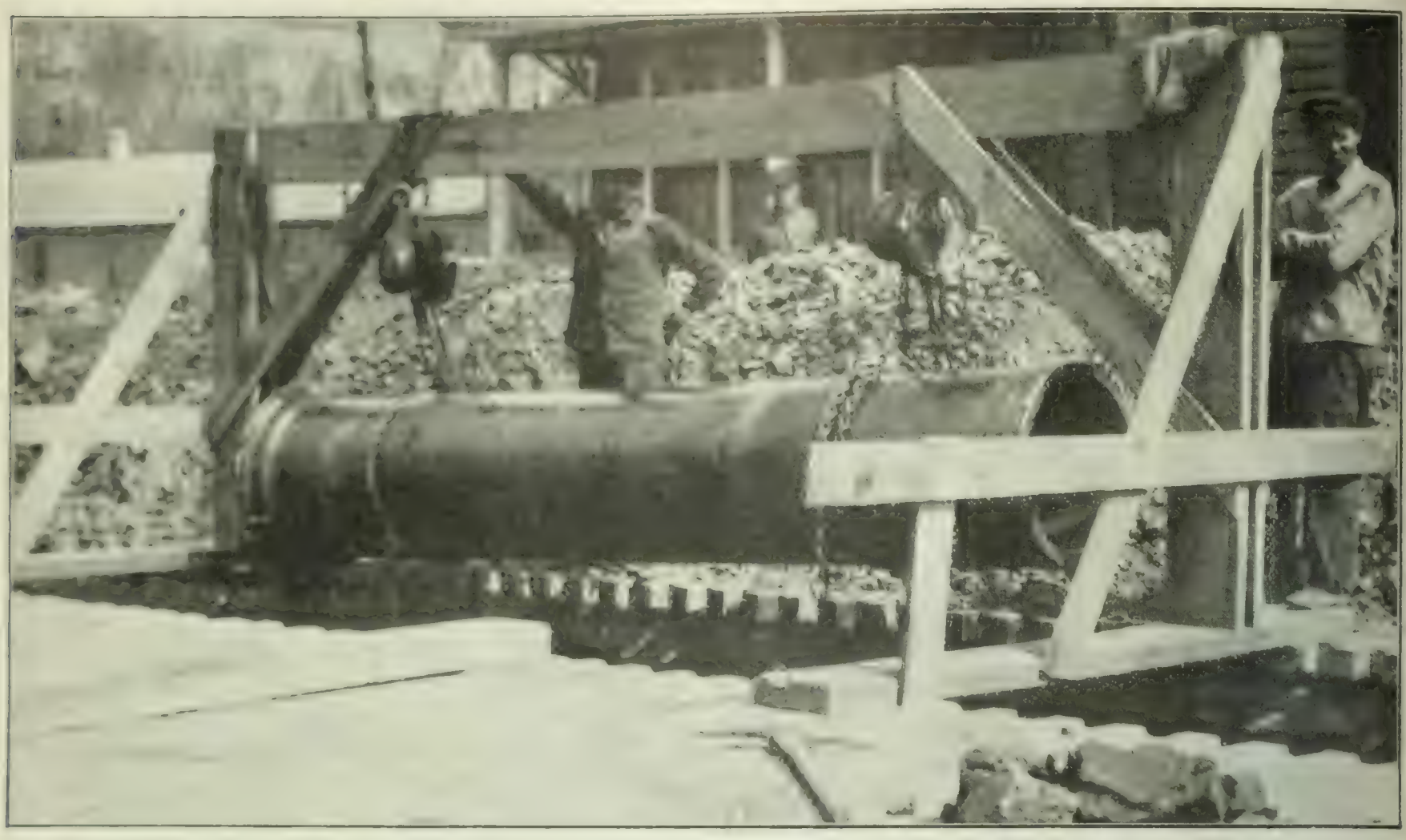
A LARGE hoe made of steel plate and a 6 x 12 timber, swung betwen the leads of a piledriver and handled by its engine, was used recently to scrape stiff mud from under a pier in New York harbor when the mud refused to flow to the dredge until the slip alongside had been dug so deep that there was danger of the ground moving out bodily and taking the foundation of the pier with it.

The pier was built on the site of an older one. The material under it was very stiff meadow mud at an average elevation of 5 ft. above low water, being only about 3 ft. below the deck of the pier. On one side for about half the length of the pier there had been no slip before, and it was necessary to dredge one 300 ft. long and 18 ft. deep below mean low water after the new pier had been completed. The stiff mud, however, held by the piling both of the new and the old piers, refused to flow out to the dredge. The earth pressure became sufficient to move the new pier 6 to 8 in. sideways

To get this mud out from under the pier a heavy steel plate ½ x 30 x 50 in. was mounted and braced on the end



HOE HAULING AWAY LOADS OF STIFF MUD A DAY FROM BENEATH PIER



FOUR MEN MOVE AND HANDLE HORSE, LAYING SEVEN LENGTHS OF TWENTY-FOUR-INCH CAST-IRON PIPE AN HOUR

of a 32-ft. stick of 6 x 12-in. timber, as shown in the photograph. The timber was pivoted between the leads of a floating piledriver. This "hoe" was raised and lowered by lines fastened to the rear end of the stick and running through blocks on the leads to drums of the hoist. The entire driver was moved back and forth by lines at the bow and stern. The hoe was raised, the driver pulled up to the pier, the hoe dropped to take a bite of mud, and the driver pulled back, raking the material out into the channel. A strain was held on the line forcing the hoe into the mud while the rig was pulled back. The mud was cut out to a depth of 10 ft. in this way, 300 yd. a day being removed at a cost of about 12c. a yd. The 6 x 12-in. timber was found to be a little light and an 8 x 16 would have stood the strain better. The rig was "invented" by the writer.

Five Men Lay 85 Feet of Pipe an Hour with Horse and Chain Blocks

By A. L. Solleder

[illegible] Co., Lindsay, Ohio.

WITH the horse shown in the accompanying photograph and two sets of chain blocks a foreman and four laborers were able to lay as many as 100 ft. of 24-in. pipe per hour and to average 85 ft. per hour in laying the entire two miles of 20- and 24-in. cast-iron pipe. The four men were easily able to handle and move the horse. The two lines of pipe were laid in a wide ditch, spanned by the horse, the frame of which was built to one side of the center so that when turned in one position it would be over the center of the 24-in. line and when turned in the opposite position would be ready to handle the 20-in. pipe. In laying the pipe two 4 x 10-in. skids 10 ft. long were placed across the ditch under the frame, the pipe rolled on them, the chains adjusted and the pipe raised before removing the skids.

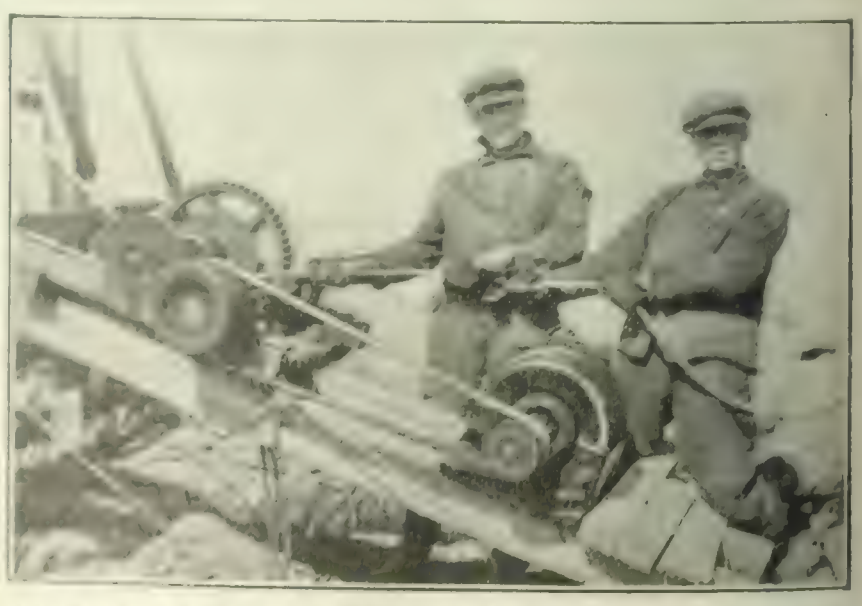
Although the 24-in. pipe weighs about 3400 lb. per 12-ft. length, two 1-ton Yale triplex chain blocks were used because of their light weight. The trench for the pipe was 3 or 4 ft. deep. The contractors on this portion of the work are Scherer, Mountain & Grimes, and the pipe laying was directly in charge of J. A. Grimes.

Winch and Motor Rigged Up To Spud Down Boring Pipe

By L. R. Talbot

Three Rivers, Que.

IN MAKING test borings with a 4-in. pipe to a depth of about 100 ft., some very hard clay was struck and the ordinary water-jet methods used would not get the



[illegible] DOWN A BORING DRILL WITH IMPROVISED RIG

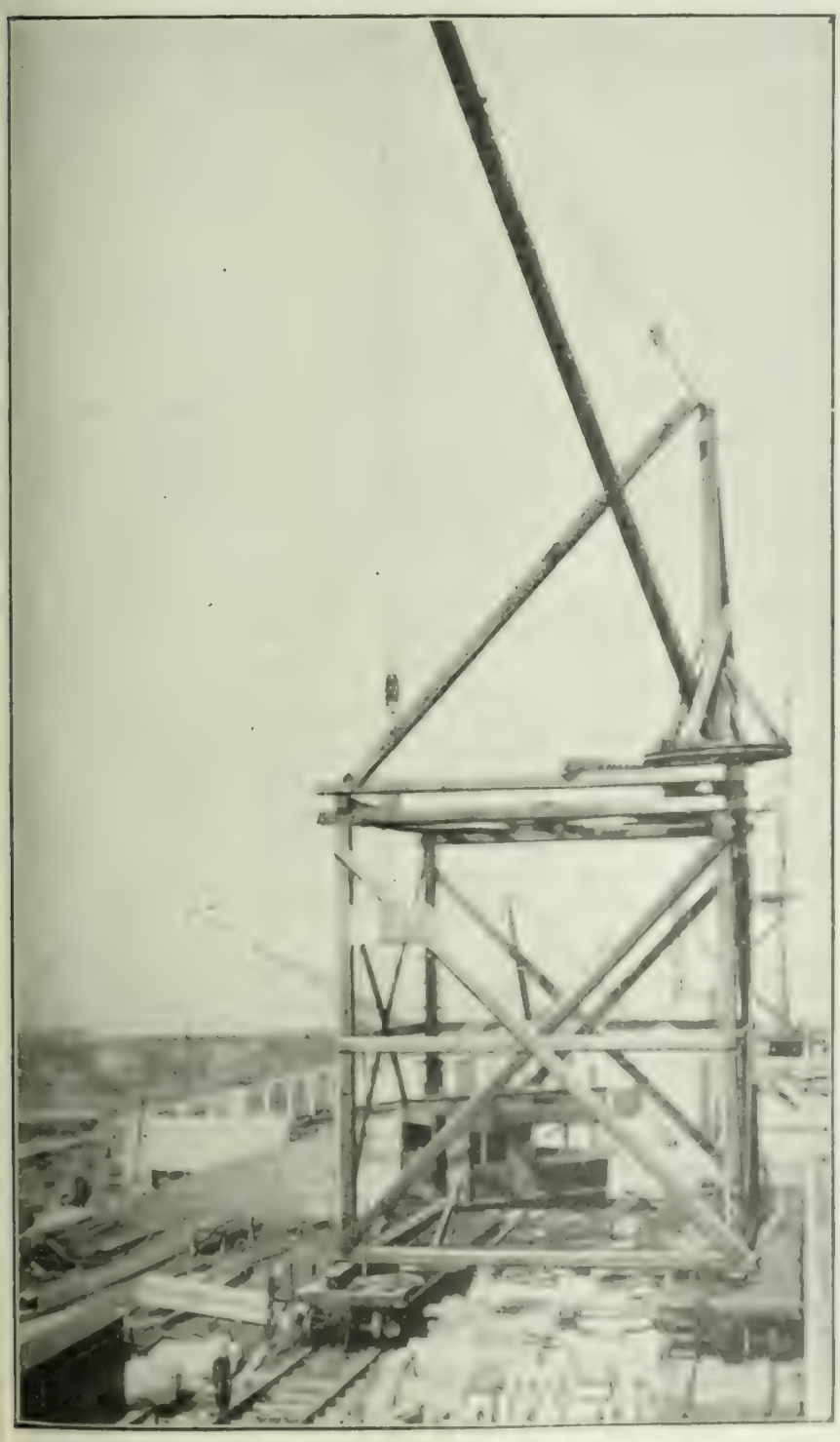
pipe down, so a chisel was rigged onto the pipe end and the pipe spudded down. At great depths, however, the pipe was too heavy for hand spudding; and when a tackle was used, the overhaul lightened the blows and made the work very hard.

For these depths the rig shown in the view was put together on the job. It comprised a 3-hp. motor and an old winch, or crab. The winch handle was taken off and a pulley babbitted onto its shaft. The winch and motor were then bolted down to the inclined frame and connected up. Using a single line from the pipe over a snatch block and with two turns around the drum, one man could spud much faster and easier with the rig than three could with the old hand-operated tackle.

In driving the pipe through quicksand the same rig was used as a piledriver, with a 12-in. birch log, 5 ft. long, as a hammer.

Traveling Tower Derricks Are Mounted on Railway Cars

CONSTRUCTION work on the Field Museum, Chicago, is being done by means of six traveling derricks rigged up on the job by the Norcross Brothers Co., of Worcester, Mass., which has the contract for masonry. The derricks are of timber construction.



MOUNT TOWER DERRICKS ON FLAT CARS TO PLACE BUILDING STONE

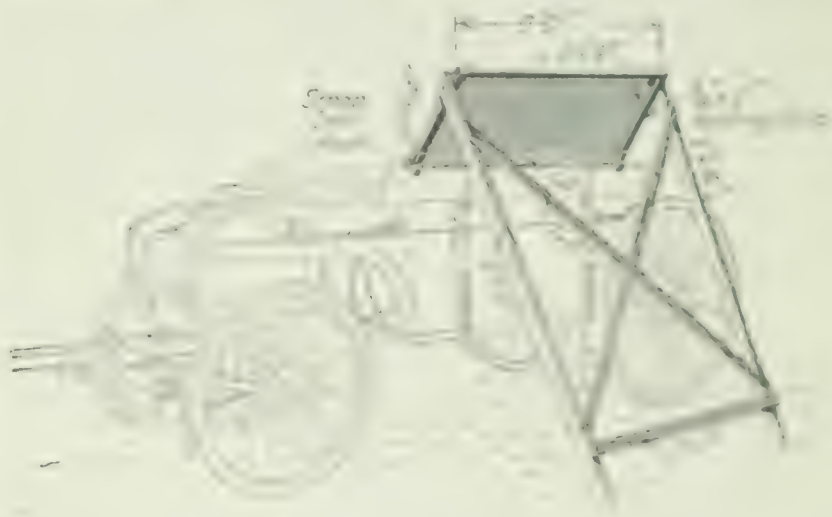
Each derrick has a tower 27 ft. square, mounted on a pair of flat cars on parallel tracks spaced 27 ft. c. to c. The height from base of rail to top of tower is 40 ft. At one corner of the tower is a mast 28 ft. high, supported by stiff-legs. This has a 10-ft. bullyheel for swinging and carries a 56-ft. boom. The hoisting capacity is 7 tons, or 5½ tons at the maximum reach of 54½ ft., with the boom practically horizontal. The hoist, with its 21-hp. electric motor, is mounted in a cab at the base of the tower.

These derricks can handle and place from 550 to 700 cu.ft. of marble blocks in an 8-hour day. For unloading the marble from cars, the Norcross Brothers Co. has five large stationary derricks of the stiff-leg type. The Thompson-Starrett Co. has the general contract, and D. H. Burnham & Co., of Chicago, are the architects.

Wagon-Side Screen Cuts Cost of Handling Gravel in Half

By Donald A. Thomas
Michigan State Highway Department, Lansing, Mich.

A SCREEN that is supported by props and by one side of the wagon being loaded is popular in certain sections of Michigan for screening gravel for roadbuilding purposes, because of its saving in cost over screening the gravel on the ground and handling it again to load it into wagons. Using the ordinary masons' screen, the cost of this work averages about 44c. per yd. for the screened product, including loading. About one-third of the material handled is waste. By throwing the material against the wagon screen, allowing the waste to drop to the ground and the screened gravel to roll into the wagon, the cost given is cut to about 22c. per yard.



SCREEN AT END OF WAGON FOR SCREENING GRAVEL

The screen used is 3 ft. wide, and the length of the dump wagon is usually about 9 ft. The frame is made of 2 x 4-in. scantling with two cross-braces of the same material. It is covered with screen wire having ½-in. to ¾-in. mesh, which gives a satisfactory product. The angle at which the screen is set can be varied to suit the material being dug. The lower edge of the screen is provided with hooks to hang on the side boards of the wagon, while the other side of the screen is supported by posts hinged on bolts to the edge of the frame.

NEWS OF THE WEEK

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

Government Will Erect Nitrate Plant

Time Needed To Build Water-Power Plant Forces Consideration of Other Processes

Secretary Baker announced July 17 that a plant for the production of nitrates from atmospheric nitrogen would be constructed immediately at a cost of about $4,000,000 and that water power would not be used. Discussion of possible sites is closed temporarily while the site committee of cabinet officers is making engineering studies.

Secretary Baker's statement follows:

"By direction of the President, certain plants will be immediately constructed for the production of nitrate from atmospheric nitrogen. The plants to be constructed do not involve the use of water power, but use a process which is a modification of processes previously known.

"Nothing further can be said at this time about the process or the location of the works which are to be constructed. Of the total amount appropriated by Congress, namely, $20,000,000, substantially $16,000,000 remains undesignated as to its expenditure by the President."

Informally, officials explained that the announcement did not mean that the idea of building a water-power nitrate plant had been permanently abandoned. Several years would be required to build a water-power plant and for that reason it was determined that for urgent war purposes it would be necessary to adopt one of other processes of producing nitrates.

Indiana Highway Commission Appoints Engineer

The new State Highway Commission of Indiana, after approval by Governor James P. Goodrich, has just selected William S. Moore, city engineer of Grand Rapids, Mich., as the new state highway engineer, who will supervise approximately 2000 miles of main highway road construction in Indiana between now and 1921. The Indiana legislature, in 1917 session, enacted the new state highway commission law. Mr. Moore's salary will be $4500 a year, and he will take office at once. L. H. Wright, of Indianapolis, chairman; Haines Egbert, of Goshen; Lewis Taylor, of Boonville, and David C. Jenkins, of Kokomo, are the members of the commission.

Mexican Engineers Will Examine Lower California Peninsula

A commission of engineers recently named by the Mexican Government for the purpose of studying and reporting on the natural resources of Lower California and the best and most practical methods of developing them, is now at work. The commission is headed by Manuel Balarezo and David Zarate. They will investigate the mineral deposits generally, kelp beds, fishing zones and the oil and artesian-water possibilities for fuel and irrigation purposes.

In commenting on the policy of the Mexican Government, Mr. Balarezo stated that the Government would not issue any concessions of a monopolizing nature, but that the policy will be to approve such development as will result in the greatest benefit.

Will Rebuild Galveston Causeway at Once

Contract Awarded July 2 on Basis of Arch Plan—Cost Not To Exceed $1,725,000

Work will start immediately on the reconstruction of the Galveston causeway, partly destroyed by the storm of Aug. 16-17, 1915. The Larkin & Sangster Co., Inc., of Buffalo, N. Y., was awarded the contract July 2, on the basis of the arch type of design submitted by William Mueser, of the Concrete-Steel Engineering Co., of New York City. The total cost is not to exceed $1,725,000. A bond of about $550,000 is required. If the contractors can finish the structure for less than $1,300,000 for actual cost of labor and materials, they are to have in addition to their bonus of $120,000, 20% of such saving in cost as is effected.

The three steam roads will bear 45% of the cost and occupy 27 ft. of the 62-ft. width; the interurban will pay 22% and occupy 13 ft., while the county will pay 33% and have 22 ft. for its roadway.

An option on $300,000 worth of steel with the Concrete-Steel Engineering Co. was immediately taken up, saving $54,000 owing to a recent advance in price.

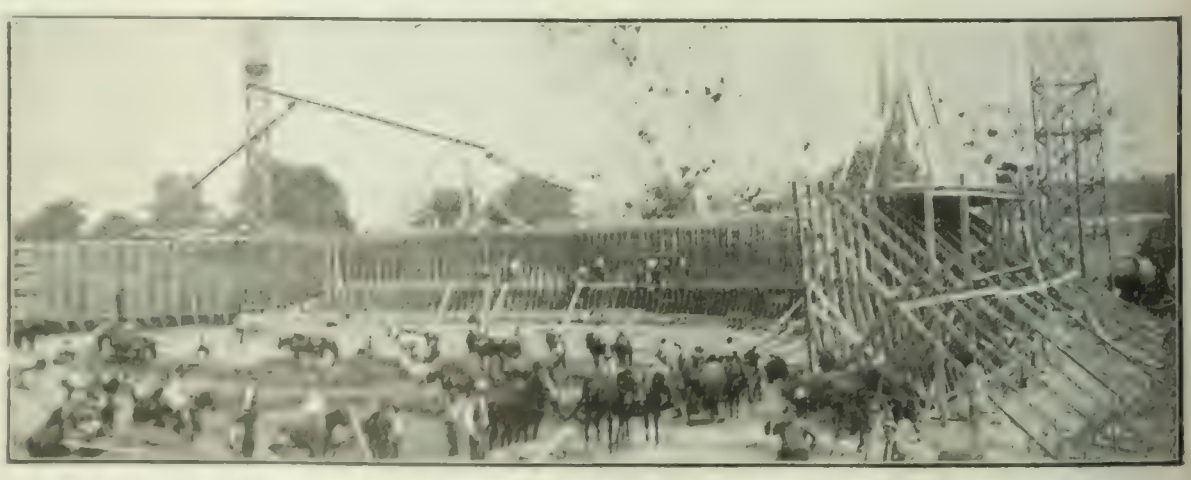
The length of the new construction will be about 5900 ft., 2240 ft. from the Galveston end and 3605 ft. from the mainland. Already 55 ft. has been repaired. There will be 84 new arches resting on piers 10 ft. thick supported on nests of piers driven 33 ft. The drawbridge and 2446 ft. withstood the storm of two years ago.

Rushing Water-Works at Fort Benjamin Harrison

A circular 3,000,000-gal. reinforced-concrete, concentrically baffled reservoir and coagulating basin is being constructed at Fort Benjamin Harrison. It is identical with the one at Bedford, Ind., and is being built from the same drawings. The Bedford basin was described in *Engineering News-Record*, July 5, page 31. Under recent date C. H. Hurd, consulting engineer for the water-works at the fort, writes as follows:

"The work is well under way and we are now engaged in sinking the well pit on the east bank of Fall Creek, about two miles above the reservoir site and entirely above the Government reservation. This pit will be 24 ft. square and from 20 to 30 ft. deep, depending on the character of the underlying gravels. It will be connected with a covered gallery, which will be about 18 ft. deep and 150 ft. long. This is to be used as an infiltration gallery, as well as a pipe gallery, for the intake to Fall Creek. The purpose of the infiltration well and gallery is to produce clear water at times of flood and high turbidity in Fall Creek."

The general plan was suggested in the article on the work at the fort, June 7, page 506.



SHAPING THE BOWL-SHAPED BOTTOM OF ARMY-CAMP RESERVOIR AT SAME TIME AS FIRST SECTIONS OF CONCRETE ARE POURED

Steel Men Promise Entire Product for War Needs

Conference of Manufacturers and Officials Will Set Price To Insure Only a Fair Profit

At a conference July 11 between the committee of the American Iron and Steel Institute and the Secretary of War, the Secretary of the Navy, Chairman Denman, of the Shipping Board, and Bernard M. Baruch, of the Advisory Commission of the Council of National Defense, further discussion was had of the prospective demand upon the steel industry of the country for supplies of various steel products for carrying on the war. The steel men repeated their assurance that their entire product would be available for the need and that they were doing everything possible to stimulate an increased production and speed deliveries of needed material.

The price to be paid for the iron and steel products furnished was left to be determined after the inquiry by the Federal Trade Commission is completed, with the understanding that the price, when fixed, would insure reasonable profits and be made with reference to the expanding needs of this vital and fundamental industry.

The representatives of the Government assured the committee of the steel institute that it was the intention of the Government to distribute the war requirements over the entire iron and steel producing capacity of the country.

Steel Men in Attendance

The heads of a number of the largest steel and iron companies in the country were present, the following attending the conference: Elbert H. Gary, chairman of the United States Steel Corporation; James A. Farrell, president of the United States Steel Corporation; Charles M. Schwab, chairman of the Bethlehem Steel Corporation; E. G. Grace, president of the Bethlehem Steel Corporation; J. A. Burden, president of the Burden Iron and Steel Co.; E. A. S. Clarke, president of the Lackawanna Steel Co.; H. G. Dalton, president of Pickands, Mather & Co.; A. C. Dinkey, vice president of the Midvale Steel and Ordnance Co.; J. A. Topping, president of the Republic Iron and Steel Co.; James B. Bonner, representing the American Iron and Steel Institute.

Gross 15%, Net 3.5%—Increase in Rail Revenues for May

Railroad operating revenues for May on 178 railroads, embracing 227,514 miles, as reported by the Interstate Commerce Commission, were $337,869,250, as compared with $294,517,994 for May, 1916. Operating expenses were respectively $233,147,873 and $193,348,746, and net revenues were $104,721,377 and $101,169,248. In other words, while gross revenues were 14.7% higher this year than last, net revenues were only 3.5% higher.

Local Engineers Condemn Methods Used on Spokane Bridge

After the failure of the Post St. Bridge in Spokane, Wash., on Feb. 6, 1917, it was pointed out in both *Engineering News* and the *Engineering Record* that there were serious defects in construction which could hardly have resulted in anything but failure. Since then the local members of the American Society of Civil Engineers have adopted as official a report made by a special committee appointed to investigate the collapse. The report confirms the earlier impression of poor work.

The special committee states that the failure was due to the fact that the "centering of the falsework was dangerously and poorly constructed, and that these defects were especially noticeable in footings, joints and bracings. We know that the structure was inadequate—there can be no question on that point—and from the data available, it seems fair to say that this inadequacy could have been foreseen."

Ben J. Garnett, city inspector on the bridge, Peter Mogensen, consulting engineer, and W. L. Maloney, a local contractor made the investigation and report. Excerpts from the document follow:

"As has already been intimated, the collapse of the bridge seems clearly to be a case in which the lack of stability and safety could readily have been ascertained by a competent engineer.

"The work was being done by the city, under the supervision of the city engineer, but through the agency of a contractor, and while the city would be responsible for the safety of the completed bridge, it appears to have been the opinion of the city attorney that the engineer could not intervene in or request modifications of the contractor's plans for the erection of the centering, even in the interest of safety, without assuming for the city, responsibilities which were intended to rest with the contractor.

City Engineer Should Have More Authority

"Had the city, through the city engineer, been responsible for the safety and sufficiency of temporary structures as well as for the bridge proper we feel confident there would have been no failure, and the additional cost of the falsework would probably not have exceeded a thousand dollars.

"We, therefore, recommend that in all future contracts made by the city for the erection of engineering or architectural works especial provision be made for the supervision of all parts of the structures, temporary and auxiliary as well as permanent, by the city engineer or architect in charge, to the end and to such an extent that the city does not only secure proper compliance with plans and specifications, but that it also through its own representative, makes certain that adequate provisions are made for the safety of all persons employed on its work."

Colonel Littell Issues Statement

Brands as False Editorials and News Items Attacking Contractors on Army Cantonments

Under such headings as "Government Hurting Business," "Disturbing the Labor Market," etc., a series of editorials and news items are appearing which are founded almost entirely upon falsehood, and the influence of which is extremely pernicious. They charge in effect that the contractors for the cantonments are paying more for material and for labor than is necessary in order that they may thereby increase the profit to themselves, which is figured upon the basis of a percentage on the cost of the operation; and they imply that the War Department has taken no precautions and is doing nothing to prevent deliberate fraud.

Such articles, says Col. I. W. Littell, of the Quartermaster Corps, officer in charge of cantonment construction, are written either with a reckless disregard of truth or a deliberate purpose to hamper the Government in this work. The contractors for building cantonments were chosen with the greatest care; the War Department had the assistance of the Council of National Defense in making the selections, and in every instance the contractors have had the widest experience and enjoy the highest reputation in their communities.

Government Protected

The War Department has taken every precaution to safeguard the interests of the Government in the carrying out of these contracts. A provision is contained in each contract which prevents the contractor from making any departure from the standard rate of wages being paid in the locality where the work is being done without the consent and approval of the Government. The prices paid for the various materials which go into the construction must, by the terms of the contract, receive the approval of responsible representatives of the Government.

In the methods adopted by this office in carrying out these contracts all material is carefully inspected both as to quality and amount, and an accurate record of the hours of labor of every employee on the job is made.

Of course the calling of approximately 100,000 men to build these cantonments must necessarily "disturb the labor market" in the localities from which they are called. Some inducements must be offered employees to do this temporary rush work, which in most cases must be done at a distance from their homes. Consequently an increase in wage is about the only method that can be employed to secure the necessary number of mechanics and laborers. However, it has rarely been found necessary to consent to the increase of wage more than 10% above the prevailing rate in any locality.

Government To Build New Ocean Terminals

Defense Council Creates Commission To Study and Provide for Needs of Emergency Fleet

The Council of National Defense has created an advisory commission on terminal facilities, to work with the general munitions board and with the subcommittee of the board on storage facilities. The committee is making a study of the ocean terminals of the country for the use of war-supply vessels and it is understood in Washington that new terminals are to be built especially for the assembly and loading of supplies for American troops abroad and for the allies.

Existing ocean terminals are reported to be entirely inadequate for the demands being made upon them, based on the exports before the President's embargo was put into effect. These, it is expected, will be cut down to the extent of $30,000,000 a month, on the present plans of the export council and its advisory commission, in accordance with the President's proclamation. These exports will be further reduced when additional embargoes are laid, as is expected to be done. The exports will greatly increase in volume, however, as soon as the ships to be produced by the Emergency Fleet Corporation and the Shipping Board are provided, and the advisory commission on terminal facilities will make a study of this subject as well as the physical engineering features connected with the present terminals and the probable needs of the future. Unnecessary freight hauls will be eliminated, it is expected, releasing cars and locomotives for inland transportation.

All Ports Are Represented

Francis Lee Stewart, consulting engineer, formerly chief engineer of the Baltimore & Ohio R.R., who represents the port of Baltimore, will be the chairman of the new organization. Representatives for New Orleans and Boston have not yet been selected. Others so far named to serve on the new organization are as follows: B. F. Cresson, consulting engineer, 50 Church St., New York, designated by the State of New Jersey to represent the New Jersey sections of the ports of New York and Philadelphia; R. A. C. Smith and Charles W. Staniford, respectively commissioner and chief engineer of the Department of Docks and Ferries of New York City, designated by the Mayor of New York to represent New York's waterfront and the port of New York; J. B. Locke, secretary of the Newport News Chamber of Commerce, designated by the Virginia Corporation Commission and the Mayor of Newport News; and W. A. Cox, secretary and traffic manager of the Norfolk Chamber of Commerce, designated by the Virginia Corporation Commission and the Mayor of Norfolk.

Announce Award of the Nelson Prizes in Plumbing

The committee in charge of the award of the Nelson prizes in plumbing announces that the papers of the following have been awarded the prizes: First prize, $100, awarded to Thomas J. Claffy, assistant chief sanitary inspector, Health Department, Chicago, Ill., for a paper entitled "Plumbing"; second prize, $50, awarded to J. W. Anderson, student graduating in the class of 1917 from the Massachusetts Institute of Technology, for a paper entitled "A Study of the Different Types of Pipe Used in the Disposal of Rain Water from Buildings"; third prize, $50, awarded to Walter E. Ward, instructor, North Dakota Agricultural College, for a paper entitled "Water-Closet Connections."

These prizes were awarded through the courtesy of the Cast Iron Soil Pipe Makers Advertising Association on Aug. 1, 1916, the only restriction being that they should be given for the best papers on subjects having to do with the theory or practice of plumbing. The personnel of the committee having the awards in charge is George C. Whipple, professor of sanitary engineering, Harvard University; Dwight Porter, professor of hydraulic and sanitary engineering, Massachusetts Institute of Technology; Gifford Le Clear, of Densmore & Le Clear, engineers and architects, Boston, and Harry Y. Carson, of the Central Foundry Co., New York.

St. Louis Engineers' Society To Give Engineer Regiment Colors

National and regimental colors are to be presented to the Second Engineers, National Army, by the Engineers' Club of St. Louis. Every member of the club is to have the privilege of contributing to the cost ($350), so that the soliciting notice asked for $1 only from each member. Thirteen members of the club are officers in the Second: Majors, F. G. Jonah and J. A. Laird; captains, F. W. Greene, F. E. Foster, J. W. Skelly, F. T. Kennedy and W. W. Burden; lieutenants, S. M. Smith, J. H. Brooking, H. H. Downes, J. J. Calahan and C. C. Brown.

Older Men Officer Engineers' Business Association

Following several adjourned stormy sessions in Chicago of the annual convention of the American Association of Engineers over the adoption of a new constitution, the organization finaliy put the matter in the hands of Isham Randolph, W. H. Finley, T. C. Williams, H. G. D. Nutting and R. C. Yeoman, who succeeded in ironing out the difficulties and getting their proposed constitution adopted July 13 unanimously. Its main provision is for enlarging the board of directors from five to fifteen members, but the board may appoint five members to actively manage the affairs of the association. Associates—those who are not necessarily engineers but interested in engineering affairs—may be admitted up to 10% of the certified membership.

To give a clean slate the old board resigned in a body and the following were unanimously elected July 13: President, Edmund T. Perkins, consulting engineer; vice presidents, W. H. Finley, chief engineer, Chicago & Northwestern Railway Co., and Isham Randolph, consulting engineer; two-year directors, P. P. Stewart, Dean R. C. Yeoman, W. W. DeBerard, C. A. Soans, H. G. D. Nutting and G. C. Dooge; one-year directors, F. H. Newell, L. K. Sherman, H. W. Claussen, O. F. Gayton, H. D. Whipple and A. C. Cunningham.

A resolution asking the board to found a Patriotic League whose aims would be to make a census of engineers and to look after the dependents of enlisted men was passed. Coöperation with other societies will be sought.

Construction of Federal Armor Plant Postponed

The building of the $11,000,000 armor plate plant and $1,500,000 naval laboratory will be deferred until the end of the war, according to an announcement from Washington. Secretary Daniels is convinced that the need for steel plants already in operation is so great that diversion of any of it to any of these projects would greatly hamper war preparations.

U. S. NEEDS TECHNICAL MEN FOR SERVICE DURING WAR

Position	Service	Salary	Date of Examination	Cir. No.
Land [illegible]	Geological Survey	$1080–$1200	.....	1401
Inspector [illegible] machinery	Navy.....	3.52–6.00 per day	..	1405
Topographic draftsman...	Coast and Geodetic Survey	1000–1200	July 25	1406
Mechanical engineer.....	Interstate Commerce...	720–1680	July 25	1407
[illegible] engineer	Interstate Commerce.	720–1680	July 25	1408
Structural engineer.....	Interstate Commerce.	720–1680	July 25	1409
Telegraph and telephone engineer	Interstate Commerce.	720 1680	July 25	1410
Engineer of tests	Ordnance	1000 2400	.....	1411
Cement inspector	Bureau Standards.	900	July 25	1450
Physical labor helper.....	Bureau Standards.....	600– 840	July 25	1451



DEEP WATER NOW CONNECTS PUGET SOUND AND LAKE WASHINGTON, A DISTANCE OF EIGHT MILES

Lake Washington Government Canal Is Opened

Ceremonies Mark Completion of Plans Recommended in 1856 by General McClellan

A marine parade and open-air festival in Seattle, Wash., on July 4, marked the official opening of the Lake Washington Government Canal. Completion of the canal fulfills an ambition cherished by Seattle since Gen. George B. McClellan, in 1856, as a Government engineer, recommended to the Secretary of War, Jefferson Davis, the construction of a waterway connecting Lake Washington, through Lake Union, with Puget Sound. In 1890 the Government surveyed the canal route from salt water on Seattle's west shore line to fresh water on the eastern city boundary. Later, the citizens acquired the right-of-way and presented it to the Government. In 1910 the Government appropriated $2,075,000 to build the locks, and in November, 1911, excavation began at the expense of the city, county and state. Since then, four million yards of dirt have been dredged and 230,000 yd. of concrete used in the lock and other needed construction. The total cost of the canal, including right-of-way was $5,000,000.

The improvement lies entirely within the City of Seattle and extends from Puget Sound, through Shilshole and Salmon Bays, and Lake Union to Union Bay, on the western shore of Lake Washington. The distance by channel from deep water, Puget Sound, to deep water, Lake Washington, is approximately 8 miles.

The Fremont Ave. bridge, crossing the canal at Fremont Ave., is 242 ft. long between trunnions, clearing the channel at right angles to the axis of the canal. The span is raised and lowered by four 100-hp. Westinghouse motors under automatic control. The structure is of steel and concrete and was designed by F. A. Rapp, bridge engineer, under direction of A. H. Dimock, city engineer.

Report Adversely on Proposed Lake Traverse Canal

Chief of Engineers, United States Army, has reported adversely on the proposed canal and lock between Lake Traverse and Big Stone Lake, which lie on the boundary line between South Dakota and Minnesota, on grounds that the interests of navigation are not sufficient to justify coöperation on the part of the Government.

The board of engineers points out that as the improvement was petitioned chiefly to provide relief from flood conditions, it is a matter for consideration under the terms of the flood control act. Forty-five hundred dollars is the estimated cost, made by the district engineer, for a survey to supplement available data and develop the plans.

The peculiar situation of these lakes has made them a tempting subject for promoters. They are separated by a distance of about 4½ miles. The divide between them is about 4 ft. above high water in Lake Traverse and the difference in elevation of the two lakes at low water is about 8 ft. It has been repeatedly proposed to drain the waters of the Red River of the North and Lake Traverse, through controlling works, into Big Stone Lake and the Minnesota River and utilize the flow along the Minnesota for power purposes. International complications have probably prevented these promotion schemes from going through, for Lake Traverse and the Red River of the North flow into the Hudson Bay.

Final Estimate of Consulting Engineer Binding on City

In a decision of the Supreme Court of Nebraska recently handed down in the case of the Katz-Craig Contracting Co. against the City of Cozad, it was held that the city must pay the contractor the full amount of the final estimate given by the engineer whom the city retained to supervise the work, and that claims for deductions set up by the city after the final acceptance of the work by this engineer were not valid. The contract plainly provided that final payment should be made upon approval and acceptance of the work by either the city council or the engineer. It appeared that the engineer accepted the work and that the city council intended to do so, but was prevented from making the final payment by the mayor. The city, however, took over the waterworks and built under the contract, and used it from the time of its acceptance. The court held that in any case the city was estopped by this action from claiming that the work was not satisfactory.

An important part of the decision was to the effect that, where a supervising engineer is employed by a city to inspect and approve construction work, and is named as the sole arbiter between the contractor and the city, his final estimate is binding upon the city as well as upon the contractor, unless fraud can be shown.

The case has been pending since 1911, although the amount involved was a little less than $7000.

Breaks in Imperial Valley Levee Cause Slight Damage

Two breaks occurred on June 30 in the Saiz levee of the Imperial Irrigation District in California, about 25 miles southeast af Calexico. On July 4 the total width of the gaps amounted to 200 ft., and the danger was then believed to be past. The break was largely due to a wind storm which came up when the water level was near the crest of the levee, causing waves which attacked the already saturated embankment.

About 800 men were engaged in the fight to hold the levees at the several points threatened. They worked under the direction of C. K. Clarke, chief engineer of the district, and C. N. Perry, chief assistant. The land inundated by the breaks is not cultivated and practically no damage to crops resulted. The overflow made its way southward, and a 600-ft. cut was made in another levee to allow it to escape into Volcano Lake.

Volcano Lake stood at El. 41.75 for several days and the levee, whose top is at El. 43.7, became pretty well soaked. However, trains continued to run on the tracks extending the full length of this levee, transporting men and bringing trainloads of rock from the quarries at Hanlon Heading.

Volcano Lake levee is the sole barrier to the reëntry of the Colorado River floodwaters into New River and thence into Salton Sea. The land behind the levee is about El. 32.0, or 9.2 ft. below the recent high-water level in the lake.

American Firms Will Build 500 Locomotives for Russia

A contract for 500 large freight locomotives has been placed by the Russian Government with the American Locomotive Co. and the Baldwin Locomotive Works. The contract is divided equally between the two companies and involves about $30,000,000. The locomotives will be of the decapod type, 5-ft. gage. Delivery is to be at the rate of 100 monthly, beginning February, 1918.

Break in Los Angeles Aqueduct

A break occurred in the Los Angeles aqueduct, July 7, on a hillside at a point near Owens Lake, about 26 miles north of the Haiwee reservoir and approximately 180 miles northeast of Los Angeles. The cause of the break is said by William Mulholland, chief engineer of the Water Department, to have been an earthquake which took place at about 3 a.m. on that date. Following the break, the water-soaked earth gave way beneath the line and a landslide from above carried away about 160 ft. of the solid concrete flume. Within a few hours a construction gang, under the direction of Mr. Mulholland, who had hurried from Los Angeles, had installed a steel pipe line, and a flow of about 10,000 miners' inches was again turned on. At the time of the break a sufficient supply of water was stored in the reservoirs along the aqueduct to supply all the needs of the city, and the news of the break was not generally known in Los Angeles until after repairs had been made. The landslide settled in an old borrow pit which had been made when the railroad was constructed below the aqueduct. A new section will be constructed at once, and Mr. Mulholland states that this borrow pit will be filled with material taken from above the pipe line, thus lessening the chances of another landslide.

Santa Barbara To Complete Water-Works Building

By a vote of more than three to one Santa Barbara, Calif., has authorized a bond issue of $590,000 to complete the Gibralter dam across the Santa Ynez River and to construct a 36,000,000-gal. distributing reservoir and provide supply mains. Work on the dam will be postponed until next spring, but contracts for the reservoir will probably be let this fall. The Mission tunnel through the Santa Ynez Mountains and the foundations for the Gibralter dam have been completed. J. B. Lippincott, Los Angeles, is engineer for all the improvements.

Hammond, Ind., Loses a Proposed Sewer System

A proposed intercepting-sewer system for Hammond, Ind., has been killed recently by the Supreme Court of Indiana, the objections having been against payment for this by special assessment. Contracts amounting to about $800,000 were let in 1913, but no work has been done. The sewer system was to discharge into the Calumet River and through this and the Sag Channel into the Chicago drainage canal. It is stated that the project will probably be taken up again on some more acceptable basis. W. S. Shields, of Chicago, was consulting engineer.

Army Wants Fire Chief for Forces in France

How thoroughly the army in France will resemble a huge engineering or industrial organization is well shown by recent advices that the services of fire chiefs are being sought for overseas work. The secretary of the National Fire Protection Association, Boston, Mass., makes announcement as follows:

"The Government wants at once for service in France a fire chief and assistant fire chief (salaries $1500 and $1200 with quarters and subsistence) who can speak French and who are capable of organizing a fire department in connection with warehouses containing military stores. The salary cannot be considered as any indication of the grade of men wanted. Personal character must be above the average. A chance for patriotic service."

Denver & Rio Grand Announces New Pension System

The Denver & Rio Grande R.R. Co. has announced that a pension system will be put into effect July 1 on that road, whereby all employees who have been connected with the company for more than twenty years, and who have reached the age of seventy years, shall be retired on a pension. A clause is also incorporated in the decision that all officers or employees who have been in the employ of the company for more than twenty-five years and who have become permanently incapacitated may be retired and pensioned regardless of their age.

Anti Stream-Pollution Suit Won by Texas City

On June 28 the Fifth Court of Civil Appeals affirmed the decision of the District Court in the suit of A. L. Brewster against the City of Forney, Tex., in which damages had been claimed for alleged injury to property by the installation of a sewage-disposal plant. As the city had agreed to change any part of the plant that was necessary to conform to the anti-pollution of streams law, and was endeavoring to do all that was possible to comply with the law, the court held that the city should not be liable. Although the jury found that the property had suffered actual damages, the court gave judgment for the city. The Court of Civil Appeals is just below the State Supreme Court.

PERSONAL NOTES

HOMER HAMLIN, city engineer of Los Angeles since August, 1906, has been removed from office by the Board of Public Works of that city. For some time there has been disagreement between the board and the engineer's office, which finally culminated in a resolution adopted by the board on July 10 declaring the office vacant. In an announcement by the board commenting upon the removal there appears a statement that "the board wishes Mr. Hamlin well. We recognize that he gave the city much valuable service during the past years." The immediate reasons for the removal involve reports on paving work in which the recommendations of the engineer were contrary to the wishes of the Board of Public Works.

ARTHUR M. SHAW, consulting engineer, New Orleans, who served in the Second United States Volunteer Regiment during the Spanish-American War, has been commissioned as major in the Engineer Officers Reserve Corps.

L. E. MYERS, consulting engineer and president of the L. E. Myers Co., of Chicago, owning the Ironwood & Bessemer Railway and Light Co. and Ironwood (Mich.) Water Co., has been called to Washington to assist H. C. Hoover, of the Food Control Council. He will take charge of the bureau of special investigations.

ROBERT W. ADAMS was elected president of the Providence Engineering Society at its recent annual meeting. Graduating from the Worcester Polytechnic Institute in 1904 and receiving the degree of electrical engineer in 1908, Mr. Adams has been connected with the General Electric Co. for the past nine years and is at present manager of the Providence office.

M. E. PARET, who resigned from the position of district engineer with the Interstate Commerce Commission, has opened an office as a consulting engineer on railway projects and railway valuation work. Mr. Paret got his early experience in railroad location and construction work with the Lehigh Valley R.R. and on the Pennsylvania Lines East and West of Pittsburgh. Several years on river and harbor work for the Government on the Atlantic Coast, he became locating engineer and later chief engineer of construction for the contractors who were building the Kansas City Southern Ry. from 1895 to 1901. Mr. Paret became chief engineer of the Kansas City, Mexico & Orient R.R. in 1901 and located 1700 miles of that road, building 800 miles. In private practice from 1909 to 1913 on railroad and hydro-electric projects, he was appointed district engineer with the Interstate Commerce Commission in 1914, which position he held until the time of his resignation.

PAUL HOOKER has resigned as first assistant engineer, water-works and sewage, in the Pennsylvania State Department of Health, to join the engineering staff of the Hooker Electro-Chemical Co., at Niagara Falls, New York.

PHILIP GUISE has been appointed county engineer of Sussex County, New Jersey, vice HARVEY SNOOK, now serving as lieutenant in the United States Army. Mr. Guise will also serve as town engineer for Newton, New Jersey.

D. KIRK, until recently checker and designer on rolling mill machine drawings for the Carnegie Steel Co., at Homestead, is now engaged in similar work with the Bethlehem Steel Company.

EDWARD G. KANE, commissioner of public works, Butte, Mont., has resigned, and W. H. ELLIS has been appointed to succeed him.

MARK T. KRAUSE has been selected to handle such engineering questions as may arise in the building of the large industrial home section known as Sawyer Park near Williamsport, Penn. Mr. Krause has had much experience in the construction of house and storm-water sewers, streets and reinforced-concrete bridges in connection with work of a similar character at Williamsport at Spirit Lake, Idaho, and at Newport, Wash., in addition to four years of experience in railroad work and private practice.

ALONZO B. REED, formerly with CHARLES T. MAIN, consulting engineer, Boston, Mass., is now associated with the power transmission sales office of James Hunter Machine Co., with headquarters at 70 Kilby St., Boston.

OTTO J. SWENSSON, city engineer of Summit, N. J., has resigned to enter the employment of the Aluminum Co. of America, with headquarters at Pittsburgh.

C. C. COTTRELL has been appointed assistant highway engineer of Nevada. Mr. Cottrell was formerly connected with the California Highway Commission.

W. H. ELLIS, formerly assistant city engineer of Anaconda, Mont., has been appointed Commissioner of Public Works of the same place, succeeding EDWARD G. KANE, resigned.

HENRY G. LEHRBACH, formerly of the Dunn Wire-Cut-Lug Brick Co., has been appointed assistant civil engineer of the United States Navy. For a number of years Mr. Lehrbach was engaged in state highway work with the New York Bureau of Highways.

J. G. HOCKE, formerly president of the General Contracting & Engineering Co., and WM. JOSHUA BARNEY, consulting engineer and formerly second deputy commissioner of docks, New York City, under CALVIN TOMPKINS, has joined with JOHN G. AHLERS, formerly of the Turner Construction Co., to form the Barney-Hocke-Ahlers Construction Corporation, with offices at 110 W. 40th St. The new company will engage in water-front and concrete construction.

WILLIAM ALBERT STINCHCOMB, county surveyor of Cuyahoga County, Michigan, is Democratic nominee for mayor of Cleveland. Mr. Stinchcomb entered the Cleveland city civil engineer's office in 1895, serving in the roads and pavements department. Later he was transferred to the Department of Surveys, working on most of the large surveys made by the city. In 1902 he was made chief engineer of the Park Department by Tom Johnson, who was then Mayor of Cleveland, and served in this capacity until 1909. For the four years preceding his election as county surveyor, he was in private practice and is now serving his second term in that office, although he has been elected for a third term, which begins in September this year. At the last election he led his ticket and next to Newton D. Baker, now Secretary of War, he secured the largest vote ever polled for any office of Cuyahoga County. The Detroit-Superior High Level and the Brooklyn-Brighton bridges have been built under Mr. Stinchcomb's direction.

Engineer Nominated for Mayor of Cleveland



WILLIAM A. STINCHCOMB

H. G. MILLER, formerly with the West Coast Steel Co., Tacoma, Wash., is at present in the service of the U. S. Government in the Hull Department of the Navy Yard, Puget Sound.

F. W. SEIDENSTICKER, formerly in the Chicago office of PURDY & HENDERSON CO., is at present in the Engineering Department of MARSHALL & FOX, architects, Chicago.

R. H. H. SPIDEL, highway bridge engineer with the U. S. Office of Public Roads and Rural Engineering, is at present assigned to field duty at Florence, Ariz. The work at this point is a Federal-Aid project consisting of building an 800-ft. extension to a 700-ft. concrete beam bridge across the Gila River at Florence. The estimated cost is $110,000, which includes approaches and flood protection, and is being done by force account under the direction of the state engineer. Previous to Mr. Spidel's employment in the Office of Public Roads, he was bridge engineer in the Ohio State Highway Department and also bridge engineer for Columbia County, Ohio.

DAVID M. OLTARSH, chief engineer of the Brady-Oltarsh Construction Co., of Johnstown, N. Y., has been commissioned captain of engineers, United States Army, with headquarters at Washington, District of Columbia.

B. F. ENGLAND is at present assistant highway engineer of Jacksonville, Tex. Previously to this employment, Mr. England was highway engineer at Garden Valley, Texas.

HENRY W. HODGE, member of the New York City Public Service Commission, has been called by the Government for military service, and is commissioned a major in the Engineer Officers' Reserve. Major Hodge is to serve as bridge engineer on General Pershing's staff and will leave for France soon.

L. P. WOLFF, consulting engineer, St. Paul, and member of the Minnesota state board of health, has been appointed consulting engineer in charge of water supply and sewerage at the same place. Twenty-two hundred buildings will be required on a space of one thousand acres; estimated cost, four million, and to be built in three months.

MAJOR M. A. BUTLER, engineer reserve officer, chief engineer Twin City Belt Line, St. Paul, has been appointed construction quartermaster in charge of construction of cantonment at Des Moines, Iowa.

ARNOLD T. BROWN, who for the past three years has been assistant engineer for the Anderson-Cottonwood irrigation district, has resigned to engage in private practice.

H. F. SHIPLEY is now principal assistant engineer in charge of the combined division of Highways and Structures in the engineering department of the City of Cincinnati.

MAJOR EARL B. MORDEN, engineer reserve officer, superintendent of construction, Hill Building, St. Paul, has been designated to take charge of cantonment construction at Battle Creek, Mich.

O. H. MANN has been appointed engineer, maintenance-of-way, of the northern division and branches, Chicago Great Western R.R., with headquarters in St. Paul, vice W. J. CALVIN, resigned.

R. L. KENAN, who for the past three years has been county engineer for Chilton County, Alabama, has recently formed a partnership with FULTON PACE as consulting civil and highway engineers, making a specialty of Federal-aid road projects. Kenan & Pace, under which name the new firm is organized, are at present working on projects for Clay, Cleburne and Toosa Counties, Alabama.

S. B. BENNETT, formerly city engineer of South Vancouver, B. C., has been appointed principal of engineering and allied trades at Winnipeg College. This school is established for the purpose of training returned soldiers.

Y. YAMASHITA, a graduate from the civil engineering department of the Tohoku Imperial University, Japan, is at present in this country, having been sent as an industrial student by the Japanese Department of Agriculture and Commerce, and is making a special study of reinforced concrete under Prof. A. M. Talbot at the University of Illinois, Urbana, Ill.

CLARENCE HEALY has resigned as assistant engineer of the Delaware, Lackawanna & Western Railroad Co. to take the position as vice president of Linde & Griffith Co., contractors, Newark, N. J. Mr. Healy was engaged in the design and construction of buildings and terminals during his railroad experience and will specialize in this work in his new position.

CHARLES EVAN FOWLER, consulting bridge and harbor engineer of Seattle, Wash., is at present and will be for some months located at 3910 Woolworth Building, New York City.

THOMAS MADDOCK has been appointed state engineer of Arizona, vice LAMAR COBB, resigned.

JULIAN MONTGOMERY, recently city sanitary engineer of Austin, Tex., and in charge of general design and construction, has been appointed chief office engineer of the State Highway Department.

ALBERT H. JEWELL, assistant engineer, Kansas State Board of Health, has resigned to become sanitary inspector for the Michigan State Board of Health. Mr. Jewell was with the Kansas board a year, going there from Toledo, Ohio, where he was assistant chemist of the water filtration plant.

FRANK S. KRUG, city engineer of Cincinnati, Ohio, has been again selected by the Rapid Transit Commission as its chief engineer, at a salary of $9000. He will continue to serve as city engineer at $6000 a year. After his first apointment as chief engineer of the commission, a year ago, the local and supreme courts of Ohio declared that the payment of extra compensation nullified the appointment. A legislative act has since been passed which permits him to receive salaries for the two positions.

S. V. TAYLOR, formerly district sales manager of the General Fireproofing Co., and M. J. QUINN, formerly engineer of the Trussed Concrete Steel Co., have recently formed the Concrete Steel Fireproofing Co., with offices at 73 State St., Detroit. The new company is the direct representative of the Concrete Steel Co., of New York City, and the General Fireproofing Co., of Youngstown, Ohio, and will handle a complete line of high-grade fireproof and waterproofing materials.

CHARLES S. CLARK, formerly of the Pennsylvania Steel Co., Boston, has been elected first vice president and general manager of the Laconia Car Co. and will make his headquarters at Laconia, where the business of the company will be transacted.

Army Engineers on Active Duty with Geological Survey

The Director of the Geological Survey authorizes the following statement giving the assignments to duty of the officers of the Engineer Officers' Reserve Corps in connection with military mapping now being done for the War Department:

Maj. R. B. Marshall, as chief geographer in charge of the topographic branch, is instructed to continue general supervision of the topographic surveys now being made for the War Department. His station will be at Washington, District of Columbia.

Maj. Frank Sutton will continue the duties of geographer in charge of the military mapping in the Eastern and Northeastern Departments, reporting to the chief geographer, Maj. R. B. Marshall. His station will be at Washington, District of Columbia.

Maj. W. H. Herron will continue the duties of geographer in charge of the military mapping in the Southeastern Department, reporting to the chief geographer, Maj. R. B. Marshall. His station will be at Washington, District of Columbia.

Maj. Glenn S. Smith will continue the duties of topographic engineer in charge of the Division of Military Surveys in connection with the military mapping, reporting to the chief geographer, Maj. R. B. Marshall. His station will be at Washington, District of Columbia.

Capt. Claude H. Birdseye will continue the duties of topographic engineer in charge of the military mapping in Texas, reporting to the chief geographer, Maj. R. B. Marshall. His station will be at Washington, District of Columbia

Majs. Robert Muldrow (topographic engineer), Joseph H. Wheat (topographic engineer), William H. Griffin (topographic engineer) and Robert H. Chapman (topographic engineer), Capts. E. I. Ireland (topographic engineer) and Asahel B. Searle (topographic engineer), First Lieuts. T. Foster Slaughter (assistant topographer), W. H. S. Morey (topographer), Samuel P. Floore (assistant topographer) and Reuben A. Kiger (assistant topographer), and Second Lieuts. Leo B. Roberts (assistant topographer) and Edwin C. Burt (junior topographer) will continue their work in connection with the military mapping in the Eastern and Northeastern Departments, reporting to Maj. Frank Sutton.

Maj. James H. Jennings (geographer), Capts. Albert Pike (topographic engineer), Carl L. Sadler (topographic engineer), William L. Miller (topographic engineer) and Eugene L. McNair (topographic engineer), First Lieuts. Thomas H. Moncure (assistant topographer), Luria L. Lee (assistant topographer) and Elmer L. Hain (assistant topographer), and Second Lieuts. Oliver G. Taylor (assistant topographer), Wilmer S. Gehres (junior topographer), R. M. Herrington (junior topographer), James M. Rawls (assistant topographer) and Martin A. Roudabush (junior topographer) will continue their work in connection with the military mapping in the Southeastern Department, reporting to Maj. W. H. Herron.

Capt. Herbert H. Hodgeson (topographic engineer) and First Lieuts. Oscar H. Nelson (assistant topographer) and Stuart T. Penick (assistant topographer) will continue their work in connection with the military mapping in the Southern Department, reporting to Capt. Claude H. Birdseye.

Maj. George T. Hawkins (topographic engineer), Capts. William O. Tufts (topographic engineer), John G. Staack (topographic engineer) and Calvin E. Giffin (topographic engineer) and Second Lieut. Frank A. Danforth (assistant topographer) will continue their work in connection with the military mapping in the Southern Department, reporting to Thomas G. Gerdine, geographer, United States Geological Survey.

Maj. Albert M. Walker (topographic engineer) is assigned to special duty at Washington, D. C., in connection with the assembling of data for use in field mapping in the State of Washington, where he will proceed about July 1 for the purpose of taking up the field work under Thomas G. Gerdine, geographer, United States Geological Survey.

Capts. Clyde B. Kendall (topographic engineer) and Bertram A. Jenkins (topographic engineer), First Lieut. John R. Eakin (topographer), and Second Lieut. John H. Wilson (assistant topographer) are assigned to special duty at Washington, D. C., preliminary to their transfer to France for duty with troops, reporting to Maj. R. B. Marshall, Washington, District of Columbia.

Capt. James W. Bagley (topographic engineer), although on active duty, is at present unassigned.

First Lieut. L. S. Leopold (assistant topographer) has been assigned to inspection work of the office, drafting and proofreading of maps in connection with the military mapping, reporting to the chief geographer, Maj. R. B. Marshall.

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The President Cuts the Gordian Knot

WHEREVER lay the merit in the controversy that has been delaying Federal shipbuilding, the President's decisive action of Tuesday will serve to clear the air. The mechanism which controlled the shipbuilding program was defective in that it permitted inharmonious personalities to retard progress. As each personality attracted to it some of those in partial control probably the only solution was to eliminate wholly one or the other side or to take the less decisive method of relieving both proponents of their responsibilities in the hope that the lesser elements could then find harmony in new chiefs. But the question of wooden or steel ships is yet unsettled, at least for the moment.

Coördination Saves Time and Money

VERY truthfully a Washington engineer remarks that the vast building operations of the Government lack efficiency because they are not coördinated under central control. It is universal experience that the absence of coördination in a large chain of interrelated enterprises brings with it many losses—time losses, or delays, and money losses, or excessive costs. Doubtless the former are the more serious just now; yet the money loss itself means further delay, since it makes more labor necessary to accomplish each single piece of work and thereby further sharpens the acutely unsatisfactory labor situation. We are bound to join most earnestly, therefore, in our correspondent's demand that coördination of the big construction program be brought about at once.

Form a Departmental Building Committee!

THE departments at Washington have shown such strength under the prodigious burden of work and responsibility of the past four months that nothing more is needed to demonstrate their resources in brains and managerial ability. The strong, level-headed men in the departments can handle the job of coördinating the national building program just as efficiently as they now handle the work of their own departments. Why are they not brought together for the purpose? *Engineering News-Record* urges the immediate need for such action by the administrative powers at Washington. Let the powers choose a group of department officers whose forcefulness is known from the way they have pushed their own work through. Make these men a steering committee clothed with plenary powers over the building construction now in progress and soon to be started. Place War and Navy men at the head—for the business all serves our fighting needs, needs military and naval. Such a committee will guide the erection of barracks, flying sheds, hospitals and warehouses with maximum speed and with greatest effectiveness.

When Public Work Is Not Public Work

THE decision of Judge Dowling, reported in the news section of this issue, will force, if sustained and followed to its logical conclusion, a readjustment of the conduct of all public work. Temporary interference with the rights of light, air and access to private property by the prosecution of public work has always been understood to be a cost that must be borne by the property owner affected. The decision rendered has cast a doubt on this precedent by holding that work carried out by a city for commercial purposes is not public work. How would a city-owned water-works be regarded in this light? Moreover, the cost of these damages, which may run very high, is saddled on contractors who have carried out the work in good faith. The decision rests on the Joralemon St. cases, where the damage to houses which settled from subway construction was a real and permanent damage, however temporary its cause. The firm of lawyers which has brought this suit is preparing a host of others. The city, apparently confident that the contractors would win in the higher courts, has refused to join in defending the cases, though, should the contractors lose, it is likely that the city would have to pay. That these suits may result in a final court decision virtually overthrowing established practice is a matter of anxiety to all connected with public work. Contract work would be placed under a discouraging handicap. We sincerely hope, therefore, that the Court of Appeals may take a different view from that held by Judge Dowling.

Garabed T. K. Giragossian

IT IS ALMOST certain that the Senate and House will be held up through the necessity of considering a joint resolution "For the purpose of promoting effi-

ciency, for the utilization of the resources and industries of the United States, for lessening the expenses of the war, and restoring the loss caused by the war by providing for the employment of a discovery or invention called the 'Garabed,' claiming to make possible the the utilization of free energy," which resolution aims to give one Garabed T. K. Giragossian protection beyond that afforded by the Patent Office for the invention of a machine through which the universal tension may pour as "free energy." To the consideration of this resolution, the Committee on Patents gave a hearing, the reprint of which fills 25 pages, duodecimo, and the House and Senate are no doubt destined to spare many precious minutes.

It is true that Garabed's language is beautiful, enticing, persuasive—and convincing. He says, in his talk before the committee, "Now, there is prevailing a prejudice or conviction among a certain class to the fact that energy can be produced without expense. They say it is against the law of nature. But I tell you, sirs, there is no expense in the economy of nature in the production of energy."

It is certainly a pleasure to see a great man or mechanism stop and consider the rights or feelings of a smaller organism. The innate kindliness, the pregnant courtesy, the deep-rooted and obviously flourishing Christianity of the act compel attention and earn their own reward. It is of this quality that the softer side of life is composed. But unfortunately, Congress now has not much time to spare. Regrettable as it may actually be, our strength and attention are, and rightly should be, focused on placing the rifle in the hands of the National Army. But Congress has its own way, and it is "Business as usual."

Massachusetts Highway Engineers To Cut Cost of Roadwork

CONFIDENT in the belief that road-construction costs can be cut by abandoning the present standard methods of letting contracts to the low bidder, the Massachusetts State Highway Commission has begun pioneer experiments in picking out the best men and offering work on a cost-plus-a-profit basis. Details of these contracts are given elsewhere in this issue.

By the terms of these agreements the contractor is relieved of all gamble on labor and materials. The state takes care of paying the labor and furnishing the materials. The contractor's problem is to get the laborers and to supervise their work to the best advantage. For both these purposes, he is presumably better equipped than the State Highway Department with all its governmental red tape to unwind.

For each unit of work performed, the contractor receives an agreed-upon "profit"—that is, it would be profit if the labor costs were the only costs to be met. But there is the contractor's own services and the expenses of his organization, depreciation of his part of the plant and equipment, etc., to be taken into account. All these are smaller as the work is hastened and economically done. Hence is furnished a spur to much desired speed and efficiency

In the savings-sharing contract made with Daniel O'Connell Sons, of Holyoke, the state has assured itself of getting the work done at the low-bid price, but at the same time is giving the contractor every facility for dong the work to better advantage. If successful by these means in reducing the cost of the work, the state shares the savings equally with the contractor.

No claim is made for these contracts as cure-alls, or as the last word in highway construction methods. They are admittedly experiments, the profit in which remains to be demonstrated. All the same the responsible officials deserve high credit for courageously trying out a possible solution of the problem in the face of much opposition from some contractors and their political friends, who profess to believe that favoritism is shown in the awards.

The Barge Canal—Now or Never

THE New York State Barge Canal has been under construction for more than ten years. During that time the people of the state have been kept constantly informed, through the usual mediums of publicity (and more practically by occasional demands for more funds), of the progress of the work. Through this and through personal observation they should have been readily able to make a fair guess as to the time when they must be prepared to make use of the expensive transportation tool furnished by the state—that is, by themselves.

Have they done so? The almost empty canal system is the answer. Today the Barge Canal is in operation for full width and for 8 ft. depth (which will be 12 ft. by Aug. 1, when a few shoals are cleared away) from Lake Ontario at Oswego to tidewater and from Lake Champlain down to the Hudson. Between Buffalo and Rome, where there is still enough work to postpone the opening of the new line until next spring, the old Erie canal with 6½ ft. depth is available. The Welland Canal makes possible the early transport of barges or ships up to 10 ft. draft and 43 ft. beam from Buffalo to Oswego, and with the Barge Canal establishes complete connection from the Great Lakes to tidewater for large freight barges.

So far as can be learned, there is no effort to build ships or barges for such travel or to organize the control or shipment of freight. Rumors of a seaworthy vessel so large that it just clears the Barge Canal structures are abroad, and some of the manufacturing companies along the route are considering plans for waterway freight carriage. But for the most part the shipper and manufacturer who are supposed to profit by the lower canal rates are quite ignorant of the possibilities of the waterway as a rival of the railroad.

The New York State Barge Canal has practically left the hands of the State Engineer. By next season at the latest he will have turned it over to another branch of the state service to operate. Its immediate future is in

the control of the publicity man. Having spent one hundred and fifty millions to open a fairly deep and wide waterway across its territory, the State of New York must now spend a considerable sum in letting its people know that such a waterway exists, in informing the cities so that the terminals may be made approachable, in promoting the organization of shipping companies by whose operations freight may have a prompt passage, and in guaranteeing to the shipper as thorough a control of his goods as he now obtains from the privately owned railway.

Fortunately the state is taking a step, somewhat belated though it is, toward that end. A traffic manager for the canals has been appointed. It will be his duty to undertake the various publicity activities outlined in the previous paragraph and to try and build up for his water-road as good a service as any freight traffic manager attempts for his railroad.

The state—and the long-time advocates of the canal—are fortunate, too, in the time when they start such work. If ever a canal could succeed, here is that canal. Railroad coöperation is promised, through way bills are guaranteed by recent state and Federal legislation, Public Service Commission control is established, and the Federal Government is offering its great powers of coöperation.

Were it not for the war-awakened disposition of the American people, the prospect for the canal would be most discouraging, for the lethargy that permits the present unpreparedness for waterway service in New York would seem to be unsurmountable. But the war is a huge motor which is driving men's minds and activities into new and hitherto unsought fields, so that the state's campaign for its freight carrier may have an audience receptive to a degree unhoped for a year or two ago.

The coming two years ought to make or break the canal as a modern transportation unit. If present conditions do not rouse the citizens of New York to its use, there is small hope for its future.

Two More Engineer Victims of City Misgovernment

THE life of the engineer in city employ has not been falling altogether in pleasant places of late. On June 25 the City Council of Portsmouth, Va., dismissed the city manager, and three weeks later the Board of Public Works of Los Angeles declared the office of city engineer vacant. In each case the action seems to have been unwarranted and unjust. In each case the information at hand indicates that the city would have been better served if the council and the board respectively had been put out of office instead of the city manager and the city engineer.

At Portsmouth there is strong evidence that the council muddled city affairs by usurping the executive functions which the statute specifically excluded it from and vested in the city manager, and that it failed to give its new city manager time to show what he could do or credit for what he accomplished in a few months under heavy handicaps.

At Los Angeles an able city engineer, of high integrity and of long service at a modest salary, appears to have been sacrificed because of his unswerving devotion to the interests of the city and its taxpayers. It has been a long, hard fight for Mr. Hamlin, under an antiquated city charter and conflicting legislative and administrative bodies on the one hand, and on the other under an electorate desiring all sorts of innovations but unable after repeated attempts at charter revision to agree on any unified system of municipal government.

In both cities the ultimate responsibility rests upon the citizens and voters who fail to protect their own interests in casting their votes for elective officers and to hold these officers and their appointees responsible for the conduct or misconduct of city affairs.

Why Can't the Railroads Check the Hobo?

ONE of the greatest sources of trouble at present with the labor supply on construction work is the hobo, according to influential contractors who expressed their opinions in the June 28 issue. With the foreign supply greatly diminished and the intelligent skilled and semi-skilled workmen attracted to other fields by higher pay, the hobo reigns supreme. One contractor hires him by the hundred at some labor center, takes him to the job and keeps him there—until he earns a "stake." Next week the hobo is back in town, his stake spent on a periodic jag, ready to ship out again and run up the cost of some other contractor's work. Those who doubt the present extent of this practice need only read in the article on page 651, issue of June 28, some of the figures of the average length of employment. The hobo travels by rail. Walking is beneath him and would never permit the run of the wide range of territory he covers. The contractor must pay his way in one direction, but the hobo himself never parts with money for carfare except in petty sums, as "graft" to freight-train crews. Consequently, on the return trip he "beats it." Were it not for the universal custom on American railways of permitting such travel, the hobo element could never have developed. Were the practice stopped now, this element could no longer operate. Having reached the job, the hobo would be compelled to stay there at least until he had cleared return carfare in addition to a "stake" meeting his ideas of the proper proportions for a spree. In most cases this would mean more than a month, contrasted with the few days averaged by most of this element at present. The practice of allowing these men to steal rides is supposedly proscribed already. Cannot the railroads induce their train crews to tighten up on this matter, at least while the need for steadying down the hobo element and inducing it to do a little useful work is so crying? What has the commission headed by Daniel Willard to say on this point, which is certainly within its scope?



Cleveland Subway Cuts Sheeted with Round Piles

Run Motor Trucks Through Excavation and Load Them by Steam Shovel on East End, Use Cranes and Portable Hoppers on West Approaches

BECAUSE prices were high and no deliveries of steel sheet piling could be promised, the contractor for the subway approaches to the Detroit Superior viaduct in Cleveland has used round piles and scrap plank for sheeting in dry sand soil with complete success. For excavating the four-track cut at the east end, motor trucks are run through the cut and loaded by a revolving shovel. At the west end, where the two 2-track approaches are not wide enough to allow this, a locomotive crane and traveler derrick loading into hoppers on the street are used. The station construction at each end of the bridge, requiring relatively little excavation, afforded places to concrete at the start of the job. Accordingly, concrete plants were set up early in the work at both ends.

Subways Enable Street Cars To Use Lower Deck

The Detroit-Superior viaduct, more than a dozen articles describing the design and construction of which have appeared in *Engineering News* and the *Engineering Record* since 1912, comprises a double-deck high-level steel arch of 591-ft. span across the Cuyahoga River, and concrete arch viaduct approaches. The upper deck, designed for vehicle traffic, is at the level of the streets at either end, while the lower deck, intended for street-car traffic, was to be reached by short depressed approaches.

In 1916, however, it was decided to modify this plan and construct a trolley station at either end of the bridge at the level of the lower deck. This means extending the four-track subway approach on the east end almost to West 6th St. on Superior Ave. and constructing a pair of two-track approaches on the west end, one extending three blocks west on Detroit Ave. and the other three blocks south on West 25th St. Although the approach for a short distance on the east end and for one or two blocks on each branch at the west end will be in subway, these structures are all being built in opencut, as it was possible to divert trolley lines and to take care of other traffic in the remaining undisturbed street width.

While the station at the west end is underground and required considerable excavation, that at the east end is largely open to the air, being above ground level on a side hill. It is carried on concrete footings extending to blue clay. The space under the floor is backfilled, the fill being retained by side walls and a cross-wall. The subway structures themselves are of reinforced concrete, the track being carried by a concrete floor bearing directly on the soil and independently of the columns and footings. The concrete roof is carried by the side walls and, in the four-track sections, by a row of reinforced-concrete columns between each pair of tracks. The open approaches consist of a

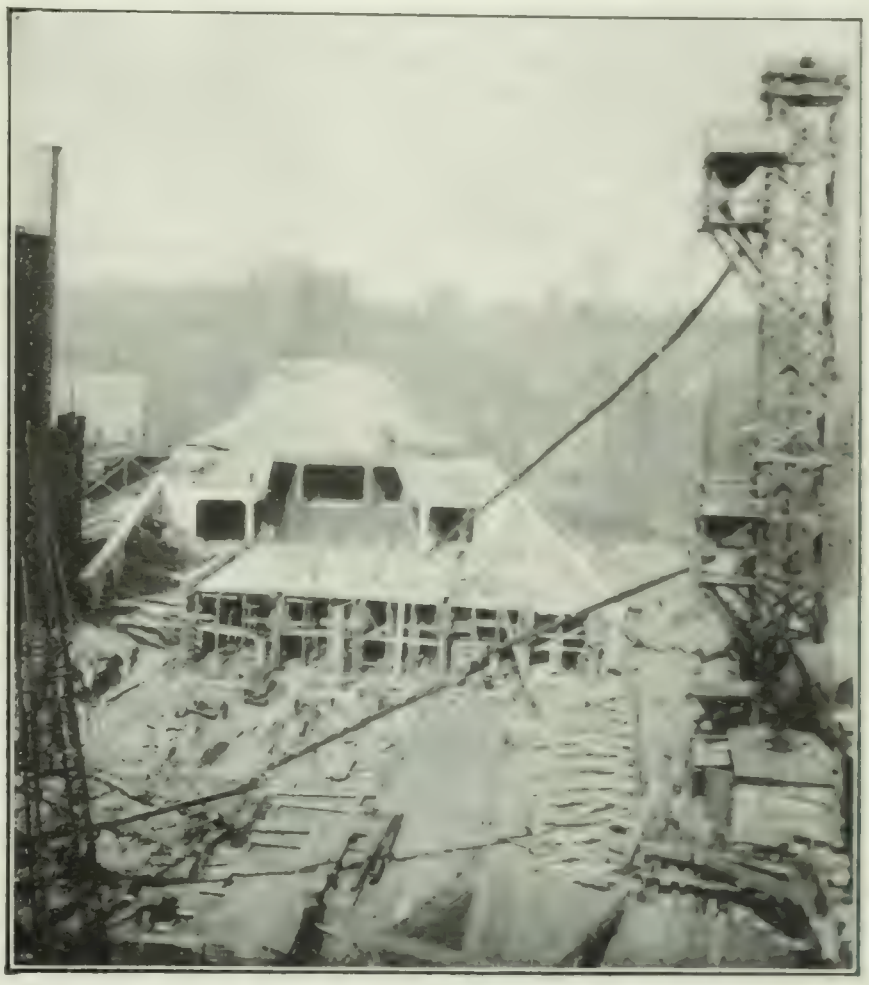
concrete retaining wall on each side and a continuation of the concrete floor of the subway.

Without much preliminary work it was possible to begin concreting on the stations at each end of the bridge almost from the start. Consequently, at each end a tower concrete plant was set up at the south side of the bridge near the center of each station. Each plant is arranged so that motor trucks can drive on top of the bins over the mixer and dump directly into them. The towers are tall enough to cover the area of the stations by direct spouting. For concreting the subway approaches, industrial track and side-gate cars, or cars carrying buckets to be handled by the cranes, will be used, supplemented by a short tower near the middle of the cut on Superior Avenue.

On the east end, derricks were set up to excavate for the piers and retaining walls, the material being dumped in a hopper and taken away by motor trucks. As soon as the footings and walls were concreted, the lower deck was finished before erecting the forms for the station walls and columns and the upper deck. The same procedure was followed at the west end, the floor of the lower deck being laid directly on the ground, and the earth excavated in the side of the hill to make room for the station being handled by a locomotive crane and also dumped into a hopper for disposal by motor truck. At this point a deep trench was constructed for the relocation of a sewer. The small amount of backfill required at the stations will come from the approach cuts later.

Wide Streets Make Decking Unnecessary

In constructing the approach cuts and subway sections in West 25th St. and Detroit and Superior Aves., the width of the streets and the possibility of diverting street-car traffic at the west end made it unnecessary to deck the streets. The car lines at the west end were detoured and the tracks entirely removed from the streets, the width remaining outside the lines of the



STATION AT WEST END OF BRIDGE

subway excavation being sufficient for the vehicle traffic originating within the blocks affected. On the east side, the street-car tracks on Superior Ave. were shifted over to the north curb. The width of the street was sufficient to leave both sidewalks unobstructed, while the long block between West 6th and West 9th Sts. is open to one-way vehicle traffic on the south side of the street. A bridge crossing is maintained, however, from Columbus Road and West 9th St. to the south side of Superior Avenue.

The subway excavation, which is in sand at both ends, reaches groundwater at the deepest points, and it



MOTOR TRUCKS ON BROAD TIMBER RUNWAYS TOOK SAND AWAY

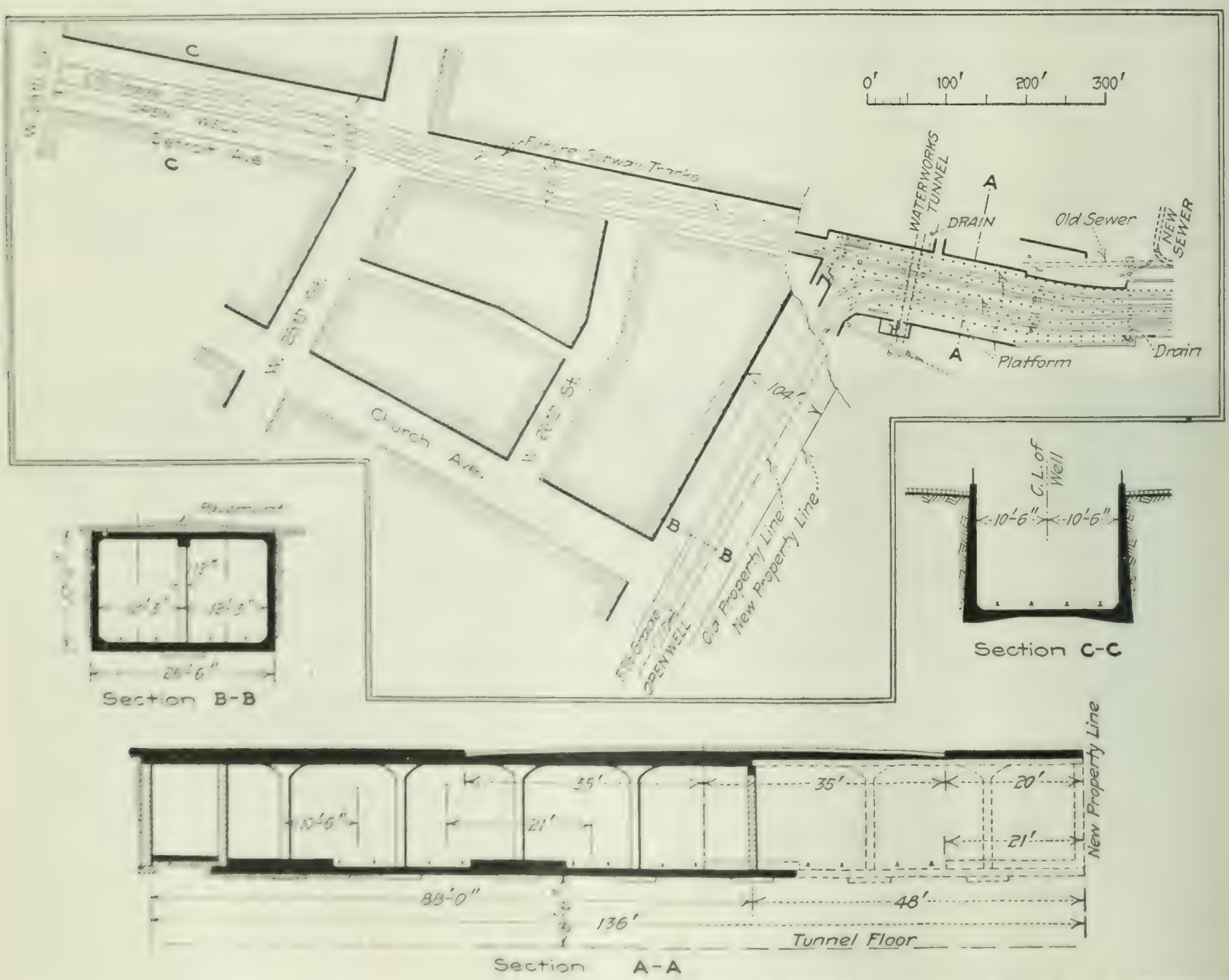
was necessary to sheet the sides of the cut. The best delivery on steel sheet piling that was promised was four months, whereas the entire contract was to be completed in less than a year. Wood sheeting was therefore decided on, and on account of the width of the cuts, heavy sheeting was necessary to avoid excessive bracing. Instead of using tongue-and-groove timber piling, however, the contractor has done the same work successfully and at much less cost by driving round piles on 2-ft. centers and placing behind the piles lagging of short scraps of 2-in. plank. About 3100 round piles were required in all, and about 100 M of plank. This method of sheeting was especially economical for the contractor, as nearly enough scrap from lumber for the entire work was left over from the Brooklyn-Brighton viaduct and other contracts recently completed in Cleveland by the same firm.

The use of the round piles, which could be quickly driven without jetting to a considerable depth below the bottom of the cut, also reduced the bracing required. Up to 12 ft. in depth, the piles act as a cantilever retaining wall without any bracing, each pile being driven as far below subgrade as the distance from subgrade to the surface. When the depth of the cut exceeds 12 ft., pile struts on 12-ft. centers are placed across the cut at the level of the top wale.

In estimating the pressure on this sheeting, it was assumed that the dry sand outside would take a slope of 33 horizontal to 41 vertical. Under this assumption it was found that only in a few places would a set of struts below the level of the ground surface be required. These were put in one-third of the distance from subgrade to the surface. They can be taken out as soon as the floor is concreted.

The round piling used as sheeting will be cut off 2½ ft. below the street surface and left in the ground. The piles were set 1 ft. outside the lines of the permanent structure. In addition to saving on the excavation, this type of sheeting will also prove an advantage in placing a large part of the concrete yardage. The industrial tracks for the side-gate concrete cars will be laid on stringers on top of the cross-struts, and the tracks can be shifted as required, so that most of the concrete except parts of the roof can be placed from the cars by gravity.

In making the four-track approach cut on Superior Ave., a ¾-yd. Marion-Osgood revolving shovel started in near West 6th St., working downgrade. The sheet piling had previously been driven, so that the shovel was able to excavate the cut down to grade for the full width. The shovel loaded 5-ton White motor trucks. From 3 to 12 trucks were employed daily on this cut,



WIDE STREETS, WITH POSSIBILITY OF DIVERTING THREE SUBWAY

depending on the conditions under which the steam shovel was working. On one occasion, 1000 yd. of sand were taken out in a 16-hour run with this equipment.

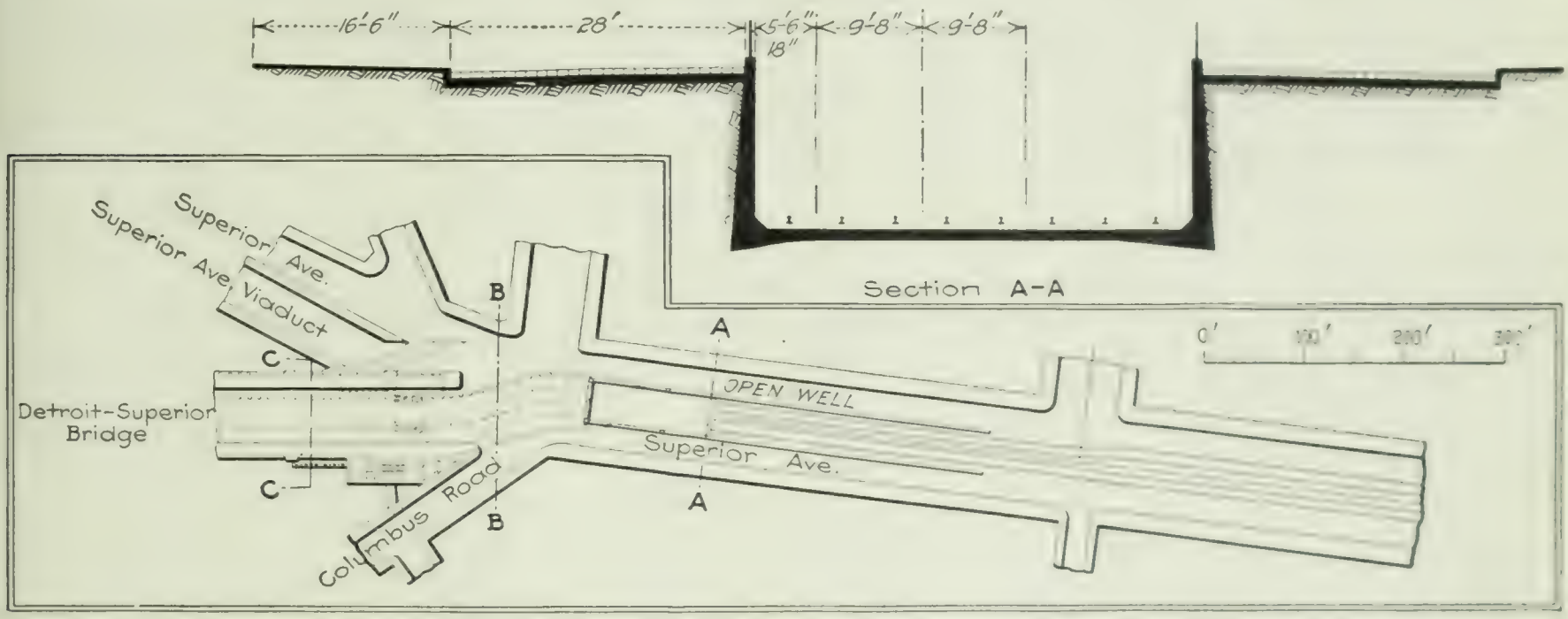
Trucks Run on Timber Track

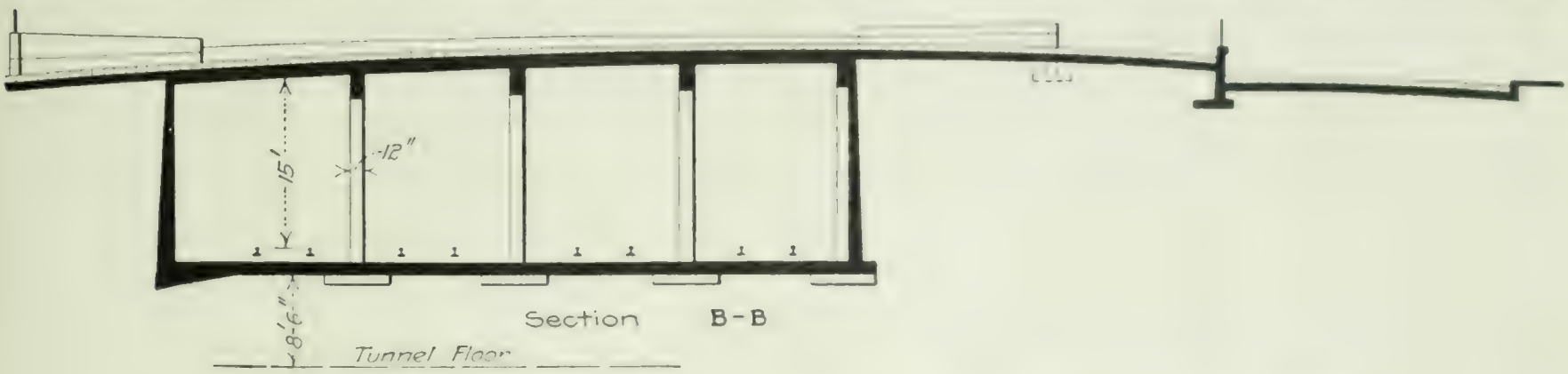
The trucks at first came south on West 9th St., ran through the cut along the north side, passed the steam shovel and came out at the east end. This made it necessary to leave a bank with a sharp downgrade against the piling on the north side of the cut. As soon as the shovel had progressed to West 9th St., however, a passage was cut through the side of the hill into Columbus Road, which is on a steep descending grade at this point. Thereafter, the motor trucks came into the cut from the south through Columbus Road, traveling east and making their exit at West 6th St., as before.

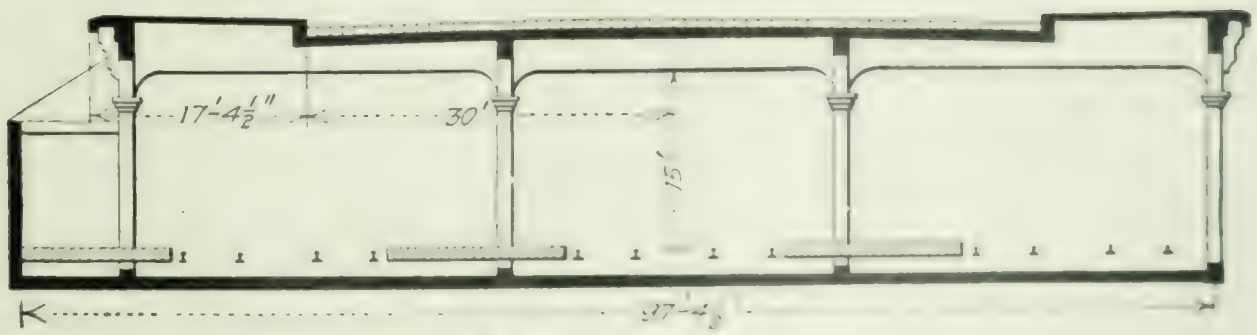
The heavy trucks were operated on the floor of the sand cut with the greatest ease by laying for them sectional track made from old bridge stringers. Each section was made of two 8 x 16-in. stringers, 16 ft. long, laid flat side by side and bolted together. Two lines of such track were laid parallel, affording a runway for the wheels on each side nearly 3 ft. wide. The track was extended as excavation progressed by adding new sections, and no shifting was required until the change was made from bringing the trucks down West 9th St. to operating them through Columbus Road. All the dirt trucks used on the work have been supplied and operated by the Blake Motor Trucking Co. With this arrangement it is possible for the general foreman to estimate the yardage he will be able to dig the next day and order just enough trucks to handle it.

Crane and Traveler Excavate West Approaches

On the west approaches the steam-shovel and motor-truck combination was barred by several considerations. In the first place, there was no convenient side-hill street corresponding to Columbus Road which could be cut through at the proper moment into the deep end of the excavation. In the next place, the lowest part of the excavation was considerably deeper than on the east end, and less than half the yardage could have been handled by running the trucks down a steep grade and







TRAFFIC MADE LOW-COST OPENCUT METHOD FOR APPROACHES POSSIBLE

out at the shallow end of the cut. When it came to a question of running in and turning around, the much narrower width of the 36-ft. cut for two tracks made such operation out of the question. A shovel that could work in this cut would only be able to load trucks on the street surface when the depth of cut was 6 ft. or less. Furthermore, the scheme could not have been used at all for a considerable yardage of excavation on the site of the station at the west end. For this work a locomotive crane, a traveler derrick and dirt hoppers were required anyway. As this plant was on hand and was also better adapted to the problem than the excavation plant used at the other end, it was planned to have the locomotive crane take out one cut and the traveler derrick the other to full depth, beginning at the deep end near the station. The crane and derrick were helped, however, by using the steam shovel in the shallow ends of the open wells on Detroit Ave. and 25th St. after it had completed the excavation at the east end.

About 66,000 yd. of sand were removed at the west end of the bridge, while 29,000 yd. were removed at the east end. Almost all of this was disposed of by the trucking contractor at various points around the city, very little backfill being required. The total yardage of concrete required on the east approach is 6000, while 11,000 yd. will be placed in the west approaches.

The two ends of the work are more than a mile apart by the nearest route, and each is in charge of a general foreman operating independently of the man at the other end. A separate job office is also maintained at each end of the bridge. The entire work is under the personal direction of C. S. Smith, in charge of the Cleveland office of the contractor, the Bates & Rogers Construction Co., while Charles Steen at the west end and J. H. Doll at the east end are general foremen. The work is under the jurisdiction of W. A. Zesiger, bridge engineer, and W. A. Stinchcomb, county engineer of Cuyahoga County, and is being carried on under the immediate supervision of K. D. Cowen.

Open-Tank Treatment of Timber Urged for Small Railroads

Used by Virginia Railway and Power Company for Poles and Other Pine Timber—Cost $15.49 per Thousand Feet

By Claude Gilbert Benham

Assistant Chief Engineer Railways, Virginia Railway and Power Company, Norfolk, Va.

OPEN-TANK treatment of timber, the writer believes, is desirable for interurban and the smaller steam railroads that have a number of timber bridges and other timber structures to maintain. Such a plant as is here described is convenient for treating fence posts, paving blocks and the like on very short notice.

The Virginia Railway and Power Co. has operated an open-tank treating plant at Norfolk, Va., since May 1, 1914, using dead oil of coal tar from its own gas-works as a preservative. Water-gas tar was tried as an experiment for a few months and finally abandoned because of the small saving and its doubtful value.

Yellow pine, mostly of merchantable grade, has been the only species of timber treated in the open tank, and has varied in size from 2 x 4-in. to 14 x 14-in. timber of all lengths. A number of pine poles have also been satisfactorily treated. The penetration obtained has been from 12 to 20 lb. per cu.ft. of timber. Well-seasoned timber is desirable for open-tank treatment; in the case of green timber it is necessary to keep it in the tanks until it becomes well seasoned from the heated oil.

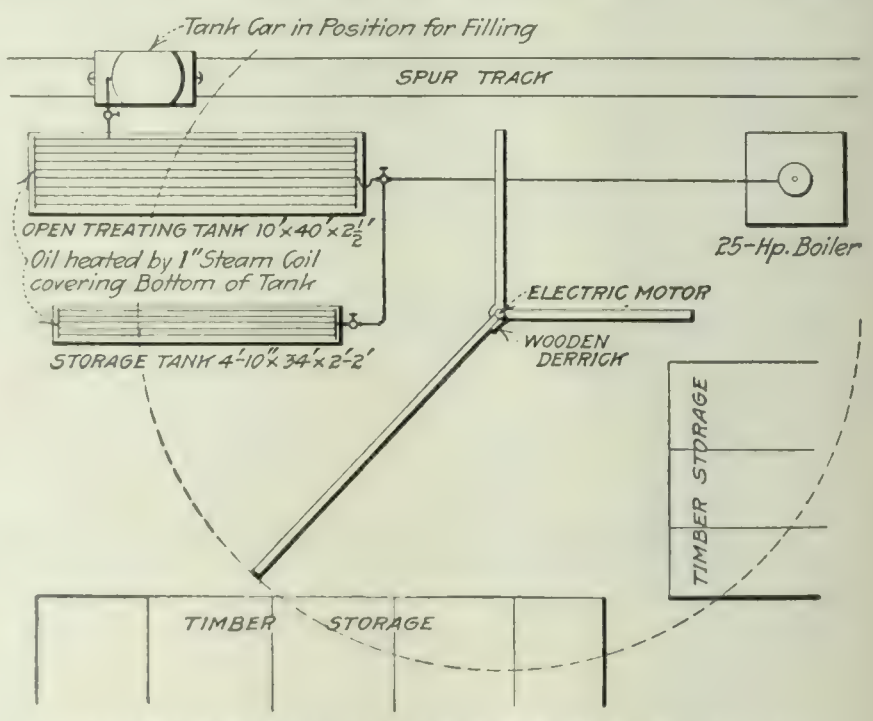
The method of treatment is, first, to place the timber in the tank and weight it to prevent floating, and then cover it with oil. The steam is turned on for about eight hours, at approximately 100 lb. pressure, the oil being kept at about 200° F. The steam is then cut off and the oil and timber are allowed to cool over night. The next day the timber is removed from the tank and placed on the storage piles by the derrick boom.

The following figures give the actual cost of treating at this plant for one month. One foreman (who also operates the electric derrick) at $3, one fireman at $1.50 and four laborers at $1.50 per day are required, working under the bridge supervisor. A total of 39,098 ft. b.m. was treated. The costs were as follows:

Item	Total	Cost per M Ft. B.M.
Dead oil of coal tar, 7,375 gal. at 6½c.	$479.38	$12.23
Coal, 6,800 lb. at $3 per ton	9.10	.23
Labor, including foreman	83.50	2.14
Maintenance of plant	20.00	.51
Interest on $3,000 investment	15.00	.38
Total expense for one month	$605.98	$15.49

Average penetration, 19.6 lb. per cu.ft. of timber

The drawing shows the layout of the treating plant. The smaller tank is used for treating only in emergencies. The dead oil of coal tar is brought from the gas-works in a 2200-gal. tank-car that is fitted with a section of pipe to allow filling the treating tanks directly.



TREATING-TANKS FILLED DIRECTLY FROM CAR

This company is very well satisfied with the results obtained. Of course, the company is unable to determine the life of this newly treated timber, but is expecting a life of at least 15 years for bridge timbers, and the same from ties when protected from mechanical wear by tie-plates.

Government Building Operations Need Strong Central Control

An Engineer in Washington Analyzes the Situation and Outlines an Urgent Need of Our National Military Building Work

By Construction Observer

A FEW DAYS AGO Congressman Fitzgerald told the House of Representatives that it is high time for the financial affairs of the nation to be managed on some kind of budget system. The occasion for the remark was the necessity of voting over $600,000,000 for aviation purposes, an appropriation not recommended by the House Committee on appropriations, in the usual way, but fathered by the Committee on Military Affairs in order to keep its details secret. But it happens that even without referring to those government operations where secrecy is necessary for military reasons, the need for something like a coördinated program is very clearly apparent here in Washington, especially when one considers the enormous building operations the government is now carrying on without any central management whatever.

Many Government Bureaus Build Independently

Buildings are planned or under construction by the Corps of Engineers, Quartermaster Corps, Ordnance Department, Medical Department and Signal Corps of the army, the Bureau of Yards and Docks and Marine Corps of the navy, and the Treasury Department. An energetic attempt by a competent investigator with access to all these bureaus failed to give any definite information concerning the total amount of money involved in these building operations. The fact that under one appropriation bill alone the Quartermaster Corps is spending nearly $80,000,000 in less than six months gives an inkling of the conditions.

The different bureaus conduct their operations quite independently. They are buying materials from the same people, drawing skilled and unskilled labor from the same districts, and hounding the same railway companies for cars and prompt transportation. At the same time a host of private companies is struggling, against the serious competition of these government bureaus, to erect buildings in which to carry out government contracts.

Two or more bureaus may be building structures for the same purpose in the same district, yet the absence of any standardization of government work results in different structures.

There Is No Central Control

At the present time there is an indefinite and quite limited supervision over this building program through the Advisory Commission of the Council of National Defense. The Council was created by the military appropriation bill for last year, to advise the President and the Cabinet regarding the mobilization of the nation's resources for war, and the Advisory Commission was created to assist the Council. It has many subcommittees which have been gathering information regarding labor conditions, the available raw materials for manufacturing needs, and the productive capacity of each industry.

When any government bureau needs materials and labor it applies, if it sees fit, to one of these committees for advice. Consequently each of these committees may have some knowledge of conditions in its special field, and the reports of these small committees to the larger committees give the latter *some* knowledge of conditions in various allied fields. Material help has been rendered the government bureaus in this way, and without such help the work of the government would now be hopelessly tangled up.

Government Work Needs Same Aids As Private Work

The government is not working for profit, the usual tests for determining efficiency of management cannot be applied to these enterprises, and if anything goes wrong the pocketbook of the taxpayer can be drained again. That is no reason, however, for not placing the work on a business-like basis, or for neglecting to provide coöperative control.

Central control is the element that enables a great contracting organization, doing work simultaneously in many parts of the country, to afford those little daily helps to each contract which cannot be obtained locally, must be given immediately and prevent serious delays and troubles. Anybody who knows how widely spread private building is carried on and sees the lack of coordination in the government's enormous undertakings cannot fail to realize the need of a centralized bureau, not to take over the work of any existing organization but to help each of them through its knowledge of the conditions in all.

An Object-Lesson Case

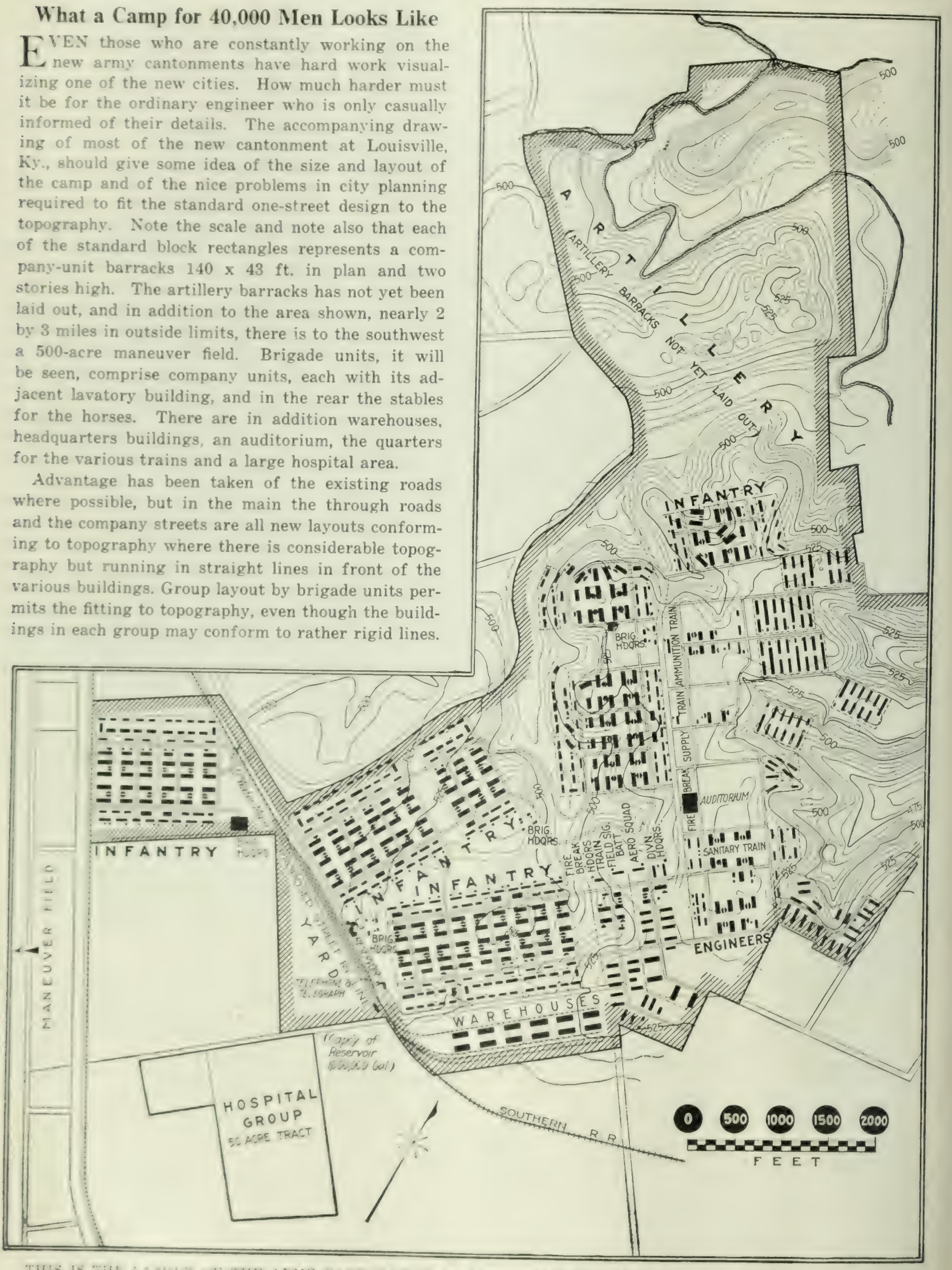
The conditions in the vicinity of Norfolk may be taken as an illustration of what will happen unless the government building work is systematized. Thousands of additional workmen are needed there, and hundreds of workmen now there are without proper lodgings and food. The only way to bring any order out of the chaos is to have all the work carried on according to a program by which the most pressing needs will be met first.

Under the guidance of such a program, handled by a capable organization, the men to carry on the work will not be assembled until they can be housed and fed, and the rivalry between different undertakings will be stopped, thus preventing needless rise in wages which demoralizes the labor situation in the entire section.

What a Camp for 40,000 Men Looks Like

EVEN those who are constantly working on the new army cantonments have hard work visualizing one of the new cities. How much harder must it be for the ordinary engineer who is only casually informed of their details. The accompanying drawing of most of the new cantonment at Louisville, Ky., should give some idea of the size and layout of the camp and of the nice problems in city planning required to fit the standard one-street design to the topography. Note the scale and note also that each of the standard block rectangles represents a company-unit barracks 140 x 43 ft. in plan and two stories high. The artillery barracks has not yet been laid out, and in addition to the area shown, nearly 2 by 3 miles in outside limits, there is to the southwest a 500-acre maneuver field. Brigade units, it will be seen, comprise company units, each with its adjacent lavatory building, and in the rear the stables for the horses. There are in addition warehouses, headquarters buildings, an auditorium, the quarters for the various trains and a large hospital area.

Advantage has been taken of the existing roads where possible, but in the main the through roads and the company streets are all new layouts conforming to topography where there is considerable topography but running in straight lines in front of the various buildings. Group layout by brigade units permits the fitting to topography, even though the buildings in each group may conform to rather rigid lines.



THIS IS THE LAYOUT OF THE ARMY CANTONMENT AT LOUISVILLE, KY., AS IT WAS MADE BY THE LOCAL ENGINEER FROM STANDARD PLANS FURNISHED BY THE WAR DEPARTMENT AT WASHINGTON

Work for the Year Outlined for A. R. E. A. Committees

Two New Committees Created To Study Economics of Railway Operation and Economics of Railway Labor

TWO new committees, on economics of railway operation and economics of railway labor respectively, have been created by the American Railway Engineering Association. They are numbered 21 and 22, the Special Committee on Uniform General Contract Forms being made Standing Committee 20. The assignments to the new committees, as announced in Bulletin 196 of the association, are of a general nature, to line up the scope of the committees. Following are new assignments to the other twenty-two committees. The committees are also instructed to continue most of the numerous investigations assigned a year ago.

Roadway—Subsidence under the shrinkage of embankments.

Draining roadway through stations and yards.

Ballast—Physical tests of ballast, and chemical also if necessary.

Ties—Methods for controlling tie renewals.

Proper dimensions for cross-ties.

Investigation as to whether statistical forms are in general use.

Track—Effect of fast trains on cost of maintenance-of-way and equipment.

Masonry—Designs and specifications for concrete culvert pipe.

Signs, Fences and Crossings—Further study of concrete fence posts, investigation of all styles of manufactured parts, and special study of end or strain posts.

Revised analysis of comparative annual cost of fences with wood, metal and concrete posts.

Signals and Interlocking—Requisites of signal locations for interlocking and block signals.

Records and Accounts—Cost-keeping methods and statistical records.

Systematic arrangement for final plans in connection with estimates.

Allocation of maintenance-of-way expense to passenger and freight service.

Various specified report forms.

Water Service—Organization for railway water-service department.

Definitions of terms in railway water service.

Suitable types of water meters, and methods followed in testing and reading same.

Wood Preservation—Water-gas tar as a preservative.

Electricity—Desirable changes in national electrical safety code issued by Bureau of Standards.

Conservation of Natural Resources—Statistics on extent of use of treated timber and of permanent materials to replace untreated timber and bare steel.

Conservation of human life and energy.

Grading of Lumber—Specifications for construction timbers and building lumber for use on railways, showing each kind and quality of lumber suitable for each class of work.

Specifications for timber to be treated with a preservative.

No new assignments were made to any of the other committees.

F. W. Green and V. K. Hendricks are respectively chairman and vice chairman of the new Committee on Economics of Railway Operation, which has 27 members. E. R. Lewis and C. H. Stein are respectively chairman and vice chairman of the new Committee on Economics of Railway Labor, which has 22 members. F. R. Layng succeeds L. A. Downs as chairman of the Committee on Ties and is succeeded as vice chairman by H. S. Wilgus. J. R. Leighty succeeds H. R. Safford as vice chairman of the Committee on Track. J. A. Peabody succeeds C. C. Anthony as chairman of the Committee on Signals and Interlocking, and is succeeded as vice chairman by W. J. Eck. Joseph Mullen succeeds C. Dougherty as chairman of the Committee on Rules and Organization. O. E. Selby succeeds A. J. Himes as chairman of the Committee on Iron and Steel Structures, and is succeeded as vice chairman by Prof. F. E. Turneaure. R. N. Begien is again made chairman of the Committee on Economics of Railway Location, succeeding John G. Sullivan. C. M. Taylor succeeds E. H. Bowser as vice chairman of the Committee on Wood Preservation. E. B. Katte and A. G. Shaver are made respectively chairman and vice chairman of the Committee on Electricity, replacing G. W. Kittredge and D. J. Brumley. The membership of most of the committees is increased.

Sealing a 200-Acre Reservoir

To Stop Serious Leak from Cedar River Reservoir Bottom Clay and Gravel Are Being Sluiced in Above Dam

By J. D. Ross

Superintendent Lighting Department, Seattle, Wash.

WHAT is probably the largest task of reservoir-bottom sealing ever attempted has been undertaken by Seattle, Wash. The reservoir to be sealed has an area of about 200 acres. The dam across Cedar River which forms the reservoir is an excellent one and has cost about $1,800,000. Its foundations are on bedrock. However, for a distance of over a mile, the north bank and the bed of Cedar River show a considerable leak, which appears through 4000 ft. of gravel in about sixteen days.

Clay Plentiful

Drilling in the neighborhood of Cedar Lake has shown at least 8,000,000 cu.ft. of excellent clay, and drilling in the lake itself has shown that the greater part of the material on which it rests is blue clay, although the north bank of the lake has naturally silted against material similar to that which is now to be treated. The waters of Cedar River running into the lake are absolutely clear almost the entire year, and at such times as they are not clear the silt all settles in the lake so that the new basin cannot seal of itself.

A pump with a capacity of 4000 gal. per min. is being installed, and this is to be connected to about one mile of 16-in. pipe, which will carry the water to an elevation of approximately 350 ft. for the sluicing out of the clay bed which has recently been discovered. The ma-

terial will be carried over grizzlies, the bars of which will be set close, as only the fine material is required. This will be carried back to the north bank of the river and along the distance to be treated. The bank is steep, and a considerable amount of material has to be sluiced into the river bottom in order to get the proper grade for silt to remain on the surface. The water, with clay in suspension, under the 350-ft. head above mentioned, will be used in sluicing the gravel from the bank and in this way will be incorporated with the gravel at the bank, the intention being to use about one part of clay to three or four parts of gravel. The first thousand feet next to the new dam will be treated first.

The present rate of seepage of the water is being carefully measured and a recording gage is being installed which will give the seepage from time to time as the sealing proceeds.

As this work is primarily for the city light and power plant, and since later on the storage will also be of use to the water department, the work is being done by J. D. Ross, superintendent of the lighting department, in conjunction with L. B. Youngs, superintendent of the water department.

Vast Amount of Construction Material Required for Army Camps

Figures just issued by the War Department will go far to give an idea of the magnitude of building activity which will be necessary for the construction of the 16 Army cantonments. These figures deal with the estimated amounts of material required, and cover such important items as lumber, electrical equipment, roofing and concreting materials.

In the Southern States there will be about 5,600,000 board feet of boards, 7,800,000 board feet of dimension stuff, 177,000 ft. of 4 x 4-in. timbers, 2,800,000 ft. of flooring, 1,200,000 ft. of siding, and 1,400,000 ft. of matched boards. In the northern cantonments the amount of lumber will be increased about 216,000 board feet.

Nails and Sheathing Required

To construct one of these cantonments in the South it will be necessary to use over 2500 kegs of nails, and in the northern cantonments about 2650 kegs. The buildings in a southern cantonment will require 4800 rolls of sheathing paper, 6300 squares of one-ply roofing, 21,900 squares of two-ply roofing, and about 2000 rolls of tarred felt. In the northern cantonments the amount of one-ply roofing will be reduced to about 800 squares, while the amount of tarred felt will be increased to 3200 rolls, on account of the more rigorous climatic conditions.

The concrete work in a cantonment is estimated to require 4700 bbl. of portland cement, 1400 cu.yd. of sand, and 2500 cu.yd. of broken stone or screened gravel.

The amount of electrical equipment will vary with the shape of the cantonment. The estimate for the total requirements for the 16 military cities amounts to 20,800,000 ft. of insulated wire, 260,000 ft. of lamp cord, and other items on a similar scale.

Ohio State Concrete Roads Have New Specifications

Proportioning Permits Use of Variable Amount of Cement—Mix To Be in Machine at Least One Minute

NEW specifications for roads issued by the Highway Department in the State of Ohio under the direction of Clinton Cowen, State Highway Commissioner, have some interesting provisions regarding the specifications for concrete pavement.

In proportioning, for instance, the specification reads as follows: "The ingredients of concrete shall be mixed in the proportion of one sack of cement to 1½ cu.ft. of fine aggregate and not more than 3 cu.ft. of coarse aggregate. The mortar shall always be more than enough to fill the voids in the coarse aggregate. If necessary to secure this result, the proportion of coarse aggregate shall be reduced. In general this will require from seven to eight sacks of cement per cubic yard of concrete, depending upon the class of aggregate used and the percentage of its voids." There is no method given, however, of determining when the voids are filled.

Consistency Requirements

In consistency, the new specification is as follows: "The materials for the pavement shall be mixed with only sufficient water to produce a concrete which will settle very slowly when deposited in a pile and which will hold its shape when struck with a templet. The consistency shall not be such as to cause a separation of the mortar from the coarse aggregate when handling. After the concrete has been lightly tamped, there shall be no free water in evidence. Individual particles of the coarse aggregate when so isolated shall show a coating of mortar containing its proportionate amount of sand." In this specification also there is no quantitative measure for any of the results demanded.

For machine mixing, it is required that the mixing shall continue at least 1 min. until the drum has made not less than twelve revolutions at a speed of between 12 and 18 r.p.m. before any part of the batch is discharged.

Definite Information Given as to Finishing the Concrete

For the finishing of the concrete, very definite information has been given. As the finished surface must conform within ¼ in. to the templet or straight-edge laid parallel to the center line, the procedure is given. By a combined horizontal and crosswise motion the concrete is struck off ½ in. high, then tamped and finally recut to the exact finished pavement. When 3 ft. from the joint the templets are lifted to it and then leveled and compacted away from the joint. An 8-ft. wooden float, not less than 6 in. wide, is to be operated from two bridges, and this float is given in a detail drawing in the specification. The axis of the float is to be parallel to the center line of the pavement. For final finishing a float 20 in. long and 6 in. wide is used, or a belt may be employed. At the joints a split float is specified. All of these floats are to be provided by the contractor at his own expense.



The American Surveyor in the Philippines

Hardships and Dangers Are Many and Varied—Much Time Lost Settling Disputes—Health Important

By J. W. EVANS

Surveyor in the Philippines 1913-1916; now Instructor in Civil Engineering, Oklahoma Agricultural and Mechanical College

THE lack of clear land titles has been a serious hindrance to the economic progress of the Philippines, since banks cannot safely lend to landholders whose rights are not clear. This need was early recognized by our Government, and it was directed that surveys be made or approved by the Bureau of Lands for those individuals who wished to obtain a title. As a result of this provision many isolated tracts were surveyed, and after plans were prepared and all claims settled the owners were granted Torrens titles. The expensive system of surveying isolated tracts has been practically abandoned since 1913, and now nearly all effort is directed to the surveying at one time of all lands within a municipality or county.

Filipinos Being Promoted

This work has been carried on by Americans, most of whom were chosen by competitive examination in the United States. The policy of giving the Filipinos a continually greater part in the management of their own government has been responsible for the recent withdrawal of a large number of Americans from the Philippine service. Positions thus made vacant in all branches of the government are being taken by natives who are being rapidly promoted from subordinate places. A reduction in efficiency, at least temporary in nature, is to be expected as a result of these changes, since many of the new men have inadequate training; but it is hoped that the Filipinos will measure up in ability and ideals to the opportunity before them. The number of American employees in the Bureau of Lands has been reduced from about a hundred men, most of whom were engaged in fieldwork, to a very few who are occupying supervisory, but not the highest, positions. The work of the American surveyor in the Philippines is practically finished.

It has been the practice to station three or four surveyors in the largest town of a municipality for which a survey has been authorized, and these men operate from this headquarters in executing the necessary primary, secondary and tertiary traverses. The primary traverse consists of the accurate measurement of angles and distances between a series of monuments placed in a line which runs around and near the boundary of the municipality. The monuments, or stations, are placed less than one kilometer apart and it is usually possible to measure all distances, so that little triangulation is necessary. Great care is exercised in the field and office work in connection with traverse, and the allowable error of closure is $1' \sqrt{L}/224$, where L is the length of the traverse. The computations show the rectangular coordinates of each primary monument. Directions are obtained by solar or stellar observations in each municipality, and it is usually possible to compare the results so obtained with those given for near-by Coast and Geodetic Survey stations.

Secondary Traverses and Sketches

Secondary traverses are run across the project connecting different points of the primary traverse, and the secondary stations are so placed that they will be most convenient as starting and closing points for the tertiary traverses.

After the completion of primary and secondary measurements, preliminary sketches, showing all property lines, are made by native assistants. These sketches are later taken into the field by the surveyor to facilitate the location of boundary lines. It is during the tertiary survey that the measurements are made from which areas are determined and plans prepared. The lot corners are located by side shots from tertiary stations. All distances are measured by tape and are

checked by stadia, while all azimuth readings are recorded to the nearest minute and are checked with the magnetic needle.

The surveyor's party consists of ten to fifteen native laborers whose wages range from 25c. to $1.50 per day.



THE SURVEYOR'S PARTY CONSISTS OF FROM 10 TO 15 NATIVES WHOSE PAY RANGES FROM 25 CENTS TO $1.50 PER DAY

One of these men usually acts as interpreter and foreman, while another is surveyor's cook.

There is no attempt made to subdivide the land into rectangular townships or sections. The surveyor's business is to make his measurements as directed by the property owners. The result is that parcels are irregular in shape, making their survey relatively expensive, since a 40-acre tract is more likely to have forty corners than four. It is not uncommon to find parcels having 200 corners. The lots range in size from a few square yards to several thousand acres.

The surveyor loses much of his time in attempting to settle disputes about the location of boundary lines. He has no authority as a judge, but often brings the disputants to an amicable settlement, making litigation unnecessary. These disagreements are at times the result of encroachments which a wealthy or powerful individual has made on the rights of a poor and ignorant



WHERE THE ROAD IS A TRAIL

neighbor. Another class of disputes arises from the rival claims to inherited property, and these are most difficult to adjust because of the intricacy and uncertainty and extent of family ties. An occasional result, for example, is that from an ancestral estate of a city lot, a dozen square yards, on which are growing two coconut trees, are allotted to a grandchild whose origin and rights may not be legitimate but are respected.

Another source of delay is the inaccuracy of the plans and titles which have in some instances been issued by the Spanish Government. It is seldom that the existing property lines agree with those described in such plans, and not infrequently the distances shown are found to be 100, 200 or 300 meters in error, and the directions are reversed. The surveyor occasionally finds on inquiry that his predecessor obtained his figures by estimation and guess while in the landholder's house.

Since there are no fences to guide the surveyor it is necessary that all interested owners be present at the time of survey and that they point out the exact location of boundaries, so that monuments may be placed at those corners where permanent marks do not exist.

The conditions under which the surveyor lives are such that his life is made interesting in spite of many discomforts. The food supply consists of imported canned goods, supplemented by fruits, vegetables and chickens of native growth. The cook buys the latter in the local market, and he devotes more thought to in-



THE COOK IS AN IMPORTANT MEMBER OF THE SURVEY PARTY

creasing his income by manipulating his expense account than to the preparation of clean, well-cooked food. Cleanliness is not a natural characteristic with him, and he acquires it with difficulty and never thoroughly. As a protection against disease it is the custom to boil all drinking water, and the surveyor does well to inspect this operation occasionally to see that the roaches are removed from the kettle before boiling begins.

During much of the time the surveyor is required to lodge at the home of some farmer or villager, since hotels and restaurants are seldom found. He meets with hospitality that is limited only by the means at the farmer's disposal. At times this hospitality consists of the excellent food and cordial friendliness offered by a wealthy sugar planter, or in the more sparsely settled country it may be so limited that the surveyor and his party must occupy the same one-room house with the farmer and his family. Except in a few homes the beds are either entirely lacking or are too short for all of an American to rest upon, so the surveyor includes in his equipment a folding cot, blanket and mosquito net.

The surveyor leads a strenuous life, and needs to care scrupulously for his personal well-being. He is exposed

to the penetrating rays of the tropical sun through the long, dry season, and to the soaking rains during the remainder of the year. He must at times work all day in the flooded rice paddies. He must flounder through the mud and water of the vile-smelling salt-water marshes, where he may wade instead of swim across the innumerable streams if the tide happens to be out. He must make his way through thickets where grass grows 15 ft. high and the blades are razor-edged.



ON THIS CONVEYANCE CORNER MONUMENTS ARE TRANSPORTED

In the forest he must learn by painful experience not to touch the leaves that burn like fire. He must learn to keep himself and his clothing intact while extricating himself from the clutches of vines whose hooks hold him with superhuman skill while the thorns stab him mercilessly. He must travel over slippery trails along steep precipices, even when an attacking swarm of bees impels him to sacrifice safety for speed. He must live alone for weeks at a time in lonely places where amusements are few, where the restraint of American ideals and society is lacking, where it is easier to degenerate than to live decently.

There are compensations for the hardships and dangers. A climb to the top of a mountain in usually repaid with a view that is as beautiful and restful as any that nature affords, combining into one panorama a wonderful expanse of forest, field, sea, sky and distant islands. In the forests there are birds and orchids of unlimited variety, and high-class entertainment is furnished by families of acrobatic monkeys in their natural environment. Association with the natives is interesting and informing, and while it is not especially elevating, it need not be otherwise. Usually the American surveyor has learned to endure and ignore the hardships and has enjoyed his foreign service, in spite of the fact that letters from home are five weeks' old and that he is utterly unable to speed up the East to the customary American pace.

A few surveyors have been maimed or murdered by revengeful or fanatical natives, and some have been physically unable to stand the strain of the work and isolation. Others have suffered because moral laxity in the Philippines is easy and the retribution for it is swift. Nearly all, after three or four years of service, have returned to the United States, wiser than when they left, but no better and little wealthier, and have found that their foreign experience has been of little value to them in furthering their interests here.

Atlanta Fire Had Lessons for City Officials and Engineers

Minor Fire Rapidly Spread by Brands Igniting Shingle Roofs—Dynamiting of Little Value—High-Pressure Water Desirable

THE Atlanta, Ga., conflagration of May 21, 1917, has been investigated by the National Board of Fire Underwriters and reported on in an elaborate document recently issued. There are many points of information well worth the study of all engineers and officials connected with city building regulations or construction.

The fire devastated a total area of about 300 acres; the number of buildings involved was 1938, of which 47 were brick and 1891 frame. Classified by occupancy, there were 1537 dwellings and apartments, 42 mercantile, 351 garages and outhouses, and 8 miscellaneous occupancies, including churches, schools, special houses and warehouses. Of the total number of buildings, 1682 or about 80% had shingle roofs.

It is estimated that the total property loss was about $5,500,000, of which $3,500,000 was covered by insurance. Extensive damage was done to the trolley wires, feeders and poles of the street railway system, amounting to approximately $125,000, and probably a like loss was suffered by the telephone company. The direct expense of the city was heavy; approximately $20,000 worth of hose was destroyed, and the cost of bringing outside aid was considerable. About 10,000 people were made homeless, and a large number of these being of poorer classes became immediately dependent upon the city, which involved another expense. These figures show without further comment what such a fire means to any community. The bettering of conditions which may prevent such a conflagration in many ways devolves upon the engineering fraternity.

Fire Spread by Wooden Shingle Roofs

The fire started in a small frame building at a time when three other fires were raging in different parts of the city. Partly due to this fact the fire fighting was somewhat delayed. By the time organized effort had been started, the embers from the original fire alighting on near-by dry roofs quickly ignited the wooden shingles, with the result that a series of conflagrations soon had started up, extending over a large area from a quarter to a half mile ahead of the fire department. The report has a remarkable series of photographs showing the development of five separate fires, all started from flying brands.

The conclusions of the committee on Fire Prevention of the National Board of Fire Underwriters may be briefly summarized as follows: This conflagration, together with two of the other fires occurring at the same time, emphasizes the ease with which spreading fires may develop in cities where wooden shingle roofs predominate, even when the fire department is mainly well equipped and manned. It illustrates the startling suddenness with which a fire may grow into a conflagration under favorable conditions. For a period of eight hours the remaining part of the city, including the business district, was practically without protection. A shift

of the wind during the progress of the fire would have resulted in a corresponding change in the path of devastation and might have involved the business district, where the high values of the city exist, for it would have been impossible to stop the spread through the shingle roof area which even now extends to the edge of that district. The fire department apparently worked well and efficiently, but all of its efforts were of little avail because of the prevalence of shingle roofs, which permitted flying brands to start local fires blocks beyond the actual fire and far ahead of the location of the fire apparatus.

Motor Fire Apparatus and High Pressure Needed

Motor apparatus instead of horse-drawn equipment is strongly recommended because of its superiority in covering long-distance runs. The value of high pressures on the distribution system is shown by the extensive use of hose lines direct from hydrants. Places where these were reported as too weak to be effective were mainly on high ground where the gridiron was weak. The need of a complete secondary feeder system is evident in this connection, and the more general use of 8-in. mains for minor distributors in sections along the edge of the system would have improved the supply.

Although no shortage of pump or of boiler capacity was experienced, all equipment at the pumping station was in use. Had one of the units been out of service for repairs, or had it broken down during the fire, conditions might have been serious. The need of ample reserve in both pumps and boilers to provide for such contingencies is evident. Numerous hydrants in districts of this character and hydrants of good dimensions with steamer outlets and 6-in. connections to the mains are evidently needed to combat a spreading fire.

Improved streets are of material value in a conflagration of this kind, as in many sections the unimproved stretches make long detours necessary for the apparatus.

Structural Tests Were Missing

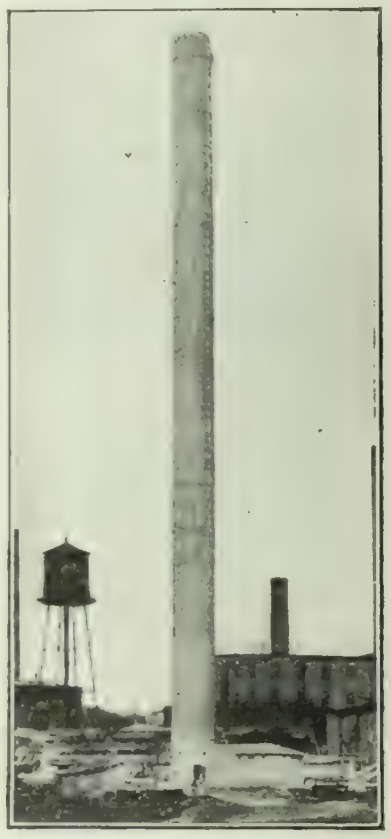
Sprinklered buildings did not have a very extensive test, as only one was directly exposed to the conflagration. This one, however, stood up very well as a fire stop, the flow forming a water curtain down one face. As no fireproof buildings or semifireproof buildings were in the path of the fire, no test of these was available.

The usual difficulties with different sizes of hose, couplings and thread were experienced in the use of equipment from neighboring cities.

Contrary to widely advertised information, the dynamiting of buildings to stop fire is not particularly commended by the National Board of Fire Underwriters. It says: "The value of dynamiting buildings to prevent spread of fire in this case is questionable. It is not apparent from the ruins that any good resulted from such work done on or near Ponce de Leon Ave. With the wide street intervening and the narrow face of the fire, the department, together with the military forces which were doing excellent work at this time, stopped the spread from direct exposure, and the wider spacing of the buildings and the newer roofs were very favorable to the work of preventing spread of flying embers and brands. The fire department is of the opinion that the dynamiting on Hunt St. was of some value, as it allowed buildings to be wet down with direct hose lines which otherwise would have been of insufficient reach."

Tapering Concrete Chimney Has Double Shell

Arrangement Improves Draft and Efficiency and Reduces Liability of Cracks—Height of Chimney 180 Feet



CONCRETE CHIMNEY 180 FEET HIGH BUILT WITH STEEL FORMS

A SPECIAL arrangement of the interior shell and the use of adjustable steel forms to give an exterior taper are the features of the reinforced-concrete chimney shown in the accompanying view. It is 180 ft. high above the ground (187 ft. above the footing), with an interior diameter of 7 ft. throughout. The outside diameter is 10 ft. 4 in. at the footing and 9 ft. at the top, with a taper of 0.056 in. per foot, commencing at the top of the breeching. The chimney is at the plant of the Rockford Paper Box Board Co. It was designed and built by Charles C. Stowell, civil engineer, of Rockford, Illinois. In the numerous chimneys that have been built by Mr. Stowell the inner shell has been carried nearly to the top, in order to protect the outer wall and to improve the draft efficiency. There are two reasons for this. In the first place, this arrangement maintains a uniform current in the gases throughout the height of the chimney. If the inner wall is carried only a little above the breeching or flue connection (30 ft. is allowed by the Chicago ordinance), counter-currents are formed which are known to materially affect the efficiency.

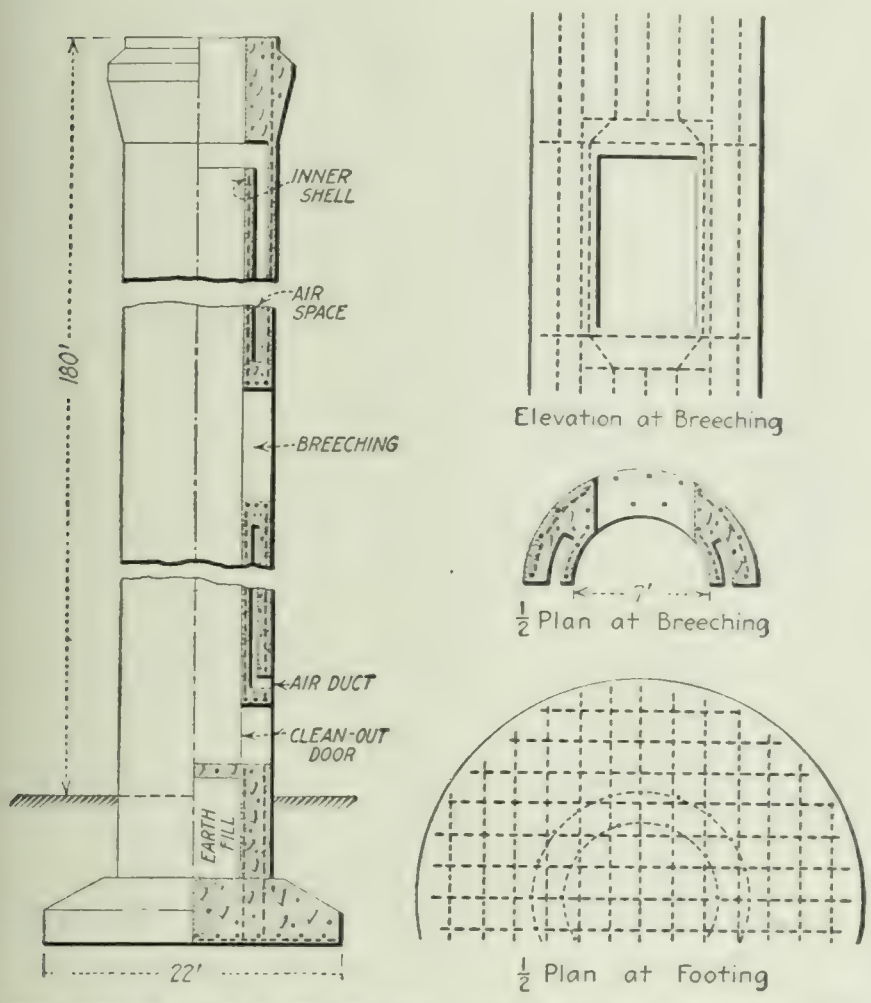
Cracks Occur at Top of Interior Wall

In the second place, the gases, when only slightly cooled, come in contact with a relatively thick portion of the outer wall, thus heating its inner surface while the exterior may be exposed to very cold weather. As concrete is a poor conductor of heat, this condition results in severe internal stresses, and Mr. Stowell states that his observations of many chimneys built in this way indicate that the most serious cracks occur about the level of the top of the short interior wall.

To create a draft in the air space, in order to protect the outer wall from high temperatures and to prevent the collection of soot, openings in the outer wall are made at the base of the air space. The inner wall is made as thin as practicable in order to minimize

unequal expansion and is 4 in. thick for its entire height.

The thickness of the outer wall of the chimney illustrated reduces from 12 in. at the bottom of the air space to 4 in. at the top of this space (beneath the cap). In Mr. Stowell's nontapering chimneys the variation in thickness is made by offsets on the inner side, but in



CONCRETE CHIMNEY WITH INNER SHELL EXTENDING FULL HEIGHT OF SHAFT

this case the inner side is vertical and the reduction is made by the tapering of the outer side. This taper was given by the use of Reichert adjustable steel forms. These were in lifts 2 ft. high, and the diameter was reduced at each lift. These forms account for the vertical marks shown on the view of the chimney. The forms were found very flexible, and the same ones used for the stack were made to serve also for the enlarged head, or cap.

Inside Tower Carried Working Platform

The concrete is a 1:2:4 mix, made with gravel ¼ to 1 in. in size. It was hoisted in buckets in an inside tower, which carried the working platform. Work was begun Jan. 22 and finished May 4. It was stopped about one week during extremely low temperature. The concrete was heated in cold weather. The reinforcement consists of steel rods and hoops in each wall, the vertical rods being hooked to the rods in the base of the footing. This footing is 4 ft. thick and 22 ft. in diameter on the base. It is built directly upon a stiff clay formation, no piles or other special treatment being required.

In Mr. Stowell's opinion, concrete gives a smoother surface than brick and has less air leakage, owing to its greater density. Thus the draft is better, and for a given power load or efficiency a concrete chimney may be smaller than a brick chimney.

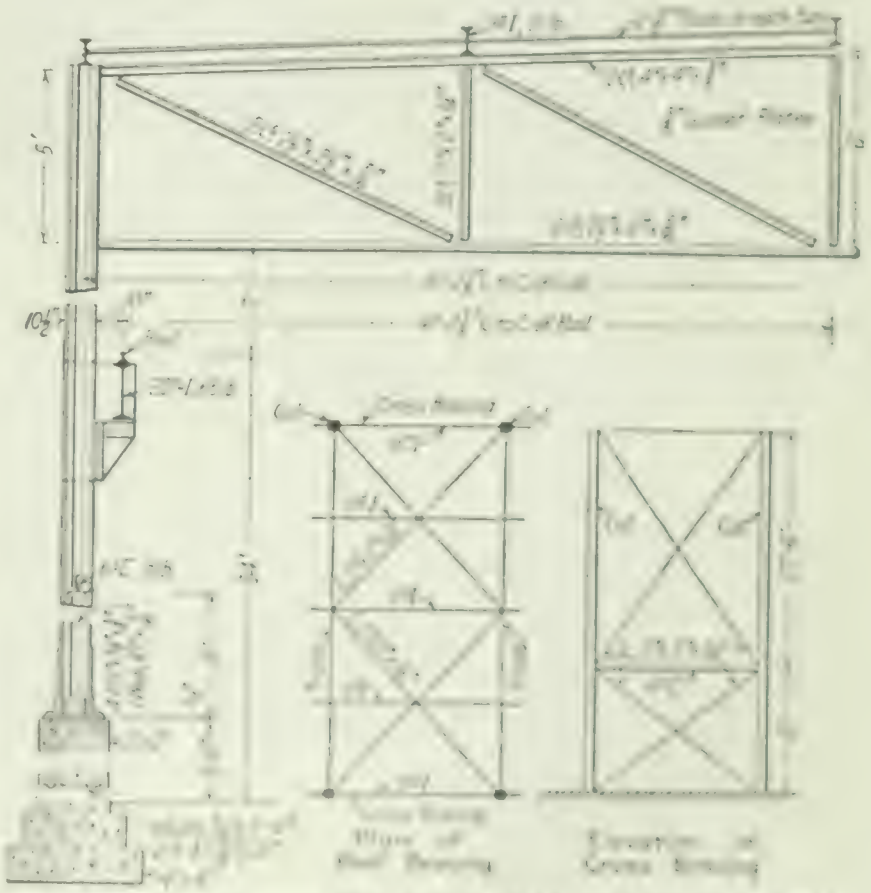
Crane Runway Columns Extended To Carry Roof

Material Yard at Chicago Foundry Will Have Cover Framing Into Posts on Which Crane Girders Are Supported

A YARD crane with supports designed to carry a roof over the yard is an interesting feature of the new foundry plant for the James A. Brady Co., at Chicago. The material yard is between two buildings and is served by a 5-ton electric traveling crane of about 41-ft. span and 30 ft. above the ground.

The crane runway consists of 20-in. I-beams carried by brackets upon columns about 42 ft. high, which are connected by transverse trusses. The construction is shown by the accompanying drawing. The runway is 180 ft. long, with columns and trusses spaced 20 ft. c. to c. The columns are of H-section, with a 10-in. web plate (transverse to the runway) and four angles 5 x 3½ in. The truss members are all composed of pairs of angles. Longitudinal bracing is provided by a double line of 6-in. channels (forming an inverted T-section) between the columns, at a height of 15 ft. above the ground. There are also five lines of I-purlins along the roof, upon which will be laid the plank sheathing. Horizontal and vertical diagonal bracing is provided in three of the bays. This consists of single angles 2 x 2 x ¼ in., arranged as shown, the horizontal bracing being in the plane of the top chord of the trusses.

This design not only provides for putting the yard under roof, but also saves yard space by allowing ordinary columns to be used. Crane runways having no transverse bracing usually require large supporting bents to give the necessary lateral stability. The architect is S. Scott Joy, of Chicago. He has introduced a similar construction in other industrial plants, as it has been found that the covered yard increases the efficiency of the work, eliminating the bad weather delays.



THIS RUNWAY FOR A 5-TON CRANE IS DESIGNED TO CARRY A ROOF

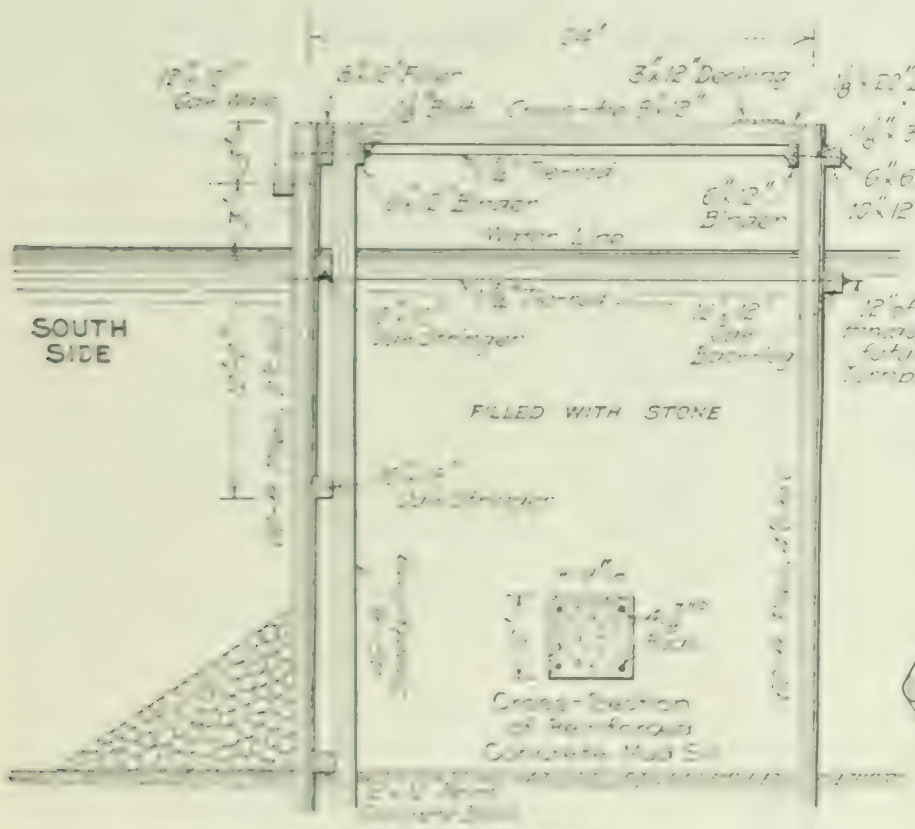
Breakwaters Protect Chicago's Municipal Pier

Rock-Fill Between Rows of Piles Forms Barrier Inside Main Breakwater and Provides Still Water Around Pier

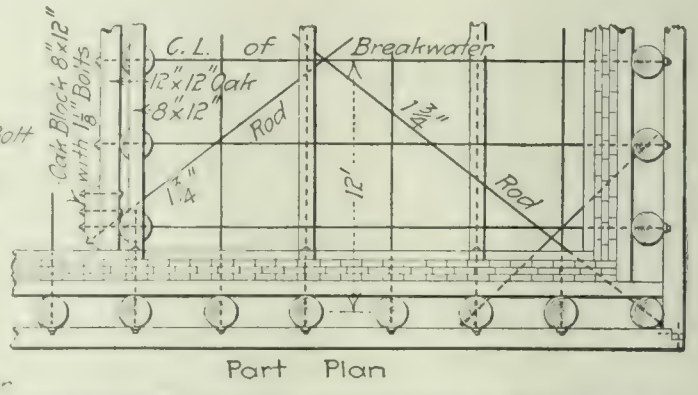
TWO breakwaters have been found necessary to protect ships docked along the exposed length of Chicago's new 3000-ft. Municipal Pier. It is partly protected on the north and east by Government breakwaters, but the area inclosed by these is so large that considerable sea is developed at the pier. The city, therefore, has built a rock-fill pile breakwater 2350 ft. long, 600 ft. south of the pier, and proposes to build this year a similar breakwater 2000 ft. long, 500 ft. north of the pier. These breakwaters are parallel with the Municipal Pier and will form the dock walls of other piers when the growth of lake traffic makes such additional accommodation necessary. They may be extended as required.

The construction of the south breakwater is shown in the accompanying drawing. There are two rows of 60-ft. wood piles, 24 ft. c. to c. The piles in the north row are spaced 2 ft. c. to c. and those in the south row, 4 ft. c. to c., the latter being backed by 4-in. Wakefield triple-lap pine sheet piling 46 ft. long. An unusual feature is the use of a 12 x 12-in. precast reinforced-concrete mudsill on the lake bed as a bottom stringer between the round and sheet piling. This mudsill has the advantage of being easily placed and does not have to be held in position pending the driving of the sheet piles. The mudsills and stringers are in 34-ft. lengths, with ends lapped behind a pile. The reinforcement of the mudsills made then very stiff, and they were handled easily by a derrick having a sling attached to a single cable. They were adjusted to position by a diver, whose signals controlled the movements of the derrick.

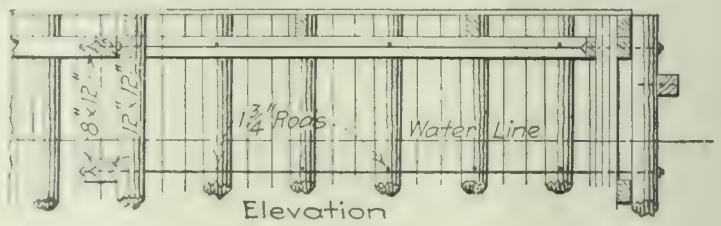
The rows of round piles are connected by two systems of transverse 1¾-in. tie-rods. The lower rods are 1½ ft. below water and spaced 4 ft. c. to c. The upper rods are 4½ ft. above water and 8 ft. c. to c. These rods pass through the piles and have nuts and washers bearing directly on the piles of the front row and on waling timbers outside the piles of the rear row. Spaced between the top tie-rods and fitted tightly be-



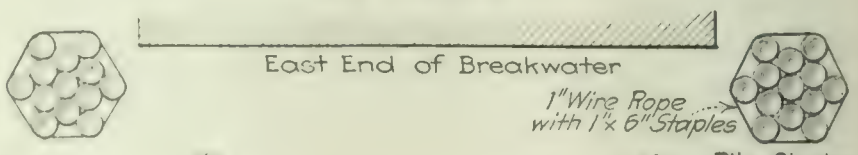
TYPICAL SECTION

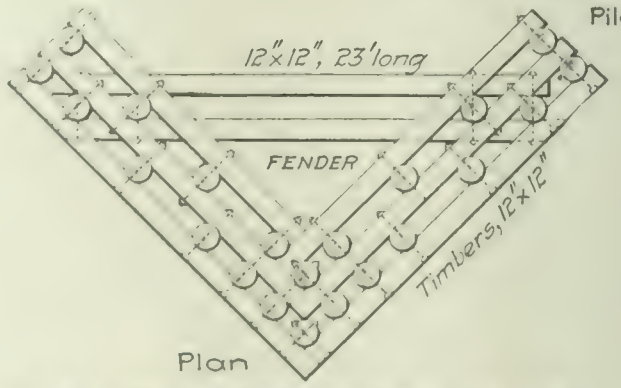


Part Plan

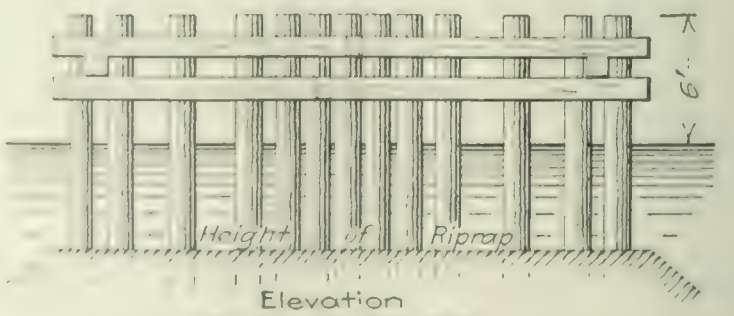


Elevation
END BRACING

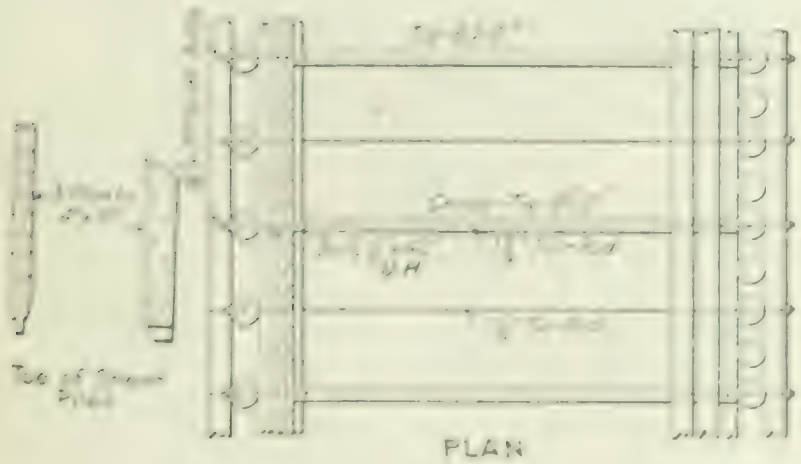




Plan



Elevation
DETAIL OF FENDER


PLAN

BREAKWATERS PROTECT CHICAGO'S 3000-FOOT MUNICIPAL PIER

tween the two rows of piles are 8 x 12-in. transverse pine ties resting on and driftbolted to the longitudinal 6 x 12-in. binder on each pile row. Upon these joists is laid a walk of two 3 x 12-in. planks. Eventually, the entire width will be decked over and the breakwater used as an unloading pier for small freight boats.

The space between the rows of piling is filled with hand-size stone deposited by means of boxes and derrick, and also by dump scows and dredge. Deep water was encountered at both ends of the breakwater, the maximum depth being 38 ft. and the minimum 18 ft. At all points where the depth of water exceeded the width between rows of piles (24 ft.), stone was dumped on each side of the breakwater and brought to within 18 ft. of the water surface alongside the pile rows to insure stability.

The top rods were first placed, and then stone was dumped into the breakwater and brought up to within 2 ft. of the lower tier of rods. These rods were then placed and the stone-fill brought up to final grade. In deep water, the riprap stone was carried up simultaneously with the filling stone to prevent sliding at the toe of piles due to excessive stone-fill. After the stone-fill was leveled off to proper elevation, the cross-ties were placed and the longitudinal planking laid. About 90,000 cu.yd. of stone was used as riprap and filling.

At 24 ft. from each end is an interior transverse row of piles, with back-logs for two tiers of diagonal rods to the corners. Diagonal tie-rods are also put across the corners, as shown. At the east (or outer) end of the breakwater is a pointed fender having two rows of 60-ft. oak piles and wales with timber struts across the angle. On each side of this is a cluster of 13 oak piles 60 ft. long, bound with 10 turns of 1-in. wire rope, secured by galvanized staples 1 x 6 inches.

The lake bottom along the line of the breakwater was found to be variable, both as to depth and character. This is due to the fact that the filling of the Municipal Pier was done by a hydraulic dredge, which caused deep holes wherever it worked. The bottom consists of 3 ft. of sand and 5 ft. of soft mud overlying the stiff clay of the lake bed.

The south breakwater was designed and its construction superintended by Percy R. Hynes, assistant engineer, under the direction of Adam F. Weckler, harbor master (representing the Harbor and Subway Commission). It was built by the Great Lakes Dredge and Dock Co. at a cost of about $250,000. Plans for the north breakwater of similar construction have been completed, and work will be started this summer.

Steam Tender Increases Hauling Power of Locomotive

Placing of Old Engine Frame and Cylinders Under Tank Gives Modern Engine More Capacity with Less Fuel Consumption

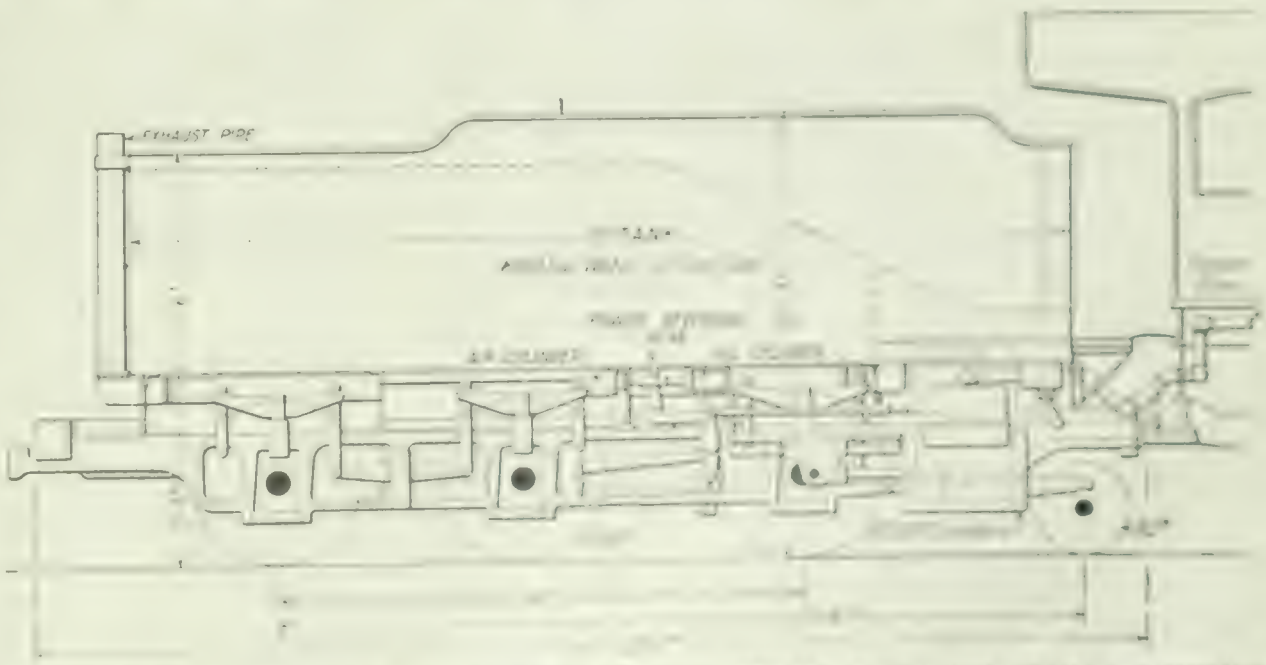
OLD ENGINES retired from service are being utilized by the Southern Ry. as steam tenders to increase the power of modern locomotives. The new freight engines thus equipped are of the 2-8-2 class, with cylinders 27 x 30 in. and 63-in. driving wheels. They weigh 136 tons, with 109 tons on the drivers.

The old engines now converted into tenders are of the 2-6-0 and 2-8-0 classes. One of the former is shown in the accompanying drawing. The boiler is removed and replaced with a tender tank carrying 8000 gal. of water and 12 tons of coal. Pipes with flexible connections lead from the steam chests to the superheater on the engine, and provision is also made for taking live steam direct from the boiler when necessary. The exhaust is carried to a vertical pipe at the rear of the tank. A power-operated reversing gear is applied and is controlled from the cab. A steel casting is placed between the frames at the forward end for the drawbar connection to the engine, and a similar casting at the rear end carries the coupler and draft rigging.

The 2-6-0 tender has 54-in. driving wheels and 19 x 24-in. cylinders. Its weight, loaded, is about 76 tons, with 62 tons on the drivers. With this power-operated tender instead of the ordinary tender, the drawbar pull of the engine is increased more than 33%, and the engines haul 1400 and 1600 tons where they formerly hauled 1100 and 1200 tons. At the same time the coal consumption per 100 ton-miles is reduced to about 12 lb., as compared with 18 lb. for the new engines without steam tenders and hauling the lighter loads.

The conversion of the old locomotives into steam tenders was done at the railway company's shops. Seven large freight engines are now equipped in this way.

This method of increasing the power of locomotives is the revival of a very old idea to meet modern conditions, the plan having been employed to a small extent in England many years ago. The recent triplex Mallet engines also have steam tenders, but in these the engine and tender form a complete new unit.



THE OLD LOCOMOTIVE CONVERTED INTO A STEAM TENDER [illegible]

Making Industrial Valuation for Tax Purposes

Appraisal of Machinery and Equipment Made Quickly in Buffalo Raises Some Assessments and Lowers Others

By GEORGE E. BARROWS
Of Ellsworth, Barrows & Reeves, Engineers, Buffalo, N. Y.

SIXTEEN thousand pages of field notes were taken last year in an appraisal of the buildings, machinery and equipment of Buffalo's industrial plants. In nine months 450 plants were covered, valued at $60,000,000. The work cost 42c. per $1000 of depreciated value. By it was made possible such an equalization of assessments between steam and electric plants, and between all manufacturing plants and other taxable property, as had not before existed. The records are permanent and can easily be brought up to date at any time.

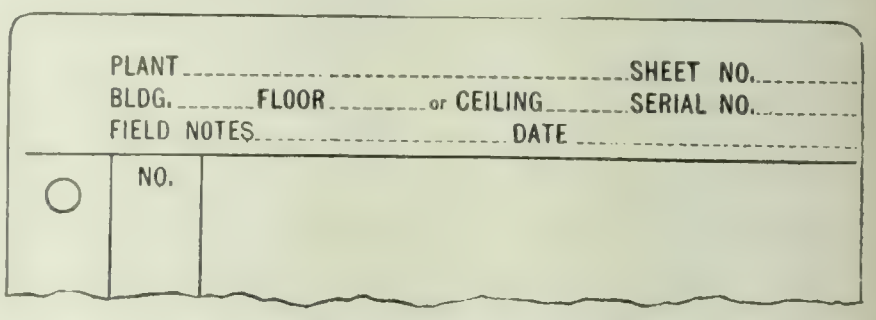
The tax law in the State of New York, as interpreted by the courts, holds that fixed machinery and equipment are real property. While there have been numerous attempts to place this value on assessment rolls, the efforts have not been very successful, since in most instances only power-plant equipment was included. Thus the intent of the statute was not fully carried out, and the tendency was to secure poor equalization, in that steam power-plant equipment was included wholly or in part, while electrical-unit drive was overlooked entirely. Therefore, in order to carry out the law impartially, and with the hope of having the manufacturer share equally with the small taxpayer in bearing his fair share of the city's expenses, Charles B. Hill, commissioner of finance and accounts for the city, undertook a general revaluation of all property in the city, and the writer's firm was retained to cover the industrial plants. The work was to include a valuation of the manufacturing buildings as well as the equipment contained in them

Twenty-Two Groups of Industries

The first endeavor was to classify all the industries of the city into 22 groups, as follows: Iron and steel, large metal-casting plants, foundries and machine shops, structural steel, automobile and marine motor construction, miscellaneous light manufacturing, newspapers and printing plants, breweries, meat-packing plants, laundries, bakeries, woodworking, stone crushing and cutting, oil and chemical plants, soap factories, telephone companies (exclusive of special-franchise property), flour and cereal mills, grain elevators, malthouses, railroad shops, banking institutions and miscellaneous industries. Since there were approximately 450 plants to be appraised, this arrangement was found very helpful.

In the selection of engineers to cover the field work the classification was followed as closely as possible. One specially trained man investigated the iron and steel plants, another the grain elevators, etc. Of course, in cases where one class bordered on another, the same man was used for both.

In getting the field work, it was necessary to have the description of the different items of equipment made swiftly and accurately, and at the same time in such a form that the office work could be carried on rapidly. Field note blanks of the form shown were found very useful in standardizing this part of the work. The loose-leaf system gave splendid results, not only because of the convenience to the field engineer, but also because of the ease with which the notes covering each plant could be permanently bound together. Each sheet, when filled out, gave the name of the plant inspected, the number of the building and the location of the items of equipment on the floor or ceiling, as the



THIS NOTE FORM FACILITATED THE FIELD WORK

case might be. The notes for each floor or ceiling were accompanied by a location sketch showing the relative position of the machines on that story. For instance, a machine might have the number B-3-26, which would mean that it was located in Building B, on the third floor, and its position on the floor would be indicated by the figure 26 on the location sketch.

Upon the completion of the field work, the name of each machine with its identifying number was transferred to the record sheets, upon which the cost of the item, the charge for installation (which included freight and handling), the depreciation and the present value were shown. These record sheets for each plant were turned over to the city and constitute a permanent appraisal, so that at any time in the future it will be possible to check over each plant and quickly make a record of the alterations that have taken place.

As suggested, the field engineer also made building measurements and described the construction fully, giving structure of walls, type of floor, ceiling and roof, and any other details which would be necessary in establishing a unit price. The building costs were worked up on the cubic-contents basis, and depreciation was reckoned by the straight-line method.

Descriptions of Machines Made

In listing the different items of equipment, the engineer was instructed to make a concise but thorough description. The name of the machine was given, together with the model number and serial number where possible. Sizes and measurements were also taken and the condition was noted. Wherever a special founda-

tion was used, its construction and size were shown. The size and length of all main-line shafts were given, as well as the number of hangers and their size, and the diameter, face and material of pulleys. Of course, it was necessary to estimate these sizes from the floor, but this can be done very rapidly and with a surprising degree of accuracy by a trained man.

In case of special machinery, especially that made by the company appraised, the weight was also estimated. It was also found advisable in the case of many machines of small value to have the engineer estimate the present value in the field. It will be readily understood that since this work was for taxation purposes, the aim was to arrive at a fair, conservative present worth, rather than to go into such detail over petty items that the cost would be prohibitive.

In the adoption of unit costs, great care was taken to avoid using figures that would not be maintained over a period of years; that is, in no cases were inflated prices due to the war used, but only those which would reflect normal trade conditions.

Sprinkler systems for fire protection were not figured as equipment, but as part of the building construction and included in the unit price per cubic foot. This statement also applies to electric lighting and steam piping, but sprinkler tanks, switchboards and all separate items of equipment were taken.

Installation Costs Averaged

The charge for installation of machines was figured according to installation curves rather than for each machine. The curves represented the average costs of installation for varying machine costs; that is, the abscissas on the curve were the typical machine costs and the ordinates the average charge for installation, which included freight, carting, handling and setting. This method was necessary because of the time limitations, but it was also the only practicable way in which fair equalization could be secured. For instance, one company might have a hammer on which installation charges would amount to 15% of the cost, owing perhaps to lack of crane facilities in the building and to natural difficulties to be overcome in getting it into the building; while another plant might be using the same hammer on which the installation charges might have been only 5% of the cost.

Although in strict accounting the actual conditions under which the machine was set up would have to be considered, it was not thought equitable to tax any manufacturer for a misfortune. This applied also to freight charges. Whether a machine came from Chicago or Boston, other things being equal the installation charge would be the same, and it was found that the law of averages gave very close results.

Straight-Line Depreciation for Buildings

Depreciation presented no difficulties so far as buildings were concerned, for the well-established custom of using the straight-line method was followed. For buildings of permanent construction 2% and for those of frame and less permanent construction 3% was used. There were no practical difficulties in applying this method, for the field engineers learned the ages of the buildings in almost all cases from the owners, and their figures could be easily checked.

Depreciation of equipment was less readily taken care of, partly because of the uncertainty among appraisal engineers as to the principles involved, but also because of the special character of the work which was being done. The straight-line method could not be used for several reasons. In the first place, it was manifestly impossible to go into a minute description of each machine, and the difficulties in the way of getting the ages of the various items of equipment, although not insuperable, would have necessitated such an expenditure of time and effort that the cost would have been out of all proportion to the results obtained. And at best, the results would have been of questionable value, for in numerous instances machines were found that had been used for a great many years and kept in first-class condition, machines which were certainly not in the minimum-service class. Then there were practically new machines in good condition, on which only a small fraction of the original cost could be realized, because of obsolescence through the adoption of more practical machines, requiring less labor to run or running more efficiently.

Another method which was considered but not adopted was that known as the deferred-maintenance method. Here again, it was a question of results. The engineer might, by spending a great deal of time, decide just what cost would be necessary to bring each machine to perfect condition. But disregarding the arbitrary nature of the results thus obtained, obsolescence would still have to be considered, and in many cases this constitutes more of a factor in depreciation than the physical condition of the machine.

Equipment Depreciated by Average-Condition Method

What was finally decided upon was what might be called the average-condition method. Without presenting the case for this method, it may be well to show how it applied to the work in hand. In practically all of the 450 plants, this is what was found. There were machines in use which had been running day after day for several years, and although still doing the work, were about ready to be discarded. On the other hand, there were machines which were practically new, and the balance varied more or less uniformly between these extremes.

Of course, some classes of machines depreciate much more rapidly than others, and there are some that can be almost rebuilt again, part by part. Thus a spinning machine may be used year after year, and as a part becomes worn, it is replaced by a new one. Then again, the main part of some machines consists of a solid framework which lasts indefinitely, and the moving parts which are attached to it are replaceable, so that aside from obsolescence the depreciation would be small.

With these facts in mind, a figure was sought which would represent the average condition of the equipment in a plant having machinery in all states of efficiency. In a typical factory of this class the average was found by considering the value of a new machine as 100% and the value at minimum service as 30%. This would give an average condition between these extremes of 65%, but to be conservative only 60% was used. Electrical equipment, being kept in better con-

dition than other classes and having a greater residual value, was on the average depreciated 30 instead of 40%.

Since a statement of the condition of each item of equipment was available (this being one of the things noted by the field engineer), it was possible and often necessary to treat plants which were out of the ordinary in a special way. For instance, there were a few very old concerns in the city, in which the equipment was well under average condition, and these had to be handled on their merits, machine by machine. The same reasoning applies to concerns in which all of the machinery had recently been installed. Thus justice was not only accorded individual plants, but a fair equalization was maintained among all the plants.

Results of the Work

It is still rather early to discuss the results of the work fully, but there are some general deductions which may be of interest. It may first, however, be interesting to note that, since the work was done for taxation purposes, it was especially gratifying that the field engineers were enabled to make their inspections with so little opposition on the part of the manufacturers. In practically all instances they were received courteously and given every assistance necessary in making the appraisal.

As has been intimated, one of the objects of the work was an equalization among the different plants to redistribute the burden, so that each would bear its share of the tax but no more. In some cases a reduction in the assessed valuation was recommended; on the other hand, there were firms that were greatly under-assessed and thus escaping their fair share of the tax. By the correcting of inequalities of this kind, all plants were placed on substantially the same basis.

Another important result of the work was an equalization as between the manufacturers and other taxpayers, which followed the placing of the taxable, but hitherto untaxed, equipment on the roll.

These are a few figures showing some of the results:

[illegible]	9 months
[illegible]	16,000
[illegible]	450
[illegible] buildings and equipment	$107,000,000
[illegible] equipment	60,000,000
[illegible]	25c per $1,000
[illegible]	42c per $1,000

The work in Buffalo is especially interesting as showing the possibilities of the application of scientific valuation to the settlement of municipal problems of taxation, for while the whole subject of taxation is still in an indeterminate state after centuries of discussion, there are signs that communities in all parts of the country are groping for a solution. The method adopted here is at least valuable for comparison.

Water Company Follows Through on Thrift-Garden Effort

Not content with promoting the establishment of gardens on 1500 vacant lots—approximately 325 acres—and giving the water to irrigate them free, the Denver Union Water Co. is now giving service to the householders through Prof. P. L. Clarke in the way of advice as to how to cope with pests as well as how to can and put away the surplus crops for winter use.

Step Baffles Hold Hydraulic Fill Placed Under Pier

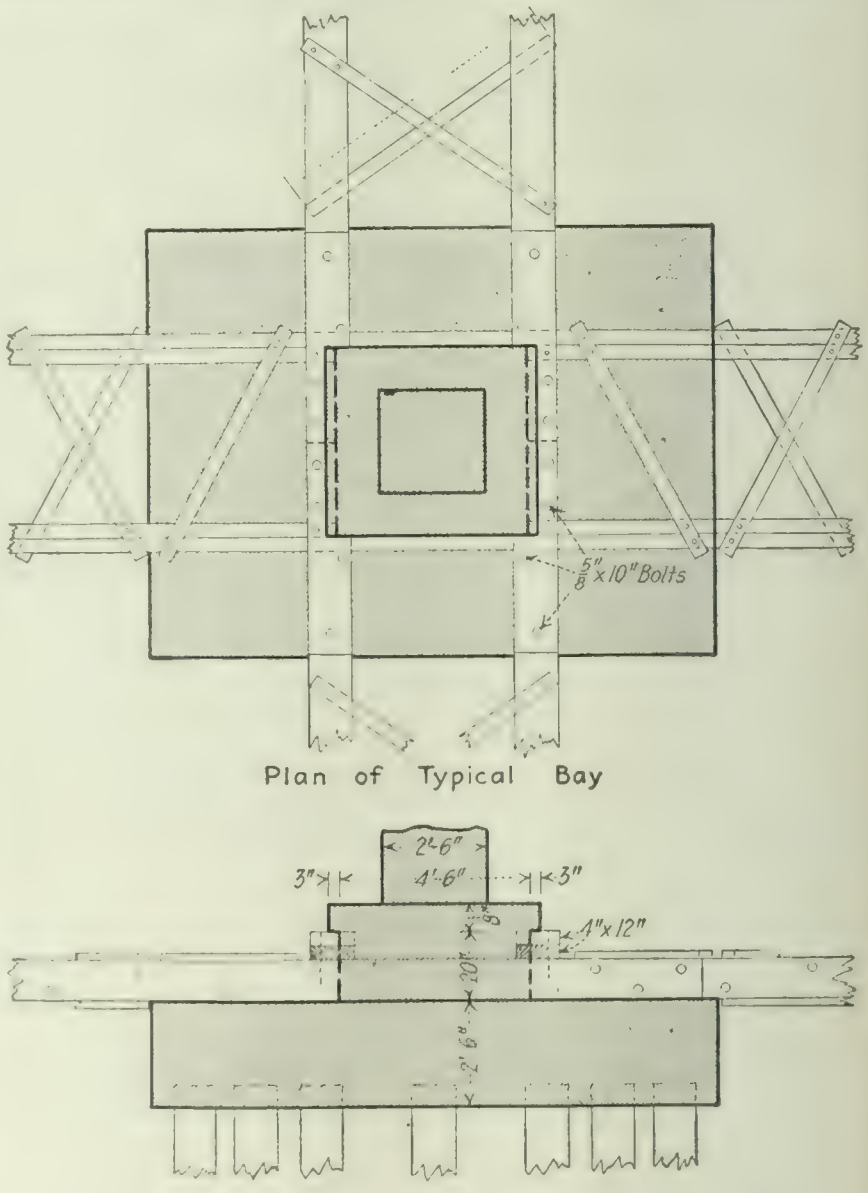
Single-Wall Wood Sheet-Pile Cofferdam 186 by 825 Feet Successfully Pumped at New Orleans Dock

By P. B. Burkhalter

Jacob A. Zimmerman & Son, Inc., Constructing Engineers, New Orleans

ADDITIONAL fill under the wharfhouse unit of the cotton warehouses and terminals being erected for the Board of Commissioners of the Port of New Orleans was placed behind a series of stepped baffles after the footings, columns and diagonal bracing were in place.

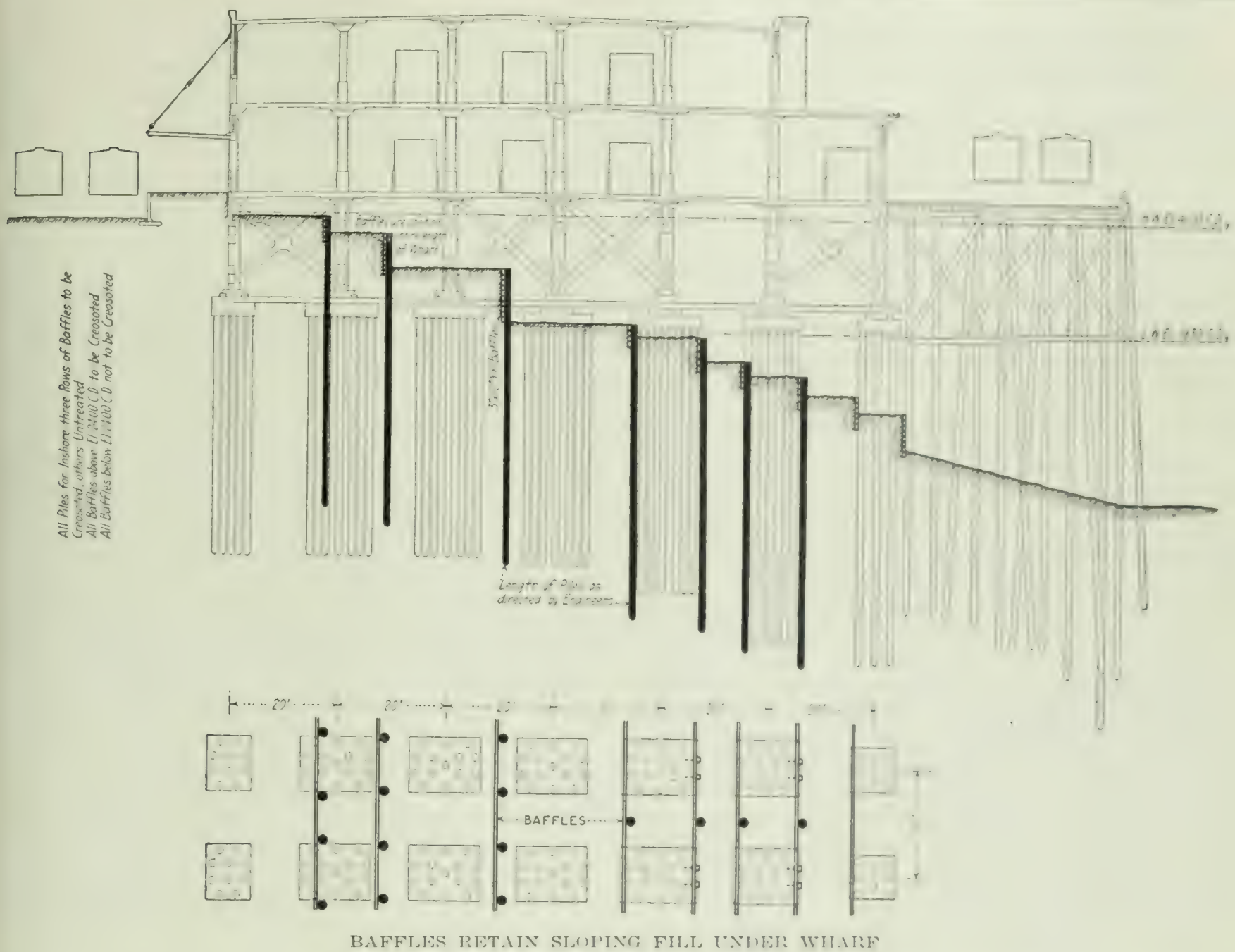
The piledriving was started in August, 1915, with the river stage 15 ft. above the pile cutoff, and in approximately 40 ft. of water. These conditions necessitated using a pile follower on 9000 piles. This driving was completed in January, 1916, after considerable difficulty owing to the fact that the high water continued practically the whole year. Because of the continued



FOOTINGS BRACED AGAINST EACH OTHER

high water the contractor was forced to abandon further operations until the stage of the river permitted the construction of the foundation.

In August, 1916, was started one of the largest single-wall sheet-pile cofferdams ever constructed—186 x 825 ft. The Martinez type of interlocking sheet pile was used. Owing to the overhang of the apron wharf adjoining the work, it was necessary on that side to drive



BAFFLES RETAIN SLOPING FILL UNDER WHARF

in a slanting position 825 ft. of completed dam, and then jet and pull it into place. A single wale, 10 x 10 in., U-bolted through each sheet pile, constituted the only reinforcement.

One 6-in. and two 8-in. centrifugal pumps were used in unwatering the cofferdam, and the sheet piles were found to be so tight that the site was practically dry, except for a small amount of seepage, after 12 hours of pumping.

After the cofferdam was pumped out, it was decided to accept a new footing design requiring about 100,000 cu.yd. of fill, which necessitated the cofferdam acting as a bulkhead also. During the construction of the foundation to the first-floor elevation the head of water varied from 3 to 7 feet.

Baffles Placed by Divers

The footings, columns and diagonal bracing were completed in February and actual operations suspended to allow additional fill of approximately 250,000 cu.yd. to be made. This fill is held in place by a series of step baffles that were placed on 10-ft. centers from El. 8, about at river bottom, to El. 42. Perhaps 75% of these baffles were placed under water by divers who sank 60 ft. of completed baffle per shift. The baffles were made of 3 x 12-in. long-leaf yellow-pine planks, which were battened together and pulled under by means of crabs on small barges. When sunk to the required elevation, they were bolted around the piles with U-bolts.

A unique feature of the design is the horizontal timber trusses that tie the footings to take care of lateral movement. This timber has a 12-lb. treatment of creosote. There are no connections or anchors to the footings, although a 3-in. lip is provided on the column pedestal that acts as a wedge, which is so designed as to form a brace to take the place of a concrete girder.

The port commissioner's dredge "Dixie" is making the fill under the supervision of Ford, Bacon & Davis, supervising engineers, who designed the cotton warehouses and terminals. The general contractors are Jacob A. Zimmerman & Son, Inc., New York City. For them W. E. Thursby is superintendent, and the writer is constructing engineer.

Government Can Now Make Optical Glass

The Bureau of Standards of the Department of Commerce, after two and a half years of continuous study and experiment, has achieved satisfactory results, and is prepared to produce optical glass. Additions are now being made to the working plant requisite to permit larger production to supply the needs of the Government. The matter is one of essential importance to the military services of the nation. Heretofore this material of the best grade has been wholly made in Germany; but the United States is henceforth independent of any foreign supply for this most important product.

Another Jump in Duty Record of Turbine Centrifugal Pumps

New Toronto Unit Showing 153.92 Million Foot-Pounds per 1000 Pounds of Steam, Eclipses Montreal Machine

A TWENTY-FOUR-INCH steam-turbine-driven centrifugal pumping unit installed in the John St. station of the Toronto (Ont.) water-works has established a new duty record of 153.92 million foot-pounds per 1000 lb. of steam, thus exceeding the performance of the much-discussed Montreal turbine unit. (See *Engineering News*, Nov. 2, 1916.)

Toronto Installs Five Centrifugals

The City of Toronto has installed five large centrifugal units, partly superseding and partly supplanting miscellaneous older equipment. The first new unit comprised a 1400-hp. turbine driving through gears two 24-in. centrifugal pumps. The acceptance test on this unit, as conducted Nov. 30 and Dec. 1, 1914, by Prof. R. W. Angus, of the University of Toronto, showed a capacity of 18.373 million Imperial gallons per day against a net pressure of 114.1 lb. per sq.in. The duty was 137 million foot-pounds per 1000 lb. of steam (at 137.4 lb. gage at the nozzle, 1.05% moisture and 28.94 in. corrected vacuum) excluding auxiliaries.

Early in 1917 two similar units, but of 24 million gallon capacity, were installed and two smaller units were purchased. One of the larger units was tested by Professor Angus on Mar. 8, 1917, yielding the new performance data shown below.

The two pumps of the unit are single-stage, double-suction types, connected in series. The condenser has 1300 sq.ft. area of 1-in. brass tubes, and passes all the water received by the pumps. The air pump is of a wet-vacuum type, and condensate is delivered from hot-well to boilers by a triplex pump, chain-driven from the main unit (and requiring about 6 hp.). No feed heater was used, and the exhaust from the air pump was introduced into an intermediate stage of the main turbine. Cooling water for bearings and oil tank was taken from the discharge of the first pump—40 gal. per minute.

The Penalty and Bonus Clauses

The manufacturer, the De Laval Steam Turbine Co., of Trenton, N. J., guaranteed a capacity of not less than 24 million Imperial gallons per 24 hours against a pressure of 107 lb. per sq.in. measured between suction and discharge mains, and a duty of 141.5 million foot-pounds per 1000 lb. of steam (containing less than 1½% moisture) including that used by jackets and auxiliaries. A penalty was fixed of $2500 per million foot-pounds below the guarantee and a bonus of $1500 was allowed per million foot-pounds above.

Acceptance Test of Large Pump

The accompanying figures on the Angus test were furnished by the manufacturer. The discharge pressure was taken on the 24-in. pipe close to the pump flange; the suction pressure was taken on the 42-in. main immediately in front of the condenser. No allowance was made for friction or added velocity head.

The maker has made extensions of the Angus test, to obtain duty figures for the bare unit so that they may be compared with the performances of earlier machines. Readings during the official test showed that the friction and increase in velocity head between the 42-in. inlet to the condenser and the 24-in. suction nozzle of the pump was 4.77 ft. (a tapering enlarger connected the 24-in. pump outlet to the 36-in. delivery main of the city) and the difference in pressure head between the two ends of this enlarger was found to be slightly over 2.71 ft.—though this does not enter the official figures of the complete unit or the extended figures of the bare turbine and pump.

SUMMARIZED RESULTS OF TORONTO PUMP TEST, MAR. 8, 1917

Average boiler pressure, lb. per sq.in., gage	148 4
Steam pressure at turbine, lb. per sq.in., gage	144 6
Moisture in steam at turbine, %	0 35
Vacuum in exhaust chamber, in.	28 69
Barometer reading, in.	29. 43
Vacuum referred to 30 in. barometer	29. 26
Net pressure produced by pump, lb. per sq.in.	107. 18
Discharge as measured by Venturi tube and mercury column, million gal. per 24 hr	25. 1
Corresponding water horsepower	1306
Steam used per water horsepower, lb.	12. 88
Duty in million foot-pounds per 1000 lb. of steam	153. 92

For the duty figures of the bare unit, the net pressure (107.18 lb.) was increased by the 4.77 ft. friction and added velocity head in the pump approach. The water horsepower was further increased by the power put into the 40 gal. per min. cooling water, drawn from the first pump at half the net pressure produced by the unit. An allowance of 6 b.hp. was made for the work of driving the boiler feed pump, and account was taken of the work secured in the low-pressure end of the turbine by the 680 lb. of steam exhausted by the air pump (this figure being found by separate test).

The resultant figure for the bare machine is 160.5 million foot-pounds per 100 lb. of steam.

What the Toronto Pump Could Do

With the energy available by the expansion of a pound of steam from 144.6 lb. gage to 0.74 in. mercury column, taken as 367 B.t.u., or 285,446 ft.-lb., and comparing this with the delivery of 160,500 in the water handled, an overall efficiency of 56.4% is indicated, neglecting the slight amount of moisture in the steam. Taking the total heat in the steam at 144.6 lb. gage over that in the condensate at 66° F. as 1160 B.t.u. per pound, the duty expressed in million foot-pounds per million B.t.u. supplied becomes 138.4. It will be recalled (see *Engineering News*, Nov. 2. 1916) that the actual duty of the Montreal pump under test conditions was reported finally as 126.2, and this corrected for the proper superheat under which the unit was intended to operate gave a probable duty of 134.6.

The manufacturer of the unit claims that if the Toronto machine were arranged for bleeding steam for feed-water heating, as was the case in the Montreal unit, and sufficient steam were bled in addition to the 680 lb. of steam exhausted from the auxiliaries to heat the feed water to 210° F., the duty of the bare machine without superheat would have run up to 144 million foot-pounds per million B.t.u. It is also claimed that if the steam were superheated 100° F. and sufficient steam were bled from the turbine in addition to that secured from the auxiliaries to heat the feed water to 210° F., the duty would become 152 million foot-pounds per million B.t.u.

California Reservoirs Silt Up Slowly

Sweetwater, Lake Chabot and La Grange Reservoirs Show Little Capacity Loss

BY EDWARD BOWEN

Offices of J. B. Lippincott, Consulting Engineer, Los Angeles, Calif.

THE building of dams across mountain streams is not unusual; most reservoirs are created in this way. The gold miners in the Sierras of California did it 50 years ago on Yuba and Feather Rivers, and many of their reservoirs are still in service.

The rate at which silt is deposited in a reservoir depends upon the quantity carried by the stream, the size of the reservoir, the volume of stream flow and the character of the drainage basin. If the capacity of the reservoir is small compared with the average annual discharge of the stream, it acts in the nature of a retention basin and when the stream is in flood and carries its greatest silt load, a portion of the silt is wasted by the dam. On the other hand, if the reservoir capacity is large compared with the average annual stream flow, little waste occurs and all the silt transported by the stream is deposited in the reservoir.

If the rock structures in the drainage basin are hard (such as granites and sandstones) and the hillsides and flats are covered with brush and timber, the storms do not erode badly and the stream carries little silt. If the hills are of soft material such as shales, adobes or loam, the brush cover sparse and there are large areas of plowed or cultivated land, the stream will be heavily silt laden.

Mountain streams in California as a rule carry little silt. The existence of glacial lakes in the High Sierras is absolute evidence of the absence of silt in the streams running through them. If there were silt in these streams in large quantities, there would be no lakes.

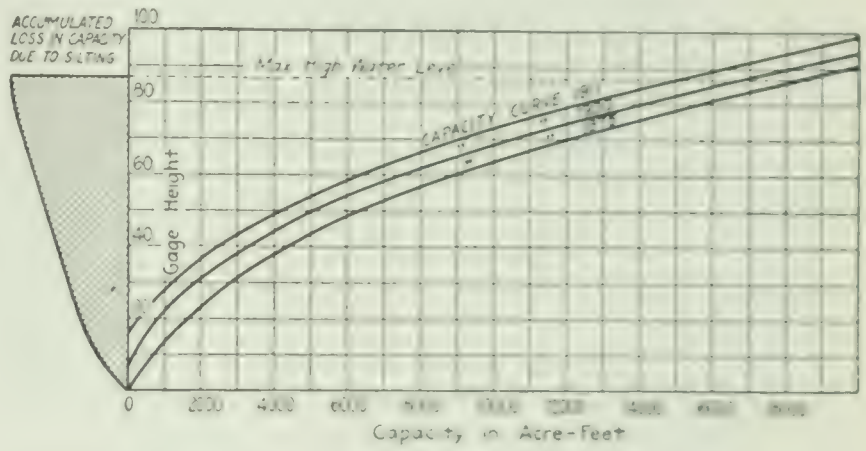
Experience has shown the silting of artificial reservoirs in California to be an extremely slow process. There are available records of the Sweetwater Reservoir and Lake Chabot on San Leandro Creek. Both are on torrential streams that produce comparatively large quantities of silt.

SWEETWATER RESERVOIR LOST ONLY 4% OF CAPACITY IN 12 YEARS

The Sweetwater dam, near San Diego, Calif., was constructed in 1887 across the Sweetwater River. Twelve years afterward the reservoir became empty through conditions of drought. It was determined from surveys made at that time that 900 acre-feet of silt had been deposited in the 12-year period. The average run-off of the Sweetwater River is about 13,000 acre-feet per annum, the capacity of the reservoir 22,000 acre-feet, and the average annual withdrawals therefrom about 11,000 acre-feet. The drainage area is 186 square miles, of which about one-third to one-half is covered with brush and timber. There are large amounts of plowed and pasture land with light soils. The average annual run-off of the stream is only about one-half the capacity of the reservoir, so that only occasionally water is wasted, and practically all the suspended matter carried by the stream is deposited in the reservoir. This condition is particularly favorable to rapid silting. The survey showed that the silt deposits are at the rate of 0.5% of the volume of water entering, or in 12 years it lost 4% of its capacity.

ONLY 16½% LAKE CHABOT CAPACITY LOST IN 36 YEARS

Lake Chabot, a part of the water-supply of the East Bay Water Co., Oakland, Calif., is created by a dam built in 1875 across San Leandro Creek. An accurate topographical survey was made of the reservoir site



CURVES BASED ON ACTUAL SURVEYS SHOW SILTING OF CHABOT RESERVOIR FROM 1875 to 1911

at the time the dam was built. Other surveys were carefully made by sounding in 1900 and in 1911. The last survey showed a deposit of 3100 acre-feet of solids during the period of 36 years since the construction of the dam. The average annual run-off of the stream is 21,700 acre-feet. It is torrential in character, carrying large floods immediately following the winter rains and going entirely dry during the summer months. The capacity of the reservoir is 15,000 acre-feet, so that the reservoir is in the nature of a detention basin, the large floods being wasted through it. The drainage area consists of 42 square miles, about one-third of which is brush covered, one-half unplowed bare fields and probably one-sixth cultivated land. The soils range from a sandy loam to adobe. They are friable, and the drainage basin is one that produces large quantities of silt. The stream is particularly muddy throughout the rainy season. During the 36-year period the deposits of silt amounted to 0.4% of the stream flow, or the reservoir lost 16½% of its capacity. The accompanying diagram of the capacity curves for Lake Chabot shows the accumulations of silt as determined by surveys.

It is interesting to note that 39% of the deposits occurred in the extreme bottom of the reservoir next the dam. The deposition of a large proportion of the silt near the dam was also evident in the silting of the Sweetwater reservoir.

The peninsula reservoirs of the Spring Valley Water Co., San Francisco, have been in service for over 40 years, and no reductions have been made in their computed capacities because of the deposits of silt. Although no surveys of these reservoirs are available, those who are familiar with them state the silting is negligible.

Sedimentation Survey of La Grange Reservoir

An observation to determine the rate of sedimentation was made at the La Grange reservoir, on the Tuolumne River, by J. B. Lippincott for the Hydrographic Branch of the United States Geological Survey. The Tuolumne River is a typical Sierra stream draining the western slope of the Sierra Nevada in central California. The drainage area above the dam is 15,000 square miles, the greater portion of which is in the Yosemite National Park. The basin is heavily forested up to a 9000-ft. elevation. From there up to the crest of the range, which reaches to 13,000 ft., there are large areas of bare granite rock and numerous alpine meadows. Glacial lakes occur above 5000 ft. In the lower portion of the river are a few old gold stamp mills, the tailings from which are washed into the channel of the stream above the reservoir. The La Grange dam was built to divert the Tuolumne River into the Turlock and Modesto irrigation canals. It is an overflow type 120 ft. high. The reservoir is long and narrow, and its capacity compared with annual discharge of the stream is small. In 1895 a topographic survey of the reservoir site was made. In October, 1905, a second survey was made by Edward Johnson for the Geological Survey.

From Oct. 1, 1895, to Nov. 1, 1905, a period of 10 years and one month, 1264 acre-feet of silt were deposited, or 54.2% of the capacity of the reservoir.

Little or no precipitation occurs in the drainage basin between the first of April and the first of October.

LOSS IN CAPACITY OF LA GRANGE RESERVOIR, CALIFORNIA BY SILTING IN 10 YEARS

Contour	Area, Acres	Capacity, Acre-Feet	Area, Acres	Capacity, Acre-Feet
	In 1895		In 1905	
300	56 12	2,332 3	54 1	1,068
290*				1,914
280	48 90	2,060 8	39 6	600
260	42 07	1,571 8	21 3	296
270	33 83	1,151 1	12 1	129
260	25 97	812 8	6 0	39
250	21 45	553 1	1 2	3
245			0 0	0
240	16 67	338 6		
230	9 55	171 9		
220	6 66	76 4		
210	0 41	9 8		

*Contour of dam in 1905

During the winter months precipitation is in the form of snow, the melting of which produces summer floods.

The discharge of the river from Oct. 1, 1895, to Nov. 1, 1905, was 18,809,707 acre-feet. According to the surveys, the deposits of solids in the reservoir accumulating between these dates was 1264 acre-feet, or at the rate of 0.0067% of the stream flow.

The above data are interesting to hydraulic engineers as indicative of the small percentage of the stream flow that is deposited as silt in reservoirs. One is frequently confronted with the statement that the construction of a reservoir is prohibitive because of the muddy character of the stream and the consequent rapid accumulations of silt. Although this is true to some extent on muddy streams, such as the Rio Grande and the Colorado, it is a relief to know that there are some streams in California which refute this.

Bascule Bridge Is Erected as a Cantilever

Double-Leaf Market Street Structure at Chattanooga Placed by Means of Traveler Mounted on Deck of Span

By W. J. Howard
Engineer, Kelly-Atkinson Construction Co., Chicago

THE erection of a 300-ft. double-leaf rolling-lift bascule span as a pair of cantilevers, in order to avoid the use of falsework, was one of the most interesting features in the recently completed construction of the Market St. bridge at Chattanooga, Tenn. The bridge is about 2300 ft. long, including the approach fills. Besides the 300-ft. steel drawspan, it has five reinforced-concrete arches of 180-ft. span and two of 165-ft., besides nine 40-ft. concrete-slab spans. The accompanying views show some of the stages of the work.

Drawspan Erected in Closed Position

The steel drawspan was erected in its closed position (*A*, Fig. 1) by means of a timber traveler having a 55-ft. boom and a 32-ft. mast at one corner of its 20 x 40-ft. frame. It was mounted on rollers and pulled ahead by a manila runner line as required (*B*, Fig. 1). The traveler was placed at one side of the deck (between the lower chords of the trusses), so that the push-car with material could be brought to it and the boom swung to pick up the material and erect it in place without shifting the traveler.

The three-drum, 30-hp. American hoisting engine (with cylinders 8¼ x 10 in.) was mounted at the rear of the traveler frame. The coal bunker and water tank were also placed there for additional ballast. For some heavy lifts the traveler was anchored to the span. One 3-sheave and one 4-sheave block were used for the topping lift, and two 3-sheave blocks for the hoisting line. All the rigging was of ⅝-in. steel cable. The heaviest pieces handled by the traveler were the 14-ton main post (N.O.-L.O.) and the 11-ton end sections of the chords (*C*, Fig. 1).

Forms Three-Hinged Arch When Closed

The 22-ton rocker sections were unloaded from the cars to the tramway push-car, and then unloaded and erected on the roller castings by jacks. The counterweight truss and cantilever truss to panel No. 3 were then erected, and the whole pulled back and anchored so as to give the end of the leaf an elevation of about 4 ft. when erected. The second leaf was erected at its proper elevation. This plan (*A*, Fig. 1) was adopted so that the end sections of the chords, which telescope to form a three-hinged arch when the bridge is closed, could be erected without cutting them apart or raising the bridge.

The steel of the counterweight truss balanced the main truss as far as panel No. 3, and falsework and forms were then placed for concreting the counterweight (*D*, Fig. 1). Owing to the slab construction of the deck of the concrete arch span on which this falsework was erected, and the use of 8 x 10-in. posts for supporting the counterweight, only 310 cu.yd. (of

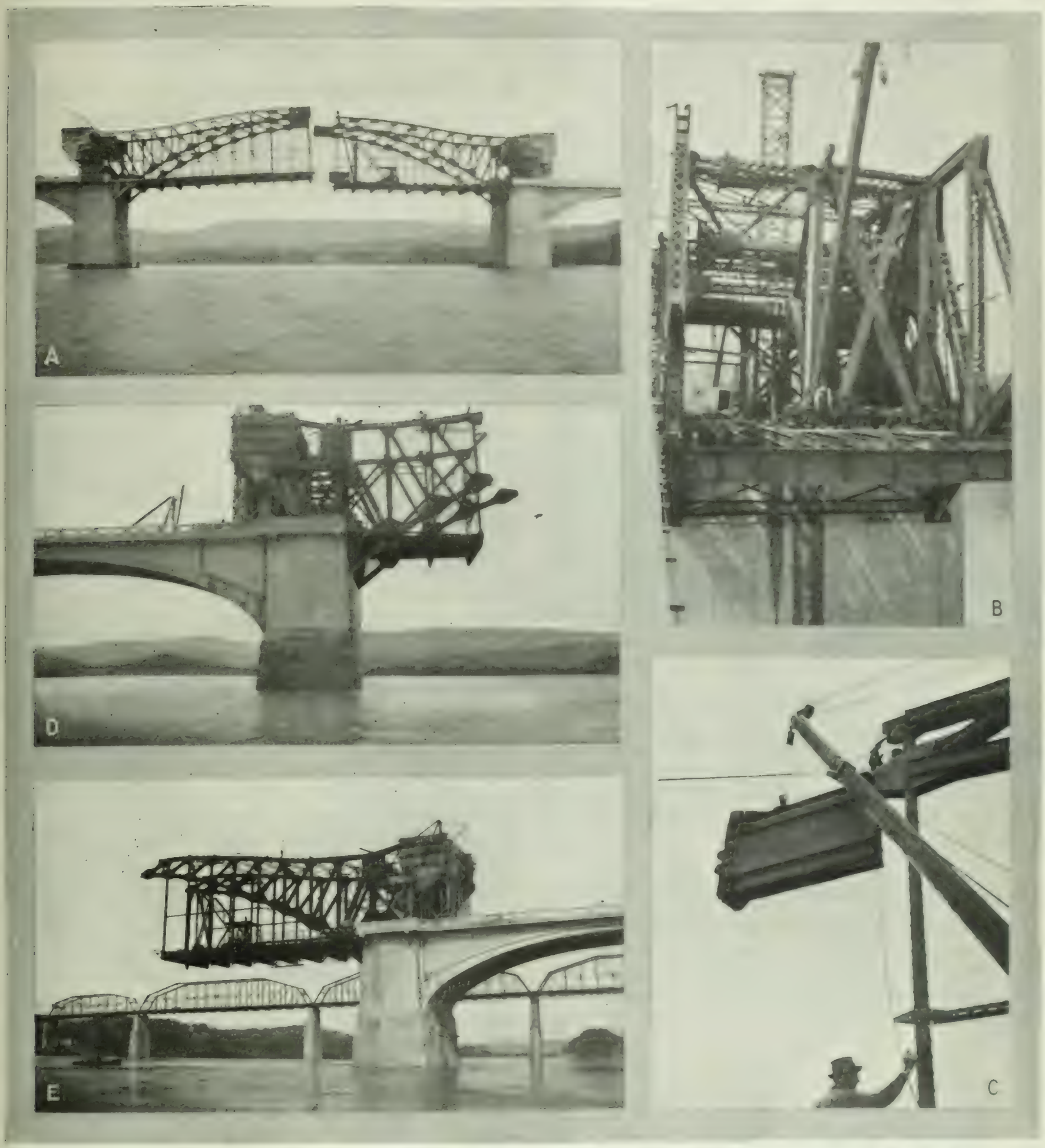


FIG. 1. CANTILEVER ERECTION OF 300-FT BASCULE BRIDGE OVER THE TENNESSEE RIVER AT CHATTANOOGA, TENN.

A—Leaves were erected at different elevations to avoid interference of chords. B—Traveler at side of anchor span. C—Traveler placing 11-ton end section of top chord. D—Cantilever erected for three panels; derrick on pier unloads concrete materials for counterweight. E—Concrete counterweight balancing cantilever and traveler; derrick on top for setting trusses and counterweight blocks

the 744-yd. total) was placed at first. Then the erection of the steel span was continued to panel No. 5, the balance of the concrete being poured while the steel was being erected (*E*, Fig. 1).

Sand and gravel for the concrete were delivered on barges, which were moored to the pier directly under the counterweight. The right proportions of sand and gravel were filled into a drop-bottom bucket, which was then hoisted by a stiff-leg derrick (*D*, Fig. 1) and dumped directly into the ½-yd. Smith mixer. The concrete was hoisted in a Lakewood self-dumping bucket in a 90-ft. tower, and spouted to the forms. About 100 yd. of concrete per 10-hour day was placed in this manner.

The concrete was so proportioned as to weigh 140 lb. per cu.ft., to give the required load. An opening was left in the counterweight for placing concrete adjusting blocks, which weighed about 1100 lb. each. These

blocks were made beforehand and stored at the site. The required number were set in place by means of a stiff-leg derrick placed on top of the counterweight for the erection of the motor and removal of the counterweight forms.

One leaf was erected complete in the first place. The pier for the south leaf was not ready until the north leaf had been almost completed, and the same equipment and methods were followed with both leaves. The bridge was completed by July 1, 1917, ready to be turned over to the county board of Hamilton County.

The engineers for the entire work were Greiner, Whitman & Spiker, of Baltimore, Md. The drawspan



FIG. 1. COMPLETED 400-FT. BASCULE SPAN OF BRIDGE OVER THE TENNESSEE RIVER AT CHATTANOOGA, TENN.

was designed under their supervision by the Scherzer Rolling-Lift Bridge Co., of Chicago. The steel was fabricated by the Toledo Bridge Co., of Toledo, Ohio. The erection was done by the Kelly-Atkinson Construction Co., of Chicago; Gus Schenewerk was superintendent in charge, and the writer is engineer for the erectors.

Create 54,800 Freight Cars by Coöperation

Comparing, for Canada, the years 1907 and 1915, it will be seen that the average freight-car capacity increased 5.8 tons and the average contents 3 tons, while 48% of the additional capacity provided was not used. The general statistics are:

Item	1907	1915	% Increase
[illegible]	11,667,711,850	17,661,309,723	51.1
[illegible]	2,908,903	6,731,265	131.4
[illegible]	105,540	201,690	91.1

The difference in capacity and contents between the average 1907 car and the average 1915 car is represented by the figures: Capacity, 27.6 tons, and contents, 15.4 tons, in 1907; capacity, 33.4 tons, and contents, 18.4 tons, in 1915. Material gains in freight-handling efficiency could be made by increasing the load. An average 1915 load of 18.4 tons, if increased by 5 tons, would be equivalent to placing 54,800 additional cars in service. Shippers should be urged to coöperate with the railroads in their endeavor to increase the existing carrying capacity by using the present available rolling stock to better advantage. Light bulky commodities, of which there are many, should be loaded to the full cubic capacity of cars, while heavier freight should be loaded to the full carrying capacity.

Meets Highway Contractors' Labor and Material Problem

Massachusetts State Highway Commission Introduce Cost-Plus-Unit-Profit Contracts To Remove Gambling Element

MEETING at the outset of the season's work with contractors' bids considerably in excess of the engineers' estimates, the Massachusetts State Highway Commission set about analyzing the situation and finding means to combat the difficulty. As a result, new forms of contract have been developed and are now being tried out. These are the joint product of many conferences of the commission, of which William D. Sohier is chairman and Arthur W. Dean is chief engineer.

It was concluded that bids were high because of the uncertainty of the labor supply and the difficulties in obtaining deliveries of construction material. To remove these gambling elements of the contract has been the object of the State Highway Commission, although in conscientiously working to that end it has brought upon itself and its chief engineer much criticism from certain Boston newspapers.

Terms of Contract

The first of these new contracts was let in May to Michael Serretto, an Italian contractor of Boston, who had previously done satisfactory work for the Highway Commission. By its terms the contractor agrees to construct seven sections of road in the western counties, including grading, surfacing, culverts, guard rails, retaining walls, etc. He agrees to furnish all labor, workmen and mechanics, as well as all teams, small tools and appliances necessary for the prosecution of the work. On the other hand, the State Highway Commission agrees to furnish all materials such as gravel, broken stone, pipe, cement, etc., as well as explosives and all machinery such as power pumps, air compressors, drills, steam shovels, etc.

The other interesting feature of the contract is this: The contractor agrees to furnish regularly itemized statements of the amounts paid by him for labor and teams, and to give the engineer free and constant access to all accounts, bills and vouchers relating thereto. The Highway Commission agrees to weekly or bi-weekly payment to the contractor of the amount of his payroll, which is kept or checked by the Highway Commission's inspector or engineer and sworn to before a notary public by the contractor. The contractor is the actual employer and takes all responsibility under the state and national employers' liability laws. By this particular contract, however, the State Highway Commission pays for insurance under the Workmen's Compensation Act as a part of the labor cost. An 8-hour day is specified in the contract, and the men are allowed to board as they see fit.

The contractor agrees to give his personal attention to the faithful prosecution of the work, and he cannot assign or sublet any part of it without the consent of the commission. He agrees to pay all his bills promptly and to allow the Highway Commission to withhold any sums due him for satisfying legitimate claims against

him. The other conditions as to quality and kind of work are the same as in the regulation contract.

To cover use of small tools, his own time, all overhead expenses and profit, the contractor receives for dry excavation 6c. per cu.yd.; wet, 12c.; all borrow 6c. per cu.yd.; ledge excavation 14c. per cu.yd.; cement stone masonry 50c. per cu.yd.; cement concrete masonry 50c. per cu.yd.; rubble masonry 20c. per cu.yd.; all local broken stone in place, rolled, including all incidental work, 12c. per ton; all broken trap rock, in place, etc., 10c. per ton; all gravel surfacing 8c. per cu.yd.; applying all bituminous material, including all heating, mixing, teaming, distributing, rolling and all incidental work, 0.2c. per gal.; for all 12-in. vitrified pipe in place, including all excavation and other incidental work, 2.5c. per lin.ft.; 18-in. pipe 4c. per lin.ft.; 12-in. cast-iron pipe, 2.5c. per lin.ft.; 18-in. cast-iron pipe, 4c. per lin.ft.; 12-in. corrugated iron pipe, 2c. per lin.ft.; 18-in. corrugated iron pipe, 3c. per lin.ft.; 24-in. corrugated iron pipe, 4c. per lin.ft.; standard guard rail in place, including painting, post preservation and all incidental work, 1.5c. per lin.ft.; rustic guard rail, 1c. per lin.ft.; for all stone filling, 8c. per cubic yard.

The Highway Commission has set maximum limits for the pay of all kinds of labor as follows, but the way is left open to increase these rates should necessity demand, and then the contractor cannot be compelled to continue work unless the increased prices are agreed to by the Highway Commission. The maximum limits are: For laborers, $2.80 per day; double teams and drivers, $6 per day; dynamite men, $3.30 per day; blacksmiths, $25 per week; foreman, $25 per week; and superintendents, $30 per week.

Labor Paid Weekly

So far as possible weekly payment is made by the Highway Commission for labor. Other items are settled monthly. No estimate or payment is made when in judgment of the engineer the work is not proceeding in accordance with the contract, or when the total work done is less than $300 above the previous estimate. The contract empowers the Highway Commission to make more frequent payments if desirable. Final payment must be made 65 days after the final estimate. All prior partial estimates and payments are subject to correction in the final estimate and payment.

The contract further provides that no member of the Highway Commission is responsible for any liability arising from the contract, and that no act of an inspector or engineer can operate as a waiver to any provision of the contract. No changes can be made without action by the Highway Commission.

A Fifty-Fifty Savings-Sharing Contract

A modification of the Serretto contract has been entered into with Daniel O'Connell Sons, contractors, Holyoke, Mass., for surfacing a state highway between Easthampton and Northhampton—a tar penetration job. The conditions which led to this contract were as follows: The work was estimated and bids called for; the three bids received all proved higher than were deemed justifiable. The low bidder was approached as to accepting the work on a cost-plus basis, provided that should the actual cost of the work prove less than the contractor's original low bid the Highway Commission would share with the contractor fifty-fifty on any such saving. But under no circumstances is the total sum to be paid by the Highway Commission to exceed the sum of the contractor's bid.

Commission Furnishes Material

Under this contract the contractor agrees to furnish all labor, tools and equipment, including the heavy machinery. The Highway Commission furnishes all materials and pays the actual cost for the labor and teams as before, the contractor however paying his own employer's liability insurance. No limits are set in this contract for wages. For profit and overhead the contractor receives: For excavation, 7.5c. per cu.yd.; for gravel borrow, 13½c. per cu.yd.; for broken stone in place, rolled, including pea stone and all incidental work, 2.5c. per ton; for applying bituminous material, 1c. per gal.; stone filling, 26c. per cu.yd.; old broken stone excavated, screened and replaced, including all incidental work, 18c. per cu.yd.; all stone removed and relaid, 11½c. per cu.yd.; no allowance is made the contractor on account of the purchase of such tools and appliances as are furnished by him, but for the use of a single drill compressor $2 a day is allowed, and for the use of a steam road roller $8 per day.

Both these contracts and two or three others of similar purport are reported by Mr. Dean to be working out satisfactorily. Where possible every effort is made to let them on such a competitive basis as in the O'Connell case.

How Softened Concrete Lining To Tunnel Will Be Repaired

Plans have been made to repair the concrete lining to the Cascade tunnel of the Great Northern Ry., which, as noted in *Engineering News-Record*, June 21, 1917, p. 579, has softened due to the formation of sulphur compounds formed from sulphur in the locomotive gases and the cement. As the lining was put in principally to protect the rock face against disintegration and not for strength, and as the steam locomotives are now superseded by electric traction, it is thought that repairs made will be permanent.

The proposed method of repair is as follows: (1) Clean the entire area of sidewalls and arch, removing all disintegrated portions. (2) Drilling 2-in. holes where necessary to provide additional drainage. (3) Drill 4-in. holes in the arch where necessary and fill cavities existing back of the concrete lining with sand filling or grouting. (4) Replace all disintegrated portions of the lining with a coating of concrete by a cement gun. The specifications provide that where the coating is over 3 in. deep it shall be supported by a triangular wire mesh—American Steel and Wire Co.'s No. 28 A—cut to fit and fastened to the old concrete by spikes driven into holes drilled in the concrete, 24 in. apart. The mixture for use in the cement gun will be one part portland cement and 3½ parts sand, mixed dry. After cleaning, the surface of the concrete is to be sprayed with an alkaline solution for neutralizing the acid in the concrete. Grant Smith & Co., St. Paul, Minn., have the contract. The plans will be carried out under the supervision of A. H. Hogeland, Chief Engineer of the Great Northern Railway Company.

Making Surveys for Land and Lake Tunnel at Chicago

Triangulation Locates Crib and Rock-Drill Borings on Lake Tunnel—Portable Telephone Used in Survey of Long Drifts—Line Transferred Down Shafts by Means of Two Transits

THE surface and underground surveys for the Wilson Ave. intake tunnel at Chicago were a feature of the engineering work for this long tunnel, which has 3 miles under Lake Michigan and 5 miles under land to a large pumping station. This survey work was described at a meeting of the Western Society of Engineers by H. W. Clausen, engineer of water-works construction. The tunnel was described in the *Engineering Record* Jan. 16 and 23, 1915, and Apr. 29, 1916, and in *Engineering News* Apr. 22, 1915, and May 25, 1916. It is being built by the city by day labor, under the direction of Mr. Clausen.

Triangulation To Locate Borings

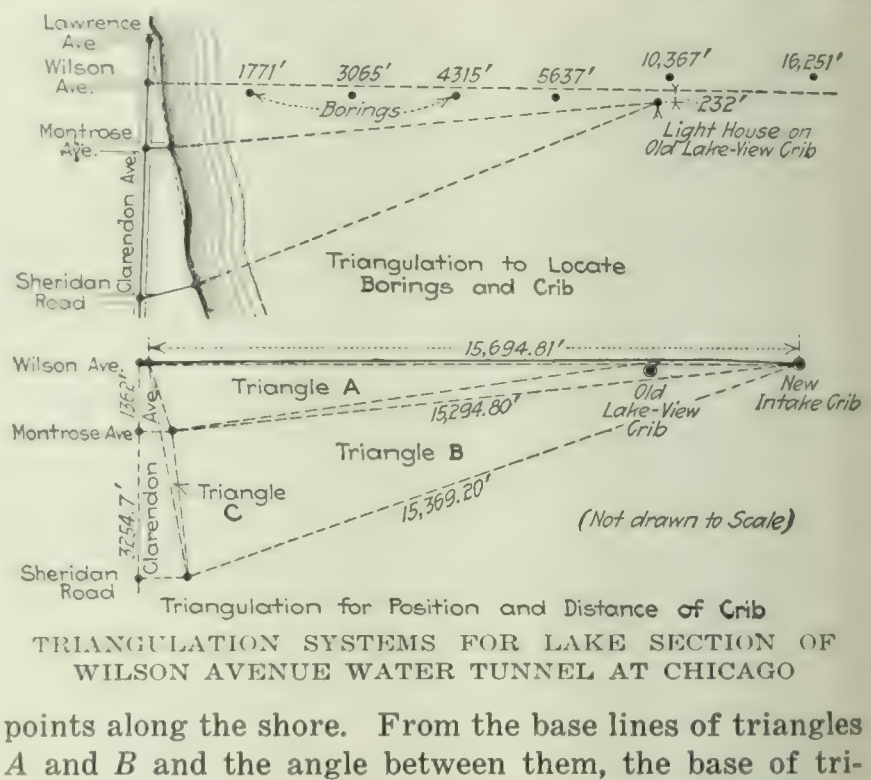
The lake tunnel is placed at such depth as to insure its being in solid rock and thus avoid the troubles of earlier intake tunnels in the shattered rock above. To determine the character of the rock, borings were made by means of core drills, the holes being offset from 40 to 100 ft. from the center line of the tunnel. This was described in *Engineering News* of Mar. 4, 1915.

A preliminary triangulation was made to locate buoys marking the sites for the drill holes and the intake crib. For this a base line 4616.98 ft. long was established on Clarendon Ave., from Wilson Ave. to Sheridan Road, and was tied in to points on the lake front at Montrose Ave. and Sheridan Road. The buoys for borings were set by sighting from the lake-front points at Wilson Ave. and at Sheridan Road to the Lake View crib, and turning the computed angles to the points for borings. This method is shown in the upper view on the accompanying sketch plan. After the buoys were set, platforms for the drills were erected on piles. The buoy for the crib was placed by sighting from the same two points. Four reference buoys were set near it.

Determining Exact Location of Crib

After the crib shell had been placed, a triangulation was made to determine its exact location and distance from the shore shaft. This was slightly different from the first, as some of the original points had been moved. Its layout is shown in the lower plan. With the length of the line in Clarendon Ave. and the lines in Wilson Ave. and Montrose Ave. to the lake shore known, as well as the inclosed angles, the length of a line on the lake front between Wilson and Montrose Aves. was calculated (as the line passed over water). With this calculated line as a base of triangle *A* (on the accompanying diagram), and with the Wilson Ave. crib as the third point, all three angles were measured, and the distance from the shore shaft to the crib was calculated by the law of sines.

Additional triangulations were made to check triangle *A*. With the three lines on Montrose Ave., Clarendon Ave. and Sheridan Road, and the two angles on Clarendon Ave., the line along the shore from Montrose Ave. to Sheridan Road was calculated. This served as the base line for triangle *B*, having the Wilson Ave. crib on its third point. One side of this is common with triangle *A*, and the calculated lengths checked very closely. A third triangle *C* was formed with the three



TRIANGULATION SYSTEMS FOR LAKE SECTION OF WILSON AVENUE WATER TUNNEL AT CHICAGO

points along the shore. From the base lines of triangles *A* and *B* and the angle between them, the base of triangle *C* was calculated. With this base and with the crib as the third point another triangle was formed, having the Wilson Ave. line to the crib as a side common with triangle *A*. A solution of this last triangle checked the common side.

The lake tunnel comprises drift 1, extending 13,882 ft. west from the crib, and drift 2 runs from this point to the shore shaft. The angle between these drifts is 2° 24′ 22″.

A branch will be built from the new tunnel to the present Lake View tunnel, which is at a higher elevation than the new one. This will permit the present Lake View crib and intake (only 2 miles from shore) to be abandoned, both tunnels being served by the new intake 3 miles out. The survey of this branch had to be done very carefully, so as to locate its western end exactly under the old intake shaft. From this end a short shaft will be driven upward and closed at the top with a horizontal steel bulkhead. When the new tunnel is completed, the old intake shaft will be pumped out and extended downward to meet the stub shaft of the tunnel, the bulkhead being then removed. The old intake shaft will then be plugged above the level of the Lake View intake tunnel.

As a check for this survey a diamond-drill boring was made on the tunnel line at a point 103.52 ft. east of the Lake View crib. A buoy for the drill hole was set

on the tunnel line (by sighting from shore) and also in line with two points previously established on the Lake View crib.

A boring platform, on piles, was constructed over this point, and the tripod of the boring machine was set by sighting with a transit on the tunnel line from the shore. The boring was sunk to 118 ft. below water level, or about 6 ft. below the springing line of the tunnel. The hole was $1\frac{3}{4}$ in. in diameter, and a 1-in. pipe about 18 ft. long was grouted in at the bottom, to be found when the tunnel reached that point.

Break Holes in Walls To Sight Through

After the boring had been completed, the platform was used to make an overhead survey to tie in the underground work with the Lake View crib. The transit was set over the boring and sighted on a plumb-bob suspended over the center of the intake shaft inside of the Lake View crib. To obtain this sight it was necessary to make a hole in the outer wall of the crib and also in the well-room wall. When the transit had been sighted on the bob over the intake shaft, the telescope was turned to the sight on the tunnel line on shore. This was repeated twice. The distance from the boring to the center of the shaft was carefully measured. As the distance of the platform from the crib breakwater was nearly 200 ft., a 200-ft. steel tape was used.

Two points 52.06 ft. apart were set on the Lake View crib platform, on the line of the connecting tunnel. The distances betweeen them and from each point to the boring were measured. The transit was set up over each point in turn, and the angle between the boring and the line on the crib platform was read. With these two angles and the line on the crib platform as a base, the distance from the boring to the point on the connecting tunnel line was calculated and found to check exactly the measured distance. This miniature triangulation was made from the base line 52.06 ft. long, on the crib platform.

Distance from Boring to Shore Shaft

The distance to the boring from the shore shaft was calculated from the base line of triangle *A* of the Wilson Ave. crib triangulation and angles read with the transit set at the ends of the base line. When the tunnel had been excavated to the calculated distance, the pipe left in the boring was found. The actual distance of the boring from the shore shaft was within 4 ft. of the calculated distance. This was considered satisfactory, because the platform and tripod were moved by wind and water during observation, and it was difficult to catch a sight with the transit. The pipe was only 3 in. north of the tunnel line, which was considered to show remarkable accuracy of work.

Methods of Underground Survey

The method of transferring the line down all the shafts comprised the use of two ordinary transits reading to 20 sec., and two plumbing wires (No. 1 piano wire) from 6 to 10 ft. apart, each carrying a plumb-bob weighing about 10 lb. The transitman on top kept these wires carefully on the tunnel line by continual observation. The pumps, cage and all other work about the shaft was stopped. The engineer below adjusted the plumb-bobs so as to allow them to hang freely in pails of oil. The oil was sufficiently thick to prevent the bobs from swinging widely, and they came to rest more quickly than in water. The crew on top would signal by tapping on a pipe when the wires were on line.

The crew below had the transit set in the drift back of the one to be lined, and about 50 ft. from the wires. On receiving the signal, and when the bobs had come to rest, the observer would shift the transit to line with the wires. He would then set a point in the roof of the tunnel close to the shaft and at least one more point nearer the face of the drift.

All the shafts were plumbed three or more times while the first 2000 ft. of tunnel was being excavated, and about once for each 2000 ft. beyond. The latter plumbings check the stability of the points previously set and also the accuracy of those carried to the face of the drift from the original points. The line points are spuds driven into wooden plugs set in 2-in. holes drilled 6 in. in the roof. A horseshoe nail with a small hole drilled for the eye is used for a spud.

Platforms in Drifts for Transit Work

In some of the drifts, platforms were used for transit work. These were built high enough to allow trains and men to pass freely underneath. In this way the instrument work was carried on without interfering with the tunnel work. A trivet (instead of a tripod) was used on the platforms. The transit was set up under the point in the roof, from which a plumb-bob was suspended. Grades were carried forward from plugs set in the side of the drift. For entering the face of the drift for drilling, the line was usually sighted in by the plummet lamps. Sometimes the grade was carried into the face by the use of plummet lamps, and at other times by a straight-edge about 10 ft. long. Hand levels were found unsatisfactory.

Three of the shafts being on the line of the tunnel, the surface line was transferred directly to the drift. Two other shafts were located away from the tunnel line, to which they were connected by stub drifts. At these it was necessary to turn an angle (the same as on the surface) between the shafts and tunnel line. This angle was checked by repeating the plumbing operations.

Telephone Assists Tunnel Survey

In the long drift under the lake (drift 2) from the shore shaft, a novel method of telephone aid was used to speed up the work of checking the line from the shaft to the heading. Three "sight boxes" were used for foresights, and no backsights were taken. Each box contained two clusters of two 60-watt tungsten lamps, connected to a piece of extension wire plugged into a socket on the lighting wires along the wall. A plumb-bob was suspended from the line point in the roof between the clusters, and sighting was done on this bob. The first box was set about 1400 ft. from the shaft. After setting the first sight box, the rodman went forward about 1000 ft. to the next point and awaited the observer's signal to place the second box.

The observer and the rodman each carried a telephone hand set, these being connected to the tunnel telephone wires by scraping the insulation from the latter. The observer would sight on the first box and when he had the vertical hair on the plumb-bob he would hammer

on the power air-pipe. The rodman would answer on the telephone, and would then be directed on the telephone to place the second sight box and bob.

When this plumb-bob was carefully set on the line with the first sight, the rodman would take his telephone and the third sight box to the next point, about 1000 ft. beyond. The rodman's helper would return to the first sight box and remove it for the observer to set the transit at that point. The helper would remain and aid the observer in setting up the instrument, then take the sight box forward to the rodman. The instrumentman would foresight on the second box and, as before, sight forward to the rodman and set that point. This operation was repeated until the line was checked into the heading.

By this use of the telephone much longer sights were used and also much walking backward and forward to receive instructions was eliminated. Only the helper was compelled to double back on the trip, and the entire drift (now 13,000 ft. long) was checked in one day.

Survey Work for the Land Tunnel

The land tunnel is located under Wilson Ave., but although this street is practically straight, it has several offsets and a few very small angles, while its width varies from 80 to 66 ft. The 12-ft. tunnel section called for 13 ft. 4 in. excavated width, and it was desired to pass under the offsets in the street without sharp curves and short tangents. A preliminary survey determined the possibility of driving this tunnel within the street lines. Measurements were taken with ¼-in. steel tapes, and corrections made for temperature. Permanent points were set on the triangulation surveys and also on the preliminary and location lines. These points were either copper plugs or iron bolts.

There is a shaft at the shore end of Wilson Ave. and another at the Mayfair pumping station, with two intermediate shafts. The distances between the shafts are from 1½ to 1⅞ miles. Drift 3 runs west from the shore shaft; two drifts extend from each of the intermediate shafts, and drift 8 extends east from the Mayfair shaft. Connections have been made between drifts 3 and 4 (within 1.2 ft.), and between drifts 7 and 8 (within 0.2 ft.).

Triangulation was necessary to locate the line of drifts 7 and 8, as these could not be run on the surface. Sights were taken from the construction trestle at the Mayfair shaft to the headhouse of the next working shaft (Lawndale Ave.) and to the Mayfair gate shaft. A sight was also taken from the Lawndale shaft to the gate shaft. The distance from the trestle to the gate shaft was measured. The third side of this triangle was the tunnel line, as determined previously by a traverse from the Mayfair shaft to the Lawndale shaft. This traversed line checked closely.

Use Broken Sandstone in Concrete Pavement

Several sections of concrete pavement were laid in Duluth, Minn., late last fall as an experiment, using Kettle River sandstone as the coarse aggregate. Lyonel Ayres, city engineer, writes that the pavement has come through the winter satisfactorily, only two small hair cracks appearing on the surface. There was no travel on the pavement before winter set in.

Society Service

A Section Dealing with the Results of Teamwork by Technical Men

Good Work in St. Paul

For some time engineers have been looking to Minnesota to learn of the results of the coöperation practiced there between the various societies. The Civil Engineers' Society of St. Paul, one of the organizations in the affiliation, has recently paid the expenses of a delegate to the National City Planning Conference at Kansas City, who made a formal report and with it a recommendation to the mayor to appoint a planning commission of local men. Quite a few members of the local society have been appointed to important committees of the Association of Commerce.

Publicity is obtained through the *Bulletin*, issued jointly with the Minnesota Surveyors' and Engineers' Society. One of the staff of this monthly magazine gets notices of the society affairs into the local papers. These items are intended to show the community what is being done to advance the interests of the profession. The governor has been induced through the society to put an engineer on the State Board of Health. Employment is handled in the *Bulletin*.

Brooklyn Works at Coöperation

The Brooklyn Engineers' Club gets out annually a 4½ x 7-in. pamphlet giving its organization, aims and appeal. The one for 1917 contains attractive views of the clubhouse, a brief outline of the organization and information as to meetings, the fine library maintained, entertainments anticipated, excursions planned and advantages of membership. Grown up since 1896 under the wing of the national societies in Manhattan, it aims to supplement them rather than interfere with their activities. It combines with its broad technical programs and social activities features which are not available either in the national society or in any social club. The club endeavors to help the younger members to improve their technical and financial condition.

Brooklyn Works at Co-operation

Results have been secured in Rhode Island, where practically all the resident members of the national engineering societies, together with twice as many more not so affiliated, are associated in the Providence Engineering Society, a membership of over 500. The general meetings of the past year have had an average attendance of 275 and the section meetings, of which there were 37, an attendance of 45. Local topics discussed at these meetings have aroused a great deal of public interest.

The society has been instrumental in securing important state legislation, has taken an active part in public safety work, has made an engineering census of Rhode Island, and is helping the advancement of technical education in the public schools. This means that the engineers of Rhode Island are getting acquainted with each other and have the inspiration of working in a common cause.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Should Concrete Pavements Have a Prepared Sub-Base?

Sir—I was much interested in your editorial comment on p. 515 of the issue of June 7, on the results of the investigation conducted by the Universal Portland Cement Co. as to the use of sub-base with concrete surfaces. This is a subject to which I have given considerable study during the past six years, and it is rather surprising how little satisfactory data can be secured relating thereto, when you consider the large amount of money involved.

Excavation for pavements in Duluth will possibly average about 80c. per cu.yd., while material for a sub-base may cost approximately $1.60 per cu.yd. Thus, for a sub-base 6 in. in depth the cost will be abount 40c. per sq.yd., or an additional cost of approximately 22% over that of a first-class concrete pavement. It would seem that before any such expenditure as this would be justified, there should be some very well defined function that the sub-base should perform in connection with the pavement.

So far as I have been able to ascertain the main purpose of the sub-base is to effect drainage and thus eliminate the swelling of heavy clay soils due to severe frost action. I inclose two photographs that were taken of a concrete pavement in the early spring. This pavement has a 6-in. cinder sub-base and is of the granitoid



FROST HEAVES CONCRETE PAVEMENT

type, with a longitudinal expansion joint down the center and cross-expansion joints every 25 ft. You will notice from the first picture how the upper slab has lifted above the other, while in the second picture it shows the pavement lifted at the center so that the fingers could be inserted with ease in the longitudinal joint. This is one case of several where excessive displacement of pavements has occurred, where a sub-base has been provided. In some cases this vertical displacement has exceeded 6 in. This could hardly be due entirely to swelling clay, for the rise is equal to that of a body of water 6 ft. in depth frozen solid for its entire thickness.

If the pavement be examined carefully one will find that this displacement is due to water freezing in successive layers, and that this condition has been aggravated by the porous sub-base allowing the water to



WATER FREEZING IN SUCCESSIVE LAYERS CAN EXPLAIN APPEARANCE OF THIS CREEK

spread out readily over a considerable area. Under no circumstances could a sub-base be expected to remove water other than that which might accumulate between the clay subsoil and the concrete, and, therefore, to be effective it must be carried to such depth that contained water would be safe against accumulative freezing, which, of course, is never done. While I am thoroughly convinced that this sub-base as a drainage feature, in cold climates at least, is not only worthless but is actually a detriment, I am not so sure, however, but that there are conditions under which it does add something of value.

The reason I think cinder or slag are preferable to sand or gravel when a sub-base is used is that the thermal conductivity of the former materials is very much lower than that of the latter. The correctness of this theory is substantiated by the better conditions of sidewalks that are laid on cinder than those laid on sand; better protection seems to be provided against frost penetrating the clay subsoil, and the intensity of freezing is thus reduced.

Another function possibly performed by the sub-base is the decrease in friction between the concrete slab and the subsoil; this could only be in times of cold weather, as the coefficient of friction between concrete and moist clay is less than that between concrete and materials used in the construction of a sub-base. However, even then one can conceive of conditions where high frictional resistance is even desirable, as it may serve somewhat in the nature of reinforcement and thus strengthen the slab.

Of course, every one will admit that a sub-base will increase the bearing power of a very wet subsoil; how-

ever, in most cases tile properly laid will accomplish the same result at a less cost.

Taking the matter as a whole, it seems to me that conditions are very unusual where an engineer can justify the expense incident to the construction of a sub-base, and much of the disagreement among engineers and those having to do with pavement construction is due to lack of strictly scientific data relating to the underlying principles. There is room for much research as to the behavior of clay under various conditions of temperature and varying amounts of contained moisture.

And it would seem that the science of paving is a matter which the physicist could very profitably give some attention to, and with the aid of his delicate instruments determine within more reasonable limits the complicated workings of the natural laws with which the paving engineer is confronted.

JOHN WILSON,
Civil Engineer.

Duluth, Minn.

Bituminous Foundations for Sheet-Asphalt Surfaces

Sir—It seems to me that Lester Kirschbraun's paper, "Bituminous Foundations for Sheet Asphalt Surfaces," on p. 591, issue of June 21, is indeed timely, in view of present-day motor-truck traffic, and in view of the increasing tendency toward cracks in asphaltic surfaces, particularly asphaltic concrete. Under closer inspection we are getting better concrete foundations, and yet the result is that the frequency of cracks on surface and base is constantly increasing.

Perhaps engineers, at least many of us, and contractors almost one and all, have gone along laying portland-cement concrete foundations and taking it for granted that they have a pavement which will stand most any test. But such a base is not standing every test. In our 45 miles of asphaltic pavement (35 miles of which are asphaltic concrete) the cracking feature has started us to studying with reference to what kind of a pavement we can lay that will not crack.

Mr. Kirschbraun and the writer have had many talks on this subject and have come to the conclusion that something must be done in Oak Park, at least, and we will do some experimenting along the lines alluded to in Mr. Kirschbraun's paper, as soon as the opportunity presents itself.

May we ask where are the contractors on discussions of this nature? Contractors should be vitally interested in developments and improvements in pavements, yet almost every improvement that has been made was conceived by an engineer. Paving is the contractor's business, not the engineer's particularly. Why should he not come forward with at least his ideas now and then?

H. W. SKIDMORE,
Construction Engineer,
Department of Public Works.

Oak Park, Ill.

Manufacturers and Technical Societies

Sir—An editorial on page 1 of the July 5th issue of *Engineering News-Record* touches briefly—too briefly—upon a most vital and important relation between the American manufacturer and such of the leading technical societies as the American Society for Testing Materials. The statement is made that ". . . the meetings are attended by the manufacturers to such a point that sometimes the original character of the society is lost." If such be the case, and no doubt it is, value might come from speaking frankly of the causes and the probable ultimate drift of our leading engineering societies.

In the first place, the engineer himself is finding an ever-increasing value for his services among the commercial interests of the country. The younger men of the profession are finding far greater opportunities by taking root in the fertile soil of the quickly growing industries of America. Now, when men who are trained as engineers take hold of the producing interest of any commodity there invariably results fundamental changes looking toward improvement, standardization and economy. It has been observed that at least these men attempt to pin the badge of honesty and frankness to their own commodity as well as to their own character. It is due them that full credit be given for such honesty and frankness. Few will deny that men who have studied their business in detail from a commercial, laboratory or consuming point of view are a valuable asset to any technical society whose chief aim it is to create a closer and better understanding between these three branches of modern industry.

The second cause for the dynamic aspect of our technical societies with relation to membership is to be ascribed to a new realization on the part of the manufacturers themselves, who have found that it pays to be honest and fair as well as "open for inspection." The editorial in question states that "it remains for the consumer to continue to be alert in the consideration of reports in order to preserve the proper balance on which the whole life of the society depends." Such is unquestionably a true statement of the case. It is a well-recognized human attribute for one to be over-enthusiastic for the particular commodity in which he has become most interested. On the other hand, the engineer interested primarily on the consuming side of the fence owes not alone to himself an active and virile interest in the affairs of technical societies, but likewise owes his best support to all the general administrative affairs of the society so that a balance will be maintained guaranteeing that continuity of healthy development for American industry which in time is sure to extend and permeate the commercial relations of the entire world.

The American engineering societies should therefore welcome the producer as well as the consumer and effect a balance of influence from these two sources, at the same time giving equal credit for honesty and fairness.

HARRY Y. CARSON,
Central Foundry Co.

New York City.

American Society for Testing Materials

Sir—Referring to the news account of the twentieth annual meeting of the American Society for Testing Materials on pp. 11-13 of the issue of July 5, I would take the liberty of calling attention to several slight errors. On p. 12, first column, the sentence beginning with line 5 should read, "The committee's recommended specifications were all accepted as tentative." That is, all of its specifications and revisions were recommended

as tentative, and, therefore, are not subject to letter ballot of the society.

The same remark applies to the sentence beginning at the bottom of p. 12, the two specifications there referred to being submitted as tentative. On p. 12, second column, the phrase "with the addition to the title of the words 'all other preservative oils,'" should be omitted. The motion to add these words to the title was made at the last session of the annual meeting, but was lost; and the specification was referred to letter ballot for adoption as standard, as printed in the report of the committee.

Referring now to p. 11, "Some Items of General Society Interest," permit me to correct what appears to be a wrong impression, as I read the second sentence under that heading. The action taken at the meeting with reference to the publication of tentative standards is to apply not only during the odd years (when the book of standards is not published), but also in the even years. Since tentative standards may be submitted in the even years, as well as the odd years, and since they are not printed in the book of standards, the need for a separate volume for tentative standards exists in the even years also.

Will you mind if I also call attention to several typographical errors which I believe you would wish to know about if they have not already been noticed?

On p. 2, the reference should be to Prof. Henry M. Howe instead of to Prof. M. A. Howe. On p. 11, second column, sixth line from the bottom, Committee D-10 should read Committee D-1. On p. 12, first column, the reference to "Committee A-3 on Wrought Iron" should be to Committee A-2. On p. 12, second column, in line 9, the word "calorimetric" should read "colorimetric." On p. 12, the reference to Mr. B. J. McAdam, Jr., should be Mr. D. J. McAdam, Jr.

C. L. WARWICK,
Assistant to the Secretary,
American Society for Testing Materials.
Philadelphia, Penn.

Use More Models in Engineering Schools

Sir—There has been a great deal of publicity given to methods of instruction in engineering colleges the past year, but as far as I have noticed there has been little published on the use of models in class work. This is a matter that deserves more attention.

The average student in college has had opportunity to see very few plants in actual operation. He is shown pictures, lantern slides, plans and sections, etc., and listens to many lectures on different phases. He reads about construction and operation in the textbooks and engineering journals, but he does not grasp the correct proportions of the various parts of structures as he should. This is not the fault of the instructor, nor is it due to the backwardness of the student. It is due simply to the fact that there has never been impressed upon his mind a picture of the different parts of the plant in their relation to each other.

The university which I attended, as a sort of "grand finale" to the civil engineering course, near the end of the senior year allowed the members of the class to take a three-day "inspection" trip to Chicago. As I look back, I think without a doubt that I learned more in those three days than I did in any one month of my schooling. There stands out the fact also that many conceptions which I had formed during the four years of the course were suddenly proved entirely wrong, and many hours of faithful study rendered useless simply because I had not previously had the opportunity of seeing what I was studying.

While, of course, it is out of the question, from a standpoint both of time and finances, to take many trips to plants in actual operation, especially when the school is far from any large center of industry, yet it is possible to bring to the student a model built to scale. I well remember in the corridor of our Engineering Hall, a model of a simple span bridge. It was made by someone in the university, and that someone will probably never know how it helped me to understand more fully the different parts of a truss.

In the American Museum of Natural History in New York is a room devoted to sanitation and water-supply. It contains a great many models of water-purification plants and sewage-disposal plants, and an afternoon spent in that room has proved as good to me as a week of study in textbooks.

As to the cost of such an exhibit I have not the slightest idea, but, unless it is prohibitive, I surely think that it would be the best investment any engineering school could make.

CHARLES M. BELL.
Woodcliff, N. J.

Should Public Improvements Stop?

Sir—I wish to take exception to your attitude regarding public improvements. It is admitted that the cost of construction work is at least double what it would be in normal times, owing to the scarcity of labor and the great demand for materials. In the case of public work this means that the tax or issue of bonds must be doubled; in other words, the taxpayer will be called upon to pay an unusual amount at a time when he is taxed to the limit to preserve his country. At least 3,000,000 of the more efficient alien workmen have been taken from the country for foreign armies. The nonalien is needed in the workshop and on the farm, and the money is needed for war expenses. For these reasons, it would seem that to advocate any public work but that of the most immediate necessity is unpatriotic, unprofessional and unbusinesslike.

W. H. RICHARDS,
New London, Conn. Consulting Engineer.

[The difference of opinion between the editorial expressions of this journal and the view held by Mr. Richards appears to be in regard to what work is of immediate necessity. If the country is to stop developing, if its public works are to be shut down, and if no business is to be continued except that immediately concerned with equipping and provisioning an army, the financial and economic setback to the entire nation will not be measured in terms of a few million or few hundred million dollars—it will be measured in terms of a national calamity. One can conceive that this country might be so close pressed by enemies that such a condition would actually be brought about. The calamity would then be inevitable, everyone would have to make the best of it. To take any action at present, however, which would even partially produce such a result, would be highly unpatriotic.

The factors to be balanced in considering whether work contemplated should be carried out are, on the one hand, the increased first cost due to inflated values prevailing in the present market, and on the other hand ultimate operating economy for the city or the country. For example, should a city at the present time by extending its utilities have the opportunity of inducing manufacturing establishments to locate within its boundaries, which would double its population, increase its property values and establish it on a more prosperous basis for years to come, the wise city engineer would not consider the present increased cost of construction materials in advocating the immediate execution of the necessary work. In other words, it is not the first cost, but the first cost considered in connection with the ultimate returns, which must govern.

It is unfortunate that Mr. Richards should make one or two evidently off-hand statements which cannot be passed without correction. It is not admitted that the cost of construction work is at least double what it would be in normal times, and an analysis of prices of labor and materials in connection with the cost of real estate and other expenses connected with every project will show, this journal believes, that the cost of construction has not increased by any such percentage. In the next place, so far from 3,000,000 of the more efficient alien workmen having left the country for foreign armies, the total number of aliens of both sexes and all ages leaving this country since January, 1914, is less than 536,000, while in that period immigration has reached a total of 1,382,000, departures exceeding arrivals only in one month of 1914 and two months of 1915.—EDITOR.]

Relations Between Engineer and Contractor

Sir—Our technical papers have given us very little advice on the human element entering into the relations between engineers and contractors. We have many technical discussions on strength of materials, structural design, equipment, organization, contract forms, the law, shortage and inefficiency of labor and many other related subjects; but what of the very necessary and ever present points of contact between those in charge of construction for the owners as engineers, and those in charge of construction as contractors? Are such matters pertinent to technical journals, or are they to be left in the domain of metaphysics and psychology?

What are some of these points of contact and what are the human relations between these two classes? Or is there only one class? Are we, as engineers, treating contractors fairly and squarely in all of our dealings with them? Are we writing our contracts and specifications clearly, concisely and completely? Are all doubtful features eliminated or drawn to the attention of the contractor? Do we call in competent contractors and ask their opinions as man to man, and equal to equal when we draw up plans and specifications for a complicated or unusual design? Do we write into specifications that certain items are to be done "to the satisfaction of the engineer," knowing full well that neither we, nor any of our assistants, have any idea of what that "satisfaction" will result in? Do we prepare our original estimates properly and completely, so that the actual cost figures do not over-run appropriations, and we do not have to cut some poor devil on his classification? Do we draw up our transportation clause on railroad work so that all work-train service is paid for by the contractor and then leave him to the tender mercies of the division officials, who are trying to make a record and who believe that all contractors are rich anyway? Do we really and truly take our contractors into our confidence? Do we mobilize all of their resources, mental as well as material?

What folly not to use to the limit the clearly bought knowledge and experience that some contractors continually and freely offer us. Many ghastly failures and costly experiments, many wranglings and lawsuits can be avoided by consulting an experienced and reliable contractor, both before the work is started and during its progress. Plans and specifications are not too sacred to be modified as conditions warrant, and the contractor's plain rights should be fought for by the engineer where the interests of other departments are involved. Better prices will be obtained and work will run more smoothly if close and cordial relations exist between contractor and engineer.

Of two large railroad systems operating on the same territory, one was fortunate in having an engineering department with a reputation for close figuring, but of absolute frankness and fairness to big and little contractors; the other road's engineering department had a reputation for doing small things—in other words, meanness. The work on the first road was always done quicker and cheaper than that on the second road.

It is commonly known among contractors that bids going to certain engineers have a percentage added to cover the unknown factor of the personal equation of that engineer. Would not more study of these relations pay us?

FRANK B. WALKER,
Assistant Engineer, Bay State Street Railway Co.
Boston, Mass.

West Genesee Street Bascule

Sir—I wish to call attention to a few errors made in adapting my article on the West Genesee St. bascule bridge for publication in *Engineering News-Record* of June 28.

Fig. 1, on p. 634, is not the West Genesee St. bridge, Syracuse, but another bridge, as is apparent from the arrangement of the lateral system and the absence of skew.

Referring to a statement in the title and the first paragraph, I would like to say that the use of a fixed floor over the counterweight pit does not depend upon the skew of the bridge. On the contrary, in a skew bridge the fixed floor, adopted for other reasons, introduces difficulties which are overcome by the special features of design illustrated in the article.

The third paragraph of the printed article states that because the girders descend through openings in the pit floor, a heel-lock may be omitted; whereas the heel-lock is omitted because the pit floor is stationary and the live-load back of the trunnions are not carried by the moving structure.

ARTHUR G. HAYDEN,
Bridge Designer, Barge Canal Office.
Albany, N. Y.

THE ENGINEER IN FIELD AND OFFICE

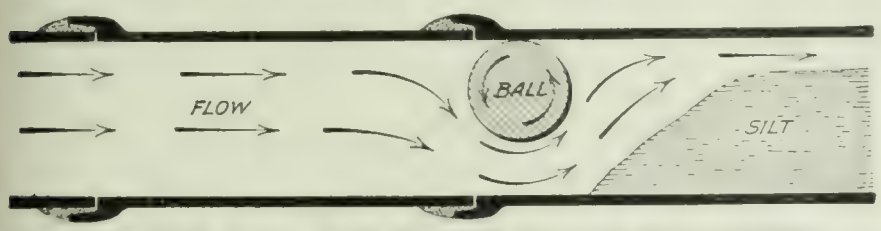
A DEPARTMENT DEVOTED TO DETAILS OF THE DAY'S WORK

Zinc Balls Clean Sewers

By J. C. Keeley

Assistant Engineer, Engineering Department, Owensboro, Ky.

SOME years ago a pipe sewer system was constructed under the supervision of E. B. Shifley, city engineer, Owensboro, Ky. It was stipulated in the specifications that a ball 2 in. smaller than the bore of the pipe should pass through without lodging. In making this test on a certain section of sewer, the ball became lodged and had to be flushed to the manhole below. When the ball appeared in the manhole, it was found carrying a half brick before it. Appreciating the



HOW THE BALL AND WATER CLEAN THE SEWER

significance of this accidental discovery, Mr. Shifley applied this principle to the cleaning of sewers. The writer for a number of years has used this method with excellent results. It is not successful where roots are encountered, but where silt and débris have collected in the sewer—due to the absence of flush tanks and catchbasins, or where the latter have been allowed to fill—this plan has been found to be cheaper than the drag or bucket method and entirely satisfactory.

When a sewer is flushed without a ball ahead of the stream of water, the sand or silt is pushed forward by the flow of water and the outlet is choked, thereby



ALL THIS DIRT REMOVED FROM SEWER BY FLUSHING BALLS AND ACCESSORIES SHOWN

causing the water to back up and so lose its nozzle pressure; when a ball is used ahead of the water, the outlet is kept partly open, thus utilizing the pressure.

If the sewer is badly choked, a ball 5 to 10 in. smaller than the diameter of the pipe is placed in the sewer at the manhole and a stream of water applied behind the ball until it appears at the manhole below; the deposit is removed from the manhole, and a larger ball is then started from the manhole above and carried through as before. This plan is repeated until the sewer is clean. To insure a clean sewer, the last ball to pass through should be 2 in. smaller than the sewer. Where sewers are not badly choked, the first ball may be large, the size depending on the condition of the sewer. The ball should float and should be as light as is consistent with strength. Those used with best results are hollow and made of two thicknesses of No. 24 gage zinc, the seams being set at right angles. The sizes run from 4 to 22 in. Wooden balls have not proved satisfactory.

A fork or screen with a sandbag directly in front of it should be placed at the inlet end of the lower manhole. This is to prevent the ball, together with the silt expelled from the cleaned sewer, from escaping into the next section of sewer. A line of sewer should of course be cleaned in sections, beginning at the upper manhole.

Last year an abandoned sewer of 15-in. diameter was found to be almost filled with silt, there being a space of about 2 in. only at the top to allow passage of water. In cleaning this the writer first used a 4-in. ball, and last a 13-in. ball. With the aid of these balls, 5 cu.yd. of sand was removed from this sewer in four hours.

The accompanying sketch shows the position of the ball and its action. The view shows the material removed from a section of sewer and the balls and tools used in doing the work.

Well-Constructed Farm Entrance Drains Are an Economic Necessity

By Donald A. Thomas

Michigan State Highway Department

IN BUILDING culverts to connect roadside ditches at farm entrances, care should be taken that they are of adequate size, of such strength that they will not become broken and so tight that they will not leak. The



PERMANENCY OF CULVERT INSURED BY PROPER END WALLS CARRIED BELOW FROST LINE

DATA FOR ORDER No. _____

Estimate No. _____

Description _____

Location _____

Contractor _____

Owner _____

Ship to _____

Shipping _____

Date of Order _____ To be completed 1st Fl. 3-16 2nd Fl. 4-10

Balance _____

Material to be ordered _____ List for ordering _____

Material on hand _____ Cut Sheets and Report _____

Painting _____ Shop Paint _____

Typ. entered by _____

Assembling completed by _____

Additional data _____

DRAFTING DEPARTMENT

Date Rec'd FEB 3 1916 Filed 6-24-6

Order Compl 6-24-6 Draftsman RAJ

Dwg No F 615 Set Shts No —

Shts No — C Plans —

Shop Lists No 1 to 4

Remarks _____

Steel Shop _____

Foundry _____

Blacksmith Shop _____

Machine Shop _____

Misc. _____

FIG. 1

Order No. 58645 Structure Clarendon Hotel Est No. 38756

Architect Thomas Jones Order Rec'd 2/1/16 Filed 6/24/16

Contractor John Smith & Co Draw Rec'd 2/5/16 Filed 6/24/16

Location Great Falls, Mont Draw Appd 2/19 Retd 2/26

Erector Contr Draw Appd 3/9 - Retd 3/16

Drawn 3/6 3/10 3/20 Plans Retd to Contr 6/24

Tonnage 376 Det Held Dwg 2 cols 2/26

Checked RAJ Det Ret'd " 2 " 3/28

Draftsman DJ TG Total Cost 300.50 P/T 804

Steel Shop 3/1 - 3/18 - 3/21 Time RAJ 9½ - FL 1½ CJ 13½

Stairs & Fire Esc. Shop Time

Ornl Shop Time

Misc'l Shop Time

Remarks Dwgs to Archt for approval COMPLETE.

FIG. 3

DRAUGHTING DEPARTMENT

Order No. 58645 St. Paul, Minn., Feb. 20, 1916

To Thomas Jones, Archt.,

At Statler Bldg., St. Paul, Minn.

The ( ) copies under separate cover { } of our { shipping lists ____ set sheets ____ drawings A-1-2-3- }

1st.Fl.Beams Basmt.Cols. for Clarendon Hotel-Great Falls. are sent for your convenience and information. In case of any errors or omissions, please notify us at once.

NOTICE

We cannot be responsible for deferred shipments when delayed in receiving measurements or approval of our shop details.

Yours truly.

E. A. Goetz
CHIEF ENGINEER

Remarks: Please approve and oblige.

Check figures noted on drawing No. 2.

2M 6-16 C&H

FIG. 4

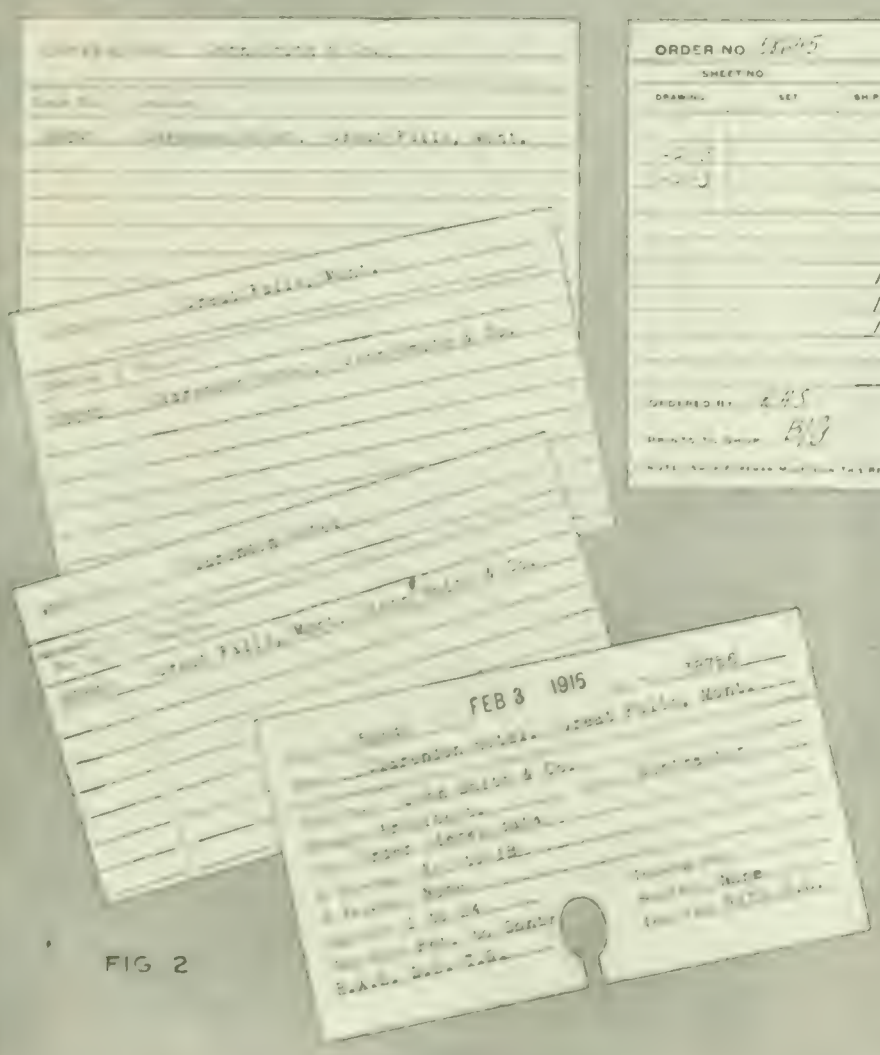


FIG. 2

ORDER NO 58645 Date 3/1/16 191

SHEET NO DRAWING	SHEET NO SET	SHEET NO SHIPPING LISTS	SHEET NO BILLS	COPIES	SENT TO	REC'T
				1	Asst. Supt	
			1 to 4	1	Template	
			1 to 4	2	Structural	
				1	Pattern	
				1	Blacksmith	
				1	Machine	
		1-2		1	Bin Clerk	
		1-2		1	Cost Clerk	
		1-2		1	Shipg Clerk	
				1	Storekeeper	

ORDERED BY RAJ

PRINTS SENT I

DATE 3/1

FIG. 5

REQUISITION

For drawings, etc., from Drafting Room files for use by other departments or other parties

Order No. . . Date . . . .

Data Sheet (with shipping lists, etc.) . . . . .

Plans . . . . . .

Drawing . . . . . .

Set Sheets . . . . . .

Shipping Lists . . . . . .

Sign . . . . . .

FIG. 6

DEFERRED SHIPMENTS

ORDER NO. | ORIG. SHIP. | BY

CONTRACTOR | DATE

MATERIAL	KIND	DRGS. S. L.	SHOP	SHIP

REASON FOR DELAY:

FIG. 7

THESE FORMS FACILITATE WORK OF STRUCTURAL STEEL DRAFTING ROOM

ends of the culvert should be protected by a head wall carried down below the frost line to a firm foundation. If this is done, it will protect the ends of the culvert from being broken, frost will not displace it, the surrounding earth will not slide down in front of the opening, and with the further necessary work of keeping the ditches clear, the culvert will be able to care for all the water alongside the road.

The prevalence in many localities of inadequate culverts improperly protected and too small in size is due to the absence of a settled policy and to an underestimation of the importance of these structures. In most cases the installation of a culvert is left to the property owner—perhaps in some cases under the supervision of the authorities—but unless care is taken, the completed job is lacking in many details that would tend to provide a suitable means of carrying off the water which inevitably accumulates in side ditches during storms. Even when precautions are taken to lay the culvert properly, it is very infrequent that the necessary consideration of permanency is sufficiently weighed.

The accompanying illustration of a farm entrance on a Calhoun County, Michigan, road, is interesting in this connection. It is an example of the substantial type of work that the Michigan State Highway Department is contending for on all state-reward roads.

Definite Procedure Simplifies Drafting-Room Work

By E. A. Goetz
St. Paul, Minn.

IN PREPARING structural-steel and iron shop details, the object to be attained is to secure legible and accurate drawings at the lowest cost per ton and at a stated time. To control the work of a drafting room to meet the above conditions, a definite and efficient method of procedure is necessary.

The writer has conducted a drafting room for some years on a regular basis of procedure with respect to each order. The order is received on a data sheet, Fig. 1, together with plans, specifications, etc., from the order clerk, and is recorded by the drafting-room clerk on four cards of the general drafting-room files, Fig. 2. The data and information then pass to the chief for examination. He records the order on a card of his private file, Fig. 3. As will be noticed, this card is useful as a daily follow-up and indicates very nearly the status of an order at a glance. The reverse side is used for special items. The "complete" stamp is affixed by the chief when the order is completed and filed.

The chief now assigns the order to a checker or squad boss who is a specialist, more or less, in the particular line of work, such as railroad buildings, factory buildings, tank and plate work, ornamental ironwork, fire escapes, railings or the like. This classification should not be carried too far with all men, as it will aid the work of the office to carry men who are experienced in more than one line, especially when the force is decreased.

The chief draftsman should make it a point to review his cards each morning, consult the checkers and prepare a schedule, as far as possible, of orders on which drawings are to go to the shop or for approval that day, and of orders on which there will be correspondence, drawings to contractor, etc. Letter writing is decreased considerably by the use of the form, Fig. 4, when drawings are sent for approval, measurements or for the contractor's use. When results are slow to follow, delay is lessened by using the stamp at the lower left-hand corner. Trouble is avoided in the field by sending the contractor details as well as erection plans.

Fig. 5 shows a record of all prints sent to the shops and the time they were delivered. "Prints to shop" is a signal by the chief to the blueprinter as to the urgency of getting the drawings to the shop.

Timekeeping System

The drafting-room clerk records the time spent on each order by each man daily. This record is given to the chief when the order is filed, and there is therefore maintained on the chief's card a record of costs, and incidentally of the draftsmen's efficiency. This cost record is used by the estimating department in some cases and includes the general overhead of the drafting department. When an order is complete, the drafting-room clerk files all data and drawings in the drafting-room vault and completes the record on the data-sheet stamp, lower right-hand corner.

When any department wishes to use drawings on file in the drafting room, the recipient must sign for the drawings requisitioned on the form for that purpose, Fig. 6.

As will be noticed in Fig. 1, a certain time of delivery is scheduled (or of completion of the order). When, however, a delay arises in the drafting room due to lack of information, measurements or approval of shop details, the fact is recorded on the forms 7. This gives the order clerk an opportunity to reschedule the material to be delivered at the time the drawings go to the shops.

Occupants of Buildings Limited by Stair Capacity

The Committee on Safety to Life, of the National Fire Protection Association, presented at the recent annual meeting a report that was mainly devoted to an analysis of the safe occupancy of a building based on the capacity of the stairways. The report was accompanied by an elaborate table that gives the safe capacity of a floor under varying conditions of construction, sprinkler protection, protection of vertical openings, height and character of materials stored, manufactured or used. The committee based its tabulation on the principle that the maximum emptying time of a building is the determining factor in floor capacity, though with the average and better classes of buildings the number of persons allowed per floor should frankly be in excess of the capacity of the stairs and the stair inclosures. There was the further proviso that, in the poorer class of buildings or with highly combustible occupancies, only so many persons should be allowed on each floor as can safely escape by the stairs. The report was subject to a long discussion at the meeting and was finally accepted tentatively and allowed to go over one year for final adoption.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Block Down Concrete Bucket and Use Dead End of Fall To Work Tower Boom

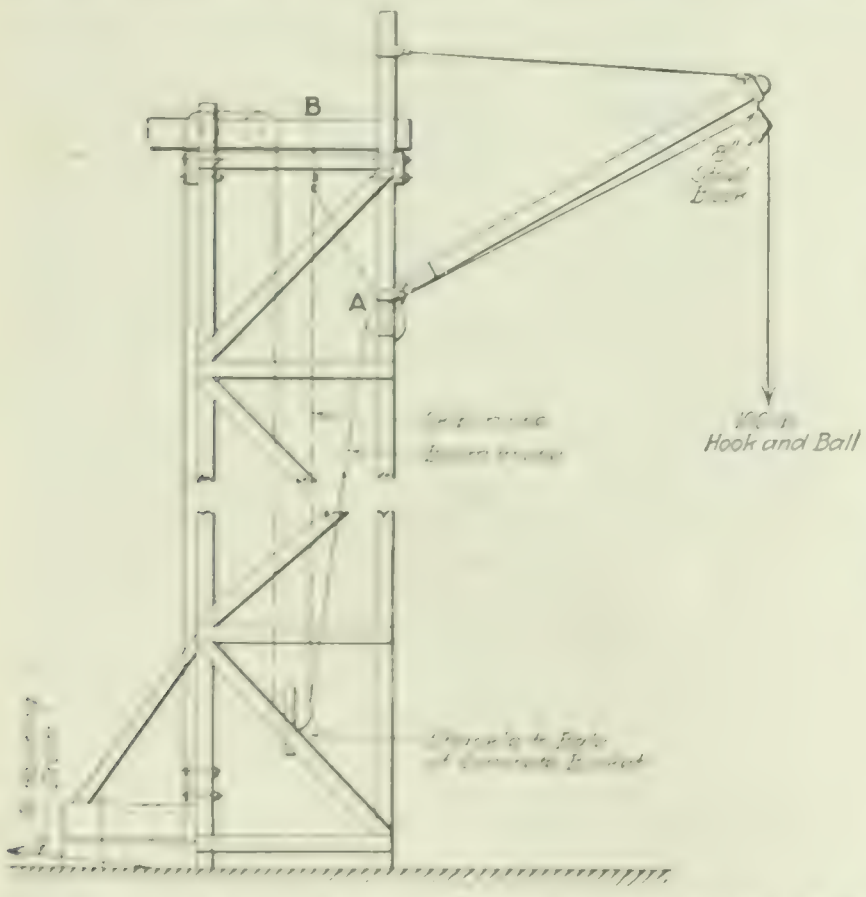
By George E. Harr

Superintendent, Turner Construction Co., Newark, N. J.

OFTEN in reinforced-concrete building construction where a tower is used it is not possible for various reasons to install two hoists, and the same line is used both to handle the concrete bucket and the boom rigged on the tower for handling reinforcing. The principal drawback to this method is the length of time it takes to change the cable from the bucket to the boom and back again.

The scheme shown in the sketch, which was used by the writer on Colgate & Co.'s building G-1, built recently by the Turner Construction Co., of New York City, was to reave a single cable through the bucket and then through the boom, leaving it in this position all the time. When the boom was to be used, the bucket could be held down by sticking a 4 x 6-in. timber through the hoist tower. When the bucket had to be hoisted, a dead end was made in the line at the top of the tower by taking a bight in the cable at *A*, throwing a turn over the header block at *B* and fastening it with two clips. When this is done and the 4 x 6 block taken out of the base of the tower, the rigging is ready for hoisting concrete.

This change was frequently made in 10 min. and never took longer than 15 min. When changing the rig from hoisting concrete to shape for using the boom, one man takes off the cable slips and another puts the 4 x 6 over the bucket at the bottom of the tower. This operation never took more than 5 min. and once the change was made in two. This time is, of course, much less than that required for the old way of rigging and unrigging the boom or bucket for each change.



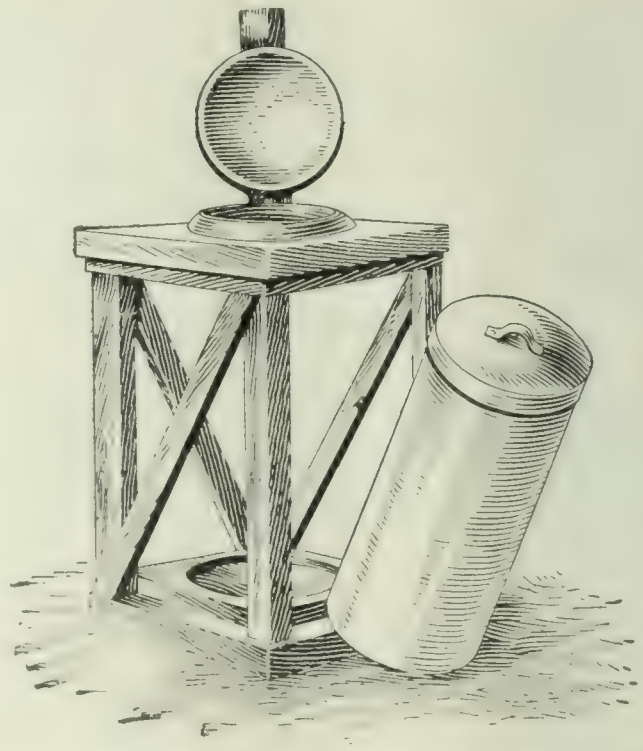
CAN CHANGE TOWER WITH THIS RIGGING FROM ELEVATOR TO DERRICK AND BACK IN 15 MINUTES

Sanitary Latrine Made from Carbide Cans and Thin Boards

By H. A. Sitterley

Chief Engineer, Low Moor Iron Co., Low Moor, Va.

A CONVENIENT, cheap and sanitary latrine that can be used in camp sanitation or on building construction before the plumbing is put in can be made from a carbide can set in a frame consisting of four 2 x 2-in. posts held together with eight ½ x 2-in. boards and braced by two ½ x 2-in. boards. One corner post is allowed to project up through the top, and serves as a handle—further serving to make the lid self-closing. A 100-lb. carbide can, resting on three ½ x 2¼ in. cross-pieces, and held in place by a ¾-in. board cut out circularly so as to fit the bottom of the can, forms the latrine proper. The top of the frame, which forms the seat and cover, is removable and the frame is made just high enough to admit the carbide can, thus making the receptacle flyproof. A solution of 1 lb. of chloride of lime to 8 gal. of water is used as a disinfectant, costing only about 1c. per gal. This latrine was designed and constructed under the direction of Roy S. Bonsib, at that time superintendent of the Low Moor mine, and can be built at a cost, including labor and materials, of less than $3. This arrangement has been in use several years, and has always proved adequate to the conditions for which it was originally designed.

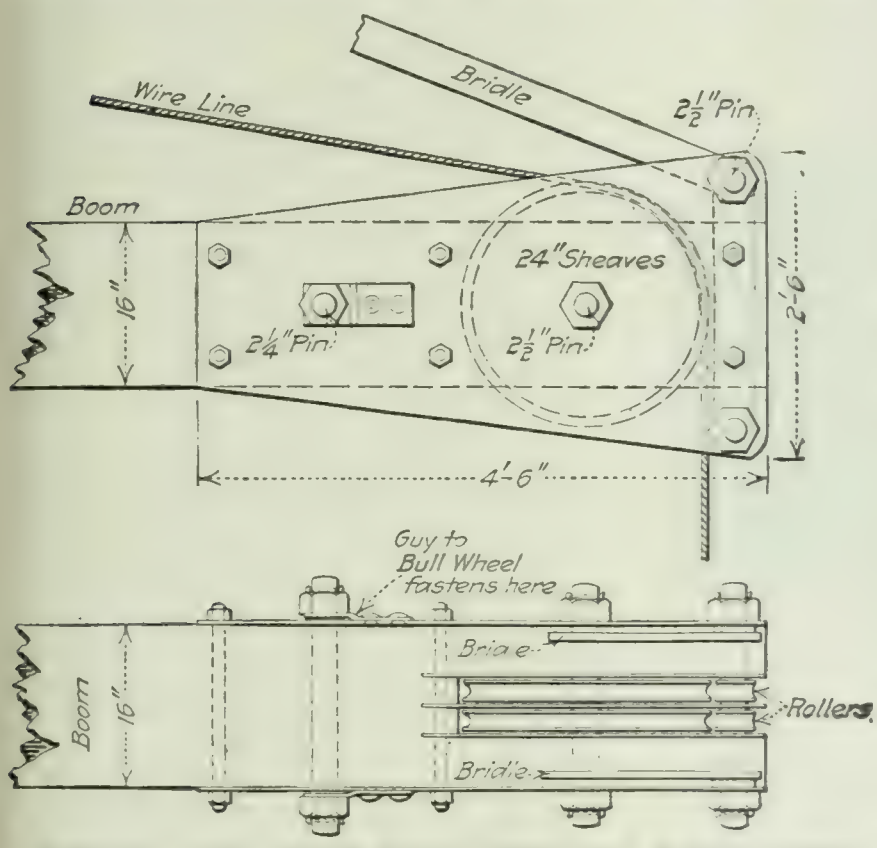


FLYPROOF AND PORTABLE, THIS LATRINE COSTS LESS THAN THREE DOLLARS

Lines Do Not Jump the Sheaves in This Boom End

By George W. McAlpin
Government Dam 39, Florence, Ind.

THE sketch shows a rigid boom end being used on the derrick boats at Government Dam 39 on the Ohio River. The inside plates shown aid in keeping the lines in the sheaves, and these boom points have proved very rigid and give excellent service. Five plates are used, two on either side of the stick, one between the boom and each sheave and one between the two sheaves.



STRONG, RIGID BOOM POINT DOES NOT WEAR LINES

The sheaves, 24 in. in diameter, are set side by side and held by a 2½-in. pin passing through them and through all five plates. The bridle, holding the boom line, is attached by a 2½-in. pin to the upper outside corner. Small steel rollers, running on the bolt through the lower outside corner, prevent the lines from wearing.

Tramway Cable Transports and Erects Own Bents in 20 Feet of Snow

A MINE tramway about 8000 ft. long was erected near Adair, Idaho, by the Riblet Tramway Co., of Spokane, in the dead of winter with 20 ft. or more of snow on the ground by the expedient of stringing the main cable and using it with a special carrier to transport the bents. As fast as each bent was erected the main cable would be attached to it, raising it sufficiently to bring it clear of the snow at the site of the next bent. The total elapsed time of construction was 85 days.

The cable, which was built for the Richmond Copper Mining and Milling Co., was erected in snow ranging from 15 to 28 ft. in depth, which had to be shoveled out of the way at the site for each bent. A light line was first run from the engine at the bottom end of the line to the extreme upper end of the tramway, and passed around a sheave. This line was used to haul the first main cable to place, the large cable being anchored and stretched as tightly as possible. The first tower bent, which had been erected next to the engine, raised



CABLEWAY CARRIES MATERIAL TO BUILD ITSELF

this end of the cable sufficiently to clear the snow at the site of the next bent. Material for the second bent was then loaded on the special buggy shown in the photograph, carried to place and lowered with tackle, by which the carriers were hung from the buggy. The buggy could then return, pick up another set of loaded carriers, and take them to the bent at which work was going on.

As each bent was erected the main cable was slacked off from the bottom, raised to the top of the new bent, and tightened. Material was received at the lower terminal on the tramway near the engine house.



MAN IS STANDING AT LEFT JUST BUILT IN BOOM

NEWS OF THE WEEK

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

Waterways Board Proposed in Senate Bill

Newlands' Amendment of Long Standing Tacked on House Rivers and Harbors Bill

The Rivers and Harbors bill, which passed the House of Representatives the latter part of June, has been amended in the Senate committee and reported to the Senate by that committee with additional clauses establishing a Waterways Commission which is not only to plan and control the navigation development of the inland waterways of the country, but to have broad powers in all related matters. These clauses incorporate an idea of waterways, irrigation, drainage and reclamation control long advocated by Senator Newlands and presented by him in many bills to previous congresses. The present Rivers and Harbors bill, with the new clauses and the usual appropriations for construction and maintenance, must now pass the Senate and be referred to a conference of the two houses.

The Waterways Commission clauses are as follows:

"That a commission, to be known as the Waterways Commission, consisting of seven members to be appointed by the President of the United States, at least one of whom shall be chosen from the active or retired list of the Engineer Corps of the Army, at least one of whom shall be an expert hydraulic engineer from civil life, is hereby created and authorized, under such rules and regulations as it may adopt, to bring into coördination and coöperation the engineering, scientific and constructive services, bureaus, boards and commissions of the several governmental departments of the United States and commissions created by Congress that relate to study, development or control of waterways and water resources and subjects related thereto, or to the development and regulation of interstate and foreign commerce, with a view to uniting such services in investigating, with respect to all watersheds in the United States, questions relating to the development, improvement, regulation and control of navigation as a part of interstate and foreign commerce, including therein the related questions of irrigation, drainage, forestry, arid and swamp-land reclamation, clarification of streams, regulation of flow, control of floods, utilization of water power, prevention of soil erosion and waste, storage and conservation of water for agricultural, industrial, municipal and domestic uses, coöperation of railways and waterways, and promotion of terminal and transfer facilities, to secure the necessary data and to formulate and report to Congress as early as practicable a comprehensive plan or plans for the development of waterways and the water resources of the United States for the purposes of navigation and for every useful purpose, and recommendations for the modification or discontinuance of any project herein or heretofore adopted."

Salaries of $7500 each are provided for the commissioners and an appropriation of $100,000 made for the expenses which the commission may find itself obliged to meet.

In Charge of British Recruiting Western Division



LIEUT. COL. JOHN S. DENNIS

THE McLean Pipers, attached to the Overseas Battalion of St. John, N. B., and the brass band of the 48th (Gordon) Highlanders of Toronto are now in Chicago aiding the British Recruiting Mission, the Western Division of which is under the direction of Lieut. Col. John Stoughton Dennis, president of the Canadian Society of Civil Engineers. During the week of July 15 New York City had the pleasure of entertaining these units of our ally, and it is expected that other centers than Chicago may be stirred by the characteristic music of the "bags." It was through Colonel Dennis' efforts that these detachments were sent to this country.

Twenty-five New Engineer Regiments Created

War Department Authorizes Organization of Additional Engineer Units for Service at the Front

Announcement has just been made at Washington that the War Department has authorized the creation of additional engineer units, aggregating about 25 regiments. These troops will have charge of the engineering operations behind the lines and will be engaged on such work as railway operation, construction and repair (in which they supplement the nine railway regiments already recruited), water-supply, forestry and topography. It is probable that companies of laborers will be included, but the question of electrical units has not been settled.

The engineers will be mobilized at the divisional cantonments. Officers will be taken mainly from the engineer officers' training camps, then from the engineer officers' reserve and from engineers not yet in either service.

Both Goethals and Denman Out of Shipping Board

On July 24 the President accepted General Goethals' resignation as president and manager of the Emergency Fleet Corporation and at the same time asked for the resignation of William Denman as chairman and member of the United States Shipping Board. Mr. Denman immediately tendered his resignation. The resignation of John B. White from the Shipping Board was also accepted by the President. It was announced that the President would appoint Edward N. Hurley, late of the Federal Trade Commission, as chairman of the Shipping Board, and Bainbridge Colby, a New York lawyer, to succeed Mr. White. Admiral W. L. Capps, a well-known naval constructor, will be detailed to serve as head of the Emergency Fleet Corporation.

Samuel M. Felton To Head the Army Railways Abroad

Samuel M. Felton, M. Am. Soc. C. E., president of the Chicago Great Western R.R., has been made director general of the railways abroad, in which capacity he will have charge of all the railway work done by the American Army in France. Mr. Felton is a civil engineer by education and training and has had long experience in railway construction and management. He was the railway adviser to the army in the Mexican expedition of last year and in the organization of the nine railway regiments.

Railways Must Pay Cost of Bridge Upkeep

St. Paul Wins Suit in State Supreme Court Affecting Street and Steam Railways

EDITORIAL CORRESPONDENCE

Court decisions and admissions by various railway companies have established the right of the City of St. Paul to make both street and steam railways pay for all bridge repairs and maintenance where bridges are necessary to maintain uninterrupted street traffic over their tracks.

An ordinance passed in December, 1913, by the City Council directed the St. Paul City Railway Co. to build and operate a line on Dale St. over a bridge crossing the Great Northern Ry. tracks, and the railroad was ordered to strengthen the bridge. The company refused to comply with the ordinance, and the bridge was strengthened by the city, which then brought suit in the Ramsey County District Court for $13,-047.

The district court denied the city's claim for $10,392, but awarded damages against the railroad company for $2655 for general repairs; on the grounds that the bridge having been erected in 1890 and the city and the St. Paul City Railway Co. having made an agreement that the city should strengthen the bridge it would not be fair to force the railroad company to pay that cost.

The State Supreme Court has just reversed the decision of the district court compelling the railroad company to pay the cost. This court held "That the use of a street for street-railway traffic is a public use in aid of public travel and that, when the use of a street for a street-railway line becomes appropriate, it is the duty of the railroad company to strengthen the bridge and make it fit for such use."

The Chicago Great Western R.R. has settled, without trial, in the Federal District Court, a suit brought against it by the city for $5000 for repairs to the Robert St. bridge over its tracks, and the Ramsey County District Court has upheld the city in its suit for $7000 against the Omaha Ry. and Great Northern Ry. for repairs made on the Westminster St. bridge.

Court Holds Up $250,000 Paving Work at Montclair, N. J.

The lowest bidder for paving some four miles of streets in Montclair, N. J., has secured an order from the Supreme Court at Newark, returnable July 30, requiring the Town Commission to show cause why a writ of certiorari should not be issued to review the award to a higher bidder made on July 17. On the day just named the commission awarded a contract for paving Park St. for $197,854 and Bellevue Ave. for $45,408 to the Standard Bitulithic Co., the material to be "warrenite." A bid $18,212 lower, to pave the same streets with a bituminous pavement in accordance with the "Topeka specifications," was submitted by Chapman, Harrop & Lawrence, who allege that the commission did not award the contracts to the lowest bidders under the ordinances authorizing the work. These ordinances, it is stated, called for bids on several kinds of pavements.

The Town Commission states that in awarding the contract to other than the lowest bidder it acted for what it believed was the best good of the town.

Constructing 455 Buildings at Leon Springs, Texas

A complete sewage-disposal system, lighting system with generating plant and water-works system supplied from wells constitute the utilities for the mobilization camp at Leon Springs, near San Antonio, Tex. The 455 buildings so far authorized in the cantonment will house four regiments of field artillery, one regiment of infantry, one regiment of engineers, two battalions of signal corps and a signal officers' training camp. J. H. Frederickson is superintendent for James Stewart & Co., contractors.

Why City Engineer Was Thrown Out of Office

Excuses in Statement by Los Angeles Board of Public Works—Real Reason Illustrated by Letter by City Engineer

VAGUE excuses for removing Homer Hamlin from office as city engineer of Los Angeles, Calif., are given in the announcement of the removal by the Board of Public Works, printed below. A letter from Mr. Hamlin calling the attention of the board to its own deficiencies illustrates why there has been an "entire lack of harmony between the board and the city engineer."

EXCUSES AND GENERALITIES OF THE BOARD

The board's statement of its reasons for removing Mr. Hamlin on July 16, signed by Lorin A. Handley, president, P. P. O'Brien and Owen M'Aleer, follows:

"The Board of Public Works has this day declared vacant the office of the city engineer. It was with regret that we were brought to this situation. The board gave Mr. Hamlin ample opportunity to resign and desired him to leave the city's service in that manner, but his positive refusal compelled the board to take this action.

"The board wishes Mr. Hamlin well. We recognize that he gave the city much valuable service during the past years. However, we were convinced that the time had come for a change. The administration of the office has long been under severe criticism. Members of the board have conferred with the engineer, individually and collectively, to seek some remedy for this situation, but no progress could be made.

"In recent months there has been an entire lack of harmony between the engineer and the members of the board. Efforts on the part of members of this body to bring about a more amicable understanding have been of no avail. Therefore it was impossible to continue this condition any longer.

NOT A SUDDEN IMPULSE

"This action is taken upon no sudden impulse. For some time the board has been carefully considering what should be done in the interest of the city, and after every angle had been considered and every problem was thoroughly weighed, the board felt that duty to the city compelled it to take the action of this day."

In marked contrast to the vague general allegations of the board against Mr. Hamlin is the following crisp, specific letter from Mr. Hamlin calling the board's attention to the failure of some oiled macadam accepted by the board and the City Council in spite of the city engineer's refusal to issue a certificate of acceptance:

"I desire to call your attention to the fact that the oiled macadam pavement on Malabar St., which was accepted on Jan. 4, 1917, over my objections, is already failing and disintegrating in many places throughout the length of this improvement.

REFUSED TO ACCEPT POOR WORK

"Your records will show that I refused to issue a certificate of acceptance on this work on the ground that it was not constructed according to the specifications and particularly that the rock provided by the contractor was unsuitable and unfit and would not compact under rolling.

"Despite my objections your honorable body referred my report to the City Council, with the recommendation that said work be accepted, and upon such recommendation the Council did accept the same.

"It was the opinion of the board, as I understand it, that my inspection was too severe in this case, and that my apprehensions as to the lasting quality of the work were unfounded.

"Unfortunately for the property owners who were required to meet the expense of this improvement, costing more than $11,000, the results prove that my objections and apprehensions were fully justified in this case. The taxpayers of the city also are affected by this defective work because of the increased expense of repairing and maintaining the street.

"It would seem to be consistent with justness and fairness that the contractor on this work, who was daily advised while it was in progress that he was not conforming to the specifications, should be required, if legally possible, to reconstruct the work and put it in condition to meet the requirements of the specifications."

Take Stock of Available Road Materials

Interstate Committee To Investigate Suitable Deposits—Nineteen States Represented

An interstate stocktaking of road materials is now under way, with Dr. William Bullock Clark, state geologist of Maryland, in general charge of the geological work, and Henry G. Shirley, chief engineer of the State Roads Commission of Maryland, directing the engineering work. This undertaking is part of the work of the National Research Council, organized by the National Academy of Sciences at the request of President Wilson to assist the Council of National Defense. The committee which is investigating road materials is known as the Committee on Available Materials for Rapid Railroad, Highway and Fortification Construction Behind the Front. Its investigations are being conducted along the Atlantic and Gulf Coasts with the aid of the geologists of the different states and the state highway departments. The members of the committee are:

Alabama—Prof. E. A. Smith, University; W. S. Keller, state highway engineer, Montgomery

Connecticut—Prof. H. E. Gregory, New Haven; C. J. Bennett, state highway commissioner, Hartford.

Delaware—Dr. E. B. Mathews, Johns Hopkins University, Baltimore; James Wilson, highway commissioner, Wilmington.

Florida—Dr. E. H. Selards, Tallahassee; W. F. Cocke, state highway commissioner, Tallahassee.

Georgia—Prof. S. W. McCallie, Atlanta; T. P. Stanley, state highway engineer, Athens.

Louisiana—Prof. F. V. Emerson, Baton Rouge; W. E. Atkinson, state engineer, New Orleans.

Maine—Dr. H. P. Little, Waterville; Prof. W. E. Ford, New Haven, Conn.; Paul D. Sargent, chief engineer, state highway commission, Augusta.

Maryland — Dr William Bullock Clark, Baltimore; H. G. Shirley, chief engineer, State Roads Commission, Baltimore.

Massachusetts—Prof. B. K. Emerson, Amherst; Arthur W. Dean, chief engineer, State Highway Commission, Boston.

Mississippi—E. N. Lowe, Jackson; Xavier A. Kramer, state highway engineer, Magnolia.

New Hampshire—Dr. J. W. Goldthwaite, Hanover; F. E. Everett, state highway commissioner, Concord.

New Jersey—Dr. H. B. Kummel, Trenton; R. A. Meeker, state highway engineer, Trenton.

New York—Dr. C. P. Berkey, New York; E. A. Duffey, state highway commissioner, Albany.

North Carolina—Dr. Joseph Hyde Pratt, Chapel Hill; W. S. Fallis, state highway engineer, Raleigh.

Pennsylvania—Dr. R. A. F. Penrose, Jr., Philadelphia; W. D. Uhler, chief engineer, State Highway Department, Harrisburg.

Rhode Island—Dr. Charles W. Brown, Providence; I. W. Patterson, chief engineer, State Board of Public Roads, Providence.

South Carolina—Prof. Stephen Taber, Columbia; J. Roy Pennell, state highway engineer, Columbia.

Virginia—Dr. Thomas L. Watson, Charlottesville; G. P. Coleman, state highway commissioner, Richmond.

Texas—Prof. J. Udden, Austin; Prof. R. L. Morrison, College Station.

Boston Engineers Reinstated

Following the decision of the full bench of the Massachusetts Supreme Court (*Engineering News-Record*, July 12, 1917, p. 93), the three employees of the Department of Public Works of Boston who were removed from office early in 1916 for political reasons have been reinstated. They will receive their old salaries for the time they were off the payroll, less whatever they have earned otherwise meanwhile. Storrs L. Durkee, supervisor of permits, has returned to city work. Bliss W. Robinson, superintendent main drainage works, will continue until Sept. 1 in charge of repairs of the German steamer "Koln" for the United States Government. Frank A. McInnes, engineer sewer and water division, will remain on private work in Nova Scotia until Sept. 1. Of the 14 other men discharged, all save Dr. Arthur H. Davison, examining physician, were restored to the municipal payroll last year, not having taken their discharge to court.

Standards Bureau To Test Cement for Reclamation Service

In accordance with a memorandum agreement between A. P. Davis, director of the United States Reclamation Service, and S. W. Stratton, director of the Bureau of Standards, the work conducted in the laboratories of the Reclamation Service at Denver, Colo., and San Francisco, Calif. is to be taken over by the Bureau of Standards. The personnel and equipment of these laboratories are to be transferred to the Bureau of Standards and maintained substantially as at present. Orders for cement shipments and inspection will be sent by the office of the chief of construction to the Denver office of the Bureau of Standards. Records of tests and inspection will be kept by the Bureau of Standards and will be available for examination by the Reclamation Service.

The Bureau of Standards will also make tests and analyses of concrete and concrete aggregates, chemical analyses of water and soils, and other tests and analyses required by the Reclamation Service. Pending the final provision for the complete maintenance of these laboratories by the Bureau of Standards, the necessary funds are to be supplied from the appropriation for the work of the Reclamation Service.

Headquarters at Menlo Park for 19th N. G. Division

Campsite for 30,000 Men Now Being Laid Out 30 Miles South of San Francisco

The camp site which will be headquarters for the 19th National Guard division has been located near the Town of Menlo Park, on the Southern Pacific, about 30 miles south of San Francisco. Leases have been drawn up for the "period of the war," and the engineers were at work on the site the second week in July.

Although the site is near the double-track line of the Southern Pacific, complete independent terminal facilities are being laid out at the camp in order to handle the large number of special trains and the freight they will transport. The first troops are expected to reach the encampment by the second week in August. Meantime, construction will be rushed so as to have everything in readiness. It is estimated that about 2,000,000 ft. Bm. of lumber will be used in the construction plan, as well as large quantities of electrical and railway supplies. Other Pacific Coast encampments are at Linda Vista, near San Diego, Calif., and American Lake, near Seattle, Wash.

Larger Force for Patent Office

A bill now before the House of Representatives provides for additional examiners in the United States Patent Office, as follows: Two principal examiners, at $2700 a year each; one examiner of interferences, at $2700 a year; four first assistant examiners, at $2400 a year each; four second assistant examiners, at $2100 a year each; four third assistant examiners, at $1800 a year each, and four fourth assistant examiners, at $1500 a year each.

St. Paul Office of U. S. Geological Survey Is Discontinued

The St. Paul office of the Water Resources Branch of the United States Geological Survey, located in the Old Capitol Building, was discontinued on July 7, 1917. This office, established during June, 1909, has been maintained in coöperation with the State Drainage Commission, of which E. V. Willard is state drainage engineer. S. B. Soule, who has been in active charge of the survey office for the past three years, has been transferred to the Denver offices of the survey. The Minnesota work in the future will be handled from the Madison office, under the direct charge of W. G. Hoyt, district engineer for the Upper Mississippi District.

During the time the St. Paul office has been in existence, hundreds of miles of rivers have been surveyed, and gaging stations have been maintained on all the principal rivers of the state. The data which were collected have been published in state reports of the water resources of Minnesota and also in various Water-Supply Papers of the United States Geological Survey.

Detroit Adopts Merit System for Sewer Inspectors

Recognizes That Service Requires Trained and Qualified Men—Provide Wage Scale

EDITORIAL CORRESPONDENCE

The Detroit City Council, acting on the recommendation of City Engineer Clarence W. Hubbell, has adopted a system for grading and promoting inspectors on sewer construction. Inspectors have been paid a flat rate of $4 per day, regardless of length of service or ability, and as a rule inspectorships have been passed out as rewards for political service. The new system is the first step in an attempt to raise the standard of inspectors, in recognition of the fact that such service is an important part of the work of the engineer's office and one requiring trained and qualified men.

New appointees shall receive $3.50 per day during a probation period of 60 days. At the expiration of this probation period, these inspectors, if retained in the service, shall be advanced to $4 per day. Inspectors advanced to $4 per day shall continue at this rate for one year. At the expiration of such term of service, if the service record of the inspector shows a rating of 80% or more, the inspector shall be advanced to $4.50 per day. All inspectors in the service of the city as inspectors on July 1, 1916, are increased from $4 per day to $4.50 per day. At the end of each fiscal year all inspectors who have received $4.50 per day for nine months or more and whose service record for one year shows a rating of 90% or more shall be advanced to a salary of $1440 per year.

SERVICE RATING WILL BE KEPT

The service record or rating will be made by the city engineer monthly, and the ratings will be based on three main divisions, namely: (1) Reliability, which includes punctuality, regularity and deportment; (2) workmanship, which comprises the broad field of enforcement of specifications, and (3) special duties, referring particularly to attention to lines and grades, completeness and accuracy of daily reports and other records.

Another departure from long-standing custom is the manner of paying inspectors. Formerly inspectors were paid weekly in cash at the paymaster's office in the City Hall. This method required that the inspector leave his work for a period varying from two hours to the greater portion of a day, depending upon the distance of the work from the City Hall and the reliability of the inspector. During the absence of the inspector from the work the contractor proceeded with the work of construction as he saw fit, and the custom supplied a very convenient alibi for the inspector for absence on pay day.

A logical conclusion was that, if the services of the inspector were not needed on the work for one day out of each week, his services were of little value and might well be dispensed with entirely, or that the system was at fault. Obviously, the latter was the correct finding. Consequently, hereafter the inspector will be paid by check. At first the checks will be delivered on the job each week; but it is the present purpose of the city engineer to extend the period of payment to two weeks and deliver the checks through the mail.

Causes of Failure of Mammoth Dam as Given by State Engineer

The failure of the Mammoth dam of the Price River Irrigation Co., Utah, on June 24-25, was due to the following causes, according to a report by George F. McGonagle, state engineer:

"This dam failed, (1) because the flume portion of the spillway was improperly and inadequately constructed; (2) because the horizontal reinforcement of the corewall had been stopped 12 ft. above the base instead of being carried to the top of the core; (3) the first section of the corewall to fall sheared off at a point 5 ft. below the top, indicating that the bond between the older section of the wall and the 5-ft. raise made last year was not what it should have been; (4) because the management deliberately permitted the level of the water in the reservoir to rise to within 10 in. of the top of the core, contrary to all precedent."

Los Angeles Aqueduct Has Two More Breaks

Earthquake Damage July 7 Followed by Unexplained Breaks July 15 Repaired July 27

An earthquake in the Owens Valley, California, early on July 7, caused a landslide that carried away about 160 ft. of the Los Angeles aqueduct 26 miles above the Haiwee reservoir. At this point the aqueduct is an open concrete flume. The break was located almost immediately and was quickly repaired with riveted steel pipe. Meantime the Haiwee reservoir maintained service.

On the morning of July 15 two breaks were discovered in the aqueduct, one 81 miles from Los Angeles, near Neenac, and the other 165 miles north of Los Angeles, in the Soda Springs tunnel. These breaks are below Haiwee reservoir and each is about 150 ft. below a standard 3 x 3-ft. manhole.

At the Neenac break, where the flow is through covered conduit, the bottom was taken out cleanly for about 70 ft. The walls and cover, which were left standing in place, showed no cracks. In clearing for temporary closure the concrete was found in excellent condition. Within three hours after the break 75 men were at work upon it preparing to install a 9-ft. steel pipe. This work was completed and the line in service again on July 22.

In the tunnel break the water was drained from the upstream side by reopening an adit used during construction. It was then found that about 100 ft. of the tunnel was closed at the top by débris from above. The repairs consisted of removing this material and blocking up the roof. The reservoirs below the break had sufficient water in storage to maintain domestic service in Los Angeles and the shut-off of irrigation water usually supplied San Fernando Valley has not resulted in damage to crops as yet. It is expected that the tunnel will be in service about July 27.

The flow in the conduit at the time of the breaks was about 300 sec.-ft. The cause of the breaks has not been ascertained. Suspicious circumstances are being investigated.

Louisville Cantonment Nearing Completion



MAP OF THIS CANTONMENT IS SHOWN ON P. 154 OF THIS ISSUE

National Guard Cantonment Contracts Awarded

The following contracts have been approved by the Secretary of War for National Guard mobilization camps: Augusta, Ga., O. Brown, Augusta, Ga.; Alexandria, La., Stewart-McGehee Construction Co., Little Rock, Ark.; Macon, Ga., W. Z. Williams, Macon, Ga.; Houston, Tex., American Construction Co., Houston, Tex.; Spartanburg, S. C., Fisk-Carter Construction Co., Greenville, S. C.; Fort Sill, Okla., Selden-Breck Construction Co., St. Louis, Mo.; Waco, Tex., Fred A. Jones Construction Co., Dallas, Tex.; and Greenville, S. C., Gallivan Building Co., Greenville, South Carolina.

Liable for Light Shut Off by Street Shaft

Carrying Out of Subway Work Is Held To Lay Contractor Open to Damages for Temporary Interference

If the decision handed down by Judge Dowling, in the Appellate Division of the New York Supreme Court, is sustained by the Court of Appeals, a subway contractor will have to pay damages to a property owner because of inconvenience suffered by the latter as a result of the carrying out according to accepted plans of the new subway construction in New York City. It is stated, however, that in the event Judge Dowling's view is upheld, the contractors are confident of recovering the damages from the city. The decision is considered very sweeping and will, it is said, open a way to an endless tangle. It has always been held heretofore, and the subway construction, as well as other public improvements, has been carried out on the theory, that private rights must yield to temporary inconvenience and loss arising from acts done in the public interest and under legislative authority. Under this theory damages suffered by abutting property owners as a result of the proper carrying out of public works could not be collected.

The only exceptions, it is believed, are the famous Joralemon St. cases and an instance in which the city, in dredging for a dock, cut off all access to abutting property for two years. The settlement occasioned by the Joralemon St. work, however, was in the nature of a permanent damage, although the subway tunneling which caused it was of temporary duration.

Judge Dowling's opinion, however, holds specifically that the subway work is not public work carried out in the public interest under legislative authority, but that it is proprietary in its nature, the city being in the same situation as a private corporation such as a railroad. Since it has been held that a railroad can be made to pay damages for temporary interference with rights of light, air and access, the judge therefore decided that the contractor, as agent of the city, can also be held liable for such interference.

Decision Expected To Work Great Injustice

The contractors for New York subway work are said to hold that, regardless of the constitutional and legal aspects of the question, it is a manifest injustice for them to be held liable for such damages when it was the universal opinion at the time the work was undertaken that such damages could not legally arise, the city having the right to carry out public work at necessary inconvenience of a temporary character to abutting property owners. Had it been held otherwise, they point out, it would have been necessary for the city to negotiate temporary easements with property owners all along the line of the proposed subway, just as in the case of permanent easements where the subway structure itself occupies or interferes with private property, before any contractor could be induced to bid on the work. Such a course would, it is further pointed out, prove very tedious and expensive to the public, as this sort of temporary interference could not be accurately foretold, and any property owner who could not reach an agreement with the city as to the terms on which he would forego claims to future damage might hold up the entire work. The contractors hope that the court will ultimately compel the city to reimburse them for all claims allowed. Otherwise, many of them might be bankrupted, as it is reported that property owners are waiting on this decision to bring actions for hundreds of thousands of dollars against various subway contractors.

Even should these damages ultimately be collected from the city, the contractors expect to have any profits they may have made on the subway work, and probably much of their capital as well, tied up in lawsuits for many months.

Present Colors to First Regiment Illinois Engineers

The Western Society of Engineers' board of directors held a meeting on July 9 and unanimously decided that the society present to the First Regiment, Illinois Engineers, the national and regimental colors. This regiment is now and will continue to be a permanent unit of the Illinois National Guard. It has been organized and recruited by the Citizens' Unit and includes many members of the society.

Akron Leases Its Municipal Garbage-Reduction Works

Owing to difficulties with its garbage-collection contract, the City of Akron, Ohio, has leased its municipally owned garbage-reduction works, which were put in operation Jan. 1, 1916. The garbage-collection contract, which took effect at the same time, provided that the city would pay the collector $3.12 a ton for garbage delivered to the works. The city, according to C. F. Beck, director of public service, found private collection unsatisfactory. The contractor threw up the work after six months. A second contractor also lost money and notified the city that it was about to throw up the contract. The city made arrangements for collection by direct labor, but was prevented from doing this by the financial condition common to Ohio cities of late. An arrangement was then made under which the city pays the collection company $3.12 per ton of garbage delivered to the reduction works and the company leases the works for five years, with an option of a five-year renewal, at a price equal to the interest and sinking-fund charges on the reduction works. Mr. Beck states that the scarcity of labor and the high cost of living in Akron have been contributing factors.

Personal Notes

J. C. Beckwith, engineer of construction on the Canadian Government Railways, has been appointed division engineer, with headquarters in Moncton, N. B., succeeding H. T. Ruhl, who resigned to accept service with another company. A. V. Redmond, resident engineer at Cochrane, Ont., has been appointed division engineer, with the same headquarters, succeeding W. A. Cowan, promoted. A. H. Willett, assistant division engineer, with headquarters at Cochrane, Ont., has been appointed resident engineer, with the same headquarters, succeeding A. V. Redmond.

The Pennsylvania R.R. system has furloughed the following officers during the period of their service with the Ninth Engineers, National Army:

H. H. Maxfield, superintendent of motive power, New Jersey Division, Jersey City, N. J., who becomes Lieutenant-Colonel; B. D. Barrett, master mechanic, Williamsport Division, Sunbury, Penn., and D. S. Gaskill, master mechanic, Baltimore Division, Orangeville, Md., who become Majors, and F. S. Robbins, assistant mechanic, Pittsburgh Division, Pittsburgh, Penn., who becomes captain. The following appointments have been made to fill the places of the men above furloughed: F. G. Grimshaw, assistant engineer of electrical equipment, Philadelphia Terminal Division, to be superintendent of motive power, New Jersey Division; R. G. Bennett, assistant engineer of motive power, Central Division, who succeeds Mr. Barrett at Sunbury; G. H. Watkins, assistant engineer of motive power, Western Penn. Division, who succeeds Mr. Gaskill at Orangeville; and J. H. Thomas, assistant general foreman, Pitcairn Shop, who succeeds Mr. Robbins at Pittsburgh. These promotions were effective July 1, 1917.

W. D. Warren has been appointed maintenance engineer of lines East, New York, New Haven & Hartford R.R., with offices at Boston, Mass. Mr. Warren began railway work with the Boston & Maine R.R., and later served on the Pennsylvania Lines. In 1903 he became connected with the New York, New Haven & Hartford R.R., and then served consecutively on the New York Central as chief of party and on the Florida East Coast Ry. as resident engineer. He returned to the service of the New Haven in 1907 as division engineer of valuation, later becoming division engineer of the Provincetown division, which position he held at the time of his recent appointment.

F. B. TAPLEY, assistant engineer of the Canadian Government Ry. at Moncton, N. B., has been appointed assistant engineer of maintenance.

FRANK H. CROCKARD, vice president and general manager in charge of operations, Tennessee Coal, Iron and Railroad Co., since 1906, has been made president of the Nova Scotia Steel and Coal Co. A special student at Lehigh University and Michigan College of Mines, all of Mr. Crockard's experience has been in connection with the steel and iron industry, he having constructed blast furnaces, rolling mills, openhearth plants, including tilting furnaces, and has developed red-ore mines and water-supply systems.

CHESTER F. LEWIS, who was employed by the Massachusetts Highway Commission during the summer of 1916 and served as assistant in the department of civil and sanitary engineering of the Massachusetts Institute of Technology, has accepted a position in the Office of Public Roads and Rural Engineering under H. K. BISHOP, engineer of District No. 10.

A. KEITH GOWANS, formerly assistant in the county engineer's office, Woodbury County, Iowa, is at present in charge of the sewer system at Wessington Springs, S. D. This work is being constructed by the Dakota Engineering Co., of Mitchell, S. D., for which Mr. Gowans is acting as resident engineer.

W. S. WOLFE, who for the past three years has been instructor in architectural engineering at the University of Illinois, is at present working for SMITH, HINCHMAN & GRYLLS, architects and engineers, on the design of structural steel and reinforced concrete.

GILBERT G. JACOBOSKY, consulting civil engineer, of Wilkes-Barre, Penn., has accepted a commission as captain, Battery F, Third Field Artillery.

ROBERT H. DOWNMAN, chairman of the lumber committee of the Council of National Defense, was elected president of the National Lumber Manufacturers Association, June 20, at the annual meeting of the directors in Washington. E. A. STERLING, who developed and managed the trade extension department, resigns, but R S. KELLOGG, the secretary-manager, states that more engineering work than formerly will be undertaken.

PROF. SELSKAR M. GUNN, director of the Division of Hygiene, Massachusetts State Health Department, has been appointed a member of the Commission for the Prevention of Tuberculosis in France, which will be headed by DR. LIVINGSTON FARRAND. Graduating from the Boston Institute of Technology in 1905, Professor Gunn became bacteriologist of the Boston Biochemical Laboratory, and in 1906 bacteriologist of the State Board of Health. From 1908 to 1910 he was health officer of Orange, N. J., and was sanitary expert of the Bureau of Economy and Efficiency, Milwaukee, in 1911. Professor Gunn is secretary of the American Public Health Association, editor of the *American Journal of Public Health*, and assistant secretary general of the 15th International Congress on Hygiene and Demography in 1912.

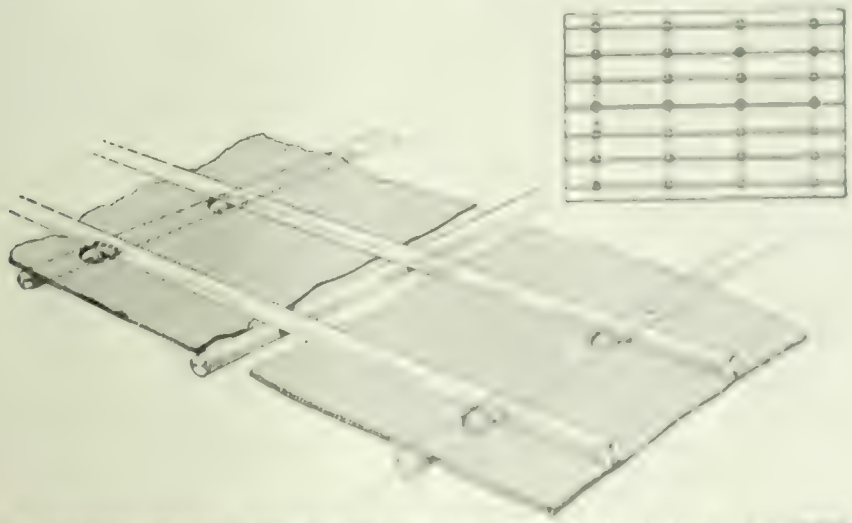
LEWIS T. CHURCHILL is now superintendent for the Joseph F. Burke Co., contractors, Plainfield, N. J., in charge of storm sewer construction and concrete pavements in Lakewood, N. J. Mr. Churchill has designed and constructed sewers and paving work in various points in New Jersey for the past 13 years.

APPLIANCES AND MATERIALS

Tarred Felt Between Welded Mesh Makes Excellent Sheathing

Clinton Welded Sheathing possesses advantages as an inexpensive support for all kinds of plastering and a light reinforcement for concrete floors and roofs. The material is manufactured by arranging longitudinal and transverse wires on opposite sides of a sheet of tarred felt and electrically welding them together through small holes previously punched in the felt at each point where a longitudinal crosses a transverse wire. In this way the tarred felt becomes an integral part of the wire mesh, being securely locked and held between the two groups of wires, but at the same time having no physical connection to any of the wires.

This material is made in stock grades of galvanized longitudinal wires of No. 13 gage, spaced 3 in. apart and cross-welded to No. 13 galvanized transverse wires spaced 8 in. apart. The material is furnished in flat sheets 32 in. wide and about 8 ft. long, packed in bundles of 50 sheets and crated for shipment. Heavier wires and sheets of special size may be obtained upon special order, but the wire spacing will be the same in all cases. The use of this sheathing effects a saving in plaster as compared with the amount required on other types of metal lath. In addition to this saving there is also a marked economy in plastering on this material, owing to the speed with which the plaster may be applied. It has been found that plaster laid on this sheathing is not only structurally strong, as a result of its peculiar reinforcement, but is unusually hard, due to the fact that the plaster has a greater density as a result of the greater pressure that may be applied. Fire and water tests have been made by Columbia University and by the Bureau of Standards on this material, and it has passed with perfect rating. It has been approved by the Building Department of New York City and every borough of Greater New York for use in fireproof and fire-resisting construction.



TARRED FELT HELD [illegible] WELDED WIRES MAKE CHEAP SHEATHING

Patents Stone, Sand and Asphalt Distributing Machines

To reduce the labor element in macadam roadwork to a minimum, J. A. Johnson, division engineer of the Massachusetts State Highway Commission at Springfield, Mass., has developed and patented a mechanical stone and gravel spreader to work in combination with a bitumen-spraying truck. Some experimental machines are already under construction, and it is hoped that will materially cut the cost of several elements in bituminous macadam and concrete.

The stone spreader attached to a bitumen-distributing motor truck is shown in Fig. 1. In construction and operation this device is a counterpart of the well-known manure spreader, universally used in farmwork. In fact, successful experiments with a manure spreader for spreading small stone are what led to the development of the stronger and more durable machines now under construction.

A modification of the same device is the sand-bitumen grouting machine shown in Fig. 2. This is intended for constructing a type of pavement much used in England and quite extensively experimented with in Massachusetts—a tar-grouted broken stone. The great difficulty with this construction is making and applying the tar grout before it separates. In the machine designed by Mr. Johnson the sand is ejected into converging sprays of bitumen, thus making a grout mixture.

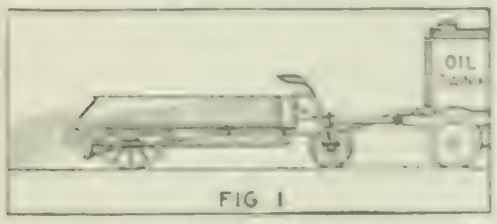


FIG 1

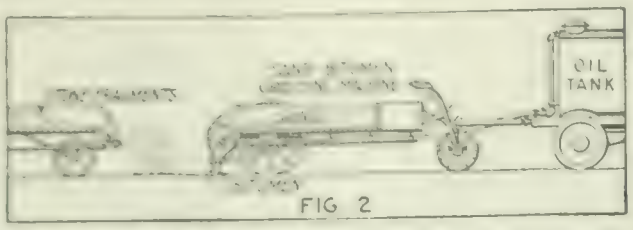
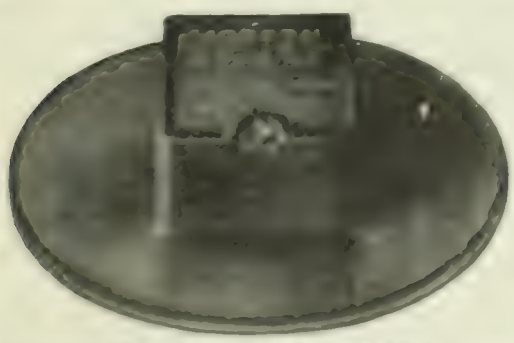


FIG 2

DISTRIBUTES ASPHALT AND COVERS IT WITH STONE—MAKES AND LAYS TAR GROUT

Cast-Iron Water-Meter Housing with Square Top

A cast-iron water-meter housing with a square top and a round base which fits a tile of vitrified clay or concrete measuring 18 in. in diameter inside, is being put on the market by the Modern Iron Works, of Quincy, Ill. The projecting square portion of the housing is of such a height that connection with adjoining brick or concrete pavement is made easily, and enough soil is carried above the flange to allow of a healthy growth of grass. No hammer, screwdriver, pick or shovel is necessary to open the top—a mere turn on the galvanized iron nut with a special key raises the cover almost half an inch. This is a great advantage when it is necessary to read meters after a sleet or rainstorm in freezing weather.

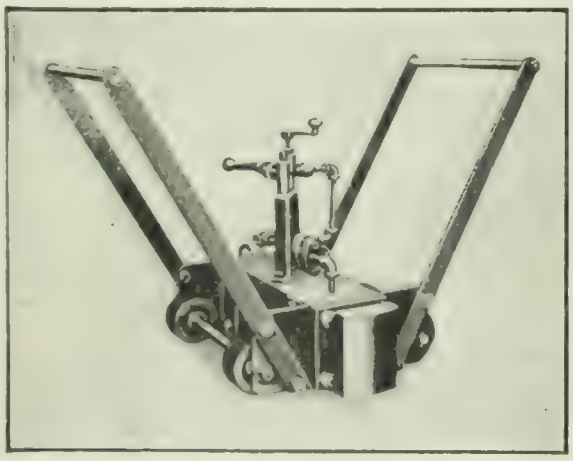


METER HOUSING HAS ROOMY RECTANGULAR CHAMBER AND IS EASILY OPENED

The housing is furnished either with or without an inner lid. With the inner lid an air-cell compartment between the outside and the inside is formed, thus making an excellent insulation against extremely low exterior temperatures. While the housing is made in only one size in order to reduce manufacturing cost, special designs conforming to any individual specification will be made without extra charge when 25 or more sets are ordered.

Bender for Ship Frames Weighs Only 750 Pounds

The Watson Stillman Co., 58 Church St., New York, has brought out a new tool for use in shipbuilding, designed to bend heavy steel shapes for ship frames, deck beams, etc. It is a very compact machine—built as light as is consistent with the work it is intended to do—consisting of a cylinder, ram and operating valve, mounted upon broad rollers so that it may be moved quickly over the bending slabs by handles at either side of the machine. It is thus possible to bend long members to templet, without reheating and with a minimum of labor.



WEIGHS 750 POUNDS—EXERTS 20 TONS PRESSURE

A loose pin is provided which fits into the holes in the bending slabs and serves as an abutment for the machine. The ram is double-acting, and its movement both forward and returning is under perfect control at all times. Provision is made to prevent overstroke. The illustration shows the machine equipped with a screw stem stop and release valve, but a single lever operating valve can be furnished if desired. Power may be supplied from a suitable pump, or preferably from an accumulator service. The machine is built as shown, with a movement at right angles to the axis of the ram, or in a direction parallel to it.

The machine illustrated has a 10-in. stroke and develops 18 tons at 1500 lb. per sq.in. and 20 tons at 1750 lb. per sq.in. pressure. It weighs 750 pounds.

National Catalog Numbering and Filing System Is Introduced

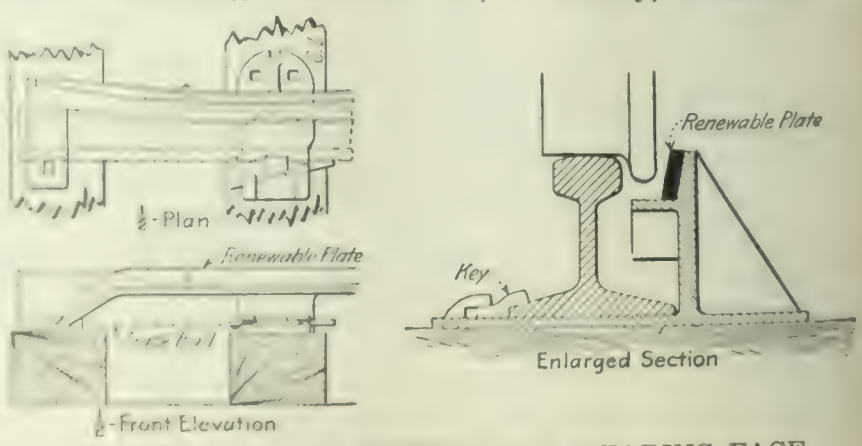
A national scheme for numbering all trade catalogs and loose-leaf bulletins is being promoted by the Catalog Numbering System, 338 Pine St., San Francisco. This concern has undertaken to maintain a central register office where numbers are assigned to any catalog or group of existing or proposed catalogs. These numbers are planned not to exceed six digits, but are used with letters as needed. Numbers are selected according to size, thickness, shape and binding of catalogs and not according to contents. Thus when any publications so numbered are filed in numerical order, the files will show an orderly size distribution. Index cards for the catalog are to be issued with the catalogs by the manufacturer—one displaying first the company's name and each of the others some article described in the catalog. The charge is $1 per number issued.

Frog Guard Rail Has Renewable Wearing Surface

A renewable wearing surface for guard rails for use at frogs is shown in the accompanying illustration. A casting 4 ft. long forms the guard rail and also three baseplates that carry the track rail, and has at each end a flange that forms a footguard. The inner face of the guard rail is recessed to receive a wearing plate of hardened steel, secured by countersunk bolts. This plate is reversible; and when both sides are worn, it can be renewed without disturbing the guard rail.

The middle baseplate has lugs on the inner end, and a horizontal taper key or wedge is driven between these and the base of the track rail. A spike driven at the back of this key prevents it from working loose. Ordinary spikes are used in the end baseplates. Teeth under all the plates grip the tie and prevent slipping.

This guard rail weighs 80 lb. It is manufactured by the National Steel Products Co., of Ensley, Alabama.



GUARD RAIL HAS RENEWABLE WEARING FACE

A Consolidation of Engineering News and Engineering Record. Published by McGraw-Hill Publishing Company, Inc.

ENGINEERING NEWS-RECORD

A WEEKLY JOURNAL
DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

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Continued Contact with Americans Abroad

THE publishers are pleased to announce that *Engineering News-Record* will be forwarded at the regular domestic rate of subscription to every subscriber called outside the United States on military duty. What these engineers are doing abroad will be of the greatest interest to engineers who must remain at home, and the editors hope to be able to report their activities in so far as the censor permits. At the same time they should strive so far as possible to keep in touch with engineering conditions and performances here, so that they will not be too detached from things when they return. Subscribers on foreign service, or those having such service in prospect, should forward to this office their address in official form, so that delays in transmission may be reduced to a minimum.

Army Now Has Enough Engineer Officers

FROM a number of letters which have reached this office it would seem that some readers have interpreted the article "Does the Army Need Engineers as Officers?" in *Engineering News-Record* of July 12, as meaning that there was a shortage of engineer officers in the army. Such was not the intent of the article. It was designed to show that the army needs real engineers; not, as a correspondent had implied, labor foremen. To remove any misunderstanding, however, it should be stated that, thanks to the wonderful response of the American engineers to the call from Washington, there is at present either in training or on the reserve list a full quota of engineer officers to meet immediate needs for general service. In some special assignments there are still openings. The department would, for instance, like to commission about 100 men with first-class railway operating experience and 50 mechanical engineers with good shop experience. The future needs in other specialties depend upon how soon other forces are raised and on how soon those already authorized are placed in the field.

Judge Prouty Nails Another Delusion

"NO, SIR. I say it does not purport to represent what it could be reproduced for, but it was produced to show what it could be reproduced for, less depreciation." Thus Director Prouty, of the Division of Valuation, at a recent hearing held in Washington. "What does that mean?" queries Mr. Brantley for the railroad on trial for claiming value. "It means . . . that a certain part of the service value of a property had been used, and it has no relation to what you can sell it for or buy it for." *"No relation to what it would cost to reproduce the property?" "No."* More than a year ago Mr. Thelen told the Interstate Commerce Commission that the Railroad Commission of California, after years of floundering, had discovered that the cost to reproduce land was not the cost to reproduce land. Judge Prouty now extends the convenient theory to cover the entire physical plant of the railroad. Many and marvelous are the interpretations lawyers can give simple English when they put their minds to it!

New Water Sterilizing Agent Promises Well

AFTERGROWTHS of bacteria at the ends of long delivery conduits and in clear-water reservoirs are the bugaboo of the operator's life. He has a hard enough time explaining high counts to the officials higher up, but a still harder one to convince the layman public. Hence, a new germicide that gives promise of eliminating this troublesome feature, although a high count has not necessarily any particular sanitary significance, will be looked into most carefully. Undoubtedly, the experiments in this country at Denver (as outlined on page 210), supplementing and checking those at Ottawa, are being duplicated in other places. At any rate they should be before any wholesale discarding of chlorine apparatus is to begin, although the diversity of kinds of supply in the Denver system includes underground galleries, open algæ-infested lakes, river water, rapid and slow sand filters, hard and soft water. Trouble from tastes and odors has not been serious in Denver, but from the start the aftergrowth problem has come up periodically. The reduction in amount and elimination of oxidizing action on organic matter should tend to minimize, if not entirely solve, the taste and odor problem. The economics of the question are well worth studying more in detail, for undoubtedly the handling of two chemicals costs more than handling one. Whether the reduced amounts required will balance the added cost for labor, upkeep of additional equipment and stricter control in the chem-

ist, has not yet been determined. Surely, those superintendents who have not a skilled analyst to direct the work should go slow about stampeding for the latest method. Let the better-equipped plants with their expert chemists find the pitfalls first and show how to avoid them.

Low-Bid Letting Bad for Road Contracting

A MORE unfortunate situation than that in which many Eastern road contractors find themselves today would be hard to imagine. Yet these misfortunes are not so much the result of war and other unpreventable conditions as of sheer reckless extravagance and ignorance on the part of some would-be contractors.

The great mileage of road-paving work let during the past two or three years has caused many men, without previous experience in road building or even in contracting, with little or no financial resource, urged on by surety bond and material salesmen, to make bids at prices which could have yielded a profit two years ago only with the best and most efficient management. With an utter lack of such management, many of these contracts are unfinished today, and the continuance of the work is an impossibility at present prices.

A good example of how these conditions have been brought about is the case of a contract which was let two years ago to a man who had borrowed the railway fare with which to go to sign his contract, and it was known that a surety company representative there loaned him the money to make the trip and furnished the certified check which he had to deposit with his bid according to law. This so-called road contractor has built less than fifteen hundred dollars' worth of culverts, and has not graded or surfaced a single square foot of road on his contract in the two years, or even paid the first premium on his surety bond. Consequently, this piece of work, like many others, must be readvertised and relet at a price far in advance of that bid two years ago. The contractor who now takes the work knows that he cannot receive the extra money unless the state is able to collect it from the surety company, which will require years of litigation at the very least.

Coupled with the shortage of labor and material, an unusually rainy spring and early summer, and with nothing to bid on except these canceled contracts, road contracting in some regions is in a sorry condition. If any road contractors there are happy, it is only the few who have been employed on a salary basis to finish canceled road contracts as superintendents of state-paid day labor. There are instances of where the state has been able to do this work very efficiently by acquiring the services of such men and by paying them in addition a reasonable rental for their equipment.

The authorities are attempting to relieve the situation by every possible means within the law, but the fundamental difficulty lies in the manner of letting contracts to low but irresponsible bidders. This is the thing which is causing a more serious setback to road construction than any other single element in the present complex situation.

A New Idea and a Simple Tool Win in Bridge Erection

THE success recorded for the locomotive crane in the Steubenville bridge erection described in our issue of July 19 has the unusual character of being accomplished by simplification of method. Modern advances in bridge erection have mostly involved refinement of procedure, further specialization of machinery, in harmony with the increasing difficulty of the problems put up to the erector.

Thus, we are apt to look on the two biggest pieces of gantry-crane erection of the last few years—the Quebec work and the construction of the Ohio span of the Sciotoville bridge—as representing pretty well the highest point reached by the art. Yet the erectors of the Steubenville bridge eliminated the costly, cumbersome gantry in a case which by prior standards would have to be rated as an undisputed gantry job. Their achievement was due to a bold idea, not to a new tool.

Their locomotive crane, while powerful, heavy, and equipped with a very long boom, was quite the same as the small locomotive cranes that are doing so much loading, unloading and miscellaneous handling nowadays. Their erection method, then, involved the use of a simpler machine, a more all around tool, rather than a more specialized one. It would seem that we are still in a period of bridge erection where simplification and standardization have a good chance for success. Perhaps there are similar chances in bridge design.

In view of the high development which bridge erection had attained over a decade ago, it is interesting to note a distinct shift of expert preference. Some years ago the heavy derrick car was looked on with favor as the prime all around bridge-erection tool. But a little later the advantages of rotation and greater freedom of maneuvering possessed by the locomotive crane came to be appreciated by bridge erectors as they had earlier been recognized by erectors of light mill-building work. Today the field conceded to the derrick car is much reduced.

The derrick car still has advocates. Its superiority remains clear in cases where mobility and combined load and reach capacity—mainly forward—are decisive. But the Metropolis and Steubenville jobs proved the unsuspected adaptability of the locomotive crane used as a truck-mounted gin pole. At Metropolis the crane handled an erection job of unprecedented size, on falsework, in surprisingly fast style. The even greater surprise of the Steubenville cantilever work followed immediately after.

That these two pieces of work required a very large forward step in weight and boom length of the crane ought to be given due consideration. It was in making this step and being willing to risk highly important

work on its success that the men in charge displayed originality and courage. In the present state of the art it is safe to say that they pushed the method to its practical limit.

The Human Element Once More

IN TIMES like these, as this journal and its predecessors have pointed out before, the contractor whose organization is a big family, which he has taken care of through thick and thin, has a tremendous advantage over all competitors. Such contractors, however, are few. Not many have been able to command the capital on which such large dividends may be realized. Not all of these have sensed the possibility of thus gathering dividends. And it is too late now to begin building in this way for returns out of the present activity—the thin has passed and the thick is with us. But the prosperity of last year and the necessities of this for larger and faster construction in many lines should drive home to an increasing number of contractors the lesson that they must learn if they would survive in the day of greater efficiency which will succeed this period of stress.

It is not enough to have machines—men must run them. It will not answer to have only clever plans—men must execute them. It will not suffice to enter the field with heavy financial backing—the human element cannot be dispensed with. Yet, although the surplus of labor for construction has long since vanished, though competent foremen and able superintendents in most lines are as hard to find as hens' teeth, much can be done even today by every contractor who will begin by studying the needs and capabilities of those men he now has. What his present employees know about his methods—their experience acquired through his instructions—is an asset that should not be thrown away. It is worth trying to hold these men by studying their human relationship to the work and the organization.

For instance, is the interest of one of your timekeepers taken off his work by worry over what you think of him and what will happen to him when work slackens? Take a few minutes to tell him where he stands. Did you hear the master mechanic, the last time you were at the bridge, growling about an overfed, lazy pipefitter who could not stand up to a full day's work? And do you recollect what a howl the walking-boss put up about the scarcity of pushers? And did it occur to you that lazy men sometimes develop genius in keeping other people busy?

Not only must the individual fitness of men receive more attention, but the needs and standards of the workmen as a class must be looked into. Men may think that a bonus system is an attempt to get work out of them for nothing, that a well-conducted camp is a cover for an otherwise undesirable job, that reading rooms and Y. M. C. A. buildings and even "movies" are attempts at interference with their private conduct, if these things are done without careful study of the element for which they are meant. Needless to say, this involves a lot of work.

But if you can begin by picking a few "bosses" on your work for personality of the sort men like and respect; if here and there you can tie this man and that to your organization; fit a few workers now and then into places that suit them better; and build up a reputation for "looking out first and always for your crowd"—then even in these times you can select an organization that, well worth holding through the slack period to come, will reap big rewards for you from the activity that the world's recovery from the present strain of war will bring.

Railroads Should Be Low-Rate Water Customers—Sometimes

WATER-WORKS managers have cast longing eyes on the railway water-supply business. The railroads use lots of water and can develop their own service usually only at high cost; on the other hand, the water-works men are seeking new fields for profitable extensions affording more efficient utilization of their property in long-hour or off-peak service. And the railroads apparently are anxious to be courted—as favored customers, however.

A railroad man argued not long ago before a gathering of water-works men that railroads are customers who should be specially sought. The plan he proposed was low rates based on the operating-cost reduction that would follow if the railway customer, once secured, should again desert. Such an offer is justified under certain conditions, but if applied indiscriminately it will bring grief. Let us reason a moment.

The railroad promises to be a desirable candidate for low rates where the supply is pumped direct from source to customer and the whole water-works investment depends heavily on the peak drafts. If the railroad's consumption is in long hours of steady draft, so that the demand (and investment) costs are distributed over many hours' use, then the true unit cost of supplying the railroad is low and therefore the rates may be low. If the railroad can erect its own cheap and convenient storage tanks and draw water only at off-peak hours (commonly from 10 p.m. to 5 a.m.), a still lower rate is justified, for investment may not enter the unit costs at all.

But a railroad cannot equitably be so favored where a water-works captures a steady stream and impounds it against the hours of use. Then there is not a heavy investment in equipment reserved for peak-load customers. The total annual costs are properly distributed more in proportion to quantity of water supplied than according to maximum demand. The rate that is proper, under such circumstances, for the large, long-hour customers will ordinarily not differ much from that of the smaller short-hour customers; whatever difference there is can be attributed to the increased influence of meter reading, billing, office expense, and investment in service lines and excess size of mains.

It has been urged that the rate to a railway should be based on the slight reduction in operating expense that would result by dropping the road, since the all-important labor and investment cost in the water-works would not decrease at all and fuel and supplies would fall but little. But exactly that same effect would result if the small customers should quit in a body, or in a group of some size. Why not make their rate the cash sum spent out of pocket by holding rather than releasing them?

Homogeneous Organization Speeds Work at Ayer Cantonment



INTERNATIONAL FILM SERVICE

CONSTRUCTING QUARTERMASTER CO-ORDINATES MANY ORGANIZATIONS TO BUILD VAST CANTONMENTS

Wooden City Spreading Across 8000 Acres of Hills and Scrub at Rate of 40 Buildings a Day—Fourteen Sawmills Frame 275,000 Feet of Spruce a Shift—60 Trucks and 120 Teams in Use

TWO AND A HALF MILES from the Massachusetts junction town of Ayer, 8000 acres of scrub-covered hills which next September will be a wooden city of 40,000 population is today swarming with thousands of workmen, crawling with freight-cars, motor trucks and wagons, and alive with an activity which seems feverish to the observer, but which is in reality directed by some of the best brains America can furnish—those of her sons who have been trained to plan and build.

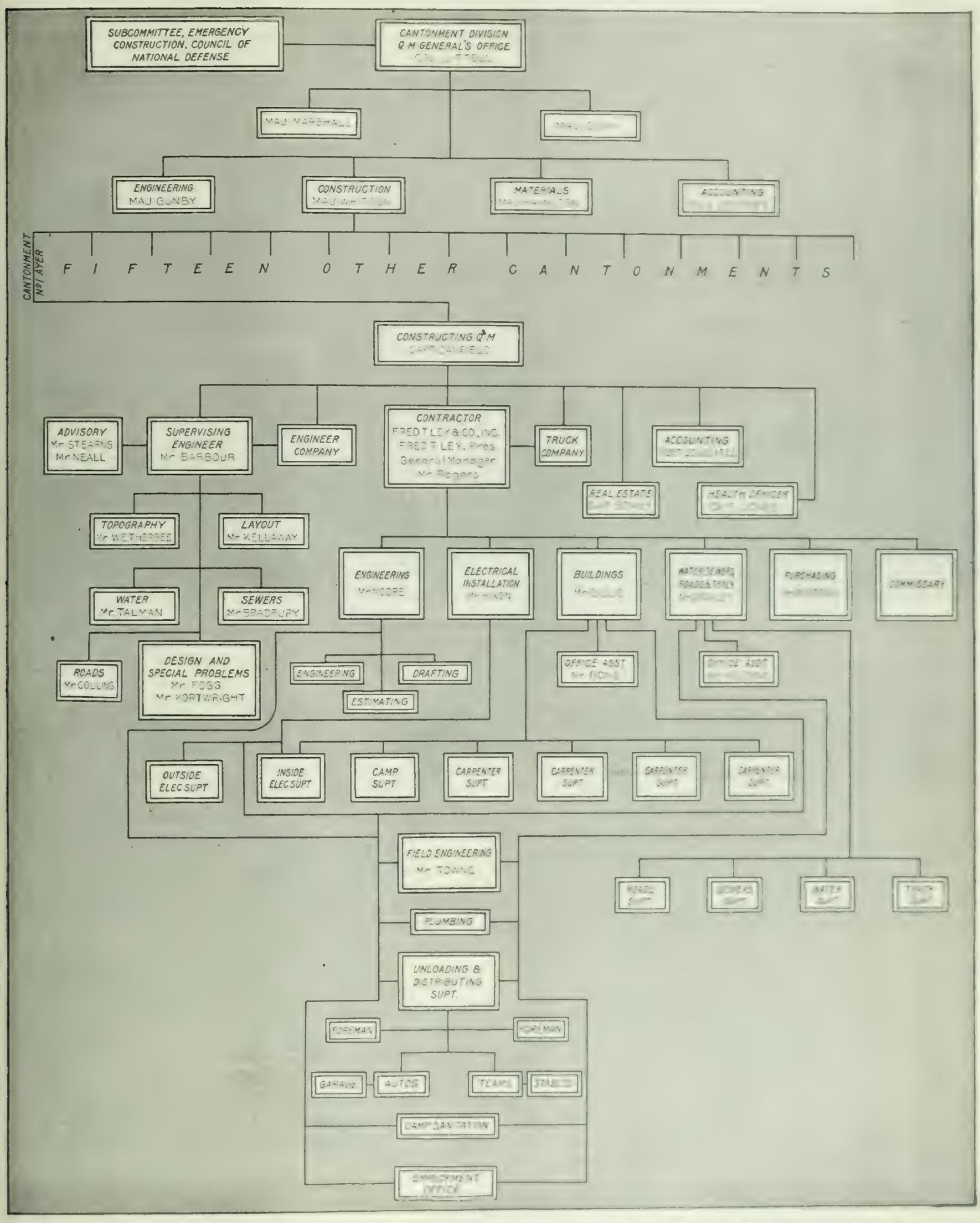
Within 75 days from the letting of the contract on June 18, this cantonment, Camp Devens, must be ready to house its quota of the National Army. Into its 1100 and more buildings will go upward of 16,000,000 ft. of lumber, which is being unloaded, framed, transported and erected at the rate of 40 carloads a day. Nearly 20 miles of highway will be ready for the feet of its soldiers, the wheels of their guns and transports. The engineering organization of its constructing quartermaster must design and lay out a water-works system of 2,000,000 gal. per day capacity, a sanitary sewer and sand filter system, and electric lighting and power circuits of 1200 kw. capacity.

The thousands of carloads of lumber, wood-stave pipe and tanks, sewer tile, paving materials, machinery, hardware and whatnot must be ordered with consideration for the sources of supply from which similar quantities are being drawn for 15 other cantonments of equal size. Only a central directing organization of the highest capacity, supplemented by the most efficient co-operation at the site, could carry through such a task at any time. Under present conditions, with the supply of most construction materials mortgaged by heavy general demand and with the country's railroad service so overtaxed that a shortage of more than 100,000 freight-cars has shown on the balance sheet for four successive months, the accomplishment of this task is a miracle. However, the miracle is taking place.

Central Office Tells Contractors Where To Buy

As shown in the organization chart, the central organization which is accomplishing this feat has at its head Colonel Littell, chief of the cantonment division of the Quartermaster General's office. Assisted by two majors and advised by the subcommittee on emergency construction and contracts of the Council of National Defense, Colonel Littell has under him four men of national reputation in their respective capacities who have been commissioned as majors in the Quartermaster Corps. The constructing quartermaster at each cantonment reports directly to this organization. He is in personal charge on the one hand of the civilian engineering organization employed at each site to adapt the standard plans to the location, lay out the work, design special features required and inspect the construction. On the other hand, the contractor's organization is directly responsible to him, as is also the auditing department.

To arrange for the purchase of materials so that the 16 contractors would not be bidding against each other for the same supply, so that materials produced near each site might be utilized to the fullest extent and all supplies so routed as to avoid throwing too great a



DIFFICULT WORK OF CONSTRUCTING ARMY CAMPS CO-ORDINATED BY CENTRAL OFFICE

burden on any one transportation system, has been the task of the central office. Finding that, in the present state of the steel market, to attempt the exclusive use of cast-iron pipe for water mains would be to court delay, this office directed the purchase of wood-stave pipe with cast-iron connections.

To avoid the serious difficulty of transporting Southern pine through the badly congested territory between New York and Buffalo, the central office directed the purchase for the cantonment at Ayer of the slightly more expensive Northern spruce. With the exception of 5,000,000 ft. of dry pine boards obtained in the Caro-

linas, the amount by which the supply of seasoned spruce in the New England yards fell short of the requirements, the carrying out of this plan has made it possible to deliver a large part of the lumber required at the site the day after it is loaded at the mill and has eliminated all the delay and confusion of tracing long-distance shipments.

This organization also takes up all matters appealed by the purchasing and transportation agents at each cantonment, tracing and expediting shipments, improving deliveries from manufacturers and the like.

Job Organization Harmonious

Assisting Captain Canfield, the constructing quartermaster at the cantonment, is a captain of the Medical Corps, who is charged with the important task of looking after the health of the construction force, seeing that no contagious diseases are brought to the site, that the ground is not fouled and that sanitary conditions are maintained. The work done by this officer is attested by the excellent condition of the working force. Although the camp commissary is already feeding 2500 men, in addition to those foreign laborers who insist upon cooking their own meals, not a fly is to be found on the entire reservation; and every bit of waste food and every scrap of paper is collected and burned so promptly that the site has remained continuously as clean as on the day work started. There are also a full company of engineers and a truck company with 33 three-ton motor trucks encamped at the site. The engineer troops are at the disposal of the medical officer and of the civilian engineering organization, while the truck company is assisting the contractor in transporting materials, besides supplying the wants of the headquarters staff and of the troops at the site.

The effective coöperation of the entire construction force is attributed to the application of the principle which Mr. Balfour is said to have urgently advocated on his mission to this country—that of utilizing existing organizations. In pursuit of this policy the engineering work has been placed in charge of a Boston consulting engineer, whose staff and associates, assisted by the additional force which the magnitude of the work demanded, has been transported to the camp and established at the headquarters of the constructing quartermaster.



FROM THE TOP OF THE CONTRACTOR'S OFFICE A GOOD IDEA OF THE SCRUB-OAK COUNTRY IS GAINED

In the same way a firm of Boston accountants has been brought to the work to undertake the auditing and keeping of records. As the work is done by contract, the organization of the contracting firm is, of course, available as it stands. It has been the policy of this firm for years never to allow a single man connected with it, from the president down, to become really indispensable. As a result it had a competent understudy for every man in its employ and was able without inconvenience to its other business to mobilize at once a complete construction organization competent to handle even the unusual work before it.

Following out still further the idea of employing existing organizations, the contractor associated with him in the management of the commissary a firm which operates a large number of restaurants in New England, New York and Pennsylvania. The facilities of this firm for purchasing large quantities of food and organizing and conducting a commissary capable of feeding 4000 to 5000 men are a great advantage, making possible the maintenance of an unusually excellent construction camp.

Every part of the organization from the constructing quartermaster down has the fullest confidence in the other divisions of the force, and there is not apparent a single point at which duties overlap or work is being duplicated.

Of the six divisions of the engineering department shown on the chart each has its own field parties and office force, with the exception of the last, whose duties naturally require little fieldwork. More than 75 men all told are included in this organization, counting the

parties drawn as required from the engineer troops at the site.

The first work of the engineering force was to produce a topographic map on a scale of 200 ft. to the inch, showing 10-ft. contours. In spite of the undergrowth, which was 6 ft. high over most of the tract, this survey was completed and the map made in the incredibly short space of two weeks. On the map was located the layout shown in the drawing, which took care of all the units required by the standard cantonment plans. A more accurate topographic survey is being completed as rapidly as possible, taking contours at 2-ft. intervals, to furnish the basis for accurate design of the drainage and road systems. Meanwhile, the work of laying out the buildings, water lines, sewers and such roads as are immediately needed is being taken care of.

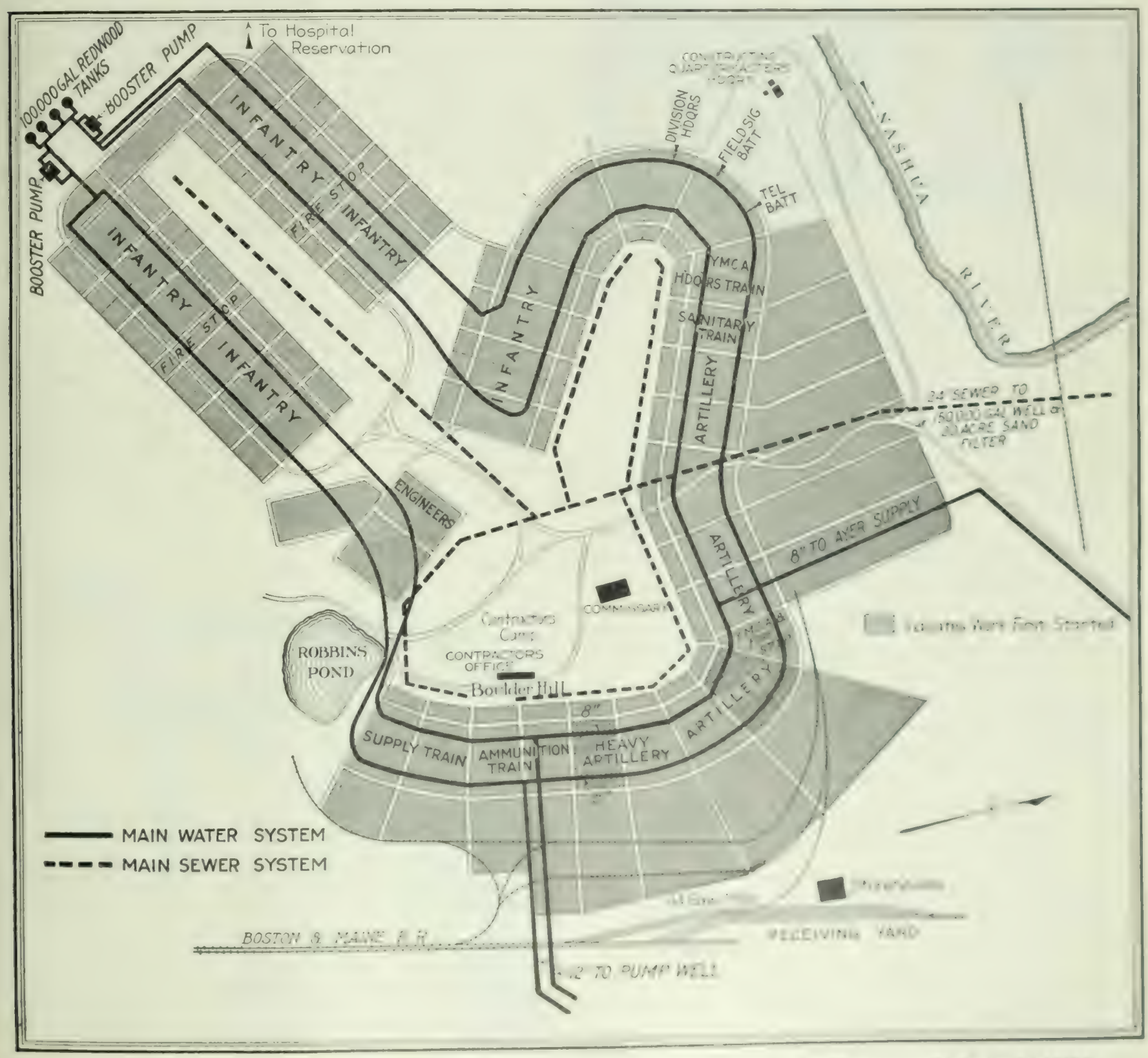
The urgent necessity for the completion of the cantonment required that almost every phase of the work be started at once, and the layout and survey parties are kept extremely busy. Their time is saved to a great extent by placing at the disposal of the engineering force a number of light automobile trucks of a city-delivery pattern, with which men and instruments can be quickly moved from place to place. Four-man parties are the rule, and 10 to 12 of them are in the field continuously.

The first problem with which the contractor was confronted was the assembly of all material and equipment at the site in the shortest possible time. This firm's general purchasing agent, in close touch with available markets, placed orders for staggering quantities of materials as fast as approved schedules could be forwarded from Washington. His office diary for the first two weeks of the work exhibits a significant monotony. Entry after entry reads:

"June ——. Received authority from Washington to buy ——."

"June ——. Bought ——."

Not an order on the list but was placed within a few hours after the receipt of the approved schedule. In



STANDARD CANTONMENT LAYOUT LOOPED INTO HILLY

the matter of spruce lumber alone, 22 saws scattered throughout New England were cutting material for the cantonment on the day following the award of the contract. Before July 1 the average daily total of lumber received at the site had risen above the required 30 cars.

A remount station, which is to handle, train and supply medical attention to at least 5000 horses, has



CONTRACTOR'S OFFICE WAS BUILT IN A DAY

been added recently to the design. This will consist of paddocks, runways, veterinary hospital, horseshoers, school and such other accessories as are necessary for the care of horses in the field.

Put Up 23-Room General Office in One Day

The vanguard of the contractor's forces reached the site on June 18, and on the following morning a double telephone switchboard was set up on scaffolding surmounting the eminence known as Boulder Hill, near the railroad yard. While trunk lines to Springfield and Ayer were being connected to these switchboards and the two operators got to work, a general office building 36 x 306 ft. began to grow around the platform. Before night it was walled, roofed and floored. By noon next day it was completed. This building contains an entrance lobby, a central corridor, two lavatories and 21 office and drafting rooms.

The lumber for this building and to start the contractor's camp was bought out of stock from near-by yards and delivered to the site almost immediately after placing the orders. The contractor's temporary camp, the location of which is indicated on the drawing, was started at the same time and pushed quite as rapidly. Work was slowed down in a few days after a housing capacity of approximately 3000 had been reached, as it is impossible to develop the work to the point where the full quota of 5000 men can be profitably employed during the first few weeks.

The classification yard of the Boston & Maine R.R. at one side of the site was already overtaxed, and it was necessary immediately to build a new yard. For receiving and unloading materials, the Boston & Maine built seven tracks averaging 2000 ft. in length, and in addition the contractor has under construction spurs and sidings totaling more than four miles. Two of these spurs, partly encircling the site, may be found useful later in supplementing the motor-truck transportation of sawed lumber.

Second-hand rails for the lines built by the contractor were not to be had from any railroad or contracting firm in New England. Nevertheless, it required but five days to lay down at Ayer all the rail needed. The contractor's purchasing agent, after failing to locate a nearer supply over the long-distance telephone, came to New York, walked with representatives of several railroads from Weehawken to Communipaw in Jersey City, and before reaching the end of his excursion had bought the tonnage of rail required. Not only the rail, but a sufficient supply of the odd fishplates needed to connect the varied weights and sizes, were delivered to the job before the local force was ready for them.

Fourteen Saw Mills Frame 550,000 Feet a Day

Carpenter labor is difficult enough to secure at this time, and practically all framing by hand has therefore been eliminated. Although Ayer is technically in the Fitchburg district, the Boston market for labor really governs the work, as practically all the men must be drawn from there. To keep these men continuously busy on progressive work, it is the object of the contractor to unload lumber scheduled for the buildings under way, frame it at the siding, load it on motor trucks and deliver it to the site without ever letting it touch the ground. For this purpose 14 sawmills and a clipper with a capacity in two 8-hour shifts of 550,000 ft. are provided.

At the start of the work, of course, deliveries of anything that was ready to ship had to be accepted, the material that was wanted for the buildings under way could not always be got at without unloading other cars, the storehouses at the siding were under construction as well as the sawmills themselves and other temporary buildings, and it was not until the first week in July,



FOURTEEN OF THESE MILLS FRAME HALF A MILLION FEET DAILY



"IT IS HERE THAT THE WORK SWARMS WITH MEN"—HALF A DOZEN OF THE SAWMILLS SHOWN IN THE CENTER

after 10 of the mills had been set up, that this organization was going smoothly. Throughout the work it is expected that perhaps a third of the lumber will have to be piled before being sawed, and handled twice.

It is here that the work swarms with men. All the lumber unloaded must be passed through the mills and tallied whether worked or not. Moreover, at one end of this yard are the main storehouses, while at the other four blacksmith shops, the main garage and the fire station form another busy center.

Motor-Truck Transport System Covers Site

At fast as it is cut, the lumber is loaded into motor trucks and wagons forming a long line on the side of the sawmills away from the yard. In addition to the 33 army trucks, which are Kelly-Springfields, the contractor has already at the site 17 large trucks, 10 of which are Duplex 4-ton trucks with 6-ton trailers, enabling each unit to handle 10-ton loads. Small supplies, tools and often gangs of men are carried around the work by 11 light Overland trucks. The trucks are, of course, loaded by hand. The large number of laborers employed, however, makes the process very rapid. The trucks are supplemented at present by 120 teams, which can transport from 1½ to 2 tons at a trip.

Naturally, the first work started was on the buildings in two of the units nearest the railroad yard. This start, indicated on the drawing, will make it possible to carry the work in both directions around the main circle and has also given the contractor an opportunity to complete some of the road grading, so that the more remote parts of the site may be reached without at the same time sacrificing any speed on the immediate work started.

Trenching Machines and Steam Shovels Busy

The grading is being done with three revolving steam shovels of ⅝- and ¾-yd. size. They are being assisted in some of the grading necessary by a pair of Keystone excavators. Hand labor on installing the water and sewer systems is also being saved by three trenching machines of different patterns. For the most part these machines operate with considerable speed, but in a few places boulders and large roots which could not be blasted out have made handwork necessary. The soil is porous sand and gravel with a sufficient mixture of clay to make it stand for a short time after a trench is opened. In many parts of the field, however, sheeting is required in sewer trenches.

A few thousand yards of concrete at scattered locations will be required. The chief items are the lavatory foundations and floors, and the intake well for the water system. This latter will be built in a wood sheet-pile cofferdam, as it is 50 ft. in diameter and extends 30 ft. down to a stratum of water-bearing gravel. Seven concrete mixers are on the site.

Temporary Water-Supply from Ayer

At the time the site selected was under consideration, the civilian engineers now engaged at the camp conducted a test to determine whether the source from which Ayer draws its water-supply would be ample for the needs of the far larger camp. The Nashua River was not considered as a source of supply, because of known pollution. The town of Ayer pumps its water from a number of driven wells, which reach a stratum of water-bearing gravel 25 ft. below ground surface at a point north of the camp. Additional pumps were secured, and the normal drain on these wells of less than 300,000 gal. a day was increased by more than 1,000,000 gal. without lowering the water table to any appreciable extent.

It was decided on the basis of this test that the Ayer system could supply the camp during the construction period and that the stratum of gravel tapped would be ample for the needs of the cantonment. It is planned to construct a well 50 ft. in diameter and 30 ft. deep, beside which the electrically driven pumping units for the camp will be installed. These pumps will deliver water to four 100,000-gal. redwood stave tanks, through a pair of 12-in. mains. Both these mains and the 8-in. line to the Ayer water system connect into a double line of 8-in. mains circling the camp, from which the supply from the various units is drawn and which is connected to the tanks.

The normal head from the tanks on the greater part of this distributing system is about 150 ft., to which, for fire service, 50 ft. will be added by means of a booster pump located on a bypass on a 16-in. main between the tanks and the distribution system. Should the demand draw down to any extent the water in the 50-ft. diameter well, additional wells will be sunk in the same general neighborhood and water siphoned to the original well.

In addition to the fire protection thus afforded, the cantonment will have a complete fire department, one of the chemical engines belonging to which is already at the site for the protection of the work during construction.

Sewage Disposal by Sand Filtration

Collecting sewers will circle the camp in a similar manner to the layout for the water mains and deliver sewage to a 24-in. main, extending to a 150,000-gal. pump well near the Nashua River east of the camp, from



TRUCKS SCATTER CLOUDS OF DUST

which a 4,000,000-gal. pumping unit will raise it and distribute it over 20 acres of natural sand filter beds.

The land acquired at the site of the water-supply and for the filtration beds, in addition to 1000 acres or more north of the camp, where a hospital is to be built capable of accommodating 2% of the force at the camp, will run the total acreage of the reservation up to 10,000.

The entire reservation will be circled by electric light and power lines, carried on poles, which will provide for a maximum lighting load of 800 kw. and for a power load for the pumps of 400 kw. additional. This current will be supplied by the New England Power Co., which is constructing an 8-mile 66,000-volt transmission line from Leominster to the cantonment. A temporary line is already in use for lighting the construction work, driving the contractor's saws and running his pumps.

Contractor's "Officers" Are Mounted

To cover the wide range of territory at the camp site, the contractor's manager and general superintendents as well as the chief engineer and any visiting officers of the company are provided with automobiles, at least 15 of which are in constant use. In addition, several of the labor foremen and others are mounted, 14 saddle horses being kept on the work for this purpose. While it cannot be said that automobile riding over the roughly graded and as yet unpaved roads and through the brush is an unmixed pleasure, three sprinkling wagons are kept in continual use to mitigate the dust as much as possible.

Substantial progress is being made at the work. On July 30 there were 399 buildings under construction, a large percentage of them closed in; the main outfall sewer was built, and 60% of all the sewer work was completed. There were then 6400 men at work at the site.

The work at Ayer, as stated, is under the direction of Colonel Littell's office, with Capt. Edward Canfield, Jr., in local charge. The duties and relations of the other firms and individuals concerned is best grasped by a study of the accompanying organization chart.

Segment Block Sewer Fails

Two Breaks Occur in 4-Foot Sewer Near Manholes—Thought To Be Due to Poor Shaping of Bottom of Trench

By Seymour U. Misner
Civil Engineer, Fort Wayne, Ind.

TWO BREAKS occurred recently in a segmental block sewer completed in the winter of 1915. The sewer is circular, 4 ft. in diameter, and is a combined trunk sewer. On June 27 about 14 ft. of the sewer showed failure, the ground above being washed into the break and channel, leaving a hole about 17 ft. deep, with sloping sides. A catchbasin was partly uncovered and its outlet pipe found to have been washed into the break and covered by the earth washed in. The failure occurred at the point where the catchbasin entered the segmental block sewer. On June 30 a second failure occurred in this same sewer about 1000 ft. below the first break. This break occurred on the downflow, or west, side of a brick manhole. The manhole itself was left standing, fully exposed on the west. Leading into the north side of the manhole is a 15-in. vitrified-clay lateral, still intact, although it is partly exposed for 14 feet.



BREAK IN SEGMENTAL BLOCK SEWER

My first theory as to the cause points to a common occurrence in sewer work. It is that the digging was done with a trenching machine and care was not exercised in shaping the trench bottom so that when the segmental blocks were placed they would have a firm and sure foundation. Loose dirt was placed behind the lower quarters and tamped sufficiently to hold the blocks in place until the circle was completed. When the arch was brought to a closing at the top, the lower quarter had settled and the sides bulged out, creating a space of several inches at the top of the sewer. The result was a flat-roof sewer, poor cement being flushed and placed in the voids and joints.

The sewer in the vicinity of the two breaks is built across and parallel to a ditch that after a rain has its banks flooded.

No damage to property resulted from the breaks.

Engineer Ousted as City Manager of Portsmouth, Va.

Council Interferes with, Then Discharges Manager—Citizens Protest—May Recall Council—Manager Makes Statement

AFTER six months' service as city manager of Portsmouth, Va., Tyrrell B. Shertzer, an engineer of 16 years' experience, mostly in municipal work, was discharged by a 5 to 2 vote of the city council. This action was taken on June 25, to become effective on July 31. The council has been severely criticized at two mass meetings, one of which voted to request the council to rescind its action and also decided to start a petition for an election to vote on a recall amendment to the city charter, as provided by statute, in order that the people may have a chance to turn the majority of the council out of office. A public protest against the action of the council has been issued by Mr. Shertzer.

City-Manager Plan Not Followed

The council is said to have organized last September on a departmental basis. It was a long time in selecting a manager. Mr. Shertzer was chosen after many applications had been received as a result of advertising in the technical press. He took office on Jan. 2, at a salary of $4000 a year. Although the general statute under which the voters declared for the city-manager plan distinctly provides that all executive power shall be vested in the city manager, and notwithstanding an adverse written opinion from the city attorney, yet the council, Mr. Shertzer says, has "persisted in maintaining" its departmental organization and has continued to insist that it "have a voice in all of the details of the administration of the city affairs."

The resolution removing Mr. Shertzer from office, which was adopted in executive session (against the law, it is said), was as follows:

"Whereas, it appears to the Council of the City of Portsmouth that T. B. Shertzer is not familiar with the needs and urgencies of the City of Portsmouth and is unable to satisfactorily handle the municipal affairs of the city, therefore be it resolved by the Council of the City of Portsmouth, Va., that the services of T. B. Shertzer as City Manager be dispensed with on and after July 31, 1917."

The City Manager's Side of the Case

The following extracts from a public statement issued by Mr. Shertzer tell a part of his side of the case:

"I came to this city on Jan. 1 a total stranger. I did not know a single man, woman or child in it. I had never been in the city but once before and then only for one day when I came on invitation of the council when it was considering the various applicants for this position. I had absolutely no knowledge or information as to existing conditions, finances or plans. Since my arrival and assumption of office, however, I have discovered a most involved and chaotic financial condition, uncared for streets, a loose system or rather lack of system in collecting trash and garbage, a disorganized street-cleaning force, a disorganized police department, a disheartened and disorganized fire department, general looseness of methods in all of the city offices, each one working for itself only and irrespective of what other offices were doing, each office and department making its own purchases when and how it pleased, no system for promptly auditing bills and paying them promptly so as to take advantage of discounts, and a thousand and one things of similar nature. There was a total lack of system and coördination throughout the entire municipal machinery. I have been working single handed with this condition and now am charged with the statement 'is not familiar with the needs and urgencies, etc.'

Some of the Things Done in Six Months' Time

"Since Jan. 1 I have reorganized the Police Department and have recently been advised by neighboring officials and the various railroad officials that Portsmouth now has the most efficient police department of its size in this section. I have purchased an entirely new and up-to-date equipment of motor fire apparatus and have made financial arrangements whereby the cost of it will be met in 7½ years by the difference in the cost of the maintenance of the antiquated horse-drawn apparatus and the motor apparatus. I have standardized all of the city supplies, purchasing them through a purchasing agent on bids only and issuing them to the departments and offices only on requisition. Notwithstanding the higher cost of all items, I have effected a saving of between 20% and 25% in this way on supplies.

"I have standardized the method of auditing and paying bills so that we have no 'running accounts' and all bills are settled weekly. I have instituted a vigorous campaign for collecting taxes and license fees so that more has been collected so far this year than in any corresponding period in the history of the city. I have so improved the methods of street cleaning and the collection of trash and garbage that notwithstanding the fact that the equipment cost is one-third more than in the past yet over 50% more work is being done at a unit cost of less than two-thirds of that in the past. These are some of the things which I have done since assuming office, and I state them only to offset the charges in the resolution.

The Whole Move Is Political

"I am a graduate civil engineer with over 16 years' experience, the most of which has been in municipal work. This whole move is political and I feel that unless a true statement of conditions as I found them, of what I have done in the face of opposition and lack of coöperation, not only on the part of the majority of the members of the council, but also on the part of many of the present city officials, is made that a garbled report of the council action will be spread broadcast and do me great injury in the future.

"At least one of the members of the original council was, so I am informed, one of the most strenuous opponents of the adoption of the city-manager form of government; and after the people had voted to adopt this form, the political machine of the city concentrated its efforts to get him on the council with the avowed purpose of doing all within his power to discredit it. Of this fact I have no first-hand personal knowledge, since it all took place long before my arrival

I have, however, been so informed by many of the most substantial citizens, and his actions since I have been here bear out the charge.

COMPLEXION OF COUNCIL CHANGED SINCE ELECTION

"The complexion of the council has changed completely since its election, as one of the original members has died, a second was forced by ill health to resign and a third resigned partly for business reasons and partly from disgust. These vacancies took place at various times; and as the law allows the majority of the remaining members to fill vacancies for the unexpired terms, advantage was taken of the absence of one of the members at one meeting to fill the first vacancy with a man who was favorable to the opposition, thus giving them a majority. The filling of the other two vacancies with men unfavorable to the city-manager plan was then easy, so that now the line-up of the council is five against the plan and two for it.

"This fight and my dismissal, I am confident, is not so much a fight against me personally as it is an effort to discredit and belittle the form of government. Some of it, however, is directed at me for my refusal on several occasions to be blindly led into doing things against my better judgment. The fact that I dismissed the brother of one of the members from the police force for leaving the city without permission and for going on a two weeks' spree did not endear me."

No Yellow-Legged Engineer Could Build Him a Dam

Western Rancher Disdained Asking Expert Advice and Went Ahead with Disastrous Results

SOME amateur engineering with the usual result is shown in the story of an irrigation dam recently started, and very soon after stopped, in a far Western state. Somewhat over a year ago a rancher decided to store water for irrigation purposes on his own ground and chose a site at the lower end of a steep, narrow gorge carrying a stream of substantial flood-water flow.

The structure was of reinforced concrete, curved upstream, with reinforcing of old railroad iron laid horizontal, none vertical. The thickness was to be 18 in., bottom and top, and the length along the crest about 250 ft. The intended height is problematical, but was probably twice that reached. "Anchoring" the ends consisted of digging a shallow trench a few feet into the dirt hillside. The foundation work was a trench three or four feet deep in the gravel stream bed. There was no attempt at reaching bedrock.

When the dam was started, the water master of that district strongly advised against its continuance under the plans the owner was seen to be working upon, and told him to consult an engineer and obtain the approval of the state engineer. The reply was that he had constructed a concrete livery stable at Spokane, and no yellow-legged engineer could show him how to build a dam.

When the structure had reached a height of about 15 ft. above the stream bed (as shown by the standing portion in one of the views), the water master ordered the work stopped. A few days later the water rose several feet in the creek, a mere starter on what would come with the spring flood, and a large section of the dam was carried away, as shown in the other view. What is left is really of negligible value!



CONCRETE ARCH DAM 250 FEET LONG AND 18 INCHES THICK ALL THE WAY UP IS BEING BUILT BY RANCHER WITHOUT ENGINEERING ADVICE



WHEN THE DAM WAS ABOUT 15 FT HIGH, ONLY HALF THE HEIGHT INTENDED, THE FIRST RISE IN THE RAPID RUNNING STREAM WASHED IT AWAY

All Cleveland United in Good-Paving Campaign

Evidence Is Convincing That Getting the Public Interested in Municipal Engineering Pays Abundant Dividends in Better Work



MAYOR LAYS FIRST BLOCK IN REPAVING EUCLID AVENUE

Civic League and Cleveland Engineering Society Play Large Part in Execution of City's Definite Plan for $10,000,000 Program

By NATHAN C. ROCKWOOD
Associate Editor, "Engineering News-Record"

DOES IT PAY to help the public comprehend the engineer and his work? What has publicity for engineering accomplished? Study Cleveland's repaving work and you have an answer which bids fair to mark an epoch in the betterment of municipal engineering. If the program already well begun is carried out in the spirit of its inception, the street-improvement work of Cleveland will form a model precedent for American cities.

The engineers of Cleveland through their active Cleveland Engineering Society have been pioneers in engineering publicity. They have set the engineers of the country an example of public spirit, they have devoted some of their energies to wider and more comprehensive things than professional discussions, they have worked for civic betterment—and their labor is bearing fruit.

When the citizens of Cleveland voted $3,000,000 to pay the city's share in a $10,000,000 street-paving, repaving, resurfacing and repairing program, the engineers of the city set about the task of insuring the city the best results the money could buy. How much their previous work in engineering publicity affected the success of this task no one can definitely state, nor can one deny that the unprecedented development in Cleveland today is in no small degree the fruit of that broad-minded outlook on engineering.

Plan for Municipal Paving Commission Failed

The first plan to give the public an interest in the work and a real insight into how the money was being spent was to have the mayor appoint a commission of public-spirited engineers, which was to coöperate with and assist the city engineering staff and serve without pay. This plan was agitated by the Cleveland Engineering Society and was accomplished, but the city fathers neglected to confer any powers on the commission, and it died in infancy.

The engineers of the city then coöperated with and assisted the Civic League of Cleveland, a well-established and exceedingly useful organization working for cleaner local politics. A paving committee of the league, consisting largely of engineers and headed by J. W. Frazier, president of the Frazier-Sheal Engineering Co., was appointed, funds for carrying on inspection work were raised and an engineer and inspectors were appointed.

Organization of Cleveland Paving Work

Paving work in Cleveland is done through a Department of Public Service, in which is a commissioner (chief engineer) of engineering and construction and a commissioner of streets. The former has charge of all new construction, the latter of all repair work. Each is independent within his own sphere. All subordinates are under civil service.

The commissioner of engineering and construction is Robert Hoffman, who has been head of the city engineering department for several years. His deputy in charge of pavement construction is F. R. Williams. The work under Mr. Williams (more than 100 contracts) is handled through a chief inspector and his staff of 45 inspectors; one field assistant engineer, who has the supervision of four field parties; an office assistant engineer, who has charge of the office force; and an assistant engineer in charge of sidewalk construction.

The extensive amount of repaving to be accomplished called for careful planning. It was desired to carry out the whole program in three years. The work was studied with the view of doing the work most needed first, of providing certain principal through routes with continuous good pavement as soon as possible, of preventing the tearing up of all the streets in one locality any more than was essential to economic construction, and of utilizing old pavements as far as possible. It was desired to do $2,500,000 worth of work during the present year, but labor and material shortages will probably cut this to $1,500,000.

Three General Types of Pavement

The larger part of the new pavement work is of three general types—for the heaviest traffic either Medina sandstone on a 6-in. concrete base and a granulated slag cushion, or creosoted wood block on an 8-in. concrete foundation, and for other streets chiefly some form of

brick pavement. Specifications are provided for granite block, but granite has never been able to compete with Medina sandstone in this locality. The Medina sandstone blocks are more irregular than the first-class granite blocks used for the paving of Eastern cities, but wear smooth and make an excellent grouted pavement. In some instances the old blocks are being relaid, but the general practice is to require new blocks.

The creosoted wood blocks are long-leaf yellow pine treated with 16 lb. of either coal tar or distillate oil, according to the usual specifications requiring a supplemental vacuum preceded by or followed by a short steaming period. Wood-block pavement is being laid on Euclid Ave., the city's principal business and residence street. A large part of all residence streets is paved with either monolithic brick or brick laid on a sand-cement bedding. Probably Cleveland is the first large city to adopt the monolithic brick construction extensively. There are one or two short stretches of two-course concrete pavement to be let, and some asphaltic concrete, including bitulithic. Some of the older pavements are being resurfaced with 2 in. of tar concrete. These comprise all of the types of pavement being used in Cleveland today. The selection of the type is a matter of some study, but no extensive investigation or research has been made. Brick has been the popular pavement in Cleveland for many years, and by far the most streets have always been paved with this material.

There are generally two inspectors on each brick paving job, one to inspect concrete and the other bricklaying. As many as four inspectors to a job are sometimes employed. These inspectors report to the chief inspector, who is responsible only to the paving engineer. The inspectors in general are of the usual city-pavement-inspector type and are not technically trained men.

Civic League Has Independent Inspection

The Civic League, through its paving engineer, H. P. Cumings, has established an inspection bureau which follows the work very closely. The paving engineer spends a considerable part of his time on inspection work, and two inspectors (formerly three) are constantly on the work, each paving job being visited by them at least once a day. They keep daily tab on how the work is being done, whether the specifications are being lived up to, whether the subgrade is properly prepared, whether the concrete is good or bad; but not the least of their tasks is to see whether the city inspectors are on the job and how efficient they are.

Colored charts on cross-section paper have been devised whereby the paving engineer keeps accurate track of each day's operation on a contract. A system of letters and figures is used by which he knows which of the city paving inspectors was at work that day, which of his own inspectors visited the job, and the character of the work being done. All this is shown at a glance by a color scheme, each chart covering an entire month and 20 or more jobs. The league's inspectors make their reports on loose-leaf notebooks, and the original data are, of course, kept. The city's inspectors are rated by the Civic League's inspectors on their general bearing toward the work, whether they are civil or surly, whether they are sober—in fact, a rather close tab is kept on their ability to do their work.



EUCLID AVENUE, CLEVELAND'S PRINCIPAL STREET, BEFORE REPAVING—REPAVING STARTED ON FAR SIDE

Moral Effect of Civic League's Inspection

The moral effect has been considerable. While the attitude of some of the city inspectors was at first antagonistic, most of them have accepted the situation in the proper spirit and have exerted themselves to make good. It has accomplished something which probably the city engineering department could not have accomplished in promoting efficiency and honesty among its inspectors. The Civic League has brought about the dismissal of at least one incompetent city inspector and has been very influential in bringing about the proper performance of their duties by the others.

In dealing with the higher city officials, the engineer of the Civic League has shown the diplomacy, tact and professional courtesy which are essential to proper co-operation. While public criticism is the one compelling force by which the Civic League is able to accomplish its work, it is never used until the matter under criticism is taken up with the city officials and they are given an opportunity to defend it or correct it, as they see fit.

There was a tendency at the beginning for the newspapers to make political capital out of whatever criticism the Civic League should make of the city engineering administration. The engineer of the Civic League soon put an end to this idea.

So far the work of the Civic League has not extended beyond the inspection work already under construction, but it is intended in another year to widen its activities

to making its influence felt in the selection of types of pavement for different kinds of streets and in the drafting of specifications.

With the city engineering department the work of the Civic League, although at first looked upon with some misgiving, has been accepted in the spirit of hearty coöperation and good will. The chief engineer has stated that he welcomed the services of the league and that he would much rather have just criticism with public interest than have the work carried on without criticism and without interest on the part of the public.

Contractors Are Members of Pavers' Exchange

As regards the contractors, the work of the Civic League has met with little opposition, and the spirit of coöperation has made itself felt.

The principal paving contractors of the city a year ago formed an association known as the Pavers' Exchange, the avowed purpose of which is for mutual service and the promotion of better work. No firm or individual is eligible for membership in this exchange until he has been engaged in the paving business in the city for at least six months. The exchange has the power to reprimand, fine, suspend or expel a member for conduct which, in the opinion of its members, is improper or in prejudice to the welfare and reputation of the exchange.

Meetings of the exchange are said to approximate an engineering-society meeting. Ways and means of doing work are discussed, the performances of various machines described, and other matters of professional interest taken up. The president of the exchange, on occasion, employs a paving engineer to inspect and report upon the work of the various members; and if the work is not up to the standard of the exchange, the guilty contractor is liable to criticism and reprimand at a meeting of the members.

Exchange Makes Suggestions to City

The exchange makes recommendations to the city engineering department in regard to methods of work. For instance, in 1917 a granulated slag cushion was recommended for all stone-block paving, a suggestion which was subsequently adopted. Other similar recommendations are made every year. One in 1917 was for the enforcement of all ordinances applying to the use of heavy trucks on pavements.

The activities of the exchange extend to such cooperative work as the pooling of materials, so that a contractor with a surplus of cement or other construction material will supply at cost one who is short. There is also a laborers' exchange agreement whereby one contractor may have an opportunity to utilize the services at once of any laborers whom another contractor is letting go. Some attempt has been made on the part of a few members of the exchange in the line of coöperative buying of broken stone and gravel.

While such an association offers an opportunity for collusion and exorbitant prices, the members of the exchange deny any such object; and no evidence has been produced to show that this has been done. The advantages of coöperation among the contractors are admitted by all the engineers connected with the work and have been practically proved in this instance, at least so far as the contractors are concerned.

Apparently little public opposition is being met because of high prices. A large part of the new paving work is by the assessment method, by which the city pays but one-tenth of the cost. Requests for pavements by property owners continue to be made, and but seldom is an objection raised because of the present high prices. The accompanying table, compiled by the secretary of the Pavers' Exchange, shows the range of prices of paving materials and labor in Cleveland from 1914 to Mar. 1, and July 16, 1917, quotations. Mar. 1 is about the date of several of the new paving contracts.

The prices bid for various types of pavements have run about 25% above the engineers' estimates of from one to three years ago, but this has not interrupted the work. The people of Cleveland want pavements and want them now. The prices the city is paying follow:

RANGE OF PRICES OF MATERIALS OF LABOR USED IN PAVING CLEVELAND STREETS IN 1914 TO 1917

	1914	1915	1916	Mar. 1 1917	Increase from 1914	July 16 1917	Increase from 1914
City test cement, per bbl	$1 35 90 95	$1 65	$1 90	$2 32	41 %	$2 80	51 %
Crushed stone, per ton	1 90 1 05	1 08	1 13	1 33	32 %	1 33	32 %
Conglomerate, per ton	65 70	75	88	90	27 %	1 20	41 %
Bank sand, per ton	55	65	70	75	26 %	1 13	32 %
Dressed block, Medina, per sq.yd.	1 42	1 55	1 65	1 65	13 %	1 65	13 %
Common brick, per thousand	6 75	7 00	7 50	11 00	38 %	15 50	56 %
Paving brick, 4 in., per thousand	16 50	16 75	19 50	21 50	23 %	24 50	32 %
Paving brick, 5 in., per thousand	.....	.....	.....	.....	...	29 00	
Teams, per hour	50	50	75	80	37 %	80	37 %
Labor, per hour	17½	22½	40	45	61 %	45	61 %
Freight increase, per ton	1 50			1 61	6 %	1 61	6 %

For 5-in. brick on a 6-in. concrete base, about $3.33 per sq.yd.; 4-in. brick on a 6-in. foundation, $2.88; bitulithic, $1.42; sheet-asphalt, $1.58; asphaltic-concrete, $1.37; with Mexican asphalts in place of Trinidad the prices are $1.46 and $1.30 respectively; 4-in. creosoted wood block on mortar cushion, $3.23; two-course concrete, from $1.98 to $2.40 per sq.yd.

The choice as between monolithic and sand-cement bedding for brick-pavement construction has depended chiefly on the willingness of contractors to undertake monolithic work; however, the tendency is more and more toward this type, the contractors who have had experience preferring the monolithic method.

The prices given for bituminous pavements and the wood block do not include concrete foundations. The various types of bituminous pavements are used largely for resurfacing older pavements. Foundation concrete (1:3:6) with unwashed gravel aggregate is costing about $6.50 per cu.yd., or $1.08 per sq.yd. for a 6-in. base and $1.44 for an 8-in. base.

Preparation of a Street Code Recommended By Civic Bodies

One of the most important developments is the interest aroused in securing street regulations which will preserve the new pavements as long as possible. Several meetings have been held by representatives of the Civic League, the Engineering Society and the Electrical League, for the purpose of framing a street code which will provide for proper organization of all street work, including the placing of all substructures, the preparation of permanent plans and records and an effective coördination of all street functions. The great weakness of having a repair department distinct from the engi-

neering department has been emphasized, and an attempt is being made to draw up ordinances which will cover all the defects in the present system. While recognizing the difficulty in drafting a code comprehensive enough to accomplish this purpose, the paving committee of the Civic League has attacked the problem with enthusiasm and earnestness, and a report is expected late in the fall. If such a code can be framed, it will be the first in the country; and its enforcement may be expected to be a great step in eliminating one of the trials of city and paving engineers.

The need for adequate cost records is another matter which the conference has taken up, so that sufficient data may be collected from it to determine with some accuracy the width of pavement, thickness of base, type of pavement and apportionment of cost between city and property owners. Also, some effort is being directed toward improving the appearance of street fixtures by regulating their use and location and avoiding wherever possible the duplication of fixtures. In fact, the whole subject of street improvement is under discussion by a board of open-minded, public-spirited engineer citizens.

Wisconsin Enacts Three Notable City-Planning Laws

Zoning by City-Plan Commissions Made Possible—Street-Widening Procedure Authorized—Building-Setback Control

By S. J. Williams
Building Inspector, State Industrial Commission, Madison, Wis.

THE Wisconsin legislature, whose session has just ended, passed three notable city-planning laws. The most important of these authorizes cities to regulate and restrict the location of trades and industries and the location of buildings for specified uses and to establish districts within which certain industries or other occupancies may be excluded or subjected to special regulations. The city may also establish districts within which the height and area of buildings may be subjected to special restrictions. In other words, the new Wisconsin law is modeled after the present New York law. A zoning ordinance must first be framed by a city-plan commission, if the city has one.

Powers of City-Plan Commissions

Under a law passed four years ago, cities are authorized to provide city-plan commissions consisting of the mayor, the city engineer, one alderman, the president of the park board, if there is such a board, and three or four citizen members appointed by the mayor and serving without compensation. This commission has no legislative powers, but the council must refer to it, before taking any action, all questions relating to streets, boulevards, parks, public buildings, etc. To these duties are now added the formulation of a districting plan, as already mentioned.

When the report of the city-plan commission has been presented to the council, the council may alter it, but only after public hearing. The plan must then be finally adopted by the council. If a change is proposed in a district once established and if 20% of the proposed owners of the frontage involved, or the frontage opposite or behind that in question, object, then such amendment requires a three-fourths vote of the council.

The new zoning law, which applies only to new buildings and extensions of existing buildings, supersedes a former law which authorized cities to establish residence districts, but provided for damage suits by property owners, which provision practically nullified the law. Milwaukee tried to establish residence districts under the old law, but the ordinances were repealed when damage suits were brought. The old law was also defective in other ways. The new law was actively supported by the Milwaukee City Council. The Public Land Commission (which in Milwaukee exercises the functions of a city-plan commission) plans to take early steps toward the formulation of districting ordinances.

In Madison, the state capital, an ordinance is before the council providing for a city-plan commission, which is expected shortly to be passed, after which the commission will undoubtedly take up zoning as one of its first duties. Madison, on account of its location on a narrow neck of land between two lakes and also perhaps on account of the largely transient character of its population, has developed problems of congestion which would ordinarily be found only in a much larger city.

Street-Widening Procedure

A second important new law is one on the widening of streets. This provides that, if the council decides to widen a street, a jury shall be convened to take action thereon, as in other condemnation proceedings; but after such action, if buildings are located on a part or all of the land to be taken, then the city may, at its discretion, take over such land at once, paying the necessary damages; or may wait until the building is torn down and then take over the land without paying for the building. Thus by waiting 10 or 15 years the city may gradually take over one portion of land after another as the old buildings are torn down to make way for new ones, and the public treasury is saved the expense of paying for the old buildings.

As soon as the jury's verdict is entered confirming the necessity for widening the street, it immediately becomes unlawful for any person to build upon the land to be thus taken, or to increase the height of any existing building on such land; and if any one does so build, he must remove his building without cost to the city when the latter is ready to buy the land.

City Councils May Establish Building Lines

The third statute provides that a city council may establish building lines set back from the street line and may prohibit building between such lines, provided that any person injured by such action may recover damages by proceedings begun within three months after the adoption of the ordinance. This makes it possible to establish such building lines where the property owners agree not to sue for damages or where, if one or two owners are actually damaged and insist upon reimbursement, the other property owners are willing to stand the expense for the sake of the improvement to their property. It is not expected that the city would ordinarily be willing to pay such damages.

Retaining Dams Prevent Overflow of Sewers at Binghamton

Sidehill Streams Which Used To Fill with Debris and Cause Floods Now Controlled by Dams and Paved Channels

By W. Earl Weller
City Engineer, Binghamton, N. Y.

TROUBLESOME flood conditions due to the clogging of the entrances of storm-water sewers at Binghamton, N. Y., were cured last year by the construction of several small retaining dams that slowed up the flood flow and stopped the débris. The solution might be applicable to other communities and is for that reason outlined here.

Binghamton is situated at the junction of the Chenango and the Susquehanna Rivers, all of the business district and a large part of the residential section being on a flat alluvial plain having a general elevation of 845 ft. above sea level. Hills rise abruptly from the edge of this plain to heights ranging from 1250 to 1600 ft. above sea level. Seven small creeks (dry for eight months in the year) carry the run-off from the hills across the flat land and into the rivers. On the hillsides these creeks are constantly cutting new or enlarging old channels through the clay and gravel. This material is brought down to the lower reaches of the streams, where it fills the channels, causing the creeks to overflow their banks. The steep profiles of the creeks and the nature of their drainage area promote freshets, every rainstorm at all heavier than normal converting the dry channels into rushing torrents.

Stopped Sewers Would Cause Floods

One of these creeks, the smallest, was especially troublesome. It is formed by the junction of two small creeks on a hillside about a mile south of the Susquehanna River and flows north into that river. The lower half-mile of the stream had been converted into a 42-in. storm sewer, and the starting point of trouble was at the entrance to this sewer. Whenever the little stream went on a rampage, it would pile brush, silt, gravel and fairly large stones (6 to 10 in. diameter) against the grating at the entrance to the sewer. The waters would then continue their trip to the river by way of streets; backyards and cellars. The 42-in. pipe, which has a very steep grade, is amply large to care for all the water the stream can deliver.

It was decided to try the effect of retaining dams to discourage the gravel-carrying proclivities of the creek. The 42-in. sewer was extended about 500 ft. south to and beyond the junction of the two branches. Two small dams were constructed on the larger branch and one on the smaller branch. The pools formed by these dams have an aggregate capacity of from 18,000 to 20,000 cu.ft. Each dam is pierced with a a 20-in. pipe and equipped with a spillway. The work was very inexpensive and the result so successful that the plan deserves consideration in other cities that may be troubled by similar conditions.

The sewer extension was built of segment block. In order to economize on the excavation and to avoid land damage, the sewer followed very closely the bed of the stream. This necessitated some short-radius curves that taxed the flexibility of the construction to the utmost. By chipping some of the blocks one radius as short as 20 ft. was successfully negotiated. The ends of the sewer were protected by vertical screens composed of ¼ x 1-in. flat bars spaced 1 in. center to center.



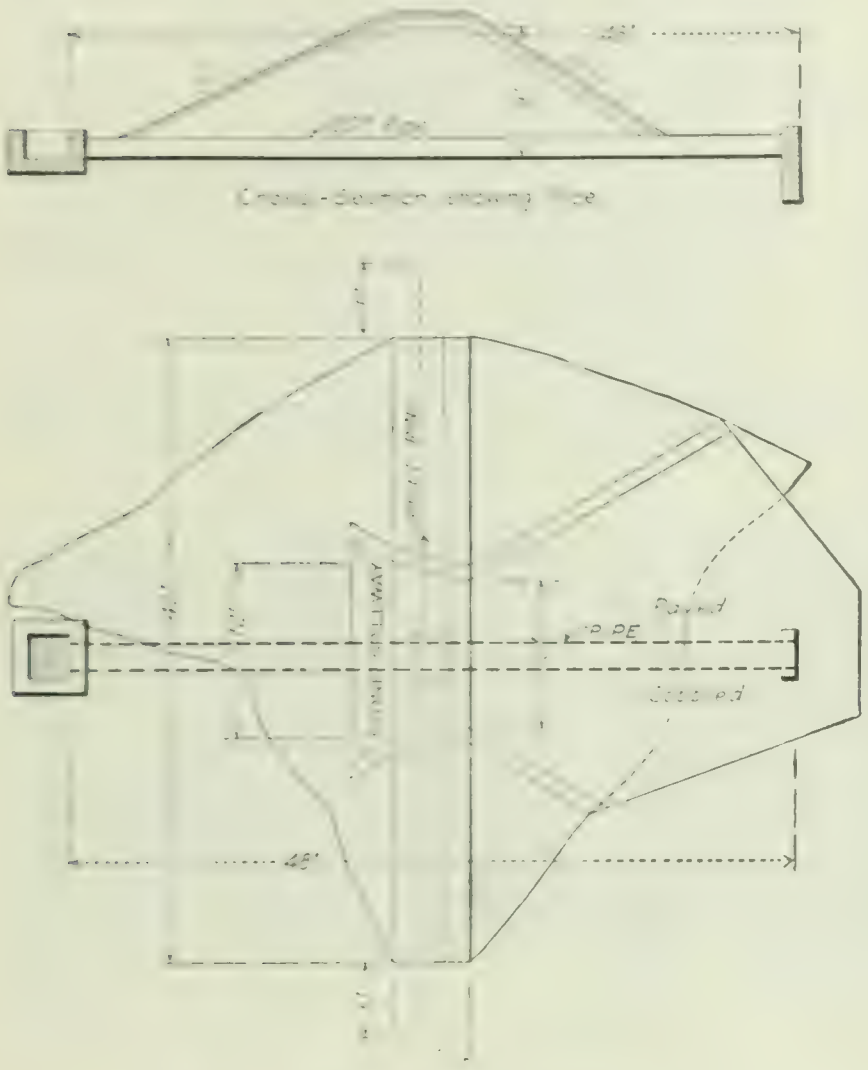
FRONT OF DAM (LEFT), INVERT OF NEW TILE BLOCK SEWER (CENTER), AND REAR OF DAM AFTER FLOOD (RIGHT)

Approach Channels Paved

Above these entrances to the sewer the bed of the creek was excavated to a uniform grade and paved with stones taken from the bed of the stream and grouted into place. This pavement was placed fairly smooth and flat for a distance of 15 ft. above the entrance. Considerable finer material finds its way through the gratings at the dams and collects at these points, from which it is readily removed by shoveling. The remainder of the paving was laid very rough in order to reduce as much as possible the velocity of the approaching water.

The three dams are all of similar construction differing merely in size. They are of earth construction with a concrete and corrugated steel sheet-piling core wall. The sheet-piling was driven well into the banks and well below the bed of the stream and 18 in. of concrete placed against its downstream face. The upstream faces of the dams are on a 2 on 1 slope and the downstream face on a 1½ on 1 slope. All earth was placed in 12-in. layers and tamped. The dams have a top width of 3 ft. at the spillway, which is depressed

1 ft. below the top of the dam. The downstream face, the spillway and the upper 6 ft. of the upstream face are paved. A line of 20-in. cast-iron pipe runs from a concrete sump about 15 ft. from the upstream toe of the dam to a headwall flush with and at the elevation of the downstream toe. The sump is fitted with a hori-



FLOOD-CONTROL DAM DETAILS

zontal bar screen. No valves are provided on this 20-in. line, so that it may be constantly open to care for the ordinary flow of the stream.

Since completion, these regulating works have been subjected to three very heavy storms, one of which approached the magnitude of a cloudburst. In each instance the water flowing in the creek exceeded the capacity of the 20-in. pipe and the pools behind the dams gradually filled to the level of and overflowed the spillways. As the storm passed, the 20-in. pipes drained the retained water from the pools and at no time was the capacity of the 42-in. sewer reached. All stones and débris carried by the streams were held back by the dams and were easily and cheaply removed.

One defect in the detailed design disclosed itself. The horizontal screens on the sump wells were too easily clogged either by natural causes or by boys intent on transforming the dry pools into swimming holes. This is being corrected at present by replacing the horizontal screens with screens built in the form of a box 3 ft. square in plan and from 3 to 5 ft. in height. This is the only change that will be made in the original plans if other regulating dams are constructed in Binghamton. The size of the pipes through the dams was criticized as being too large. Experience has proven that the 20-in. pipes are not too large. Any lull in the rainfall gives the pools a chance to unload part of their contents and to prepare for another downpour. The cost of maintenance has been very small.

The total cost of the work was $6862. The dams complete with pipe lines cost $875.33 each, and paving the creek bed cost $498.75 (about $3 per lin.ft.). The 42-in. sewer cost $5.15 per lin.ft. The cost of placing the segment block was three times the figure usually assumed in estimating such work, owing principally to the sharp curves in the line.

The general plan was worked out by Commissioner of Public Works John A. Giles in 1915. Detailed plans were prepared by the Bureau of Engineering, and the work was constructed under the direction of that bureau during the summer of 1916. F. A. Tillman was the engineer in charge of design and construction.

Chloramine at Denver Solves Aftergrowth Problem

Bacterial Increases in Chlorinated Filtered Water Eliminated Entirely at Greatly Reduced Cost for Chemicals

STERILIZATION by the use of chloramine is now an established fact on this side of the Canadian line. Following the publication of the results at Ottawa by Joseph Race (*Engineering News-Record*, June 21, page 606), H. I. DeBerard, chemist for the Denver Union Water Co., began immediately to try out chloramine. Aftergrowth counts on gelatine in the Capitol Hill reservoir dropped within four days after its use was initiated from 15,000 to 10 per c.c. The hypochlorite dose was also cut from 0.26 to 0.13 p.p.m. available chlorine. There was added 0.065 p.p.m. of anhydrous ammonia. These amounts were found to be the minima that could be used on the filtered effluent from a stored lake water.

At another point an unfiltered lake water had been treated with 2 lb. per million gallons of liquid chlorine. After application of chlorine, the gelatine count was 20 per c.c., but multiplication took place during the passage through a 48-in. conduit for 10 miles and the numbers would increase to 200. As this water enters directly into the city mains no opportunity was afforded to note any further increase. The liquid-chlorine outfit has been abandoned at this point and the former hypochlorite plant put back into commission. Effectual sterilization without subsequent aftergrowths, either at the end of the conduit or in the city distribution system, is obtained by the use of 0.2 p.p.m. of available chlorine and 0.1 p.p.m. of anhydrous ammonia.

Until permanent plants are installed a 10% solution of ammonia will be used. Ultimately about a 1% solution of ammonia, equivalent to 0.29% anhydrous ammonia, will be provided for. A more accurate feed can then be obtained and possibly the amounts may be still further reduced.

In using this mixture it has been found absolutely necessary to test each mix of bleach for available chlorine and then correct the amount of solution added to secure the required amount of available chlorine. The experiments were carried out and the new equipment installed under the direction of D. G. Thomas, chief engineer of the Denver Union Water Company.

Rational Study of Rainfall Data Makes Possible Better Estimates of Water Yield

Second Phase of Preventing Failure of Hydraulic Projects from Lack of Water Embraces Weighting and Interpolation of Records

By ROBERT E. HORTON
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Our need of more dependable estimates of probable water-supply for power, domestic-consumption and irrigation projects was outlined in Engineering News-Record *of June 7, p. 490, together with some suggestions for more adequate studies of stream yield, frequency of light flows, degree of flashiness and dry-weather evaporation from storage. In the following article, the author turns to a second phase of the broader problem to suggest similarly what improvements over common practice are advisable in the use of rainfall data.—Editor.*

A GOOD example of certain prevailing methods in hydrologic estimates that seem worthy only of condemnation is seen in the determination of the average precipitation over a drainage basin, year by year. The practice is not uncommon of assigning weights to different rainfall records within and without the drainage basins, basing these weights wholly on judgment. Here is a clear case where assumptions should be eliminated and the results made to rest directly on physical data.

It has seemed to the writer desirable to devise a method, first, that would provide a definite rule as to which records should be included and which excluded in estimating the mean precipitation on a drainage basin; and second, that would always give the same mean precipitation from the same data, thus eliminating the personal equation and element of judgment as largely as possible.

Geometrical Assigning of Weights

Other things being equal, the weight assigned to a given rainfall record in determining the mean precipitation on a drainage area in a given year should be proportional to the percentage of the total area of the drainage basin to which this given station lies nearer than does any other rainfall station. This purely geometric method of assigning weights to rainfall records was suggested by A. H. Thiessen in the *Monthly Weather Review*, July, 1911, pp. 1082-4. It was independently developed and has been extensively used by the writer.

In the application of the method a small-scale outline of the watershed boundary should be drawn and the different rainfall stations within and adjacent to the area located on the same map.

Fig. 1 illustrates such an outline map for a small basin having one station lying within the area and several stations adjacent, but external to it. Lines connecting the different stations are drawn, as 1-2, 2-3, and perpendiculars are erected at the median points on these lines, as *AB* and *BC*. Station 1 lies nearer than any other station to all points within the inclosed area *ABEFG*. Station 2 lies nearest to the portion of the figure *GABC* and station 3 nearest to the portion



FIG. 1. WEIGHT ASSIGNED GIVEN RAINFALL RECORD IS PROPORTIONAL TO AREA NEAREST OBSERVATION STATION

of the figure *BHKLMN*. Points on the line *GB* are equidistant from stations 1 and 2. Stations 6, 7 and 8 are not applicable to any portion of the area and may be eliminated. This is evident in case of station 6, since the perpendicular *OP* at the median point of the line 3-6 lies wholly outside the area. Hence no part of the area is as near to station 6 as to station 3. The graphical construction is easily checked by the fact that the perpendiculars at the median points of the three sides of a triangle intersect in a common point, as *K* in the case of the triangle 3-4-5. The areas of the figures nearest the different stations may be determined by planimeter and the corresponding percentages of the total area computed. The precipitation at station 1 for each time unit is multiplied by the corresponding percentage and so on for each of the other stations and their appropriate areas. The sum of the resulting weighted or percentage quantities is used as

the mean precipitation on the area for the given time unit.

Cases will arise where, owing to abrupt changes in elevation and corresponding changes in precipitation, the subdivision lines between areas belonging to each rainfall station as determined by this method will need some modification. In general, rain gages are located in the valleys, although cases may arise where they are all at the higher elevations in a given basin. These facts should be considered in interpreting precipitation records, but it should be borne in mind that precipitation does not always increase with altitude. In general, such an increase occurs only where moisture-bearing winds are deflected upward by a slope.

Theoretically, the increase in precipitation from an ascending air current is a function of the inclination and not of the absolute altitude. A clear understanding of the relation of coast lines, prevailing winds and topography to precipitation will often help toward a correct determination of the rainfall on a drainage basin, but arbitrary modifications of actual records should always be avoided, except as dictated by adequate scientific reasons applicable to the specific case in hand.

Interpolation of Missing Rainfalls

It frequently happens that the data for some months are missing in rainfall records used as a basis for estimating the precipitation on a drainage area. Various methods have hitherto been used for filling in gaps in rainfall records, but no uniform practice seems to have been established. Comparisons with observed rainfall show that most methods of interpolation of monthly precipitation may be subject to large errors in individual cases. The use of the mean of the precipitations at three surrounding stations in place of the missing record has the advantage that it is simple and is based on contemporaneous data. That method, however, gives equal weight to the records at each of the three stations used, although they may be at very unequal distances from the interpolation station.

In the absence of information to the contrary, the best assumption which can be made is that the rainfall varies uniformly between adjacent stations. Using this principle, the writer devised the following method of interpolating rainfall, which depends upon the fact that the position of a plane is completely determined by the coördinates of three points in the plane.

Inclined Plane Method of Interpolation

Select three base stations surrounding the interpolation station. On a suitable map (Fig. 2), showing the relative positions of the stations, connect any pair of the base stations, erect perpendiculars to this line at the stations, and measure off on each perpendicular a length proportional to the precipitation at that station for the period to be interpolated. On the assumption of uniform variation, the precipitation at any point along this line will be proportional to the ordinate from the base line to the line connecting the two plotted points.

Draw another line from the third base station *C*, Fig. 2, through the interpolation station *D*, intersecting the base line *AB* at *E*. Erect a perpendicular to *AB* at *E*, intersecting the line *FG* at *H*. The precipitation at *E* is assumed to be proportional to *EH*. Draw perpendiculars to *CE*, one at *C* proportional to the precipitation at that station, and one at *B* equal to *EH*.

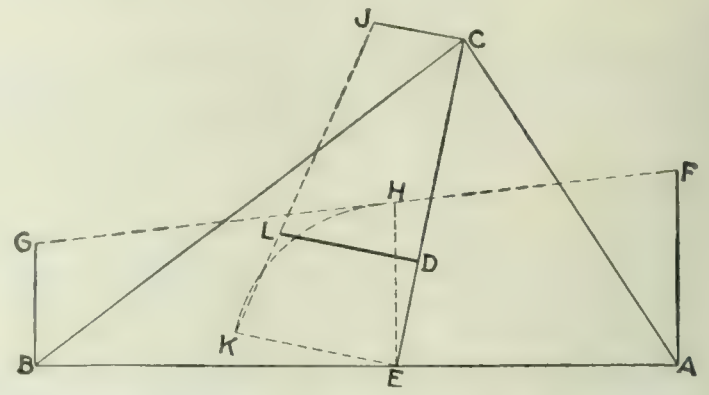


FIG. 2. RAINFALL AT A GIVEN POINT IS INTERPOLATED FROM THREE NEAR-BY STATIONS

Connect these lines by a line *JK*. Then a perpendicular *DL* at the interpolation station *D* will have a length proportional to the precipitation at *D*.

The graphical construction is extremely simple. Only simultaneous records are used, and the method involves but little more labor than the use of the mean of the three surrounding stations, but it is more logical. The weight given to remote stations in the inclined-plane method decreases as the distance increases.

Modification of Method

In practice, it will often be found that the rainfall does not vary uniformly between adjacent stations. In order to take this factor into account, the method may be modified as follows: Assuming that there is given for the interpolation station and for each of the three base stations the rainfall during the months preceding and following the month to be interpolated, find the ratio of the mean of these two months to the precipitation for the given month at each of the three base stations. Plot the values of this ratio by the inclined-plane method and find the corresponding ratio for the interpolation station. Multiply the mean of the rainfall during the preceding and following months at the interpolation station by this ratio. If preferred, the mean precipitation in the preceding and following years may be used with this method.

The modified inclined-plane method above described involves the principle that the departure, or abnormality, as it may be called, of the rainfall at the interpolation station in a given month as compared with the mean of the preceding and following months will be of the same nature as at the interpolation stations.

Rainfall Distribution

Hitherto in computing run-off from rainfall and other data, the month has been used as a time unit. Thus, details of distribution and precipitation are wholly ignored, yet these details are of the utmost importance. Considering the monthly precipitation only, the estimated yield of the stream would be the same whether the rain during a certain month having 2 in. precipitation all fell in a single storm or was distributed in 10 storms averaging 0.2 in. each. In the former case, only a small proportion of the precipitation would be lost by interception; and after the soil had dried out.

following the rain, the evaporation opportunity would be nearly zero. In the case of 10 storms of 0.2 in. each, 50% or more of the rain may be lost by direct interception and the soil surface evaporation opportunity would probably be 50% or more. Rainfall distribution thus affects the interception loss and soil evaporation losses directly. Its effect on the transpiration loss is taken into account if a method of estimating such loss from crop yields is used, as will be shown subsequently.

It is not surprising that monthly run-off estimates based on rainfall have often been criticized when so important a factor as rainfall distribution has been wholly neglected.

The natural time unit for estimating run-off is the storm period—that is, the average interval between rain storms in a given year and season. If the number of storms per month is used as a factor in estimating interception and soil evaporation losses, the monthly precipitation may still be utilized, thus avoiding the excessive labor of compiling precipitation data for shorter time units.

A third article will conclude this presentation of means for preventing excessive estimates of water-supply—discussing the conducting of a drainage-basin inspection, the effect of crops on run-off, evaporation losses, winter run-off and ground water storage.—Editor.

Temporary Hinges Advantageous in Concrete-Arch Erection

Guard Against Additional Stresses Arising from Arch Shortening Produced by Dead-Load Compression

By D. B. Steinman
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THE common assumption that, with an arch curve laid out to conform to the dead-load equilibrium curve the dead-load produces no bending moments in the arch, is materially in error. This error arises from the arch shortening produced by the dead-load compressive stresses and is similar to a fall in temperature; it results in a reduction of the horizontal thrust, with a consequent divergence of the true pressure line from the assumed arch axis. The pressure line becomes more stilted, passing above the axis at the crown and below the axis at the springing, thereby increasing the compression in the outer fibers at the crown and in the inner fibers at the springing.

The magnitude of the foregoing error depends upon the proportions of the arch. It may be neglected in arches having a rise greater than one-fourth of the span; but in flatter arches it becomes increasingly serious. From some designs that have been worked out, in which the depth of rib was uniformly 3% of the span length, it appears that the addition to the dead-load stresses on account of rib-shortening may attain considerable magnitude, especially in the flatter arches.

A method of avoiding these additional stresses is to provide hinges at the crown and springing during the erection of the arch. Temporary hinges were employed by the late George S. Morison in the construction of masonry arches; they have also been used in a number of European bridges. These hinges should be closed (by pouring concrete into the joints) only after the full dead-load is on the structure and the shortening and shrinkage changes have taken place. This device of temporary hinges is particularly advantageous in flat arches; it practically eliminates all dead-load bending stresses in the structure in addition to stresses from shrinkage or settlement. Furthermore, by selecting the temperature for closing the hinges, the range and effect of the subsequent variation may be minimized.

The above advantages of the three-hinged construction apply mainly to the conditions during erection. For the finished structure, a hingeless type is to be preferred on account of the greater rigidity and the greater security against crown settlement. Temporary hinges eliminate the shrinkage stresses without involving the difficulty in the construction of bulkheads caused by interference with the steel in the case of reinforced construction.

In laying out the arch curve for the first trial, the writer has found that a simple circular curve is ordinarily satisfactory. With this curve drawn, the weights of the arch segments and superimposed filling are figured and the resulting equilibrium curve constructed. With this pressure line as a new arch curve, the dead-loads may be revised and a second equilibrium curve drawn; as a rule, however, the first curve may be retained without the revision of a second trial.

For ordinary concrete arches, with earth-filling up to a level line, the ideal arch curve will be found slightly higher at the haunches than a simple circular curve. The following table gives the amount of this deviation, as found from actual designs, for different rise-ratios:

Ratio of Rise to Span	Deviation from Circular Curve at Haunches, in Per Cent of Rise
0.25	4.5
0.20	4.2
0.15	3.7
0.10	3.5
0.07	3.1

In the flatter arches, the deviation from a circular curve is barely noticeable.

Theoretically, the ideal arch curve is the equilibrium curve for the dead-load plus one-half of the live-load covering the full span. This curve would be the exact mean of the two extreme curves obtainable by placing the live-load alternately on the two halves of the span. In practice, however, on account of the usual small ratio of live- to dead-load, there is no material difference in using the equilibrium curve for dead-load alone.

American Society Guarantees German Hospitality for Engineer Troops

The *Bulletin* of the General Contractors' Association notes in the *Proceedings* of the American Society of Civil Engineers for May that among the societies to which members of the American society will be welcome is the Architekten-Verein zu Berlin, Wilhemstraase 92, Berlin, Germany. The *Bulletin* continues, "Colonel McKinstry's regiment please take notice and go there, stopping on your way to partake of the welcome extended by the Sachsischer Ingenieur and Architekten Verein in Dresden."

New York Road Building Suffers from Sins of Past

Incompetent Contractors Threw Up Work Which State Must Finish at Present High Prices

ROAD BUILDING today in New York State is more affected by previous methods of letting contracts than by war conditions, and though construction is far from normal there is a great deal of work under way. This work is practically all the completion of contracts canceled by the state because of the inefficiency displayed by the contractors.

The situation grew out of the enormous amount of road work to be accomplished last year within a short space of time, a condition which gave opportunity to numerous so-called contractors who had had no experience in road building and oftentimes not even in contract work. Throughout the state a number of such contractors have involved the state in serious delays and legal difficulties without having done any work to speak of. The result is that the state has almost as much uncompleted work at the present time as ever before, and the Highway Department is not attempting to let any new contracts. There are about 1500 miles under construction. The finishing of these canceled contracts is being done by the state either by day labor, under the supervision of high-class construction superintendents, or by a new contract.

Many difficulties are involved in this taking over of work, as the cost always amounts to more than the price bid a year or more ago; and in every case the state will be compelled to sue the surety company for the difference. It is naturally difficult to get contractors on such work. There is a very real shortage of labor and the wages are high—from $2.50 to $3 per day of eight hours. Hardly a single contractor is working with a normal force. On 165 state jobs in progress the first part of July the average number of men to a job was 27, whereas 35 would have been the number under more normal circumstances.

Main Routes To Be Completed Early

The chief aim now in construction work is to complete all contracts which are essentially important connections to main routes and also to complete those roads next of importance which tie together the feeder system of roads. The idea in this is that should the transportation of supplies reach a greater magnitude than could be accommodated by the railroads, the roads would be in condition for a heavy motor-truck traffic.

There will be lettings from time to time of contracts that have been canceled and also for repair work. The new construction work and that to be done by the repair department, which will be in the neighborhood of $5,000,000, will, if the contractors are able to do it at all, constitute about a usual year's work. Should conditions be more favorable later, the authorities seem willing to go on with the letting of more construction work.

City work in Albany, Syracuse, Rochester and Buffalo is proceeding in an almost normal manner, and is limited only by the ability of contractors to take care of it. There is no tendency on the part of city officials to hedge on public improvements, and in all these cities probably as much public work, certainly as much pavement work, is under contract as the contractors can take care of.

In the west of the state the labor situation is most acute. In Rochester there was recently a three months' strike on nearly all construction work which practically tied up everything for that period of time. This was settled by granting a rate of 32c. an hour, which was considerably less than the laborers' demand.

Labor Scarcity Is Hurting Municipal Contractor

Municipal contractors are almost wholly at the mercy of what few laborers are available, and seem everywhere alive to the opportunity to substitute mechanical equipment. An instance which might be mentioned is in Buffalo, where a contractor for making pavement repairs met with the demand on the part of the laborers, who are employed to cut out the old asphalt with axes, for an increase in wages of 30 to 50%. He met this demand by devising a mechanical pavement cutter driven by a gasoline engine which, while it is not as economical or as efficient as might be hoped for, has the great advantage of being a safety valve on the demands of his men. He has found it well worth while to operate these machines, so that the laborers might see that there was a limit to what they could demand, and that there was a very likely chance of their work being replaced by mechanical means.

Near Cortland a gang of 30 convicts from Auburn prison is engaged in doing some heavy grading work on a feeder line to a state highway. This work is in charge of an experienced road foreman, but the convicts are in charge of and supervised by two regular guards from the prison. The convict camp consists of an old farmhouse fitted up with iron cots and a temporary wooden building used for kitchen and mess hall.

Convict Laborers Are Paid and Work Practically Unguarded

The convicts chosen for this work were picked from the whole number of inmates at Auburn and none go who do not so elect. They are much better fed than when in prison, have four packages of tobacco given them a week and are allowed pay of 50c. a day. No arms or prison equipment are in evidence, and the men are at perfect freedom to move about as they choose, being practically on their honor to keep within prescribed bounds. There have been no escapes, and the only way discipline is enforced is to threaten, or finally to send, the prisoners back and get new ones to take their places.

This same crew, or a similar one, was used for heavy grading work on another piece of work in this vicinity. The men are used for grading work, laying Telford foundation, etc., but not for any road work requiring skill or experience. There are similar gangs at work in other parts of the state, but it appears that the use of convict labor as a whole is largely of an experimental nature and is not carried out on such a scale as to have any real effect on the labor situation; although highway officials believe that were laws passed which would give the highway department more jurisdiction over their work convicts could be used in much larger numbers to advantage.

Fire and Load Tests of Columns Now Being Made

New Testing Machine at Underwriters' Laboratories Tests Building Columns Under Combined Fire and Load Conditions

ABOUT two years ago the National Board of Fire Underwriters, the Associated Factory Mutual Life Insurance Companies and the Bureau of Standards, acting jointly, prepared plans for a program of testing large building columns under load, at the same time subjecting them to the usual fire tests, with the view of determining the effectiveness of different types of fireproof columns now in use or proposed. The testing machine has now been installed in the Underwriters' Laboratories in Chicago, and the tests are under way.

The collection of columns on which tests have been begun includes samples of various types. Among these are rolled-steel sections, built-up steel sections, steel pipe filled with concrete and vertically reinforced and hooped columns. It is proposed also to test several wooden columns. At least one of each of the sections is to be tested without protection; others are to be partly protected with concrete, and still others will be completely protected with various thicknesses of concrete, clay tile, gypsum blocks and plaster on metal lath, in accordance with the methods commonly employed in building practice.

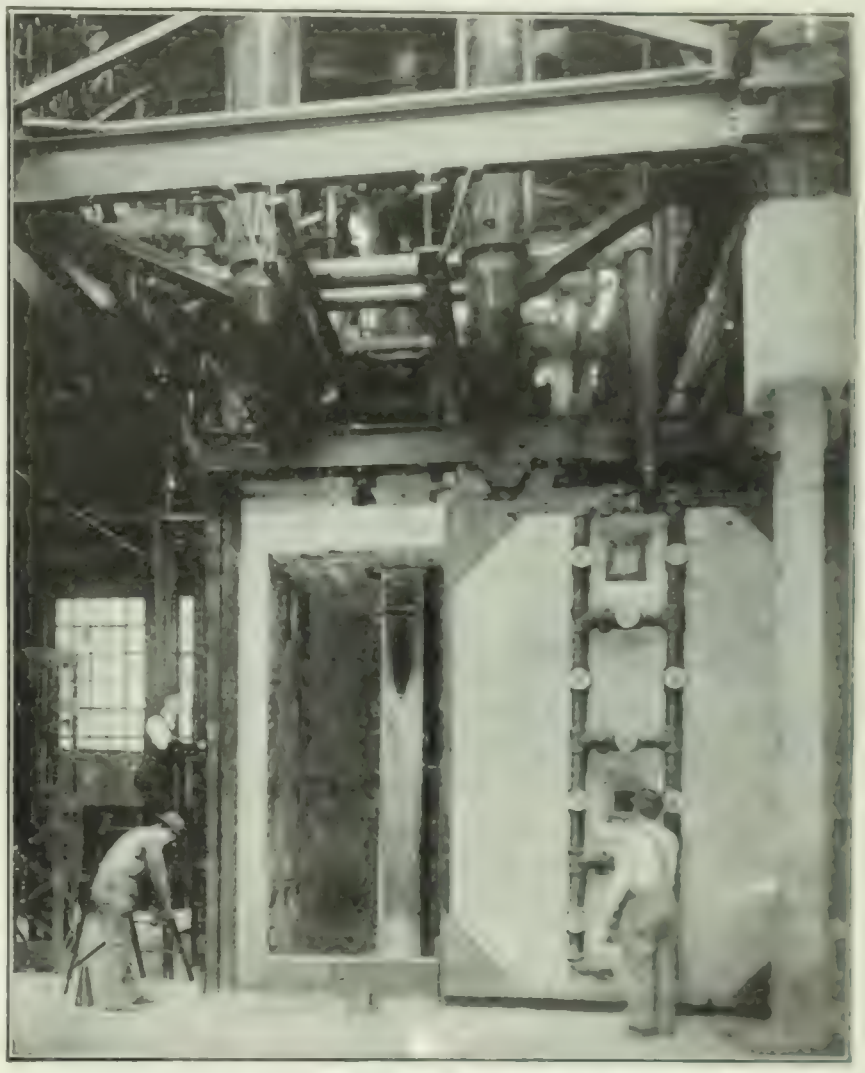
Test Equipment Is of Special Design

The test apparatus is located in a fireproof building designed especially for work of this character. The central portion of the building is one story high, with headroom of approximately 37 ft. At three sides of this portion the building is two stories, with headroom of 17½ ft. under the second floor. The central portion of the building is provided with sliding skylights that can be opened for ventilation and with a traveling crane.

Exclusive of two shallow pits at the bottom to receive falling material and carry off the water during the fire-stream tests, the test furnace has a height of 12 ft. In horizontal cross-section it is a 7-ft. square. Stationary brick walls form two of the opposite sides, while two movable brick walls in steel frames or panels suspended from overhead beams by trolleys provide the other two sides of the inclosure. The top of the furnace is of heavy fireclay blocks supported by a steel frame; it is partly removable to permit the installation of the columns to be tested. The bottom is formed by the fireproofing on the steel bearing plate and restraining frame of the loading apparatus. Four 13-in. flues, extending from the top of the furnace out through the roof of the building, carry away products of combustion. The fixed sides of the furnace have mica glazed observation windows, so arranged that all parts of the column under test can be observed. Eight 6-in. blast burners of special design heat the furnace.

The apparatus employed in applying the loads to the columns during the fire and the fire-stream tests consists essentially of a hydro-pneumatic ram, the pumps and tanks supplying the pressure, the necessary restraining frames and the accessory pressure-indicating, controlling and recording apparatus.

The ram has a rated capacity of approximately 256 tons; it is bolted to the under side of the heavy steel beams which form the top of the restraining frame in such a manner that it will engage the top plate of the test column when that is in position. The column transfers the compression to the beams constituting the bottom of the frame, and these complete the action by transferring the stresses back to the top through steel tension cords which form the sides of the frame. The ram is designed to maintain the load on the test column



NEW TESTING MACHINE DETERMINES RESISTANCE OF COLUMNS TO COMBINED FIRE AND LOAD

automatically and to develop characteristic deformation at the point of failure.

The temperatures within the furnace are indicated by means of thermocouples inserted through the walls near the top, middle and bottom; temperatures at the surface of the structural portion of the test column are measured with thermocouples placed at several levels on the column.

Deformation and deflection of the column during test are taken by measuring the relative rise of protected wires attached one on each side of the column at both ends of a 37-in. gage length. One end of each wire is attached to the column, and the other is weighted and passed over an idler at a point outside of the furnace as far away as room conditions permit. Movement is measured at intermediate points on the wires, and true movements at points of attachment of the column are calculated from the established ratio of distances.

For exposing heated test columns to the action of fire streams a special 4-in. hydrant is employed. There is a hydrant location on each of the two sides of the furnace that have movable walls, the respective distances from the middle of the furnace being approximately 26

and 39 ft. A standard play pipe with a 1¼-in. nozzle and with a pressure gage tapped into its base will be used. The hydrants are connected with a 6-in. underground main supplied by a pressure tank and an electrically driven fire pump of 500 gal. capacity. The hose connections on the hydrants are provided with pressure gages and 2½-in. hose valves.

How Tests Are To Be Made

After being allowed to season for a period of about a year, the column to be tested is placed in the furnace and the top and bottom bearings are adjusted for even distribution of load. The connections for temperature and deformation measurements having been made, the furnace is closed and readings on all instruments taken. The safe load is then applied, and a second set of readings is made of deformation and deflection. The gas is then ignited, and gas and air are gradually turned on to establish the predetermined temperature rise in the furnace. It is proposed to make this uniform for all tests although the exact temperature figure has not as yet been announced by the Board.

Readings on gages for load, on column and furnace thermocouples for temperature and on deformation and deflection instruments are taken in regular sequence at five-minute intervals up to a point near failure, the load being maintained as nearly constant as possible during the test. Observations of the visible effects of the fire on the column and its protection are made at regular intervals during the procedure.

After failure, the furnace doors are opened and the column is allowed to cool. Photographs and notes are made as a record of the general condition of the column. The covering is removed and its constituent materials investigated for deterioration due to fire.

When the fire-stream test is to be applied to a hot column, it is probable that the nozzle pressure of the hose stream will be kept at 50 lb. per sq.in. and the application maintained for five minutes, the tip of the nozzle being located 20 ft. from the column. After suitable observation of the effects of the fire and the water, the furnace doors will be closed again and the fire-and-water treatment repeated in the same or other predetermined manner.

The Choice of Grasses To Protect Road Embankments from Erosion

By W. C. Buetow
Division Engineer, Wisconsin Highway Commission, La Force, Wis.

THE use of grasses to protect embankments and slopes, particularly on high-class roadwork, is so generally neglected that very little information has been published as to the kinds which are most suitable. Much damage that cannot be prevented even by the provision of proper drainage and keeping cattle from trampling the slopes can be taken care of by the planting of well-chosen grass, which should be properly cared for until a mat or blanket has formed.

Grasses do not form a mat or blanket very quickly, due to the variance of the climatic conditions. The action of frost is the most disturbing factor, and on account of the depth of its penetration the upper stratum of the bank is kept in a loosened state that is very susceptible to the spring rains. For this reason it can readily be seen that shallow-rooted grasses are of no practical value.

A Grass Having a Good System of Roots Should Be Selected

When selecting grasses to be planted on the slopes, it should be kept in mind that a grass with a good system of roots is to be used, as well as one able to withstand the hot rays of the sun. Grasses that will grow on a sunny bank probably will not take root and form a mat on the shaded slopes, in which case a different kind of grass is necessary.

The protection to the bank lies almost wholly in the ability of the roots to interweave so minutely as to form a system to reinforce the surface stratum. Hungarian brome grass, Canadian blue grass, fescue grasses and Western wheat grass are good to plant. In many cases sod is handy to get and, when properly cut and placed, offers very good protection. The sods must be held in place by wooden pegs until the grass has taken root.

Seeding and planting are equally successful when conducted properly. The surface in each case must be prepared in order to make it at all conducive to a good growth. The seed cannot be merely distributed on the slope and left with the hope that it will catch. If necessary, the ground should be manured before any seeding is done and if a sandy slope is treated, the surface must be protected from the wind with straw or brush until the grasses are able to withstand the elements.

Mixed Seed Best for Clay Soils

Different kinds of soil require a certain kind of grass or a combination of several kinds. For shaded places a combination of Kentucky blue grass, wood meadow grass, crested dog's tail and various leaved fescues are well adapted.

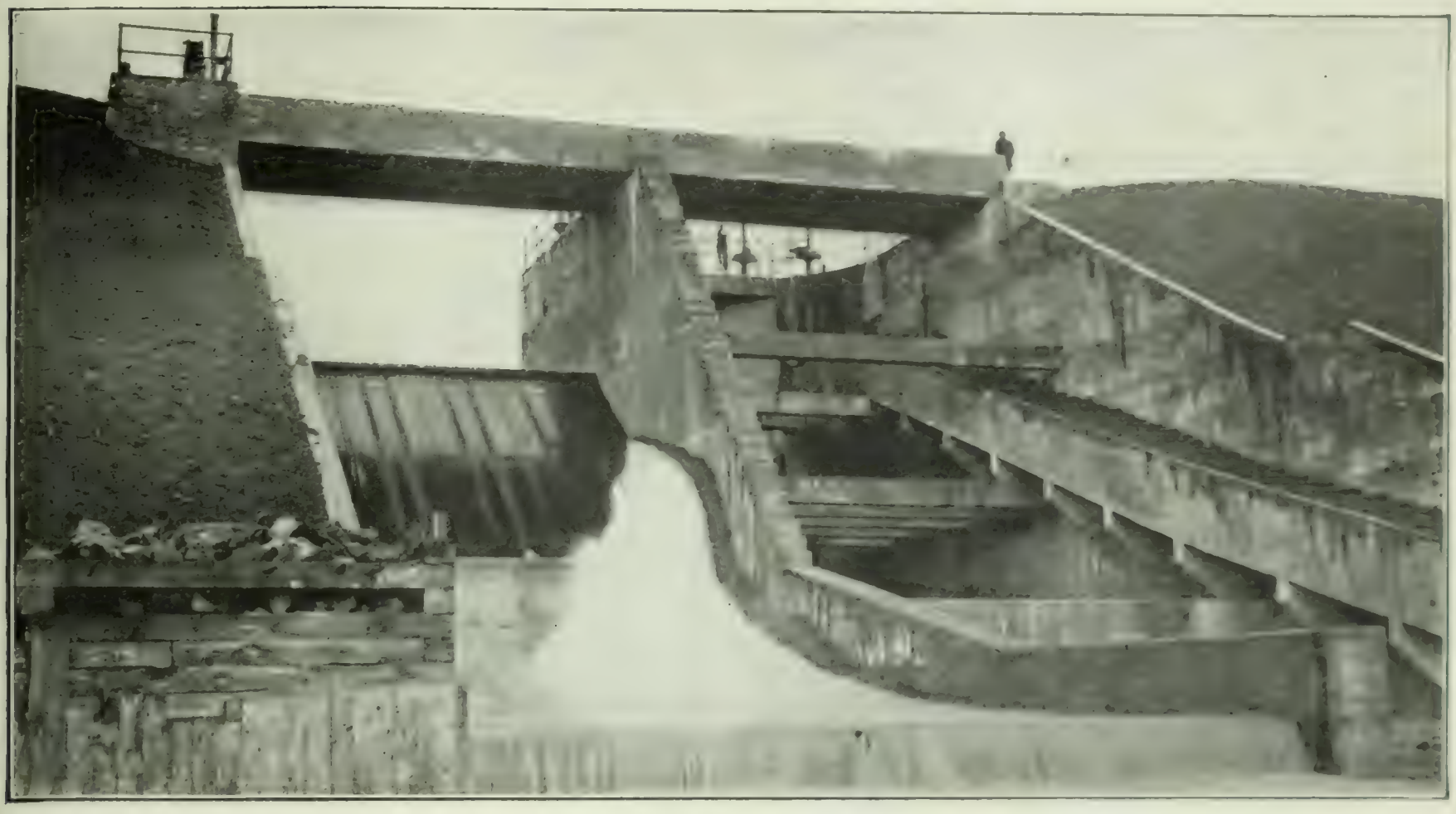
Clay soils can be treated with a mixture of Kentucky blue grass, English rye and fancy red top. The rye grass gives an early quick result, the red top makes a bottom grass, and the blue grass is the permanent feature.

Sandy soils require a quickly growing binding grass that will withstand the drought. Creeping bent, Rhode Island bent and fine-leaved fescue are grasses that answer this purpose. Western wheat grass has unusual ability to grow on the sunny side of an embankment. Creeping bent, Canada and Kentucky blue grass and crested dog's tail are quick growing, deep-rooting grasses that will bind the soil until such time as the more permanent grasses are in possession. Sweet clover and creeping honeysuckle are recommended for planting in cuts.

Denver Experimenting with Road Oil

Denver, with its high costs for water for dust prevention, has had to turn to oil as a more suitable palliative. The city officials have started experimenting with a 1000-gal. motor-driven oil spreader. Six carloads of 65% asphaltic oil are to be used.

Island Lake Storage Dam Has Immense Log Sluice



Bear-Trap Dam of 30-Foot Clear Width and a Crest Rise and Fall of 20 Feet Passes Logs—Alongside Is 28-Foot Sluiceway Closed by Vertical Arch with Sluice Gates

Prepared in Office of GARDNER S. WILLIAMS
Consulting Engineer, Ann Arbor and Chicago

A LOGWAY 30 ft. in the clear with a 20-ft. rise-and-fall movable crest is the most notable feature of the Island Lake storage reservoir of the Great Northern Power Co. This logway and an adjacent sluiceway are placed in an earth dam that raises the level of the Cloquet River 35 ft. and creates a lake with an area of about 12 square miles. The dam is located 18 miles north of Duluth, Minn. It impounds water from a drainage area of 546 square miles to help equalize the flow at the company's hydro-electric plant on the St. Louis River, into which the Cloquet discharges. The sluiceway mentioned discharges impounded waters when the river is low. Flood waters are passed by an independent spillway, built in one of two low dikes required to prevent the overflow of the reservoir into high swamp lands. The spillway discharges down a valley of low slope to the main river, a mile and a half away.

Hot Water Played on Winter-Built Earth Dam

The earth portion of the main dam has an upstream slope of 1 on 3. The downstream slope is 1 on 2 with a 6-ft. berm at about half the maximum height. Six-inch tile drains were laid on the natural ground surface under the downstream slope every 15 ft. along the embankment so as to discharge into a ditch at the toe of the slope. The material for the fill was excavated with a steam shovel from a neighboring hill above the pond level and was hauled in dump-cars by small locomotives to the site, where it was deposited in place. The fill was made in the winter and was kept from freezing by playing streams of hot water upon it. The embankment rises 10 ft. above the crest of the spillway and contains 84,250 cu.yd. of material.

Sluiceway Gate Stems in Oil-Filled Pipe To Prevent Freezing

Two reinforced-concrete retaining walls 55 ft. high and 60 ft. between faces make an opening through the embankment, the opening being divided into two parts by a middle wall. One part, the wasteway, contains sluices for discharging the impounded water when the river is low; the other contains the log sluice. The wasteway, which is 28 ft. wide, is closed by a vertical arch, 18 in. thick and of 14-ft. radius. In the bottom of the arch and below tail-water level to prevent freezing, are set five 4x8-ft. rectangular cast-iron sluice gates. Piers extend upstream from the face of the arch between each pair of gates to carry trash racks and to permit the use of stop logs, should the gates get out of order. Similar provision for stop logs is made downstream. The gates are hand operated by gate stands

from a platform at the elevation of the top of the embankment. To prevent ice from forming around the gate stems, each one is incased in a pipe that is filled with oil.

The other part of the opening, which is 30 ft. in clear width between walls, contains the log sluice, one of the most interesting features of the whole design. The lumber company, which controls the site, required a log sluice having a clear width of 30 ft. and a movable crest with a rise and fall of 20 ft. The ice conditions in northern Minnesota are very severe, and a type of gate was required which would not freeze up. After considerable study, the type of bear-trap dam was adopted. It is operated by admitting water to and discharging it from the space under the dam. Timber dams of this type on a small scale have been used successfully as log gates and were kept from freezing by allowing a stream of water to run through the operating chamber during the winter. The structure as built consists of two leaves connected by links, the open space at the links being closed by the idler, a third leaf hinged at one end and on rollers at the other. In the up position the crest is at the elevation of the crest of the spillway. The main leaves are hinged to a concrete floor that extends between the side walls about 25 ft. above the footings. The upstream end of the space under the floor is closed by three vertical arches. The floor and its supports have been designed in such a way that, should log driving on the river cease and the log gate be abandoned, a power house can be built in the opening with a vertical turbine on the floor and a draft tube beneath.

Raising and Lowering Dam in Logway

Connecting the pond upstream with the chamber under the gate are two 24-in. pipes furnished with gate valves. The flow through these pipes, together with the leakage around the sides of the idler and the upstream leaf, supplies the gate chamber with water for raising the gate and keeping it up. In the retaining wall next to the gate is a well communicating directly with the gate chamber by an opening through the wall. The well contains the operating valve and gives access to the gate chamber for inspection when the water in the reservoir is drawn down. In the bottom of the well is a conical opening discharging into tail water and closed by a vertical steel pipe 30 in. in diameter extending up to pond level. The pipe forms the operating valve and is lifted from its seat by a chain hoist to allow water to escape from the gate chamber and the gate to fall.

Normally, the upstream valves are kept open and the downstream valve closed. As the storage reservoir fills, the gate rises, the crest floating high out of water until it approaches the up position. When it is desired to sluice logs, the gate can be lowered by opening the downstream valve and letting water out from the gate chamber. As the head on the operating valve is much greater than on the inlet valves, the operating valve will pass a much greater quantity of water than the inlet valves; consequently, the inlet valves may be kept open at all times and the gate may be operated by the outlet or operating valves alone. In practice, however, it has been found that the gate works better if the upstream valves are closed during operation.

With regard to the design of a movable gate of this type, there are two positions that control. The gate must rise from its down position under the small head available and it must go down by the critical position when the link is at right angles to the downstream leaf, a position in which the idler tends to hold the upstream and downstream leaves apart. The first requirement can be provided for by making the structure light enough to float, the second by placing the upstream and downstream hinges a sufficient distance apart and making the link short. No exact solution of the problem is apparent, but a few trials determine a base length



THE SPILLWAY IS A LOW MULTIPLE-ARCH DAM

that will make a workable gate. Placing the link pin of the upstream leaf on the under side of the leaf aids materially in shortening the requisite base.

The size of the Island Lake gate was so great as to necessitate a steel structure; but the parts had to be small enough to allow hauling several miles over logging roads, and adapted to erection between vertical walls. A cellular girder construction was adopted for the downstream leaf. The girders are spaced 24 in. c. to c. and are 20 in. deep—large enough for a man to enter the cells and assemble the work. The leaf was shipped in five sections of two cells each, which were joined by cover plates in the field, so as to form the other four cells. The upper end of the leaf was closed by another girder that fitted over the end like a box cover. A manhole cover fastened by brass machine screws in the top cover plate at the end of every cell gives access to the interior of the leaf.

Upstream Leaf Had To Be Buoyant

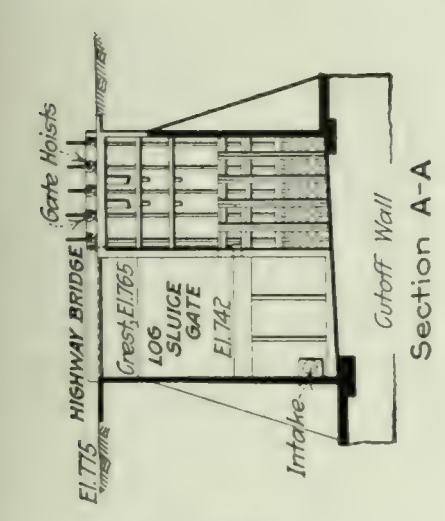
The same type of construction was not used for the upstream leaf, because the cells could not be kept from filling with water and it was necessary to make the leaf buoyant or nearly so, since the downstream leaf can exert but little lifting force through the link when the gate is down. Accordingly, the leaf was made of plate girders, 15 in. deep, with waterproofed timbers bolted to the sides between the flanges, 8 x 8's above and 10 x 10's below. These girders were spaced 24 in. c. to c., so as to align with the girders of the other leaf. The timbers were bolted on in the field before erecting the girders, and the spaces between the 8 x 8's were closed by other 8 x 8 timbers spiked in. A half-inch crack was left at each closing piece to allow for swelling.

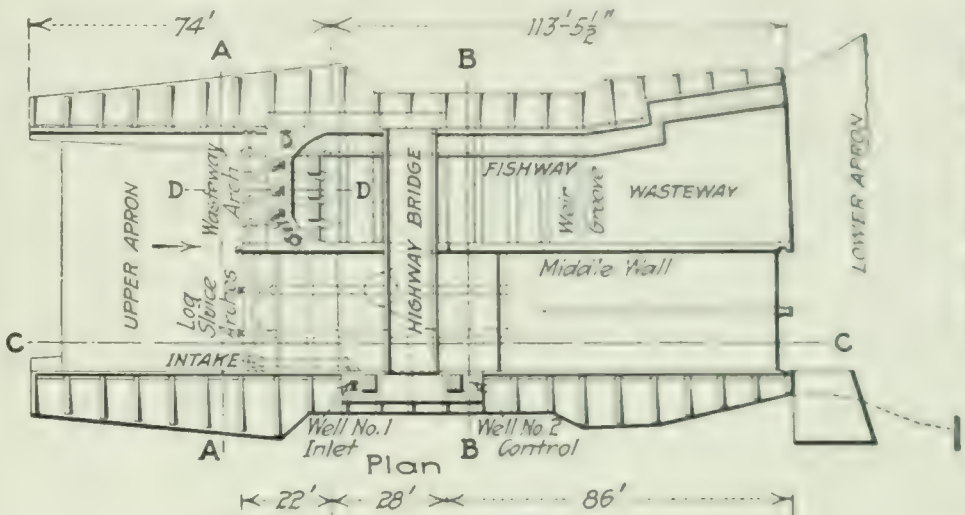
Fourteen links made up of two angles with a U-plate bolted to each end connect the upstream and downstream leaves, the timber packing being cut short of the end of the girder to give space for the links. At one end the U-plate forms a slotted hole to prevent binding when the gate is down and to let the downstream leaf rise about a foot off the pillow block before the upstream leaf, which is somewhat lacking in buoyancy, offers any resistance. The link pins are 3 in. in diameter and are continuous, except that they were cut on the center line for convenience in shipping.

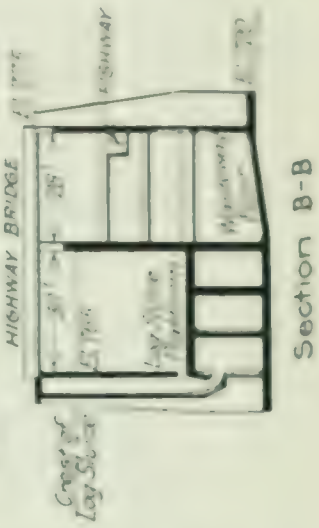
The idler, whose load is relatively small, was made of 12 x 12-in. timbers covered with $\frac{1}{8}$-in. skin plates. The timbers are bolted to steel plates at each end, the upper plate being hinged to the downstream leaf and the lower plate resting on cast-iron carriages with cast-iron rollers that track on the flange angles of the upstream leaf. The spaces between the rollers and their carriages are filled with wooden blocks.

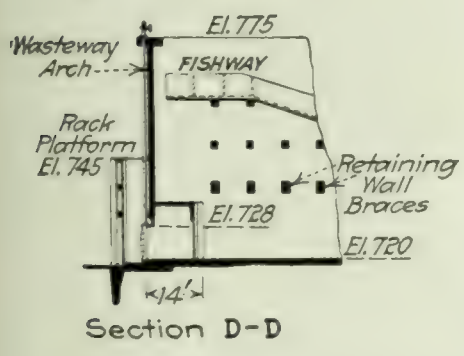
The design of the water-tight joints required more study than any other one feature. The downstream leaf forms one continuous piece and can leak only at the sides and bottom. It is the part that is relied upon to hold back the water. Leakage through the upstream leaf and the idler is not of importance so long as a difference in head of several feet between the gate chamber and the pond can be obtained when the gate is to be lowered. Accordingly, the upstream leaf and the idler were made to fit only fairly closely between the side walls, but more care was taken with the clearance.

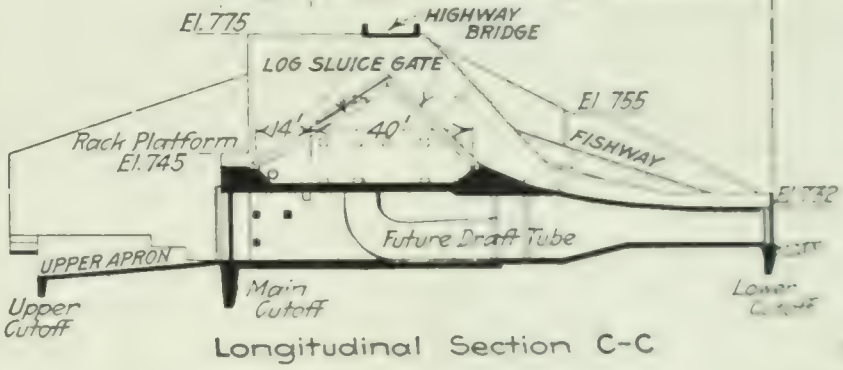
The struts across the wasteway (see detailed drawing and view on front cover) take up the water pressure from the gate chamber against the middle wall. In the plane of the floor under the log gate are heavy struts to

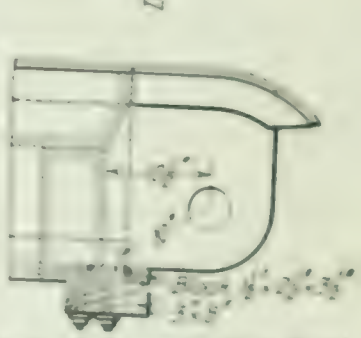


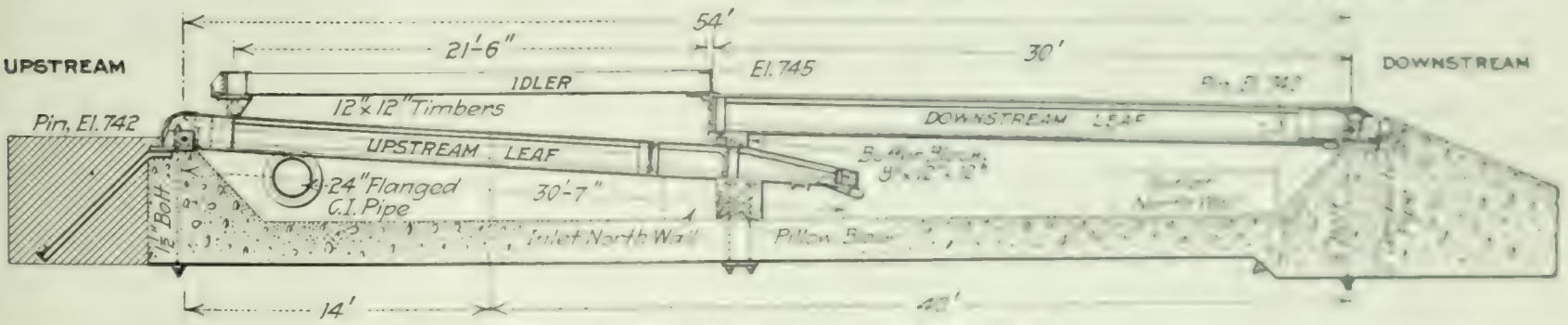


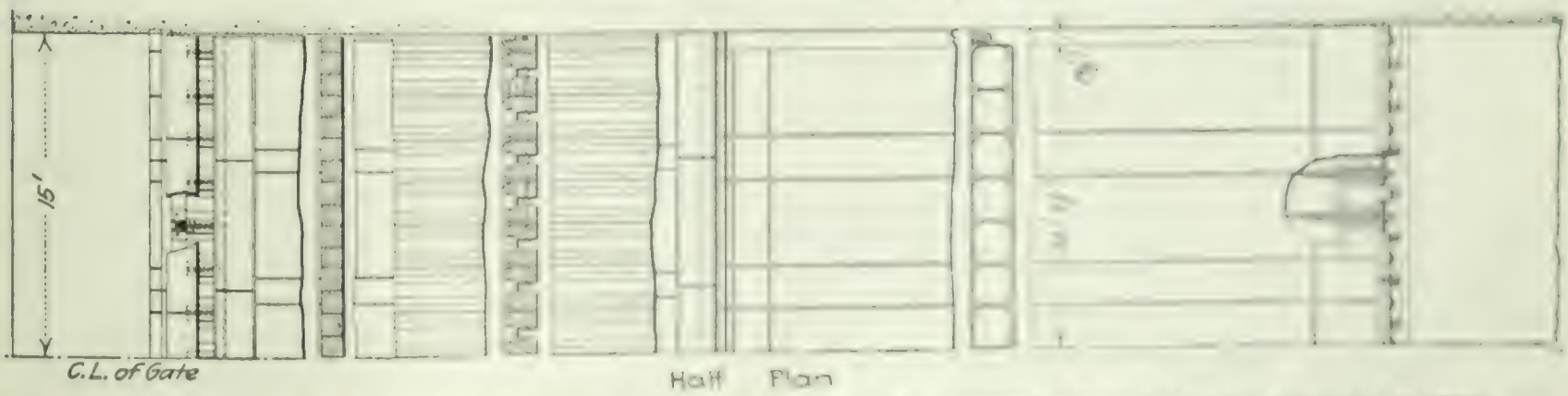












ISLAND LAKE DAM HAS LOGWAY WITH MOVABLE DAM AND [illegible]

Reinforced-concrete structure in earth dam. Steel leaf-trap type of movable dam in upper portion hinged to give necessary water-tightness and buoyancy [illegible]

help hold apart the retaining walls, which have a narrower base than a gravity section would demand. Both sets are reinforced with structural-steel columns.

The fact that the downstream leaf must not be allowed to fill up with water, because of the buoyancy required to raise the gate from its down position, precluded the use of the usual cylindrical watertight joint attached to the top cover plate. Instead, cylindrical castings were attached to the pedestals, and the joint was made by a timber bolted to the bottom cover plate and rubbing against the castings. Leakage through the joint and into the downstream leaf is taken care of by drains through the base of the pedestal. To prevent the flow over the gate, when sluicing, from entering the inside of the leaf, the lower end of the top cover plate is made concentric with the pin and fits inside a casting bolted to the pedestal. The casting, which is made heavy enough to take the blow from a log, is embedded in the concrete floor. The curved plate can be detached to give access to the pedestal.

Multiple-Arch Spillway Dam

The spillway is a multiple-arch reinforced-concrete dam 12 ft. high from the top of footings to crest and 300 ft. long between retaining walls. The footings rest on boulders and gravel. A concrete cutoff wall 5 ft. deep at the upstream edge stops the underflow. The interior bays are 32 ft. c. to c. of buttresses, and the end bays are 38 ft. from the center of the buttress to the face of the retaining wall, the distance from crown to springing of the arches next the retaining wall being made longer to reduce the normal component of the thrust against the retaining wall. All the arches are circular cylinders, 15 in. thick, with a radius of 32 ft. The falling water is deflected by a reinforced-concrete slab containing steel I-beams that are carried by the main buttresses and a small intermediate buttress. At the bottom of the slab is a tumbling pool, and beyond it a boulder-and-reinforced-concrete apron extends downstream to prevent a flood from cutting under the structure. Ventilation of the sheet is provided through wells in the retaining walls and holes in the buttresses. The earth embankment is 7 ft. higher than the crest of the spillway, which has a capacity of about 15,000 cu.ft. per second.

The main dam and the spillway were completed in the spring of 1915, and the reservoir was partly filled shortly afterward. The log sluice has been tried out, and it worked in an entirely satisfactory manner.

Both the dam and the spillway were designed, and their construction was supervised, by Gardner S. Williams, consulting engineer, Ann Arbor and Chicago. The steel was fabricated by the National Iron Co., Duluth, Minn., and erected by E. S. Johnson & Co., St. Paul, Minn., who had the general contract for the work.

Reports 1000 Accidents Daily

An average of nearly 1000 accidents a day, excluding those which cause no loss of time other than the day or shift in which accidents happen and which require no other medical attention than first aid, occur daily in New York State. This fact was brought out in the annual report of William C. Archer, second deputy commissioner of the Bureau of Compensation of the State Industrial Commission.

Training City Managers

Special Relations to Public Health and Sanitation Suggest Plan of Education Along Broad Lines

By Murray P. Horowitz

Assistant, Department of Biology and Public Health, Massachusetts Institute of Technology, Cambridge, Mass.

According to statistics compiled up to Jan. 1, 1917, there were 99 towns and cities in the United States that were governed under the city-manager plan. Of these, 70% were cities with populations under 10,000, and 86% with populations under 25,000. It is becoming apparent that the city-manager plan is growing in favor, particularly among cities of the residential type. It seems almost certain, therefore, that in the near future there will be a demand for expert municipal managers, which means that such managers ought to have special training and that our highest institutions of learning, especially our engineering schools, should recognize and meet this demand.

Modern health activities have become so wide in their scope that they touch the community in most of its vital parts. Public health today is applied biology in its highest and most interesting form, dealing with the effects of varying factors on the health, welfare, comfort and convenience of the people. A safe and adequate water-supply is essential to the life of any community; likewise, proper and adequate means of sewage disposal. The control of the city milk supply and other food materials is also essential. The removal and disposal of garbage, refuse and ashes frequently also demand the attention of the health official, particularly in the smaller communities. Lately there has developed a realization of the important relationship between the public health and industry, economics and sociology. This includes such subjects as industrial hygiene and sanitation, wages, hours of employment, poverty, alcoholism, the improving of the condition of the poor, school hygiene and sanitation, recreation, protection against street accidents, the establishment of comfort stations, and many other activities.

Public-Health Training Points the Way

The interest of the health official is thus apparently very wide and all inclusive. The importance of this and the realization of the necessity to train men for this work, were recognized very early by W. T. Sedgwick, professor of biology and public health at the Massachusetts Institute of Technology. Many of the leading health workers throughout the country have obtained their training under him. The time is now ripe to take another step forward and to bring the training in sanitary science to even greater service to the community by training men to be city managers.

Before outlining the plan of education for the town manager, let us observe what his duties and interests should be. The town manager must be an efficient business man, with a thorough knowledge of business methods. He must have knowledge of and be interested in effective and adequate transportation facilities, fire protection, police protection, health protection, water-supply, milk supply, food supply, sewerage and sewage disposal, garbage and refuse collection and disposal,

street cleaning, street lighting, street paving, parks and recreational facilities, markets, relief work and other civic activities. The town manager should also have knowledge of the principles of government. Neither is it hoped for nor desired that the town manager shall be an expert in all these various fields. But it is expected that he shall have at least a knowledge of the important principles of these different activities.

It is realized that, although the training offered in the department of biology and public health at the Massachusetts Institute of Technology fits one for activity in many of these fields, yet it falls short of the requirements of the new and larger profession. But it is possible to formulate a course that may be molded about such training offered in the department of biology and public health, which will develop trained and efficient town managers. The writer proposes to show how this may be done by combining work in different departments at a school like the Massachusetts Institute of Technology.

Composite Graduate Course Suggested

This course should be a graduate course, given jointly by the departments of biology and public health, civil and sanitary engineering, and economics and statistics, and should lead to the degree of bachelor of municipal engineering. The following courses are taken from the 1916 catalog of the Massachusetts Institute of Technology and give an idea what the proposed course should consider. Any person interested may obtain a better idea of the nature of the courses by consulting the catalog.

SUGGESTED COURSES FOR DEGREE OF BACHELOR OF MUNICIPAL ENGINEERING

Course No.	Department of Biology and Public Health
731	Elements of bacteriology
733	Bacteriology of air, water and food
738	Public-health laboratory methods
739	Biology of water and sewage purification
742	Bacteriology in relation to refrigeration, canning and food preservation.
743	Control of city milk supplies
751	Biology of infectious diseases—II
753	Industrial hygiene and sanitation
755	Public health problems
756	Principles of sanitary science and public health
757	Public-health practice
762	Sanitation of houses and public buildings
770	Public-health field work
772	Sanitary law
773	Public-health administration
780	Journals
	Department of Civil and Sanitary Engineering
130	Highway engineering
137	Highway specifications
175-6	Hydraulic and sanitary engineering
177-8	Sanitary engineering
181	Engineering of water and sewage purification
190	Vital statistics
199	Specifications and contracts
	Department of Economics and Statistics
35	Transportation
38	Securities and investments
45	Labor problems
58	Business management
60	Business law
70	Taxation
	Department of History and Political Science
38	Municipal government

Courses dealing with municipal markets, organization of charity and relief work and any other matters that may be found necessary to consider, should be added.

It would be advisable to have several series of three to six special lectures given by experts, in their particular specialties. In this way the special problems related to the general activities of a town manager may be adequately considered.

The students must of necessity be mature men, preferably about thirty years or over. They should be men who already hold an academic degree. They should also have had training along engineering lines. Experience in municipal work would of course be an asset. Candidates in this new course should be men of pleasing personality and good address. They should show tact, intelligence, executive capacity, the ability to write well, speak well and to meet people. They should of course be honest and energetic and possess the ideal of service to the community.

The course itself should require at least two years residence, ending with a special piece of work in the field. There may be added later a course leading to the degree of doctor of municipal engineering, which will require longer residence and more intensive work and research.

It is hoped that the above plan or one similar to it will be adopted in the near future by some high institution of learning, like the Massachusetts Institute of Technology. The need for such trained men is already felt and will become more pressing in the future. Furthermore, it represents an effort to bring municipal administration out of politics as much as possible and to place such government on an honest and efficient basis, with the ideal of community service paramount. An accomplishment of this nature would be a boon to the people of this country.

Connecticut Controls Disinfectants

An act designed to control the strength of disinfectants used in Connecticut by providing for testing and labeling any put on the market was passed by the last session of the legislature and takes effect Aug. 1, 1917. The act is designed to cover all disinfectants which can be standardized by comparative tests with carbolic acid, we are informed by John T. Black, Commissioner of Health for Connecticut. It will thus not include formaldehyde, Dr. Black states, but does embrace all the coal-tar and other common disinfectants in use. The act reads as follows:

"The receptacle containing any disinfectant for external use the phenol coefficient of which can be determined by a bactericidal test, manufactured, sold or offered for sale within the state shall bear a label showing the carbolic acid coefficient or relative germicidal value of such preparation as compared with pure carbolic acid. The relative germicidal value of a disinfectant shall be determined by the application of either the Rideal-Walker or the Hygienic Laboratory method. Any such disinfectant shall be misbranded if the statement contained on the label is false. Any person who shall misbrand any disinfectant within the meaning of this act or shall sell or offer the same for sale shall be fined not more than $100 or imprisoned not more than 60 days, or both."

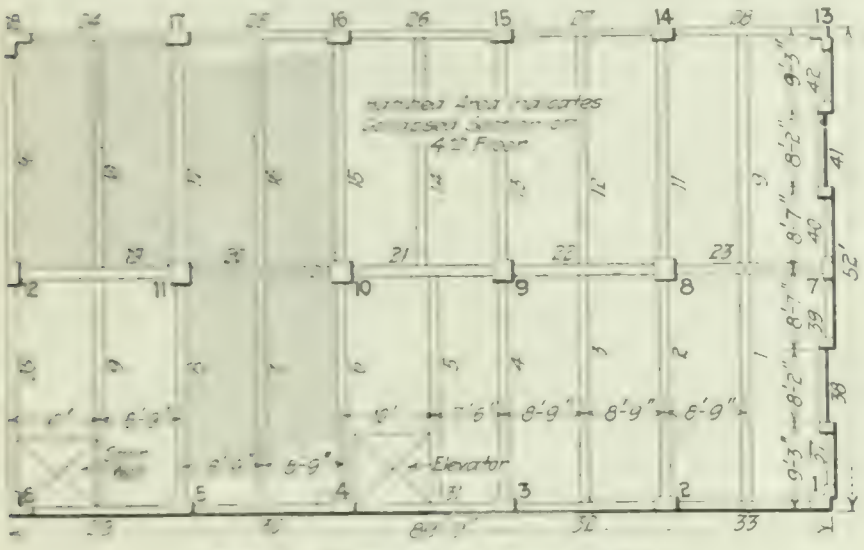
Discolored Maple Has Low Shock Strength

Two pieces of maple received from the National Hardwood Lumber Association, one of which was badly discolored, were tested at the Forest Products Laboratory. Where slowly applied loads were used, the two samples were about equal in strength; but in resistance to shock the discolored piece was decidedly inferior. A microscopic examination showed the cell walls of the discolored piece to be partly destroyed by fungi.

Fire-Wrecked Concrete Building Repaired for Service

Columns and Floor Units of Far Rockaway Warehouse Replaced or Repaired So Building Is Now in Use

IN NOVEMBER, 1916, a fire in an adjoining frame structure worked its way into the interior of a reinforced-concrete building operated as a warehouse by Mullen & Buckley at Far Rockaway, Long Island, and in the comparatively short time before it was put under control caused structural damage of considerable importance, although the property loss of the contents was small. The fire was noted in *Engineering News*, Nov. 9, 1916, p. 956, and a very complete report by Ira H. Woolson, of the National Board of Fire Underwriters, was afterward abstracted in both *Engineering News* and the *Engineering Record*. At the time of the fire the local building authorities decided that the damage was


4th Floor
Elevator
8'-9"
8'-9"
8'-9"

depth of 4 in. and to the full size of the main girders, and additional rods placed in the box forms for the girders, these rods extending into the pockets made. Framing into these girders steel and forms for the cross-beams were placed as for new construction, except that the steel for Beam 17 was left in place. The floor slabs were then reinforced as shown in the drawings, and the whole panel poured as though it were a new structure. The steel in the sections was figured as though the beams were T-beams with free ends taking a live-load of 120 lb. per sq.ft. The floor slabs were 5 in. thick, reinforced with ½ x ½-in. tension bars, 9 in. on centers, with two tie bars ½ x ½ in. in each panel. The concrete was a 1:2:4 mixture.

DETAILED MEMBERS REPAIRED OR REPLACED IN FAR ROCKAWAY CONCRETE WAREHOUSE DAMAGED BY FIRE

	New Beams	Repaired Beams	Patched Beams	New Columns	Repaired Columns	Patched Columns	Miscellaneous
Roof			1, 2, 4, 14				
7th floor		1, 33				11	
6th floor		1, 33				11	
5th floor		1, 33	3, 4, 23, 31, 32			11	
4th floor	7, 16, 17, 18, 19, 20	2, 3, 4, 5, 6, 8, 9, 12, 13, 14, 15, 21, 22				11	Pilaster 3
3rd floor			1, 33	11			
2d floor			1, 33				
1st floor							

Repaired Beams—The repaired Beams 1 and 33 are at a corner of the building, where expansions under heat seem to have caused a continuous crack from the second to the seventh floor. On the fifth, sixth and seventh floors these beams were repaired as shown in Fig. 2. That is, steel-plate hangers were fastened to the side wall by bolts and hangers passed down through the floor and around the bottom of Beam 1, thus suspending that beam from the wall above and making it independent of the Girder 33, which in all these three floors showed cracks about as in the location noted in the drawing. As noted further below, on the second and third floors at this location the cracks were of minor importance and were merely patched up.

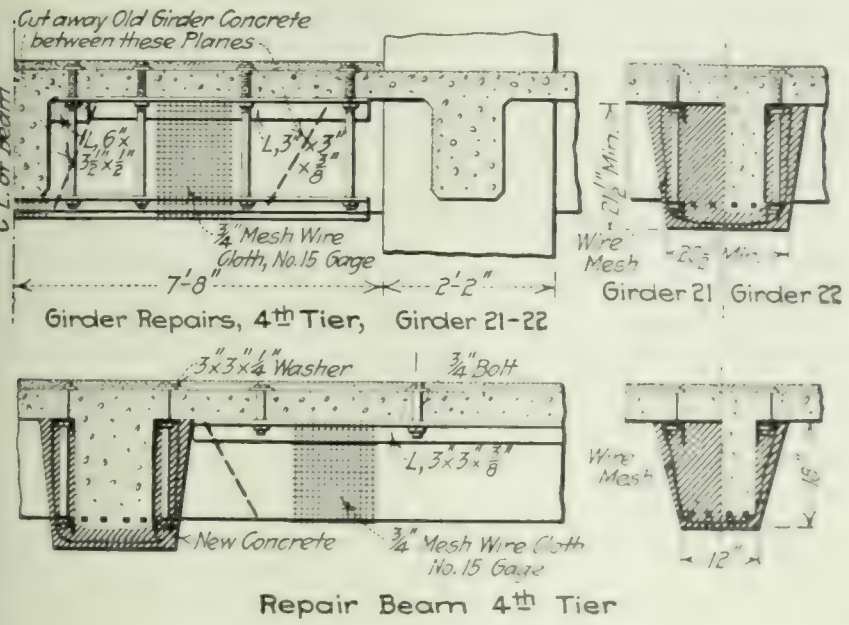


FIG. 4. THESE BEAMS AND GIRDERS WERE HEAVILY SPALLED BY THE FIRE

Under the heading, "Repaired Beams," of the table, Girders 21 and 22 and Beams 2 to 6, 8 to 9, and 12 to 15, all on the fourth tier, were repaired as shown in Fig. 4. These beams and girders were very heavily spalled by the fire, but not so much that it required the entire removal of the concrete. The beams were gone over thoroughly with a hammer, and all loose concrete was removed. A form was placed around them and extra reinforcement in the way of longitudinal angles bolted to the floor slabs, as shown in the details, was placed. For the girders this reinforcement consisted of two rows of angles, one under the slab and one at the bottom of the girder; for the beams only the angle under the slab was placed. Concrete according to the sections shown was then placed by pouring through a hole cut in the floor above. This new concrete was composed of 1 part cement, 2 parts sand and 2 parts No. 1 grit, and the additional section was bonded to the old by a wire mesh hung around the angle reinforcement.

Patched Beams—All the beams noted under the heading, "Patched Beams," were repaired by plastering concrete to the original section over the whole section after that had been cleaned of the spalled concrete by hard hammering. This was, in effect, merely the replacing of the fireproofing.

New Columns—One tier of one column had to be entirely replaced; that is, Column No. 11 on the third floor. Here the column, which was originally 26 x 26 in. square, was cut off flush with the floor and with the ceiling, the floor above having previously been strutted. The steel bars were cut off 1 ft. above the floor and 1 ft. below the girder bottom. A new column was then placed according to the section shown in Fig. 3, 28 x 28 in. square with eight ⅞-in. steel vertical rods tied with ¼-in. steel ties 12 in. on centers. For this same column on the floors above, the old surface was hammered off to a hard bottom and additional reinforcement, consisting of four ⅞-in. steel bars, was placed vertically and tied with ¼-in. steel rods 12 in. on centers. Forms were then erected and 3 in. extra of concrete, as shown in Fig. 3, was added to the column section through all the floors. The new concrete was composed of 1 part cement, 2 parts sand and 2 parts grit.

Additional work consisted of tying together the parapet wall, according to the detail shown in Fig. 2, where it had cracked at its corners. The steel strap was bolted around the corner of the wall and the cracks filled up with grout.

The work of repairing the building was done by the Moyer Engineering and Construction Co., of Brooklyn, N. Y., after plans prepared in its own office, and under the direction of Morrell Smith, architect, of Far Rockaway, the designer of the building.

Drifting-Sand Water Filters for Oshawa

A contract has been let by the town of Oshawa, Ont., for an installation of drifting-sand filters similar to those now nearly completed at Toronto, Ont. The Oshawa filters will be built of reinforced concrete; otherwise they will be like those at Toronto (see *Engineering News*, Sept. 21, 1916, page 568). About two-thirds of the Toronto plant is in operation, but no official tests are yet available.

Cantilever Concrete Bridge Has Suspended Link

Put Light Structure of Arch Form on Pile Foundation So Settlement or Dynamite Can Affect One Pier Only

IN APPEARANCE an arch, actually a cantilever type, each unit supported by a pier, the 2200-ft. reinforced-concrete bridge proposed to connect Belle Isle with Detroit will consist of 19 spans, each made up of cantilevers extending out from the piers and supporting at their ends a suspended beam section. Except for the latter feature the structure will be somewhat similar to the 2280-ft. Hanover St. bridge in Baltimore, described in *Engineering News*, Mar. 29, p. 497.

The original steel bridge, 2956 ft. long, of 12 spans 156 ft. long, a pivot span 318 ft. and five 88-ft. pony spans, costing $295,000, was destroyed by fire in April, 1915, as reported in the *Engineering Record*, May 8, 1915, p. 599, and *Engineering News*, May 6, 1915, p. 906. As the traffic to this most beautiful park of the city is extremely heavy, a temporary pile bridge with 22-ft. roadway and two 7-ft. walks was built in 1916 at a cost of $100,000. It was assumed that this would last until the necessary plans, bond issue, court proceedings and construction on the proposed new structure of monumental type could be built. The accompanying drawing shows the novel features in the design. Live-loads assumed were 50-ton steel cars on two tracks, an 18-ton road roller, 100 lb. per sq.ft. on the roadway and 100 lb. on the sidewalk. Some of the reasons for the design are given below.

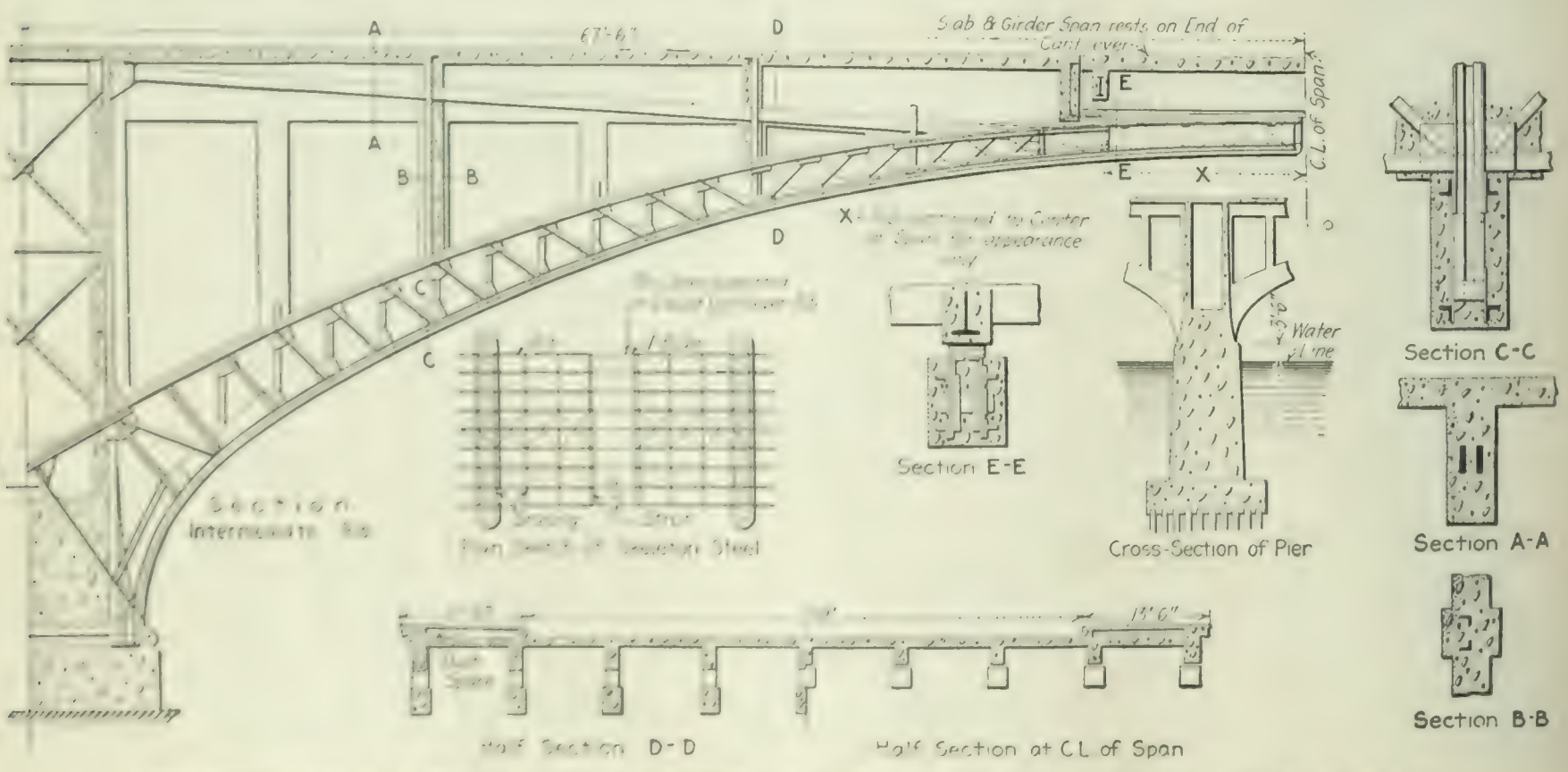
The total width of the bridge will be 86 ft., a roadway of 59 ft. and a 12-ft. sidewalk on either side. The proposed width of roadway is about the same as North Woodward Ave. or Fort St. near the City Hall, or about 10 ft. less than Jefferson Ave. at the site of the bridge. The roadway width of the new bridge is adequate for three lines of traffic either way, and the sidewalks are each capable of delivering 15,000 people per hour. The maximum clear headroom for boats under the bridge will be 30 ft. This clearance allows for the passage of all tugboats and other river traffic, except the large private yachts having masts more than 30 ft. in height.

Dynamite Cannot Wreck It

As regards stability, it will be impossible to wreck the bridge by dynamiting any single pier, nor would the settlement of one pier have any detrimental influence on any other pier or on the structure as a whole. In an arch structure each span would be dependent on its neighbor for stability, and the destruction of one span would likely result in the collapse of the entire bridge. This type also lends itself better than any other to the possibility of introducing a drawspan, if at any time in the future such a span should become necessary.

The type of structure was determined largely by foundation conditions. Soil examinations show 90 ft. of soft blue clay before one encounters any sort of satisfactory foundation material. The distance to rock, presence of poisonous gases in the soil and the character of the material render foundations to rock inadvisable. The conditions require that the structure be supported on piles and be made as light as practicable, consistent with strength and attractiveness.

The present boulevard approach is 200 ft. wide and is adequate for all vehicular and pedestrian traffic and a street-car terminal. To relieve the traffic congestion on Jefferson Ave. during rush hours, a subway is provided under the avenue of sufficient width for four lines of traffic. The width of the boulevard is such that a subway can be constructed, and in addition there will be a roadway on either side, each sufficient for two lines of traffic. During the major portion of the day, automobiles may turn onto the bridge approach from Jefferson Ave., but during rush hours they will be required to pass through the subway, thus avoiding interference with the regular traffic east and west on Jefferson Avenue—a very much needed arrangement at this point.



PROPOSED TYPE OF REINFORCED-CONCRETE BRIDGE ACROSS DETROIT RIVER TO BELLE ISLE

At the island end a separation of automobile and pedestrian traffic has been accomplished in a manner similar to that at Jefferson Ave., by means of easy inclines. The pedestrians pass down and under the automobile driveways and thus safely reach the inside of the automobile loop on the island without interruption of traffic. This terminal is also planned so as to allow the use of street cars operating under a shuttle system.

It has been considered very desirable, in view of the nature and amount of the river traffic, to eliminate the drawspan. The opening of the drawspan introduces a serious interruption to traffic over the bridge and entails a considerable sum annually for operation and maintenance.

The Lake Carriers' Association will make no protest, as the 1500-ft. main channel on the opposite side of the island is considered entirely adequate for all present and future anticipated needs. Sanction, however, must be obtained from the War Department. Detailed estimates as submitted at a public hearing last November indicated that at the prices then current the cost would be $2,000,000, of which one-half will go into foundation. The war situation has deferred action on a bond issue by the city officials for the present.

The plans were prepared following the request to the City Council by the Detroit Engineering Society to appoint a bridge commissioner. The consulting board so constituted consisted of M. E. Cooley, chairman, F. C. McMath, W. R. Kales, H. E. Riggs, E. Lorch, architect, and L. M. Gram, engineer. The plans were prepared under the general direction of George H. Fenkell, commissioner of the Department of Public Works, and the consulting board. Louis E. Ayres is engineer of the Belle Isle bridge division of engineering and construction.

Ohio Falls Into Line

The Ohio State Board of Health was succeeded on July 1 by a Department of Health consisting of a Commissioner of Health and a Public Health Council of five, of which the commissioner is a member. The council is specifically barred from exercising either "executive or administrative duties," these being vested in the commissioner. The four members of the council other than the commissioner are appointed by the governor and receive compensation of $10 a day "while in conference," with reimbursement of expenses.

The commissioner is appointed by the council, subject to approval by the governor, and receives a salary established in the same way. He must "be a physician, skilled in sanitary science," must give his full time to the work and is appointed for a term of five years. Two of the members of the council must "be physicians, who shall have had training or experience in sanitary science." The principal duties of the council are to make and amend a sanitary code, applicable throughout the state; to take evidence on appeal from decisions by the commissioner of health as to "the approval or disapproval of plans, locations, estimates, or cost or other matters heretofore required to be submitted to the State Board of Health for approval"; and to fix the number of divisions and the qualifications of directors of divisions of the department.

SOCIETY SERVICE

A Section Dealing with the Results of Teamwork by Technical Men

An Active State Society

The Illinois Society of Engineers maintains active connection with engineering development throughout the state. It has supported the good-roads movement and the work of the State Highway Department. It has assisted in the movement for arousing greater interest in land drainage, lending its aid to the drainage conferences held at the University of Illinois. These movements are not confined to engineering features, but aim at general publicity and promotion. For this reason the society has established sections dealing with special branches, membership in these (but not in the society proper) being open to nontechnical men who are interested in the work. Thus, the drainage section aims to enlist drainage commissioners, landowners, contractors and lawyers who make a specialty of drainage cases. The sewerage section also is open to superintendents and men in charge of sewerage work or sewage-treatment plants.

Oregon Society To Try Local Chapters

The Oregon Society of Engineers has set itself the task of organizing engineering opinion on matters of public interest. An active spring campaign was conducted to develop coöperation among engineers. A systematic series of lectures and published reports has aroused much discussion, and has proved of value in bringing engineers into close contact with public questions. Among the subjects recently discussed by prominent speakers are, "The Wooden Ships as Proposed by the Emergency Fleet Corporation," "The Oregon $6,000,000 Road Bond Issue," "The $3,000,000 Bond Issue for Harbor Improvement in Portland" and "The New Portland Building Code," the latter being a discussion having special reference to æsthetics. The last spring meeting was held June 28.

An important change in the constitution permits the formation of local chapters in the smaller districts of the state to coöperate with the parent society. The society is about to conduct an engineering prize story contest, for a cash prize, as a means of further stimulating interest in organization activities.

Iowa Tackles Legislature Successfully

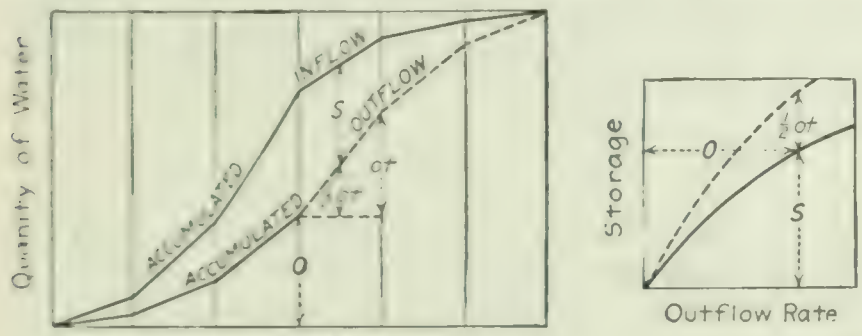
The shaping of legislation has been the most active interest in public affairs recently in the Iowa Engineering Society. The society has succeeded in having passed much-needed legislation of engineering interest, and corrections to statutes already on the books. In the last effort a bill on licensing engineers nearly passed, but failed from lack of interest. T. S. DeLay, who has been chairman of the committee for the last few years, believes the bill was too long and two years hence a much shorter one will be drafted. Apathy on the part of members to not presenting up their representatives is also blamed.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Flood-Retarding Reservoir Problem Directly Solved

Sir—A problem often encountered in flood-prevention studies is to determine how the flood flow of a stream will be affected by the construction of a retarding reservoir. The nature of this problem and the usual method of solving it are outlined in the following words in an article on "The Miami Valley Flood-Protection Work" in *Engineering News* of Feb. 1, 1917: "The rate of outflow from the basin in a flood depends on the height to which the basin is flooded. This height in turn depends on the volume stored, which is the difference between the inflow and the outflow. Thus the quantities involved are inter-related. The problem of computing



STORAGE-OUTFLOW CURVE (FIG. 2) CAN BE PLOTTED FROM ACCUMULATED-FLOW CURVES (FIG. 1)

the outflow had to be solved by trial and error." This method of working is inconvenient and laborious. It may be avoided by the use of the solution given below.

Notation: t = any short interval of time during the flood; o = rate of outflow from reservoir at any instant, or during interval t; O = total or accumulated outflow up to the beginning of interval t; S = total quantity of water stored in reservoir at any instant, or at the middle of interval t.

Given: (a) The original time-flow curve or flood-hydrograph of the stream, giving the rate of inflow into the proposed reservoir at each instant during the flood considered. (b) The depth-storage curve of the reservoir, giving the total quantity S of the water stored in the reservoir when the surface is at any given elevation. (c) The depth-outflow curve of the reservoir, giving the rate o of the outflow from the reservoir when the water surface is at any given elevation. This curve will be approximately parabolic if the outlet is a tunnel.

Required: The new time-flow curve for the stream as modified by the proposed reservoir, giving the rate o of the outflow which would pass from the reservoir during each instant of the flood considered.

Solution: From the original time-flow curve of the stream plot a curve of accumulated inflow at successive instants during the flood, as shown in Fig. 1. This curve is the "mass curve" for the stream during the flood considered. Erect ordinates to this curve, spaced at a uniform time interval t so small that the curve will not vary sensibly from a straight line between ordinates.

Using the depth-storage and depth-outflow curves, construct a storage-outflow curve for the reservoir, as shown in Fig. 2, and on the same sheet construct another curve whose ordinate corresponding to any outflow o is $S + \frac{1}{2}ot$.

In Fig. 1, if the accumulated outflow O is given at the beginning of any time interval t, the outflow curve may be extended through that time interval without the use of trial and error methods by taking from Fig. 2 the outflow rate o corresponding to the value of the quantity $S + \frac{1}{2}ot$ as scaled from the middle of the time interval t in Fig. 1, and multiplying this rate by t to obtain the outflow ot during the interval. The method applies without change to the first time interval of the flood where O is zero. The operations may be carried out in tabular form if desired, without drawing the curves.

When the accumulated-outflow curve has been completed in the manner described, the desired outflow hydrograph of the stream may be readily obtained from it.

HAROLD A. THOMAS,
Associate Professor of Civil Engineering,
Terre Haute, Ind. Rose Polytechnic Institute.

Army Camp Bunkhouses

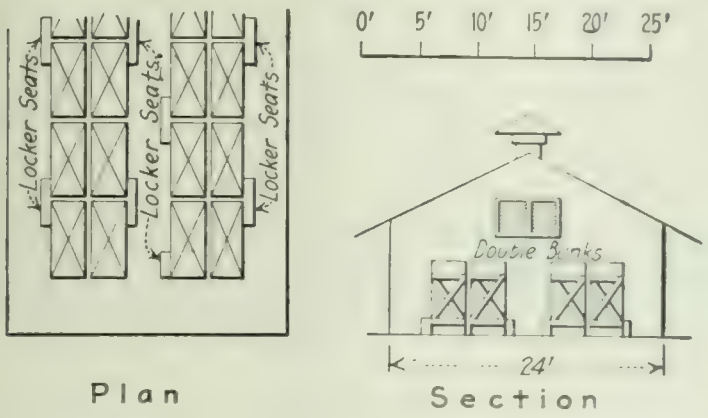
Sir—While it is assumed that the authorities have already decided on the details of design for the buildings that are to house the new army which is to be raised under the selective draft, it is considered possible that a discussion of experience gained in large construction camps might still be profitable. The design submitted by Frederick J. MacIsaac and printed in the June 14 issue of *Engineering News-Record* shows a number of details which have been worked out in his experience, but this design is lacking in one feature which is essential to health—good ventilation.

From the remodeled box-car to the typical logging camp, it has been almost the universal custom to range the bunks along the sides of a long, narrow structure, depending on openings at the ends, and sometimes on windows opening directly off from the bunks to secure ventilation. The plan submitted by Mr. MacIsaac is an improvement on these in that it provides for a wide space through the center with ventilators in the peak of the roof, but it still leaves much to be desired in the facilities for insuring an ample supply of fresh air to each of the bunks. An attempt to secure fresh air through windows in the side walls, opening directly from the bunks, will result in a "feast or a famine," as the man most directly affected will surely close the window during cold or stormy weather.

A plan which the writer prefers is shown in the accompanying sketch. This is considered to be a minimum spacing arrangement. It would be greatly improved by providing wider spacing between the double rows of bunks and also making each alternate cross-space wide enough to permit passage between. As shown, the use of double-deck steel bunks is contemplated, with a 6-in. space between the adjacent bunks. Each bunk to accommodate only one man. It is possible that the writer's experience as a volunteer in the Spanish-American war, when six men were quartered in a

7x9-ft. tent, has something to do with his idea that each man should be given a separate bunk.

By this minimum spacing, it is possible to secure housing at the rate of 21 sq.ft. of floor space per man, exclusive of area of cross-alleys. It is to be noted that the width of the building is 24 ft., a dimension that permits the use of lumber of ordinary commercial sizes, with little waste. The roof of such a building can easily be constructed without providing any interior supports. Ventilators of generous dimensions should be placed in the roof at frequent intervals. Fixed slat ventilators in each gable should be installed, and these should remain open at all times. Along each side of the building, stock check rail windows should be placed. It is recommended that these should be completely covered by outside screens to permit the opening of windows at either top or bottom without permitting the entrance of insects. Similar windows should be placed at each side of the central end doors.



SUGGESTED PLAN FOR MILITARY BUNKHOUSE

Spaces between windows in the side walls may be utilized for hanging clothing and equipment. For more permanent quarters, the building should be increased in width to permit the installation of lockers along the side wall. The only locker space provided in the accompanying plan is under the 12-in. by 4-ft. "locker seats," which will be utilized by the men in dressing and by the occupants of the upper bunk for mounting into their bunks. All bunks should be of metal and should be fastened to the floor so that they may not become accidentally displaced, but may be easily detached if required.

Each section of four double bunks will furnish quarters for one squad. This arrangement permits the quartering of men under their normal arrangement in the company unless separate quarters are to be provided for all noncommissioned officers. It is considered desirable in a camp of this nature that no movable articles of furniture be permitted in the quarters. Under military administration, it should be possible to keep as many of the windows of such a building open as may be consistent with the existing weather conditions.

The writer does not agree with Mr. MacIsaac's recommendations as to abbreviated eaves, it being considered that the advantage of a wide overhang would more than offset any trouble that might be occasioned by the formation of ice. This would be especially marked in a warm climate, but should also apply in northern sections as there are several months of the year in any section of this country when hot-weather conditions prevail. A generous overhang keeps the sun from the sides of the building for the most of the day and assists in keeping the building cool.

Where necessary to heat the sleeping quarters, spaces at proper intervals should be provided for heating stoves though these should not be required in the milder sections as reading rooms, washrooms and other facilities will doubtless be provided in special buildings.

In the training of an army, the physical well-being of the men is of prime importance. Nothing is to be gained by exposing them to unnecessary hardships, especially during the time that they are resting. Their fitness to withstand the necessary hardships of campaign life will be secured by thorough drilling and not by sleeping in poorly ventilated quarters and in uncomfortable beds. The experience of the European armies shows the danger of the development of tuberculosis in camps; and if it is impossible to guard against in trench life, it is more important then that no efforts should be spared to give the men an even start by insuring them as fully as possible against this malady by providing them with good quarters during their period of training.

ARTHUR M. SHAW,
Consulting Engineer.

New Orleans.

Pacific Coast Defense League Defended

Sir—Gen. H. M. Chittenden in his letter published in *Engineering News-Record*, July 12, 1917, p. 81, tries to give the impression that the Pacific Coast Defense League is asking for a military road to "lie practically all the way along the immediate coast line." Had he followed the newspaper reports of the project and studied the legislation now before Congress at the instigation of the league, he could have easily learned that it is defining no route. It is leaving the location of whatever military roads the Government decides to build out here entirely in the hands of the War Department; in the hands of men eminently capable of locating roads from a strategic standpoint.

I have not read your article referred to, which so sarcastically assails all good-roads promoters who are masking their efforts to rob the treasury of the United States under the guise of military roads, and I have no doubt that it is a just and emphatic criticism. I am glad to see or hear of such fearlessness on the part of your paper. But this does not deter us in the least from calling the attention of Congress to the absolutely defenseless condition on the Pacific Coast and to the further fact that our railroad facilities on this coast are inadequate for any military operations and the mobilization of troops. Very unfortunately for us, the industrial development of our district has not been great enough to warrant the same railroad development as on the Atlantic Coast, and we decry the attempt to insinuate that the same conditions for defense exist here as on that coast. Nevertheless we feel that we have wealth enough and are important enough to deserve defense, and that is what we are asking the Government to give us.

Permit me this suggestion: The Pacific Coast Defense League is officered by men who are keen and capable of judging conditions for themselves; they are men of the highest business standing and men who have studied the defensive conditions on this coast for years.

They are men upon whom the Government relies in more ways than one and are men who are keenly interested in the future of the Pacific Coast. Our sole object is not good roads or military roads, but a comprehensive defensive system on this coast, and we stand ready to assist the Government in any way possible to accomplish this.

R. W. EMERSON,
Secretary, Pacific Coast Defense League.
Seattle, Wash.

Stitch Rivets Spaced for Bending

Sir—Edward J. Squire, in *Engineering News-Record* of June 21, p. 616, apparently overshoots the mark when he finds

$$S_s b = 1004 \text{ lb. per in.}$$

and on the assumption of ⅞-in. rivets with a value of single shear = 7220 lb.,

$$p = 7.2 \text{ in.}$$

His results are due to what appears to the writer an arbitrary establishment of a bending moment, $\frac{w}{8}\left(\frac{L}{2}\right)^2$, as causing the unit stress of $70\frac{L}{r}$ lb. on the extreme fibers.

It is reasonable to assume this unit stress of $70\frac{L}{r}$ lb. on the extreme fibers being produced by a uniform load of w pounds per inch (not per foot as Mr. Squire inadvertently states) over the span L (in inches). The maximum bending moment produced by this unit load w, the strut considered as a beam with fixed ends of span L, is the (negative) one at the ends = $\frac{1}{12}wL^2$. (The positive moment at the center of span is $\frac{1}{24}wL^2$.) The maximum bending moment and the maximum shear are at the ends of the strut. Retaining Mr. Squire's symbols throughout, we have

$$\tfrac{1}{12}wL^2 = 70\frac{L}{r} \cdot \frac{Ar^2}{c}$$

Substituting W for wL (the total load) and solving for W, we have

$$W = 840\frac{Ar}{c}$$

and

$$V = \frac{W}{2} = 420\frac{Ar}{c},$$

making the shear and the rivet pitch for the given example

$$S_s b = \frac{420}{1.45} \cdot \frac{1.87}{3.75} = 376 \text{ lb. per in.}$$

$$p = \frac{7220}{376} = 19.2 \text{ in.}$$

The 19.2-in. pitch applies only near the ends of the strut, as the shear toward the middle decreases to 0, but to use this pitch throughout is a trifling extra expense and is on the side of safety.

It *should not be overlooked* that, in addition to the rivet strength required for the transmission of the direct strut pressure to the ½-in. gusset plate, the shear due to the bending moment $\frac{1}{12}WL$ inch-pounds has to be provided for. On account of the small arm of the force couple (the shear resistances of the rivets on opposite sides of the gusset plates, which have to balance the moment $\frac{1}{12}WL$), this shearing stress is very considerable.

The moment figured for the given example and a strut length of 96 in. given by Alex. W. Mosely in the first article of this subject is

$$\tfrac{1}{12}WL = \frac{70L \times A \times r}{c}$$

$$= \frac{70 \times 96 \times 9.0 \times 1.45}{3.75}$$

$$= 23{,}400 \text{ in. lb.}$$

and

$$\frac{23{,}400}{\frac{1}{2}(arm)} = 46{,}800 \text{ lb. shear on rivets}$$

requiring $\frac{46{,}800}{7220} = 6\frac{1}{2}$ rivets for this purpose.

Summing up:

Capacity of strut = 9.0 sq.in. × 11,100 = 99,900 lb.;
For bearing of one ⅞-in. rivet on ½-in. gusset plate, 10,500 lb.;
Number rivets required for direct pressure $\frac{99{,}900}{10{,}500}$ = 9.5;
Number rivets required for end bending moment = 6.5;
Total number of rivets, 16.

A uniform load of w pounds per inch has been assumed to cause the stress $70\frac{L}{r}$ lb. in the extreme fibers, rather than a concentrated load in the center, because the uniform load gives the greater V and the smaller p. For a concentrated load in the center the V would be only ⅔ and the pitch ¾ of the respective values found for the uniform load.

The writer does not wish to be understood that no other lateral load or loading system causing the fiber stress $70\frac{L}{r}$ lb. would give a greater shear than the uniform load, but has used the uniform load as the more plausible assumption.

P. J. MARKMANN.
St. Louis, Mo.

Compares Automobile and Team Costs

Comparing the cost per mile of the automobile with a team for the use of the project and irrigation managers of the Belle Fourche project, B. E. Hayden, in the July number of the *Reclamation Record*, finds the first cost of smaller machines considerably less than the cost of a good team, buggy and harness, and the operating cost about one-half as much. The efficiency, in point of time, however, is twice as great. A team will travel about 6 miles per hour against 15 miles for the machines. In traveling 15,600 miles in five years, assumed to be the life of a team, there is a saving of 195 eight-hour days.

Some of the costs of operating these machines on the Belle Fourche project are as follows:

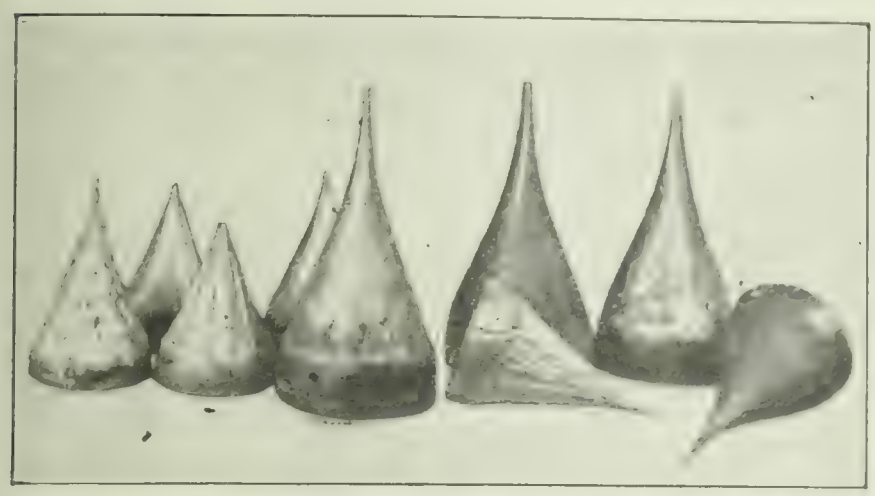
Unit	No. 1	No. 2	No. 3
Horsepower	30	20	20
[illegible]	5	5	5
[illegible] purchased	June 13, 1911	Aug. 21, 1915	Nov. 11, 1916
[illegible] from Newell, S. Dak.	$1,200	$502.26	$405
[illegible] condition	Sold Dec. 16, 1916	Good	Excellent
Miles operated	15,900	8,593	350
[illegible] per mile, including depreciation	$0.157	$0.080	$0.066
Miles per gallon of gasoline	10	15	17
Miles per gallon of lubricating oil	191	192	

THE ENGINEER IN FIELD AND OFFICE

A DEPARTMENT DEVOTED TO DETAILS OF THE DAY'S WORK

Alaska's Glacial Silt Rapidly Erodes Needle Tips of Waterwheels

EROSIVE action of suspended glacial silt on waterwheel parts is strikingly illustrated in a photograph recently made by Hugh Currin, chief operator of the Nugget Creek plant of the Alaska Treadwell mine. The plant consists of two units, one a single overhung Pel-



NEEDLE TIPS SUBJECTED TO GLACIAL SILT LAST ONLY A FEW YEARS

ton unit rated at 1900 hp., the other a double overhung Pelton unit rated at 3800 hp. Each runner is equipped with two nozzles. Both units operate under a head of 490 ft. and are fitted with water-economizing relief nozzles.

Nugget Creek has its source in a glacier, which for a large part of the year discharges large quantities of silt into the stream. This silt varies in size from fine glacial flour to ordinary quartz sand; all is highly abrasive.

The large tip in the center of the illustration was in the relief nozzle of the single runner unit. It had been in service for four years when replaced. Before it could be removed from the stem, it was necessary to drill the holes shown near the base. The other two large tips from the relief nozzle of the double overhung unit, after three years' service, were removed by the tip spanner without difficulty.

The four small tips in front were in service for four years before replacement. With the exception of the one on the left, which required starting by a cold chisel, as shown by the scoring near the base, each of these was readily removed by the spanner. The two small tips in the rear were in service under extreme silt conditions, even for Nugget Creek, for one year before replacement.

Lantern Slides Should Be Carefully Indexed and Filed

BY RUTH CANAVAN

Librarian, Metcalf & Eddy, Boston

PERHAPS the most customary method of filing lantern slides is in the wooden boxes which are on the market for that purpose. These are of varying capacities, containing from 50 to 200 slides. Each slide has its individual compartment formed by cardboard partitions inserted in grooves in the sides of the box. When the hinged cover is raised the rim of the long way of the box is seen to be divided off by the indentations made by the grooves. Each division marks a slide compartment, and it is convenient to number these divisions on the front rim with small india ink figures to correspond with the numbers of the slides. On either end of the exterior of the box the inclusive numbers should be indicated. As the slides are numbered in the order of their accession no duplication occurs, and the boxes may be arranged uniformly and neatly in numerical sequence.

Each slide when received is numbered in india ink upon the thumbspot. An indelible ink is especially necessary for this since the thumbspot marks the position

Canadian Camp Roof Trusses Easily Built



ON SEVERAL buildings now being erected in the Canadian Military Camp, long span roofs were demanded by the specifications. Bate & McMahon, contractors, of Ottawa, have originated and perfected a design which is economical of material, uses small-size sticks and is easily handled. One of the interesting features is the extension of the diagonal ribs beyond the upper chord—thus forming slots, as shown in the illustration, between which the purlins fit and are securely held. On these purlins the roof sheathing is laid in the direction of the span.

for the operator's thumb when he inserts the slide in the lantern, and ordinary ink would smut. Close beside the thumbspot there should be another small sticker which is left blank so that those slides selected for a lecture may be lightly numbered in pencil to insure their temporary sequence. On a narrow strip pasted across one end of the slide the brief title should be written.

To avoid misplaced slides they should be arranged so that they face the left-hand end of the box and have the thumbspots at the top, thus facilitating ready detection of any discrepancy between a slide number and that of its compartment. Similarly, in the traveling case, this arrangement is a convenience since it enables the operator to seize the slide with its face toward him and by a turn of the wrist to invert it in readiness for insertion in the lantern.

Slides Should Be Carefully Indexed as They Are Received

As received the slides are listed under the headings Slide Number, Title, Owner, Date and Origin, on letter-size sheets secured between cardboard covers by brass binding pins. Following this accession list and separated from it by a colored sheet is the place or subject list. To each place of which there are descriptive slides a page is devoted upon which the numbers and titles are listed. For theoretical features, diagrams, tabulations, etc., a sheet headed Miscellaneous is provided, from which, however, any of the items may be segregated upon separate subject sheets when desirable. These place and subject sheets are assembled in alphabetical sequence.

A heavy manila envelope, say 9 x 5 in., pasted on the inside of the back cover, affords an opportunity for the filing of lists of slides temporarily withdrawn from the file. While these lists may be mere memoranda to be destroyed when the slides have been checked off as returned, it is preferable to typewrite them in permanent form upon sheets headed with the name of the borrower, the title of the talk, the place, date, etc.—since such lists have a suggestive value in the preparation of further illustrated talks. Before the slides are returned to their compartments the pencil numbers added by the borrower should be transferred to the loan list, to show the sequence in which the slides were used, and then erased from the slides.

Photographs Taken by City Departments Are Better and Cheaper

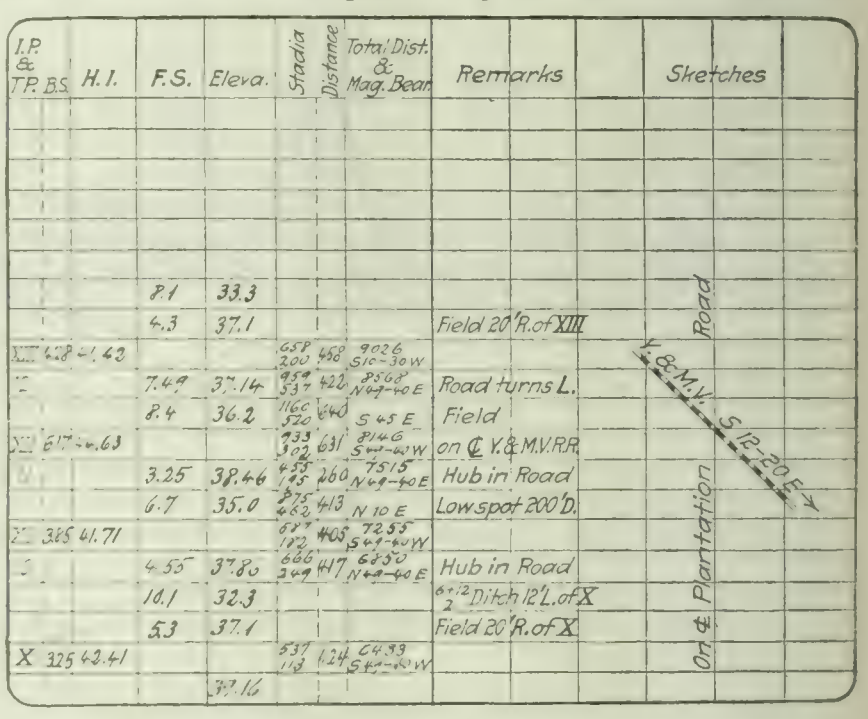
Owing to the fact that commercial photographers do not fully appreciate the engineering side of work of which they may be called upon to take a picture, important points are not brought out so clearly as they are when the work is done by an employee of the department, if he be provided with proper equipment, according to the annual report of Roscoe N. Clark, City Engineer of Hartford, Conn. Furthermore, it often proves difficult to get a photographer to take pictures upon short notice; and, as is often necessary, the man hired for the work does not look with favor upon the prospect of descending a shaft and entering a wet tunnel, for instance, with his own expensive outfit.

The value of photographs in accenting and making clear a verbal or even written description has been proved over and over. The difference in cost between pictures taken by the department and the cost of the work done through professional photographers is decidedly in favor of the former, since by doing its own work, the only cost that the department finds it necessary to carry is the cost of the materials—plus, of course, the time of the man who has to be taken from his regular work to make pictures.

Value of Stadia Surveys Increased by Carefully Kept Field Notes

By A. M. Shaw
Consulting Engineer, New Orleans, La.

IT IS especially important that some definite form of note-keeping be followed in making stadia surveys, even if they are to be platted by the one who makes the



SYSTEMATIC NOTE-KEEPING HELPED BY THIS FORM

survey. There are so many classes of information to be recorded, that if the work is not done systematically, the value of the data recorded is lost through the impossibility of transferring the information contained in the notes to a scale map. This form must, of necessity, be adapted to the work to be done, and should, so far as practicable, conform to established forms of note-keeping. The form used by the writer in making drainage reconnaissance surveys is illustrated by the accompanying sample of notes which were recently taken in the field.

Turning points and instrument points are numbered successively—arabic figures being used for turning points, as they are usually placed on the stake by an untrained assistant, and Roman numerals for the instrument points. The turning points are available for later cross-line surveys. All instrument heights and heights of turning points are calculated in the field as well as the stadia distance. A mental calculation is made by adding one-half the observed distance to the lower stadia reading as a check on the level reading on the central cross-head. This also serves as a check on the observed distance.

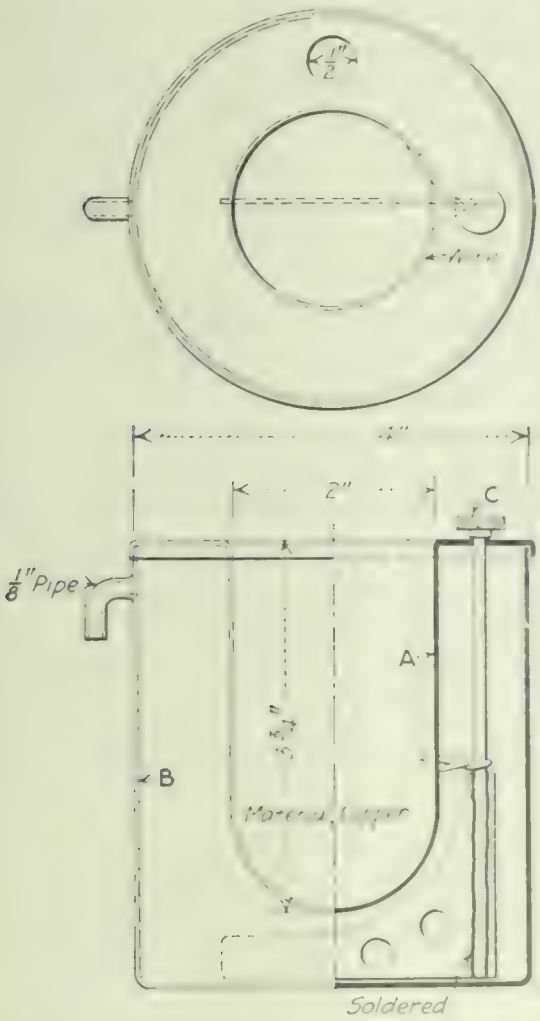
Stadia hairs on a level are always open to objection, owing to the danger of the observer using one of the stadia hairs in place of the central hair in taking level reading, but this danger is reduced as one becomes fa-

miliar with the instrument and is eliminated if the foregoing method of checking is followed. In the level used by the writer the focal point and the center of the instrument coincide, so that no constant is applied to stadia distances.

In line surveys the distance from starting point to each instrument point and turning point is computed and recorded in the distance column, this computation being done at night, or after return to the office. After being checked by adding the observed distance from starting point, the total distances are set down in ink, and are of assistance in platting the survey.

Design Simple Tester for Gaps Between Viscosimeter and Penetrometer

THERE has always been some question as to the value of using the viscosimeter for determining the consistency of road oils when the test has to be made at a temperature much above 100° F. Generally, also, there are many petroleum and tar products which offer so little resistance to penetration at the standard temperature of 77° F. that the necessarily short test period makes the error of determination excessive.



COMBINED BITUMEN CONTAINER AND WATER BATH IS OF SIMPLE CONSTRUCTION

Both Lunge and Hutchinson have designed and used tar testers with considerable success, and in the transactions of the American Society for Testing Materials of about ten years ago Allan W. Dow describes a modification of the penetration needle which consisted of, in effect, a plunger fitting with varying degrees of closeness into a cylinder which contained the material to be tested. To all of these instruments Prevost Hubbard and F. P. Pritchard, of the Office of Public Roads and Rural Engineering, found exception. After a good deal of experimentation and minor changes in design, they finally designed the apparatus shown in the accompanying illustration, which in their opinion, expressed in a paper before the recent convention of the American Society for Testing Materials, will give indications of practical and relative value on petroleum and tar products in the critical range outlined above.



TIME REQUIRED TO SINK ONE INCH IS MEASURE OF CONSISTENCY

The apparatus itself, weighing 2.8 grams and having a specific gravity of 2.13, is extremely easy to handle and clean—being only 3 in. long. It is made entirely of aluminum and brought to correct weight by means of fine shot. Two 0.14-in. holes are placed diametrally, in the disk, close up against the larger cylinder. A special bitumen container is used with this instrument. The details of its construction are shown in the drawing. The inner compartment is filled with the material to be tested, and after it has been cleared of all air bubbles, the instrument is allowed to sink of its own weight from the lower mark to the upper mark—a distance of 1 in.—and the time required is noted and serves as a measure of the consistency of the material.

Attention to Small Details Facilitates Street-Improvement Surveys

By M. Y. Crowdus

GOOD equipment for a municipal engineering corps should comprise (1) a self-reading rod for setting grade points; (2) a small hand ax and a small cold chisel for marking grade points on curbs; (3) a spool of Cuttyhunk fish line; (4) a 10-lb. sledge hammer, an 18-in., 2 x 2-in. square-pointed steel bar for setting stakes, and an 18-in. key-hole saw with detachable handle for use when the stakes cannot be driven with heads to grade; (5) a sifter-top tooth-powder box for holding tacks; (6) a hand level—a great time saver on turning points, preventing errors of judgment in setting up the level too high; (7) a pocket indicator or counter for registering loads of material, stationing, etc.

In using a wye level, to relieve eye-strain, remove the screw cap of the objective end of the eyepiece. The field is greatly enlarged, and quicker sights are possible. Never neglect, however, to replace the cap, for a broken lens is a broken lens.

In giving pavement grades, mark the spring line of the crown of the pavement on the curb at each break in grade. Then with a light line stretched from the head of the stake [illegible] to the gutter grade, the inspector or foreman can restore any grade points that may be lost. This is a help when sanitary manholes have to be reset at points opposite breaks, where a stake could not be driven on account of the manholes.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Contractor Develops Economical Camp Building, Two Men to a Room

A TYPE of camp building which is unglazed and which provides a locked room with two single cot beds for every two men has been developed during the past few years by the Fred T. Ley Co., Inc., and is a feature of its construction camp at the Ayer cantonment. The rooms are 8 ft. square and are arranged in buildings two rooms wide and thirteen rooms long, or



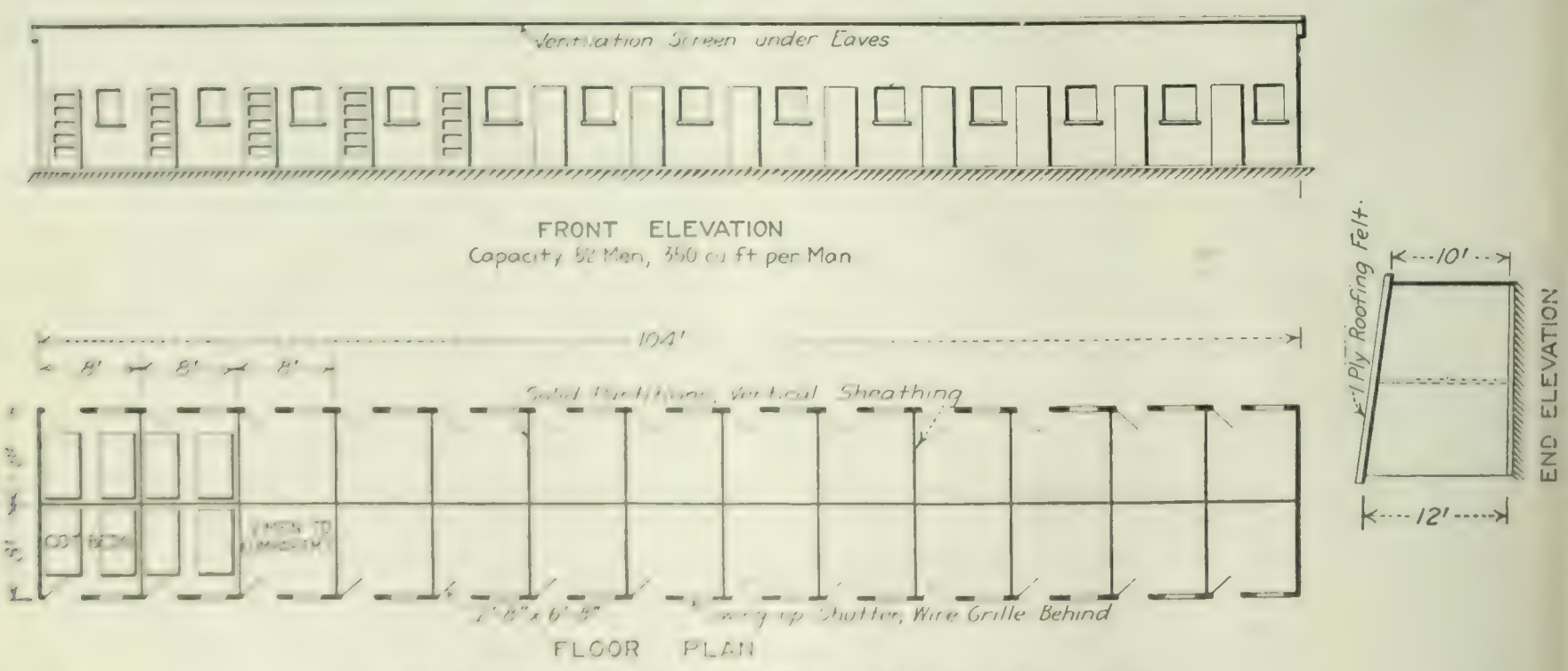
WITH TWO-STORY BUNKS IN CONTRACTOR'S CAMP
BUNKHOUSES HAVE NO GLAZING

16 x 104 ft. Each room has a door and a window. The door is an ordinary solid affair, but the window in place of sash is provided with a swing-up shutter, which leaves the opening unguarded when raised, except for a chicken-wire screen. Ordinary fly-screen wire is substituted for the chicken wire in locations where flies or mosquitoes occur. Each building has a sloping roof, pitched 2 ft. in 16, with a ventilating screen under the eaves at each side. The interior partitions are only 9 ft. high, being carried up to the roof with chicken wire. With this arrangement the ventilation is equal to, or better than, that in an ordinary bunkhouse, while the men are not easily able to climb around into each other's rooms. While, of course, an expert cracksman would find no difficulty in burglarizing such a bunkhouse when no one was around, it is believed that personal belongings and tools are safer in them than in the average contractor's camp. The cost per man is said to figure very low.

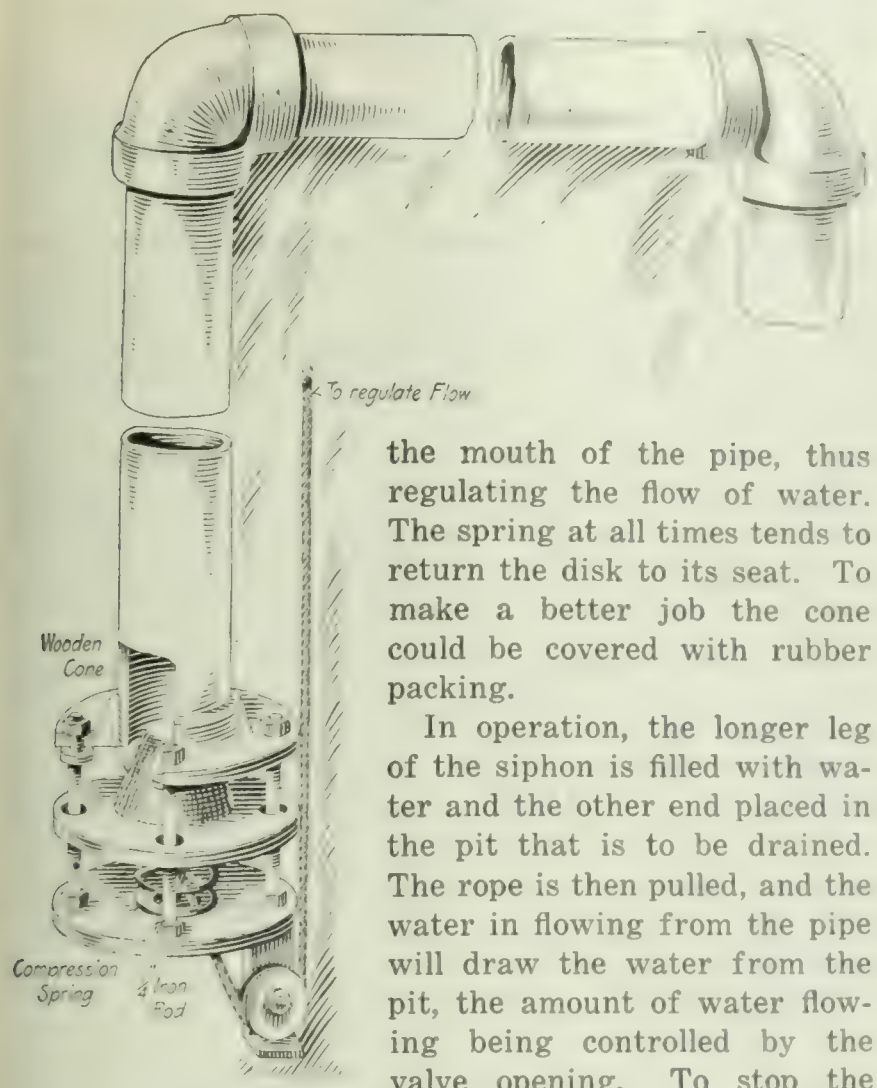
Simple Valve Avoids Necessity of Priming Siphon Continually

THE objection is sometimes raised to the use of a siphon in draining pits, that it is difficult to regulate the flow so that when the pit is entirely drained the pipe will draw air, necessitating priming it again, and this continual priming might involve more labor than the direct use of a pump. Regulation of the flow of a siphon to any degree up to the capacity of the pipe can be secured by use of a valve made as described by J. M. Purcell in a recent issue of *Power*.

The essential parts are shown in the illustration and consist of three flanges fitted to the discharge end of the siphon pipe, four rods, a compression spring, a cone-shaped piece of wood and a piece of rope. One flange is screwed to the end of the siphon pipe and connected to a second flange, by the four rods equally spaced. The cone-shaped piece of wood, which acts as the disk of a valve, seats on the third flange, which is guided by the four rods and forced to its seat by the spring. The rope can be attached to the lower end of the wooden cone and is used to pull the disk away from



COT BEDS AND TWO-MAN ROOMS REPLACE OPEN FLOOR



FLOW REGULATED BY ROPE

the mouth of the pipe, thus regulating the flow of water. The spring at all times tends to return the disk to its seat. To make a better job the cone could be covered with rubber packing.

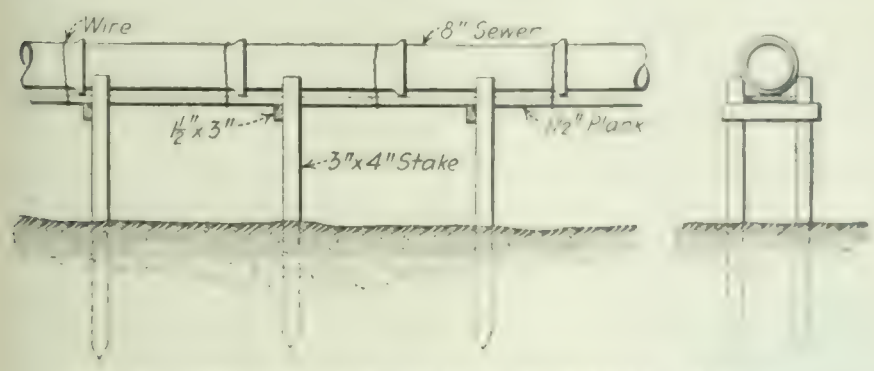
In operation, the longer leg of the siphon is filled with water and the other end placed in the pit that is to be drained. The rope is then pulled, and the water in flowing from the pipe will draw the water from the pit, the amount of water flowing being controlled by the valve opening. To stop the siphon, the rope is released allowing the disk to return to its seat, thus entrapping the water in the long leg, until it is desired to start the siphon again. This is preferable to the common practice of throttling the intake.

Sewer Pipe at Dam Laid on Elevated Plank Before Fill Is Made

By G. W. McAlpin

Florence, Ind.

TO SAVE future excavation, sewer pipe, as shown in the accompanying sketch, has been laid before fill was made at Ohio River dam 39. A trench dug for



THIS TRESTLE FOR SEWER PIPE SAVES FUTURE EXCAVATION

the sewer pipe after the fill had been made would have had to be sheeted, as the material was fine sand and gravel. Hence it was decided to lay the sewers first, if possible, and fill around them.

Crosspieces, at the proper grade, nailed firmly to stakes driven into the original ground, supported a 1½-in. plank, upon which the pipe was laid. The supports were spaced about 3 ft. center to center, thus preventing the plank from sagging with the weight of the pipe. The pipe was wired to the plank to further hold it in position. When fill was placed, it was carefully tamped under and around the pipe and plank.

This method will allow the fill time to settle before taking the weight of the pipe, which of course it may do eventually if the plank rots.

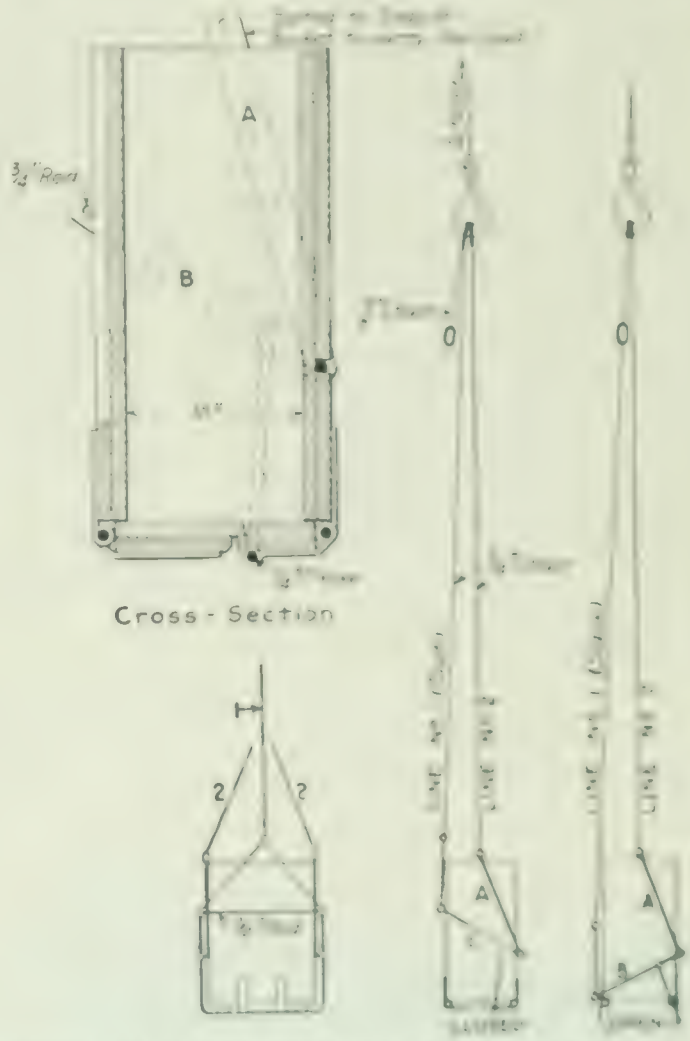
Makes Bottom-Dump Bucket for Under-Water Concrete on Job

By E. S. Needham

Livingston, Mont.

IN THE construction of the Ozama River bridge at Santo Domingo, the remoteness of the site and the unsettled political conditions made it most difficult to obtain equipment, so the contractor had to resort to a good deal of improvisation. Among the many pieces of equipment made up on the job from the material at hand was a bottom-dump bucket for placing under-water concrete.

It may be seen from the accompanying drawing that the details are rough, though adequate in strength. Constructed of candelon, a native hardwood, it was 18 x 30 in. in plan and about 40 in. deep. The action



ENGINEER ON SANTO DOMINGO WORK MAKES HIS OWN BOTTOM-DUMP BUCKET

of the bucket is clearly seen, but is best explained briefly by saying that, while the tension was upon it, line No. 1 held the bottom shut through the toggle lever. After the bucket had reached position, the main line to the hoist was slacked sufficiently to allow line No. 1 to be lifted from the crane hook and let out about 2 or 3 ft. This released the bottom doors, and the bucket would be raised entirely by line No. 2—and the bottom doors, thus released to the slack in line No. 1, would open and deposit the concrete at the point desired.

NEWS OF THE WEEK

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

Bayonne's Proposed Terminal Killed by Voters

Planned on Lines of Bush Terminal, It Combined Warehouses and Piers

The project for Bayonne, N. J., to issue $10,000,000 bonds for a terminal port and warehouse scheme was defeated on July 31 by a vote of 3408 to 1075. The proposed terminal, which had been worked out in considerable elaboration by B. F. Cresson, was planned on the lines of the well-known Bush Terminal in Brooklyn; that is, it was to have combined warehouses with terminal piers which were to be used not only for ocean transfer but for local transfer in New York harbor. The vote was upon a plan whereby the Bush Terminal Co. was to lease the terminal for 50 years.

Bridgeport May Have City Manager

The adoption of a commission-manager charter will be voted on at Bridgeport, Conn., Aug. 11. If the proposed charter carries, the city will have a manager who will appoint all city officials subject to appointment, except only the city clerk and the corporation counsel. The charter provides for five commissioners, elected by preferential ballot. The Civil Service Commission will have jurisdiction over the selection of appointees in all the departments. A proposed commission-government charter received a heavy majority of the votes cast in November, 1916, but it lacked the statutory requirement of 60% of all those voting.

Concrete-Mixer Wins Suit

A decree signed by Judge F. A. Geiger, of the District Court for the Eastern District of Wisconsin, sustained as valid patents owned by the Koehring Machine Co. in its suit for infringement and injunction against the Oshkosh Manufacturing Co. The decree awarded an accounting of damages and profits sustained by the plaintiff.

The above suit involved an adjudication of the patents controlled by the Koehring Machine Co. directed to what is known as the reversible mixing and discharge chute feature and also patents of the same company covering the boom and bucket distributing attachment for mixing machines.

The expert used by the plaintiff Koehring Machine Co. at the trial was Nathan C. Johnson, consulting concrete engineer of New York, whose articles on "Material versus Methods," "Testimony of Moving Pictures and the Study of Concrete" appeared in the *Engineering Record*, Dec. 4, 11 and 18, 1915. The moving pictures used by Mr. Johnson in his studies and referred to in the articles were exhibited to the court at the trial of this cause and formed part of the evidence on which Judge Geiger based his decision.

Cleveland Employs Coal Expert

After a search of several weeks for a coal expert, W. E. Davis, commissioner of light and heat, Cleveland, has arranged with Prof. H. E. Nolds of the Ohio State University to study and report on the several propositions under consideration in connection with the city's intention to buy its coal at the mine.

Type of New Ore Docks on the Great Lakes



DOCK NO. 5 OF THE DULUTH MISSABE & NORTHERN RY. AT DULUTH, MINN. THIS DOCK IS 1,016 FT. LONG AND HAS 344 POCKETS OF 300 TONS' CAPACITY EACH—OR 113,300 TONS' TOTAL CAPACITY. HEIGHT FROM WATER TO RAILS 63 FEET 6 INCHES. WIDTH OF DECK, 56 FEET

Illinois Wants Engineers for Water-Works Valuation

Civil Service Commission To Hold Examinations—Applications Before August 23

The Illinois State Civil Service Commission will hold an unassembled examination to provide an eligible list for the position of mechanical engineer for the Illinois Public Utilities Commission. There is one position to be filled now at Springfield. The position is open to nonresidents of Illinois and is open to male citizens of the United States over 25 years old. The salary ranges from $160 to $250 a month. The duties of the position involve charge of investigation of water-works and steam-heating properties with regard to valuations for rate-making proceedings and special operating problems and preparations of orders in water-rate cases. In general, the examination will consist of the following subjects weighted as indicated: Training and experience, 4; special subjects covering the above-mentioned duties, 6; total, 10.

It is expected that applicants will have general familiarity with the Illinois Public Utilities Commission law and the equivalent to graduation in mechanical engineering from an engineering college of recognized standing, together with experience in the operation, construction and design of mechanical equipment with particular reference to water-works property; ability to make valuation of such property and compute satisfactory ratings is also desired. It will not be necessary for candidates to come to Illinois unless notified to do so. Applications must be on file at Springfield before 5 p.m., Thursday, Aug. 23, 1917. No application blanks will be mailed after Monday, Aug. 20, 1917. Application blanks may be secured by addressing the Illinois State Civil Service Commission at Springfield.

Port Authorities Will Meet at Portland

The Pacific Coast Association of Port Authorities will hold its annual meeting at Portland, Ore., Sept. 4, 5 and 6. There will be delegates in attendance from the several ports along the Pacific Coast. Matters of mutual benefit to each section in a shipping way will be discussed. Last year the session was held at Vancouver, B. C. Charles B. Moores, Portland, chairman of the Commission of Public Docks, is president and G. B. Hegardt, engineer for the Portland Commission, is secretary.

Investigate Austin Dam To Palliate Citizens

Engineer To Determine What Receiver Should Do To Make Structure Comply with Specifications

EDITORIAL CORRESPONDENCE

The City of Austin, Tex., has employed Daniel W. Mead, of Madison, Wis., to investigate the Austin dam as constructed and make recommendations as to what should be done to complete it properly. The city claims that the specifications were not complied with, and so far has refused to pay for the construction. It was partly in compliance with the wishes of the receiver of the construction company and partly to palliate the citizens who were clamoring for the completion of the dam that Mr. Mead was engaged to determine what the receiver should do in order to make the dam comply with the specifications and be acceptable to the city. Mr. Mead is expected to begin his investigation about Aug. 1. He is to receive a retainer fee of $1000 and $100 per day and expenses during the time he is engaged on the investigation and report.

Laguna Dam To Irrigate 200,000 Additional Arid Acres

By a contract just executed between the Secretary of the Interior and the Imperial Laguna Canal Co., of southern California, a tract of arid land comprising from 120,000 to 200,000 acres adjoining the Imperial Valley is to be irrigated by means of an all-American canal some 30 miles in length. The water is to be taken from the Laguna dam of the Yuma reclamation project on the Colorado River at Yuma, Arizona.

JOINT SURVEY WILL BE MADE

Before the proposed system is authorized to be constructed by the Department of the Interior, there is to be a joint survey and examination of the proposed route of the canal by an engineer of the Government, an engineer for the Imperial Laguna Canal Co. and a representative of the State of California. The land which is to be irrigated is contiguous to the present irrigated area in the Imperial Valley and was withdrawn from entry some years ago under the Reclamation Act for reclamation purposes. The contract just executed provides for the release of the lands at the proper time in such a manner as to make them part of the project and irrigable thereunder in 160-acre tracts.

The Government is to build the connection with the Laguna dam and the enlargement of the Government canal at the expense of the Imperial Laguna Canal Co., or to have the privilege of supervising the construction. The corporation is to pay its proportionate share of the cost of operating and maintaining the Laguna dam and appurtenant structures. Under the terms of the contract the company concedes the prior right of the United States Government to all water necessary for the Yuma project, now in operation, or which may be built and put in operation within the next 10 years.

The contract has been so drawn as to protect the interests of the public and to insure the feasibility of the project before connection with the Government dam is permitted, and before any money derived from the sale of stock is made available to the corporation. It is expected that the completion of the canal will largely enhance the productivity of California lands along the Mexican boundary.

New York City Traffic Commission Authorized

A Traffic Commission, to consider the entire problem of traffic congestion and the most efficient plan for future development of the thoroughfares of New York City, has been authorized by the Board of Estimate. The members of the commission will serve without pay, and no positions will be created or appropriations made for the work of the commission. Nelson P. Lewis, chief engineer of the Board of Estimate, and the engineers of the various boroughs will make the necessary engineering investigation and report. Robert H. Whitten, secretary of the Committee on City Plan, will serve also as secretary of the commission. The commission will consider traffic regulation and other means of increasing the capacity of existing streets; grade separation at important intersections, together with street widenings and new streets, and a complete system of automobile and trucking thoroughfares for the five boroughs in order to link them and the whole city with neighboring centers in both New York and New Jersey.

Steel Market Typifies Trade Conditions in Construction Materials

Buying Stagnation Will Persist Until There Is a General Readjustment of Prices on Lower Basis

New influences developed during the month added to the halting tendency caused by abnormally high prices and excess of orders for nearly all materials. The unfortunate effect of the general conditions strongly seconded by the increasing railway congestion is to check the activity in those lines where prices remained nearer normal. The fact is, probably, that the fundamental uncertainty as to Washington's price-regulating moves exerts even a greater influence than would be supposed.

The steel market is typical of the situation. As regards new buying it has been absolutely stagnant since early in July. A common view in the steel trade is that the stagnation dates from the publication on July 12 of President Wilson's appeal to mine owners and manufacturers, that they should "forego unusual profits" and that there should be "one price for all," that is, for the Government, for its Allies, and for the ordinary domestic buyer. The words of the President have had an important effect upon the market, quite out of relation to his power, as at present he has authority to fix prices only on material purchased in connection with prosecuting the war. He spoke at a moment when buyers tended to halt altogether, after having become decidedly more reserved in the matter of making commitments for far forward deliveries. During May and June the open market buying was confined very largely to relatively early deliveries.

VERY LITTLE NEW CONTRACT TONNAGE

In the matter of specifications against contracts entered into some time ago, and of course at prices much below those lately ruling as the open market, there was a slight decrease noted as early as the first fortnight of June, and there were further decreases in July. Of new contract tonnage, as already indicated, there has been very little. The Steel Corporation's unfilled obligations decreased by 500,000 tons in June and are predicted to decrease by perhaps 750,000 tons in July, although there has been considerable tonnage entered for Government account. The Corporation's shipments average about 1,300,000 tons a month.

That the pig-iron and finished-steel markets will remain stagnant, or at least that there will be no general buying movement, until there has been a general readjustment of prices on a lower basis, is now a universally accepted conclusion. At such a juncture producers endeavor to hold prices as long as possible, in order to encourage specifying on existing contracts, for once the market declines below the contract level buyers seek to cancel, or withhold specifications, except in such cases as provide specifically that the contract is firm and not subject to revision. From this viewpoint a period of several months, probably more than three, would elapse before there would be any disposition for open market prices to decline.

LOWER COST WILL AFFECT PRICE OF PIG

If the proviso in the Senate food control bill, that the President is empowered to fix prices on coke, remains in the bill as finally approved, and the President exercises the power, a readjustment in the price structure may be started at an earlier time. In the past two months Connellsville furnace coke has been at an extremely high price, and a large reduction would decrease the cost of making pig iron and would

exercise a sentimental influence besides, so that furnaces would probably see the necessity of reducing pig-iron prices, and steel prices would naturally begin to yield also.

Predictions of a scarcity of steel in general, such as that recently made by the United States Chamber of Commerce, a prediction that was severely criticized in the steel trade, lose sight of the vital fact that the steel rolling industry is highly specialized. The industry is producing at the rate of 43,000,000 or 44,000,000 gross tons of steel ingots a year, but it is impossible greatly to increase the output of one form of rolled steel at the expense of another. The plate rolling capacity will be strained to the limit, to meet shipbuilding requirements, but the greatest tonnage of structural shapes that can be used in shipbuilding will still leave much shape rolling capacity. Government requirements in pipe, for all war purposes, cannot be large in future, now that the deliveries on the Mesopotamian pipe line, nearly 300 miles, are about completed. For ordinary sizes of merchant steel bars, and for bars rolled from old rails, used largely for concrete reinforcement, there cannot be any particularly heavy Government demand. The railroads, however, are taking up few old rails as the mills have been accepting only limited tonnages in new rail orders. Mills in a position to supply light or rerolled rails can get premiums of $5 to $10 per ton over normal prices.

Stagnant Condition Is Country-Wide and in All Lines

As indicated above, steel just now typifies conditions in the other materials markets. The price of sewer pipe has advanced only in Dallas and New Orleans; in Denver there was a decided drop. Practically the same condition obtains in the case of clay drain tile and the concrete materials, even though sand, gravel and crushed stone are largely a local proposition. Common brick is stagnant, owing to diminished building and consequently small demand. Other construction materials, such as hollow tile and roofing, show no action. Lumber is variable, as might be expected. The drain due to cantonment and other camp work has not yet been overcome, railroad conditions are almost impossible, and at most points prices stop many normal lumber users.

Secretary of the Interior Lets Irrigation Contract

The Reclamation Service has been authorized by the Secretary of the Interior to award a contract to J. E. Hilton, of Lingle, Wyo., for the earthwork on the Fort Laramie Canal, Fort Laramie unit, North Platte irrigation project, Nebraska. The work involves approximately 336,500 cu.yd. of excavation and is located near Torrington, Wyo. The contract price is $53,410.

Taking Bids on $1,000,000 Road Improvements

Editorial Correspondence

The Oregon State Highway Commission has awarded or is calling for bids upon a large amount of roadwork. On July 20, bids were opened upon about 40 miles of paving. On July 31, bids will be received upon about 250,000 yd. of grading work, largely heavy rock. Altogether, the work started or authorized by the commission amounts to at least $1,000,000. Just how this is to be financed is a question, as none of the bonds authorized in June have been sold, and the available funds from other sources are entirely inadequate. It seems likely that the commission will ask contractors to take their pay in bonds.

The commission has recently made a decree that a 10-year guarantee will be required upon all paving work. Since the bonding companies will only issue corporate surety bonds upon pavements for a term of five years, the remaining five years will be covered by a personal bond.

The requirement of a 10-year guarantee is plausible, but is liable to lead to serious abuses and tends to limit competition upon paving work. The form of guarantee used in the past in Oregon has been so loose that unscrupulous contractors could escape, while reputable contractors would refuse to bind themselves with the opportunity of escaping on technicalities.

Venezuela Is Using American Construction Materials

Venezuela is now relying largely upon American manufacturers for her supplies of construction machinery and materials, but a report made public Aug. 1 by the Bureau of Foreign and Domestic Commerce, Department of Commerce, warns that effective measures will have to be taken to prevent much of this business going to Europe when the war is over.

Although construction work is not being carried forward with special energy at this time, says the bulletin, the field is worth the closest attention because there is certain to be a marked development in the future. A careful and judicious cultivation of the market is essential to the maintenance of the favorable position now enjoyed by the United States.

The report contains an illuminating discussion of the general industrial and commercial conditions in Venezuela and chapters on specific building activities, markets for all lines of construction materials and machinery, and the commercial practices and requirements of the country. "Markets for Construction Materials and Machinery in Venezuela," Special Agents Series No. 144, may be obtained for 10c. from the Superintendent of Documents, Washington, D. C., and from all branch offices of the Bureau of Foreign and Domestic Commerce.

Publicity Gets Engineers for Chicago Regiment

Needed Financial Backing Furnished by Business Men—Daily Papers and Movies Do Their Bit

The expansion of Company A, Engineers, Illinois National Guard, into a regiment has been under way for nearly a year, but it required a special drive in publicity, handled by an expert, to make any headway in recruiting in these days when so many other organizations and branches of the service are claiming the attention of the newspapers. A Citizens' Unit, composed of well-to-do business men, furnished the necessary financial and moral backing, but somehow the recruits were not forthcoming. E. H. Lee, vice president and chief engineer of the Chicago & Western Indiana R.R., was finally made chairman of a publicity committee. He enlisted the interest of the Universal Portland Cement Co., and the latter detailed J. H. Libberton, in charge of the promotion department, to the work.

Special Delivery Return Envelope Used

The first drive was made on the daily papers. Each managing editor was addressed (by name) with a special-delivery letter, explaining the regiment and that it was distinctively a Chicago affair. Plans for a recruiting week were announced and suggestions invited. This was the "come back," and a special-delivery return envelope was inclosed for this purpose. Without exception the editors responded, and articles from a "stick" up to a column resulted. Twenty-two items appeared in two weeks. Plans for recruiting week were to include several startling features, among them the dropping of numbered pamphlets over the city by Ruth Law, the aviator. A reward of $50 was to go to the person who would bring in a predetermined number, or one nearest to it. These plans were abandoned because the navy subsequently decided upon a drive the same week.

Movies Show Slides

Two days after the editors were attacked, 125 moving-picture managers were sent special-delivery letters asking if they would show a slide for the engineers. As before, special-delivery returns were inclosed. This brought 100% results. A moving-picture scenario has been written by Mr. Libberton and pictures made by the Universal Weekly company. Types of men desired were shown in front of a recruiting station; also the awkward squad in training at the City Pier, a crack regiment, and work in the field. The weekly is shown in 150 theaters. In addition to these methods a committee was formed in every engineering organization to circularize the respective memberships and to push the propaganda at all meetings. Two weeks after the drive started, 700 of the 1070 desired men had been obtained.

Break in Los Angeles Aqueduct Near Neenac, Calif.



STEEL PIPE, WHICH WILL BRIDGE BREAK, IS SHOWN AT FAR SIDE

Building Show Next Year Instead of Usual Cement Show

The usual annual Cement Show at Chicago, which has been held for a number of years past, will not be given next year, but in its stead there will be a cement, machinery and building-materials show to be held in the Coliseum from Feb. 6 to Feb. 13, 1918. Practically the same rules which governed the ordinary Cement Show will govern the coming exhibition, with the exception that machines and products of interest to builders, even though they do not relate to concrete, will be permitted. The show is under the management of the National Exhibition Co., 123 West Madison St., Chicago.

Brick Against Segmental

The sewer-brick and segmental-block interests are having a tilt at Detroit. Heretofore the brick interests have controlled the field. The segmental-block people are now trying to get in. The Council Committee on Sewers started out on July 31 to inspect segmental-block construction in various cities. The Detroit Bureau of Governmental Research has submitted to Clarence W. Hubbell, city engineer, a proposition that bids be thrown open to brick, segmental block (vitrified clay and concrete), reinforced-concrete pipe and monolithic concrete.

Missouri Submits Federal-Aid Road Project Statements

The Missouri State Highway Department has just submitted to the federal department project statements for the improvement of 25 miles of macadam and gravel roads in Cole County, and 8 miles of concrete roadway in Jasper County. The Cole County project will cost $115,000, while the Jasper County project will cost $97,000. The Missouri department, operating under a new law, will supervise the building of more than fourteen million dollars worth of roads during the next four years.

Everglades Drainage District Gets Engineer

Supervisors of the Napoleon B. Broward drainage district, recently created by the Florida legislature, have engaged Isham Randolph & Co., of Chicago and Jacksonville, as chief and consulting engineers for the district drainage works, which are estimated to cost upward of $6,000,000. The district includes about 550,000 acres of land in the Florida Everglades, near Miami and Fort Lauderdale, and is to be reclaimed by a system of canals, dikes, ditches and roads. It is expected that the cost of reclamation will be from $10 to $15 an acre.

Bids were asked from engineers for taking charge of the plans and engineer work of the project, and the Randolph firm was low bidder. William A. O'Brien, who has been engineer in charge of the drainage of the half-million acre Girardeau district, in Missouri, has been employed by the district supervisors as project engineer.

Ogden, Utah, Paving Program Largest in Its History

Forty blocks of paving are on the program for this season, writes Joseph M. Tracy, city engineer of Ogden, Utah. "This is far above the amount done in any other previous year in the history of the city. Paving and sewers are the main municipal improvements. Sewer District 134, embracing one-half the area of the city, probably will not be under construction this year, but plans requiring from four to six months to complete are being made."

Board of Fire Underwriters Doing War Work

Besides General Fire-Protection Publicity Is Working on Cantonment Design

The National Board of Fire Underwriters since the beginning of the war has been particularly active in publicity work and other campaigning which would tend to reduce fire waste. This work consisted primarily in the organization of committees who, by means of public meetings and conferences with owners and with officials, aroused the communities to the need at present more than ever of safeguarding from fire all food repositories and similar structures.

Food Repositories Guarded

Each local advisory committee was furnished with a list of the various special agents in its territory and was requested to organize the field force therein for conservation work and to carry out any investigations and to secure any information which might be desired by any department of the Government or of the Council of National Defense. In practically all the states thus far organized special authority has been granted to the inspectors. In certain states where the law permits, the state fire marshal has deputized insurance inspectors as assistant fire marshals. In New York the State Council of Defense has a Bureau of Fire Prevention and has designated two of the engineers as directors thereof and has provided an office for the use of this bureau and an appropriation for clerical hire, etc.

Working on Cantonments

In addition to general informational service to the Government officials engaged in building the army cantonments two engineers were detailed for permanent service with the Committee on Emergency Construction and were assigned to the construction of water-works and designing the systems of fire protection for all of the new cantonments and for other new structures which the Government is erecting. One of the board's engineers has been detailed to direct in person at each cantonment the layout of water mains, the organization of fire brigades and the installation of both temporary and permanent fire-protective apparatus.

Pioneer Paving Decision In Minnesota Court

If a recent decision in a lower court is sustained, Minnesota cities may award contracts for patented pavements even though their charters provide that all contracts must be let to the lowest responsible bidder. The decision was made by a judge in the District Court for St. Cloud, Minn., on application for an injunction against the award of a contract for bituulithic pavement. The judge said that there are decisions in other states both for

and against the plaintiff's claim, but that the precise question had never been decided in Minnesota. After weighing the decisions he concluded that the balance was in favor of permitting the award, which he felt was "the more reasonable position to take." Continuing, the judge said:

CONTRACT IS HELD VALID

"If it be good law that a city could not call for bids on a patented article, it would seriously interfere with the public comfort, safety and progress. The proper construction, it seems to me, to give to a charter provision of this kind is that a contract shall be let to the lowest responsible bidder where that is possible or practicable, and that in case of a patented article such a charter provision would not apply. In the instant case, however, it appears by the proof that the city before letting the contract did call for bids, not only for this kind of pavement, but for several other kinds, and after receiving all of such bids in the exercise of a sound discretion let a contract for bitulithic in preference to the others. It seems to me this contract is valid at least under the present showing, and that it would not be right for this court to interfere any longer in the progress of the work."

Another claim made by the plaintiff was that Warren Brothers Co. does not have a valid patent on bitulithic pavement and that, in the language of the opinion, "by specifying such pavement under such patent at the price of $1.45 [per yard?] to be paid said Warren Brothers Co." an unjust burden is placed on property owners and that the charge is unreasonable and unfair. This contention was disposed of by the familiar statement that the court could not consider a mere allegation of mistaken judgment on the part of administrative officers.

PERSONAL NOTES

ALEX. F. PROCTOR, Victoria, B. C., has been appointed acting chief engineer of the Provincial Department of Railways.

ANDREW T. HANSEN has been appointed city engineer of Los Angeles, Calif., to succeed Homer Hamlin, whose removal from the office was noted in these columns last week. Mr. Hansen was graduated from the University of California in 1903, and was then for three years assistant engineer in the United States Reclamation Service, spending the major portion of his time in the construction of the Yuma project. In 1906 he was made assistant engineer of the City of Los Angeles and was detailed to the outfall sewer as Mr. Hamlin's assistant, under whose personal direction this structure was completed. In 1908 he was made division engineer on the Los Angeles Aqueduct, and constructed the Jawbone division, one of the most inaccessible and heaviest divisions upon the aqueduct. Before the completion of this work Mr. Hansen was given, in addition to the Jawbone division, supervision over the Mojave and North and South Antelope divisions —an additional length of 76 miles. Upon completion of the aqueduct Mr. Hansen returned to the City Engineer's Department and assumed charge of the street work. In 1913 he was appointed chief deputy to the city engineer, serving in that capacity until his present appointment.

PROF. BORIS BAKHMETEFF, special ambassador from Russia to the United States, was recently elected a member of the Canadian Society of Civil Engineers.

O. LAURGAARD has been appointed city engineer of Portland, Ore., to fill the place left vacant by the resignation of PHILIP H. DATER.

FRANK A. FARLEY, formerly assistant engineer of the City of Cincinnati, has been appointed construction engineer of the Department of Public Works, State of Ohio.

C. E. HENDERSON has resigned as city engineer of St. Augustine, Fla., to take the position of county engineer of St. Johns County, of which St. Augustine is the county seat.

LAWRENCE H. DOOLITTLE, formerly with the American Smelting and Refining Co. at Perth Amboy, N. J., is now in the office of CHARLES A. TRIMMER, consulting engineer, Madison, South Dakota.

JAMES H. HOPKINS, who has been chief engineer on roadwork for Rhea County, Dickson County and Robertson County, Tennessee, has been appointed commonwealth engineer in charge of the construction of the "Midland trail" through Rowan and Carter Counties, Kentucky.

HARRY S. WRIGHT, CEDRIC H. COLLINS, ALBERT G. BARSTOW, RAYMOND H. BURTON, JAMES B. TURNER, FREDERICK L. DONEGAN, RALPH S. MOORE, JOHN H. KING, CARL FRANCIS and HARRY O. V. NORDQUIST have left the employment of the Water-Supply Board, Providence, R. I., to enter the Federal service.

W. H. WAUGH, formerly division engineer in charge of highway construction and maintenance, Bureau of Public Works, Manila, P. I., has been appointed senior highway engineer, Office of Public Roads and Rural Engineering, with headquarters at Juneau, Alaska.

CHARLES D. THOMAS, assistant engineer, Public Service Commission, First District, New York, has been commissioned captain in the Engineer Officers' Reserve Corps.

E. FRENCH CHASE, engineer, Streets and Sewer Department, Seattle, has been commissioned captain in the Reserve Engineers' Corps, United States Army.

THOMAS R. BEEMAN, deputy engineer, Kings County, Washington, has been commissioned captain in the Reserve Engineers' Corps, United States Army.

R. B. FREELAND, of Grand Forks, B. C., has been appointed provincial engineer for the government of British Columbia.

C. M. REPPERT, division engineer of design; JOHN D. STEVENSON, assistant engineer, Division of Design; NATHAN SCHEIN, assistant engineer, Division of Streets; and CHARLES F. BROWN, assistant engineer, Division of Surveys, all of the City of Pittsburgh, have joined the service of the Government in connection with the building of the cantonment at Annapolis Junction, Maryland.

MAJ. JOHN C. OSTRUP, who in May was assigned to the Plattsburg training camp, was recently transferred to the Engineer Officers' training camp at American University, Washington, D. C. Major Ostrup, who was connected with the Chicago and the Boston elevated railroads, and who later was called as professor of structural engineering at Stevens Institute of Technology, will maintain his office as consulting engineer at 17 Battery Place, New York City.

R. M. BOWMAN, who for the past four years has been assistant engineer of the Lake Erie & Western R.R. Co., with headquarters at Indianapolis, has been appointed highway bridge engineer in the Office of Public Roads and Rural Engineering with headquarters at Washington, District of Columbia.

C. E. PARIS, who has been business manager of the Imperial Irrigation District since November, 1916, tendered his resignation to the Board of Directors, effective Aug. 1. Previously to Mr. Paris' connection with the Imperial District, he was for eight years in charge of various engineering work in the same valley.

M. E. ALLEN, at present secretary and contracting engineer for the Central States Bridge Co., Indianapolis, Ind., has formed a partnership with R. W. BAILY, consulting engineer for steel structures and machinery, Chicago. The arrangement becomes effective Aug. 1 under the name of Baily & Allen Company.

L. G. HICKS, who for the past several years has been city engineer of Roseburg, Ore., has resigned to accept the position of district superintendent of construction for the Standard Oil Co., with headquarters at Seattle.

WESLEY PEASE, assistant engineer, and MARVIN PIERCE, assistant to City Engineer FRED O. EICHELBERGER, Dayton, Ohio, have tendered their resignations to become effective next week. Mr. Pease will become associated with the mili-

tary cantonment at Chillicothe, where he will be in charge of the engineering work. Mr. Pierce has accepted a position in connection with the construction of the Wright aviation field.

A. W. PHILLIPS, for the past year general superintendent of the Aetna Chemical Co.'s Canadian plant at Drummondville, Que., has resigned to accept the superintendency of the Synthetic Acetone plant of the Canadian Electro Products Co., at Shawinigan Falls, Que. R. A. LOCKERBY, who has been operating superintendent at Drummondville, succeeds Mr. Phillips. Mr. Phillips was formerly superintendent of the Aetna Explosives Co.'s guncotton plant at Gary, Indiana.

HENRY W. HODGE, whose commission as major in the Engineer Officers' Reserve Corps was noted in these columns two weeks ago, has resigned as a member of the Public Service Commission of the First District, New York State. During the year and a half that Mr. Hodge has served as

Resigns as Public Service Commissioner First District, New York



HENRY W. HODGE

Commissioner his engineering experience has been of much value in constructing the "dual" system of rapid transit for New York City. The firm of Boller, Hodge & Baird, of which he has been senior member since 1912, designed many of the largest bridges and buildings in the country, among them being the Duluth & Superior Bridge, the cantilevers across the Monongahela and Ohio rivers at Pittsburgh and Steubenville, Ohio, and the Municipal Bridge at St. Louis.

PROF. JOHN F. HAYFORD, director of the College of Engineering, Northwestern University, is at present in Washington serving as a member of the National Advisory Committee for Aëronautics, and is also temporarily on the staff of the Bureau of Standards in connection with the work of that bureau having to do with special problems of aëronautics.

PROF. JAMES M. BARKER, of the civil engineering department, Massachusetts Institute of Technology, has been retained as consulting bridge engineer by the Massachusetts Public Service Commission.

JOHN D. GALLOWAY has been appointed engineer in charge of the Northeastern Mineral Survey, covering the important districts in British Columbia.

CHAS. J. DECKMAN has resigned as president of the Medal Paving Brick Co., Cleveland, Ohio. Mr. Deckman has been connected with the paving-brick industry for the past 30 years.

ROBT. H. MURRAY, vice-president and manager of operations of the Chicago Bridge & Iron Works, has been given a commission as Captain of Engineers in the Officers Reserve Corps, and is now stationed at Fort Leavenworth, Kansas.

N. S. KLINK, formerly assistant engineer with the Aberthaw Construction Co., is now in the office of CHARLES T. MAIN, consulting engineer, Boston, Mass.

C. S. COE, engineer, maintenance-of-way, Florida East Coast Ry. Co., has been granted indefinite leave of absence for service with the Seventh Regiment of Railroad Engineers. The position occupied by him has been abolished, and L. T. FROHMAN has been appointed principal assistant engineer.

LLOYD T. MCAFEE, LEO GLICK, JOHN H. RYAN, EUGENE J. RIORDAN, RICHARD W. MONTELL, HENRY W. SWANITZ, EMIL F. MUHEIM, WILLIAM F. DONNELLY, JOSEPH E CASEY, SAMUEL HODES and WILLIAM J. FITZGERALD were presented gold medals by M. M. O'SHAUGNESSY, city engineer of San Francisco, at the celebration of the completion of the Twin Peaks tunnel, July 14, as a token of appreciation of the assistance rendered to him in this work.

WILLIAM F. MOORE, city engineer of Grand Rapids, Mich., has been appointed state highway engineer of Indiana by the State Highway Commission. Mr. Moore has had experience in both the contracting and the engineering field. He was associated for a number of years with the firm of John Moore & Sons, contractors, but for the last 17 years has been engaged in engineering work. He was city engineer of Mishawaka, Ind., and then held the same position in South Bend for about 6 years. He has been city engineer of Grand Rapids for the past 2½ years.

GEORGE H. HARRIES, prominent as a public utility executive, has received a leave of absence from the various corporations with which he is connected in order to resume military service. He is now in command of the Nebraska National Guard, at Fort Crook, having been commissioned brigadier general by Governor Neville, and will be recommended by the War Department for similar rank in the regular army. Since 1912 General Harries has been a vice-president of H. M. Byllesby & Co. He is also president

Now in Command of Nebraska National Guard



BRIG GEN GEORGE H HARRIES

of the Louisville Gas & Electric Co., the Omaha Electric Light & Power Co., the Arkansas Valley Ry., Light and Power Co. and an officer in a number of other large utility organizations. During the past several months General Harries has been engaged in work for the Council of National Defense and War Department. The son of an officer in the British army, born in Wales in 1860, General Harries came to the United States when a boy and served as a scout under Generals Miles and Crook in frontier wars with the Indians. He was a member of the Government's commission settling the grievances of the Sioux Indians in 1891. In 1898 he went to Washington, D. C., later becoming president of the Metropolitan R.R. in that city. From 1907 to 1917 he was brigadier general in command of the military and naval forces of the District of Columbia, retiring as major general May 28 of the latter year. During the Spanish-American War he served as colonel of the First District of Columbia Infantry, United States Volunteers.

H. H. RUTTY, vice-president of the Grand Trunk Ry., has assumed the duties of E. J. CHAMBERLIN

president, during the latter's absence on a three months' leave.

CHARLES ALLEN GOODNOW has been appointed vice president of the Chicago, Milwaukee & St. Paul Ry. Entering the railroad service in 1868 with the Vermont & Massachusetts R.R., he became superintendent of the New Haven & North Hampton R.R. in 1881, and in 1886 was appointed superintendent of construction with the Chicago, Milwaukee & St. Paul Ry., being promoted in 1888 to division superintendent, with headquarters at Dubuque. In 1902 he was appointed general manager of the Chicago, Rock Island & Pacific Ry., and in November, 1903, became general manager of the Chicago & Alton R.R. Assistant to the president of the Chicago, Milwaukee & Puget Sound R.R. from 1908 to 1913, on the latter date he became assistant to the president of the Chicago, Milwaukee & St. Paul Ry., and had under his charge the electrification of that road from Freeport, Mont., to Deer Lodge, which work was remarkable for the rapid progress made and the results achieved in but three years of work. Mr. Goodnow also constructed the Gallatin Valley Ry., a subsidiary of the St. Paul, and is now president of that line. Many interesting innovations can be traced to Mr. Goodnow, such as interlocking plants, English staff machines, the perfection of the Manual Block System as now in use on the St. Paul, and the introduction of the floating system of handling freight on Puget Sound.

J. F. DEIMLING, assistant chief engineer of the Michigan Central R.R. at Detroit, Mich., has been appointed acting chief engineer, vice GEORGE H. WEBB, who has been commissioned lieutenant colonel in the Sixth Engineer Regiment.

R. S. REYNOLDS, formerly with WALTER G. KIRKPATRICK, civil engineer, Birmingham, Ala., is now in the Aeronautical Drafting Division of the Bureau of Construction and Repair, U. S. Navy, Washington.

HERMAN C. NUFFER has resigned as county surveyor of Franklin County, Idaho, and is now assistant engineer in the United States Indian Irrigation Service, with headquarters at Albuquerque, New Mexico.

Engineer Officers' Reserve Corps Assignments

The following-named officers of the Engineer Officers' Reserve Corps are relieved from their obligations in connection with their enlistments at the Engineer training camps named below and are assigned to active duty.

At Vancouver Barracks, Washington —Capt. Bertram D. Dean, First Lieuts. Franklin W. Bush, Jr., Harold Cogswell, Merrill Butler, Frank M. House, Arthur M. Bohnert, and Roy E. Tremourex. Second Lieut. Ernest M. Wright.

In the vicinity of Washington, D. C. —Capts. John W. Mark, George H. Throop, Oscar B. Perry, James G. Ross, John H. Watson and Martin P. Korn. First Lieuts. Harwood S. Haynes, Merritt T. Cooke, Jr., Harry S. Abell, Albert O. Loomis, Ira B. Pearce, Isadore E. Behrman, Page B. Blakemore, Paul Freedley, Ambrose Harwell, Philip O'B. Montgomery, Carl L. Raymond, Lois L. Adams, Caleb S. Kenny, Herbert I. Collins, William V. Hill, William S. Grace, James C. Fitz-Simons and Willard W. Troxwell. Second Lieuts. John E. Morelock, Hugh M. Heiskell, Gerald M. Keith, Orris S. Wood, Robert L. Glose, Frederic F. Frech, Charles H. Chandler, Jr., Ephraim, B. Wilkinson, Frank S. Neely, Kenneth B. Jones, John S. Beck and William A. Richards.

At Fort Leavenworth, Kans.—Maj. Walter E. Winn; Capts. Henry N. Brooks, Rennie B. Fanning, Frederick R. Giertsen, Albee L. Ladd, George G. Stroebe, Warren R. Thompson, George C. Parsons, George Goldman, George A. Knapp, Frank B. Watterson, Oscar W. Urbom, Charles S. Rogers, Chester A. Rothwell, Benjamin H. Lampert, Byron L. Kelso, and Walter V. Buck; First Lieuts. Leroy Johnson, Charles M. Seymour, Meyer Barnert, Samuel E. Minor, Henry V. Hubbard, Bjarne N. Folling, Horace C. Rawson, Jonathan W. Freeman, Frank Scott, Gordon A. Beebe, Allison T. Yorton, Edward A. Wood, Arnold A. Kriegsmann, Gerald S. Kibbey, Royal S. Durrell, George A. Geib, Ralph G. Aultman, Leo H. Weisfeld, Chancey L. Currier, Lewis H. Merrill, Ray E. McCurdy, Samuel J. Gates, Robert R. Fisher, Jamison Vawter, Edward W. Falanders, John T. Watry, Andrew H. Holt, Victor Morris, Robert J. Parmenter, Prescott G. Brown, Jessel S. Whyte, William E. Stanley, Malcolm K. Whyte, Jerome Powers, Dan S. Helmick, and James B. Black; Second Lieuts, Harvey A. Wood, Bolling W. Coulter, Edward Illsley, Robert A. Thurstin, Arthur W. Baumgarten, John E. Hayden, John A. B. Tompkins, Leslie A. Kibbe, Lynn U. Martin, Dudley K. Sadler, Edwin J. Stephenson, Clyde F. Weingartner, Albert M. Bowles, Waldimar Karkow, Walter S. Shively, Eugene L. Colcord, William D. Stuart, Jr., Neil A. Fowler, James F. Lardner, Jr., David H. Levy, Charles W. Campbell, Donald M. Cook, Francis J. Sherwin, Russell F. Albert, John D. Gould, Ralph L. Nessler, Kenneth A. Barren, Milton N. Levy, Charles K. Dunn, and John L. Niesse.

OBITUARY

PROF. ALBERT F. GANZ, of Stevens Institute, Hoboken, N. J., died July 27. He was born in Elberfeld, Germany, Apr. 25, 1872, and came to this country in 1881. In 1902 he was appointed professor of electrical engineering at Stevens. To readers of *Engineering News-Record* he was best known through his work in the field of electrolysis. He was chairman of the committee on electrolysis of the American Water-Works Association and was the author of many papers on the subject of stray electric currents and their effects. Prof. Ganz did much consulting work in this specialized field.

JAMES E. JENKINS, who was associated with H. R. BEEBE, civil engineer and contractor, Utica, N. Y., died, July 5, at Saranac Lake, N. Y. In 1897 Mr. Jenkins was engaged on the Oswego-Little Falls section of the deep waterway survey; and on the Trenton Falls, N. Y., power development from 1898 to 1901. Graduating from the Rensselaer Polytechnic Institute in 1904, he was in charge of the alignment of the eastern sections of tunnels A and B under the East River, and then engineer for Thomas Crimmins Contracting Co. on barge canal contracts near Lockport, N. Y. Subsequently he was engineer for Smith, Hauser & Locker Co. on the section of the Catskill Aqueduct from 96th St. to 14th St., New York City. His health having become impaired on this work, he accepted a position as superintendent and general manager for the Cook Construction Co. on the Montreal aqueduct, and later was engineer for John W. Cowper Co. on a large chemical mill at Buffalo.

JOHN F. CONWAY, at one time assistant superintendent of the Bureau of Sewers, Manhattan, New York City, died July 10 in Brooklyn, New York.

BUSINESS NOTES

B. ORUM ANDERSEN has become connected with Aall & Co., of Tokio, the Japanese agents for the American Steel Export Company.

The Osborn Engineering Co. announces that at the annual meeting of stockholders the following officers were elected: F. T. OSBORN, president; B. L. GREEN, vice president and general manager; P. P. EVANS, secretary; and L. C. MIDDOUGH, treasurer.

SLOANE, HUDDLE, FUESTEL & FREEMAN, consulting engineers, Chicago, have been retained by the Rhode Island legislature to investigate the affairs of the Rhode Island Co. street-railway system.

J. H. FLYNN has been appointed manager of the bucket department of the Blaw-Knox Co. Mr. Flynn was draftsman for the Isthmian Canal Commission and later mechanical engineer on the same work, serving through the period of heavy construction until 1911. During the past six years Mr. Flynn has been connected with the Lines-Flynn Co., of New York City, handling a general line of contractors' equipment.

A Consolidation of Engineering News and Engineering Record

ENGINEERING NEWS-RECORD

A WEEKLY JOURNAL
DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

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Joint Effort Produces Great Results

WORKING shoulder to shoulder is the essence of our national spirit just now. Only the immense sweep of this spirit through the country could accomplish what has been accomplished. We are learning new things in efficiency. Records are being made under hastily organized coöperation that surpass the best ever done through single effort—as witness the years of doing that have been crowded into four months in the Government's own work. But as fine a record as any is that which the Railroad's War Board can show. The traffic performance of the country's railroads has increased everywhere: in degree of loading, in daily mileage per car and per engine, in traffic moved daily per engine and per car. If these are the results of coöperation in wartime, may we look to reaping similar advantage from peace-time cöoperation?

Technical Men Get No Apology

SOME weeks have passed since two or three senators attacked the reputation of technical men engaged in helping the military authorities in their present rush work. The patent injustice of the attack surely became evident to the senators soon after, as the facts were so clear that they could not be mistaken—but there has been no apology to the men whose work and motives were wronged. Simple justice calls for such apology. The senators said, while speaking of civilians elevated to high military rank while still performing civilian duties, that this list constituted a burning scandal, "that many of the men did not know enough of military tactics to drill ten men without getting them all tangled up in their feet." Most of the civilians in question are men who have been appointed majors, and most of them are engineers and have been urgently needed by the Government in rushing its great building program forward. They undertook the work at a personal sacrifice. Their $3000 stipend as major is far less than their professional income. No better evidence of their efficiency could be asked than the powerful progress which is being recorded by the cantonments, with whose construction most of the majors in question are connected. These men were not commissioned for the purpose of maneuvering troops, and the gibe at their alleged ignorance of military tactics is, to say the least, pointless. If the Government is really paying these men more than their services are worth, the senators should by now have followed up their idle accusations and cleaned those civilians out of office. The only alternative is that they apologize for their unjustified attack.

Portable Saws and Army Camps

THE wonderful speed being made in the construction of wooden buildings for army camps is due in no small degree to the portable sawmill, the development of which has been largely brought about through the growth of reinforced-concrete construction. Contractors engaged on concrete building work soon discovered that these little power-driven saws were most effective labor savers in form construction. Big reinforced-concrete structures often require the framing of more than a million feet of lumber, which can be done far more quickly and cheaply by one or two of these little mills than by hand. This development has paved the way for the quick execution, in the face of a severe labor shortage, of the greatest frame building operations ever undertaken—the encampments for regular land and naval forces, and the sixteen cantonments for the National Army. At each of these locations batteries of these busy little saws are framing daily half a million feet or more of lumber so accurately that the pieces go together without further fitting like a set of children's building blocks. The contractors and manufacturers who developed this useful tool deserve the thanks of the country.

Waterways Commissioners Should Be Engineers

THE long advocated Waterways Commission is practically assured by the agreement in conference of both houses of Congress to include it in the current Rivers and Harbors bill. There are many who could wish for a stronger organization than is assured by the bill, for the law gives only the vaguest powers to the commission. Its functions are purely investigatory and its duties embraced by instruction to "formulate and report to Congress a comprehensive plan or plans for the development of waterways and the water resources of the United States for the purposes of navigation and for every useful purpose." The control, then, of the many interwoven activities relating to the uses and abuses of water will remain in its present divided state

awaiting the further action of Congress in response to the commission's investigation. That any commission at all was appointed, however, is one very definite step toward a rational administration of the diverse elements that go to make up what are called the water resources of the country. Whether such a preliminary step toward a rational administration of the diverse sonnel of the commission, for an entirely inadequate amount of money has been appropriated for its expenses and its organization. The President will have the appointment of the seven members, at least one of whom must be an army engineer and one an expert hydraulic engineer from civil life. The remaining five may each be selected either from civil life or the public service. A salary sufficiently attractive to politicians has been provided, but the job is so essentially of an engineering nature that the President should surely see to it that a larger representation of engineers is made. Is there not here a chance for engineering organizations to practice some of the recent publicity preachments and to try to get through the barriers now surrounding the White House a proper appreciation of the need of engineers on this commission?

Structural Engineers Need To Assert Themselves

ECONOMIC design of industrial buildings such as mills and factories is a matter for the trained engineer, to insure that the structures combine strength and economy. Especially is this the case where heavy loading or the stresses due to operation of machinery are factors in the design. This seems obvious enough. But it is not recognized as generally as it should be by those who order the construction of buildings of this class.

Sometimes this is due to a direct desire to save the expense of expert engineering advice, under the mistaken impression that such expense is not really necessary. More often it is due to a failure to comprehend the functions of engineering and the engineer in relation to building design. And this condition results in large part from failure of the engineer or the engineering profession to properly assert or give publicity to these functions.

An engineer specializing in the design of large industrial buildings stated recently that in many cases he finds the owner has no conception of the function of an engineer in the design of buildings. Thus, a man intending to establish a factory or industrial plant will give first consideration to the machinery and equipment, and regard the building merely as some sort of shelter to house the plant. Then he is likely to place the contract for the machinery as the first and most important step. It happens not infrequently that the machinery firm will then undertake to furnish him plans for the buildings "free of charge." Of course, he has to pay for them indirectly, and it is surprising that a hard-headed business man does not see this. If they are uneconomical or defective, he may have to pay for subsequent alterations or reinforcement.

The engineer noted above states that in investigating buildings designed in this way he has found girders of excessive strength as compared with the floor slabs, and columns of insufficient strength for such loads as could be carried easily by the girders. In one case where plain footings were planned, the owner fortunately conceived some distrust and called in an engineer. The latter not only found it absolutely necessary to provide heavy pile foundations to carry the load, but was able to improve the structural design greatly.

A lesson to be drawn from this situation is that it is highly desirable for the engineer and the engineering profession to do more than has been done in the way of educating investors, proprietors, manufacturers and others as to the real need and value of engineering advice and skill in the design of buildings as well as in that of the machinery or plant which the buildings are to contain. One way is for the engineer to become an active member in the local Association of Commerce and thus establish personal relations with men in commercial and industrial lines. These men would as a result learn the scope and importance of engineering, and at the same time the engineer would broaden his own views as to the commercial aspects of engineering work.

One Commission Sees Through Two Common Valuation Fallacies

BECAUSE of the illiberal attitude shown by the state utility commissions in the proceedings before the Interstate Commerce Commission relative to the valuation of the railroads, and in valuation matters generally, *Engineering News-Record* is glad to be able to commend certain findings of one state commission. The case in point is a recent decision of the Maine Public Utilities Commission concerning the Biddeford & Saco Water Co. There are parts in the decision with which we disagree, but two points in the decision stand out.

One of these is that the cost of service pipes charged against earnings should be allowed in the valuation. The finding is definite and concise. "We think," says the commission, "that it makes no difference that the cost of the services represented by this sum had been charged off; nor, under the circumstances of this case, that the payment for them came from water revenues. The water company has installed the services; they remain its property, used and useful, and they were paid for from moneys otherwise available for division among the stockholders, received from rates then legally in force, and not shown to have been excessive, and before the present accounting regulations required such charges to be capitalized. Neither law nor equity requires this claim to be disallowed."

The other point is that depreciation in a rate case

may be less than for a sale. The argument is that "so long as the utility is giving efficient service, the public is interested only that it be able to renew parts when they cease to be efficient, and the utility is impressed with the duty to make such renewals. There is devoted to the public service a present plant, its life partially gone but still efficient, plus the owner's obligation to maintain the efficiency by renewal of parts. This renewal will be at his own expense, from income otherwise available for dividends, because the future depreciation load in the rates should be sufficient only to care for current depreciation."

On both of these points the Maine commission's views are absolutely at variance with the attitude of the state commissions at the Federal hearings on the railroad valuations. Even Director Prouty, of the Division of Valuation, contended at a recent hearing that to allow value on plant paid for out of earnings is to charge the public twice for the same thing. The Maine commission perceives what the state commissions generally do not see, that the stockholders, by reduced dividends, pay for all they get, without any deductions from value. If they pay for plant out of earnings, they go without money otherwise available for dividends. If they fail to provide depreciation funds, they ultimately make up the deficit by going without money otherwise available for dividends. The adjustment in either case is automatic, and the Maine commission is to be commended for perceiving this fact.

Hard Roads, Marketable Produce

AS NEVER before, hard-surfaced roads are going to mean prosperity to the farmer. No small part of the great American problem of feeding the rest of the world rests on the serviceability of our country highways. The difference between mud roads and hard-surfaced roads will be the difference between crops rotting on the ground and in farmers' cellars and crops on the way to the world's markets.

Never before have the railroads been so tied up with the transportation of industrial products. The building of the many army cantonments and the immense shipments of lumber and other construction material required for them is but one item in the transportation business which the establishment of these cantonments will bring about.

The time is soon at hand when immense crops, greater than ever in the history of the country, must be moved. Railroad men in the industrial centers of Pennsylvania and Ohio are stating that they themselves do not believe the railroads, by fall of this year, will be able to handle anything like the business which will be expected of them. For several years they have pleaded poverty and lack of adequate terminal, track and equipment facilities, so that today in the agricultural sections of the country the railways are little, if any, better prepared to handle business than they were during the depression period of four or five years ago.

An officer of a large railway company operating in Western Pennsylvania has stated that by fall the company will not be able to take shipments for distances of less than forty miles. The difficulties experienced already by contractors all through the East in obtaining cars for moving their plants and in getting shipments of materials of any kind whatsoever are too well known to need repetition. These same conditions may be expected by the farmers when they are ready to ship the enormous crops which have been planted.

The contractors have met the situation in many instances by using great fleets of motor trucks, and in many large industrial cities in the East they have ceased altogether to depend upon the railroads for gravel and broken stone supplies. Gravel and stone plants which are so far from cities as to be dependent upon the railroads for moving their output have been obliged to close down because it is impossible to operate them so intermittently as cars can be secured.

It was pointed out in *Engineering News-Record* a few weeks ago how a number of manufacturing concerns have adopted motor trucks for long-distance haulage, even so far as from Akron, Ohio, to Boston, Mass. The solution of the problem of moving the farmers' crops distances of forty miles or less is inevitably going to fall upon motor trucks and teams. The prospects are that motor-truck owners in the cities will find a legitimate and constantly increasing business in moving farm products, just as today they are engaged in moving every other kind of freight between cities.

This can be done and is now done only where there are hard paved interurban roads. Fortunate, therefore, is the agricultural community which is connected with the great industrial and railway centers by paved roads. Highway engineers throughout the East have fully appreciated this and reports from them made to this journal early in June emphasized the necessity of continuing road building. The Ohio Highway Department has steadfastly stood out for an extensive road-building program even against opposition from Washington, and in the face of discouraging conditions.

The wisdom of this move is already being felt in Ohio, and it will be in every agricultural state. It is not so much a question of whether the roads can be built as cheaply and efficiently today as they were yesterday, but it is a question of whether the crops which the farmers have been induced to plant are going to be used or are going to rot.

If the pinch of railroad congestion has been felt by such shippers as the great industrial concerns, how much more will it be felt by the lone farmer. If motor trucks have helped solve the problem for the manufacturer, merchant and the contractor, how much more will they help solve the problem for the farmer, *provided* the farmer has the roads to utilize trucks. More than ever before will the farmer appreciate good roads if he has them, or lament their absence if he has them not.

Worn Pin Bearings of Railway Bridge Repaired Under Traffic

Bad Wear at Pins in New York Central's Most Important Bridge—Rig for Boring Chord Webs Around Pin Is Used Successfully—Steel Bushings Pressed In

By H. T. WELTY
Engineer of Structures, New York Central Railroad, New York City

SERIOUS wear at the pins of the New York Central's Harlem River bridge—one of the most important bridges on the system—led to a difficult repair job, completed a month ago. The pins had worn the holes in the chord webs oblong to the extent of allowing very noticeable motion under a passing train. No precedent for repairing such a condition could be found. Entirely original method and tools were devised. The chord webs were bored out around the pins, without removing the pins and without stopping traffic on either bridge or river. Then tight-fitting steel bushings were pressed in. The joints are now in as good condition as when the bridge was built.

The four-track Harlem River bridge, commanding the railway's only line of access to Grand Central Terminal, New York City, carries some 700 train or engine movements per day. It was built in 1895 and consists of a swingspan and two fixed spans, each having three lines of trusses supporting steel trough flooring. Types and span lengths are shown by an accompanying sketch.

The bottom chords of the trusses, continuous from end to end of each truss, are composed of two angle-and-plate segments with their top flanges connected by double lacing bars. They vary in depth from 36 in. to 48 in. The trough floors are suspended from these chords by riveted angle connections and are continuous under the center trusses. The tension diagonals consist of eye-bars. Practically all joints throughout the trusses are made by pins, of diameter from 5 in. to 10 inches.

Remarkable Wear at the Pins

Due to the alternating positive and negative bending of the bottom chords under load, caused by the solid floors and the continuity of the chords, and to reversal of stress in the web members, there has been a constant wear on the pin bearings in these chords. On account of the great number of train movements this wear finally reached the point where repairs were imperative.

Careful measurements were made throughout the structure to determine the exact amount of wear at each pin bearing, the location of the wear in the chord webs relative to the pins, and to note the bars which were slack due to wear at the pin bearings. The accuracy of these measurements was facilitated by templets which were made of each bearing by fitting pieces of heavy paper over the ends of the pins, hammering the paper lightly against the chords.

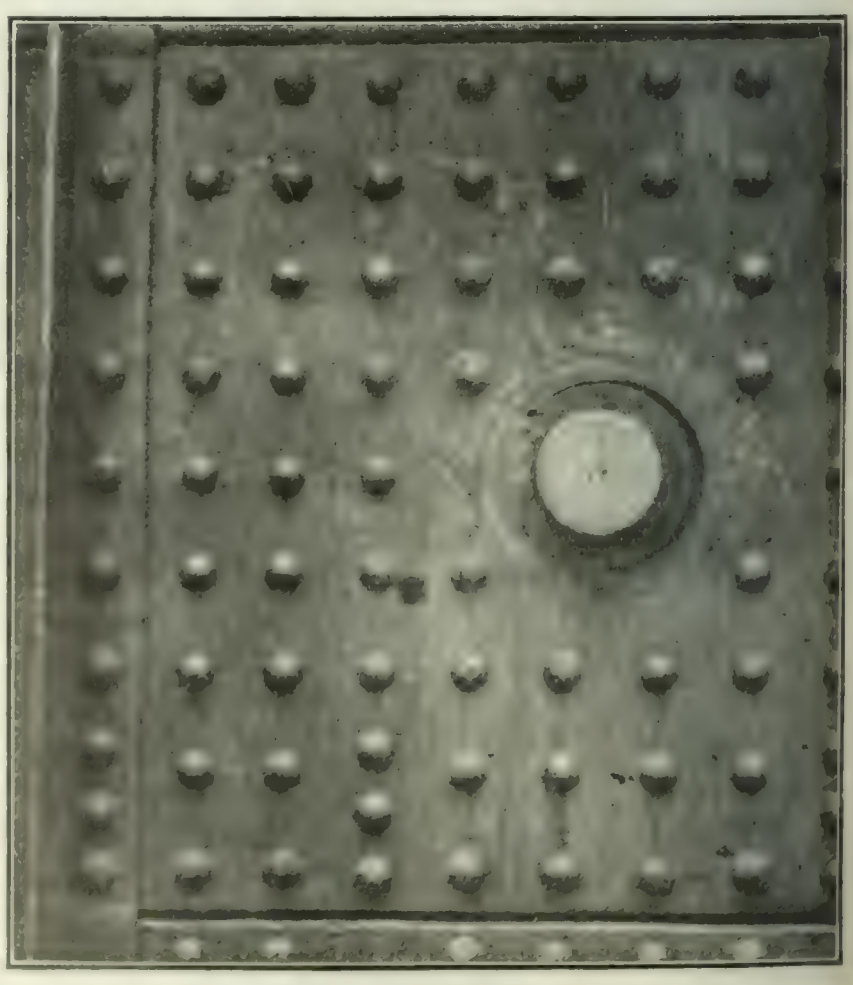
It was found that practically all of the excessive wear occurred at the bottom-chord panel-points of all three spans, although a few top-chord points also required repairs. At the main panel-points wear took place both in the webs of the chords and in the pins. In general, the main web members were either absolutely tight on the pins or reasonably so. Wear at the few top-chord points which required attention was undoubtedly caused by reversal of stress in the web members and by movement of the web members following the wear in the bottom-chord pin bearings.

At the lower pins of the subhanger bars, wear had occurred in the eye-bars to such an extent that a considerable deflection took place in the bottom chords under train load before these bars were brought into action.

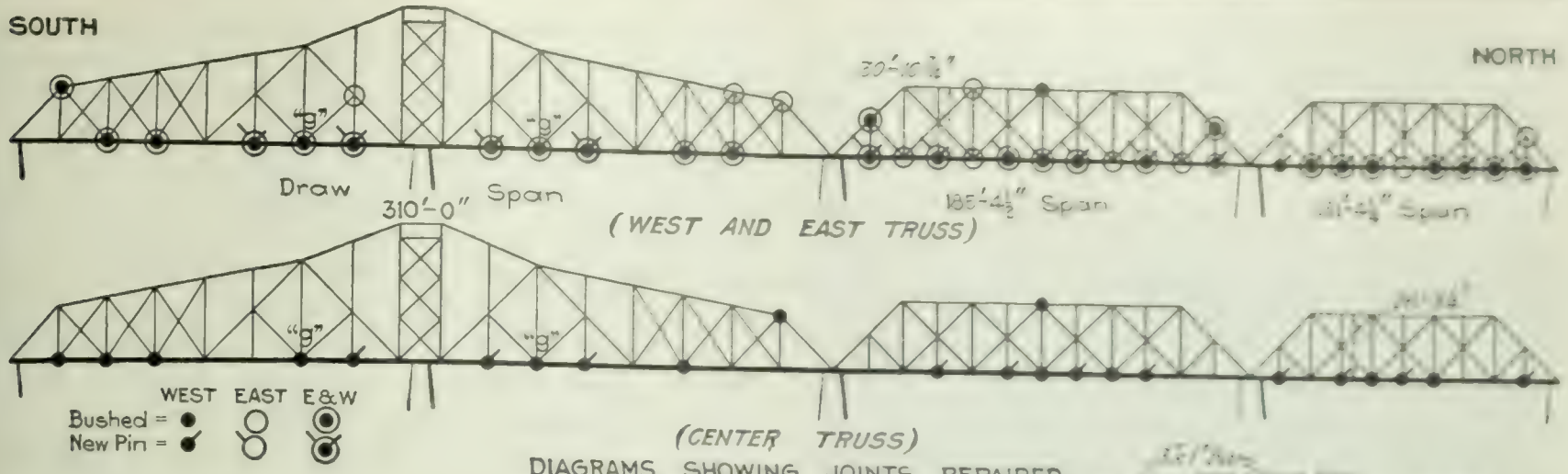
The wear in the inside webs of the side-truss chords was generally greater than in the outside webs, due to deflection of the floor troughing under load.

Raising the Sagged Ends of the Swingspan

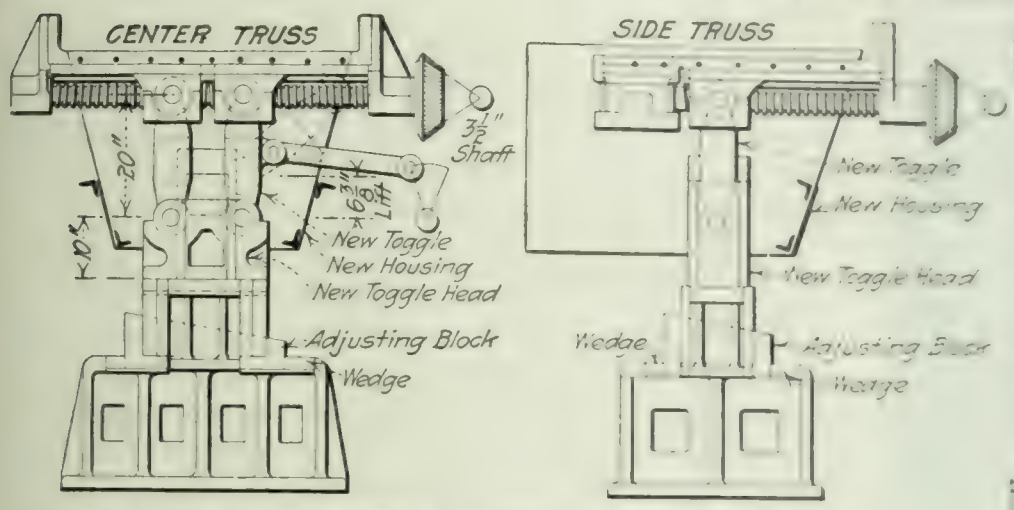
The wear in the pin bearings of the swingspan had caused the ends to sag, necessitating the lowering of the end-lift wedge blocks about 1 in. to provide clearance during the opening of the span, with a consequent reduction in the lift of the same amount when the span was closed. This condition produced high stresses in some of the truss members. It had to be remedied be-



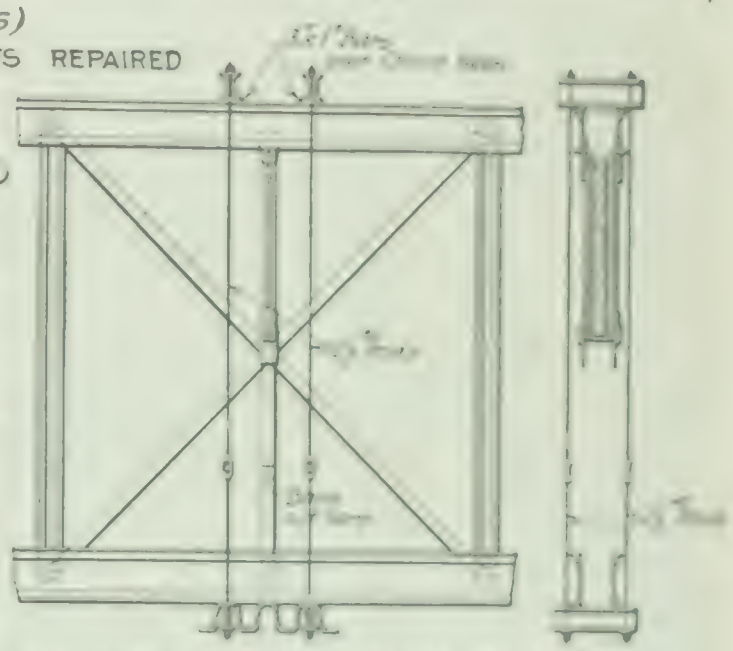
WEAR AT A SWINGSPAN MAIN PANEL-POINT



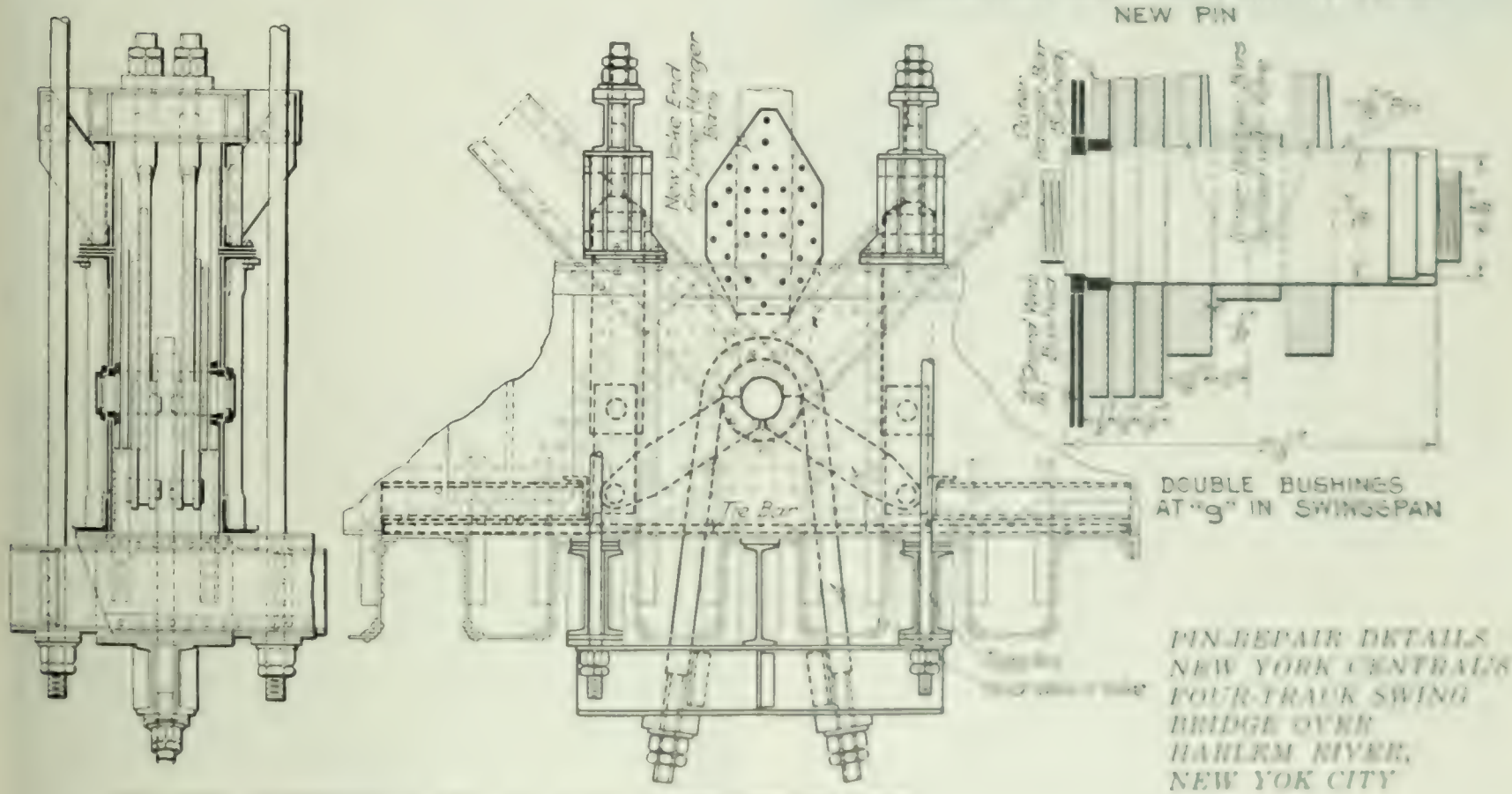
DIAGRAMS SHOWING JOINTS REPAIRED



END LIFT REBUILT WITH SHORTER LINKS AND DEEPER SHOE TO INCREASE LIFT



SUPPORTING SUBPANEL POINT TO PLACE NEW PIN



RIG FOR SUPPORTING PIN AT MAIN PANEL-POINTS FOR BORING AND BUSHING

DOUBLE BUSHINGS AT "g" IN SWINGSPAN

PIN-REPAIR DETAILS NEW YORK CENTRAL'S FOUR-TRACK SWING BRIDGE OVER HARLEM RIVER, NEW YOK CITY

fore the pin conditions could be corrected, if satisfactory stress conditions were to be obtained.

The end-lifting device of the swingspan consists of toggle-head castings moving vertically in guides attached to the trusses and operated by means of toggle castings. The toggle castings are attached at their upper ends by pins to nuts moving in horizontal guides which are operated by screws attached to the operating machinery. The lower ends of the toggle-head castings rest on adjustable cast-steel blocks.

The desired additional lift could not be obtained by raising the adjustable blocks, as the latter would in that case have interfered with the swinging of the span. It was necessary, therefore, to provide deeper toggle-head castings, compensating for the additional depth by shorter toggle castings which provided greater vertical movement with the same horizontal movement of the nuts.

Various methods for removing the defective pin bearings of the structure were considered. Falsework could

have been placed under the fixed spans with litttle difficulty, but would have been entirely impracticable under the swing-span. To have replaced the pins at the main panel-points with pins of larger diameter would have necessitated boring through all the web members which were tight and would have entailed very difficult and costly field work. Because of these limitations it was decided to bore out the pin holes in the chord webs and turn down the pins a sufficient amount to produce concentric surfaces, and to fill the resulting spaces with steel bushings.



BORING MACHINE WORKING AT HIP OF DRAWSPAN

To repair the defective pin bearings by the method finally decided upon it was necessary: (a) To design a portable boring machine which could be operated in the limited space available and could be readily handled and which would bore out the pin holes in the chords and turn the pins down simultaneously. (b) To design a device which would transmit the stresses from the web members to the chords, relieving the chord pin bearings, and which would hold the pin with absolutely no displacement from passing train loads.

The design of the machines was taken up with one of the large machine-manufacturing companies, but, inasmuch as no guarantee of results could be obtained, the machines were designed, tested and built at the railroad company's West Albany shops under the supervision of H. Wanamaker, superintendent of shops.

The Boring Machine Operated by Air

The machine consists, briefly, of a tool head holding the cutting tools, provided with both automatic and hand feed and driven through a train of gears by an air motor. The tool head is guided by a sleeve threaded to fit the thread on the end of the pin. This method of attachment serves the purpose of centering the cutting tools exactly.

The tool head bears three cutting tools placed 120° apart. The first tools used were arranged so that one tool made a cut on the outside, another on the inside and a third made the finishing cut. This arrangement, combined with a slight tendency of the tools to crowd inward, produced a very small shoulder in the bore. The later tools furnished were made so that each tool cut the full width, which eliminated the tendency to form shoulders. The spring in the tools also produced a slight taper in the cuts, which was considerably reduced by slow hand feeding. It is thought that with the experience obtained on this work new machines could be designed which would largely, if not entirely, overcome these slight defects.

The distance from the inside face of the bottom chord to the center of adjacent track is about 7 ft. 6 in., which necessitated a compact machine to clear passing trains. The extreme dimension of the machine from face of tool head to end of feed screw is about 19 inches.

Adjustable Rig To Hold Pin During Boring

The device used to hold the pins during the boring operations consisted of a yoke and two opposing pairs of thrust toggles. The yoke bore on the pin midway between the chord webs and extended down through the floor troughing to anchorage beams. The toggles, one pair on each side of the yoke, extended downward at an angle of about 30° and were pin-connected at their lower ends to vertical hangers extending upward through crossbeams resting on the top of the chord. The lower ends of the toggles butted against stiffener angles riveted to the chord and tied together by a horizontal tie-plate which took the thrust from the toggles.

This device, which is shown by drawing herewith, was designed to transmit all stresses from the web members to the chords which normally are taken care of by the bearing of the pins on the chord webs. At the center truss, however, the space available for the yoke and toggles was so limited that only a portion of the maximum stress could be provided for, necessitating the boring of such points at times when traffic could be restricted to the outside tracks. Very careful stress calculations were made, including a computation of the elastic deformation of the material in the yokes and toggles. This detailed investigation was necessary in order that the holding device might be so designed as to eliminate any movement of the pins during the passage of trains and to reduce vibration to a minimum.

Starting the Field Work; Boring Machine Works Well

Large-scale drawings were made of each panel-point, showing the various parts assembled and giving detailed directions to the field forces, to insure that each move would be made expeditiously and in proper order. There was little precedent upon which to base this work, and its success depended largely on the ability of the yokes and toggles to hold the pins absolutely centered. Fortunately, no great difficulty was experienced in placing the holding device, and it was found that by adjusting the nuts on the yoke and hangers the pin could be moved in any direction a sufficient amount to take up in the diagonal bars the slack caused by wear.

Having adjusted the location of the pin, all nuts were tightened a sufficient amount to produce stresses in the toggles and yoke which would compensate those produced by the train load. The proper amount of tightening was determined by observing the action of the pin under passing trains.

After the holding device for the first pin had been satisfactorily adjusted, boring was begun. The action of the pin under the first train passing after the boring started was carefully observed. While there was a slight vibration, there was no permanent movement whatever in the pin. The cutting tools were reëntered and the boring completed satisfactorily.

Bushings Machined to Micrometer Dimensions

The steel bushings had been obtained rough-turned to approximately correct dimensions. After the boring was completed, the diameters of the hole and pin were calipered both inside and outside with a micrometer caliper, and the bushing was finished to an exact fit on a lathe installed at the bridge site. Finally, it was pressed into place by means of a screw-jack screwed on the end of the pin and operated by a 5-ft. lever.

Having encountered no insuperable difficulties on the first pins repaired, the work proceeded. The repair of the two approach spans, which involved fewer difficulties than did that of the swingspan, was undertaken first. Due to the differences in the packing of the members on the various pins, it was necessary to obtain a number of different yokes, toggles, etc., although in some cases the same material could be used a number of times.

In the repair of the worn pin bearings of the sub-hanger eye-bars, it was found impracticable to bush the eye-bars themselves. At these points, the pin holes in the chord were bored the same as for the main panel-points which were bushed. After boring, the pins through the lower chord and the lower ends of the eye-bars were removed and replaced by new pins and bars, the latter being spliced to the old upper sections (see view). While the pins and eye-bars were being replaced, the bottom chord was supported from the top chord by means of four adjustable rods, as shown in



BORING COMPLETED, READY FOR BUSHING



THE BUSHING BEING PRESSED IN BY SCREW-JACK BORING MACHINE IN PLACE AT HIP JOINT

sketch. These rods were tightened a sufficient amount to take approximately the same dead-load stress as originally existed in the bars.

Practically all of the boring and the placing of bushings was done at night, between midnight and morning, to minimize interruption to the continuity of the boring by the passage of trains.

After a number of bushings had been placed, there was found to be a tendency of the bushings to work out due to the slight taper mentioned above. This was corrected by inserting three small tap screws in each bushing, 120° apart, the center line of the screws being on the lines of division between the bushings and the chord webs.

Work on the approach spans was started in the field about Nov. 1, 1916, and was completed about Mar. 1, 1917, during which time 54 points were repaired.

Special Problems in the Swingspan

The swingspan presented a somewhat different and more difficult problem. As mentioned before, the wear at the pins had caused the ends of the trusses to sag, which, in turn, had caused the pins at the main panel-points to bear hard against the chord webs toward the center of the span. Boring operations could not be safely undertaken until the pins were relieved from bearing on the chord webs. It was thought that with the end-lifting devices remodeled to secure additional lift, thus removing the excessive sag in the trusses, the yokes and toggles would release the pins from bearing, and the work was planned and carried out on this assumption. The size and close packing of some truss members presented other difficulties.

After the new end-lift castings had been placed, the additional 3-in. lift at the ends was obtained by inserting shims under these castings and removing from

beneath the end rails shims of compensating thicknesses previously placed. This lift was made ¼ in. at a time. Because of the three lines of trusses and the heavy traffic, it was a slow and laborious piece of work, but it was finally accomplished successfully and produced the desired result, no difficulty thereafter being experienced in releasing the pins.

Probably the most difficult points to repair were the bearings at the lower ends of the side-truss main hanger bars near the center of the swingspan. Each of these hangers consists of four bars 10 x 1 3/16 in. The packing of the members and the method of making repairs are shown by sketch. In addition to wear at the chord bearings, there was so much wear in the eye-bar pin holes that it was considered inadvisable to simply cut and splice the bars. It was impracticable to replace the pins and the lower ends of these bars, as was done at the subhanger points, because of the difficulty of supporting rigidly the subdiagonal compression members hinging at these points, and the difficulty of providing temporary suspender rods large enough to support the points with the bars cut.

The procedure adopted was as follows: Temporary suspender rods which had been used at the subhanger points were placed, and the lower ends of the inside bars were removed, giving space for the toggles, which with the yoke and other parts of the holding device were put in place and adjusted. The chord webs and the outside bars were then bored and bushed, and the lower ends of the inside bars replaced with yokes spliced to the upper part of the bars. In this way very satisfactory results were obtained.

Except as described above, the repairs on the swingspan were of the same nature as those on the approach spans and were carried out in the same manner. Work on the swingspan was started in the field about Mar. 1, 1917, and was completed about July 1, 1917, during which time 35 points were repaired, the end lifts were remodeled, and new lift rails were installed in all tracks.

After a few points had been repaired, the men became quite expert in handling the tools and fitting the bushings, getting absolutely tight fits between the bushings, the pins and the chord webs. In fact, the results were better than was anticipated. The work was completed without any mishaps other than occasional breaking of tools, and it is thought that the tight fit of the bushings will prevent the starting of wear at these points for a considerable number of years.

The work was planned in the office of the engineer of structures, construction department, New York Central R.R., Buffalo and East, of which G. W. Kittredge is chief engineer and J. W. Pfau is engineer of construction. The field work was done by company forces under F. Boardman, division engineer, and N. W. McCallum, supervisor of structures.

Why Sewer Is Bigger at Upper End

The mystery of a sewer at Youngstown, Ohio, which is bigger at the upper than at the lower end, has been explained for the benefit of the general public through the local press by Frank Lillie, city engineer. It is very simple. The upper part of the sewer carries storm water until it approaches near enough to a stream to permit overflows, which diminish the volume to be carried.

Australian Concrete Dam Impounds Billions for Brisbane

Structure 125 Feet High Filled with Rock Plums and Faced with Rich Concrete Reinforced with Steel Rods

By John Peart
Engineer for Water-Supply, Brisbane, Queensland

A CONCRETE dam of gravity section, 125 ft. high from foundation to top, designed to impound about 7,000,000,000 U. S. gal. of water, was officially put in use in December, 1916, by the Metropolitan Water Board of Brisbane, Queensland, Australia. The structure is known as the Cabbage Tree Reservoir dam and is a part of the water-works system of Brisbane and its suburbs, supplying a population of about 158,000 at the close of 1916. The main supply is taken from the Brisbane River, by means of a pumping station about 20 miles from the city.



LOOKING ACROSS THE TOP OF THE DAM ITS MASSIVE BUT GRACEFUL LINES IMPRESS ONE

The new dam is located on Cabbage Tree Creek, a tributary of the Brisbane River. The dam is 5½ miles from the pumping station, with which it will be connected by a concrete conduit. The reservoir has an area of about 700 acres and a catchment area of 28 square miles.

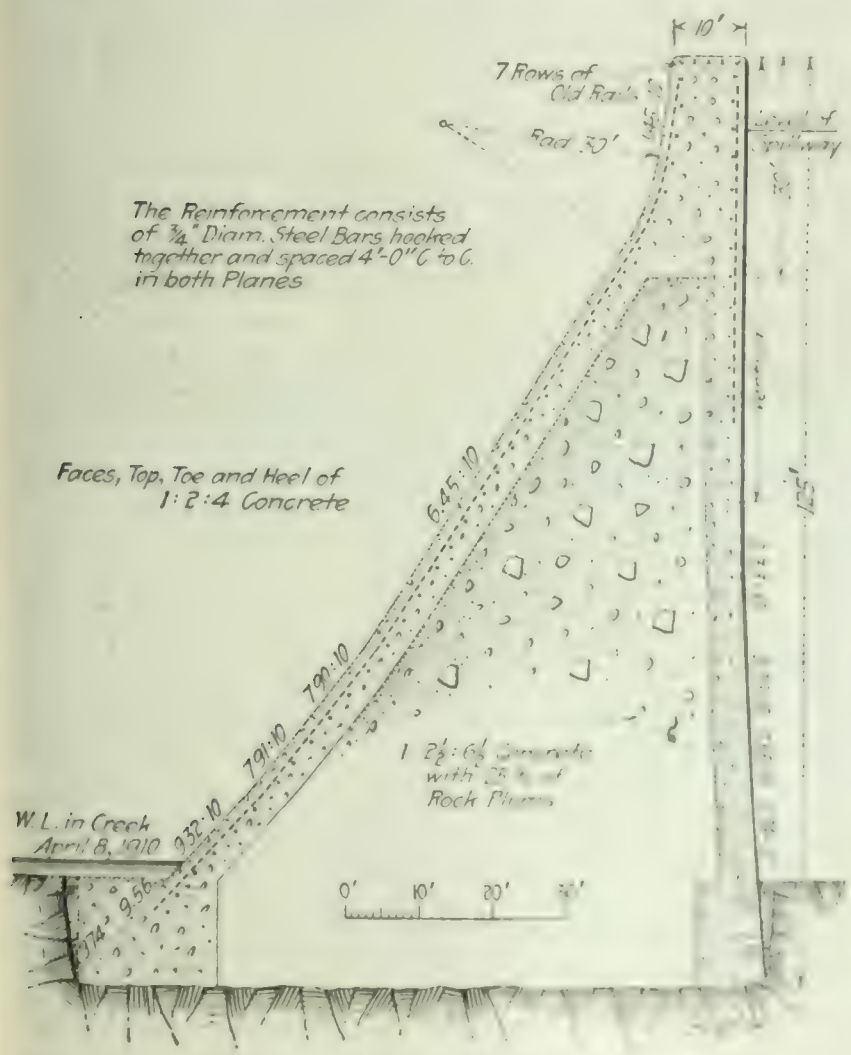
The dam rests on blue quartzite, which was found at a depth of 15 ft. below the creek bed. The dam proper is 580 ft. long, and beyond it is a spillway 160 ft. in length. The main construction quantities were: Ex-



ONE END OF THE SPILLWAY OF CABBAGE TREE DAM MAY BE SEEN AT THE LEFT

cavation, 33,222 cu.yd.; extra excavation, below assumed bottom, 5859 cu.yd.; spillway excavation, 64,500 cu.yd.; cyclopean concrete, 58,400 cubic yards.

The rainfall in and near Brisbane is intermittent. For long periods no rain falls, but periodically there are downpours. The longest known period of drought was in 1915, when for eight weeks the Brisbane River was dry. The period of greatest scarcity of water is put at 100 days. When full and after allowing for evaporation, the new reservoir will give a supply of 15,000,000 U. S. gal. a day for 300 days, or with greater economy for a longer period. At the present writing (May 16, 1917) the reservoir is within 20 ft. of being full.



THE DAM HAS A GRAVITY SECTION

The dam, reservoir and accessories, including the clearing of the whole reservoir site from detritus, were built under contract by Arthur Midson at a cost of some £172,000, or about $838,000. The work was done under the direction of the writer. E. J. T. Manchester, M. Am. Soc. C. E., is president of the Metropolitan Water-Supply and Sewerage Board.

Delivery of Concrete Materials Is a Problem for Contractors

Prompt and regular delivery of sand, gravel and stone in carloads at the site of construction cannot now be reckoned on by contractors, owing to shortage of cars and the necessity of pressing cars into military and other service. On some large works where the concreting plants are equipped to receive materials dumped from railway cars the contractors have to get material where and how they can and have it delivered by wagons or motor trucks. In Wisconsin the railways have announced that they will handle shipments of sand, gravel and crushed stone only in certain directions where it will not interfere with other more important traffic, and will not guarantee deliveries. This is likely to interfere seriously with concrete roadwork, and many contractors for such work are now looking for local gravel pits to supply their needs.

New Rails Made from Old

Worn Rails Rerolled to Smaller Sections—Those Made from Badly Worn Rails Given Heads of Unsymmetrical Shape

THE present high cost of steel rails and the necessity for the exercise of economy are conditions encouraging more extensive use of old rails rerolled to standard sections of somewhat reduced weight and size. A recent development, known as the McKenna Process, that allows rails with very badly worn heads to be treated in this way is being used by several railways.

In the process the rail is heated and passed through rolls which shape it to the desired section. It is considered desirable to do the work at a moderate temperature, in order to avoid changes in the character of the steel. This has made it difficult to handle badly worn rails on account of the severe draft on the relatively cold metal in forcing it to fill the section in the rolls. The result is a distortion of the metal, likely to set up internal stresses which may make the rails unreliable in service.

One Side Only Brought to Gage

To overcome this difficulty, the idea was conceived of bringing only one side (the gage side) of the rail head to standard section in the rerolling process, allowing the other (outer) side to be of smaller size to compensate for the loss of metal by wear. As the proportions of the rerolled head conform to those of the worn head, a uniform draft on the metal in rolling is obtained.

In the top left-hand rail section in the accompanying drawing the full line *A* of the outer side of the head gives the outline of the best of the worn rails, in which the heads are rerolled to a symmetrical section. The dotted lines *B* and *C* represent the outlines of unsymmetrical heads as rerolled from more or less badly worn rails. In all of these sections the base and web are symmetrical and match each other for rails of the same weight per yard. The heads of the rerolled rails may have a variable amount of metal, but have a uniform contour for the running surface and the gage side. The web and base are not altered, so that the standard splice bars can be used.

Preliminary Work and Sorting

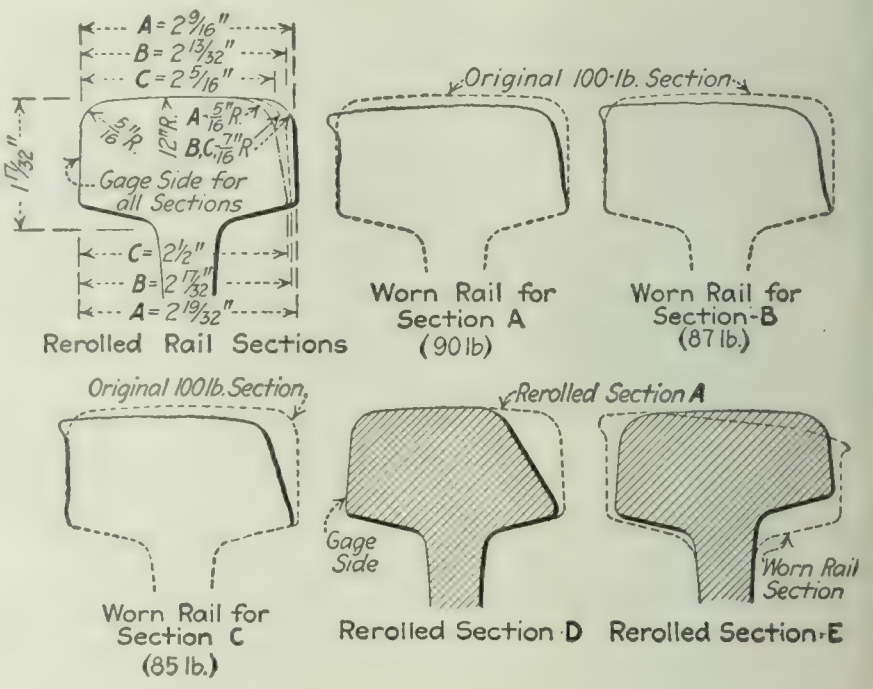
Besides the heating and rolling there is preliminary work and sorting. When the worn rails are received considerable work has to be done in grinding off the slivers and ridges caused by flow of the metal, which would break out in rerolling. The rails are then sorted, and those with the least wear are passed through rolls giving the symmetrical section *A*. The rolls are then changed to the unsymmetrical section *B* for the next best rails, and then to section *C* for the others. The rails of each section are shipped separately.

In many cases the bevel of the outer side of the rail head is not too great to permit of the rail being turned in the track after the gage side has been worn. Even if this is impracticable, as in the special rail shown in section *D*, rails which are so badly worn that they could not be rerolled at all under the original method can now be made serviceable.

A modification of the plan is to reduce both sides of the rail head to the contour indicated by the dotted lines, thus slightly reducing the width of the top rolling surface. Such a section may be used on sharp curves, or by railways which prefer an inclined side to the rail head, but in general the unsymmetrical section is preferred. A special rail for curves is shown at *D* in the drawing. This has a narrow head (for reduced friction), but is otherwise a standard rail and requires no special joints or fittings.

Ends Cropped After Rerolling

Most worn rails have the ends battered and crushed. These parts are not cropped, however, until after rerolling. The rerolled rails when cropped are usually somewhat longer than the original length, but if the



THESE REROLLED RAILS HAVE ONE SIDE OF HEAD CONFORMING TO STANDARD SECTION. THE OTHER (EXCEPT IN SECTION A) IS SMALLER TO COMPENSATE FOR LOSS OF METAL

elongation is not sufficient to include all the bolt holes in the ordinary cropping, the rail may be cut 6 or 12 in. shorter than its original length. Some railways prefer to reduce the section as little as possible, while others prefer increased length, even at the sacrifice of a greater reduction in cross-section. Thus 100-lb. 33-ft. rails can be rerolled to a 90-lb. section 34 ft. long, or to a 92-lb. section 33 ft. long. If such worn rails are simply cropped for relaying in secondary track, their length will usually be 30 ft., but by rerolling they are increased in length besides having the heads reshaped.

The St. Louis & San Francisco R.R. has a 75-lb. section rerolled from 85-lb. rails, and the Chicago & North Western has an 80-lb. section made from old 90-lb. rails. The Michigan Central R.R. and the New York Central Lines (West of Buffalo) are having a 90-lb. section rerolled from 100-lb. rails. All these are of the A. S. C. E. sections.

Another type of rerolled section is shown at *E*. This has the outer side of the rail head shallower than the gage side, requiring a higher splice bar on the outside. It is used where the worn rail has insufficient metal to fill out the new section in rerolling and is designed to combine wear and strength. The section combines the two series of rail sections of the A. R. A. type, the

side with the shallow head and deep splice conforming to the A series, while the other side conforms to the B series. Rails of this section have not yet been put in service.

The process is patented and controlled by George Langford, general superintendent of the McKenna Process Co., of Milwaukee.

Water-Supply at Fort Benjamin Harrison Nears Completion

Pump Water for Training Camp from Infiltration Well and Gallery to Concrete Reservoir— Provide Chemical Treatment

THE new water-supply plant for the training camp at Fort Benjamin Harrison, near Indianapolis, Ind., has been practically completed. This post now has nearly 14,000 men. The second training camp will start Aug. 15, and it is anticipated that the maximum requirements will be for 40,000 men.

The original post was built to accommodate only one regiment, and considerable difficulty was experienced in obtaining the necessary supply. Three deep wells proved to be practically dry holes, and the fourth produced only about 150 to 200 gal. per min. The principal supply was finally obtained by connecting up a 900-ft. well which had been drilled for natural gas.

When this location was selected recently for a large training camp, the water-supply problem gave considerable anxiety. In the description of this camp in *Engineering News-Record* of June 6, reference was made to a conference between Colonel (now Brigadier General) Glenn and other officers with C. H. Hurd, consulting engineer, of Indianapolis. A recommendation for an entirely new supply was made and was approved.

Infiltration Well Sunk on Bank of Fall Creek

It was decided to sink an infiltration well in the gravel strata on the bank of Fall Creek, with an emergency connection to this creek, at a point above the reservation and above the intersection of Indian Creek. The infiltration well and gallery are designed to supply at present a maximum of 2800 gal. per min. The whole plant is laid out with the idea that the demand may reach approximately 6,000,000 gal. per day. For such an amount, however, it would be necessary to extend the gallery. The depth of well and gallery is about 24 ft. below the surface. The pumping station is built directly over the well and is of colonial brick to conform to the general architectural design of the garrison buildings.

A reinforced-concrete reservoir of not less than 3,000,000 gal. has been built. This is circular and conforms to the dimensions of the Bedford reservoir designed by Mr. Hurd and described in *Engineering News-Record* of July 5. It is of a thin, reinforced-concrete type, designed to give the maximum capacity for a minimum cost. It is 160 ft. in diameter. The lower 12 ft. of the circular wall will be covered by an embankment. On the upper 4-ft. exposed portion of the outside, the concrete is rubbed and washed to give a smooth surface.

The reservoir was built in exceedingly short time. Plans were started immediately, and the work was begun by the Gaylord Engineering and Construction Co. about June 1. The actual time from beginning the excavation to the completion of the reservoir did not exceed 30 working days.

The Whole Supply Will Be Chlorinated

The infiltration well supplies water of excellent quality and abundant quantity. As a precaution, chlorinators are being installed by the Wallace & Tiernan Co., for disinfecting all water used at the fort. Provision is also being made to use sulphate of alumina as a coagulant in case an emergency makes it necessary to use water from Fall Creek. There are three electrically driven Hill-Tripp centrifugal pumps, each having a capacity of 1400 gal. per min. These pump against a head of about 100 ft. and deliver water into the new reservoir. Three similar pumps of 1000 gal. capacity each are installed in the old pumping station which furnishes the pressure supply to the fort. These will be used as auxiliaries for general supply and fire service for both the garrison and the cantonments. The mains are all of cast iron and are laid to a depth to insure against freezing.



CONCRETE RESERVOIR FOR NEW TRAINING CAMP AT FORT BENJAMIN HARRISON, IND.

A New Niagara Would Develop 2,000,000 Horsepower

Construction of Large Dam in Gorge Below Present Falls, at Foster's Flats, Would Create Waterfall 100 Feet High

By T. Kennard Thomson
Consulting Engineer, New York City

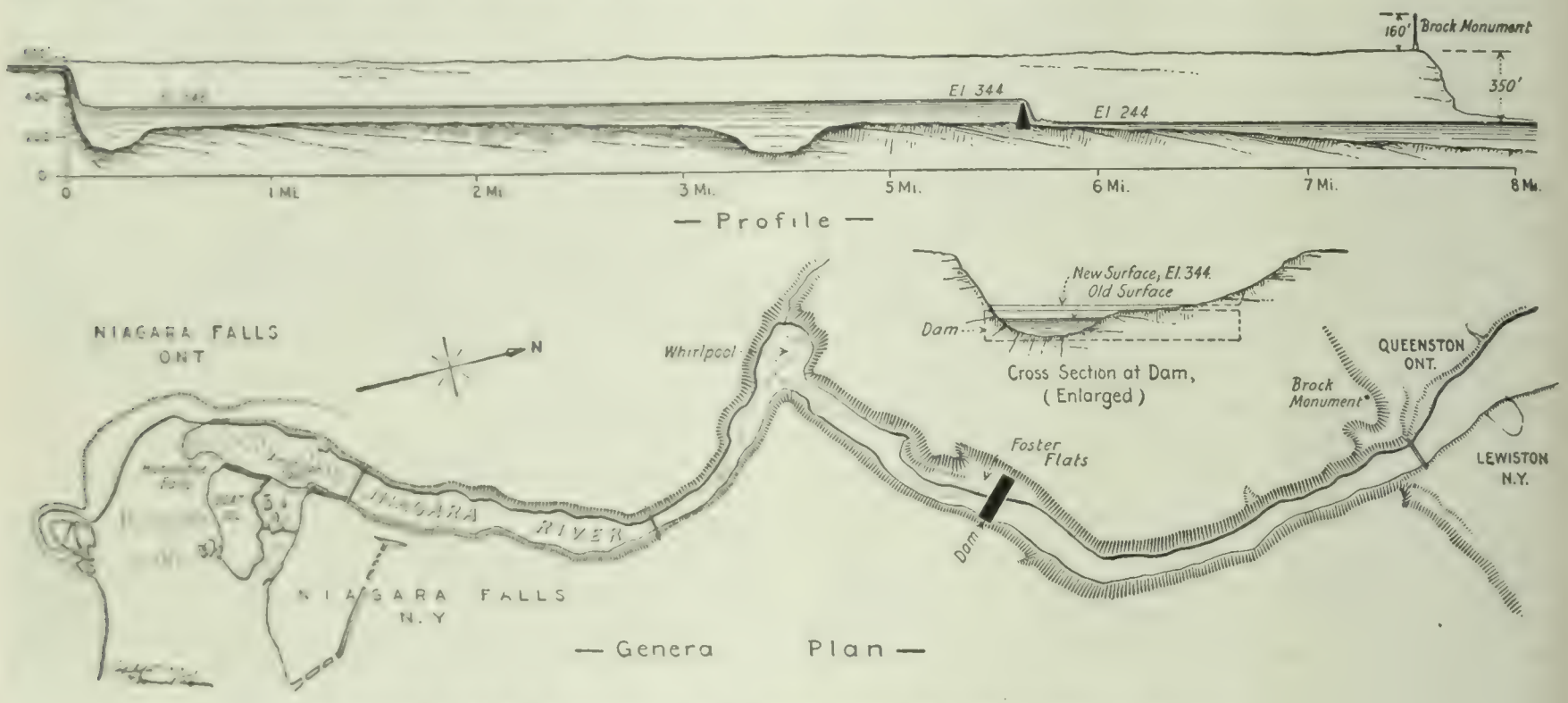
THE existence of a scheme to build a large dam in the Niagara River below Niagara Falls has been widely known, but nearly every engineer to whom the author has spoken recently and many laymen have asked how we were going to build the dam in the Niagara River. Therefore, the inclosed plan showing the location of this dam and development should be of much interest to many readers, and the author has pleasure in first publishing it in *Engineering News-Record*.

Almost everyone remembers the lower Niagara River as running through a narrow gorge which is about 500 ft. wide at the water line and about 1000 ft. between the tops of the banks standing from 300 to 350 ft. above the water; and all realize the naturally great difficulty of a dam in such a location.

They do not notice, or else forget, the place called Foster's Flats, a beautiful spot on the Canadian side where there is quite a low shelf with easy slope to the top of the bank. A glance at Foster's Flats on the map will show at once how this simplifies the work; more than half of the dam can be built on dry land. This first half will then afford an easy means of diverting the water from the present channel before building the rest of the dam, where the water now flows.

There is a 102-ft. drop in the Niagara River from the base of the old falls to Lewiston, with a minimum flow of 220,000 cu.ft. per sec. Now, this total head and volume should be developed as a unit—in one large dam. Otherwise the public would have to pay for a number of disconnected power plants which could not develop anything like the full value of the river and would—as stated in my letter published in your issue of July 19—result ultimately in the destruction of all the power plants below the falls by ice. The most economical method in developing the river, of course, is to use as much water at the falls as the Governments will allow, afterward returning the water to the river directly below the falls so that it can be used over again at the proposed new falls made by the dam at Foster's Flats, about 4½ miles below.

As to the dam and power houses, little more need be said at this time. The masonry structure will be about 1200 ft. long and 150 ft. high, and it will raise the down-



A LARGE DAM IS PROPOSED IN THE GORGE BELOW NIAGARA FALLS

stream level of the river about 100 ft. The power houses would extend downstream from the dam on both the Canadian and American sides, considerable distances being required to accommodate the many turbines necessary.

Michigan Has New Experimental Flume

A new experimental hydraulic flume, built through the generosity of the Detroit Edison Co. at its Argo dam at an expense of $1300, has been opened for the use of the Engineering College of the University of Michigan. The flume has a total length of 138.42 ft., 36.1 ft. of which is 8 ft. wide and 8.75 ft. deep, while the main testing section, which is 102.42 ft. long, is exactly 6.56 ft. wide and 8 ft. deep. The flume is equipped with two sets of adjustable baffles, one set being vertical and one horizontal. It has at one end a standard Bazin weir, with an installation of four gages for observing the "head." The capacity of the flume and the available water-supply at practically a constant head give this flume the distinction of being excelled by no other experimental flume in this country. It has proved absolutely water-tight, so that no leakage corrections have to be introduced into the experimental calculations. It will prove of great value in experiments with aërated and submerged weirs, V-notch weirs, free and submerged orifice, current meters, pitot tubes, chemical and color gaging, etc.

How Temperature Varied in Two Dams While the Cement Was Setting

Thermometer Readings in Large Structure Showed an Increase of 44° F. 14 Days After Pouring—Thin Arch Showed Only Slight Increase, Affected by Weather

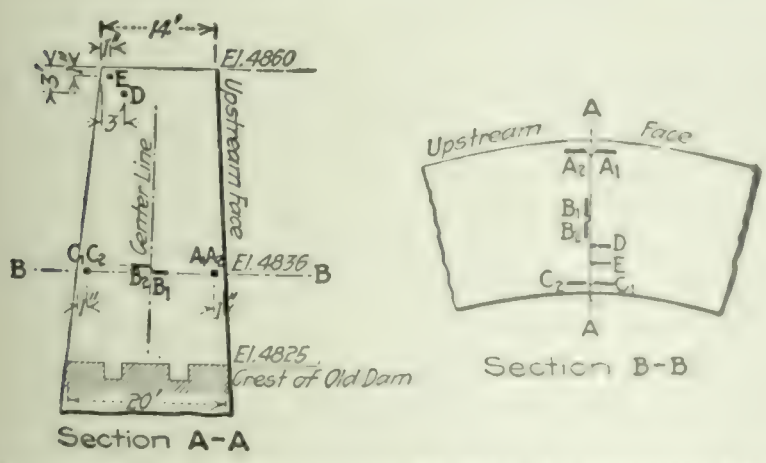
By R. A. MONROE

IN PLANNING the recent 40-ft. height increase of the large Lake Spaulding dam of the Pacific Gas and Electric Co. in northern California, it was decided to determine how temperatures varied within the concrete. Accordingly, as the work was under way, thermometers in the shape of thermocouples were put in at predetermined locations so that records could be kept. The construction was begun last year at about the same time that the company built a dam of the multiple-arch type, and it was decided to apply the same tests to both structures so that the effect in thin arches might be compared with that observed in a structure of large section.

In the large dam the thermometers were located both at the center and near the surface, while in the thin arches only the central location was used. In every case the instruments, which consisted of resistance coils incased in copper tubes, were put in in pairs so there would be a check on all readings. The wires from the instruments were led to the outside through lead cables and connected to a Wheatstone bridge. Readings were taken on a scale calibrated to give the temperature in degrees Fahrenheit.

Results at Spaulding Dam

The addition to the Lake Spaulding dam consisted of about 15,000 cu.yd. of concrete, raising the dam from El. 4820 to El. 4860. The concrete used was a 1:3:6 mix of the Golden Gate and Standard Napa Junction brands of cement, Marysville sand and Natomas rock ½ to 3 in. in size. The concrete was mixed in 1-yd. batch mixers,



LOCATION OF THERMOMETERS IN THE SPAULDING DAM

spouted from the mixer house to the dam and then conveyed to place by side-dump ore cars. The yardage placed varied from 300 to 700 cu.yd. per day.

As shown in one of the accompanying sketches, three sets of two thermometers each were installed at El. 4838, 24 ft. from the top of the dam, set *A* being 1 ft. from the upstream face, set *B* at the center, and set *C* 1 ft. from the downstream face of the dam. These were all put in on Oct. 5, 1916, in soft concrete placed that day to a depth of 3 ft. and completed to El. 4845 on Oct. 6. On Oct. 21, 1916, thermometer *D* was placed at El.



WATER IS NOW 260 FEET DEEP BEHIND THE SPAULDING DAM

TABLE I TEMPERATURE READINGS FOR SPAULDING DAM

Date	Air Temperature Max.	Air Temperature Min.	Concrete Temperature in Degrees Fahrenheit A	A	B	B	C	F	J	L
Oct. 5	46	36	48 0	47	47	47 0	47 0	53		
6	48	36	54 0	53	55 0	55 0	53 5			
7	40	34	58	58 0	62 0	62	56 0			
8	48	32	61 0	61 0	68 0	68	59 5	65		
9	48	40	63	63 0	71 0	72	59 0	64		
10	54	38	67 0	67 0	77	78	61			
11	50	38	68 0	68 0	80 0	81				
12	66	32	69 5		83 5	85	61 5	67		
13	64	38	71 5	71 5	86 0	87				
14	72	34	72		88 0	89		72		
15	72	38	73	73 5	89 0	90				
16	80	40	75 0		90 0	90	70 5			
17	78	48	75 0		90 0	91	70 5			
19	72	40	73 0	73 5		91	69 0	72		
20	73	36	72			90				
21	74	36	71		88 0	89				
22	68	34								
24	60	34								
25	70	32	69							
26	76	44		69 5						
27				69 0				70		
29	62	34	68				66 0			
31	64	28		66 0			64 0			
Nov. 1	68	30	65							
2										
4	48	34								
7	44	18								
10										
12	42	16								
13		32								
14	48	32								
15	66	38								
17										
Dec. 1	44						61			
2										
3										
4										
1917										
Mar. 16	81	40								

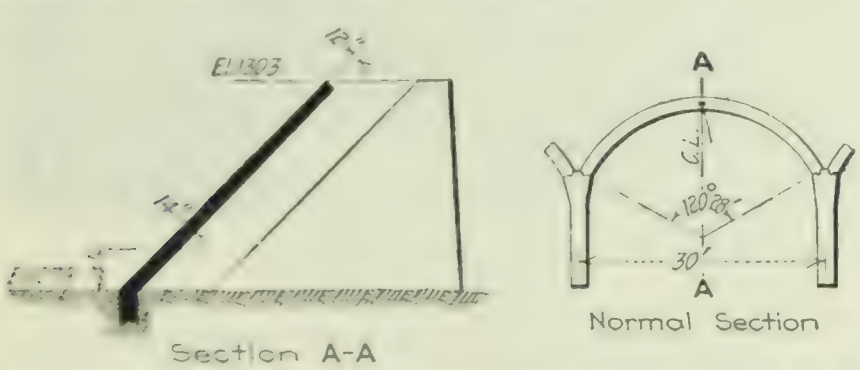
4807, 3 ft. from the downstream face, and on Oct. 22 thermometer E was installed at El. 4807, 3 ft. from the downstream face.

The temperature of the freshly placed concrete, as shown by the table, was 47° to 48°, and in 11 days the temperature across the entire section had risen notably. At the upstream face the gain was 27°, 22.5° at the downstream face, and at the center the increase was 43°, or roughly, twice as much as at the faces.

In two months the temperature of the concrete 1 ft. from the faces of the dam had returned to normal atmospheric temperature (about 40°), while that of the center of the section was still 20° above normal atmospheric temperature and falling at the rate of about 3° per week. This indicates that the temperature at the center of the section would not return to normal until about four months had elapsed from the time of pouring, two months longer than was required for the concrete at the faces. A reading taken over six months from the time of pouring showed the concrete at the center to be 4° above that at the faces, but at practically the mean atmospheric temperature for the preceding month.

Thin-Arch Results Were Different

The Rock Creek dam is a multiple-arch reinforced-concrete structure, consisting of thirty-five 30-ft. arches, giving a crest length of 1050 ft. The maximum vertical height of arch is 35 ft., the arch axis being inclined



LOCATION OF THERMOMETERS IN THE ROCK CREEK DAM

at an angle of 45°. The normal thickness of the arch at the top is 12 in., and this increases 1 ft. in thickness for each 10 ft. of vertical depth.

The concrete mix used for the arch rings, determined after a long series of field tests, consisted of one part tested Golden Gate cement, 1½ parts Marysville sand, 2⅛ parts rock ranging from dust to ¾ in., and 2⅛ parts rock ¾ to 2½ in. in size. The concrete was mixed in a ½-yd. mixer located at one end of the dam and delivered by means of side-dump ore cars running on a trestle built up to an elevation of 8 ft. above the top of the arches.

Assumed Rise of 10 Degrees

The arch was designed with two hinges, these being in the concrete and located at the points where the arch ring joins the buttress. This design was adopted to reduce the binding stresses due to temperature and shrinkage, which were found to be excessive for an elastic or hingeless arch. It was assumed that, due to the chemical action of the cement, the setting temperature of the concrete in the arch rings would be 10° above the average daily temperature.

The two thermometers inserted in the dam, as indicated in the sketch, were read three times a day, and as their readings checked very closely, the accompanying table was made up from the mean of the two readings. After the first six days the atmospheric temperature was recorded at the time of taking the concrete temperature, but the maximum-minimum temperature readings are from the United States Weather Bureau station at Colfax, located about 15 miles north of the dam, but which has practically the same climatic conditions.

The mean temperature for this locality for the period over which the above readings extend is 45°, and the maximum temperature attained by the concrete in setting is 62°, or a rise of 17° above the mean. From this it would appear that the assumption of a 10° rise was a little low. The results also show that the highest temperature was attained in about 18 hours after pouring, or shortly after the concrete had taken its permanent set, but that this temperature was maintained for only a few hours.

TABLE II. TEMPERATURE READINGS FOR ROCK CREEK DAM

		—Temperature in Degrees Fahrenheit—			
			—Atmosphere—		
			At Dam	—At Colfax—	
Date	Time	Concrete		Max.	Min.
Jan 20	1:59 p.m.	55.0	..	59	24
	4:50 p.m.	54.1	..	..	..
21	8:00 a.m.	62.1	..	49	32
	12:45 p.m.	61.8	..	..	..
	4:50 p.m.	62.5	..	..	..
22	9:30 a.m.	49.4	..	50	29
	12:45 p.m.	50.5	..	..	..
23	8:15 a.m.	41.5	..	54	29
	12:45 p.m.	42.8	..	..	..
	4:50 p.m.	46.8	..	..	..
24	8:15 a.m.	38.2	..	60	40
	1:00 p.m.	40.7	..	..	..
	4:50 p.m.	45.2	..	..	..
25	8:15 a.m.	39.9	..	60	30
	1:50 p.m.	43.2	..	..	..
	4:50 p.m.	47.0	..	..	..
26	8:00 a.m.	40.4	..	60	30
	1:00 p.m.	42.8	56	..	..
	4:50 p.m.	47.2	56	..	..
27	8:00 a.m.	41.8	42	55	37
	12:50 p.m.	43.0	53	..	..
	4:30 p.m.	45.5	51	..	..
28	8:00 a.m.	42.7	44	50	35
	12:00 m.	41.8	46	..	..
	4:30 p.m.	41.8	..	..	..
29	8:00 a.m.	40.5	46	42	38
	12:00 m.	40.7	47	..	..
	4:30 p.m.	41.0	47	..	..
30	8:00 a.m.	39.9	45	45	37
	1:30 p.m.	40.4	46	..	..
	5:00 p.m.	42.9	44	..	..
31	8:00 a.m.	33.6	34	47	24
	12:00 m.	35.1	43	..	..
	4:30 p.m.	38.6	44	..	..
Feb. 1	8:00 a.m.	32.5	35	52	30
	12:00 m.	32.5	42	..	..
	5:00 p.m.	39.0	45	..	..
2	8:00 a.m.	35.4	33	62	32
	1:00 p.m.	39.0	54	..	..
	4:45 p.m.	42.0	50	..	..
3	8:00 a.m.	39.5	36	63	36
	1:00 p.m.	43.8	56	..	..
	4:45 p.m.	46.8	57	..	..
4	7:30 a.m.	41.9	42	71	35
	1:00 p.m.	45.5	60	..	..
	4:00 p.m.	49.7	62	..	..
5	7:00 a.m.	45.6	62	71	44
	1:00 p.m.	48.0	59	..	..
	4:15 p.m.	51.3	62	..	..

It is interesting to note how closely the temperature of a concrete wall of this thickness (14 in.) follows that of the air, and these results indicate clearly that in a structure of this type provision must be made for a temperature variation of approximately the same magnitude as shown by atmospheric temperature records.

Rock Creek dam was designed by the writer under the direction of H. C. Vensano, civil and hydraulic engineer of the Pacific Gas and Electric Co. The Spaulding dam addition was also designed under Mr. Vensano's direction and built under contract by Twohy Brothers, with O. W. Peterson, superintendent of construction for the Pacific Gas and Electric Company.

Kentucky Road Department Has Standard Bridges

Standard Designs for State-Aid Structures—Small Spans Concrete Girders, Large Ones Steel Trusses

FOLLOWING the passage of a state-aid road law, the Department of Public Roads of Kentucky started the preparation of a series of standard bridge designs, to be furnished all bidders on roadwork. These bridges were all designed for the same loading and for a width of at least 16 ft., the increase in heavy loads and in traffic making it necessary to dispense with the old-time "secondary" road where less strict load and width requirements might be safe.

Structures Vary with Span

Standard designs have been prepared for the following types of structures:

Concrete Spans

Openings from 3 sq.ft. to 24 sq.ft. inclusive—concrete box culverts.

Spans from 2 ft. to 20 ft. in clear inclusive—reinforced-concrete flatslabs.

Spans from 16 ft. to 30 ft. in clear inclusive—reinforced-concrete T-beam spans.

Spans from 32 ft. to 42 ft. in clear inclusive—reinforced-concrete through girder spans.

Steel Spans

40 ft. to 80 ft. c. to c. bearing inclusive—low riveted trusses.

85 ft. to 130 ft. c. to c. bearing inclusive—through riveted trusses.

135 ft. to 175 ft. c. to c. bearing inclusive—through pin connected trusses.

Alternate plans are being prepared for spans 130 to 150 ft. inclusive, with riveted connections. No attempt has been made as yet to issue standard plans for arches, although they are recommended wherever foundation conditions would justify.

Concrete Designed for Easy Fieldwork

It has been the attempt of the department in designing its standards for concrete bridges to employ designs which could be easily and readily cast in the field and which would insure a pleasing appearance with the most economical forming. All concrete bridges in addition to their own dead weight have been designed for a covering weighing 120 lb. per sq.ft. of roadway and for a live-load of either one 15-ton tractor or a uniform load of 100 lb. per sq.ft. The live-load above noted is increased by 25% for impact.

In the design of steel standards no attempt was made to design the spans for concrete floor alone. It was endeavored, however, to design the structures at present for a satisfactory type of wooden floor and yet strong enough to allow, at some future time, the employment of a floor of reinforced concrete.

Steel Bridges Have Fixed Requirements

It has been the endeavor of the department to comprise the following in each design:

1. To provide for the increased dead-load of a better type of flooring.

2. To allow shipment of the trusses in sections to the field and eliminate as many field rivets as possible. Further, to arrange the field rivets to be driven to the best advantage in the field.

3. To provide splices in tension members capable of developing the full capacity of the member and in compression members to develop at least 75% of the value of the member (this in addition to milled joints which in many cases have not proved satisfactory).

4. To permit free air circulation and surfaces easily accessible for painting.

5. To show in detail the required rivet spacings and the desired details of all members. This eliminates any uncertainty on the part of bridge companies in bidding and unnecessary changes and delays prior to the final approval of shop drawings.

6. To eliminate, where feasible, all secondary stresses.

Either the uniform live-load or the 15-ton tractor governed the design of the steel standards as in the case of the concrete standards, the uniform live-load employed, however, in the design of the steel spans being 80 lb. per sq.ft. of roadway for all spans up to and including the 100-ft. span and reduced thence 2 lb. for every additional 10 ft. of length until the 180-ft. span was reached. For the spans of 180-ft. and beyond, 64 lb. per sq.ft. were used in the design. Twenty-five per cent. was added to the above loads for impact.

Wooden Flooring Gives Good Results

Excellent results are being obtained from the type of wooden flooring now employed. The floor consists of 2 x 4-in. white-oak timbers laid on edge and fastened to the nailing strips by 20d. nails and to each other every 2 ft. by 16d. nails. The nailing strips are of creosoted timber and fastened to the top of each stringer by bolts. The pieces of 2 x 4-in. timber are thoroughly swabbed with hot tar along the sides in contact and laid as closely together as possible. The nailing strips are so arranged as to give a crown of 1 in. to the finished roadway.

The stringers used on the standard spans will permit the use of a reinforced-concrete or wood-block floor at a later date without change. In designing the stringers for 4-in. wooden floor or wood-block flooring, it was assumed each stringer spaced 24 in. center to center carried one-half the concentrated live-loads thereon. The maximum spacing for the 4-in. flooring allowed is 27 in. center to center of stringers. The load carried by each stringer was determined by dividing the spacing of stringers center to center in inches by 48 and multiplying by the total wheel loads on the stringer. For concrete floors it was assumed that stringers spaced 30 in. center to center carried one-half the concentrated load, and for other spacings the live-load carried by each stringer was obtained by dividing the center to center spacing of stringers in inches by 60 instead of 48 and multiplying by the total wheel loads on the stringers.

Wind Pressure Called For

In the design of the lateral systems, the wind pressure was assumed acting in either direction horizontally at 30 lb. per sq.ft. on the exposed surfaces, as seen in elevation, and in addition thereto a horizontal live-load of 150 lb. per lin.ft. of span was assumed as acting in the plane of the loaded chord. In spans in

cluding the 150-ft. span, no additional provision was made in end post due to the wind; however, in spans above 150 ft. in length, wind is considered. The total area opposing the wind was determined by adding together the areas of twice the vertical projection of the windward truss, railings, hub guards, blocking, flooring and ends of floor-beams.

Many bridges are allowed to rust because the rust is not readily apparent. It has appeared wise, therefore, to the department to utilize a paint for the two final field coats which will not only show the rust, but also will make a bridge clearly visible at night, and it has therefore utilized a light paint for the two field coats.

Thus the department is endeavoring to furnish the counties of Kentucky with standard plans which will not only fulfill the present conditions, but be strong enough to suffice for time to come. It will be noted no short-span steel bridges are designed, but instead reinforced concrete is employed, including the approaches to steel bridges. Every effort has been made to minimize maintenance charges.

Rodman Wiley is commissioner, and Charles D. Snead is bridge engineer in the Department of Public Roads, which has its headquarters at Frankfort, Kentucky.

Breakages of Timber Stringers Show Safe Stresses

Heavy Locomotives on Santa Fe Require Heavy-Type Pile Bridge Decks—Safe Stress About 1500 Pounds Per Square Inch

THE occasional failure of the stringers of pile bridges has been found to be pretty definitely related to the weight of locomotives operating over them. On the Atchison, Topeka & Santa Fe Ry. two kinds of stringer arrangements exist on the line, heavy and light, and the more frequent failure of stringers in the light floor construction drew attention to this relation.

All spans are 14 ft., and the stringers are made of timbers 7 x 16 in. in section, Southern (Texas or Louisiana) yellow pine, except that Oregon fir is used on lines west of La Junta. In the heavy floors used on main line and important branches there are four pieces per rail, set side by side with 1-in. clear space provided by separator washers on the through-bolts. The light floor used on some branch lines has three-ply stringers. During the past years a number of breakages of sticks in the three-ply stringers has occurred. Only one stick breaks at a time; and thus the breakages do not mean accidents, although they call for immediate repair work.

Four-Ply Construction Now Needed

It was concluded that reinforcement to four-ply construction is now needed on many of the branch lines. Studies of bending moments in stringers were made to give more certain foundation to this conclusion. Some of the failures are of the longitudinal shear or splitting type, and others are bending-stress failures. The stress investigations, however, were made with reference to bending moment alone.

The first general fact was that locomotives whose total driver weights exceed 100,000 lb. for Atlantic, 140,000 lb. for Pacific and 157,000 lb. for Consolidation engines are likely to produce breakages in three-ply stringers. On the other hand, four-ply stringers gave no trouble anywhere on the system.

The railway company's standard bridge loading produces on 14-ft. span a bending moment equivalent to E-47 loading. It produces an extreme-fiber stress of 1400 lb. per sq.in. in four-ply and 1860 lb. per sq.in. in three-ply stringers. Various actual engines used on the line gave the following bending stresses in three-ply construction: 1520, 1780, 1824, 1792 and 1740 lb. per sq.in. These figures contain no allowance for impact.

Low and High Impact Effect

The engines studied include some four-cylinder balanced compounds which produce a low impact effect, while others produce a high counterbalance-weight impact. Partly for this reason it was not possible to make a direct deduction from the facts. The final conclusion, however, was that bending stresses below 1500 lb. per sq.in. are safe, while loads whose static effect materially exceeds 1500 lb. fiber stress may produce breakages.

A. F. Robinson, bridge engineer of the Atchison, Topeka & Santa Fe system, adds the following remarks: "In general, I find it a difficult matter to fix an exact maximum unit fiber stress to be permitted in stringers with 14-ft. panels and three-ply chords.

"Generally, broken stringers occurring in three-ply chords are the only criterion.

"It is quite probable that for longer panels the fiber stress might be higher. It is also assumed that for shorter panels these fiber stresses should be reduced."

Small Railway Bridge Is Displaced by Earth Pressure

Pressure of an earth-fill on soft soil recently displaced a flat-top reinforced-concrete bridge carrying the new Indianapolis & Frankfort R.R. over the Levi Thomas drainage ditch at Frankfort, Ind. This is attributed to the pressure of a bowl or pocket of soft peat under the south abutment. That this was merely a pocket instead of an extensive formation of peat is inferred from the fact that the settlement under the embankment heaved up the ground immediately adjoining the toe of the embankment, while at 50 or 60 ft. from the embankment there was no evidence of upheaval.

The bridge itself did not settle, but the bank just south of the abutment went down 3 or 4 ft. and the pressure forced the entire structure a little to the north. Investigation showed about 18 ft. of soft material and then a hard formation. The piles under the abutment reached into the latter, but a considerable portion of their length was in the soft peat.

The heavy bank was taken out for 40 or 50 ft. south of the bridge and rebuilt with engine cinders. When this heavy material was removed, the bridge went back to some extent and then stopped. This happened some four months ago. Since that time the bridge has been in constant use, carrying the contractors' construction trains consisting of 45- or 50-ton locomotives and heavy cars. There has been no settlement of any kind and no other movement of the bridge in any direction, and it is believed that it will stand without further trouble.

Duluth Ore Dock New Type of Structure

Structural Steel Frame Carries Precast Concrete Slabs Forming Ore Pockets—Bulk Cement Wheeled Direct to Mixer for Wall and Deck Concrete Placed on Job

STEEL and concrete in unusual combination are employed in ore dock No. 2 of the Duluth & Iron Range R.R. at Two Harbors, Minn. The superstructure has a frame of structural steel, with precast concrete slabs for the bottom and front wall of the bins, while the deck and the partition walls between the bins are of concrete poured in place.

The dock is 1368 ft. long, 56 ft. wide inside the pockets with top walks outside of the pocket, and with its deck 80 ft. above the lake. There is a double row of pockets, 114 on each side, and holding 300 to 350 tons each. Transverse expansion joints are placed 144 ft. apart. The pockets are 12 ft. long, so that trains of 24-ft. ore cars can dump into alternate pockets without shifting. This length also corresponds to the 12- or 24-ft. spacing of hatches on most of the ore boats. The slope of the bottom of the pockets is 48°. The substructure consists of timber piling in a space inclosed by a timber crib and filled with lake sand and gravel. This stops below the water line and is capped with concrete to form the walls of the dock and the column footings of the superstructure. Fig. 1 shows the dock and the construction plant. Fig. 2 is a typical section and part elevation.

Building the Concrete Ore Pockets

The slabs for the front walls of the pockets are 10 in. thick, and five slabs form the necessary height. The bottom of each pocket has eight slabs 8 in. thick. The partition walls, cast in place, are 12 in. thick. These walls were made with curved fillets for the joint with the bottom and bevel fillets for the joint with the front walls. The gate opening, 7 ft. wide, is at one side of the pocket. A specially designed concrete hopper section was formed in connection with the partition at the opposite side to deflect the ore toward the opening and so cause the pocket to empty itself completely.

The slabs were cast in the railway yards and delivered to the contractors on flat-cars, which were taken out on the two outer tracks of the steel frame of the dock. The erection of these slabs was done by means of an A-frame derrick mounted on four trucks and traveling on the two middle tracks of the dock. The derrick had a 40-ft. timber boom 12 x 12 in., and was operated by a Thomas 25-hp. double-drum electric hoist, with swinging gear. Fig. 3 shows the derrick placing the slabs. At the right is a carload of slabs.

The slabs were loaded flat on the cars. Each slab had cored holes with machine nuts embedded at the base of the holes. Eye-bolts were screwed into these nuts for erecting, and cable slings were used to catch the hook on the derrick block as shown. Owing to the diagonal bracing at the top of alternate pockets, almost half of the slabs had to be lowered halfway and then landed temporarily while the cables were changed to permit of final lowering to position. The heaviest slab weighed 3 tons. The total weight of the 13 slabs for a complete pocket was 36 tons. As high as 78 slabs were set in one day.

The concrete-slab deck of the approach to the dock proper was constructed before starting the erection of the concrete slabs for the pockets and the superstructure concrete work of the dock. A double-track line leads to the dock from the railway yards, passing from the earth-fill to a timber trestle which joins the steel approach to the dock proper. This last section consists of structural-steel bents carrying steel girders and with a concrete deck 14 in. thick to carry the tracks. This section is 318 ft. long, and it is at this point that the double tracks of the approach diverge to form the four tracks of the dock proper.

Forms Supported on L-Shaped Brackets

The only feature of special interest on this section was the concrete cantilever extending beyond the steel girders to form the sidewalks. In some parts this extended 10 to 12 ft. beyond the girders. This, together with the height above ground, made the securing of the falsework a difficult matter. The forms were supported on L-shaped brackets (inverted), with diagonal bracing and a steel strap connection from the top of the bracket extending across the top of the girder. The strap hooked over the inside flange, thus making the brackets deep cantilever trusses with tension stresses at



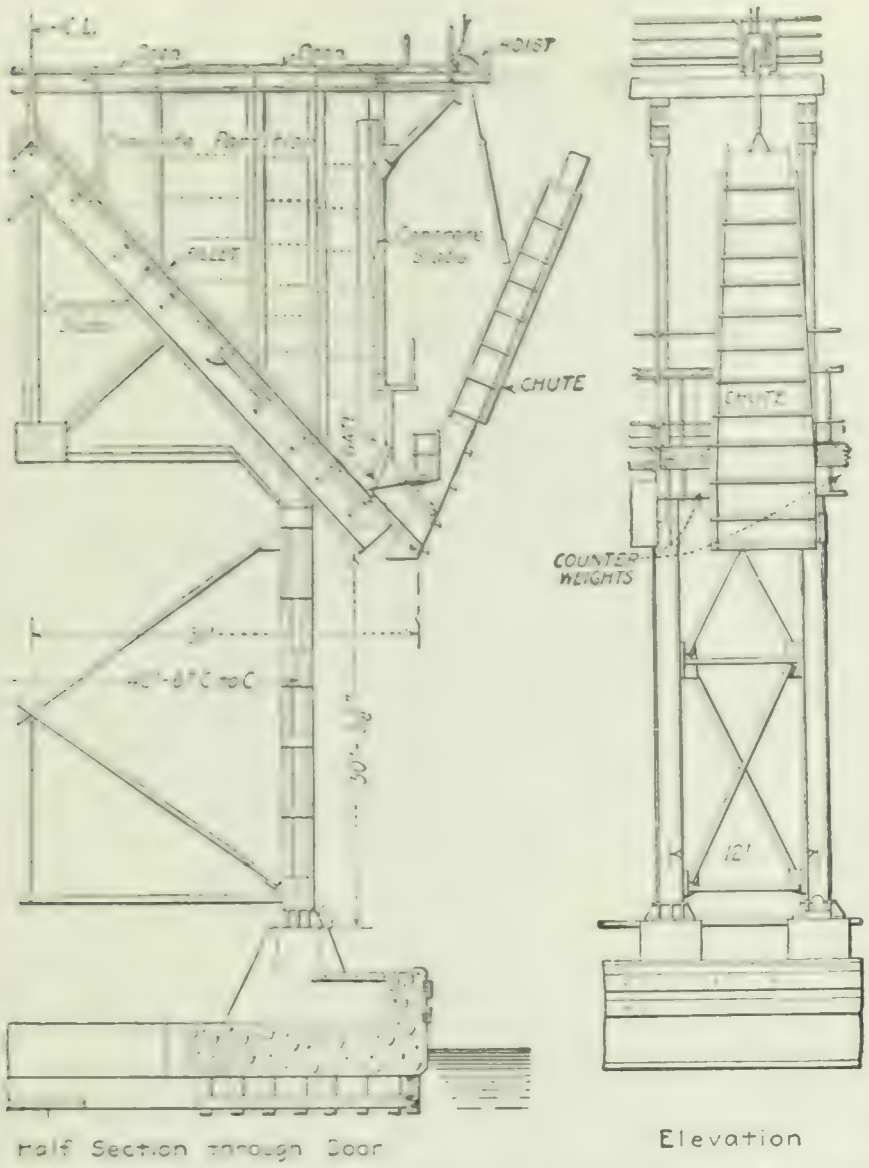


FIG. 1. ORE DOCK HAS STEEL FRAME, CONCRETE SLABS AND POURED-CONCRETE DECK AND PARTITIONS

the top transferred directly to the steel girders. The post of the L-bracket rested on the lower flange of the girders.

These brackets were about 8 ft. c. to c., and joists were placed on them to carry the forms. The $\frac{3}{8}$ x 3-in. steel strap connections across the top of the girder were made with square bends at the end to fit the flange of the girder. Before pouring the concrete a test was made on one of these straps to determine the load it would carry before straightening out at the bends. It supported a load twice that which it would receive from the concrete without showing any sign of failure at the bends.

Bulk Cement and Portable Concreting Plant

All the concrete for the dividing walls between the pockets was handled with a portable concrete plant mounted on a flat-car. A Milwaukee ½-yd. mixer driven by electric motor, together with a batch hopper, was mounted at one end of the car. The balance of the car was occupied by three material bins with sliding gates underneath to discharge onto a 28-in. conveyor belt. The conveyor was driven through friction gearing from the mixer motor, and was set at a slope steep enough to feed direct into the batch hopper of the mixer.

Bulk cement was used, the cement being taken direct from box-cars to the mixer in special wheelbarrows holding just enough for a ½-yd. batch. Where it is possible to handle the cement direct from car to mixer there are several advantages in using bulk cement. Among these are the saving in time in not having to handle the empty cement sacks, and the elimination of the usual sack losses. The gravel, crushed rock and sand were delivered on the dock in ore and gondola cars, and were handled from the cars directly into the bins of the mixer plant by means of a locomotive crane with clamshell bucket.

For the dividing walls the concrete was poured directly from the mixer to the form through swinging chutes, supported at one end from the mixer car and resting on the track rails at the other. Fig. 1 shows the mixer-plant car with locomotive crane delivering material to the bins and the form derrick farther out on the dock.

The forms for the dividing walls were built of 2-in. dressed and matched spruce with 4 x 8-in. studs not over 42 in. c. to c. The forms were built up in sections, the maximum size being about 8 x 8 ft. They were held together by $\frac{3}{4}$-in. bolts, not more than 4 ft. apart vertically and located in the studs. The fillet forms were built on as part of the form sections, the curved surfaces being covered with sheet steel. In pouring the walls, the forms were subjected to the pressure from 30 ft. of concrete placed very often in as short a time as three hours. In spite of the heavy pressures, the concrete surfaces came out very smooth and free from bulges.

A small A-frame derrick, similar to the one used for handling the slab erection, was used to erect and strip



FIG. 3. DERRICK PLACING CONCRETE SLABS FOR FACE OF ORE POCKETS

the wall forms. The stripping was handled almost entirely at night, as the concrete plant when operating by day occupied the space directly over the walls which were to be stripped. The mixing plant was moved back every evening to clear the space for stripping the forms. The form surfaces were oiled on an average

every other time used. The forms were stripped about 30 to 36 hours after pouring and were transferred from wall to wall on flat-cars.

The forms for the deck slab for the dock proper were of ordinary construction, but were much cut up by openings for dumping the ore and for other purposes. The slab varies from 6 to 9 in. in thickness. The forms were made of 1 x 6-in. tamarack, dressed and matched, and made up into panels to facilitate handling, with 2-in. joists of varying depths.

Concreting the Deck in Cold Weather

The concrete for this deck slab was handled by the mixing plant described above, and for a length of about 150 ft. it was poured by chutes in the same manner. Then the weather became so cold it was necessary to provide for winter work. A boiler and heating plant had been installed on a flat-car prior to the completion of the wall work. This consisted of a 40-hp. return-tube boiler and two water tanks; one for the boiler feed and the other for hot-water supply for the concrete mixer. The latter tank was heated by steam. A locomotive tender delivered water to the tanks by means of a steam ejector. A steam connection was made to the mixer drum to inject live steam there, and the batch water tank for the mixer was heated with steam.

With this equipment it was possible to turn out concrete heated to almost any temperature desired. If concrete is too hot, however, it will set up badly in the mixer, clogging this rapidly, and will also cause checking in the finished slab work. The contractors consider 90 to 100° about as warm as it is desirable to go.

Although a comparatively thin concrete slab on top of a high structure extending into Lake Superior would not seem a very favorable place for cold-weather concrete work, there were several advantages for this work. The bottoms, fronts and dividing walls of the



FIG. 4. TRAVELING SHELTER ENABLED THE CONCRETING TO BE DONE DURING VERY COLD WEATHER

pockets were all in place, thus shutting off the under side of the slab very effectually. The dock was provided with the four railway tracks, and there was also a substantial steel railing on each side of the dock. These points were all used to assist in housing in the deck-slab work.

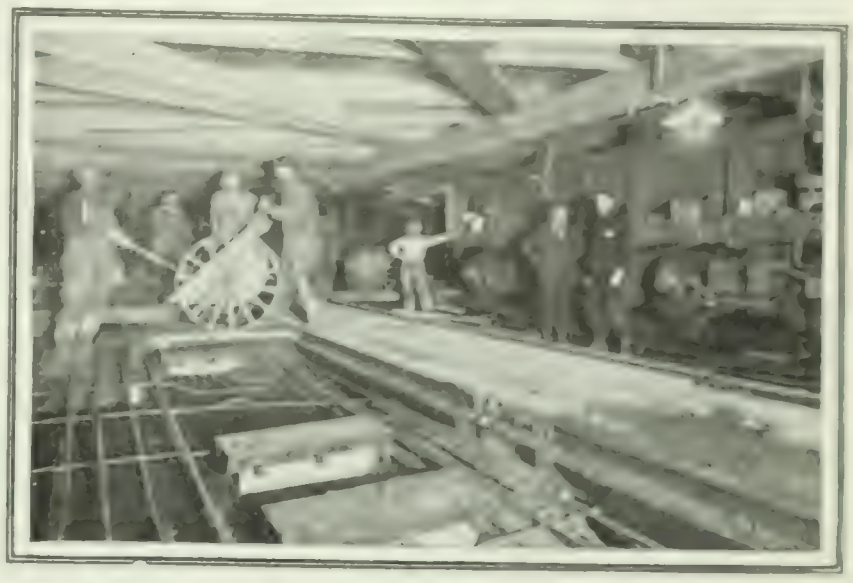


FIG. 5 PLACING CONCRETE UNDER THE TRAVELING SHELTER

The work was done under the protection of a portable housing built on four wooden ore cars. These were placed in pairs on the two center tracks of the deck, with a space of 12 ft. between the cars on the same track. Four 10 x 10-in. timbers 40 ft. long were placed across the tops of these cars, and from their ends were hung longitudinal timbers. From these last it was possible to span across to the railing with 2 x 8-in. joists. At the railing these were supported on a wooden channel section with wood wheels inside, which traveled on 4 x 8-in. sticks set on top of the steel railing.

The roof and ends of the house were made of 1-in. boards covered with tar paper. The ends extended down nearly to the concrete slab, and the slight gap was covered with a canvas flap. The sides were closed with canvas which extended down from the roof of the house to the top of the concrete slabs for the pocket front, some distance below the deck slab. Steam coils were built completely around the sides of the house and connected to the boiler car. Fig. 4 shows this traveling shed, or housing, with the boiler car at the rear. Fig. 5 shows the work in progress inside the shed.

Shelter Moved Every Other Day

Swinging doors were provided where one outside track passed through the house to permit of handling form materials from one side of the house to the other on push-cars. The house was about 70 ft. wide and 75 ft. long, being large enough to cover half of a section between expansion joints. The usual procedure was to pour a complete run inside the house in a day, wait one day to keep the protection over the concrete and give it time to set, and then move and pour the next section the next day. The mixer-plant car was attached to the house, and housed in with it, a concrete hopper extending from the front of the mixer to inside the house.

Carts were used to distribute the concrete inside the house, using wooden runways. The locomotive crane was able to move the house and mixing plant. A move of 72 ft. could be made in 5 min. after the canvas was loosened at the bottom. The use of this house enabled the dock to be completed ready for service by the opening of navigation for 1917, which was a saving of several months' time as compared with waiting for weather that would have permitted the deck-slab concrete to go in without protection. With weather very

ing from zero upward, it was found entirely feasible to put in the deck-slab concrete. With weather much below zero it was not found advisable to handle that class of work.

Winter Concrete Costs $2.50 Per Yard More

An item of interest in connection with the winter concrete work on the deck slab was the extra cost of this over concrete placed in more favorable weather. Aside from the initial delay due to very severe cold, no unfavorable conditions were encountered. When started, the concreting progressed at the maximum rate, very smoothly and with an unusually efficient crew of men. Yet the extra cost amounted to about $2.50 per yd. This was due chiefly to the cost of the housing, the fuel and boiler-plant attendance, increased concrete labor cost due to decreased production, cost of moving housing and cost of canvas. This is not considered excessive in view of the results achieved.

The work on this ore dock was under the direct charge of W. A. Clark, Chief Engineer of the Duluth & Iron Range R.R.; Leland Clapper was Resident Engineer in charge. The steelwork of the superstructure was made and erected by the American Bridge Co. The contract for all the superstructure concrete work, including the placing of precast slabs and pouring concrete in place, was handled by the Newton Engineering Co., of Milwaukee, Wis., with George C. Newton, Vice President, in active charge

Simple Formula Determines When To Haul, When To Waste and Borrow

By W. C. West
Highway Engineer, Bureau of Public Works, Manila, P. I.

A SIMPLE formula by which to calculate the economical length of haul beyond which it is preferable to waste and borrow may be developed as follows:

Take two adjacent sections, one in cut, the other in fill, and each containing the same volume of material V, measured in excavation in both cases. Under this condition the material taken from the cut will just make the fill, and therefore, provided the haul from cut to fill is of a certain length, the total cost of grading the two sections, with all the material from cut used in fill, will be the same as by the system of borrow and waste. These two conditions may be expressed by the equation

$$V(a + dx\ 100) - V(a + b) + Vc$$

in which a equals cost of excavating and loading, in cut, per cubic yard; b, cost of hauling and dumping wasted material, per cubic yard; c, cost of borrow and fill, not rolled, per cubic yard; d, cost of hauling and dumping material taken from cut to fill, per cubic yard hauled, and x length of haul, center of gravity of cut to center of gravity of fill, in feet.

Eliminating V and a from the equation and reducing,

$$dx\ 100 - b + c$$

whence

$$x = 100(b + c)/d$$

Very likely d will be found practically constant for the entire job, but b and c will need to be estimated separately for each cut and fill, and will no doubt show considerable variation.

Column Tests and Formulas

Comments on the Bureau of Standards Tests from an Original Viewpoint—the Parabolic Formula

By Roberts S. Foulds
Phœnixville, Penn.

AMONG other things, good structures depend upon good specifications, and these in turn depend upon good tests and correct reasoning of the engineer and the physicist. The description of the column tests made at the Bureau of Standards, given in *Engineering News-Record* of June 28, 1917, is valuable.

The editor pointed out that, as engineers would expect, thin material makes stronger columns than thick material. He also called attention to columns which are erratic in failing at a stress considerably lower than other columns of the same dimensions and similar materials.

Failure at a lower stress is probably caused by slight defects of fabrication, by micro-flaws in the steel, or by some undiscoverable defect. Probably this erratic behavior cannot be eliminated, but it is hoped it can be improved. The greater strength of thin material affects tension tests, and probably bending tests, just as it does column tests. The erratic behavior is not peculiar to column tests; it occurs in tension tests, and the writer believes it would occur in bending tests.

Certain Sections Seem Better

Plotting the tests of light and heavy material separately brings out the fact that certain sections seem better than others. The Bethlehem H-column, not having its component parts tacked together with rivets, shows up very well, for it acts as a unit. So does the latticed column, which is made up of only two rolled main sections, test well, with the metal located in the periphery of the cross-section. The Z-bar column tests fairly well; the torsional method of failure does not seem to impair the usefulness of the section. Section 4 seems good only in short light sections. The box sections 2, 3 and 10 seem to be about medium in value. In sections 1 and 7 the metal is concentrated too near the center of gravity of the cross-section to get the best results. The tie-plate columns are, of course, poor.

Sections much more complex than those tested can be designed so that the member will buckle as a whole to a large deflection before local failure develops. Tests on the customary bridge top-chord sections are desirable, as are also tests on sections made of two I-beams latticed or with cover plate and heavy bottom-flange lattice. The writer believes that the octagonal section (such as was proposed in complex form for a bridge across San Francisco Bay) and the circular section (such as was used in the Phœnix column) would test very well indeed.

On account of erratic tests, it is idle to expect plotted results of any particular series of one cross-section to give a smooth curve for a column formula. Further, with erratic results eliminated, different sections with ends squared, as in the Bureau of Standards tests, would probably have varying degrees of end fixity, and this would give curves of different slopes.

The general trend of these tests as a whole is seen to follow the direction of the formula $36{,}000 - 0.386\left(\frac{l}{r}\right)^2$, tangent to the Euler curve $28\frac{E}{(l/r)^2}$ at $l/r = 216$. Perfect fixity of the ends is not to be expected—that is, a curve tangent to $4\frac{\pi^2 E}{(l/r)^2}$. In column tests with pin ends, we would expect a general slope such as is expressed by a curve tangent to $16\frac{E}{(l/r)^2}$, which end conditions it is believed approximate the end conditions in structures. Had the length l between points of inflection in these tests been measured and the results plotted, they would probably have the general slope of a curve tangent to $\frac{\pi E}{(l/r)^2}$.

Too Few Tests To Establish Formula

Not enough lengths of any particular columns are tested to determine a column formula, even should there have been no erratic results; and it is manifest that no one formula for a steel of particular chemical combination would exactly express the facts for various sections, and for thin and thick material. For dimensioning, we shall have to rely upon a formula that best expresses averages of good tests, and the form of the formula should approximate the law that perfect columns would follow.

The writer dissents from the conclusion of the *News-Record* that "practically the entire ultimate strength of the column is to be regarded as 'available strength' for purposes of design," because the elastic limit is considerably below the yield-point, which in the stress-strain diagrams is the beginning of the gentle curve which turns toward swift failure. In columns where the stress varies from zero to the elastic limit, the latter point is the ultimate for a great number of repetitions.

It would have been very desirable to have given in the tables the elastic limit and yield-point of each column, as well as the ultimate. Of course, the elastic limit (a stress that is of great importance, because the working stress of carbon steel should be based thereon) is difficult to determine, but the expert experimenter can tell when minor permanent sets have taken place, and when the permanent set of the column (or tension member) as a whole commences. Had the elastic limits been given and emphasized, we should probably see that the ratio of the elastic limit of these columns to their ultimate is roughly equal to the ratio of the elastic limit of full-sized tension members to their ultimate.

Working Stresses Should Be Changed

When this relation is appreciated, the working stresses in most specifications will be changed. This relation is not generally appreciated, partly because of the fact that in testing small specimens the elastic limits in tension and compression are equal. The result is that the working stresses of most specifications give a greater factor-of-safety in tension members than there is in compression members.

In ordinary carbon steel, the average of good full-sized members in a testing machine will be about 54,000 lb. per sq.in. in tension (computed on the net section), and about 36,000 lb. per sq.in. in compression (computed on the gross cross-section), properly reduced for column action. The elastic limits of these carbon-steel members will average 30,000 lb. per sq.in. in tension, and 21,000 lb. per sq.in., reduced, in compression.

A curved-line formula is more rational than a straight-line formula. The writer believes that in time engineers generally will adopt a curved-line formula for this reason, and he prefers the J. B. Johnson parabolic formula $36{,}000 - 0.7\ (l/r)^2$ because it is the most rational of the practical formulas and because it probably represents the average end conditions of bridge columns. It is about as easy to use as a straight-line formula.

The American Railway Engineering specifications prescribe 16,000 lb. per sq.in. in tension, and $16{,}000 - 70\ l/r$ with a maximum of 14,000 lb. per sq.in. in compression. This column formula is roughly equivalent to $12{,}000 - 0.233\ (l/r)^2$, but if the above ratio of elastic limits were followed it would be $11{,}000 - 0.214\ (l/r)^2$.

In the specifications for the New York Connecting Ry., 20,000 lb. per sq.in. in tension, and 20,000 lb. per sq.in. in compression reduced by a column formula, were used. The net section of the members was made equal to the computed area in compression, as well as in tension. If two-thirds the above elastic limits were used, the result would be 20,000 lb. per sq.in. on the net section in tension, and $14{,}000 - 0.272\ (l/r)^2$ on the gross section in compression. This indicates disproportionately high stresses in columns on the New York Connecting Railway.

Pennsylvania R.R. Specifications Too Low

The Pennsylvania R.R. specifications prescribe 16,000 lb. per sq.in. on the net section in tension, and $\frac{16{,}000}{1 - \frac{l^2}{13{,}500\ r^2}}$ on the gross section in compression. This clearly gives values for tension members too low in proportion to the values for compression members.

The above specifications, and all others of which the writer has knowledge, give either uneconomical tension members or overloaded columns—a result that is not good engineering.

For axial stresses, it would seem that two-thirds the elastic limit should not be exceeded, but if, in bridges, secondary stresses in the plane of the truss due to deflection and rigid joints are added to the primary stresses, the sum should not exceed 24,000 lb. per sq.in. in tension and $17{,}000 - 0.33\ (l/r)^2$ in compression. In columns, it should be noted whether the secondary stress is a maximum or zero at midlength, and in both columns and tension members the stress due to the dead-weight of the member should be kept in mind. In considering the margin left for the other incomputable secondary stresses of a bending, or torsional, nature, it is well to remember that stresses on extreme fibers beyond the elastic limit do not produce proportional strains and may be beneficial rather than harmful.

Specifications for steel bridges ought to state whether or not the computed (or approximated) secondary stresses are to be included in dimensioning to the given working stresses, and the working stresses should be prescribed accordingly.

Faster-Flowing Water Does Not Mean More Water

Increasing the Rate of Flow Past a Given Point Does Not Pour More Water Upon the Stream Below

By H. M. Chittenden
Brigadier General (Ret.) United States Army

THE writer's attention was recently drawn to the subjoined statement which emanates from high engineering authority. He italicizes that portion which he proposes to use as a text for the accompanying criticism.

"If it provides for an improved channel, or otherwise for increasing the rate of flow past the point, *the result will be the pouring of more water in a given time upon the stream below* than it would otherwise have received, and a possible flooding of localities which might have escaped."

The same idea pervades nearly all the literature of the Mississippi flood problem, wherever it treats of the cutting off of bends. It is invariably considered that the shortening of distance and the acceleration of velocity, which of course would result in transporting water more quickly from the upper to the lower end of the reach affected, would bring *more* water to the lower end and thus aggravate the situation in that vicinity. This, it will be understood, is one only of the several objections urged against cutoffs on that river, but it involves the particular matter which it is here desired to consider.

Occasionally, we run across similar assumptions in foreign literature. Thus De Mas says that cutoffs tend to "bring more water in a given time to the lower portion of the valley" than would be the case without them.

In October, 1916, the writer witnessed a very dramatic presentation of the same idea, but in entirely different circumstances. It was on the occasion of the notable hearing by the Court of the Miami Conservancy District upon objections filed against the official plan of flood protection for the district. The lawyer who was conducting the case for the district—a very able man and admirably equipped for that kind of work—was cross-examining the chief witness for the opposition upon the witness's plan for making an improved channel through Dayton. This improved channel would develop higher velocities for the same volume of flow than the old channel. Acting upon the theory enunciated in our text, that this would mean the arrival of a greater volume of water at the lower end than by the old channel, counsel drew a picture of the resulting ruin and devastation in the valley below, which was truly appalling. And the force of his argument was greatly enhanced by the fact that he profoundly believed every word he was saying.

Analysis Shows Theory Is Wrong

In the face of so much and such respectable authority, it seems fairly presumptuous to pronounce the whole idea an "airy nothing" and to express amazement that it should so long have found a "local habitation" in the consciousness of the engineering profession. The trouble seems to arise from confounding velocity of flow with volume of flow and in carelessly assuming that, because an improved channel, with its higher velocity, *may* carry more water, it *must* do so under any and all circumstances. It seems incredible that so obvious a fallacy should ever have gained any standing among experts, as the above citations show that it has, and the writer can find no explanation except that just given.

The simplest analysis will show the absurdity of the whole idea. No more water can pass down a given reach of channel than enters at the head, and no amount of improvement or regulation of the channel can affect that quantity a particle. Whether it be just an ordinary channel with a coefficient of roughness of, say, 0.035, or a solid concrete channel with a coefficient of only 0.011, it will convey no more water in one case than in the other, because there is no more to convey. The water will pass through the improved channel with higher velocity, but this will be entirely offset by the smaller cross-section, and the volume arriving at the lower end per unit of time will be the same in both cases.

We have stated the rule as absolute, but there is a possible qualification, which, however, is so slight as not to affect the rule itself. We refer to differences in channel storage between the original and improved channels. If the improved channel follows the same location as the original and has therefore the same length, it will probably have somewhat greater cubic capacity, and the volume absorbed in storage with a rise in the stream will be somewhat greater. If, on the other hand, the improvement involves a cutoff and a material shortening of the channel, its cubic capacity would be diminished and there would be less water absorbed in storage. But the slightly greater quantity in one case and the slightly smaller in the other, which would flow out below, as compared with the inflow from above, would be spread over the entire period of rise, and when reduced to a second-foot basis would be practically negligible. Indeed, since all of the storage effect takes place before the flood reaches its crest, and none whatever at the crest, it would be correct to pronounce it absolutely negligible.

No Menace in Increased Velocity

But is there not a menace involved in the increase of velocity itself? This is no part of the question which we set out to consider, but it is often advanced as if it were directly connected therewith. A great deal was made of it at the Miami Conservancy hearing. Nevertheless, the "menace" is wholly inconsequential. The increment of velocity due to any practicable improvement would be at most but a few feet per second. It would be absorbed in the first few hundred feet of return to the old channel and without serious disturbance. Farther down it would have no effect whatever.

It is scarcely necessary to point out that the matter we are discussing should not be confused with the effect of cutting off valley storage. It is well recognized that the cutting off of such overflow throws a heavier burden upon the main channel in time of flood.

To return to the text of our criticism, it is submitted that there is nothing to sustain the theory that the improvement of a channel and a resulting increase of velocity mean the "pouring of more water in a given time upon the stream immediately below." For instance, if the Mississippi River were shortened, as it

might be, so that a flood entering Cairo would reach Vicksburg two days earlier than by the present channel, that fact would involve no menace if more water did not also come, which would certainly not be the case. Extensive improvements of this sort have been made upon such great European rivers as the Rhine, the Danube and the Theiss, and there seems to be no evidence that they have borne ill results in this particular respect, while their general influence has been highly beneficial.

Construction Costs Reduced by Freight Bureau

New York Highway Department Gives Contractors First-Hand Assistance in Getting Road Materials

A BUREAU to determine the quickest, shortest and cheapest routings of materials and to give an organized, authoritative and effective means of meeting the present-day car-shortage and railway-embargo problems has been established by the New York State Highway Department in the attempt to aid road building in these days of stress.

The first step necessary to place the bureau in a position to do effective work was the assembling of tariffs concerning commodities necessary in highway construction. Requisition was made on the chief of the tariff bureau of each railroad for such publications as were required. This request was stated in general terms, and as the various roads responded the tariffs were checked against the official tariff indices of the several roads, which were available in the files of the Public Service Commission, Second District.

The tariffs were filed and numbered on end in folders arranged in consecutive order in the cabinet. The arrangement was such that the tariffs of each road followed one another in alphabetical order. This makes it possible to locate quickly the tariffs of any given road in the event of an error in indexing. Future expansion was provided for without disturbing the general plan of filing.

The tariffs of each individual road are placed in the folders in numerical sequence, using the I. C. C. number where shown, or, where no I. C. C. number is given, under the P. S. C. 2, N. Y. number directly following the I. C. C. tariffs.

Card Index by Railroads

A card system is used to index class rates, demurrage, switching tariffs and exception sheets under the name of the road from or on which they apply, showing the general application, the I. C. C. or P. S. C. number as the case may be and the number of the folder in which they are located in the cabinet. Separate cards are used for each road, and in the event that one tariff covers rates from originating points on two or more roads, the tariff is cross-indexed under each of them.

The specific-commodity tariffs applying on asphalt, cement, sand, etc., are indexed under the name of the commodity. Separate cards are made for each originating road, and the application of the tariff, etc., is shown as in the case of the class-rate tariffs. General commodity tariffs are cross-indexed under both the commodities on which they apply and the name of the originating road.

At present the files contain more than 1300 tariffs and 1100 supplements. A check is maintained on the tariffs by means of a tariff bulletin issued weekly by the Public Service Commission, which insures the file being kept up to date. From information shown in the tariff publications, official classification, etc., the bureau is enabled to quote rates for the use of the engineering force in making up estimates of the cost of construction; and for the accounting department in verifying the charges assessed by the carriers on shipments where the freight is to be paid by the department.

Where No Commodity Rates Existed

In many instances no commodity rates are in effect from and to points between which it is desired to make shipments. The freight bureau in such cases takes up with the traffic officials of the interested carrier the establishing of proper rates. Rate studies are also made by means of the tariff file, and where published rates are not "in line" or are unreasonably high, the carriers are asked to reduce them to a proper basis. Reductions covering 24 individual transportations totaling $12 per net ton, have thus far been agreed to by the carriers, and are in effect.

Several instances have been noted where carriers, in their attempts to hold to their line the long haul on traffic which they originate, are moving shipments via unreasonably roundabout routes, at rates which are a burden to the traffic and which fail to maintain proper competitive relations between producing points. Some corrections of this practice have been secured and others will be taken up as occasion demands.

The work of the freight bureau has been quite seriously interfered with this season on account of the existing car shortage and the many embargoes in effect. This has necessitated considerable correspondence with the carriers and in one or two instances with the Car Service Commission of the American Railway Association, National Defense Committee. The results obtained have been quite satisfactory. The freight bureau in special instances also arranges for expeditious movement of freight through the operating departments of the various roads.

Card Index of Costs, Delivered

A card index of the delivered cost of sand and crushed stone from various sources to each point of destination in the state makes possible a comparative study of the cost of such material at any given point of destination. This index includes more than 2000 cards.

The savings effected by the bureau are tabulated to show the saving in freight charges secured through the application of the correct tariff rate; the saving in freight effected by securing material from a different source at the same price but a smaller freight rate, and the saving effected by securing from a different source at the same freight rate but at a lower price.

The freight rate bureau is managed by F. W. Hessyn and is under the general supervision of H. Eltinge Breed, first deputy commissioner in charge of construction, New York State Highway Department, Albany.

Modern Steel-Frame Shop Design Used in New Foundry

Steel Frame of Simple Design Well Lighted and Made Attractive by Use of Standard Finishing Materials

THE new foundry of the James A. Brady Co., Chicago, is a modern building of the shop type in which great care has been taken not only to get structural efficiency and ease of working but also to produce a pleasing appearance from the outside. It is U-shaped in plan, with a main building 266 x 143 ft. and two wings 220 x 90 ft. In the space between the wings is the material yard, served by a traveling crane whose runway is designed to carry a roof over the yard. All the buildings are of steel frame construction. A railway track is laid along the material yard. Another track runs through one of the wings and into the main building. In this way materials and heavy castings can be handled directly by the overhead cranes.

Material from Old Plant Utilized

An interesting feature is the utilization of material from the company's old plant, about a mile distant. The main building is entirely new. Both of the wings will be old steel structures. After the new main building had been completed and put in service, the old buildings were dismantled, transferred and reërected on the new site. Each of these also has its old electric overhead traveling crane. New cranes were installed in the main building and the material yard.

The main building is a good example of modern factory construction. Its 140-ft. width is made up of a high central truss span of 62 ft. 6½ in. c. to c. of columns, a side truss span of 44 ft. 6 in. and a pitched roof of 34-ft. span over the space for the ovens and cupolas. The general arrangement and structural design are shown in Fig. 1. The foundations are simple concrete footing walls and interior footings, as the buildings are only one story high and carry no great loads.

The exterior has pressed-brick walls (with terra-cotta trimming) to a height of about 6 ft., brick pilastors at the columns, and a narrow upper line of brick. The remainder of the wall space, and the entire face of the monitor roof, is of Fenestra window sash, with clear glass. This arrangement, shown in Fig. 2, insures ample light over the working floor. To prevent the accumulation of dirt on the sills at the windows, a concreté filling sloped at 45° is placed on the wall. Each window bay on the main wall has a hinged panel for ventilation, and similar openings are provided in the sides of the monitor roof. Exhaust ventilators are placed

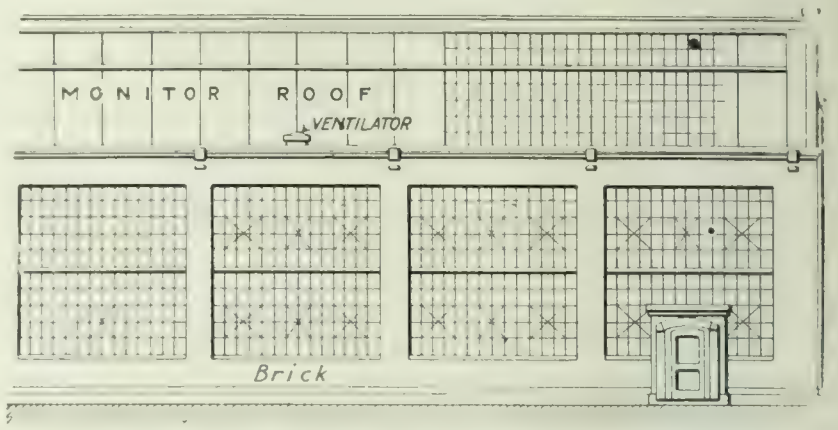


FIG. 2. NOTE THE AMOUNT OF WINDOW SPACE IN THE WALL AND ROOF OF THIS FOUNDRY BUILDING

in the lower part of the roof. The buildings are covered with composition roofing on plank sheathing. It will be noticed that the roofs slope inward to gutters which lead to drains at each end of the building.

Upper floors are required for the charging platform at the cupolas, the fanroom and the offices. These have tile and concrete ribs with a 5-in. concrete slab, supported on steel framing and columns. In the charging floor are embedded 4-in. channels, paving their flanges flush with the top of the slab. These are placed alternately 2 ft. and 3 ft. c. to c., and form depressed tracks for the wheels of the charging buggies. The office floor (9 ft. above the shop floor) has one stairway to the main entrance and another giving access to the shop. This floor is about 42 x 62 ft. and accommodates the

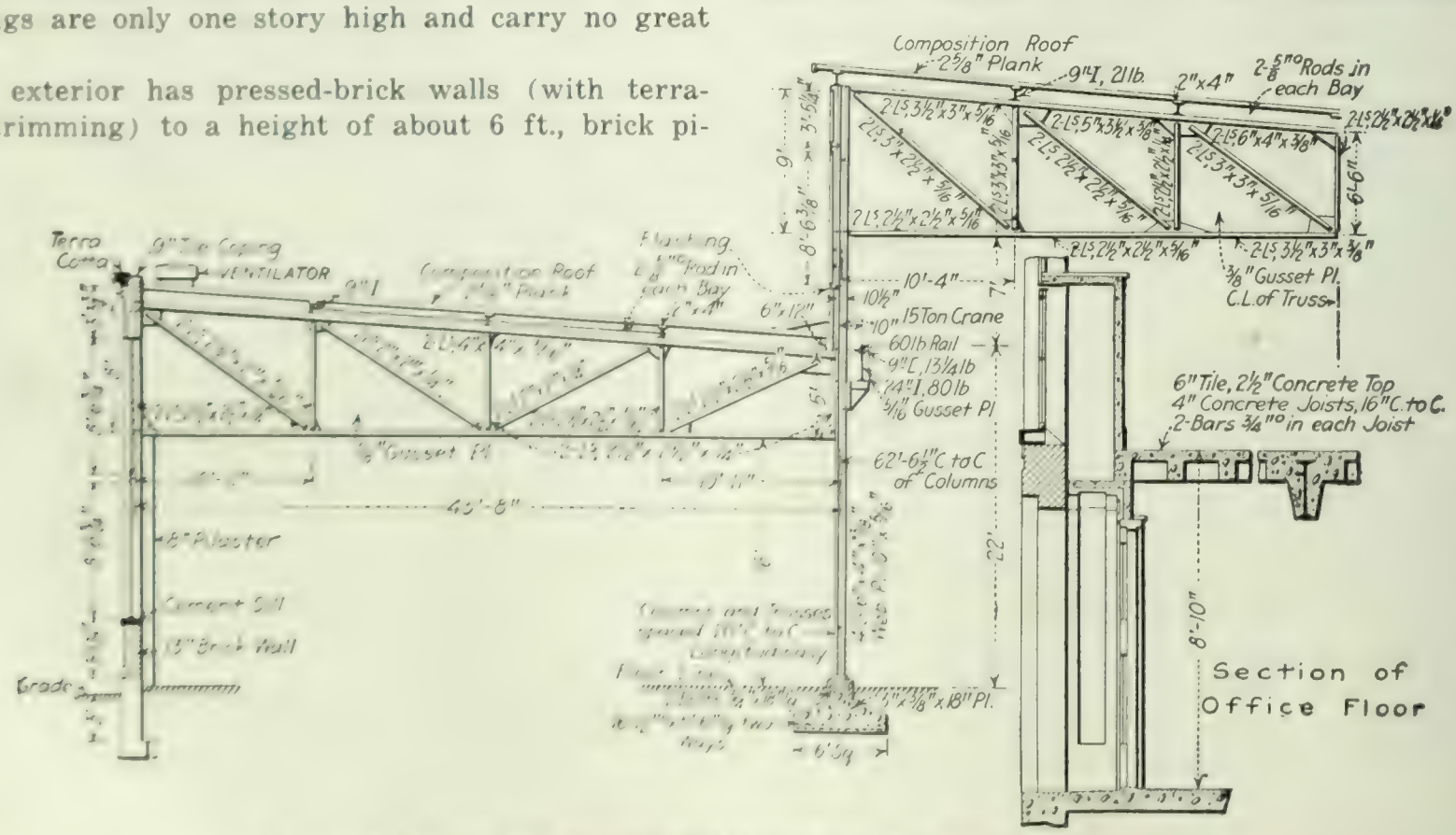


FIG. 1. STRUCTURAL DESIGN OF STEEL-FRAME FOUNDRY BUILDING

general offices, drafting roof and vault, as well as toilet facilities for the staff.

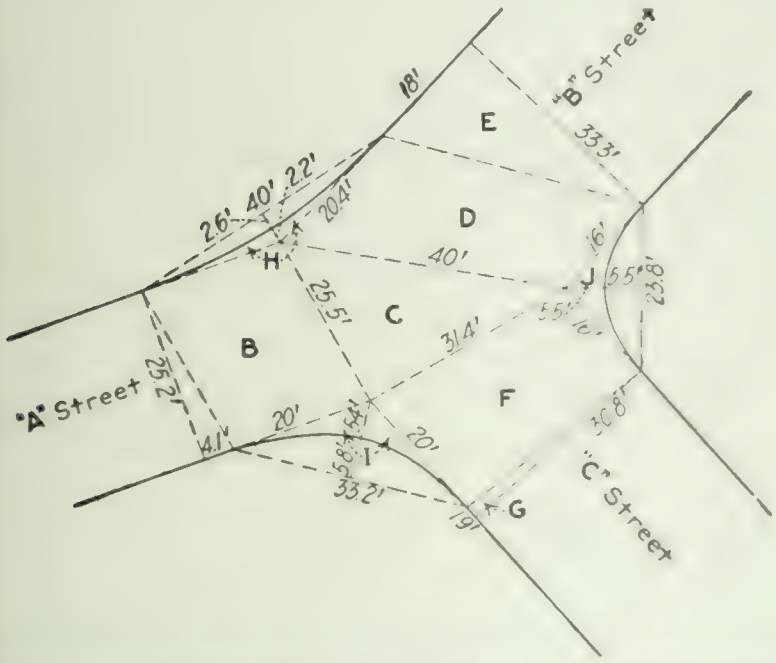
The main, or shop, floor is well supplied with toilet conveniences and drinking stands for the use of the workmen. In one corner, under the office floor, is a locker room 45 ft. square, with washing sinks and shower baths. Here also is a surgical room for first-aid in case of accident.

The appearance of the building, with pressed-brick and terra-cotta finish, might be taken to represent extra and unusual cost for buildings of this character. It is of interest to note, therefore, that by the adoption of a standard or typical architectural design for all industrial buildings the architect is enabled to purchase material in large quantities and get the benefit of wholesale prices. In this way high-class materials can be used at lower cost than cheaper materials purchased separately for each building. The architect is S. Scott Joy, of Chicago.

Irregular Street Intersection Area Calculations Simplified

By R. B. Gladding
Resident Engineer, Street Improvements, Wilson, N. C.

IT IS almost always necessary to compute the areas of some very irregular street intersections at the time of their improvement. Unless some planning is done beforehand, the proper measurements, which will result in a determination of the area with any degree of precision, are not made in the field. The accompanying diagram of a hypothetical intersection serves to illustrate

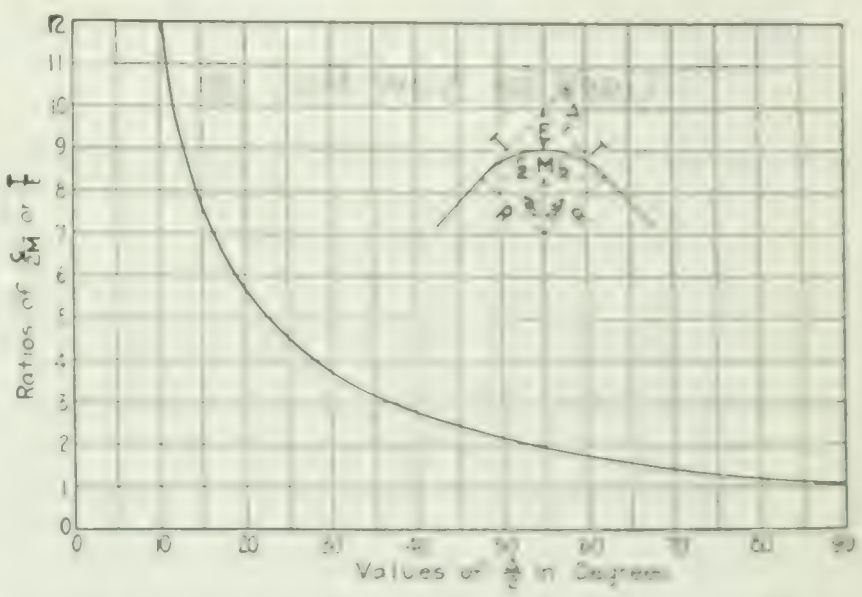


COMPUTATIONS OF AREAS OF THIS NATURE SIMPLIFIED

the use of a special curve by which the calculations are simplified, and its employment will make the fieldwork as simple as possible. Only a very brief explanation will make clear the proper procedure to follow in the field.

Let us assume that the areas of H, I and J are desired. While, of course, it is not exactly true that the curves at the intersection are always arcs of circles, they may be considered so for practical purposes, and very close results will be reached if proper averages are taken.

To compute these areas, the average radius and the internal angle must be determined. Since the ratio



ENTER THIS CURVE WITH AVERAGE OF LINEAR MEASUREMENT TO GET AVERAGE RADIUS

of T to E is the same as that of C to $2M$, as may be seen from the small diagram given with the curve, the one curve is all that is necessary. To determine, for instance, the area marked J, the procedure would be as follows:

$$\frac{T}{E}\ \frac{16.0}{5.5} = 2.91$$

$$\frac{C}{2M}\ \frac{23.8}{11.0} = 2.16$$

$$5.07$$

Average 2.53 equals "Ratio."

With this ratio, using the curve, $\frac{\ }{2} = 43°$

$$= 86°$$

Then

$$R = \frac{16.0}{tan\ 43} = \frac{16.0}{0.933} or\ 17.2$$

or

$$R = \frac{11.9}{sin\ 43} = \frac{11.9}{0.680} or\ 17.5$$

$$34.7$$

Average 17.35

Area inclosed by the tangents and the radii,

17.35 × 16.0 equals 277.5

Area of segment of circle, 86 360 × π ×

17.35² equals 226.0

J 51.5 sq.ft.

5.7 sq.yd.

If the curve is considered as a parabola, the area might have been calculated in the following manner, but it does not seem at all certain that the result is as near the actual value as is obtained by the method outlined above.

$$\text{Area} = 2 = M \left(\frac{\ }{4} + \frac{\ }{\ }\right)$$

$$\text{Area} = \frac{\ }{\ } \times \frac{\ }{\ } \times \frac{\ }{\ } = 41.1\ \text{sq.ft.}$$

$$J = 4.56\ \text{sq.yd.}$$

It may be seen that the first method is more likely to give a better result than the one based upon the curve being a parabola, because more measurements are utilized. However, either assumption will simplify the computation over the usual method.

Serious Fuel-Oil Situation May Affect Many Industries

Conservation of Oil Resources Now a Vital Need—Committee Outlines Plan and Appeals for Government Aid

A REPORT has just been completed by the committee recently appointed by Governor Stephens of California to make an investigation of the petroleum resources of that state, with particular regard to the industrial and military needs of state and nation in the present war emergency. The committee found that the oil production in California (whence comes one-third the entire supply of the United States and about one-quarter of the world's supply) is falling behind consumption at the rate of 35,860 bbl. per day. This excess of consumption over production is now being taken from oil in storage, and at the present rate the storage in California will be reduced to the 10,000,000-bbl. safety margin by Sept. 20, 1918. Should consumption increase or production decrease, both of which are likely unless immediate action is taken, the safety margin will be reached at an earlier date.

The seriousness of the situation is emphasized by the fact that considerable time is required to adapt power equipment for other sources of energy. It is pointed out in the report that fuel oil is largely used in the operation of the steam railroads of the Western States, the Panama Canal, steamship lines, cement plants, mines and smelters, gas plants, sugar refineries and, in general, a substantial portion of the manufacturing, industrial and agricultural enterprises of the Western States.

Consumption Exceeds Production

The oil production in California has not been increasing in recent years. In 1914 it was 103,620,000 bbl.; in 1915 it was 89,570,000 bbl.; and in 1916 it was 91,820,000 bbl. The production in 1917, indicated by the present conditions, would be about the same as last year. The report points out, moreover, that further substantial increases in the annual petroleum production cannot be expected through the discovery of new fields or large extensions of existing fields.

Throughout 1916 the consumption exceeded the production by an average of 1,100,000 bbl. per month, or 36,650 bbl. per day. During the first five months of 1917, consumption exceeded production by 5,415,000 bbl., or 35,860 bbl. per day. Of course, the storage has been reduced correspondingly. Although the total remaining storage on July 1, 1917, is reported to have been about 38,000,000 bbl., this would be reduced to a much lower figure if limited to available fuel oil, because a considerable percentage is light oil, is below tank outlets or is otherwise unavailable. The stored oil is owned principally by the Standard and Union oil companies.

The substitution of coal for fuel oil was considered in the investigation, and the conversion of steam railroads from oil to coal burners in regions adjacent to coal fields is touched upon in the report. However, apart from the changes already made or contemplated, there is little possibility of further conversion from oil to coal during the war, unless the conditions surrounding the production and transportation of coal materially change.

The substitution of hydro-electric energy has already taken place to a considerable extent in industrial and agricultural uses, but this has been hampered by difficulty in securing copper and other material and also by the disturbance of existing conditions that would be entailed by diverting large blocks of hydro-electric energy to service previously rendered by oil-burning plants. Large additional oil saving through the substitution of hydro-electric energy cannot be expected during the war, the report states; but after the war and the restoration of normal industrial conditions, wherever hydro-electric energy is available it will play an increasingly important part as a substitute for the fuel. Meantime, interconnecting the transmission systems of electric companies is suggested as a means of eliminating or at least reducing the necessity of maintaining steam-electric plants.

Relief Measures

The difficulties standing in the way of prompt and substantial increase of production must be quickly removed, the report states, if a serious industrial crisis is to be forestalled. The emergency cannot be met without the assistance of the Federal Government, and the report urged that California state officials make direct appeal to the administration at Washington.

While it is believed possible to increase production more than 30,000 bbl. per day, this increase cannot reasonably be expected to be available before June 1, 1918. To secure the best and most immediate results the committee recommends:

1. That production be increased immediately by additional drilling on the lands which can be developed in the least time with the smallest expenditure of material and labor.

2. That every effort be made to reduce field losses, to encourage the highest use of petroleum and its products and the substitution of other forms of fuel or power where possible.

3. That the Federal Government be promptly advised of the situation and asked to render every assistance possible.

4. That manufacturers of oil-well supplies and the railroads be directed to expedite the production and transportation of oil-well casing, drill stems, wire cables and similar material—bringing the influence of the Federal Government to bear, if necessary.

5. That all skilled workmen in the oil fields be exempted from military service.

6. That lands in litigation be developed either through the Federal receivers or through the claimants to the lands, with due regard to the rights of all parties. (In this connection it is notable that 70% of the desirable undrilled lands are involved in litigation with the Federal Government.)

7. That additional lands be thrown open for development by the Federal Government.

8. That steps be taken immediately to correlate the transportation facilities of the railroad, steamship, oil-pipe and oil companies, that transportation may be expedited, and

9. That as far as possible the burning of unrefined petroleum be prohibited.

The committee, which is officially known as the Committee on Petroleum of the State Council of Defense, consists of Max Thelen, president of the California Railroad Commission; Eliot Blackwelder, professor of geology, University of Illinois; and David M. Folsom, professor of mining engineering, Leland Stanford, Jr., University. The preliminary outline of the committee's report was telegraphed to Washington on July 7 by Governor Stephens, and a prompt acknowledgment was received by wire signed by President Wilson, expressing appreciation of the importance of the work and promising Federal support for the general plan.

Iowa's Traffic Census Includes Weight

A unique traffic census is being taken in Iowa. It includes actual weighing of vehicles on a farm scale set up over one-half the roadway. The purpose, according to the *Service Bulletin* of the Highway Commission, is to secure accurate data upon the number of vehicles using the roads; upon the relative proportions of travel between farm market traffic; the traffic between towns, classed as interurban traffic and tourist traffic; the relation between motor vehicles and team traffic; the character of the tires in use, and the actual tonnage transported. Ten-day tests will be made on important roads and will continue for three months. The relative importance of various roads, the amount of traffic roads of various characters will carry in varying types of weather and the proportions of various kinds are sought. Some indication will be adduced as to the apportionment of expense of first cost and maintenance to local, township, county, state and Federal agencies.

Six Months Allowed To Erect Large Concrete Warehouse

Five-Story Warehouse and Freight Station Covering Three Acres, Started in March, To Be Finished Next September

RAPID construction is a prominent feature of the $1,500,000 freight station and warehouse now being built for the Central Manufacturing District, of Chicago. The contract was let Mar. 1, 1917, and called for completion by Sept. 1. For this reason, the equipment and layout of the construction plant were worked out by the architects and the contractor in consultation, and certain structural features were designed to facilitate the arrangement of this plant and the carrying on of the work. S. Scott Joy is architect for the District, with John L. McConnell as assistant architect. The contractor is E. W. Sproul. Fig. 1 shows work in progress on June 1 and gives an idea of the size of the building.

Floors Are Flat-Slab Type

The building is 590 x 240 ft. It has a basement for machinery, a freight station on the first floor and five warehouse floors leased to Montgomery Ward & Co. It is divided into four units or blocks, 125 ft. wide, by transverse 30-ft. light courts, but the units are connected by bridges at the center line of the building. This is shown by Fig. 2. The design is of reinforced-concrete throughout, with floors of the flat-slab type. The walls are of pressed brick with terra-cotta trimmings.

The concreting outfit is the principal feature of the plant, and its arrangement is shown in Figs. 2 and 3. Sand and stone are brought in by bottom-dump railway cars on a track on the first-floor level, the materials being dumped into bins in the basement. The storage capacity here is 400 yd. of stone and 200 yd. of sand. Excess material is stored in stockpiles in the open yard (as much as 75,000 yd. at times) and loaded into cars as required (for transfer to the bins) by a derrick car with grab bucket. Cement (in sacks) is delivered by cars and is stored in a shed on the first floor.

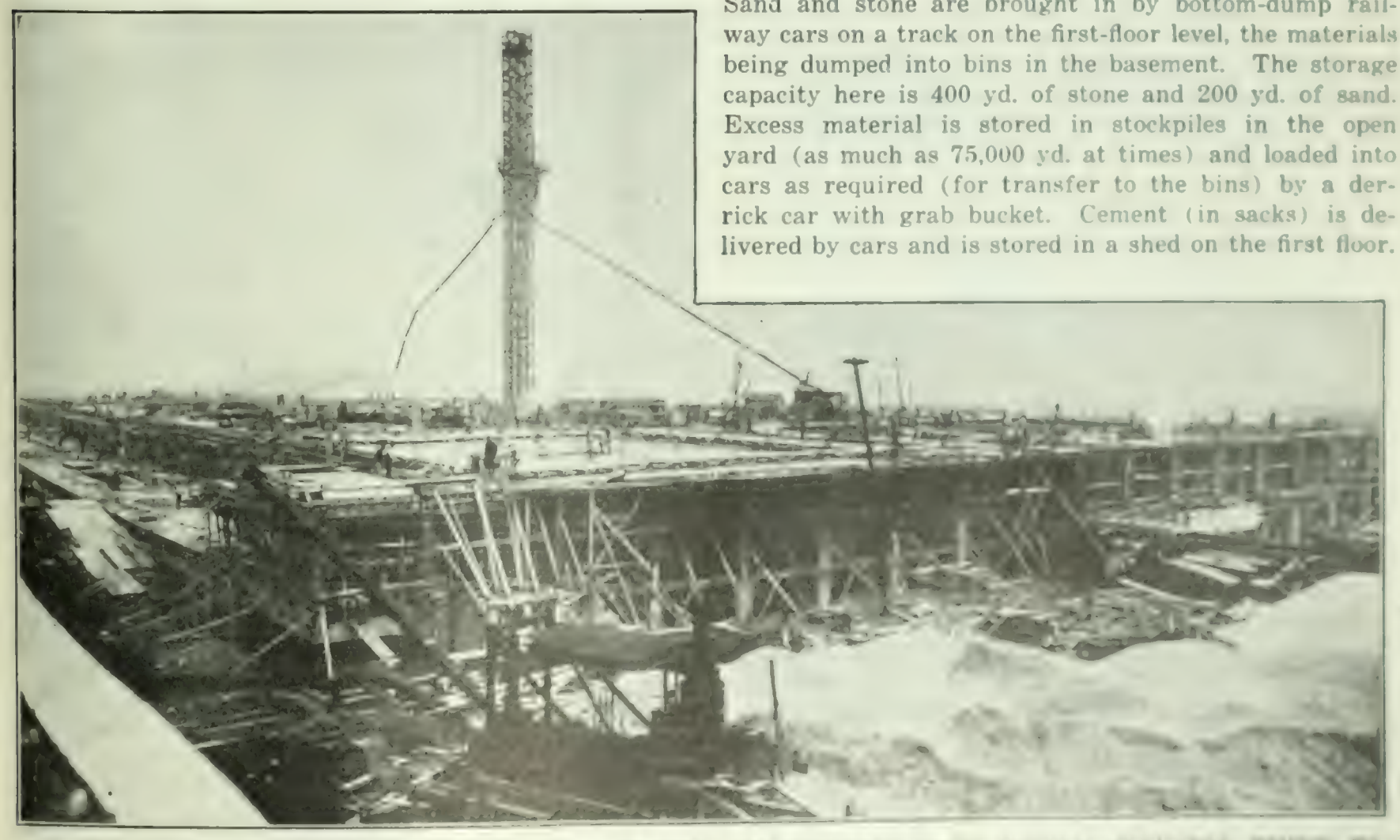


FIG. 1. CONCRETING THIS HUGE WAREHOUSE IS DONE BY HOISTING [illegible] ELEVATOR TOWER TO FLOOR HOPPERS AND CHUTES

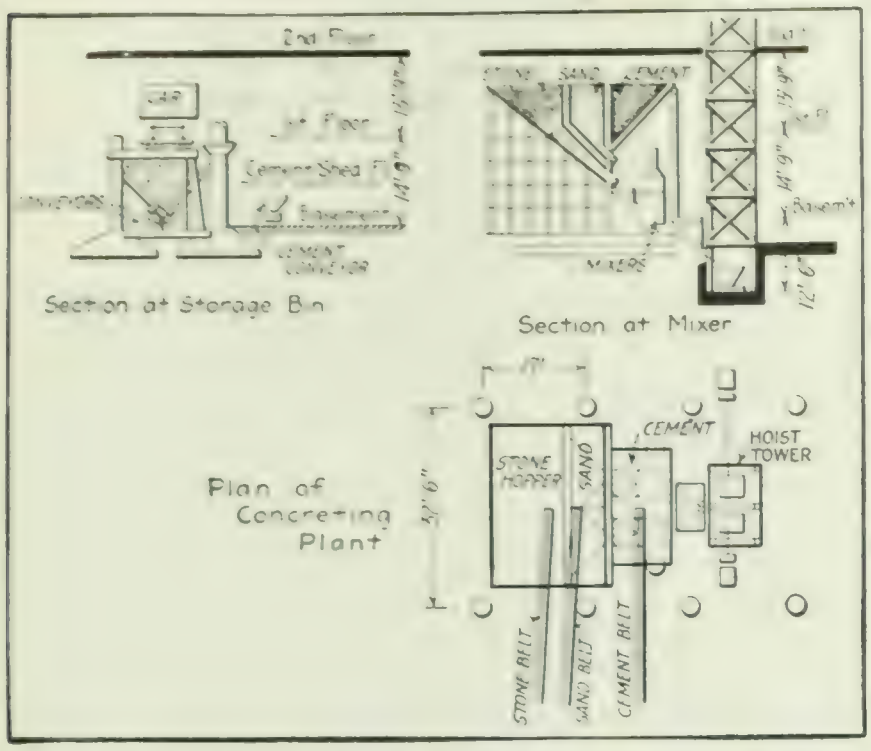


FIG. 3. ELEVATION AND PLAN OF CONCRETING PLANT

Two parallel 36-in. belt conveyors, 150 ft. long, extend under the bins, one for stone and the other for sand. Their ends are inclined so as to deliver the materials to the 50-yd. feed hoppers just below the second-floor level (Fig. 3). A third conveyor (on the first floor) extends from the concrete shed to a third feed hopper. The bags are opened at the shed and the cement dumped through a hopper onto the belt. The conveyor is inclosed to protect the cement from the weather.

From the three feed hoppers the materials are fed to an automatic measuring hopper. This discharges the batch into two 1-yd. Milwaukee mixers in the basement. Each mixer delivers the concrete into a 1-yd. bucket working in a double elevator tower having a height of 185 ft. above the first floor. The concreting plant and tower are located at the center of the site, as shown. Cables from the top of the tower carry two lines of steel spouting. This spouting and the concrete hoppers in the tower were raised as the work progressed. This plant makes and places from 900 to 1000 yd. of concrete per day.

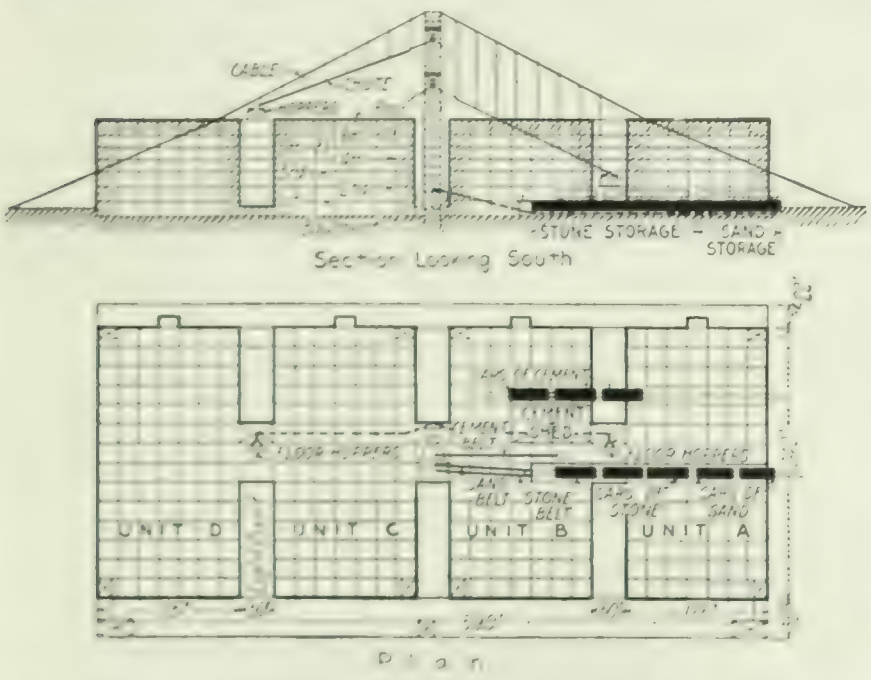


FIG. 5. ARRANGEMENT OF CONVEYORS AND HOPPERS TO SERVE PLANT WITH TWO CONCRETE MIXERS

The spouts deliver to two floor hoppers, from which the concrete is discharged through gates into ½-yd. wheeled carts or buggies. For some of the outlying work there are two small (½-yd.) portable mixers (one steam and one gasoline), as it does not pay to haul the concrete far in the buggies. These mixers were used also for the footings and other parts of the earlier work before the installation of the main plant.

All form work is of wood, except that sheet steel is used for the column forms. In order to enable the second floor to be built before the first floor was hard enough to carry shoring, the upper forms were supported on wood trusses seated on the concrete beams between the columns. This detail is shown in Fig. 4. A wood-working shop and bar-bending outfit facilitate the work.

The concrete is a 1:2:4 mix, except that for the lower columns it is 1:1:2. To make the basement water-tight Ceresit is added to the concrete, and a coating of tar is applied to the outside of the walls.

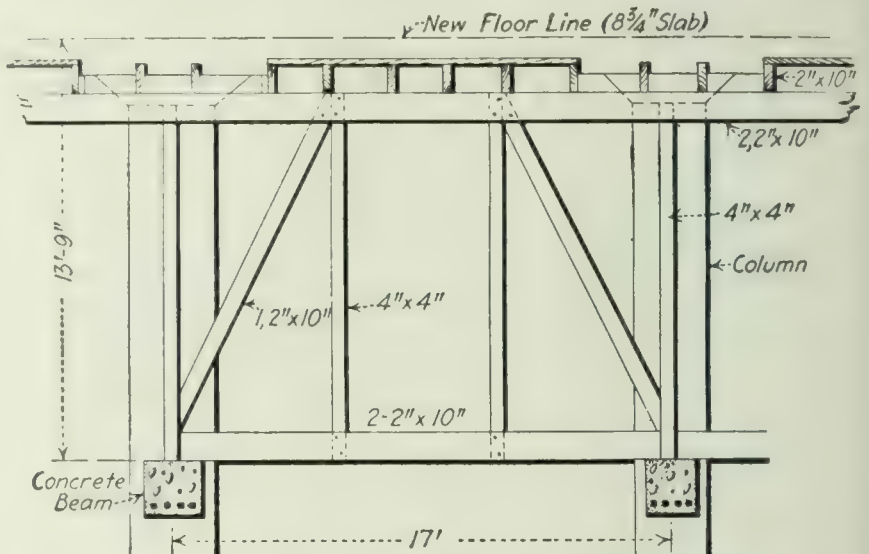


FIG. 4. FORMS OF UPPER FLOOR ARE CARRIED BY TRUSSES SEATED ON CONCRETE BEAMS

The site is partly on solid ground and partly on filled land alongside the old Bubbly creek. For this reason the outside column footings near the creek are tied back to the next row of columns. The foundations are mainly groups of Raymond concrete piles. For the heavily loaded columns of the tower, concrete piers 4 ft. in diameter are carried down to hardpan at a depth of 50 feet.

Excavating for the column footings would have been slow work, so the entire area was graded down to the basement level by steam shovels. This enabled part of the space below the first floor to be utilized for the storage of concrete materials and for the concreting plant, as described. Later the space up to the first-floor level (except the basement for machinery, etc.) will be filled with sand brought in by trains.

The Automobile and Roadbuilding

In 1916 there were 3,513,000 automobiles and 251,000 motorcycles registered in this country, according to the United States Office of Public Roads. The revenue they yielded in the form of licenses and registration fees was $25,865,000. The revenue had increased 42% over that for 1915, and the number of cars and motorcycles had increased 43%. About 92% of the revenue was spent on road improvements of some kind.

Dewatering Activated Sludge at Urbana Sewage Station

Rotary Filter and Specially Designed Centrifuge Among Devices Tried—Centrifuge Gave 88% Moisture Sludge

MANY DEVICES for dewatering sludge produced in the activated-sludge experiments conducted at the Sewage Experiment Station of the Illinois State Water Survey at the University of Illinois have been tested. A review of the tests was given in a paper by Prof. Edward Bartow, director of the survey, read last June before the American Institute of Chemical Engineers, at Buffalo, New York.

Drying on sand beds proved unsuccessful, even when the beds were constructed with great care and covered with canvas on a frame as protection against rain. A filter press with leaves 8½ in. square has not given a cake of good consistency, but is being tested further.

Rotary Filter with Filtros Plates

A rotary filter was tested. This is described in the paper as follows:

"Through the courtesy of the Koering Cyaniding Co., Detroit, a rotary filter was placed at our disposal. This style of filter is used satisfactorily in filtering slimes in extracting gold and silver by the cyaniding process. The apparatus consists of a cylinder of filtros plates supported on a perforated steel cylinder, outside of which at a distance of about 1 in. is a solid-steel outer shell. The material to be filtered is forced into the interior of the cylinder of filtros plates, the cylinder is revolved, and a cake of sludge is built up on the inside of the plates. The liquid filters through the plates into the space between the cylinders. Air pressure can be exerted from the interior to dry the cake, and from the exterior to loosen it. The plates can be cleaned by back-flushing with water. The first trial with a comparatively heavy and not very fresh sludge did not give satisfactory results. The quick-opening door could not stand the pressure. Another trial will be given as soon as the door can be replaced."

Specially Designed Centrifuge

Various centrifuges of basket and bowl types were tested. The description of one of these follows:

"A specially designed centrifuge was purchased from the Tolhurst Machine Works, of Troy, N. Y. This machine is 12 in. in diameter, 9½ in. high and at a speed of 1800 r.p.m. exerts a centrifugal force of 550 lb. The machine can be filled in 12 min., using sludge of about 99% moisture. Approximately 25 gal. of the sludge are added and 10 lb. of sludge cake obtained. The sludge cake contains about 88% moisture. The space underneath the rim contains 0.158 cu.ft. Owing to the small size of the machine and to the fact that the material must be scraped out, the time of cleaning is longer than would be required for a larger machine with an opening in the bottom, so that a large machine could undoubtedly have been filled and emptied more rapidly than the small laboratory machine.

"We have found it entirely possible to fill and empty the small machine twice in one hour. Calculating that the same rate could be used with a 40-in. machine having 46 times the capacity, we could obtain in each filling 460 lb. of sludge of 88% moisture, equivalent of 55 lb. of dry material. One 40-in. machine would, therefore, deliver the equivalent of 1100 lb. of dry material in a working day of 10 hours. On the supposition that one-half ton of dry material will be obtained from 1,000,000 gal. of sewage, one machine would easily dewater the sludge from 1,000,000 gal. of sewage per day. The cost of the 40-in. machine at present is only $750, and the power to run it is small enough to make the process appear practical for preparing sludge cake for a drier.

"The actual cost of dewatering will depend upon the amount of water that can be removed by the centrifuge, the size of drier and the amount of coal required for removing the residual water. It is hoped that these figures will be available in the near future."

Filtros Plates Made Best Showing in Air-Diffuser Tests

Competitors Were Basswood Plates and Perforated Pipe—Tests by Illinois State Water Survey at Urbana

PARALLEL tests of air diffusers for the activated-sludge process of sewage treatment have been made at the Sewage Experiment Station of the Illinois State Water Survey at the University of Illinois and were reported at the Buffalo meeting of the American Institute of Chemical Engineers, June 20, by Prof. Edward Bartow, director of the survey. The tests were made in four concrete activated-sludge tanks, each 3 ft. 2 in. square and 8 ft. deep, having a capacity of 350 gal. of sewage per filling.

In the bottom of each of two of the tanks were placed three filtros plates. In one tank the filtros plates were rated as "fine," and in the other they were rated as "coarse." The fine plates on a dry rating passed 5.8 cu.ft. of air per minute per square foot under a water pressure of 2 in., and the coarse plates under the same conditions passed 12 cu.ft. The wooden blocks were ½ in. thick, 6 in. long and 2¼ in. wide. These blocks filled a space 1 ft. $3\frac{9}{16}$ in. by 2 ft. 3 in. in plan, the blocks being set in a cast-iron frame so shaped that the blocks were on a curve, so that in swelling they would wedge themselves more firmly into position. The pipe diffuser had perforations $\frac{1}{32}$ in. in diameter, 2 in. apart, set at an angle of 45° from the top of the pipe. There were about 40 holes in the pipe grid, or four per square foot of surface area.

The tanks were operated during three periods of 15, 20 and 35 days. The air was measured by gas meters, the same amount of air was delivered to each tank and all the other conditions were maintained as nearly identical as possible. The tests are thus summarized by Professor Bartow: "The results obtained from these comparative tests indicate the superiority of filtros plates and air diffusers over perforated pipes such as were used in our tests under the conditions mentioned. The wooden blocks were difficult to handle, though this was caused in part by the faulty design of our containers. Even in the time they were used there was

evidence of considerable deterioration. From the results obtained we could distinguish little, if any, difference between the coarse and fine grades of filtros plates. With air free from dust and oil, there should be little trouble experienced from clogging of plates."

From sources outside the paper by Professor Bartow we learn that the wood plates latterly used at Milwaukee by Carl H. Nordell in tests carried out by him under the direction of T. Chalkley Hatton were creosoted, and that this and other improvements obviated some of the difficulties experienced at Urbana.

Convict Labor Proves Effective on California Roads

Difficult Construction in Rough Territory Done at Low Cost—Camps Increased to 100 Men Without Armed Guards

CONVICT LABOR has been entirely successful in California, according to Charles F. Stern, state highway commissioner, who, in an address before the League of California Municipalities, recently described the work being done. It has taken some time to effect the necessary legislation and try out the various means of carrying out the idea, stated Mr. Stern, but the system as now in use is believed to be as effective as could be desired.

At the outset there was a division of opinion as to whether the honor system or armed guard should be adopted. The honor system was finally decided upon, and the first camp established in Mendocino County in 1915 had only three representatives of the prison authorities, all unarmed. This camp was described in the *Engineering Record* of Feb. 19, 1916. After the success of this first unit was demonstrated, the camp was increased to 100 men.

A 33-mile section of mountain road has just been opened to traffic in the northern part of Mendocino County. The work on this section was extremely difficult, and the engineers' estimates on cost ranged from $335,000 to $400,000. The actual cost of constructing it by convict labor was about $200,000, and it was completed in two years' less time than was considered feasible under any other system.

In the course of this work about 200,000 cu.yd. of material, averaging more than 50% rock, was moved at a cost of about 40c. per cu.yd. This is little more than half what similar work has cost under contract in the same locality. Included in these cost figures are all items of expense incidental to employing convict labor, such as supplying the men with clothing, transportation, food, camp equipment and medical attention.

Since this first camp was established in the northern part of the state, four others have been opened on difficult roadwork in the Sierra Nevadas. The men are practically free of restraint and are treated on and off duty like free men. Mr. Stern believes that "unquestionably this system, sanely and sympathetically handled, means the building of many hundreds of miles of roads that could not otherwise be built, at a saving of many thousands of dollars in the cost of construction."

Imperfect Washing of Filter Causes Aftergrowths

The Exact Reason for This Action Is Not Certain but Indications Point to Accumulation of Sand in the Underdrains

AFTERGROWTHS in the Akron (Ohio) filters were caused by an abnormal growth of crustaceans which the filters could not remove entirely. They were also entangled in the alum "floc" and were carried to the bottom of the coagulating basins, where they died and formed a food supply for bacteria. The same condition existed in the filters. "An examination," says J. S. Gettrust, chemist, in the last annual report of the Water Department, "showed that all the Crustacea were not removed by the washing process and that some of them became attached to the sand grains and remained in the sand bed, where the bacteria thrived on the food supplied by their bodies. By the use of liquid chlorine the bacteria in the filtered water were easily reduced in numbers so that a very good effluent was obtained.

With regard to the filter underdrain efficiency, he states as follows:

Laborers May Have Disturbed Gravel

"In the corners and in some places along the sides of the filters the sand does not wash perfectly and there is a tendency for it to pile up at these places. The exact cause of this imperfect washing has not been determined. It may be caused by sand in the underdrains, which has been washed to the corners of the underdrains during the washing process. The gravel layer may have been disturbed by the laborers in walking over the gravel at the time it was put in place. The gravel may have been disturbed by accumulations of air in the filters which, if forced through the gravel during the washing process, could destroy its even distribution. In the operation of the plant every precaution has been taken to avoid this. The displacement of the gravel would allow sand to work down into the underdrains. The concrete ledge around the sides of the filters, which is formed by the top of the pyramids, may have a tendency to cause this behavior of the sand along the sides and in the corners. If the wash water is not applied with a uniform pressure under the openings in the pyramids, there would be a tendency for the sand to behave as has been observed in the filters.

"The hydraulic valve on the wash-water line, which operated automatically to maintain a constant pressure in the wash-water supply to the filters, gave trouble during the first part of the year. The use of this automatic arrangement was discontinued and the pressure of the wash water to the filters was controlled by throttling a bypass valve around the automatic valve. This arrangement gives very satisfactory results."

Results of the operation of the filter reduced the bacterial count from 1827 in the raw water to 34 in the effluent, but it was observed during the year that there was a great difference in the sanitary quality of the water from certain taps in the city. Investigation pointed to contamination from industrial connections. This was prevented by placing duplicate check valves on the factory side of the meter.

Concrete Dam 17 Feet High Has Automatic Flood Gates

Concrete for Cedar River Structure at Nashua, Iowa Placed in Cofferdam from Trestle— Floods Complicate Work

By C. W. Older
Superintendent of Construction

IN BUILDING a 17-ft. concrete dam for a hydro-electric plant on the Cedar River at Nashua, Iowa, some interesting construction methods were employed. The dam is equipped with a number of automatic flood gates,



DAM AT NASHUA, IOWA, HAS 7 x 46-FT. FLOOD GATES

or movable dams, each 46 ft. long and holding back a maximum of 7 ft. of water.

The contract was let and work commenced when the spring floods subsided sufficiently to start the cofferdam. This was hand construction, built out from the shore. The filling followed close to the sheeting progress, so it was secured at all times against accident by high water.

Difficult To Keep Water from Cofferdam

The condition at the bottom of the river was such that it made it very difficult to keep the water out of the cofferdam. Boulders and gravel covered the river bed, and the distance to bedrock below the river bed varied from 4 to 20 ft., sloping from both banks to mid-channel. This condition could not be determined before excavation, as all testing rods stopped on boulders or shattered ledges at about the same elevation. When bedrock was uncovered, it was found to contain fissures through which flowed "well water" that was taken care of with pumps. This broken ledge had to be penetrated to the solid rock and a heavy footing of concrete built.

In locating the cofferdam, it was necessary to find a natural cutoff, as on a sand bar. Then by putting in a well-ballasted crib, all water was shut out except that which came in through the rock ledge. The ballast was essential, as Cedar River is subject to frequent floods; and at such times the current is very swift.

When the floods subsided, the undamaged cofferdam was still there and only required pumping out to allow operations to continue. When bedrock was exposed, it remained to wash and wire-brush it thoroughly to allow a perfect adhesion with the concrete. Because of the "well water," tile weepers were installed where the veins were the largest, to prevent possible heave. A thin layer of grout was spread over the rock and worked well into all irregularities before the regular concrete was put in. This made a first-class water seal, which subsequent tests proved to be perfectly satisfactory.

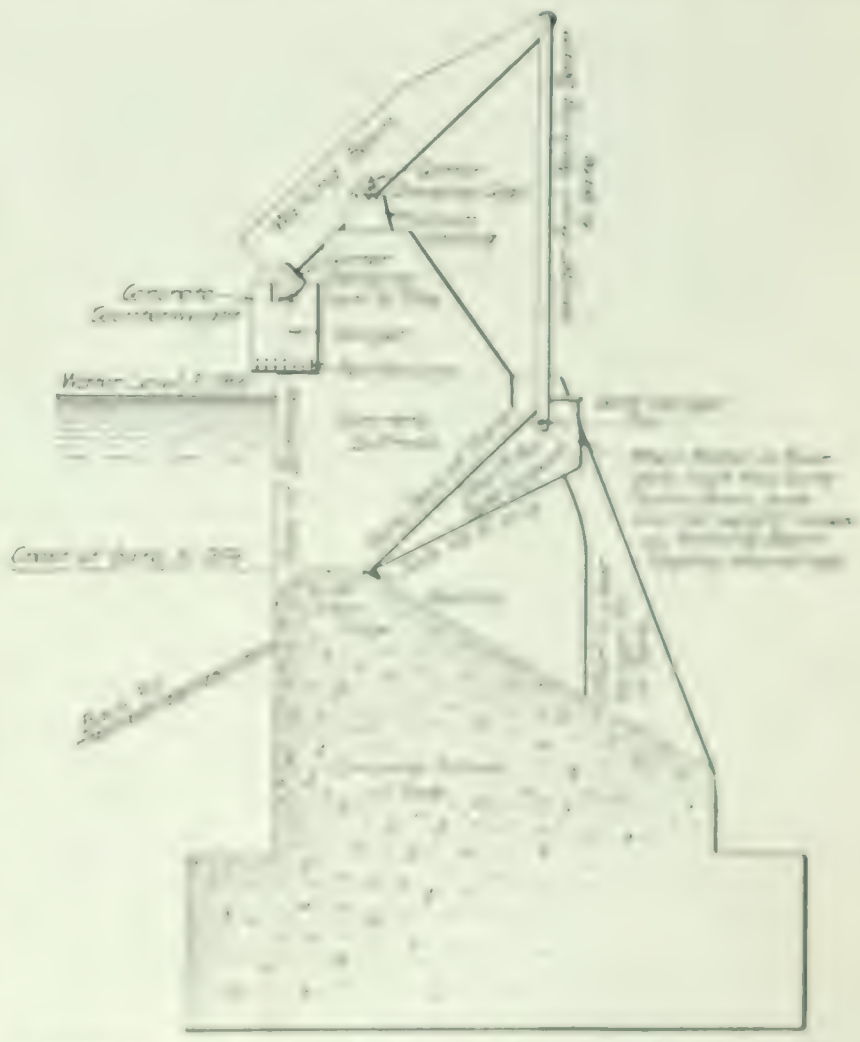
Concrete Placed from Trestle

The concrete was all placed by the trestle system. The mixer was installed on the bank and a double-track trestle built to reach all parts of the job. An endless cable, on a hoisting drum, was run continually. Each concrete car was provided with a grip and brake. An operator rode with each car; and as the mixer dumped directly into it, there was no time lost, for a car was always in readiness to take the batch as soon as mixed. Chutes were hung to the trestle wherever required, so very little labor was needed in placing. Large "keys" were left in the top of each run, and in each key anchor rods were inserted for safety.

The footings did not require much formwork, a curb on the downstream side being sufficient. The concrete upstream ran directly into the rock. The downstream side was cut down with a clearance of 35 ft. to provide for a concrete apron 3 ft. thick, to prevent wash by the water over the flood gates. This apron was then loaded with large rocks up to the natural river bed. It was also provided with weepers at frequent intervals.

In the rollway section, the exterior shoring was not used to any great extent, but the forms were well tied together with No. 8 black wire attached to wales on the outside. By turning these up against a gage stick, the form, when full, held to an exact line.

Because of possible floods, the amount of exposed form was always kept as small as possible. This was



WALL FOR DEAD-END COUNTERWEIGHT GATES PLACED LATE WHEN RIVER WALLS

accomplished by building the dam mostly in vertical sections. Expansion joints were allowed between some of these, with an ingot-iron cutoff. The joints were filled with ½-in. fiber, which was applied with an adhesive paste. The fresh concrete running to this made a water-tight expansion joint. About two-thirds of the dam was built in this way, leaving the rest of the channel open for the river.

To build the remaining part of the dam required diverting the river. For this purpose temporary openings were left in the rollway. These were later cut off with stop-logs and filled with concrete, which was accomplished with very little difficulty. Bearing strips for these logs were bolted to the upstream side and built out 2 ft., with a concrete sill 2½ ft. wide at the bottom of the opening on which to rest the stop-logs. This made the clearance between the stop-logs and concrete line ample for the form and wales. These were backed up with sand, making them nearly water-tight. Pipe weepers were inserted in the bottom, which took care of the seepage, the pipe entrance being between the form and the stop-logs. After the form was filled, a few batches of concrete dropped into this interval shut it off completely.

Design and Installation of Flood Gates

The installation of the flood gate is worthy of comment, because this particular type is new to this country. It was imported from Switzerland by the Fargo Engineering Co., and service has already proved its value. It is simply a walking-beam with a gate hung at one end and a concrete counterweight hung at the other. The gate is hinged at the bottom. When the water rises above the required elevation, the gate turns down, which in turn raises the counterweight. The higher the water the farther it opens the gate. When the gate opens, the leverage between the counterweight and fulcrum increases and that between the gate hinges and fulcrum decreases, thereby overcoming the increased weight of water at every stage of gate opening. Gravity and constantly shifting leverage are its features. The gate is of steel and was entirely fabricated and set before grouting in.

To prevent freezing during construction (the weather being cold), a double form was used and live steam turned in through a pipe, the whole being covered with straw. Setting this concrete with live steam made it extra solid, so a stone-dressing tool made slow impression on it.

Leather Bearings Prevent Leakage

Creosoted plank was used for decking, well bolted on. Leaking around the ends was prevented by a leather bearing on the concrete. A leather bearing on a curved plate prevented leakage over the hinge where the gate fastened to the rollway.

The counterweight was formed and poured in place, being shored up from the crest of the dam.

The power house is built into the dam at one end. It contains four waterwheels, each directly connected to a horizontal generator developing about 900 horsepower.

The building of the power house required much solid rock excavation, some of which had to go deep to provide for the draft tubes. These required large horn-shaped forms, which were made of segments with 1 x 1-in. strips attached securely and as regularly as possible. The whole was then covered with sheet iron to give a smooth surface to the inside of the finished tube. The forms were built on shore and hauled down with a large stoneboat. They were hoisted into place with a gin pole, then shored, weighted and concreted. The penstock walls were then set on the foundation. When this was done, the wheels were set on the top of the draft tube and grouted in. The main floor that supports the generators is composed of beams and panels of reinforced concrete, with a maximum thickness of 2½ ft.

The dam was built by the H. A. Maine Co., Waterloo, Iowa, for the Cedar Valley Electric Co., Charles City, Iowa.

Approximate Methods Desirable for Arch Design

Properly Applied, It Is Contended That They Will Give Results Conforming Closely to Full Elastic Analysis

By Joel B. Cox
County Engineer, Wailuku, Maui, T. H.

THE elastic theory when applied to arches with fixed ends is not only time-consuming, but is essentially a method of analysis and not directly of design. Hence there is a real need for satisfactory formulas or methods for determining approximately the crown thickness and the proper form of the arch ring. It is necessary in order to determine the stresses to assume the dimensions of the arch rib. Experience must be the main guide in this primary assumption, and the designer has two classes of aids:

1. *Empirical formulas,* which are crystallized expressions of past experience;

2. *Approximate methods,* by which crown thrusts and lines of pressure may be determined.

Formulas of the first class are the modern representatives of the experimental proportions which probably guided the ancient arch builders. Methods of the second class are an outgrowth of the line of pressure theories developed for voussoir arches, and are an improvement over class 1, principally in that a greater range of conditions can be considered, and that more particulars of the form of the arch can be determined by their use.

Procedure in Design of Arch Ring

In the *Engineering News* of Nov. 9, 1916, page 880, Joseph P. Schwada presents formulas for the thrust T and the depth d at the crown in terms of a coefficient K representing the ratio between the average crown stress and the maximum stress in the arch. The writer has derived the following equation for the thrust, based upon the assumptions used by Mr. Schwada, but using the general formulas derived by C. Tourtay in 1902. In Mr. Schwada's notation:

$$T = \frac{L^2}{R - d}\left(\frac{B + w}{8} + 2.28R + 17.61d + 15F\right)$$

This equation gives slightly lower values than Mr. Schwada's equation, all terms being identical except

those in the parenthesis containing R and d. The depth at crown is

$$d = \frac{T}{144fK}$$

Mr. Schwada presents a valuable series of diagrams and tables for the value of the coefficient K, and for the solution of his equations.

The process of the design of an arch ring is then as follows:

1. Tabulate the general conditions which can be at once determined or assumed, and the known factors such as span, rise, loads, etc.

2. Make a rough assumption of the crown and springing line thickness (possibly using a formula of class 1).

3. Compute the value of thrust T, and if necessary correct the assumed crown thickness.

4. Construct a line of pressure with horizontal thrust (pole distance in the force polygon) equal to T.

5. Choose a value for K which will suit the type, the rise, and the span of the arch, and compute the value of the crown thickness d.

6. Choose a curve for the arch axis which will fit the line of pressure constructed as in 4.

7. Vary the thickness of the arch and place the reinforcement in accordance with the thrusts shown in the force diagram, but making proper allowance for the effects of moving loads and temperature.

8. Analyze the arch thus determined by the elastic method.

It will be found that a very close approximation to the best design is determined by the first seven steps, and only minor changes may be expected from the full elastic analysis, while the labor is far less than a preliminary analysis by the elastic method.

In this way, although the elastic analysis of concrete and reinforced-concrete arches is usually assumed to be the only satisfactory basis for design, and so may be thought to have superseded the older methods of formulas and lines of pressure, the very fact of its growing use has called for a revival and improvement of the approximate methods as aids and time savers to be used in conjunction with the modern analysis.

Sanitary Patrolmen in Cleveland

Since July 1, Cleveland, Ohio, has had 25 patrolmen at $1400 a year and a sergeant at $1500 a year engaged in sanitary-patrol duty. The charge is to be against the Police Department appropriation. This will be a continuation of work started in September, 1916, by the Health Department, which since that date has employed eight sanitary patrolmen acting under a sergeant (the latter assigned from the police force). These nine men were put to work in the most congested sections of the city, specializing on alley conditions and giving particular attention to the installation of receptacles for garbage. Up to June 1, garbage receptacles with a total capacity of 316,810 gal. were installed, or receptacles for 31,681 families. In addition, 734 manure boxes were removed to the premises of the owners and made fly-tight with good covers. The work thus far has covered an area of about 10 square miles. With the increased force on July 1, it is expected to expand the service rapidly.

SOCIETY SERVICE

A Section Dealing with the Results of Teamwork by Technical Men

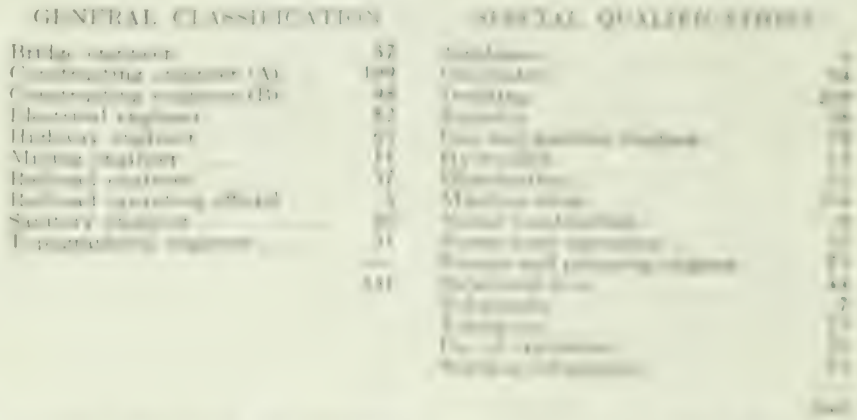
How the Classification of Engineers Was Done in Rhode Island

Robert W. Adams, president of the Providence Engineering Society, contributes the following live account of the classification of engineers in Rhode Island:

Early in the year, when it became evident that suitable provisions should be made for the mobilization of all resources which could be used to advantage for the preservation of our welfare, a group of public-spirited citizens called together at the order of Governor Beekman organized the Rhode Island Committee of Public Safety, Feb. 23, 1917. The officers of the Providence Engineering Society had previously recognized the important assistance that the engineers could render in any crisis and had volunteered its services to the governor; as a result the writer was appointed a member of the Public Safety Committee. A classification of engineers throughout the state, according to special qualifications for either military or auxiliary civilian work was at once undertaken.

For a list of engineers, the mailing list and prospect list of the Providence Engineering Society were used as a basis. This list was enlarged by consultation with public service corporations and other organizations, so that the final result was a list of over 900 names of men connected with engineering work throughout the state.

To these men were mailed classification blanks, together with a suitable explanatory letter and a stamped return envelope. Over 500 replies were returned properly filled out, indicating a very general interest and willingness to be of service. The replies were tabulated as below, (1) in accordance with the enrollment blank for commissions in the Engineer Officers' Reserve



Corps, and (2) by special qualifications. The duplications in the second list are due to the fact that the training of nearly every engineer includes certain fundamentals, such as drafting and familiarity with machine work.

The original classification blanks have been bound in alphabetical order for future reference and the committee now has at its disposal very complete information with reference to the engineering resources of the state; while in addition the Providence Engineering Society has available a great deal of data with reference

to engineers which will enable it to arrange its future program so as to be of the greatest value and interest to the engineers within its influence.

It has been particularly interesting to note the engineers of remarkable talent and experience in certain specialized lines, who have never taken a great interest in work of a public nature and who can be of the greatest inspiration and value to their associates if they become interested in the engineering society and secure the prominence in its discussions to which their experience entitles them. The spirit of coöperation developed by the investigation will be to the advantage of engineers throughout the state. Incidentally, the Providence Engineering Society is in a stronger position than ever before and its patriotic activities have been publicly acknowledged by both the Mayor of Providence and the Governor of the State.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Picture Language Is Required for Concrete Patent Suit

Sir—In *Engineering News* of Oct. 5, 1916, the writer gave an account of a patent decision against Frederick Melber, who had sued the School Board and the contractor and the architect of the Schenley High School for infringement of his patent on reinforced-concrete design. The case was decided against the patentee. This case was carried to the United States Circuit Court of Appeals for the Third Circuit and argued before that court in its March term. The decree of the lower court was affirmed in a decision handed down recently. The case was heard before Circuit Judges Buffington, Wooley and McPherson, and the opinion was written by the last named.

This case is interesting, not because there was ever ground, from an engineer's standpoint, for belief that the patents were either valid or infringed, but because there was confidence enough somewhere not only to finance a suit, but also to finance an appeal. The case is also interesting because of the nature of some of the arguments set forth by the complainant in his brief.

Part of Melber's patent was on a retaining wall consisting of vertical and horizontal slabs connected with ribs or counterforts. This shape of reinforced-concrete retaining wall had been patented many years before, and models had been tested and the tests made public as early as 1894. The remaining claims of his patent called for ordinary tension and compression reinforcement and included therewith a lot of disjointed shear rods. In a redesign of the Schenley High School the writer had eliminated many tons of loose shear rods; not a shear rod was used in the entire building. Main reinforcing rods were bent up toward the support to act in tension and by so doing relieve the concrete of what would otherwise be shear.

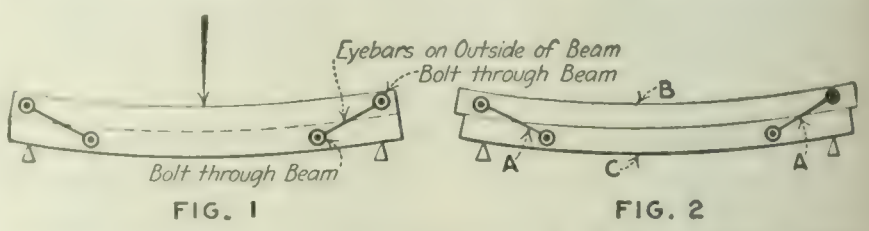
Some of the principal arguments in the case center about what is called Defendant's Exhibit *Y*. Owing to the bearing that the question has on reinforced-concrete design, the writer believes that both Melber's argument and the writer's device to combat the same will be of interest to the profession.

The accompanying sketch (Exhibit *Y*) is one made by the writer to illustrate before the court why bars *A* are in tension and not in shear (as claimed by Melber) and are therefore tension bars and not designed for shear, though they relieve the concrete beam of what would be shear in the concrete if the rods were absent. Engineers will understand how two beams *B* and *C*, if joined together by bars *A*, will, when loaded, give tension in the bars *A*. They will also see that these bars will be in tension, though they take up what would be horizontal *shear* between beams *B* and *C;* also, they carry the shear of the beam to the support. Laymen can also see this.

The writer believed that engineers and laymen would be able to see that the corresponding bars of the whole beam of Fig. 1 would also be in tension—he believed this until he read Mr. Melber's argument.

To quote from that argument: "Godfrey assumes that when the bending force is applied in both figures in the sketch, the eye-bars *A* are in diagonal tension. This is a complete error. In the case of Fig. 1, where there is no longitudinal separation between the upper and lower portions of the girder or beam, the upper portion or zone of the girder is shortened by the deflection, thus bringing the upper pivot bolts of the eye-bars closer together, while the lower portion or zone is elongated, thus spreading apart the lower pivot bolts of the eye-bars. Thus the two ends of each of the eye-bars *A* are forced toward each other, the eye-bars tending toward a vertical position, thus shortening said eye-bars. Thus, there is no *tension*, which would be merely an elongating strain or pull, but there is simply *compression* exerted on said eye-bars, tending to shorten them.

"Looking at Fig. 2, if it be theoretically assumed that the elements *B* and *C* fit together perfectly and uniformly, with mathematical or ideal contact surfaces—as is never attained in practice in timber—then somewhat



COURT EXHIBIT TO PROVE TENSION IN INCLINED RODS IN CONCRETE BEAM

the same result as above explained would occur in bending: Only to a lesser degree, owing to the free movement between the elements. However, there would be no *tension* at all. . . ."

To refute the arguments the writer prepared a model to be used before the Court of Appeals. A stick of wood about 1½ x 1 in. and 5 ft. long was used. On one side two mandolin strings were stretched in positions corresponding to eye-bars *A*. On the other side a continuous wire was stretched from end to end of beam, passing over screw-eyes at the third points of beam, to represent a bent-up-and-anchored tension rod.

The demonstration consisted in first taking the tone of the wire, with the beam laid across two books as supports and not loaded, then forcing down the middle

of the beam and taking the tone again. The tone rose very appreciably in all wires, proving conclusively that tension on rods in these positions will result from the loading of a beam. It is inconceivable that any tension could have been observed if the wires had been vertically placed to correspond with stirrups.

No further appeal can be made in this case, so that another menace is removed; and builders, who never heard of an obscure patentee and who would have purposely avoided the things laid down in his patent as essential, if they had seen the patent, will have just that much more freedom from annoyance and expense.

Pittsburgh, Penn. EDWARD GODFREY.

As Another Member Sees the American Water-Works Association

Sir—In view of the developments at the recent convention of the American Water-Works Association at Richmond, the beneficiaries of what has been termed "rotten politics" will probably not care to retain office secured under such conditions.

Broad-minded men with high ideals do not approve of underhanded work and would refuse to accept office where it was used in their behalf. Sometimes, a man is led into a scheme without realizing just what it means. That may have been the case in the recent election; if so, resignations will be promptly tendered.

Assuming that resignations will be tendered, President Leisen (whose election was legitimate, as was also that of Mr. Little), could call for a special election. The newly elected Executive Committee could then make appointments.

For the good of the society, this matter should be followed up with a thorough investigation.

Publicity is a good thing, and *Engineering News-Record* is to be commended for its course. Men who have not done anything to be ashamed of do not object to having the light turned on.

DOW R. GWINN,
President, The Terre Haute Water-Works Co.
Terre Haute, Ind.

Women Draftsmen

Sir—I have read with interest the articles appearing for the past few weeks on the subject of replacing male draftsmen with women, and have remained silent even though I was tempted by Mr. Webb's contribution to burst into song. The spasm passed; but upon reading the paragraphs on page 82 of your issue of July 12, it comes again with renewed vigor.

Agreeing perfectly with the expressed opinion of the anonymous gentleman from Kansas City in so far as his observation touches upon the actual subject of discussion, I must nevertheless take issue with him in the matter of the qualifications of Messrs. Webb and Newell, whom I do not know. It appears to me that Mr. Webb is thoroughly conversant with his subject. Adding his bit to the excellent remarks of Mr. Newell, he proceeded to show that it is the experience of actual practice that, even though draftsmen be required to be technical graduates before they are considered for employment (although it was not until Kansas City came to the front that attention was called to this fact), their rate of pay is commonly fixed at about three-fourths that of Chinese and Hindu labor, and their status in the organization is on an equally high plane.

From this it would appear to be an entirely logical and proper conclusion that their places may easily be filled by women having two or three weeks' training in the use of the right-line pen, by well-balanced, healthy children recently graduated from the seventh grade, or by laborers who have sustained injuries and are convalescent. Among the Hindus particularly are many accomplished gentlemen whose talents and training should amply qualify them for positions of responsibility at the boards of your esteemed correspondents.

It would undoubtedly be a distinct economic waste to employ women in positions which any human automaton would seem to be able to fill with entire success and satisfaction to his employers, and with this in mind I confidently call these further suggestions to the attention of Mr. Newell and Mr. Webb.

Seattle, Wash. W. L. HILL, JR.

American Engineers Must Wake Up to Foreign Opportunities

Sir—Within the last few months two very interesting articles appeared in *Engineering Record* dealing with the engineer's relation to the expansion of American influence in foreign countries. These articles, written by Fred Lavis (Jan. 6, 1917, page 5) and Charles A. Stone (Nov. 25, 1916, page 659), should be read carefully by every American engineer who has the desire to go beyond the frontiers of the United States.

Having been connected with various enterprises in South America since 1902 and having witnessed the development going on in that continent, I have always been at a loss to understand the apathy exhibited in my own country toward the opportunities which exist in South America for the profitable employment of capital, provided the work is carried out under capable administration.

There are, of course, some radical differences between organizing and handling work abroad and within our own borders, but a man cannot learn to swim unless he goes into the water and tries. The English writer, Dr. Johnson, once said: "Nothing will ever be attempted if all possible objections must first be overcome."

UNITED STATES NOT THE ONLY FIELD FOR DEVELOPMENT

One of the favorite arguments, or rather excuses, put forward in the United States concerning the lack of interest shown in foreign development is that the American people have been so busy developing their own country that they have had no time or desire to take things outside their own borders seriously, and anyway, the United States is independent of the world. Mr. Stone points out the fallacy of this latter belief in the opening paragraph of the article referred to. Now, admitting that the expansion of our influence in undeveloped countries is desirable and that enterprises requiring the work and administration of engineers are as safe and profitable abroad as are similar enterprises of a domestic nature, the problem seems to be to get those who possess the necessary capital to realize that its employment in the development of new countries

rich in natural resources and capable of sustaining a large population, is worth taking seriously. What force, or means, does the engineer possess to turn American capital in the foreign field?

Hundreds, yes, thousands, of pages of matter teeming with vital information relating to American development in the international field have been published in the last two years in high-class magazines of nation-wide circulation, but such matter seems to be regarded by the public more as "light reading" than as an exposition of facts the thorough digestion of which is of great importance to our national life and well being. On the other hand, in the great commercial countries of Europe the business man and the educated man read with understanding and due consideration that which concerns their country's influence and prestige in other lands, and in this respect they are much more wide awake than the American.

Technical Press Must Help

Narrowing down to the technical part, it is almost impossible to pick up a French, English or German technical periodical without finding one or more articles devoted to works being carried out in other countries. What we ourselves are doing is carefully watched and studied, and I do not think that I am making a misstatement when I say that, right now, the aims and purposes of the only two concerns in the United States really prepared to undertake engineering work abroad are better known and more widely commented on abroad than in the United States.

When we refer to our own technical periodicals we find really very little about what is going on in other lands, and unless the engineer is far-seeing enough to subscribe for several foreign papers he becomes saturated only with our own ideas and methods, which, while they may be ideal at home, require considerable modification and adjustment when an engineer is called on to carry out work abroad.

Mr. Stone remarks that some of our American technical schools are paying more attention to training men for work abroad. The importance of looking into what is being done in foreign countries cannot be too strongly impressed on students, and I have at times been astonished at the lack of such knowledge on the part of graduates of some of our universities.

I am glad to note Mr. Stone's recognition of Rensselaer in this regard, for that institution has been fortunate in possessing a faculty embodying men who have always taken a keen interest in engineering as an international profession and have demanded of undergraduates the same high standards and original thought that are required in French and German technical schools.

French Most Useful Language

It is not my intention to go into the qualifications needed to make an engineer successful abroad. A discussion of this subject would require a volume, and after all, success depends on the man and to some extent on the circumstances by which he is surrounded. But an important matter is the language equipment a man possesses. Just now the great idea seems to be for men to take up Spanish, but this may often be a mistake. From a truly international standpoint I would select French, as this language is fairly universal, outside of the United States, among people with whom engineers will have to deal in treating of important affairs. Of course, in handling working forces an engineer will have to know the language of the particular country in which he is located. For example, except in Brazil, which is the largest part of South America, Spanish is spoken; but in Brazil the language is Portuguese. This latter tongue is in many respects quite unlike Spanish. But one who is a master of French has gone a long way toward acquiring either Spanish or Portuguese. French is also invaluable in Russia, the Orient and Continental Europe.

Early Start Must Be Made

In conclusion I can only say that if Americans, laymen or engineers, are going to accomplish anything abroad the sooner they begin in earnest the better. The firm intrenchment of American prestige and influence is going to be no easy matter, and first attempts will not always meet with instant success. There is a long, hard road ahead, and we are under an enormous handicap, largely due to the lack of active interest on the part of our own people. Though the countries in whose development we should strive to take part will welcome us, we must do our share by taking up this work with an open mind, studying each proposition from all angles, taking advantage of what is suitable and rejecting what is unsuitable in our own methods, if we are to accomplish, and to bring to a successful and practical conclusion, the work with which we may be intrusted.

Charles J. Seibert,
Resident Engineer, Trussed Concrete Steel Co.
Rio de Janeiro, Brazil.

Road Work Can and Should Be Continued

Sir—In regard to the present road situation, I think that highway-work can and should be continued, possibly not as extensively as during better conditions, but enough so that contractors can keep their organizations intact and their plant investment working. The state has many short connecting roads to let, on which the cost will run high anyway, whether they are let this year or after conditions change. They are small jobs, but about all a contractor dares undertake at this time.

Labor is, of course, scarce, but at present we have enough. We must compete with the electrochemical plants at Niagara Falls and pay 30c. per hour for 10 hours. Teams are 55c. per hour. They are farm teams which otherwise would be idle at this time.

In regard to changing the form of contract, I feel that something should be done at this time to help out the contractor and relieve him from the gamblers' chances which he must now take. I would like to see a cost-plus-a-fixed-sum contract used. Competitive bids could be received on the fixed sum, which would include rental of necessary plant. Cost should of course include labor, materials, supplies, bonds and insurance. Payments of cost should be made monthly, and the fixed sum held until work is entirely completed. The state is already familiar with the abilities of its contractors and therefore would be able to place these contracts with dependable firms.

Walter C. Rich,
Treasurer, Rich Construction Co., Inc.
Youngstown, N. Y.

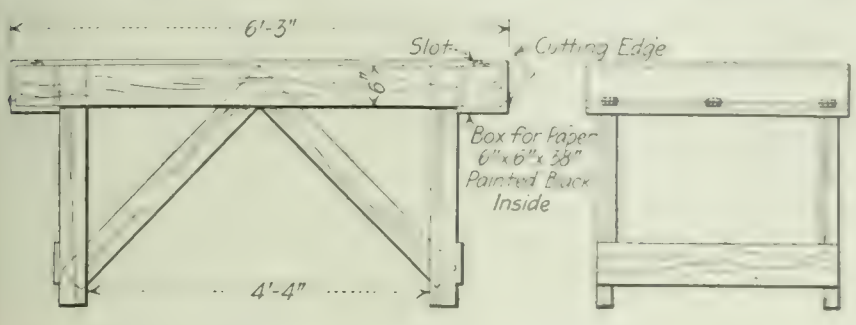
THE ENGINEER IN FIELD AND OFFICE

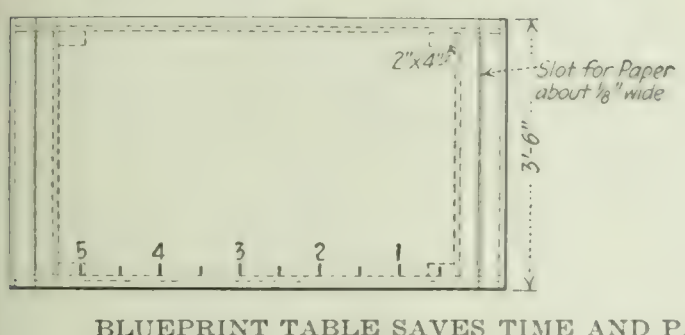
A DEPARTMENT DEVOTED TO DETAILS OF THE DAY'S WORK

Special Blueprint Table Combines Several Functions

By C. B. Coe
Mead Pulp and Paper Co., Chillicothe, Ohio

THE table shown in the sketch combines the functions of the storage can, the scissors and the yardstick. The roll of paper is stored in the box at the end





BLUEPRINT TABLE SAVES TIME AND PAPER

and pulled out through the solt, measured with the foot marks and torn off on the cutting edge. Less than ½ in. of paper is spoiled, and this only when the strip is left exposed for a considerable length of time. At least this much is ordinarily wasted by excess cutting. The left-hand box is used for odd sheets of paper, but may be slotted and used for a different grade of paper.

Oiled Macadam Roads Smoothed by Plank Drag

OLD macadam roads that have been surface-treated with bituminous materials are smoothed and resurfaced by the Connecticut State Highway Department largely through the use of the plank drag, hitherto chiefly advocated only for gravel- and earth-road maintenance.

The worn-out surface is first scarified or, more accurately, "combed" with a spike-tooth scarifer or harrow drawn behind a motor truck, as shown in the accompanying view. The best method has been to hire the truck and driver, which can be done for $20 per day.

The harrow loosens the stone to a depth of about 2 in. on the high places, after which the road is dragged with a regulation plank road-drag. This smooths the surface, filling the smaller depressions and scraping the loose stone to the edges of the road. This loose material is then used to even the surface and bring it back to grade. After being rolled and surface treated, the pavement, according to C. J. Bennett, state highway commissioner, is nearly as good as new.

Must Post Bridge Capacity in New Jersey

County authorities in New Jersey have been notified by the state commissioner of motor vehicles, W. L. Dill, to post the carrying capacity of every bridge in a conspicuous manner, as warning to truck drivers. Vehicles that attempt to cross bridges whose posted capacity is too low for the weight of the vehicle will do so at their own risk. The new requirement is due to increase in market hauling and other freight business by motor truck.

A Manning Formula for Flow

By L. Chivvis and C. N. Monteith
Office of State Engr., St. Louis

THE Chezy-Kutter expression for mean velocity of a uniformly flowing stream involves the three variables n, R and S in a rather awkward relationship. This fact limits its practical use to office work where diagrams are available. The need of a less complicated expression has led to the introduction of many formulas having for the exponents of R and S odd decimals which more nearly conform to true conditions of flow than do





MOTOR TRUCK PULLS ROAD DRAG OVER MACADAM

the exponents in the Chezy formula. The C term in these formulas is, for this reason, simpler than Kutter's C, since the latter must necessarily contain corrective terms to balance the deficiencies of the basic equation, $V = C\sqrt{rs}$.

The Manning formula, $V = \frac{1.486}{n} R^{\frac{2}{3}} S^{\frac{1}{2}}$, is of this type. It is apparently not founded on actual experiment, although the lack of published data on the formula leaves the question of its origin open to some doubt.

The probable method of derivation, however, is as follows: By solving the Kutter equation for a range of sizes commonly met with in sewer design, assuming

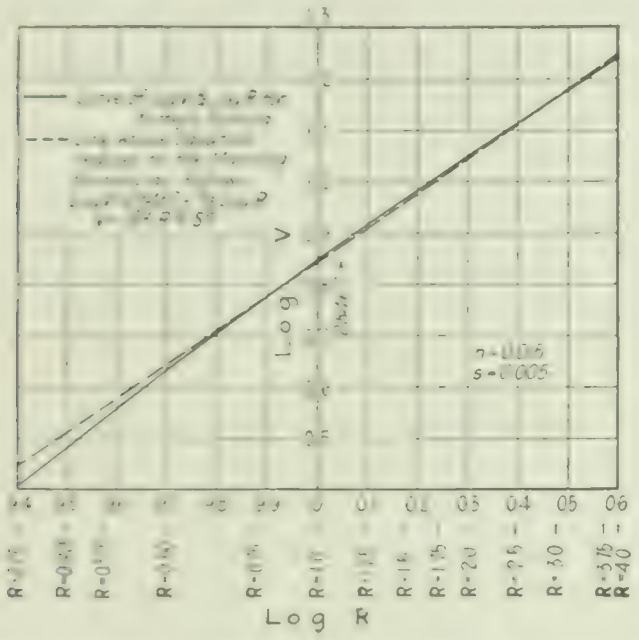


FIG. 1. DERIVATION OF MANNING FORMULA

typical values of $n = 0.015$ and $S = 0.005$ throughout, a series of velocities is obtained which is dependent on R alone. If the logarithms of these velocities are plotted with those of the corresponding radii, a slightly curved line is obtained, the general inclination of which, between the values of $R = \frac{2}{3}$ and 4, can be closely approximated by the equation

$$\log V = 0.8467 + \tfrac{2}{3} \log R \quad \text{(See Fig. 1)}$$

This can be reduced to a flow formula of the Manning type, the Y intercept 0.8467 being equal to log $\left(\frac{c}{n} S^{\frac{1}{2}}\right)$. In this case $c = 1.49$ and the formula is $V = \frac{1.49}{n} R^{\frac{2}{3}} S^{\frac{1}{2}}$.

The above linear equation, with its limiting values of R, was chosen with a view of keeping the variation between it and the Kutter curve less than 1%, this being well within the probable error of the latter.

By raising the line, keeping the inclination at $R^{\frac{1}{2}}$, the coincidence with the Kutter curve is closer, but the range of this coincidence is smaller. Thus, the expression $V = \frac{1.5}{n} R^{\frac{2}{3}} S^{\frac{1}{2}}$ gives a maximum error of only 0.6% between $R = 1$ and 3, but is at wide variance above and below these values.

Manning Formula Not for All-Around Use

Although the agreement is close for these limited ranges, it cannot be said that the Manning formula is a serious competitor of the Kutter for all-around use. This is particularly true for office work. Most of the computations for the capacity of circular or egg-shaped sewers can be solved directly in terms of discharge from graphs drawn up for standard values of n. For shapes other than circular, this office is now using a large-scale graph similar to that given in Hering & Trautwine's translation of Kutter's work. Entering this graph with $V\sqrt{R}$, n and S, the Chezy C is obtained.

The field of the Manning formula would seem to lie in such work as irrigation reconnaissance or the laying out of temporary water and sewerage systems for military camps. It should not be used for permanent installations without an understanding of its variations, some of which are:

Every change in n, the coefficient of roughness, produces variations in the general slope of the log V log R curve platted from Kutter's formula, keeping S constant. This necessitates a different exponent of R, as well as a different constant in the exponential formula if the maximum range of coincidence for this degree of roughness is to be realized. Fig. 2 illustrates these

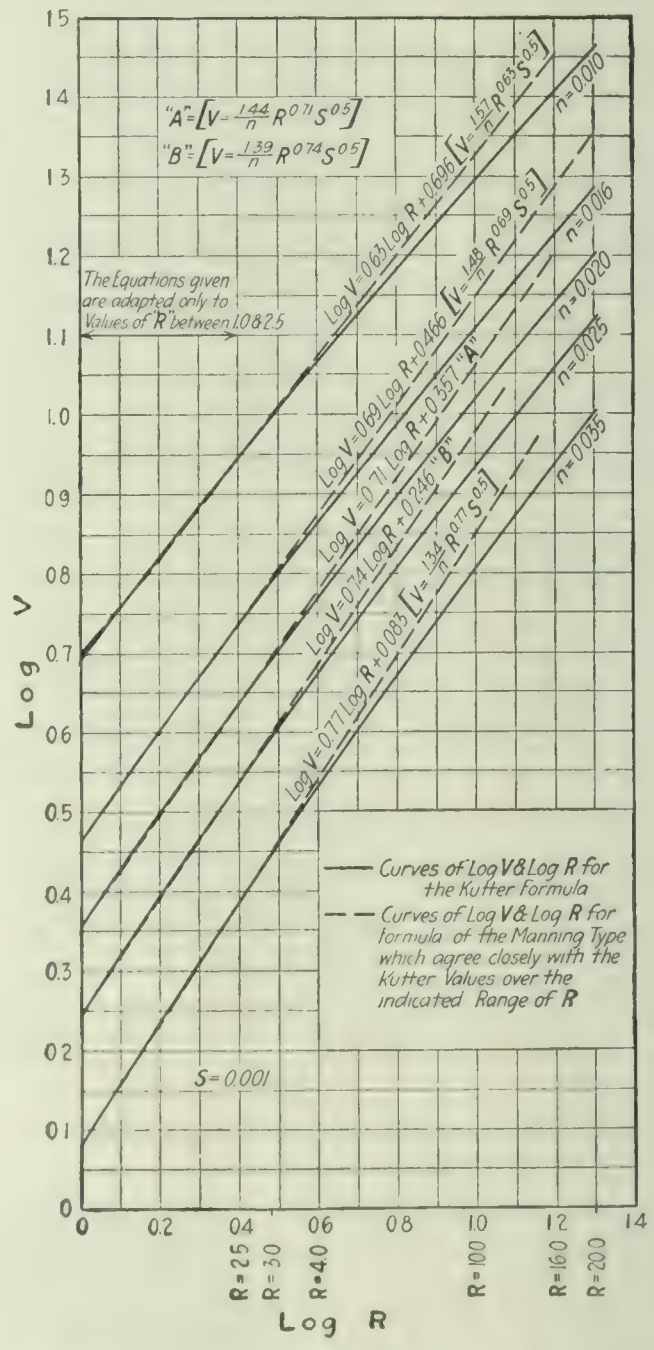


FIG. 2. GRAPHICAL COMPARISON OF KUTTER AND MANNING FLOW FORMULAS

variations. It is seen, however, that for $n = 0.016$, the equation agreeing best with Kutter over a range of R from 1 to 2½ (for circular sections—4 to 10 ft. in diameter) is practically the Manning formula.

Changes in size, while they do not have as pronounced an effect as changes in roughness, produce variations in the R exponent which must be considered in extreme

cases. This is illustrated by a formula which was used in this office for the design of some rather large concrete-lined channels having an assumed roughness coefficient of 0.016 and varying in hydraulic mean depth from 4 to 20. For slopes of about 0.001 the expression which best fitted the Kutter formula for this range of R was

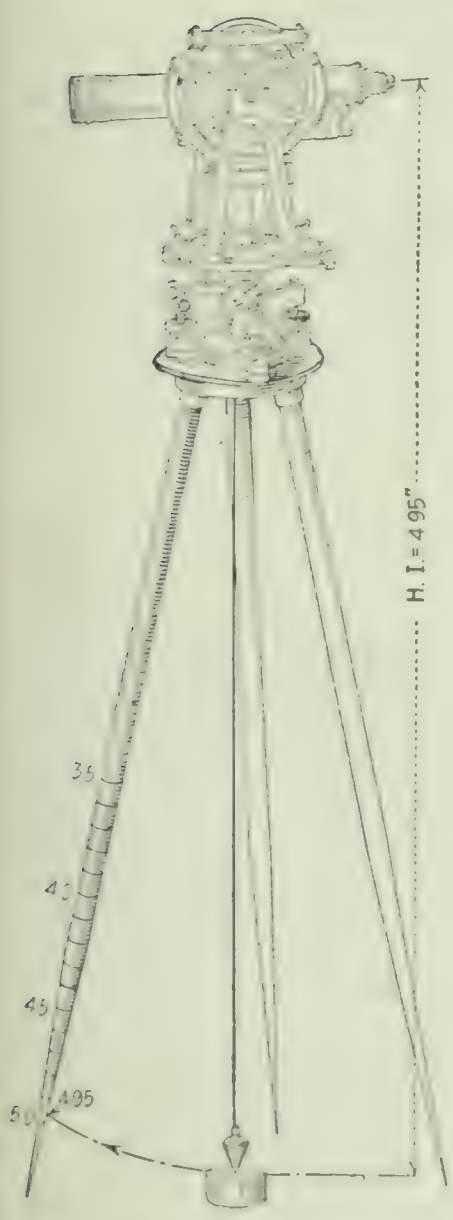
$$V = \frac{1.61}{n} R^{0.6} S^{0.5}$$

the maximum variation in velocity being 1.6%. Changes in slope have very little effect within practical limits.

It might be argued that, since the Kutter formula itself is far from perfect, its use as a standard of reference for any other formula is open to criticism. However, the limitations of this formula have been fairly well determined, and with these in mind it may serve as a basis for an approximate determination of the accuracy of the Manning formula. This requires much less time than the laborious and somewhat unsatisfactory task of proving the derivation of a formula such as Manning's by working up a long series of actual experiments.

Scale on Transit Leg Fixes H. I.

By William Halvernberg
New York City



HEIGHT OF INSTRUMENT HEAD FROM TRIPOD LEG

AN EASY method of establishing the height of instrument of a transit where this is needed, as in stadia surveys, is to fix a scale on one of the tripod legs by which the length of plumb-bob string and hence the H. I. may be gaged. The procedure of placing and using the scale is as follows:

Set up the transit over the hub and measure the H. I. carefully and accurately. Have the point of the plumb-bob just touch the tack or wherever the H. I. is measured from. Swing the point of the bob to one of the legs of the transit and mark this point on the transit leg. By similar markings scratch a scale on the transit leg, using feet and tenths. Then at any time, with the point of the bob touching the tack at any set-up, the H. I. may be read directly on the leg of the transit by swinging the bob in an arc and reading the point of the bob. This will give results to the nearest hundredth, which is generally close enough

Bureau of Mines Prepares Gasoline Specification for Government Use

THE method adopted by the Bureau of Mines in preparing specifications for Federal purchases of gasoline in the District of Columbia was, briefly, as follows:

Samples of the various types of motor gasoline sold in the District were analyzed. A specification was then written which represented the average product already on the market, previous experiences having indicated this to be satisfactory. The procedure adopted made it possible for the Federal Departments to obtain motor fuel suitable for the motors in use, and equal in quality to that dispensed to private users. While this method of determining specifications is not absolutely scientific, it is highly practical and resulted in the following specifications:

Color

Requirement—Water white.

Method of Determination—Inspection of column in 4-oz. sample bottles

Acidity

Requirement—Total absence.

Method of Determination—Ten cubic centimeters of the gasoline is to be shaken thoroughly with 5 cc. of distilled water. The aqueous extract must not color blue litmus paper pink.

Volatility

Requirement—The gasoline shall, when distilled by the method described in Technical Paper No. 166 of the Bureau of Mines, meet the following requirements:

A. The temperature read on the thermometer when 20% has distilled shall not be below 70° C. (158° F.), nor above whatever limit is fixed after due consideration of conditions of use.

B. The temperature read when 90% has distilled shall not be above another limit similarly chosen.

C. The temperature read when 50% has distilled shall not be higher than a mark halfway between the 20% and the 90% limit.

D. The dry point shall not exceed the actual 90% reading by more than 55° C. (99° F.).

Tolerance—If either the 20% or the 90% temperature mark is above the required limit by an amount not exceeding 10° C. (18° F.), the gasoline may be considered acceptable if the sum of the two temperatures read for the 20% and the 90% marks does not exceed the sum of the adopted limit.

French Laboratory Glass Is Excellent

LABORATORY glassware now made in France has been found equal to the best Thuringen and Jena ware in resisting the action of water (below, at and above 100° C.), hydrochloric acid, ammonia and N 10 solutions of ammonium chloride and sodium carbonate, according to a writer in *Comptes Rendu*, noted in the *Journal of the Society of Chemical Industry*, Nov. 30, 1916. Superior ability to withstand sudden cooling was observed only in Jena and with one make of Bohemian glass.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Concreting Plant for Circular Reservoir

ONE of the concreting outfits used in building the 3,000,000-gal. 160-ft. reservoir for the new training camp at Fort Benjamin Harrison, near Indianapolis,



CONCRETING RIG FOR A CIRCULAR RESERVOIR

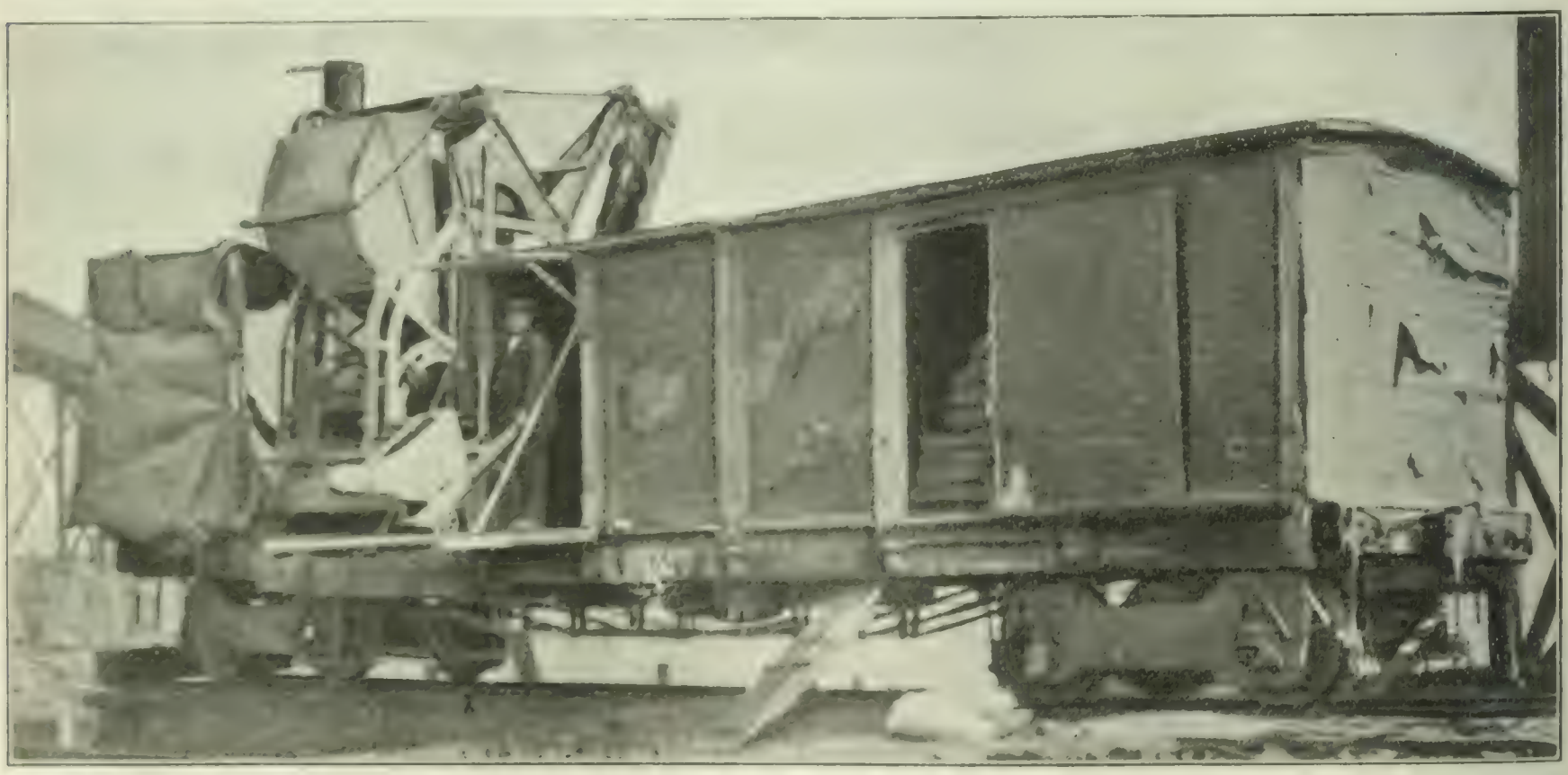
Ind., is shown in the accompanying view. The floor concrete is being deposited. The elevator bucket in the outside tower discharges through a hopper into the long steel chute, which is made rigid by truss rods and wooden struts. The lower end of the chute is carried by tackle in an A-frame whose posts are stiffened laterally by plank bracing. This frame rests on the floor of the reservoir.

This and a smaller A-frame carry another length of steel chute, beyond which are two wooden chutes. One is supported on horses, and the other has a horse at one end only, the lower end delivering the concrete in place. One of these wooden chutes is shown at the left. This makes a very flexible arrangement for distributing the concrete over the area of the floor. The reservoir was designed by C. H. Hurd, of Indianapolis, Ind., and was built by the Gaylord Engineering and Construction Co., of Scranton, Penn. The work was under the direction of Brigadier-General Glenn, U. S. A. The construction occupied only about 30 working days.

Hopper on Baggage Truck Saves Taking Sacks Out of Cement Shed

By W. F. Collar
General Superintendent, Municipal Bridge, St. Louis

IN THE track-mixing plant seen in the photograph the sacks were never taken outside the cement shed. The wood hopper, shown in the picture, was mounted on a common truck and was used to dump the cement into the loading hopper of the mixer. The cement sacks were emptied into the small truck hopper inside of the car and put into a sack-baling and counting machine in one operation. This procedure not only saved time, but made a large saving through eliminating any loss of cement sacks through theft or ordinary carelessness.



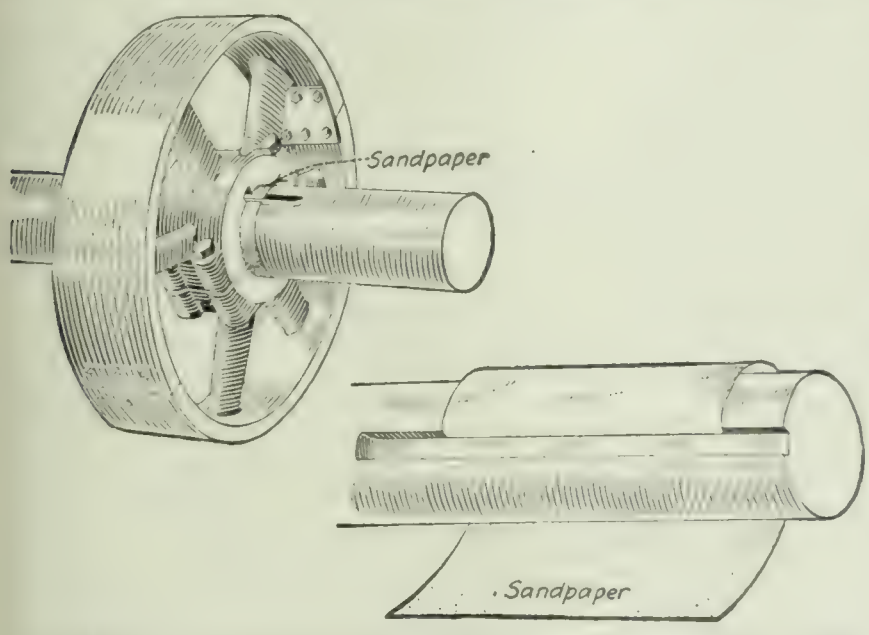
SACKS NEVER LEAVE HOUSE, CEMENT BEING CARRIED TO MIXER IN SMALL HOPPER ON BAGGAGE TRUCK

The mixing plant, which was used in pouring the footings for the East St. Louis approach, was mounted on a flat-car on one end of which the cement house was built. At the time the photograph was taken the outfit had been in use two years.

Sandpaper Replaces Broken Key on a Split Pulley

By H. S. Carpenter
Billmyer, Penn.

In August, 1916, the key on a drive pulley of a No. 9 McCully crusher sheared off and an immediate repair was necessary. As a temporary expedient, the pulley



A LAYER OF SANDPAPER TAKES PLACE OF STEEL KEY

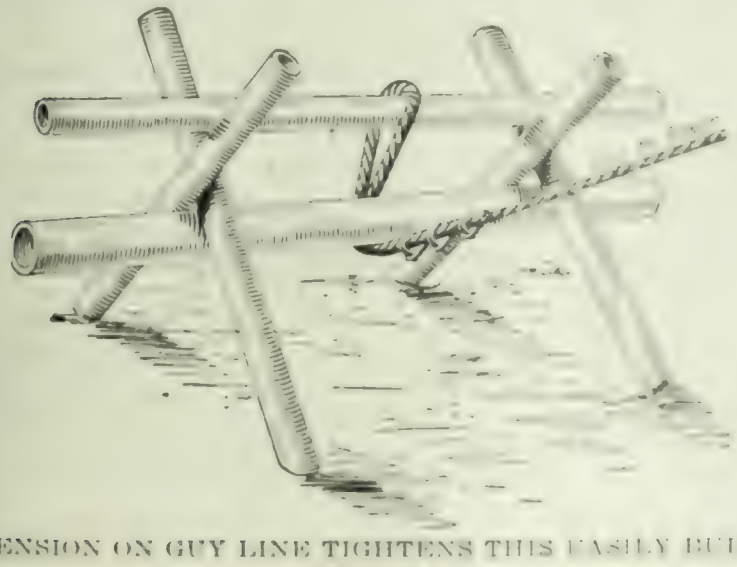
was unbolted, spread, and a layer of sandpaper was placed between the pulley and the shaft. The holding-bolts of the pulley were then drawn up tight and the crusher put into operation.

As a special precaution, the bolts were pulled up as tight as was possible; and though trouble was expected, none developed—the pulley driving the crusher without slipping and giving perfect satisfaction to date.

Make Self-Tightening Anchor of Wrought-Iron Pipe

By J. A. C.
Sistersville, W. Va.

On THE Sistersville filtration-plant construction, William Francis, of Dayton & Francis, contractors, New Martinsville, W. Va., have built and used successfully an anchorage for a concrete-tower guy line of the construction shown in the accompanying drawing. Wrought-iron pipe of 2- and 3-in. diameter was used—two sets of two each being driven into the ground in the form of an X and carrying transverse pipe above and below the point of crossing. The guy rope was then wrapped around these horizontal pipes.

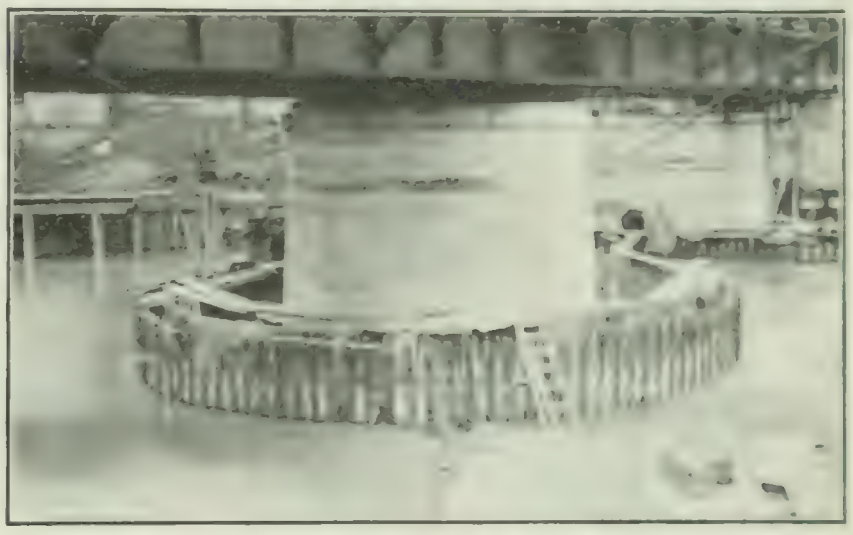


TENSION ON GUY LINE TIGHTENS THIS EASILY BUILT ANCHORAGE

Any pull or jerk on the guy line has a tendency to pull together the two crosspipes and tighten the crossed pipe in the ground. The pipes, being of small diameter, are easily driven into the ground—needing no digging and therefore getting their reaction against solid earth. Furthermore, instead of being clumped and mutually weakening each other through any movement, they are separate and, having each its own bit of earth to push against, are enabled to get a solid reaction.

Drive Old Rails for Cofferdam Around Piers in Hard Bottom

In THE construction of a bridge pier at Mt. Clemens, Mich., for the Detroit United Ry. lines, old street-railway rails were driven instead of wood sheet piles because of the hard bottom. The inner row was driven



TWO ROWS OF OLD RAILS MAKE BRIDGE-PIER COFFERDAM

with the heads adjacent to the flange of the next rail around the circle. At intervals the heads were clamped to the flanges by bolts, fillers and by plates. For the outer row the rails were driven with the heads pointing in toward the center of the circle and just far enough apart to take a 2 x 12-in. plank between adjacent rails—thus making a nearly watertight job.



RAILS WERE DRIVEN FACE-TO-FLANGE AND SIDE-BY-SIDE

NEWS OF THE WEEK

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

National Guard Camp Now Well Under Way

First Group Will Be Ready for Occupancy by August 15 Others by September 1

Reports of the progress of construction work at the Southern camps to which the National Guard divisions will be sent have been assembled by the Quartermaster's Department, and the following facts are given out:

The adequate provision of a water-supply is the most vital point to be considered in putting a camp in condition to receive troops.

The work at each site includes providing railroad sidings, roads, buildings for mess houses, regimental, brigade and divisional headquarters, and storehouses. About 4,500,000 ft. of lumber is required at each camp. Installation for electric power and lighting must be provided in each camp.

The constructing quartermaster for each camp, after conferring with the cantonment division officer, was sent to the work as quickly as possible. In every case they arrived within a few days after orders had been given to proceed.

CAMPS DIVIDED INTO GROUPS

The plans, as originally made, divided the camps into three groups, to be completed on Aug. 1, Aug. 15 and Sept. 1, to accommodate National Guard divisions brought into Federal service on July 15, July 25 and Aug. 5 respectively.

As conferences over the relative merits of available sites were not concluded until very recently, the beginning of work was delayed until long past the time originally planned. It was recognized that completion of any camps by Aug. 1 was out of the question. It is now possible to state, however, that the first group of camps will be ready for occupany less than two weeks after the date originally set. Camps in the other two groups will be ready for occupancy on Aug. 15 and Sept. 1 respectively, as scheduled.

GROUPS AS ORIGINALLY PLANNED

The groups, as originally planned, are as follows:

For Completion Aug. 1—Augusta, Ga.; Deming, N. M.; Montgomery, Ala.; Spartanburg, S. C.; Waco, Texas.

For Completion Aug. 15—Anniston, Ala.; Charlotte, N. C.; Greenville, S. C.; Houston, Tex.; Palo Alto, California.

For Completion Sept. 1—Alexandria, La.; Hattiesburg, Miss.; Fort Worth, Tex.; Fort Sill, Okla.; Linda Vista, Calif.; Macon, Georgia.

Co-operative Roadwork in Oregon

Approval has been given by the Secretary of Agriculture for coöperative roadwork in Oregon, involving $1,114,-194, which is distributed in 15 projects. This amount is matched by the state, assisted in some instances by counties. The projects covered by this announcement are: McKenzie Pass Road, 44 miles; Mount Hood-Loop Road, new construction, 25 miles; Eugene-Florence road, 18 miles; Pendleton-La Grande Road, 15 miles; Medford-Klamath Falls Road, 25 miles; Ochoco Creek Road, 13 miles; Canyonville-Galesville Road, 8 miles; Reedsport-Coos Bay Road, 6 miles; Little Nestucca, 5½ miles; John Day project, 20 miles; Flora-Enterprise Road, 12 miles; La Pine-Lakeview Road, a part of the main north and south highway of eastern Oregon, 5 miles; Pilot Rock-Prairie City Road, 16 miles; Crescent-Klamath Falls Road, a part of the main north and south highway, east of the Cascade Range, 22 miles; Zigzag Road, part of the main highway to Mount Hood and eastern Oregon, 11 miles; location surveys and the letting of contracts and other preliminaries necessary will be made at once.

Idaho Votes Million for Roads

Governor Alexander of Idaho has signed the road bill of that state, and almost a million dollars is to be expended in the next two years on the road from Moscow through Lewiston, to Weiser and southern Idaho, a connection with the transcontinental highway to Portland and Seattle. Under the Post Roads bill the United States Government will appropriate $150,000 for the road, the state will provide $375,000, and the balance will be furnished by the counties. For the highway from Montana to Lewiston, which will connect with the automobile highway to Portland and Puget Sound, Idaho has appropriated $30,000, the Forestry Department $30,000, and the counties $30,000.

Governors Appoint Harbor Commissioners

A step toward the coördination of the facilities of the port of New York and its development was taken July 20, when Governor Whitman, of New York, appointed Arthur Curtis James, Eugene H. Outerbridge and William H. Wilcox, and Governor Edge, of New Jersey, appointed De Witt Van Buskirk, of Bayonne; Frank R. Ford, of Caldwell, and J. Spencer Smith, of Tenafly, as members of the New York Harbor Commission.

St. Louis Water Rates Again Under Revision

Legislature Takes Control of Rates Away from Missouri Public Service Commission

EDITORIAL CORRESPONDENCE

The revision of water rates for the City of St. Louis is again before its Board of Aldermen. This rate revision has had a checkered career, running back over a number of years.

Prior to 1914 the city had a schedule of flat rates and also meter rates for domestic consumption and a rate of 6c. per 100 cu.ft. for manufacturing purposes. In 1914 certain ordinances were passed at the request of the assessor of water rates and inadvertently the section allowing the 6c. rate to manufacturers was repealed. About this time the assessment of water rates was put under the control of the water commissioner, who proceeded to assess the manufacturers at the regular rates. This produced an immediate protest. A new ordinance was passed in 1916 establishing for manufacturing purposes a rate of 4½c. per 100 cu.ft. This was followed by protests from the Civic League and certain improvement associations, alleging undue discrimination against the domestic consumer. These associations carried the matter before the Missouri Public Service Commission, which handed down a ruling, effective Dec. 1, 1916, requiring the City of St. Louis to establish uniform rates plus service charge for all purposes. The time allowed for the establishment of this rate was extended from time to time. Meanwhile the opponents of uniform rates secured passage of a bill in the state legislature which took away from the Missouri Public Service Commission any and all powers to regulate the rates and services of municipally owned water-works in cities of over 300,000 inhabitants.

There is now pending before the Board of Aldermen a bill revising the water rates, which puts the domestic consumers and the manufacturer on a sliding scale. In the case of a manufacturer, the rate begins at 12c. per 100 cu.ft. for the first 10,000 and runs down to 5c. for all over 150,000 cu.ft., these amounts being for the semi-annual period. For the domestic consumer the rate is 15c. per 100 cu.ft. for the first 3000 ft., running down to 9c. for amounts between 150,000 and 260,000 ft. and to 5c. for all over 18,000,000 feet.

This bill is being fought by the manufacturing interests because of the increase to them. The increase is a considerable percentage to small users and about 20% for the very large consumers.

Lower Court Rejects Luten Patent Claims

In Case Partly Defended by State of Nebraska—Familiar Bridge Patents Not Upheld

Judge Munger, sitting in the United States District Court for the district of Nebraska, has just handed down a decision dismissing a bill of complaint brought by Daniel B. Luten against the Wilson Reinforced Concrete Co. et al. for infringement of certain claims in Luten's patents on concrete bridges. This is one of the cases in which the state stepped in to help defend, through the attorney general, infringement suits brought against contractors who had built structures for the state.

Principles Are Old

The main rulings were on three patents, Nos. 853,202, 853,203 and 818,386. The first of these is on a "concrete bridge having a concrete spandrel extended back of the abutments with upright rods or bars embedded near the ends of the spandrel." The judge decided that such a structure was anticipated by a number of patents and publications. Patent No. 853,203 relates mainly to the placing of transverse reinforcement in an arch rib. The judge ruled that the old Monier webbing reinforcement constituted a substantial anticipation. The last patent, No. 818,386, is on the familiar Luten arch-rib reinforcement, in which the rods are bent up from intrados to extrados at varying distances along the haunch. As to these claims the judge said that they "attempt to cover the positioning of members where stresses will occasion fractures. The principles that govern the location of the danger points from live loads were old when Luten entered this field. Writers and inventors had indicated the methods of correcting these dangers by the use of tension members substantially as Luten's patent attempts to apply the correction. In view of the state of the art, Luten cannot be said to have supplied more than ordinary mechanical or engineering skill in giving functions to tension members when applied to the problem of arches upon which is to be imposed a live load."

Missouri To Use Convict Labor on State Road Construction

According to an announcement made July 22, by the Missouri State Highway Commission, a conference with members of the State Prison Board resulted in a decision to use the convicts in the state penitentiary at Jefferson City in working the roads. Under the tentative plan the state prisoners will be equipped by the Highway Commission and the Prison Board, each sharing the expense. While the prisoners are working the road the expense will be borne by the Highway Commission.

The convicts also will be available to the counties for work on the roads. All of the money resulting from their work will go to the state. The men will be placed in camps in the district where the work is to be done—the camps—accommodating 50 to [illegible] men.

Task of U. S. Engineer Regiments in France

Will Make All Preparations for Our Armies from Wharves to Camouflage —Will Furnish Water Supply

The following statement relative to operations, projected and under way, to accommodate American armies on their foreign expeditions was authorized by the Office of the Chief of Engineers of the Army:

The value of railroad materials and rolling stock alone, now being purchased to provide in advance for the needs of the American Army, is about five times that of all purchases made annually in this country for the Panama Canal during the last four or five years.

American engineers must undertake large operations in the construction and repair of bridges in France. They must repair and maintain the roads and highways over which our supplies will be brought up to the battle line. Much of the latter work will be done within range of the enemy's guns. To accomplish this work the same kind of street and road equipment as is used in our leading American cities will have to be shipped to the front.

Will Equip French Terminals

Our engineers will equip the wharves and piers in France utilized by American forces, with the terminal facilities required by our armies. The lumber for this work will be cut from European forests by regiments of American foresters. This method will save burdening our ships with lumber from the United States. One regiment of foresters is being organized and several more will be raised. They will carry with them complete lumbermen's outfits, including sawmill equipment.

Experts will install electric plants which will furnish lights to the trenches, dugouts, storehouses, etc. The power houses will be "dug in" in such a way as to protect them from shell fire.

Will Furnish Water-Supply

It is the duty of the Corps of Engineers to furnish an adequate water-supply for the large bodies of men suddenly placed in localities where the entire water-supply is already needed for the small civilian population. Our experts are already in France studying this problem. Well-driving apparatus, pipe and all necessary supplies will be sent over. Settlements in which our troops will stay will be piped as is done under an American city system. Material for extensive standard-gage and narrow-gage railroads will be sent to Europe, to enable the engineers to carry out their task. The lines to be built will both transport our troops to the front and handle all transportation behind the firing line. The lines running up to the front will remove wounded and salvage gathered from the field. Lines of this type are broad-gage, feeding numerous narrow-gage spurs which radiate from the main line and accommodate supply trains often hauled by gasoline engines.

The Engineer Corps will carry its own rolling stock to the theater of war. This in itself will be a gigantic operation.

Special mining companies will be formed for the purpose of carrying on the intricate operations involved in modern trench warfare. For this work expert miners will be chosen.

The engineers will go into the study of battle map making on a large scale. They will study this work under expert British and French instructors, who have made a specialty of the fields of battle since the war began. The present war has brought into being a vast number of appliances hitherto unknown. Battlefield illumination with searchlights, trench lights, flares, star bombs and rifle grenades will be handled by our engineers. Appliances for this work will be of American manufacture.

Will Apply Camouflage

Camouflage, the modern war art of reducing the visibility of objects, must be applied for the protection of our troops, artillery, etc., in France, and our engineers are making this subject their special study. Well-known artists and experts in color effects will precede the engineers and study out the problem of obscuring our operations from the enemy. The actual work will be done by sign painters and soldiers trained in the craft.

The engineers will attend to the construction of all buildings for the housing of troops. They will build hospitals, refrigerating plants, machine shops and other structures incident to the care and supply of the army in France.

The purchasing and supply department of the Engineer Corps faces the task of buying the equipment that must be shipped to the front. The item of intrenching tools is in itself a considerable one, as the destruction in this one particular has been very large in the French and British armies. Wrecking cars and all the paraphernalia which goes with them must be supplied. Complete equipment for the making of concrete must also be provided.

The engineers must construct at harbors in the United States wharves, piers and storehouses of sufficient capacity to handle all materials and supplies to be shipped to France. Every effort is being made to put through the work on hand without clogging the machinery. It will be the endeavor of the engineers to prepare accommodations ahead of troops as fast as they are sent over to the front, but they will not try to provide for the entire army all at once.

Vancouver To Have New Shipyard

The Griswold-O'Donnell Co., of Portland, Ore., is the latest shipbuilding firm to be organized, and it will erect a plant on the waterfront at Vancouver to have four ways. Plans for machinery to accommodate eight ways have been completed, and the second unit will likely be put in shortly. Room is also leased for a sawmill to accompany the yard.

Garbage Reduction Recommended to Mayors of Large Cities

Because of the shortage of fats and fertilizers throughout the world, Secretary of Agriculture Houston has advised the mayors of the large cities of the country to adopt garbage reduction. He wrote: "Garbage contains on the average about 2% of grease and about 20% of tankage, the latter having valuable properties as a fertilizer material. Any method of disposal of garbage in large cities which does not recover both the grease and the tankage is uneconomic and particularly deplorable in the present circumstances. We wish therefore to urge upon your consideration the advisability of so treating the garbage from your city as to insure the recovery of its valuable constituents. That this may be made a source of profit to a municipality has been proved by numbers of cities in the United States where municipal rendering plants have been erected, and in a number of others private plants are now operating and paying dividends on the investments."

Illinois Engineer Regiment Now at Full War Strength

The First Regiment Illinois Engineers (National Guard), organized in Chicago as the "Citizens' Unit," has reached a total enlistment of 1095 (officers and men), and a reserve battalion is proposed. One company is now at Camp Grant, Rockford, Ill., the others are quartered on the Municipal Pier at Chicago. The regiment is expected to be mustered into the Federal Service very shortly. Col. Gordon Strong, who was active in the organization of this regiment, has been commissioned as colonel of the Third Artillery, and is succeeded in command by Col. Frank L. Beals, who has been instructor at the Northwestern Military Academy.

New Law Frees More Convicts for South Carolina Roadwork

The provisions of the new law recently passed by the South Carolina legislature, forbidding the hiring out of state convicts to any individual or corporation, will make available for roadwork a considerable number of convicts who have hitherto been denied the state authorities. According to W. S. Fallis, state highway engineer, the logical place to use these men is on roadwork, most probably on the Hickory Nut Gap section, for the opening of this stretch of road will make the convict camp already established in Rutherford County more easily accessible to Hendersonville, from which all its supplies and materials are obtained.

Starts Sanitary Engineering Bureau

The Nebraska State Board of Health now has a Bureau of Sanitary Engineering, with headquarters at Lincoln. H. P. Letton, sanitary engineer of the United States Public Health Service, until recently located at Chicago, has received a year's leave of absence for the purpose of serving as chief.

Army Training Camps Under Construction

NATIONAL ARMY

No. of Division	Location	Name of Camp	Constructing Quartermaster	Contractor
76	Ayer, Mass.	Devens	Capt. Edward Canfield, Jr.	Fred T. Ley & Co., Springfield, Mass.
77	Yaphank, L. I.	Upton	Maj. O'Kelly Myers	Thompson Starrett Co., New York City
78	Wrightstown, N. J.	Dix	Harry O. Williams	Irwin & Leighton, Philadelphia, Penn.
79	Annapolis Junction, Md.	Meade	Maj. Ralph F. Proctor	Smith, Hauser & MacIsaac, N. Y. City
80	Petersburg, Va.	Lee	Captain Edward	Rinehardt & Dennis, Charlottesville, Va.
81	Columbia, S. C.	Jackson	Maj. William Couper	Hardaway Constructing Co., Columbus, Ga.
82	Atlanta, Ga.	Gordon	Maj. James N. Pease	Arthur Tufts Co., Atlanta, Ga.
83	Chillicothe, Ohio	Sherman	Capt. Ward Dabney	A. Bentley Co., Toledo, Ohio
84	Louisville, Ky.	Taylor	Maj. F. E. Lamphere	Mason & Hanger, Richmond, Ky.
85	Battle Creek, Mich.	Custer	Maj. Earle B. Morden	Porter Bros., Detroit, Mich.
86	Rockford, Ill.	Grant	Maj. D. H. Sawyer	Bates & Rogers Construction Co., Chicago, Ill.
87	Little Rock, Ark.	Pike	Maj. John R. Fordyce	James Stewart & Co., New York City
88	Des Moines, Iowa	Dodge	Maj. M. A. Butler	Charles Weitz & Sons, Des Moines, Ia.
89	Fort Riley, Kan.	Funston	Capt. J. F. Herman	George A. Fuller Co., New York City
90	Fort Sam Houston, San Antonio, Tex.	Travis	Capt. George E. Thorne	Stone & Webster Co., Boston, Mass.
91	American Lake, Wash.	Lewis	Capt. D. L. Stone	Hurley Mason Co., Tacoma, Wash.

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26	Charlotte, N. C.	Green	Maj. C. H. Greene	Consolidated Eng. Co., Baltimore, Md.
27	Spartanburg, S. C.	Wadsworth	Lieut. Col. J. D. Kilpatrick	Fisk-Carter Construction Co., Greenville, S. C.
28	Augusta, Ga.	Hancock	Maj. Gratz B. Strickler	T. O. Brown Co., Augusta, Ga.
29	Anniston, Ala.	McClelland	Maj. L. C. Dulin	John O. Chisholm & Co.
30	Greenville, S. C.	Sevier	Maj. A. G. Doyle	Gallavan Building Co., Greenville, S.C.
31	Macon, Ga.	Wheeler	Maj. Walter Hernwood	W. Z. Williams, Macon, Ga.
32	Waco, Tex.	MacArthur	Maj. Matthew Hanson	Fred A. Jones Construction Co., Dallas, Tex.
33	Houston, Tex.	Logan	Capt. W. P. Rothrock	American Construction Co., Houston, Tex.
34	Deming, N. M.	Cody	Maj. Charles H. Miller	J. W. Thompson Co., St. Louis, Mo.
35	Fort Sill, Okla.	Doniphan	Maj. George D. Guyer	Selden Breck Construction Co., St. Louis, Mo.
36	Fort Worth, Tex.	Bowie	Maj. P. J. Vanzuben	J. W. Thompson, Dallas, Tex.
37	Montgomery, Ala.	Sheridan	Maj. A. W. Reynolds	Algernon Blair, Montgomery, Ala.
38	Hattiesburg, Miss.	Shelby	Maj. W. J. Howard	T. S. Moody & Co., Chattanooga, Tenn.
39	Alexandria, La.	Beauregard	Maj. W. R. Goss	Stewart McGhee Construction Co., Little Rock, Ark.
40	Linda Vista, Calif.	Kearney	First Lieut. Charles Rogers	W. E. Hampton Co., Los Angeles, Cal.
41	Palto Alto, Calif.	Fremont	....	The Lindgren Co., San Francisco, Cal.

Railroads Are Meeting Extra War Burden

Report of Chairman Harrison Shows Advantages of Joint Operation by Railroad Men

The Railroads' War Board issued a review on Aug. 5 of the work it has accomplished in the war operation of the carriers of the United States as one continental system, in which it was shown that with practically no increase in equipment the roads were doing 16.1% more work than under individual operation.

In a statement signed by Fairfax Harrison, president of the Southern Ry. and chairman of the war board, it was said that the success of the war operation of the railroads by railroad men to give the maximum of transportation service, irrespective of the welfare of any particular road or roads, could no longer be doubted.

First Month's Figures Show Increase

The first meeting of the war board was held Apr. 23. Figures for May, the first full month following, show that the railroads rendered about 16% more freight service with practically the same number of cars and locomotives as last year.

Actual returns just now compiled are from railroads having 173,105 miles of line. The reports show that these lines in May last year gave service equivalent to carrying 25,426,845,011 tons of freight one mile, while this year they carried 29,522,870,109 tons one mile, an increase of exactly 16.1%. This great increase in service was rendered with a very slight increase in the amount of equipment used. The number of freight locomotives in service in May last year was 24,362, while this year the number was 24,483, an increase of one-half of 1 per cent.

Last year in May there were 1,800,842 freight cars in service, while this year the number was 1,833,921, an increase of 1⅞ per cent.

Repairs Are Speeded Up

A distinct mark of progress is the great reduction in the number of freight cars in the shop or awaiting repairs. Last year in May there were 114,147 cars under or awaiting repairs, while this year only 104,061 were in that condition. Locomotives in repair or awaiting repairs last year were 4006, and in May this year 3593, a reduction of 10.3 per cent.

Last year railroad locomotives ran an average of 65.5 miles per day, while this year they made 71.3 miles. Freight cars made an average of 28.3 miles a day in May last year, and this year 29.6 miles, an increase of 5%. In the same period, the mileage of cars moving empty was reduced by 5%, while the mileage of cars moving under load was increased by 9.5%. The foregoing figures will appear all the more remarkable when it is realized that May, 1916, was itself a month of heavy traffic.

Dominion To Take Over Canadian Northern Railway

Plans of the Canadian Government for acquiring the Canadian Northern Ry., with its 9000 miles of line, were announced in Parliament last week by Sir Thomas White. The Canadian Northern is one of the systems that has received a large amount of Government aid and is still in financial difficulty, as was pointed out in the recent report of the Royal Commission. The Government already owns $60,000,000 of the $100,000,000 capital stock.

The acquisition of the Canadian Northern would give the Dominion Government, with the Intercolonial Ry., a coast-to-coast line. The Finance Minister states that the Government also contemplates the acquisition of the Grand Trunk Pacific Ry., but is not at present ready to finance the project.

It is understood that the Government favors the retention of many of the present operating heads of the Canadian Northern.

Municipal Work Active in Bismarck, N. D.

One of the largest paving projects ever carried out in one job west of Chicago is under way in Bismarck, N. D. The total amount of the work is $500,000. Of this, $130,000 is in the business part of the city, being bitulithic on 5-in. concrete base, while $370,000 is being expended in the residence district, where sheet asphalt pavement on 5-in. concrete base is being laid. The two sections will be completed by Aug. 10 and Nov. 1 respectively. The Ford Paving Co., of Cedar Rapids, Iowa, has this paving contract.

Incidental to the work of paving, storm-sewer construction to the amount of $70,000 was necessary, and is practically completed at this time. There is also about $7000 worth of sanitary sewer being constructed in the city this season. T. R. Atkinson, of Bismarck, is in charge of the construction.

Far West Wants Road Maps on Smaller Scale

A stipulation of the United States Office of Public and Rural Engineering is that prior to the Government's participation in highway improvement, maps of all proposed routes shall be made on a scale of 1 in.-1 mile. It is claimed that this condition imposes an unnecessary hardship in map making in the case of desert roads in states of "magnificent distances." Under this condition the improvement of a little stretch of 50 miles would call for a great deal of tracing cloth to designate a pair of parallel lines. It is expected that a concession will be made in favor of smaller scale maps, or a more definite ruling made as to whether improvements of the kind contemplated constitute the "permanent highway improvement" required as the prime requisite for Federal aid.

Contract Soon To Be Let for New Lower Otay Dam

Foundations Found To Be Satisfactory for Gravity Type Dam To Replace One Destroyed

Test borings and detailed examinations of the foundations at the site of the lower Otay dam, near San Diego, Calif., are being made for the city as a preliminary to letting the contract for a gravity type concrete dam to replace the one which was destroyed by flood last year. Complete details of the accident appeared in the *Engineering Record* of Feb. 12, 1916, and in *Engineering News* of Feb. 17, 1916.

The foundations have been found to be satisfactory, the details of the new structure have been decided upon and bids are to be called for as soon as the bonds are sold. The new dam will involve about 30,000 cu.yd. of excavation —about one-third in rock—the placing of 75,000 cu.yd. of concrete and 20,000 cu.yd. of mass rock. Some grouting of foundation may also be required as well as 2000 cu.yd. of concrete in the separate spillway, which will require some 6000 cu.yd. additional excavation.

The work is located about 20 miles southeast of San Diego and about 10 miles from the industrial track of the San Diego & Arizona Ry. H. N. Savage, hydraulic engineer for the City of San Diego, is directing the preliminary work at the site.

Committee Will Register Engineers for Engineering Council

A committee has been appointed by the Engineering Council to get up a register of engineers and work has started actively. The committee originally had four members, one from each of the founder societies of the Engineering Council. It has instructions "to collect information regarding the special qualifications of the members of the four societies to perform the various kinds of engineering service." The committee was also given authority to invite other societies to cooperate in its activity. As at present constituted, the committee consists of George J. Foran, Alfred D. Flinn, A. S. McAllister, E. B. Sturgess and G. C. Stone.

A list of all available engineering addresses is now being prepared by the committee, made up from membership lists of technical and semi-technical societies and other sources. An eight-page blank form has been prepared to be sent out to all names on the list. The answers to this form will constitute a very thorough biographical record of engineers, and from this special groupings will be made according to different kinds of service.

It is intended to make the list available to the Government, to enable the department to select engineers for special service that may be needed. The permanent use of the list, however, will be wholly for purposes of the Engineering Council.

States Adopt Uniform Boiler Law

The American Uniform Boiler Law Society, organized to secure the legal adoption of the boiler code of the American Society of Mechanical Engineers, reports, under recent date, that the work it has accomplished promises to be very far reaching in its results. The main efforts have been turned toward having the various legislatures pass enabling acts creating boards to draw rules, feeling that if this were accomplished the inherent value and balance of the American Society code would make its adoption an assured fact. While there were several states which failed to pass the necessary legislation, the committee feels quite confident that but little opposition will be encountered next time.

Unexpected opposition was met with from the Boilermakers' Union, which, under the leadership of James J. Casey, succeeded in several cases in having a rider attached to the enabling act, which provided that only boilermakers should be appointed as inspectors. Generally this rider succeeded in defeating the law. The society has remained steadfastly single in its aims and has not attempted to limit in any way the manner in which the code should be applied or who should have jurisdiction over it—feeling that these are matters which must be settled in the various states according to conditions.

The states and cities in which the code has been adopted, or is in process of adoption, are as follows: New York, New Jersey, Pennsylvania, Ohio, California, Minnesota, Wisconsin, Michigan and Indiana, and the cities of St. Louis and Kansas City, Mo. The bill was introduced in the following states, where it has failed of passage due to various reasons: Washington, Oregon, Texas, Tennessee, Rhode Island, New Hampshire, South Dakota, Iowa, Utah and Kansas.

Government Will Investigate Feeding Garbage to Hogs

An investigation of feeding garbage to hogs with a view to utilizing this material to the best advantage in conserving the food supply of the country will be made by the United States Department of Agriculture through the Bureau of Animal Industry, of which Dr. A. D. Melvin is chief. The work has been assigned to the Division of Animal Husbandry, George M. Rommel, chief, and also to George H. Shaw, sanitary engineer of the department. Mr. Rommel will study how to utilize garbage to the best advantage as food for hogs, and Mr. Shaw will take up the sanitary engineering features involved.

Visits will be made to large hog farms where garbage is used, and in addition experiments will be conducted at the Bureau farm at Beltsville, Md. It is expected that such questions will be considered as methods of garbage collection from houses, the sanitary handling of garbage, heat treatment of garbage before feeding, layout of feeding plants, various garbage-feeding data and the financial side of the problem.

The department will be glad to receive from sanitary engineers, city officials and others interested in garbage disposal any available data bearing upon the general subject under investigation. It is likely that a department publication covering the results of the investigation will be issued.

New Railroad Shops for Southern Pacific at San Francisco

Railroad repair and freight-switching yards are being built by the Southern Pacific company at a new location in Visitacion Valley, on the southern boundary of San Francisco. The company owns a 260-acre tract there, and extensive improvements are now well along toward completion. Two large steel-frame shop buildings have been completed, a third building of the same type is nearing completion, and a 17-stall roundhouse, power plant and 20 miles of track are already finished. Among the other improvements are a freight-car repair shop, 118 x 140 ft. in plan; 185 x 335-ft. planing mill and car shop; 130 x 346-ft. machine shop; and a 52 x 103-ft. store building. The work is expected to be completed and the yard in operation by the end of the year.

An independent organization of San Francisco citizens is planning the construction of a model workingmen's town on a newly laid out townsite adjoining the shops. Here, conveniently located, attractive homes in good surroundings are to be leased or sold on terms within reach of the workingman.

Pit River Power To Be Available Within Five Years

The Pacific Gas and Electric Co. has announced that it will at once take over the construction work on the Big Bend project on Pit River, developing the rights recently secured from the Mt. Shasta Power Corporation. The power house site is about 60 miles northeast of Redding and is served by drainage basins of 4385 square miles from which the minimum flow is about 2400 sec.-ft. The head utilized will be about 940 ft. and at minimum flow it is expected that 180,000 hp. will be developed. The installed capacity is to be 200,000 kw.

The construction required involves a diversion dam which will divert the stream into a 7-mile conduit, of which 6 miles will be in tunnel and 1 mile in reinforced-concrete pipe. The tunnel is to have a grade of 1 in 1000 and will be kept under a head of about 50 ft. Small storage capacity sufficient for daily load fluctuations, will be provided in the fore-bay.

The construction schedule as at present laid out calls for expenditures on the following basis: First year, $300,000; second year, $1,500,000; third year, $2,000,000; fourth year, $7,000,000; fifth year, $6,700,000, making a total expenditure of $17,500,000 distributed over a five-year construction period. The purchase of water wheels and generators is to be left until the last, so as to take advantage of such improvements in design as may take place meantime.

The work this year is to be a continuation of the two exploration tunnels begun by the Mt. Shasta company. These tunnels are now 7 x 7 ft. in section. From now on these will probably be advanced as the top headings for a larger bore. A tunnel 20 ft. in diameter is to be the size for supplying the plant now proposed. The voltage of the transmission line to connect with the company's system has not yet been decided upon but will not be less, it is announced, than 110,000 volts. A recent report of the State Water Commission estimates a total of 412,000 hp. available on the Pit River without storage.

Ohio Engineering Society Proposes Uniform Fees

The schedule for engineers' fees that is in force in Mahoning and Trumbull Counties, Ohio, has been sent to the various engineers of that state as one which has met with success and is worthy of being followed. The per diem rate of $25 a day is the base charge for consultation, opinion, testimony, preliminary investigation, report and consulting capacity upon design. In addition to this figure, sums are named for special kinds of services from rodman and chainman up to engineering and supervision for sewer districts.

Chooses Heavier Concrete Base

The Kansas City Board of Public Works, acting on the recommendation of Curtis Hill, city engineer, refused the petition to reduce the thickness of concrete base under pavements from 8 in. to 7 in. Mr. Hill feels that the recommendation should be rather to increase the depth of the base, because the specifications now in use did not anticipate the heavy tonnage of motor trucks under which pavement bases have been breaking down and the life of the pavements materially shortened —the saving of a few cents in the original cost hardly being balanced by considerations of final economy.

Septic Tank Conference

A conference of the National Septic Process League has been called to meet at the La Salle Hotel, Chicago, Aug. 14, at 10 a.m. One of the objects of the conference is to consider a proposition made to the officers of the league by the Cameron Septic Tank Co. to settle its claims against members of the league at a reduction of at least 25% of the regular royalties charged. Nonmembers of the league, threatened with suits for septic tank patent royalties, are invited to attend. Frank G. Pierce, Marshalltown, Iowa, is secretary of the National Septic Tank Process Protective League.

PERSONAL NOTES

M. P. PARET, formerly district engineer with the Interstate Commerce Commission, has opened an office as consulting enginer at Lake Charles, Louisiana.

G. MURRELL MIDDLETON has resigned as road engineer of Shelby County, Kentucky, to take effect Nov. 1.

THOMAS A. HAMILTON, who has for the past four years been connected with the Crane Co., is now representing the Walter A. Zelnicker Supply Co., St. Louis, in the Birmingham district, with headquarters in the Woodward Building, Birmingham.

WILLIAM SMITH has succeeded HENRY DENNEN as city engineer at Jackson, Ky. Mr. Dennen's resignation was due to failing health.

FRED TATE, formerly resident engineer for the Smith Building Co., Norton, Va., has resigned to accept similar work in Bluefield, Kentucky.

GEORGE WELLS has been appointed chief engineer of highways of Pike County, Kentucky, with headquarters at Pikesville.

WILLIAM FORRESTER, Nashville, Tenn., has become chief engineer for the Mayking Coal Corporation at Mayking, Ky. Mr. Forrester was formerly connected with the city engineering department of Nashville, Kentucky.

R. C. ROBINSON has been appointed resident engineer for the Michigan Central R.R., in charge of the field work connected with the boring for examination of foundations for a bridge at Niagara Falls.

W. F. GREENE has been appointed division engineer of the Monongahela Division of the Pennsylvania R.R., with headquarters at Pittsburgh, Penn., succeeding P. J. SKILLMAN, transferred.

F. B. TAPLEY, assistant engineer of the Canadian Government Railways at Moncton, N. B., has been appointed assistant engineer of maintenance, all lines, and will report to the chief enginer.

J. F. DEIMLING, assistant chief engineer of the Michigan Central R.R., has been appointed acting chief engineer, vice G. H. WEBB, who has been commissioned lieutenant colonel in the Sixth Engineers, National Army.

ROGER TAYLOR has been promoted to assistant general superintendent of the Northern Pacific R.R., with headquarters in Helena, Montana.

A. B. WOOD, mechanical and electrical engineer of the New Orleans Water and Sewage Commission, has been retained as consulting engineer by the Sanitary District of Chicago on the design and construction of the 1000-sec.-ft. Calumet and other pumping plants under consideration. He will still retain his position in New Orleans.

F. F. LONGLEY, a member of the firm of Hazen & Whipple, consulting civil engineers, New York City, has been commissioned as major and has been sent to France to assume entire charge of water-supply for the American expeditionary forces. Graduated from the United States Military Academy in 1902, Mr. Longley was commissioned in the Corps of Engineers, but soon afterward resigned, working from 1902 to 1903 under Joseph H. Wallace, on the construction of a paper mill, and then under George S. Pierson, of Kalamazoo, Mich., in charge of design and construction of sewage systems and disposal plants, and of the construction of a concrete steel weir at Rome City, Ind. At various times in the following few years he had charge of test runs of mechanical filter plants at Moline, Ill., of the operation of the Watertown mechanical filter plant, and of the Washington, D. C., filtration plant, making a report on the preliminary treatment of the Potomac River water. In 1908 and 1909 he had charge of investigations, surveys and preliminary design for increasing the water-supply of Washington, D. C., and from this latter date to 1912 he was in charge of construction of the sand filter plant for Toronto. In 1912 he became a member of the firm of Hazen & Whipple and had in charge various sanitary engineering problems, including design of additional filters for Toronto, investigations and design of work for increase of water-supply of Salem and Beverly, and investigations connected with the treatment of the Catskill water-supply for the City of New York.

Goes to France To Assume Charge of Army's Water-Supply



MAJ. F. F. LONGLEY

PROF. CHARLES J. BARTLETT, director of the Pathological Laboratory at Yale University, has been appointed director of the Bureau of Laboratories, Connecticut State Department of Health.

W. L. SACKETT has been appointed superintendent of waterways of the Department of Public Works and Buildings, State of Illinois, succeeding R. F. BURT, who remains temporarily at the head of the office.

J. H. PRIOR, formerly chief engineer, Illinois Public Utilities Commission, has left the service of the commission to open an office as consulting engineer in Chicago.

W. D. SHANNON, who has been superintendent of construction for Stone & Webster on the work of installing a new unit at the White River station of the Puget Sound Traction, Light and Power Co., Seattle, Wash., is at present in Youngstown, Ohio, where he is engaged as superintendent on the construction of an industrial city for the Carnegie Steel Co. This work is being done by Stone & Webster and consists of the installation of water-works, sewers, pavements and sidewalks and the construction of approximately 250 houses of various types. The new city is located near Girard, Ohio, and adjacent to the new mills being erected by the Carnegie Steel Company.

H. E. REEDER, formerly with the Southern California Edison Co., of Los Angeles, Calif., has accepted the position of construction engineer for the U. S. Smelting, Refining and Mining Co., of Pachuca, Hildago, Mexico.

CARL H. REEVES, consulting engineer and secretary-treasurer of the Seattle Association of Members of the American Society of Civil Engineers, who was recently appointed captain in the Officers' Reserve Corps, has been appointed superintendent of construction at the National Guard cantonment at Palo Alto, California.

WILLIAM B. HOKE, who has served as assistant to the engineer, Water-Supply Commission of Pennsylvania, and assistant engineer, Board of Water-Supply, City of New York, has accepted a position as field engineer for Mason & Hanger Co. on the erection of the United States Army cantonments at Louisville, Kentucky.

LEROY K. SHERMAN, for three years engineer member of the Illinois State River and Lake Commission, has taken up private practice as a consulting engineer and has opened offices at 137 South La Salle St., Chicago, Ill., making a specialty of hydraulic engineering, land drainage and sewage disposal and public-utility organization and appraisal. Mr. Sherman was at one time assistant chief engineer of the Sanitary District of Chicago, having charge of the construction of the controlling works and hydro-electric plant at Lockport, Illinois.

CAPT. PAUL HANSEN, Engineer Officers' Reserve Corps, and formerly chief sanitary engineer of the Illinois State Board of Health, has been

ordered to service with the United States forces in France.

HENRY D. LINDSLEY and THOMAS T. DESMOND announce the organization of their business as investment bankers and engineers under the name of Lindsley, Desmond & Co., with offices at 31 Nassau St., New York City.

E. H. BARNHARD, division engineer, maintenance-of-way, of the Baltimore & Ohio R.R. at Wheeling, W. Va., has been transferred to Baltimore, Md., succeeding RICHARD BROOKE, who resigned to enter military service. P. A. BEATTY, assistant engineer at Baltimore, has been promoted to division engineer, maintenance-of-way, with headquarters at Wheeling, succeeding Mr. Barnhard.

HOWARD ELLIOTT, formerly president of the New York, New Haven & Hartford R.R., has been elected chairman of the Executive Committee of the Northern Pacific Ry., with headquarters in New York. Mr. Elliott has been a member of this committee since July 1 and retains his connection with the New Haven road as chairman of a committee in charge of intercorporate affairs. He will also continue as a member of the Railroads' War Board.

S. J. WILLIAMS, formerly of Milwaukee, state building inspector under the Wisconsin State Industrial Commission, has been promoted to the position of engineer-in-charge of safety and sanitation of the Industrial Commission. This department includes factory, building and boiler inspection and fire prevention.

C. H. BYERS has been apointed district engineer and W. H. DAVISSON has been appointed assistant district engineer in the office of the Pacific District, Division of Valuation, Interstate Commerce Commission, with offices at San Francisco. These appointments were effective Aug. 1.

OBITUARY

HENRY NEWTON RANDALL, general contractor, of Portland, Ore., was killed recently in Battle Creek, Mich., by a Michigan Central passenger train. For the past ten years Mr. Randall had been connected with the Porter Bros. Co., general contractors, of Portland and Spokane, and was engaged at the time of his death in a subcontract from this firm on the Battle Creek cantonment.

D. W. SPENCE, dean of engineering and professor of civil engineering at the Agricultural and Mechanical College of Texas, died at Galveston, June 28. Born at Austin, Tex., in 1868, Professor Spence graduated from the University of Texas in 1889, attaining a C. E. degree at the University of Michigan in 1890. For the year after graduation he was engaged in bridge construction in Colorado, and during the next year was chief draftsman for the South Halsted Street Iron Works, Chicago. In 1890 he was appointed assistant professor of civil engineering, physics and drawings at the Agricultural and Mechanical College of Texas, and in 1899 he became professor of physics. In 1903 he was made associate professor of civil engineering, in 1909 professor of structural engineering, and in 1913 dean of engineering and professor of civil engineering.

Engineer Officers' Reserve Corps Assignments

The following-named officers of the Engineer Officers' Reserve Corps are relieved from their obligations in connection with their enlistments at the places indicated below and are assigned to active duty at the same places:

At Vancouver Barracks, Wash.—First Lieut. James O. Jensen.

In the vicinity of Washington, D. C.—Capts. Joseph V. Birch, Dana Q. McComb, Charles R. Humphreys, William H. Messenger, Vinton D. Cockey and Merwin Armstrong; First Lieuts. George H. Morgan, William H. Smith, Samuel A. Graham, Harry W. Hill, Matthew J. Hoff, Francis H. Kingsbury, Lester C. Smith, Robert Lloyd, Henry C. McRae, Raymond C. Semple, Francis H. Wisewell, Jr., Philip B. Hoge, Hobert W. French, J. Milnor Roberts, David A. Gilbert, Walter R. Morse, Archibald S. Wilson, Donald B. Adams, Henry W. Clark, Fred C. McFarland and Frank L. Weaver; Second Lieuts. Fred G. Rockwell, William A. Bassett, William G. Perry, Charles E. Bretz, Frank E. Edebohls, John C. Metzger, George L. Winslow, James P. Woodson, Daniel C. Kane, Bewley E. Merrell and Walter F. Flynn.

At Fort Leavenworth, Kan.—Capts. Eugene N. Sanctuary, Carroll R. Forbes, Hill P. Wilson, Jr., Edgar S. McCandliss, Dickens S. Adams, Arthur J. Rife, James R. Fuller, Albert Smith, Clarence E. Russell, Thomas H. Holmes and Philip J. Watson, Jr.; First Lieuts. George A. Anderson, Harry B. Kircher, Albert R. Montague, Walter G. Gruber, Ridgely C. Lilly, Ilo I. Taylor, Francis S. Lehmann, Clarence N. Bott, Henry C. Bryan, Albert Gonsior, William S. Etheridge, Ralph D. Salisbury, Edwin M. Sincere, Henry S. Gove, Earle W. Jennings, Edwin B. Styles, Alexander M. Thompson, Robert L. Fitzgerald, Philip R. Elfstrom, L. Garland Lyman, Edward P. Alexander and Charles Sacra; Second Lieuts. Charles R. Wood, Albert O. Ayers, Orville T. Beadle, Willard E. Lofgren, William J. Brush, Thomas A. Mottram, William W. Zass, Jr., Scott B. Christopher, Barton D. Wood, Otto L. Robinson, Fred R. Beerman, Hamlet P. Jones, Fred A. Rohn, William H. Dial, Lloyd Heulings, Joseph A. Noble, Ralph E. Dickie, Leo J. Dillon, Peter K. Lutken, George R. Mitten, Alvin E. Scott, Dean P. Woleben, Robert S. Meston, Arthur H. Besse, Luther G. Lewis, Charles P. Mottz, Luroy Croy, Edwin A. Kauheimer and Lawrence J. Welch.

The following-named officers of the Engineer Officers' Reserve Corps are relieved from their obligations in connection with their enlistments at the engineer training camps named below and assigned to active duty at the same camps:

At Vancouver Barracks, Wash.—First Lieuts. Clifford E. Chase, Lester O. Wolcott and Benjamin B. Bessesen.

Second Lieuts. Gordon C. Hess and George E. Sperbeck.

In the vicinity of Washington, D. C.—Capts. Richard W. Reading, Cambridge U. Trott, Hugh J. Betterley, George J. F. Carey, William T. Gould, Alexander Colt and Hobart B. Baird.

First Lieuts. Hugh A. Tillett, George M. March, John E. Degan, Frank J. Zapf, Alfred C. George, Homer L. Cappleman, John P. Hallowes, Stewart W. Anderson, Johnson C. Brady, Frederic M. Hartshorne, Lewis H. Hubbard and Thomas B. Kennedy, Jr.

Second Lieuts. Roland G. Stafford, Ray L. Hufford, William E. Bowler, A. Craig Meikle, Lovell L. Turley, Andrew O. Jackson, William Robinson, Clayton E. Swain and Eric W. Luster.

At Fort Leavenworth, Kan.—Capts. Thayer D. Sterling, Alfred P. Poorman, Leon L. Clarke, Leon H. Brady, Alfred C. Whitney, Samuel L. McGlathery, David E. Hannan, Willard A. Knapp, Gary E. Block, Arthur T. Kennedy, Thomas W. Blinn, John J. O'Connor, Lewis D. Rowell, Gustavus A. Loeb, Wilber M. Wilson and Pendleton S. Morris, Jr.

First Lieuts. Carl D. Smith, Ben Gest, Frederick E. Booss, Luther R. Swanson, Thomas J. Summey, William G. Saunders, Lowndes W. Shaw, James Archer Smith, Ralph E. Stevens, James M. Templeton, Benjamin A. Thaxton, Hugh A. Thompson, Charlton C. Whittle, Lester J. Williams, Frank W. Young, Thomas V. Woodring, Herman Fluegel, George K. McCollough, George R. DeBeque, Clarence W. Zachow, Edward H. Taylor, Ernest H. Bailey, Albert B. Jones, Gordon H. Butler, Joseph F. Villavaso, August M. Engel, Richard C. Limerick, Voris R. Norton, Durbin Van Law, Harry G. Burrowes, George B. Farlow, Edward S. Bres, Cassius P. Fletcher and Edgar B. Tolman, Jr.

Second Lieuts. Austin B. Reeve, Royal D. Sundell, James L. Craig, Kenneth Urquhart, Clifford H. Stem, Clarence McK. Rader, Marney B. Willey, Douglas S. Watters, Frank T. Payne, Fred L. Waterman, Merle V. Holmes, Charles K. Elmer, Maurice W. Hewett, Leon L. Savage, Julian W. Alger, Gerhard W. Gunderson, William H. Betts, Joseph W. Anderson, Arthur Hagener, Harold A. Thackrey, Ralph E. Johnston, Daniel R. Crosswell, Swdney A. Mewhirter, Walter E. Higgins and Robert G. Breene.

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ENGINEERING NEWS-RECORD

A WEEKLY JOURNAL
DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

Investigate Water but Provide Water Power

YEARS of fighting for a highly useful purpose reached success with the signing of the River and Harbor act this week. The Newlands section of the act, aimed at ultimate unification of Federal water administration, has been on the carpet for years. Now finally it managed to pass, although in somewhat emasculated form. Whether the ideal end is to be looked for in a Federal bureau of water or in other forms of administration is secondary. The great thing is to make a beginning toward unsnarling the tangle which now binds up the irrigation, power, water-supply, navigation and other uses of water. Under the new law the next few years can only bring forth investigation and report. Meanwhile, one phase of the question—that relating to water power—ought not to wait for the results of this study, and the subsequent delayed action of Congress. Present restrictions on development of water power are so hurtful to the Nation's interests in the pressure of war work that immediate relief legislation should be had. There is no danger that the passage of such legislation will prejudice the results of the Newlands commission's work.

Cautious Progress in Price Regulation

FEELINGS of relief are in order now that both the River and Harbor and the Food Control Bills have become law. The greater relief is to come, however, when the Government's policy and procedure in price-fixing will have been clearly defined. The nation is committed to regulation of prices—that is certain now. It is made more certain by the passage of the Food Control Bill, since no one price can be fixed, safely, without fixing other prices as well. And to safeguard the food situation it is obvious that prices will be fixed. Indeed, the new administrator's first act was to issue a statement containing warnings against excessive prices, and almost immediately thereafter the project of Government purchasing and selling loomed up. Quite generally, the word "profiteering" has been a Washington shibboleth during the week, and it seems to mean asking prices that exceed the production cost by more than x per cent., where x is the as-yet-unknown quantity. There is a bothersome problem in the fact that one producer's rock-bottom price may be a very rich figure indeed for another producer. To date the Government has done nothing toward solving this problem, in spite of much discussion. Pending such solution—and other matters as well—much good business is stagnating, which is not precisely helpful to the country's interests. But we may feel with some comfort that by the Federal Trade Commission's studies and otherwise the price-fixing matter is progressing, though cautiously.

More Map Making in Future—Perhaps

THE leisurely rate at which mapping of our country proceeded in the past was doubtless in part the expression of a feeling that active practical work is more important than drawing maps. It may be that the same sentiment had hold of our military engineers; at any rate we know today how they were caught in the first swirl of war-preparedness work bare of a great many maps necessary to defense. Now comes the experience from every cantonment job that the first urgent need is a topographic survey, adequate maps being not in existence. Thus circumstances are creating a greatly enhanced respect for an ample supply of map information. A logical outcome will be an increase of mapping in all the states, after the war. That would represent a much-to-be-desired advance. As we stood until a few months ago, were there prospect of handling extensive military movements—even if only maneuvering—within the United States on the basis of the Geological Survey's inch-to-the-mile sheets, neither our civil nor our military authorities could be particularly proud of the result.

For Safety Use the Closed-Circuit Idea

THE wider use of automatic fire and other alarms is being proposed here and there over the country, to replace watchmen and thus to relieve in one direction the difficulties expected from shortage of men. And in almost as many instances the employment of mechanical or electro-mechanical devices is opposed on the ground that they get out of order, fail to function when most needed and double the dangers they should reduce. But just such devices have been successfully used for years in many fields, and that criticism fails if the mechanisms embody the "closed-circuit" principle which has become a fundamental requisite in railway signaling—that is, if when they get out of order they give a warn-

ing through this very failure to hold themselves ready for service. A few false alarms will be given, of course, but their number will be comparable with the lapses in judgment of the human minds replaced.

Stealing Estimates from Contractors

SOME corporations in the western part of the country have been abusing the practice of calling for bids on construction work by using the bids received as a basis for making an agreement with some favored contractor, or simply for checking their own estimate as to the cost of work which they have no intention of carrying out at the time. It costs money to submit a bid, and the contractors who are imposed on in this way are forced to charge other owners more for their work in order to save themselves from loss inflicted as a result of this practice. In other sections reputable contractors have from time to time refused to submit tenders to this class of owners, and the offenders have found themselves in the end dependent for their new construction on a few parasites who were in a position to reverse things and make the misguided owners pay anything they might ask. It is rumored that even trunk railway systems have found themselves in this unenviable situation as a result of pursuing this selfish policy. The western contractors propose to combine in refusing to bid on the work of any company that does not agree to announce the result of the letting. This is the proper remedy. It is to be hoped that the western contractors mentioned will not hesitate to apply it and compel a prompt reform.

Fine Screens or Imhoff Tanks?

UPON the outcome of the long contest between fine screens and Imhoff tanks for sewage treatment now hanging in the balance at Cleveland, Ohio, may depend in large measure the near future of fine screening in America. We say "near future," because some features of the later phases of the contest seem more likely to be temporary than permanent in their influence—at least outside of Cleveland. We refer more particularly to the fact that after several years of experiments, first with the whole range of currently available methods of sewage treatment, then with fine screens as an outgrowth of the earlier tests and with activated sludge as a new and promising process, all by a resident consulting engineer and local staff, a second consulting engineer was called in. After a few weeks' study he recommended procedure in some respects in direct variance with the conclusions and plans of the first consulting engineer. The story is outlined and many details of the test results and of the report of the second engineer are given in an article beginning on page 308.

The outstanding engineering facts are: (1) That according to Messrs. Pratt and Gascoigne, fine screens, as represented by the protracted test of a full-sized Riensch-Wurl screen, did not fulfill the promise expressed in the Cleveland sewage-testing station report of 1914 and fell far below the contract-test requirement of being equal to sedimentation tanks in removal of suspended matter; (2) that notwithstanding, in fact one might say almost ignoring, the results of the Riensch-Wurl screen tests, Mr. Fuller advised the use of fine screens instead of Imhoff tanks at all three of the proposed Cleveland sewage-works; (3) Messrs. Pratt and Gascoigne concluded that fine escreens would not remove sufficient solid matter to prevent formation of a sludge mat on the lake bottom, with subsequent loosening and beach pollution, and would otherwise be unsatisfactory as compared with Imhoff tanks and more expensive in total annual charges, while Mr. Fuller believed that the fine screens would do all that is needed at the lake-shore plants, at less annual cost than the proposed tanks; (4) that at the one works where a relatively high degree of treatment is required Mr. Fuller would follow fine screening with sprinkling filters and these with deep Dortmund tanks, instead of using Imhoff tanks as proposed by Mr. Pratt; and (5) that Mr. Fuller, like Mr. Pratt, has high hopes for the future of the activated-sludge process, and Mr. Fuller here, as in an earlier report for Lima, Ohio, believes in fine screens as preliminary to the activated-sludge process.

Time must tell whether Messrs. Pratt and Gascoigne are right in preferring sedimentation in Imhoff tanks to fine screens or Mr. Fuller right in his real or apparent ignoring of the latest Cleveland screen tests and recommending fine screens over Imhoff tanks for clarification.

It must be understood that in the Riensch-Wurl tests and report, a result equal to 1½ hours of sedimentation was the criterion, whereas in Mr. Fuller's report it is assumed that at two of the sites fine screens will afford all the clarification now required and at the other site they will be a useful and satisfactory preliminary to sprinkling filters and deep Dortmund tanks. In other words, fine screens are assumed by Mr. Fuller to be sufficient and preferable to anything else for the general end to be accomplished and are not measured in terms of removal of suspended solids, either absolutely or as compared with some other method.

On the face of the two reports, the earlier one is unfavorable to fine screens from various specific points of view, while the later report is most encouraging for fine screens, but in broad general terms, with few supporting operating data, and after an apparent discard of the Pratt-Gascoigne tests and conclusions.

Technically, at least in so far as meeting Cleveland conditions is concerned, the points at issue are before the Ohio State Department of Health. Its decision will be awaited with interest—an interest heightened by the fact that Prof. Earle B. Phelps, of Washington, has been called into consultation by the State of Ohio. Professor Phelps' connection with the United States Public Health Service and with the International Joint Commission studies of pollution of the Great Lakes

will tend to give the final decision reached a national and an international aspect, from the sanitary but not necessarily from the economic viewpoint.

Reform Due in the Regulation of Joint Committees

SOME very definite regulations are needed governing the conduct and reports of joint committees if these reports are to have the authority which is their main justification. Ostensibly such committees are organized because their reports will realize on all of the talents of the different societies which cover the subject under study. Actually they approach this ideal only in so far as the representatives gage the combined mind of their respective societies. The membership itself has small opportunity for detail changes in the report, which is in effect only the expression of the qualified experts who make up the committee. This is representative government carried to the second degree, for joint-committee members are as a rule appointed by officers who are in turn elected by the membership—and there is no recall.

All of this does not detract from the technical excellence of joint-committee reports. It does mean that under present conditions it is not quite fair to label reports with the names of the contributing societies.

The final report of the Joint Committee on Concrete and Reinforced Concrete is a case in point. That report was printed last December in the *Proceedings* of the American Society of Civil Engineers and presented to that society in January as a report of a special committee. According to established procedure, it was neither adopted nor rejected, but was simply received. In February it was received by the American Concrete Institute, in March adopted by the American Railway Engineering Association and in June accepted by the American Society for Testing Materials. At these later meetings there were present men who either on the floor or in the lobbies urged the impossibility of amending and even of rejecting the Joint Committee report without pronounced discourtesy to the other societies that contributed to it. Even in the American Society of Civil Engineers, which recognizes the report as coming from its own committee, some tactless semi-official criticism of the Joint Committee and of one of the other constituent societies led the chairman of the special committee to refer to the discourtesy of suggesting the discharge of that committee without due notice to the other societies.

Here is built up a vicious circle of courtesy which prevents any society from considering a joint report on its merits. Add to this the fact that the concrete report, presented as new matter to the Testing Materials society in June, had already been in print and extended circulation for six months—duly labeled with the name of the American Society for Testing Materials—so that by that time it had reached the stage of a permanent and accepted document!

The anomalous situation created by the concrete report at the Testing Materials meeting led to a resolution calling upon the executive committee of that society to lay down some rules governing the conduct of all joint committees. Such action may well be considered by other societies. It is evident that if such committees are not to become creations greater than their creators, appropriate rules must be agreed upon. Some arrangement must be made for the presentation of their reports more or less simultaneously to the respective societies. Some provision must be made to prevent publication of the names of any one of the constituent societies as parties to the joint report until such societies have had opportunity to act upon it. Some control of the contents of the report must be vested in the societies themselves.

And lastly, the report should have final publication with the authorized discussion of all the contributing societies, so that its joint reception may be judged as fully as its joint production is guaranteed.

Cost-Plus-Savings Contract for U. S. Engineer Corps

CONTRACT reform traceable to the unusual conditions attending the war is being extended to Mississippi River work done under the direction of the Corps of Engineers, U. S. Army. There has been adopted for this work a cost-plus-25-per-cent. form of agreement under which bids are asked and contracts awarded on a field cost per cubic yard. If the contractor does the work for less than the bid price, he receives half the saving in addition to his percentage of the bid cost. If the work costs more than the bid, the excess will be deducted from the 25 per cent. of the bid cost which the contractor would have received, up to the point where the amount deducted becomes 10 per cent. of the bid cost.

A greater premium is thus put on saving than is the case with any private work of which this journal has been informed. Very economical work should result. On the other hand, the contractor cannot, in the event of unforeseen rises in labor and materials, receive less than field cost of the work plus a fee equal to 15 per cent. of his bid. Thus, no work is apt to be thrown into the hands of a receiver, even as a result of unfortunate circumstances, which is also greatly to the Government's advantage. These percentages are not excessive when it is remembered that absolutely nothing except labor and materials consumed in doing the work is included in the field cost. Even freight and unloading charges on plant are paid for out of the fee. Furthermore, the Government reserves the right to place additional plant on the work at the contractor's expense if progress is not satisfactory.

The experience to be gained with these contract provisions and with those adopted by the Bureau of Yards and Docks of the Navy Department ought to go a long way toward educating the public to the many urgently needed reforms in contract provisions on public work in general.

Two Novel Coal Piers Recently Opened at Port of Baltimore

Both Pennsylvania Plant at Canton and That of Baltimore and Ohio at Curtis Bay Are Radically Different from Any Others on Atlantic Coast, as Well as from Each Other

TWO coal piers, both representing radical departures from anything yet built, and the two totally different from each other, have recently been put into operation at the port of Baltimore. A combination of 4-ton cable cars and traveling loaders on the pier features the plant of the Pennsylvania R.R. at Canton, just east of Baltimore proper. The capacity of this plant is considerably less than that of other older ones, but the terminal is designed especially to serve vessels and barges of every sort in local coastwise business. At Curtis Bay, south of Baltimore, on the other hand, the Baltimore & Ohio had two demands of a conflicting nature to meet. It was desired to load large ships quickly and at the same time to handle small shipments for local vessels of all types without interference with the larger operations. The company therefore decided upon a system of belt conveyors, traveling towers which the conveyors mount, and cross conveyors on the towers. With the system the company can handle 7000 tons of coal per hour—more than any other pier on the Atlantic seaboard—while at the same time small shipments can be handled as they come, with no delay to either operation.

Car Dumpers at Both Plants

At both piers the road cars are emptied by car dumpers—two at the Baltimore & Ohio plant, one at the Pennsylvania—and up to the dumpers the layouts are not dissimilar to those at other terminals, as the general plans indicate. Road cars are pushed over the hump at the entrance to the load or advance yard, and from that point no locomotives are required except to remove the cars from the empty yard. With brakes released the loaded cars run down to the foot of an incline, where a barney takes them to the dumper, after which the empties run by gravity to the "empty" yard. As the "load" and "empty" yards are side by side there are kickbacks to turn the cars back on themselves; at the Pennsylvania plant the cars are turned back before they reach the dumper, while the reverse is the case at the Baltimore & Ohio terminal.

Both roads have thawing houses on the load yards. At the Pennsylvania pier all six tracks pass through the house, which has a capacity of 30 cars. At the Baltimore & Ohio pier the thawing house is over two tracks of the much larger load yard.

The barney at the Baltimore & Ohio pier is of the disappearing type, so that on the return trip it may pass under a car at any point, a movable arm rising up and engaging the car when the barney starts up the incline.

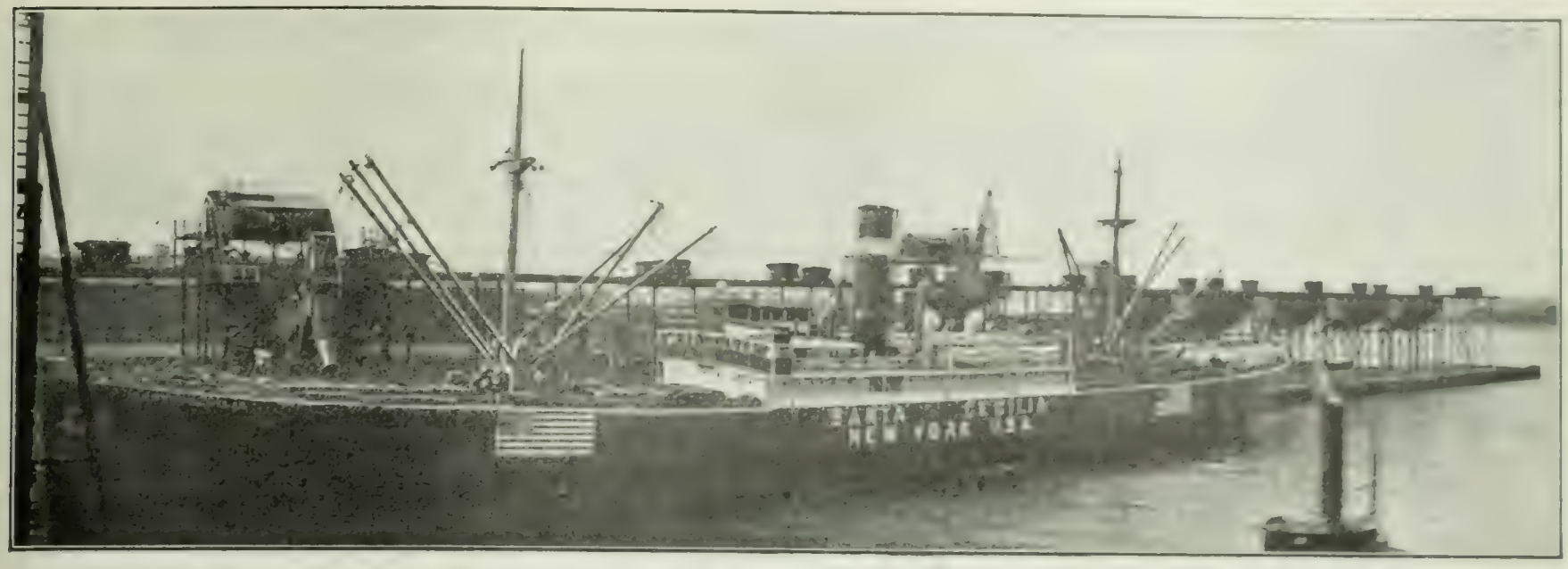
Pennsylvania Uses Small Cable Cars and Traveling Loaders

At the Pennsylvania plant the dumper hopper feeds into 4-ton cable cars traveling on an endless narrow-gage track. The cars are hauled up a 6.72% grade to the high steel superstructure in the center of the pier, whence they pass to the outer end of the pier and back, and down the incline to the starting point. In transit they can be made to deliver their coal to any of the three traveling loaders that constitute the second distinctive feature of the system, or deliver it into any of the bunkers at the outer end of the pier, on the south side. As the photographs show, these loaders are machines moving along the pier on a two-rail track, and carrying a hopper and a chute delivering into the holds of vessels. There are two loaders on the north side and one on the south, in addition to the weighing loader which travels along under the pier bunkers.

As previously stated, the aim in the design of the Pennsylvania pier was to secure flexibility for handling local and coastwise traffic in vessels of every type,



BROADSIDE OF BALTIMORE & OHIO PIER AT CURTIS BAY—



BROADSIDE OF PENNSYLVANIA PIER—LOADER 1, EQUIPPED WITH CONVEYOR, ON LEFT; BUNKERS AT RIGHT

rather than great capacity for bulk shipments. Hence the three loaders are all somewhat different. No. 1, the inner loader on the north side, is the largest and is intended to serve the largest vessels. Its hopper has a capacity of 40 tons, and it is equipped with a pan conveyor on a movable arm, so that the coal can be made to go either up or down to suit the height of the side of the vessel. It has a reach of 34 ft. from the side of the pier and will go over the side of a ship 56 ft. above water level.

No. 2 on the same side has a 10-ton hopper and a gravity chute. No. 3 on the south side has also a gravity chute, but a 35-ton hopper. The gravity chutes must incline about 10° to make the coal move, but can be lowered to a greater angle.

Weighing Loader Serves Bunkers

No. 4 is the weighing loader. It travels along the pier and receives its coal from any of the pier bunkers, of which there are ten, extending for a distance of 625 ft. The weighing loader has a 10-ton hopper and is equipped with a conveyor. The bunkers are each of 75 tons capacity.

The 150-ton bunker at the car dumper has four hoppers arranged in tandem, equipped with a special arrangement by which each hopper delivers one ton of coal to the pier car as the latter passes under it.

The cable system is divided into two parts—one for the incline, the other for the pier superstructure. A tripping device at the top of the incline releases the car from the first cable, and if it is too close to the car ahead it can be held at will until the spacing is as desired. The aim is to have the cars about 60 ft. apart.

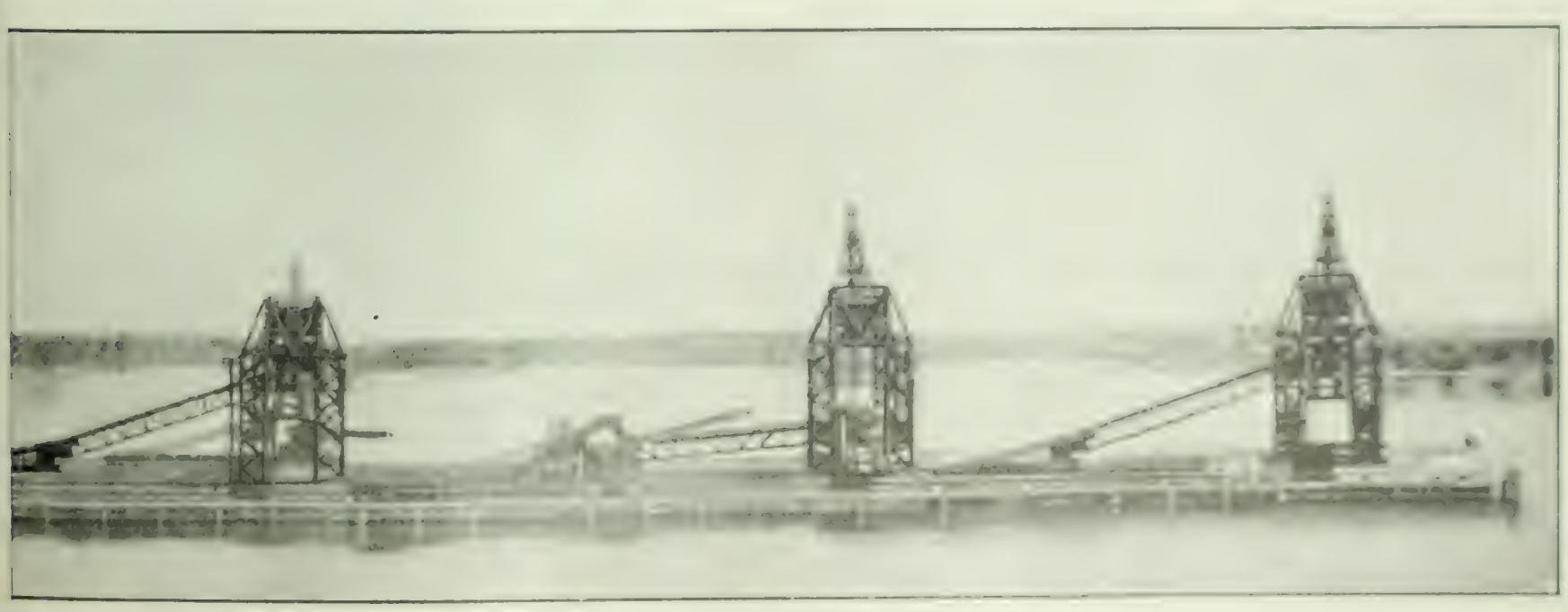
The emptying of the pier cars is centrally controlled from the house at the head of the incline, so that it is impossible for loader No. 1 or 2 to take coal intended for No. 3. The operator in the headhouse in turn has telephonic connection with the operator of the car dumper, so that he may know the proper destination of each car of coal.

The pier is 1000 ft. long and 66 ft. wide. The present capacity of the plant is 1500 tons per hour. By the addition of more cable cars this capacity can be doubled without changing any of the other units.

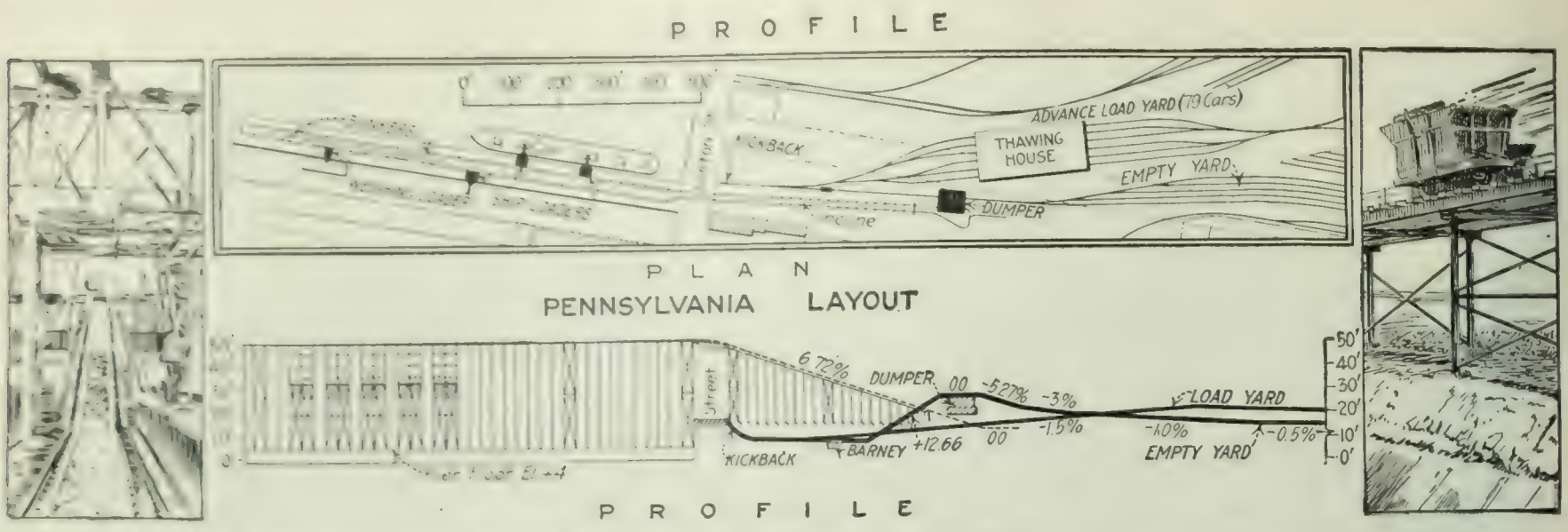
Belt Conveyors at Baltimore & Ohio Plant

At the Baltimore & Ohio pier the need for maximum capacity for bulk export shipments by the car load, as well as for the greatest flexibility, and the desire to minimize the breakage of the coal, led to the adoption of the conveyor system to be described.

Each car dumper empties into a lowering bin, a hopper under which supplies three short feeder belts. Two of these for each dumper feed the main 60-in. loading

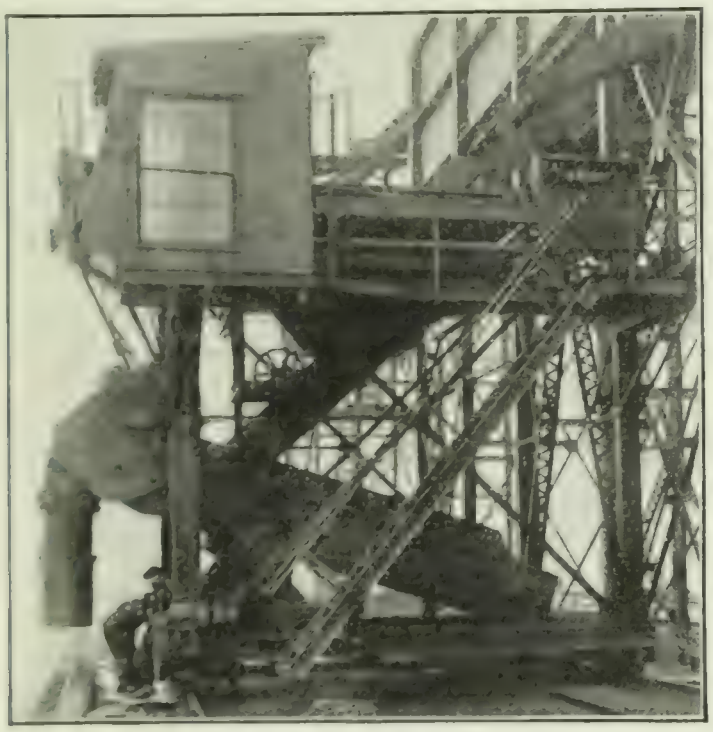


CAR DUMPERS AT LEFT—LOADING TOWERS AT RIGHT



LAYOUT OF PENNSYLVANIA PLANT AT CANTON—POSITION OF CABLE TRACK, LOADERS AND BUNKERS

belts and pass the full length of the pier. The third delivers to another conveyor carried on an inclined bridge. The lower end of this bridge pivots at the discharge end of the short conveyor, while the support near the center travels on an arc of circular track, so that the conveyor can be discharged at any desired point in what is called the balancing bin at the shore



WELDING LOADER TO SERVE BUNKERS AT CANTON, HAS PAN CONVEYOR

end of the pier. Thus there are four 60-in. loading belts and over them a large balancing bin fed from two conveyors on two inclined rotating bridges.

From the balancing bin, and fed by it, run two more belt conveyors, one either side of the main belts, on the edges of the pier. These are 48-in. belts and are known as the trimming belts.

Four Loading Towers

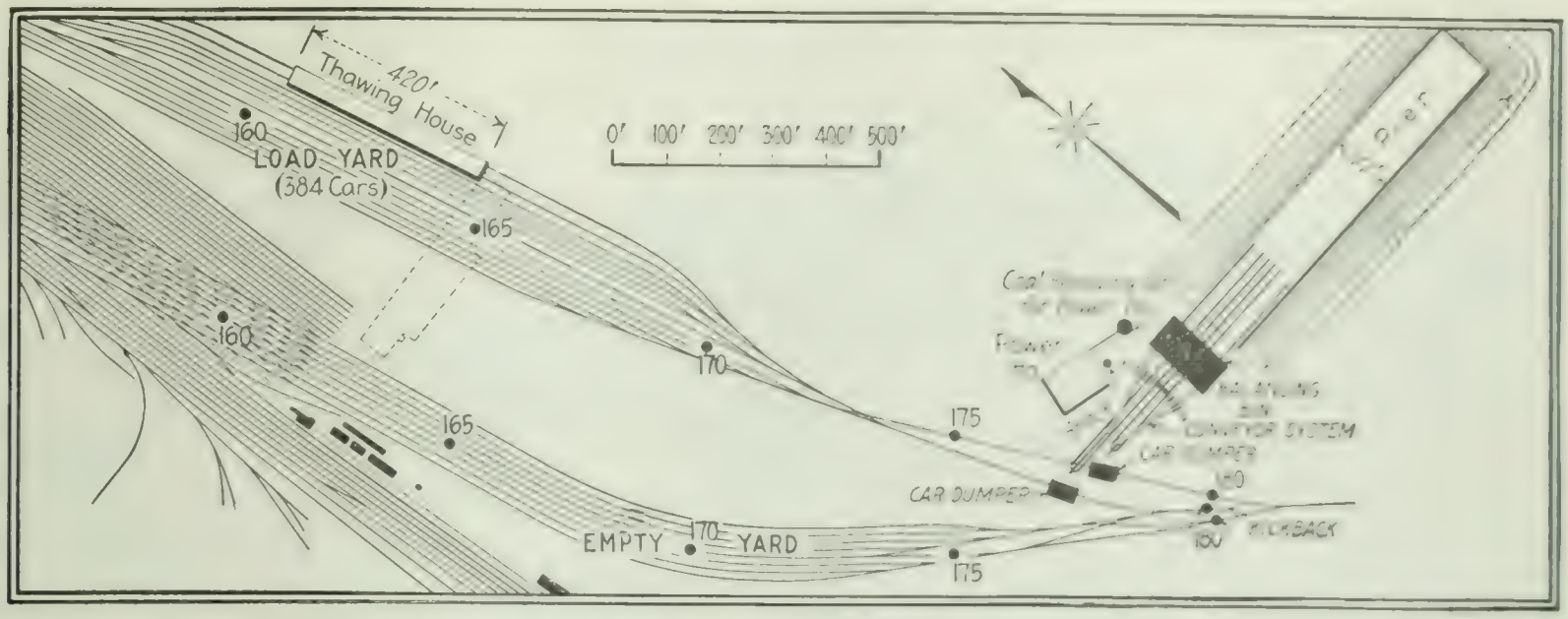
Corresponding to each of the main belts is a loading tower. The four towers are similar, being traveling bridges spanning the main belts and carried on a track system between the loading and trimming belts. Each tower, however, takes the coal from one belt only. An incline at the shore side of the tower takes the belt up and discharges it upon a cross conveyor or shuttle ram on the bridge, whence the empty main belt doubles back and passes under the tower, on out to the end of the pier and back to the dumper. The most southerly belt serves the inshore tower, the next belt the next tower, and so forth.

The cross conveyor has three kinds of motion. The belt can be run in either direction to load ships on either side; the conveyor frame can be moved longitudinally so that the belt will discharge 35 ft. beyond the side of the pier, and it can be raised and lowered within a range of 27 ft. to conform to the height of the vessel, the incline for the main belt being raised accordingly.

In a similar manner each trimming belt serves a trimming tower, there being one on a special track on each side of the pier. The belt passes up an incline on the

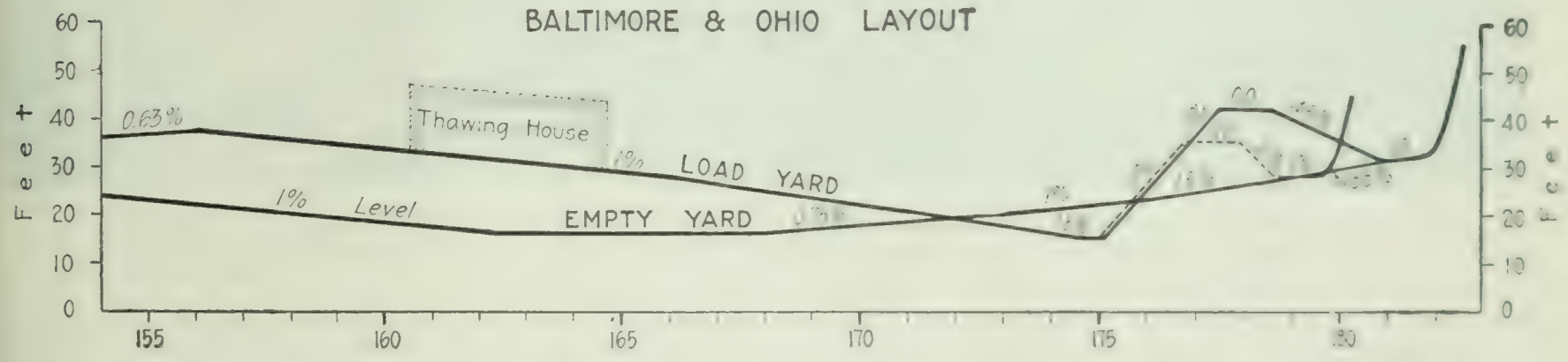


GRAVITY LOADER 3 AT CANTON IS DESIGNED FOR OPEN-TOP BOATS



P L A N

BALTIMORE & OHIO LAYOUT



TRACK ARRANGEMENT AND PROFILES AT BALTIMORE & OHIO PIER, CURTIS BAY

tower and discharges into a hopper, which in turn feeds a conveyor on a swinging boom. The name of the trimming towers tells their purpose.

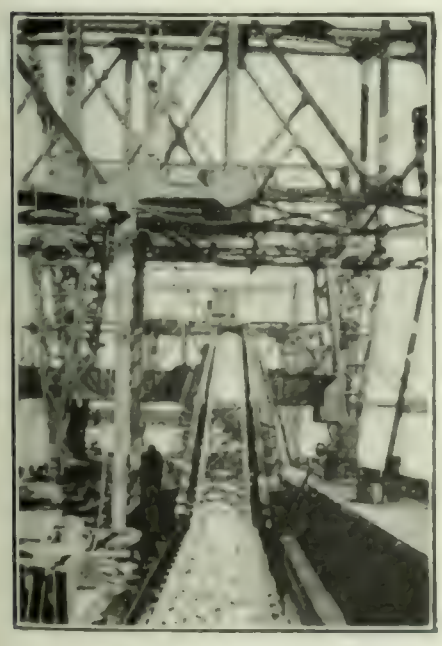
The object of the balancing bin is also implied in its name. Normally the bulk of the coal delivered by the car dumpers is handled by the main loading belts. During the moving of the towers from one hatch to another, however, when these belts are unable to take the coal, it can be diverted into the 5000-ton balancing reservoir, and the dumping of cars need not stop. Conversely, two of the four main belts can be fed from the balancing bin in case the dumper is not working. The trimming belts, also, are fed from the balancing bin.

To prevent the breakage of coal each dumper empties into a 120-ton lowering bin or pan, which is pulled up during the dumping to a horizontal position minimizing the fall of the coal. The pan is then lowered to an angle of 50° and a gate over the hopper automatically opens. At the same time the feeder belts start. When the pan is raised the gate automatically closes, and the feeder belts also stop automatically before the 15-ton hopper is empty. Thus there is always a cushion to receive the coal from the lowering bin.

Operations Automatically Interlocked

Coal can be taken from the hopper by any or all of the feeder belts at any time.

The balancing bin is divided into eight units—four trimming hoppers with 750 tons capacity each, and four storage hoppers of 500 tons each. The latter, as shown,



BELT CLIMBING TOWER



TWO LOADING TOWERS AND ONE TRIMMING TOWER (AT LEFT) WORKING ON ONE SHIP AT CURTIS BAY



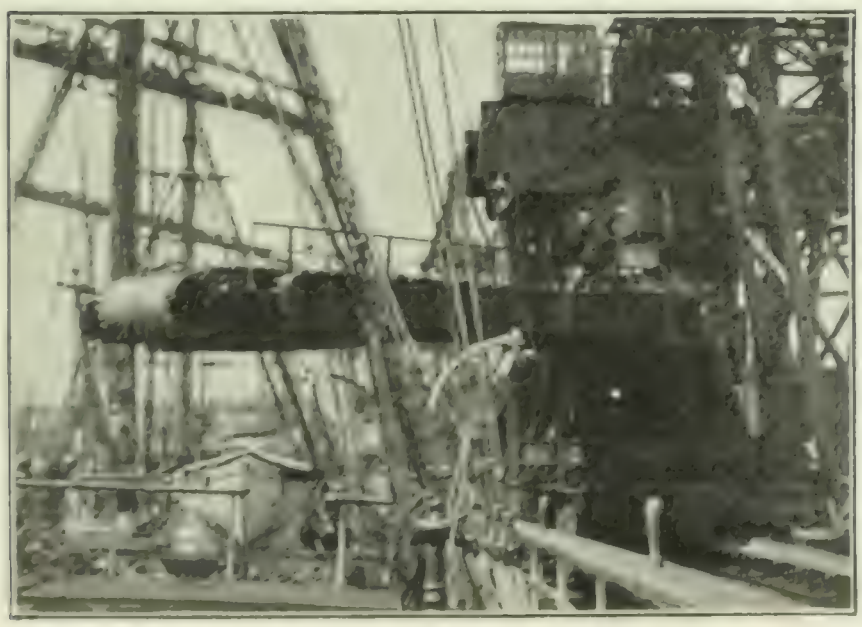
DUMPERS AND INCLINED CONVEYORS AT CURTIS BAY PIER BEFORE COMPLETION OF SECOND DUMPER
One car at kickback, second on dumper, third coming up barney incline; minimum interval between cars timed at 43 seconds

feed the middle two of the four loading belts. The discharge gates of the balancing bin are controlled from the various towers.

The operation of the belts for any given unit is automatically interlocked to render the flooding of a belt impossible. When a unit—belt and tower—is put into operation the shuttle belt starts first, the main belt starts about three seconds later and the feeder belt starts after that. Thus each belt attains full speed before coal is delivered to it. When the unit is stopped the belts stop in reverse order.

All belts have three speeds—250, 375 and 500 ft. per min. The purpose of this is to permit the proper handling of the various grades of coal to prevent breakage. The speed is absolutely controlled by the superintendent of the pier.

The entire plant is electrically operated. Subject to this speed control, and to emergency buttons every 20 ft. along the conveyors, by which the machinery can be stopped, but not started, the operation of each unit is controlled from a cab on the tower. This control includes the movement of belts, shuttle rams, trimming boom and the towers themselves.



TRIMMING BOOMS GET INTO SHIP RIGGING WITH EASE

One of the photographs shows the facility with which the trimming towers work in the midst of the rigging of ships. The booms are 45 ft. long to permit the delivery of coal to the far bunker hatches. They rotate through 180° and have a vertical movement of 57°.

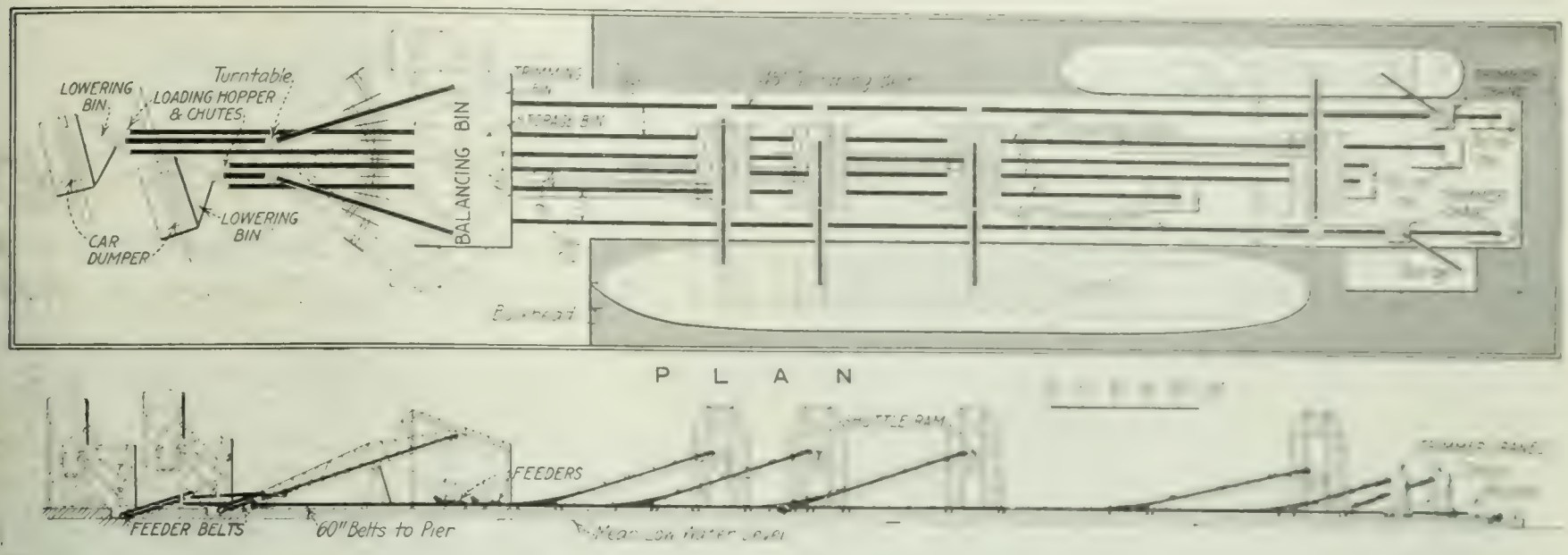
Belt Drives

The belt drives are located at the far end of the pier. They consist of two drive pulleys, operating as a tandem drive, and a third pulley on a sliding frame provided with counterweights. This arrangement is necessary for such long belts to take their slack in starting and maintain an even tension during operation, in spite of temperature variations and uneven loading.

An auxiliary device planned for the loading towers, but not yet installed, is what is known as a "lowerator," a vertical bucket conveyor which would receive the coal discharged from the shuttle ram and lower it directly into the hold of a vessel, thus further lessening breakage.

The total capacity of the pier is 7000 tons per hour. With 12 men one unit will load a 7000-ton vessel in 3 or 3½ hours. This compares with 7½ hours at the old trestle, with 75 men. More than one unit, however, can work on a ship, as each tower has the range of the whole 700-ft. pier, except at the ends, where widths of about 35 ft. for each unit limit the travel of each other. One of the photographs, in fact, shows two loading towers and a trimming tower all working on the same ship.

The equipment for the Pennsylvania pier at Canton, including the car dumper, cable railroad and the various traveling towers, was furnished and installed by the Mead-Morrison Manufacturing Co., of Chicago. The



EACH TOWER OF BALTIMORE & OHIO PIER HAS ITS PARTICULAR BELT

work was done under the direction of A. C. Shand, chief engineer of the Pennsylvania R.R., with J. W. Craig, assistant engineer in immediate charge.

The belt-and-tower installation at the Baltimore & Ohio pier was designed by and has been patented by F. L. Stuart, consulting engineer, of New York City, and formerly chief engineer of the Baltimore & Ohio. The machinery was built by the McMyler Interstate Co., of Cleveland, which also furnished the car dumpers. The Robins Conveying Belt Co., of New York, furnished the belts. The pier and equipment were built under the direction of Mr. Stuart and his successor, R. N. Begien, more recently chief engineer of the Baltimore & Ohio, assisted by W. S. Bouton, engineer of bridges; M. A. Long, architect and assistant to chief engineer, and J. T. Wilson, district engineer. Fred C. Thornley, of New York, was retained by the railroad as consulting engineer on the improvement.

Sacramento Creates Engineering and Street Departments

City Engineer and Superintendent of Streets Head Departments—Qualifications, Duties and Salaries Defined

A DEPARTMENT of engineering headed by a city engineer and a street department headed by a superintendent of streets were created by ordinances of the City Commission of Sacramento, Calif., passed on July 5. The two departments appear to be quite independent of each other.

The city engineer is appointed by and holds office at the pleasure of the city commission. He must be "a civil engineer of at least five years' practical experience as such." He exercises all the powers and duties provided for by state law or municipal ordinance. He is authorized to appoint, and to remove at pleasure, a deputy chief engineer, a chief draftsman, a secretary; also to appoint from time to time assistant engineers, surveyors, rodmen, extra draftsman and inspectors as the City Commission deems necessary.

Qualifications of Deputy City Engineer

The deputy city engineer "shall have been employed in the practice of civil engineering at least three years prior to his appointment and shall possess a practical working knowledge of material and methods of construction commonly employed in municipal engineering, and be qualified to superintend the construction of ordinary municipal engineering works and structures." The chief draftsman must have had three years' experience "in the preparation of drawings intended for use in civil or mechanical engineering or in architectural structurals."

The following scale of annual salaries is provided: City engineer, $3600; deputy, $2100; chief draftsman, $1500; secretary, $1200. Temporary assistant engineers or surveyors get $150 a month, or $6 a day for periods of less than 25 days; inspectors and draftsmen, $4; rodmen $3.50. All the officers named except the city engineer, rodmen and inspectors "are declared to be professionally educated persons or experts within the meaning" of the charter.

Organization of Street Department

The superintendent of streets receives $2700 a year. He appoints and may remove at pleasure an assistant at $1500, who shall serve as chief deputy; a foreman of streets and sewers at $1800; a permanent street improvement clerk at $1620; two field engineers at $1800; an assessment clerk and two draftsmen at $1248; four rodmen at $3.50 each, besides such additional deputy superintendents of streets and additional employees of the other classes named, laborers and inspectors as he shall deem necessary. Inspectors are paid $4 a day. Temporarily employed engineers and surveyors get $6 a day, but not over $150 a month.

Bonds must be given to the city as follows: Superintendent, $10,000; assistant superintendent and foreman of streets and sewers, $5000 each. These three subordinates, together with all field engineers, all engineers and surveyors and all draftsmen, are classed as "professionally educated persons or experts" within the meaning of the city charter. With the consent of the Civil Service Board the foreman of streets and sewers may be exempt from the civil-service provisions of the city charter.

Flat Site at Chillicothe Camp Demands Careful Drainage

Area of 1900 Acres Has Extreme Range of 25 Feet in Elevation but Is Underlain by Gravel Bed—Cornfields Quickly Converted Into Cantonment—Steam Shovel Digs Water-Supply Well



By NATHAN C. ROCKWOOD
Associate Editor, "Engineering News-Record"

THE FLAT 1900-acre site selected for Camp Sherman, the national army cantonment at Chillicothe, Ohio, presented few topographical obstacles to rapid construction, but required a comprehensive system of drainage ditches to convey the runoff from the buildings and paved roads to the Scioto River. The big expanse of cornfields made ideal stamping-grounds for a herd of trenching machines, and both the sewer and water systems were laid out for relatively shallow ditching to take advantage of this condition. The gravel stratum underlying the site is waterbearing, and a well, the first 20 ft. of which was dug with a steam shovel, will tap this source to furnish water for the camp. The building work, highly organized, has progressed with great rapidity.

Drainage Ditches for Unusually Level Site

The Chillicothe cantonment is laid out with regimental streets perpendicular to a main U-shaped artery embracing the parade ground, through which runs the intercounty highway from Chillicothe to Clarksburg. The entire camp site lies between elevations 625 and 650 ft. above sea level, while the Scioto River, which approximately parallels the main arteries of the camp at a distance of about half a mile, is 600 ft. above sea level at normal flow. Fully 95 per cent. of the camp site proper is above elevation 635 and below 650. From this a conception of its ideal topography may be gained. Under ordinary conditions such a level plain would have many undesirable features from a drainage and sanitary standpoint, but in this instance the whole site is underlain at a depth of but a few feet with a bed of river gravel and sand, so that natural subdrainage under conditions of cultivation is almost perfect. But with the 1200 buildings to be erected on the site and with several acres of paved streets, the runoff factor becomes serious, and elaborate plans have been made for surface drainage.



A FOUR-MILE INDUSTRIAL RAILWAY HELPS TRUCKS

Near each outside longitudinal boundary of the camp is a large open drainage ditch from which the water is removed by natural channels to the river. These ditches are built on grades of approximately 0.08 per cent. and their maximum cross-section is 72 sq.ft. It is intended to protect them from scour with brush revetment. Each block of buildings drains into gutters and small ditches and thence to the main drainage ditches. The character of the subsoil is such, however, that little or no water will ever stand in the latter.

The same gravel contains the camp water-supply. Wells have been sunk all over the site and water thus obtained for the construction needs. For the permanent water-supply of the camp, a well 70 ft. deep is being sunk about half a mile northeast of the center of the camp. For the first 20 ft. a steam shovel is being employed for excavation. Steel sheetpiling is then to be driven and the remaining excavation will be made by clamshell bucket. Three pumping stations and necessary storage tanks are to be built to supply the camp.

All the water mains, with the exception of 1800 ft. of 12-in. suction and force mains from the well to the pumping station and tanks, are of California wire-wound wood-stave pipe. The principal main is 14 in. in diameter and 3060 ft. long. There are nearly 75,000

ft., of sizes from 10-in. to 6-in. The water-works system, owing to the simplicity of the camp design, is merely a rectangular gridiron, both sides of the encampment being practically identical.

The water is of excellent quality, but somewhat high in iron content, so that it becomes cloudy on exposure to the atmosphere.

Sanitary Sewers Drain to Septic Tank

The sewerage of the encampment is to be taken care of by two main trunk sewers of 24-in. pipe, on the east and west sides respectively, connecting at the southern end of the cantonment with a 30-in. outfall sewer leading to a simple septic-tank treatment plant a mile below, whence the sewage is to be pumped through a 20-in. vitrified-pipe main 2500 ft. long to the river bank. The joints of the vitrified pipe are to be filled with a bituminous material. From the river bank to the channel outfall there are to be two lines of 16-in. Universal joint cast-iron pipe.

Another proof of the ideal topographic conditions is the fact that the construction work has proceeded without a hitch with no accurate topographic map as a guide. On June 18 not one bit of work had been done on this site. A topographer from the United States Geological Survey came about this time and made a hand-level contour survey under the direction of R. Winthrop Pratt, consulting engineer, of Cleveland. From this the main drainage scheme was laid out. On June 21 the site was approved and the contract was awarded. On June 29 a revised camp layout was finished on the scanty survey data gained in the interim. During these ten days the consulting engineer also developed the water-supply system.



GRAVEL ROADS BUILT BY LOCAL CONTRACTORS

On the first of July the location of the water-supply well had been established, also that of the sewage-disposal plant and of the main roads, and the methods of road construction were decided upon. Since July 1 the building work has proceeded at such a pace that there is no question but that the barracks will be ready before the time set.

Until July 6 the work on the camp was organized and carried out by Captain T. Eckford Rhoades, an engineer reserve officer detailed as acting constructing quartermaster. Captain Rhoades was previously vice president of the Whitney Co., engineering and architectural contractors, New York City; and in no small degree the impetus given construction during his period of command has had its influence in permanently speeding up the work.



DRAINAGE HANDLED BY OPEN DITCHES

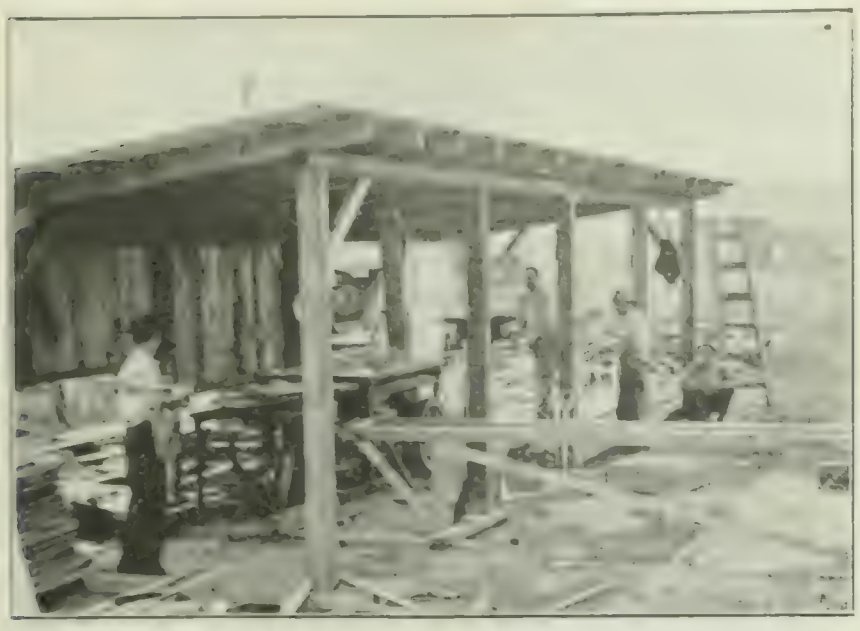
The rapid-fire construction work done by the contractors bears the impress of the personality of the general superintendent, C. H. Hollingsworth. Under him the contractors' organization consists of 14 department heads, responsible to and in constant touch with the general superintendent. These include a general foreman of carpenters, an office engineer, J. C. LeDuc, a traffic manager, a purchasing agent, an accountant, transportation superintendent who supervises all the unloading and camp delivery work, an electrical engineer, a field engineer, who looks after all the building layouts and the staking out of sewer laterals and water-works services, a sewer and water superintendent who supervises the installation of all sewer and water mains, a superintendent of employment, sanitary inspector, a garage superintendent, a general storekeeper and a commissary chief. Under the general foreman of carpenters are five foremen, who on July 23 had 68 sub-foremen, 1300 carpenters and 300 laborers on the job.

Efficient Handling of Construction Material

Transportation within the camp is further looked after by a separate and distinct official known as the distributing agent, who is under the authority of the general foreman of carpenters in his general duties.



SHELTER OVER THE LUMBER HANDLED



SAWMILLS CUT TO STANDARD UNITS

The lumber arrives on railway sidings at about the middle of the east side of the cantonment. It is unloaded and handed directly to a series of sawmills, where it is all cut into standard units. From these mills it is loaded on industrial railway cars, motor trucks or wagons, and taken west, north or south to the proper camp unit. A four-mile industrial railway, operated by three gasoline locomotives, is an important element in expediting the work, for it releases the trucks of the Quartermaster Department and hired motor trucks for other work. Within about three weeks the contractor has not only completed some of the barracks, but has been able to prepare the new buildings for immediate occupancy by some Ohio State troops. During the last week of July the army motor trucks were being used as much for carrying the Army Commissary Department supplies as for the contractors' purposes.

How Engineering Work Is Organized

R. F. McDowell, resident engineer, has been associated with the consulting engineer, R. Winthrop Pratt, for a number of years. Under the resident engineer are a water engineer, a sewer engineer, three road engineers, one of whom is an employee of the United States Office of Public Roads and Rural Engineering, and a surface drainage engineer.

All the surveying work for any purpose whatsoever is in charge of one man. Under his direction seven survey parties are constantly in the field. These survey parties consist of from one to three salaried men, the rodmen, chainmen, etc., being engineer troops from Company D, Ohio National Guard.

Several Construction Contracts

The work is actually being done under five contracts. One contract, however, with the A. Bentley Sons Co., of Toledo, Ohio, covers the construction of everything but the roads and the water-supply well. Small sections of the work are being done under minor contracts with A. S. Hecker & Co., of Cleveland, Ohio, for the well, and with the local gravel road contractors for distinct pieces of the road work.

The road work consists chiefly of a detour road to divert all traffic from the Chillicothe-Clarksburg turnpike, which runs through the camp, and two main camp arteries parallel to the turnpike and on either side of it. All these are built of the local gravel which underlies the whole camp site and are to be given a surfacing of bituminous material. The detour road is 7600 ft. long and 20 ft. wide, and the two main camp roads are 1300 ft. long each and 18 ft. wide.

The A. Bentley Sons Co. is represented on the job by Thomas Bentley, president, James Bentley, vice president and general manager, and R. B. Daudt, chief engineer.

The Constructing Quartermaster in command of the cantonment is Captain Ward Dabney, U. S. A., and his engineering assistants are Captains Rhoades and Colman, U. S. R.

Railways Help Cantonment Builder Overcome Handicaps

Central Freight Agency for Railways at Des Moines Enables Interurban to Handle Heavy Tonnage Expeditiously

TRANSPORTATION and labor were the two factors most difficult of solution in building the Camp Dodge cantonment, 11 miles northwest of Des Moines, Ia., where 45,000 men for the Thirteenth Army Division will be trained. The site (7 square miles) is on an electric interurban line having 65-lb. rails and correspondingly light bridges. The latter have been strengthened to carry small switch engines. These engines haul to camp at night the cars assembled in Des Moines the preceding day by the half dozen steam roads.

A week after the contract was signed (June 22) orders came to shut down everything until Central Headquarters could check up the water supply and sewage disposal facilities, which a rival city claimed could not be made adequate. This delay required a reduction of the contractor's force from 900 to 300, and naturally discouraged the hundreds of men who were already on the way and reached the camp when men were being turned away. In consequence the contractor had to advertise and use labor bureaus freely.

Campaign Brings Results

The results of this campaign were beginning to show July 26 when a representative of the *Engineering News-Record* visited the camp. A net gain of over 150 men per day was being made and the total had increased to 2200. Only a few hundred of these men were kept overnight in the barracks, most of them returning to Des Moines by special cars loaned to the interurban line by various railways.

The 5-day delay also put all material orders at the end of the list for the 16 cantonments in the country. The order for the 24,000,000 ft. of lumber was split one-third each to the hemlock, the southern pine and the Pacific Coast fir associations. As the hemlock people were unable to make deliveries their share was distributed to the other two associations. About 80 cars of material of all kinds were set in on the above date. In one day, 1,890,000 ft. of mixed lumber was unloaded.

Handling the freight has been reduced to a workable system by the coöperation of the railways with the camp officials. A central agency in town is sup-

plied by each railway every morning with information as to what cars for the camp are in Des Moines. This information is telephoned to a division engineer in camp at 10 a.m. He goes through the list and makes up a "spotting" schedule which he telephones back at 3 p.m. to the central agency. The agency turns this over to the interurban company to carry out during the night.

During the day the cars are assembled in proper order on sidings along the interurban tracks. The trains are therefore practically made up in proper order for setting out at the camp. A few distribution switches already existed near the storehouse of the Iowa National Guard (included in the camp site), but 3 miles of permanent track had to be built and 3 miles of temporary track for sidings 200 ft. from the building line.

In unloading it is aimed to handle those nearest the main line first, but at 4 p.m. an inspection is made to push along the work on the partially unloaded cars so as not to have many cars half unloaded. However, about 20 unloaded cars are retained overnight, so that if the night switching should not be done for any reason, there would still be work for the men next day.

Materials had come in such quantities by July 26 that an additional 1000 men (half carpenters and half laborers) could have been employed to advantage. It is planned to increase the number to 5000 or 6000 if possible. A month after the contract was signed, 115 buildings were under construction, of which 45 were practically completed. By Aug. 1, 36 additional barrack buildings had been completed.

Camp Site Ideal

Topographically the camp site is excellent, and the layout follows closely the ideal plan sent out from Washington. It is located on the west side of a narrow ridge forming the watershed between the Des Moines River and Beaver Creek. The line of barracks forms a hook, with headquarters near the center at the bend of the shank. A concrete road, 20 ft. wide and 3 miles long, will serve as the main street, and there will be 4 miles of gravel road and 8 miles of graded streets.

Gravel comes from a pit 6 miles away equipped with screening, washing and loading facilities for supplying 50 cars per day. About 15,000 yd. will be required. The sand is unloaded by clamshell buckets to a fleet of 6-ton White motor trucks with wide tires, 1½-ton army trucks (sent up from the Mexican border) and also wagons. The greater part of the short haul of lumber and other materials is done by teams direct from cars to the barracks.

Water Supply from a Large Well

A well 60 ft. in diameter and 33 ft. deep is being sunk on property belonging to the state. It is in a gravel bed 16 to 24 ft. thick and overlain with a loam cover of the same depth. A circular concrete shell in 8-ft. sections is being excavated by a steel stiffleg derrick operating a clamshell bucket. There will be three electrically driven pumps, each with a capacity of 1000 gal. per min. against a total head of 250 ft. (200 ft. static head). These will discharge through 4460 ft. of 16-in. wood pipe into a 1,000,000-gal. circular concrete reservoir on the top of the ridge. This will give a total head of approximately 180 ft. on the lower portions of the barracks.

For construction purposes there already existed two steel tanks (16,000 and 40,000 gal.) on the hill for the Iowa National Guard encampment, whose grounds are included in the cantonment. Sewers and water mains are being installed at the rate of about 1¼ miles and 0.75 mile per day respectively.

A 30-in. trunk sewer extends 17,000 ft. to the Des Moines River. Treatment of the sewage is considered unnecessary, as no city now uses this river for water supply. The ridge breaks down into rolling country to the south, so that there is little deep cutting. Most of the trenching is good machine work, except for a few hundred feet of quicksand at the lower end. A dragline and at least four different makes of trenchers have been brought in for the sewer and water trenches.

An alternative plan was to carry the sewage across the valley to Beaver Creek. The distance is nearly as great. The stream is nearly dry in summer so that both tanks and beds would have been required to produce an acceptable effluent.

Staff and Organization

The organization at Camp Dodge is headed by Major M. A. Butler, Engineer Officers' Reserve, who is Constructing Quartermaster. He drew on the construction department of the Great Northern Ry. for the following assistants: A. O. Leach, supervising engineer, A. N. Deuell, assistant supervising engineer; also the following division engineers, W. S. Cooper in charge of roads and pavements, William Burns in charge of railway facilities and materials, H. W. Zolper in charge of sewers, and C. M. Ahlberg in charge of buildings. G. M. Garen, the only division engineer from another company, is in charge of water supply. L. P. Wolff is consulting engineer for sewers and water supply, and Robert Wheelwright is the city planner. H. H. Lotter, senior highway engineer, U. S. Department of Agriculture, is supervising the road construction. A regular line officer, Capt. J. C. Kay, U. S. A., is detailed to assist Major Butler in the necessary routine and matters of military nature.

Charles Weitz' Sons, for whom J. F. Gould is superintendent, is the contractor for all work except the roads and pavements, which were let to the Raymond Wright Co. Both of these firms are of Des Moines.

Water-Waste Survey at Memphis

The pitometer survey of the water system at Memphis, Tenn., was completed last year. The annual report of the Water Department shows that 3169 leaks were detected, of which 2779 were property leaks. The others are classified as follows: Fire hydrants, 112; mains, 93; property metered, 65; services, 43; valves, 43; meters and couplings, 30; sidewalks, 8. Aside from the detection of leaks, the check of the minimum flow of water at night with the pump records was very satisfactory, showing only a slight difference between the two records. The survey work is distributed over the 43 districts comprising the city proper, and the records indicate the districts still showing excessive consumption (either by legitimate consumption or by waste).

Contractors Speed Grain-Elevator Construction Despite Labor and Material Shortage

Plant Layout for New Orleans Structure Makes Great Use of Machinery—Large Storage Facilities Provided To Insure Against Freight Delay

By A. M. CRAIN
Of the firm Janse Bros., Boomer, Crain & Howe, Contractors, New Orleans, La.

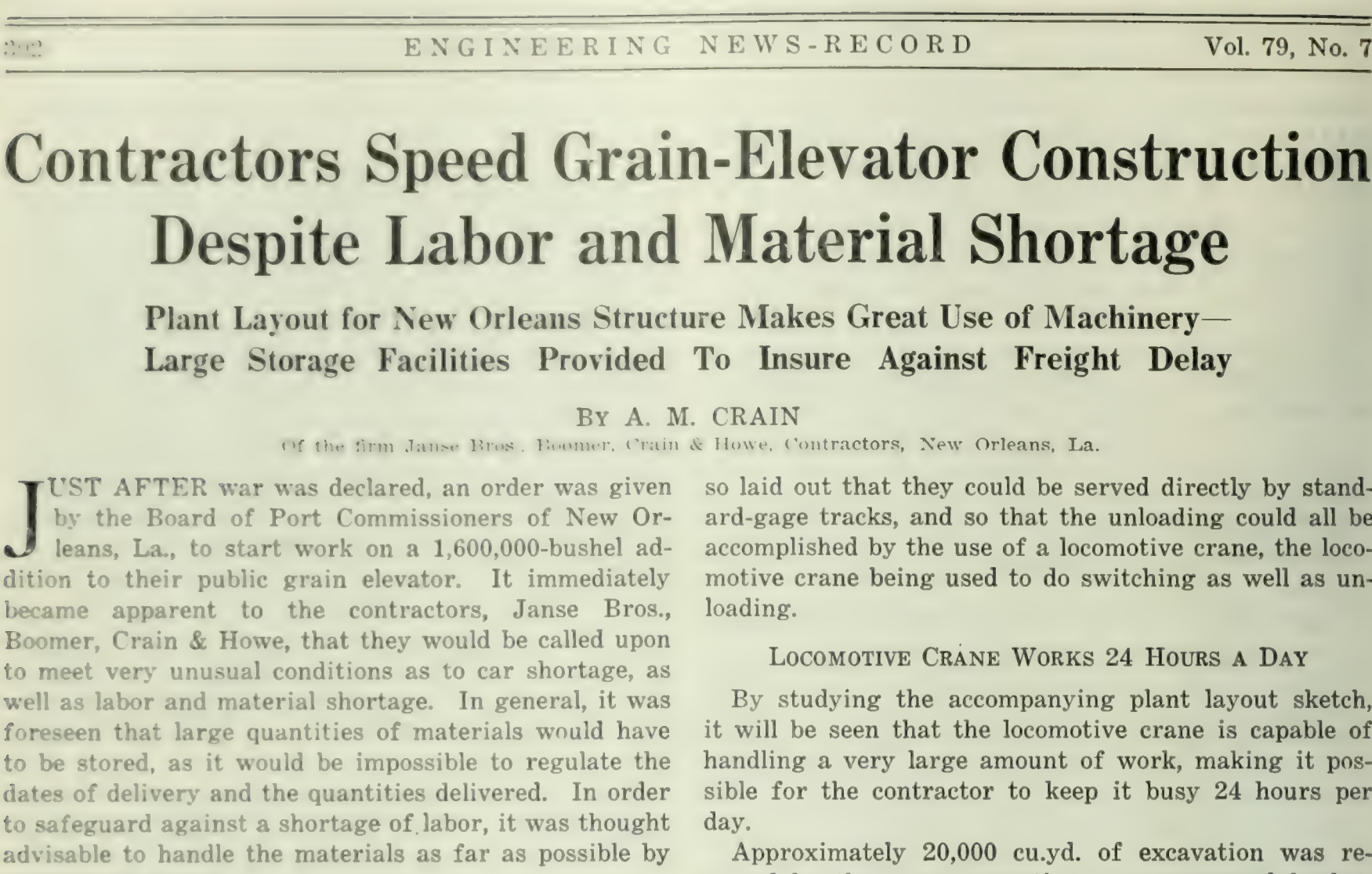
JUST AFTER war was declared, an order was given by the Board of Port Commissioners of New Orleans, La., to start work on a 1,600,000-bushel addition to their public grain elevator. It immediately became apparent to the contractors, Janse Bros., Boomer, Crain & Howe, that they would be called upon to meet very unusual conditions as to car shortage, as well as labor and material shortage. In general, it was foreseen that large quantities of materials would have to be stored, as it would be impossible to regulate the dates of delivery and the quantities delivered. In order to safeguard against a shortage of labor, it was thought advisable to handle the materials as far as possible by mechanical means.

In preparing the contractors' plant layout, an estimate was made of the quantities of materials to be handled, and suitable storage yards, houses, bins, etc., were provided. These buildings, yards and bins were so laid out that they could be served directly by standard-gage tracks, and so that the unloading could all be accomplished by the use of a locomotive crane, the locomotive crane being used to do switching as well as unloading.

Locomotive Crane Works 24 Hours a Day

By studying the accompanying plant layout sketch, it will be seen that the locomotive crane is capable of handling a very large amount of work, making it possible for the contractor to keep it busy 24 hours per day.

Approximately 20,000 cu.yd. of excavation was removed by the crane operating an orange-peel bucket, loading the dirt directly on the flat-cars, which were switched by a switch engine to a dump on the river front. Another locomotive crane, rented temporarily, unloaded the dirt into the river. After the excavation



NEW ORLEANS GRAIN ELEVATOR BUILT BY PLANT WHICH PERMITS GREAT AMOUNT OF STORAGE



LOCOMOTIVE CRANE CONTROLS WHOLE JOB ON GRAIN ELEVATOR AT NEW ORLEANS

was removed, gravel, sand, lumber, steel, etc., began to arrive at the site of the work, so that the crane was kept busy unloading these materials. As the piledriving proceeded, the pile cutoffs were removed from the hole by the locomotive crane and placed in storage piles, from which they were worked up with a portable sawmill and the lumber later used in the construction of formwork.

The sand, gravel and cement are removed from the storage bins by belt conveyors and delivered to the mixing house, which contains a battery of two 1-yd. mixers, the surplus gravel and sand piles being handled into the storage bins by the use of the locomotive crane.

Provision was made for storing approximately 10,000 cu.yd. of sand and gravel and 10,000 bbl. of cement. So much trouble later developed in the way of securing cars for delivery of gravel, sand and cement that it would have been almost impossible to maintain an organization, except at a prohibitive expense. The large storage capacity for materials made it possible for the work to proceed at a uniform speed, which is desirable on construction work.

After fabricating the form units in the sawmill and on the framing platform, the trackage made it very economical to transfer the finished forms directly to the building, the locomotive crane being used to place them in the building. The reinforcing steel, after being bent, was handled in the same manner.

While the plant layout as shown might appear to be expensive, it has been found to be very economical in the long run, when it is considered how much labor at high prices was saved.

First-Class Carpenters Kept on Job

In nearly every part of the construction some accommodation of an unusual condition had to be arranged for. By beginning the formwork at about the time the excavation was half completed, the contractors were able to pick out a gang of about 30 first-class carpenters and keep these men steadily employed throughout the job. To do this, everything was built up in units on a framing platform adjacent to the sawmill. In order to reduce further the cost of the formwork, a very complete woodworking mill was equipped with two swing cutoff saws, one 40-in. band-saw, one power rip-saw, boring machine, grindstone, and emery wheel for gumming circular saws. This mill was operated with a 20-



PORTABLE SAWMILL ON CITY JOB MAKES CONCRETE FORMS FROM PILE CUTOFFS

hp. electric motor and laid out in such a manner that material traveled in straight lines, with a minimum of rehandling from the material piles through the mill and to the framing platform.

It was observed that the carpenters working on the framing platform were almost exhausted before the day's work was completed, owing to the excessive heat and bright sun. A rough roof was put over this platform so that the men could work in comfort, without hats or outer clothing, and the efficiency of the gang was increased almost 50%.

The forms for a grain elevator when made up in units are, of necessity, very heavy and cumbersome. To



LARGE STORAGE CAPACITY PERMITS WORK TO GO ON DESPITE FREIGHT EMBARGOES

handle these economically, they were pushed to one side of the framing platform on trucks and push-cars. Three times a day the locomotive crane spent about an hour taking the finished forms away from the platform and piling them in storage piles along the tracks, where they were again picked up by the crane.

Laborers Come at Sound of Gong

A number of laborers worked around the mill carrying lumber, etc. When the carpenters completed their heavy unit of formwork, a gong was rung, and these laborers immediately came to the framing platform and removed the completed piece of work. The carpenters, in the meantime, started another form, each gang having enough room to carry on two operations. The gong was used so that the foreman in charge did not have to hunt up and call each individual laborer.

Reinforcing steel was piled and blocked up so that all the handling was done by the crane.

The sand and gravel, as well as the cement, were carried to the mixing hoppers on a 20-in. belt conveyor. The gravel and sand conveyor belt discharged into a hopper above the mixing floor. The cement belt ran through the cement shed, directly under the sand and gravel belt, and discharged on the mixing floor of the concrete plant. The plant had a capacity of from 40 to 50 cu.yd. per hour. Two Smith mixers of 1 yd. capacity each mixed the concrete, and two 8 x 12-in. American hoisting engines hoisted the concrete in buckets, which were made in the contractors' shop, up a double tower 160 ft. high. The concrete was spouted to a hopper and placed in its final position by the use of concrete carts. The concrete mixers and conveyor belts were electrically operated.

Several years ago the contractors experienced many minor annoyances from concrete tower equipment built too light to stand the wear and tear of rapid modern construction work. To eliminate this, all sheaves on the concrete tower are of extra size and weight, the sheaves being keyed onto heavy shafts which run in bearings, equipped with large compression grease cups. This equipment is quite costly, but is found to pay for itself by eliminating minor delays from burnt-out bearings and sheaves.

The concrete buckets and receiving hoppers were of ¼ in. boiler plate and heavy angles, the guide angles being 5 x 4 in. The receiving hoppers were similar to the hoisting buckets and supported by cables, and handled in the same manner as the hoisting buckets. This feature is necessary, owing to the fact that points of discharge are constantly changing.

The blacksmith and machine shop was equipped with lathe, power grinders, power drill press, power bolt and threading and cutting machines, punches and shears. The several thousands of bolts required, as well as all gratings and light structural work, were made up in this shop.

That the layout and general methods of construction, as explained on this New Orleans work, fulfilled the purpose for which they were designed, is shown by the fact that construction work proceeded smoothly right through the car shortage and other difficulties. The construction is under the supervision of J. Devereux O'Reilly, chief engineer for the Board of Port Commissioners of New Orleans. The writer is resident partner on the work. E. T. Malloy is general superintendent, and R. R. Hepinstall is chief draftsman.

Collections of Paving Data

The State Bureau of Municipal Information of the New York Conference of Mayors is continuing its good work of collecting data in various municipal fields. Three such collections, in typewritten form, are before us: No. 245, "Street Oiling in New York State Cities in 1916" (5 pp.; 50c.). No. 246, "Experience of American Cities and States in Concrete Paving" (23 pp.; $2.10). No. 255, "Method of Levying Assessments and Awarding Contracts for New Paving in Large Cities" (20 pp.; $1.05). The reports may be obtained for the prices stated from the Public Affairs Information Service, White Plains, New York.

Build Concrete Shell Around Tall Steel Water Tanks

Panel Forms and Staging Held by Bolts and Raised from Floats—Concreting Approximately Continuous—Build Road for Delivery of Materials—Work Done To Improve Real-Estate Values

TO MAINTAIN or increase real-estate values in the vicinity of standpipes, which, considered as rusty steel tanks dominating the surrounding landscape, are usually viewed by property owners as but one degree removed from gasholders, the Cincinnati Water Department now incases them in concrete. In the case of the Eastern Hills tanks, the second group to be so incased, the problem of placing a concrete shell around five 40-ft. diameter steel cylinders 100 ft. high was solved by using combined form panels and staging bolted to the steel and raised a panel at a time by derricks mounted on floats at the top of each corner tank.

The cylinders were erected first and kept full of water during concreting to maintain them as nearly as possible in cylindrical shape and prevent splitting the concrete shell, which might have been strained were the steel incased while in a slightly elliptical form and then forced into a true circle by the water pressure when filled for the first time. With the tank steel in place to the top, it became impossible to use sliding forms, even if the numerous offsets would have permitted it, and hence the floats were employed.

In the preparation of plans for the two most recently constructed tanks for the distribution system of the City of Cincinnati, utility has not been the only consideration. It is considered a crime to erect unsightly, bare steel tanks in a residential district, the increased cost of architectural embellishment and of parking the surrounding grounds being considered as money well spent. The old Mt. Auburn tanks, two 40 x 70-ft. bare steel tanks situated in one of the best residential districts and facing a beautiful park, form an eyesore in the landscape in the opinion of the Water Department, which hopes within the near future to incase these tanks in masonry, improve the grounds and add another beauty spot to the city.

When an effort was made to secure property for the Western Hills tanks, the first to be incased in concrete, much opposition was raised by property owners on the plea that unsightly tanks would depreciate the value of surrounding real estate. For this reason the most desirable site could not be secured, except at a prohibitive price. These tanks, built on an ornamental concrete foundation and surrounded by paneled concrete, present a very pleasing appearance and have been the subject of much praise. Instead of declining, property values in the vicinity have increased. Consequently, when plans were made for the Eastern Hills tanks no trouble was encountered in obtaining the necessary property, a very desirable site being offered, and at a very reasonable price.

To Resemble Huge Chess Man

The Eastern Hills reservoir consists of a group of five steel stand pipes, 40 ft. in diameter by 100 ft. in height, the four outer tanks spaced at the corners of a 61-ft. square, the fifth being placed in the center.

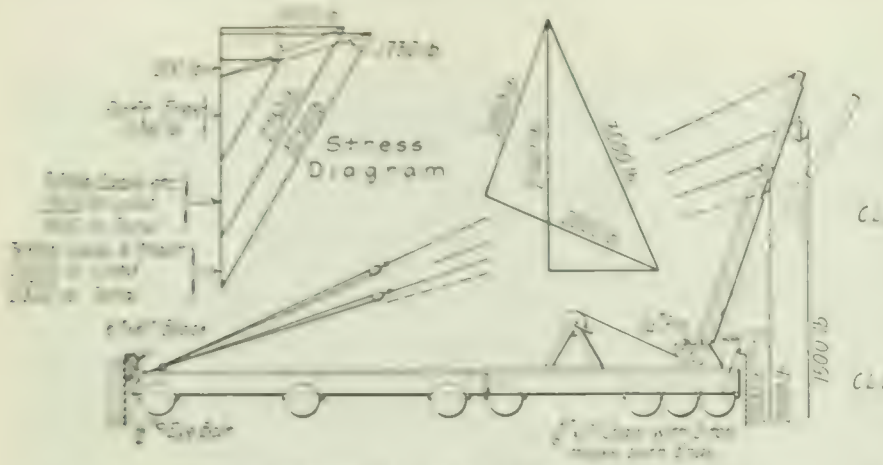
When completed, the Eastern Hills reservoir will somewhat resemble a large chess man. The base for more than a quarter of the total height is square, above which the structure is octagonal. The casing of the center tank of the five, however, is square in plan, and in the recess between the south corner tanks an inclosed stair well with concrete walls and landings and steel stairs is located. The office room for the gages is also located in this space at the foot of the stairs, which lead to an observation platform on top of the tanks. The shell is reinforced vertically and horizontally, chiefly to take up temperature stresses, the steel tanks being designed to withstand all loads. The minimum 6-in. thickness of the shell was determined entirely by the least clearance in which the reinforced concrete could be placed with economy.

The exterior surface of the concrete is to be picked clean, washed with diluted acid and water and receive a dash coat of portland-cement mortar, except the belt courses, corbels and parapets, which are to be rubbed smooth.

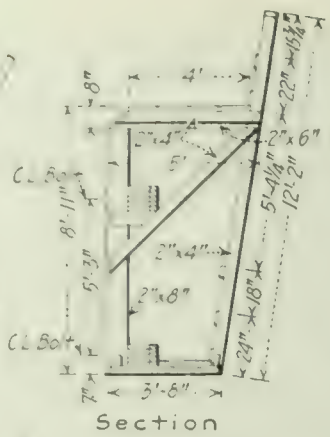
It will be evident that the forms used for the con-



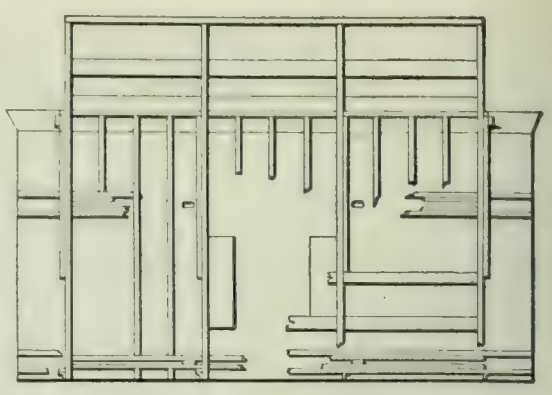
FORMS HANDLED BY FLOATS (CONTINUED PAGE



DETAILS OF ERECTING DERRICK

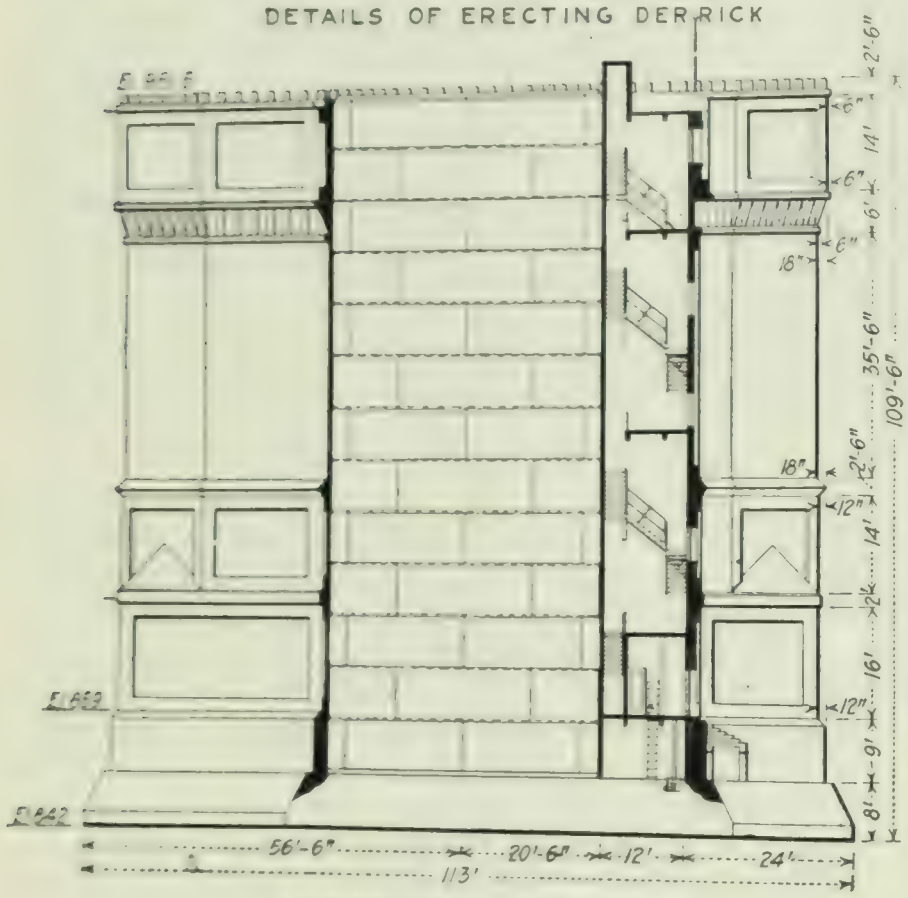


Section

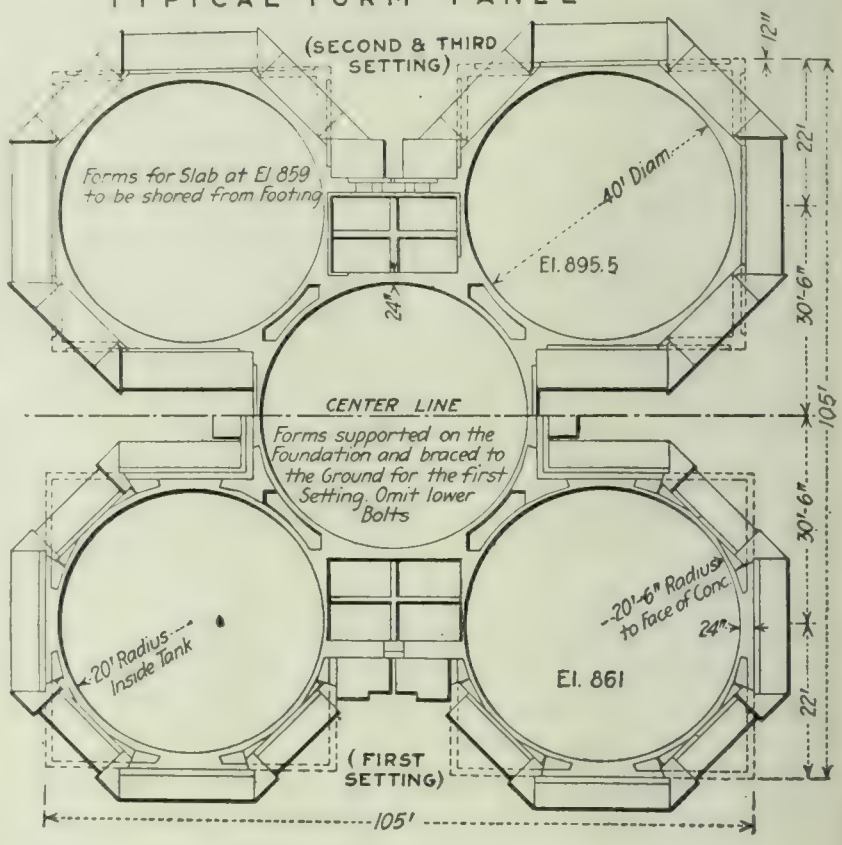


Elevation

TYPICAL FORM PANEL



SECTIONAL ELEVATION



FORM-SETTING DIAGRAM

ONE SET OF FORM PANELS ADAPTED TO ENTIRE HEIGHT OF ORNAMENTAL CASING FOR STEEL TANKS IN CINCINNATI

crete casing had to meet two peculiar conditions. They must be changed in form during the progress of construction, and must be held and raised by some method with which the presence of the completed shells, filled with water, would not interfere. In designing the tanks, U-shaped pieces of plate, each end of which was riveted to the tank steel, and the outstanding bend of which had a hole in it for a form bolt, were provided for holding the forms to the tanks during concreting. The means of raising the forms, and of altering their shape, were left to the contractor.

Early in April last the contractor set up a 1-yd. mixer and tower in the recess next the stair well and began the construction of forms and floats for raising them. A portable sawmill was used in this work.

Forms Changed from Round to Octagon

At the upper edge the form panels support runways forming a continuous platform around and between the tanks, on which concrete is delivered in carts from the hoisting tower. As will be seen from the drawings, the square base of the structure is not filled solid with concrete, but consists of a thin, nearly circular casing around the tanks, with air spaces between this and the outer wall, 1 ft. thick. Rather than form all this at once, the contractor devised a way of using the octagonal form panels for the nearly circular inner casing by fitting two sets of fillers inside each panel, as shown. At the next setting, when the outer square wall was stepped in, one set of these fillers was removed to give the correct shape to the inner casing. The forms were carried up in this way until the octagon proper was reached, when the second set of filler blocks was removed. The forms for the outer walls were built up from the base at this stage and concreted. When the octagonal forms reach the corbel course they will have to be enlarged and cut down again slightly for the upper portion of the work.

Barrel Floats Raise Panels

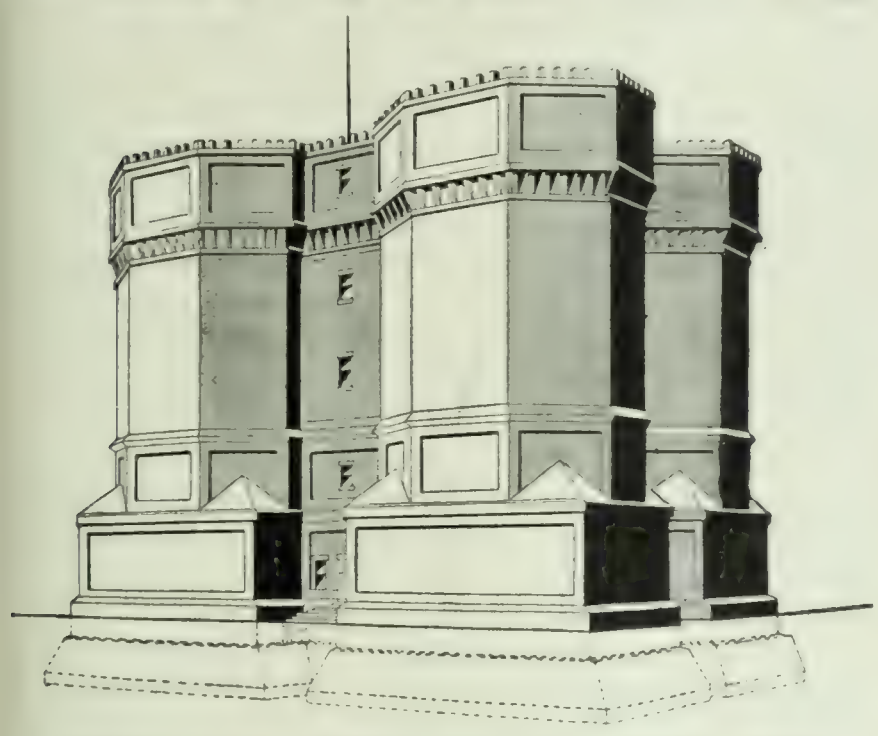
A two-boom, crab-operated rig resting on empty oil barrels on the water surface of each of the four corner tanks raises the forms, a panel at a time. Each panel weighs about a ton, and to pick this weight from a floating platform of reasonable cost which would fit in a 40-ft. circle was found to be out of the question. The rear end of each float is therefore blocked down from the Z-bar which forms the top of each tank and the forward end held by hooks over this Z-bar. In picking a form, the rig is thus independent of its flotation, most

of the load being taken on the hook bars at the boom end, and the buoyancy of the float being used only while rotating the rig from one form to the next.

In raising the form panels, each of which is held by two rows of bolts, the bolts are screwed out of the nuts, which remain embedded beneath the steel clips riveted to the tank plates. The forms are then swung out slightly and raised 5 ft. 3 in., the bolts which came out of the upper ranger being screwed back into the same holes in the concrete, but through the lower ranger. The bolts taken out of the lower ranger are then passed through the upper one and screwed into nuts behind the next row of clips.

Concreting Approximately Continuous

There are 270 to 300 yd. of concrete in a complete lift, which must be distributed over a considerable area, the foundation plan being 100 ft. on a side. It is therefore possible by using stop planks to concrete one-half



TANKS TO BE COVERED WITH IVY TWENTY FEET ABOVE GROUND

of the structure while the horizontal reinforcing is being set and the forms raised on the other half, so that the mixing plant is kept going at the rate of 100 yd. or more a day. The total volume of concrete, exclusive of the footings, which were placed with another plant, is about 3800 yd. The hoisting tower is double, one side being used for the concrete skip and the other containing an elevator for the workmen. The tower also mounts a boom for raising the reinforcing.

The mixer, having a power loader, is supplied by wheeling with materials brought to the site in wagons and motor trucks. The streets on top of the hill being unpaved, and wet weather prevailing when the hauling was begun, the contractor laid a corduroy road of ties, covered with cinders, to the nearest paved highway about 1000 ft. south of the work.

The tanks were designed and are being built under the direction of J. A. Hiller, General Superintendent of the Cincinnati Water-Works. T. J. Mulloy is resident engineer in charge. The Ferro-Concrete Construction Co., of which W. P. Anderson is president, are the contractors. J. Hodges is in charge of the work for the contractors, while the forms and methods of construction were designed by Henry D. Loring, engineer for this firm.

Steel Arch To Replace a Famous Cantilever Bridge

First of Its Type in This Country, the Michigan Central Bridge at Niagara Is Now 34 Years Old and Inadequate

A STEEL arch of about 560-ft. span is to take the place of the Niagara cantilever bridge of the Michigan Central R.R. at Niagara Falls, N. Y. The cantilever bridge is famous as being the first of its type in this country, having been built in 1883-84 to the designs of the late C. C. Schneider. Each of the two cantilevers is 395 ft. long, with 195-ft. anchor arm, 175-ft. river arm and 25-ft. tower span. The suspended span is 120 ft., making a total length of 910 ft. The height is 240 ft. from the water to rail level. The two lines of trusses are 28 ft. c. to c., and the deck carries a double track.

The cantilever bridge was strengthened in 1900 in order to adapt it to the greatly increased loading. This remarkable piece of bridgework consisted in building a third truss on the center line of the structure, supported on new columns in the towers. Further strengthening to meet the requirements of the still heavier loadings of the present day is not practicable, and the famous bridge, which has already given 33 years of active service, is to be replaced by a new bridge of a different type.

The new steel arch bridge will have a clear span of about 560 ft., with a rise of about 132 ft. from the hinges to the bottom chord, while the truss depth at the crown will be about 30 ft. The bridge will carry three tracks. The present steel-arch railway bridge at Niagara Falls, built in 1896-97, has a span of 550 ft., with a rise of 114 ft. from springing line to bottom chord, or 134 ft. to the deck.

No time has been set for the construction of the new bridge. Under present conditions definite action will probably be postponed, but the plans are in preparation. This work is in charge of H. Ibsen, special bridge engineer, who has a separate staff independent of the bridge department. The work is under the direction of J. F. Deimling, acting chief engineer of the Michigan Central R.R. during the absence of George W. Webb (now a colonel in the army).

Wisconsin Architects Must Register

An architect's registration law was passed by the recently adjourned Wisconsin legislature. According to S. T. Williams, state building inspector, it provides that after Jan. 1 no person shall use the title "architect" unless he has a certificate of registration from the examining board. Any other person may, however, design buildings without hindrance as long as he does not use the title "architect." Thus the law follows the lines of the New York law and not those of the Illinois law, which has been the source of so much controversy between the architects and the engineers. The Wisconsin examining board consists of the state architect and the dean of the Engineering College of the state university, ex-officio, together with three architects appointed by the Industrial Commission. The appointment is placed with the Industrial Commission because it now administers the state building code.

Changes in Cleveland Sewage-Disposal Plans Recommended

Fine Screens Advised by Fuller After Adverse Report on Tests by Pratt and Gascoigne—Summer Chlorination at Two Plants—Sprinkling Filters and Dortmund Tanks at the Other

MARKED changes in the methods of sewage treatment at Cleveland, Ohio, as proposed by R. Winthrop Pratt, consulting engineer on sewerage improvements, after several years of investigation, were recommended in a recent report by George W. Fuller, consulting engineer, New York City. A notable feature of Mr. Fuller's report is his recommendation of fine screens, notwithstanding an adverse report on fine screens after long, detailed tests by Mr. Pratt and George B. Gascoigne. Mr. Fuller recommended fine screens for all three of the proposed sewage-works at Cleveland, but did not specify the make. In place of Imhoff tanks and sprinkling filters at the Cuyahoga River plant he advises that screens be followed by sprinkling filters and deep Dortmund tanks. The activated-sludge process, which has been extensively studied at Cleveland, is regarded by Mr. Fuller as likely to be required at the two lake-front plants in 5 to 20 years. Meanwhile fine screens, with chlorination during the bathing season, are advised by Mr. Fuller at these two plants, instead of Imhoff tanks and chlorination, recommended by Messrs. Pratt and Gascoigne.

The proposed changes in the plans are now before W. H. Dittoe, chief engineer Ohio Department of Health, who has called into consultation Prof. Earl B. Phelps, Washington, D. C.

Course of Events Sketched

Before taking up the screen tests and the Fuller report in detail, the recent course of events pertaining to sewage treatment at Cleveland may be sketched.

During 1913 and the early part of 1914 an extensive series of sewage-treatment tests was made at Cleveland. (See "Report on Tests at Sewage Testing Station," by Robert Hoffmann, commissioner and chief engineer; R. Winthrop Pratt, consulting sanitary engineer; and Harry B. Hommon, chief chemist and bacteriologist. The report was dated 1914, but not published until 1916.) Several fixed screens and one mechanically operated fine screen were tested. The latter removed from 20 to 25% of the suspended matter in the sewage. Settling tanks removed about 45%. The report recommended that clarification be effected by either tank treatment or fine screens. It was believed that the latter would be cheaper, but a large-scale test of fine screens was considered advisable.

For the two proposed lake-front plants clarification was needed to prevent the fouling of bathing beaches and waters with solids, the bacterial infection of the water and to minimize the color of the lake waters about the outfalls. At the outset, it was thought that all necessary clarification could be effected by either tanks or fine screens. In either case chlorination was counted on for needed disinfection during the bathing season.

It having been decided to test a large-size mechanically operated fine screen, contracts were made in 1915 for supplying and installing a Riensch-Wurl screen, to be operated on test by the city. The first sewage passed through the grit chambers and screen on Nov. 19, 1915, but owing to various delays the test was not concluded until Sept. 10, 1916.

The official report on the tests was transmitted to Robert Hoffmann, commissioner and chief engineer, Department of Public Service, on Jan. 15, 1917, by George B. Gascoigne, sanitary engineer, who had charge of the tests under Mr. Hoffmann and R. Winthrop Pratt, consulting engineer. The letter of transmittal states that the first draft of the report was submitted to Mr. Pratt for criticism and that the report as submitted "contains such corrections and modifications as were mutually deemed advisable." The report declared that the screen failed to comply with the contract provisions as to removal of solid matter from the sewage, volume of sewage and continuity of action.

Before the tests were completed, Messrs. Pratt and Gascoigne had concluded that for Cleveland conditions tank treatment would be far preferable to fine screens and cost less in total annual charges. On Aug. 10, 1916, they recommended for the lake-front plants: (1) Sedimentation in two-story tanks having six months' sludge storage and digestion capacity; (2) disinfection of settled or partly clarified sewage during the bathing season; (3) disposal of sludge within inclosed structures.

George W. Fuller Reports on Best Procedure

On Feb. 17, 1916, about a month after the date of Mr. Gascoigne's report on the screen tests, George W. Fuller, consulting engineer, New York City, was instructed by Alexander Bernstein, director of public service, to report on the best procedure for Cleveland to adopt for the treatment of its sewage. Mr. Fuller's report, dated May 14, 1917, recommends (1) a fine-screen plant at West 58th St., with chlorination during the bathing season; (2) a fine-screen plant with sprinkling filters and with settling tanks for the filtered sewage, at the southerly site, on the Cuyahoga River; and (3) fine screens and chlorination at East 140th St., the site of the testing station.

With this general review of the two reports, each may be taken up in some detail, beginning with that on the screen tests by Mr. Gascoigne.

The screen consisted of a revolving inclined 14-ft. circular disk of perforated brass with the central portion replaced by a truncated one. The perforations were $\frac{1}{32}$ in. wide and 2 in. long, comprising altogether less than 10% of the total area of the disk. The screen was partly submerged in the sewage being screened. As

it rotated, the floating solids were removed, carried upward and swept off by revolving brushes. Before the sewage reached the screen, it passed through coarse bar screens and grit chambers. The bar screens had clear openings of 2 in. during the official test. The grit chambers were of the two-story type, 50 ft. long, designed for a velocity of 1 ft. per sec. and a detention period of 50 seconds.

The screen was operated by the city, with Karl Probeck as resident engineer and chemist in immediate charge, under the general direction of Messrs. Hoffmann and Pratt, already mentioned. George B. Sowers, assistant engineer of sewage disposal, participated in the installation of the screen and in the preparation of the report.

Screen Contract Requirements

The main requirements of the contract were: (1) That the screen should be capable of passing a maximum of 7,500,000 gal. of sewage per 24 hours with a maximum loss of head of 2 ft.; (2) that during a three months' test, by and at the expense of the city, beginning two weeks after the installation of the screen "and operating at least 90% of this period, the screen shall so operate that its efficiency will meet the approval of the Ohio State Board of Health"; that the "intent" of the contract was "results comparable to settling tanks with a flow-through period of 1½ hours," and that "before the approval of the Ohio State Board of Health will be applied for by the city of Cleveland, such results must be approximated."

Payment for the screen was to be 20% on delivery; 75% "at the conclusion of the test if the apparatus has met the requirements" of the contract, and 5% after the customary lapse of one year.

The report states that prospective bidders for a test screen were informed of the results with settling tanks obtained at the testing station. These indicated a 45% removal of suspended solids in a 1½-hour flowing-through period. An early draft of the test requirements provided for a 50% removal of suspended solids, as determined by the Gooch crucible process, over a continuous period of four months. Two screen manufacturers, including the Sanitation Corporation, which controls the Riensch-Wurl screen in this country, objected "to the definite 50% removal," the report states, apparently regarding screens as "competitors of sedimentation tanks" and feeling that a definite 50% removal guarantee might be considered as a precedent to be applied to any sewage elsewhere. The test requirement was therefore fixed as stated, but it was verbally understood, the report says, that the removal to be obtained would be "approximately 45%" and that it would "be determined by the Gooch crucible method."

Reading between the lines of the report, it appears that there was subsequent controversy over the test methods employed. As the report states, the city was made judge of whether the test requirements as to removal of solids was met. We are informed that it never applied to the Ohio State Board of Health for approval of the operating efficiency of the screen and never made the 75% and the 5% payment to the contractor.

Although sewage first passed through the screen on Nov. 19, 1915, the official test did not begin until Mar. 20, 1916. Repeated breakdowns prevented the continuous 90-day test called for by the contract. The official testing finally ran through 175 days, from which 100 days were selected as representing "the best accomplishments" considered in all phases.

Experience showed the importance of supporting the screen so as to keep it in alignment. Otherwise, the seal at the inlet side was broken, the sewage passed under instead of over the screen, and the brushes struck against the sharp edge of the screen and were worn. This seemed to demonstrate the disadvantage of the overhung type of screen.

Various incidents which resulted in shutdowns led to changing the clear openings between the bar screens, ahead of the grit chambers, from 3 in. to 1 in., but the narrower openings cut the fine screenings from 10 to 5 buckets a day, so 2-in. openings were adopted and were used throughout the official test.

The tests indicated the need for a trained mechanic to keep the screen in good adjustment and repair. The safe life of a screen is placed at 10 years in the report.

Keeping Screen Clear Was Finally Simplified

By reversing the brushes and by applying gasoline about three times a week the brushes, which at first became very dirty and greasy, were kept in good operating condition. A combination of tar and oil wastes, wool washings and grease made keeping the screens clean an important phase of the work, but finally this became a comparatively simple operation. It was effected by flushing the screen with cold and then with hot water through a 1-in. perforated pipe placed over and close to the line on the screen just in advance of its immersion in the sewage and along the part of the screen just swept by the brushes. Water under 80 lb. pressure was applied—cold water for 5 and hot water for 2 min. Although this is a simple method of cleaning, it has the disadvantage "that the material removed from the slots gets into the effluent and is costly."

How Nearly Screen Met Sewage Capacity Test

For only one week of the test was the 7,500,000-gal. maximum guaranteed capacity of the screen reached. The average maximum rate was 5,000,000 gal., or only 4,700,000 gal. if allowance be made for the fact that while the screen treated 96% of the night flow it treated only 76% of the stronger day flow—the total volume of sewage being in excess of what the screen could pass, night and day.

The screen was so installed that the maximum loss of head was only 22 in., but it was estimated that even had the full permissible loss of head of 24 in. been attained, the 7,500,000-gal. capacity rate would not have been reached.

The percentage removal of solids computed by three different methods is shown by the accompanying table. On the weighed-screenings basis, the removal of total suspended matter was 4%—which may be corrected to 8% if it be considered that the grit chamber removed 2% that would otherwise be removed by the screen and if another 2% be allowed because the screen did not treat a constant proportion of the flow to the plant. The report states: "It is believed that this figure is the maximum which can be expected as an average accomplishment of the screen when operating over long pe-

riods on the sewage discharged at the West 58th St. site."

By both the suspended-solids and settleable-solids methods, the removal was apparently negative in many instances. After discussing this and related matters and making various corrections, the report concludes that "*under the most favorable condition* [italics ours—Editor], a removal based on settleable solids" might be obtained as high as 19%. One of these corrections

PERCENTAGE REMOVAL OF SOLIDS

Days Week Ended	Weighted Screenings			Suspended Solids			Settleable Solids		
	Day	Nt	Average*	Day	Nt	Average*	Day	Nt.	Average*
Mar. 26	5	4	5	—	1	—	—	14	—
Apr. 2	5	5	5	—	8	0	9	0	10
Apr. 9	4	6	5	—	3	—	—	16	—
Apr. 16	4	4	4	0	—	—	15	20	15
May 14	4	2	3	0	9	2	—	12	—
July 2	4	3	4	—	0	—	13	5	11
July 9	4	3	4	10	—	8	2	4	3
July 16	3	2	3	—	—	—	—	—	—
July 23	3	2	3	9	—	7	12	0	11
July 30	4	3	4	10	3	9	8	0	7
Aug. 20	3	2	3						
Aug. 27	3	2	3	5	—	3	0	—	—
Sept. 3	3	3	3	0	3	1	—	—	—
Sept. 10	2	2	2	6	—	5			
Average	4	3	4						
Mar. 26 to Apr. 16	5	5	5						
May 14	4	2	3						
June 2 to July 30	4	3	4						
Aug. 20 to Sept. 10	3	2	3						

* Day and night results weighted according to the total flow through the screen. — Apparent negative removal.

takes into account an 8-hour result that was 83% above the 24-hour average. The 8% removal figure is used as indicating what the screen could do on this sewage, day in and out.

While the specification did not contemplate tests of a sedimentation tank alongside the screen, yet such tests were made. The results are said to corroborate the conclusion from the 1914 testing report that sedimentation for 1½ hours removes 45% of the suspended solids.

Sewage Screenings Were Burned

Although no part of the test, disposal of the sewage screenings was studied. About 1½ tons of wet screenings were burned daily in a Kewanee garbage incinerator, after their water content had been reduced by a centrifuge. Analyses showed that the screenings had a low fertilizing value. The "handling of the screenings was disagreeable at its best," but it is believed that an incinerator giving a higher temperature would reduce some of the objections and that it would be possible so to operate a screening plant as to make it free from odors.

Results of Tanks and Screens Compared

In summing up, the report puts the average removal of suspended solids by screenings at 8% compared with 45% by sedimentation, or 160 lb. compared with 900 lb. of dry material per 1,000,000 gal. of sewage. On this basis the cost per pound of material removed by screening would be 2c. and by sedimentation only 0.4c. Simplicity of operation lies with tanks rather than screens. As regards odors, the two processes are on an equal footing. Disinfection of screened sewage would require 10 p.p.m. of available chlorine, against only 6 p.p.m. for tank effluent. Screened effluent would retain the original sewage color, while tank effluent would be partly clarified.

"The test has shown that the Riensch-Wurl sewage screen, when viewed from a mechanical standpoint, has a number of commendable points, and that at certain locations when treating sewage or industrial wastes of favorable composition, it should be satisfactory. However, the screen contract for the installation at the West 58th St. site introduced conditions which would ordinarily be considered severe for a screen to accomplish.

"The screen failed to comply with those provisions of the contract which pertain to the removal of solid material from the sewage, the screen's capacity and the continuity of operation.

"Also, the test has definitely shown that a sewage treatment plant at the West 58th St. site which depends upon screens for clarification purposes cannot be expected to accomplish a degree of purification equal to that obtained by sedimentation tanks."

Best Sewage-Disposal Procedure for Cleveland

As already stated, George W. Fuller, consulting engineer, New York City, reported, May 14, 1917, to Alexander Bernstein, director of public service, on the "best procedure for Cleveland to adopt for the treatment of the sewage of the city." This necessitated a consideration of the plans already worked out more or less fully for disposal works on the Cuyahoga River (southerly site) and for two works on Lake Erie (easterly and westerly sites). These plans were based on conclusions drawn from a wide range of experiments at the testing station, described in the 1914 report; subsequent experiments with the activated-sludge process; and the screen tests, outlined in the foregoing pages.

The activated-sludge process is mentioned a number of times in Mr. Fuller's report. At one place he speaks "of the probability of its being the method ultimately to be adopted at plants along the lake front." Present conditions do not warrant its immediate adoption, but Mr. Fuller believes that the fine screens which he recommends for installation at each of three plants would prove a useful preliminary to the activated-sludge process, should it be used later on.

Cuyahoga River or Southerly Plant

The Cuyahoga River, with a drainage area of 830 square miles near its entrance to Lake Erie, is described by Mr. Fuller as "one of the most polluted streams in the country," with very little fresh water in dry weather. Consequently, works which will produce a relatively high degree of purification will ultimately be required at the southerly site. At the easterly and westerly lake sites clarification, with disinfection during the bathing season, is all that is required.

Plans for Imhoff tanks and sprinkling filters at the southerly site had been presented to the state Board of Health for approval before Mr. Fuller was called in, and about $125,000 had been spent in grading the site. Two hours of sedimentation was proposed. The sprinkling filters would have treated sewage at the rate of 20,000 people per acre. Mr. Fuller estimates that these works, with a capacity for 170,000 population, would cost $960,000 to build and $83,160 a year for capital charges and operation. The first cost of fine screens and an activated-sludge plant is estimated at $1,124,412 and the net annual capital and operating charges at $105,500, allowing $24,750 for income from the sludge. For an

activated-sludge plant without screens, the figures would be $904,245, first cost, and $87,890, annual charges, allowing $54,000 income from sludge. (All the estimates in Mr. Fuller's report are as of May 1, 1917.)

Fine Screens Before and Tanks After Filters

Passing over the activated-sludge process as not suitable under present conditions, Mr. Fuller states that by using fine screens instead of Imhoff tanks preliminary to sprinkling filters, the amount of sludge available for fertilizing material may be increased and sprinkler-nozzle clogging lessened. "By arranging the sprinkling filters so as to produce a somewhat more efficient oxidation than ordinarily is accomplished in order to remove colloidal matters," Mr. Fuller believes "that a fertilizer product having a value about 58% that obtained with activated sludge can be secured."

The suspended matter unloaded from the sprinkling filters from time to time would be recovered in deep Dortmund tanks, figured to produce sludge of 90% moisture, although it is believed they would produce an 85% sludge. The yield of sludge is estimated at two-thirds of the suspended solids in the raw sewage, or ⅔ ton per 1,000,000 gal. It is estimated that the ammonia in the dry sludge from the proposed tanks would be 3.5% or 38 lb. of organic nitrogen per 1,000,000 gal. of dry-weather sewage, or 1.9 grams per capita, compared with 65 lb. or 3.2 grams from activated sludge. After the first year it is estimated that 4500 tons of dry sludge containing 3.5% of ammonia would be produced from a population of 170,000, contributing 18,700,000 gal. daily of "quite fresh dry-weather sewage," receiving street wash, but little trade waste. The cost estimates are based on the foregoing figures. They show $1,021,142 as the first cost and $78,190 as the annual net capital and operating charges for a plant at the southerly site, after allowing $31,500 as the income from 4500 tons of sludge at $7 per ton. Operating expenses alone are put at $41,400, or only $9900 more than the estimated revenue from the sale of sludge.

It is proposed that of the $80,000 allowed for sludge pressing and drying plant only $25,000, or enough for a single unit, be expended at the start. With Imhoff tanks, 10,000 tons of dried sludge would have to be got rid of yearly by dumping.

Screens and Chlorination Ultimately Required at Two Other Sites

At the two lake sites Mr. Fuller assumes that eventually the activated-sludge process will be required, but not for 5 to 20 years, depending upon local opinion and progress in state and national control of lake sanitation. For the present, the Ohio authorities have indicated that clarification will suffice, accompanied with chlorination during the bathing season. In this opinion Mr. Fuller concurs.

Mr. Fuller's statement of the case for screens rather than Imhoff tanks for clarification is as follows:

"Two means of clarification of this sewage have been considered—namely, fine screens and sedimentation tanks of the Imhoff type. The former have been studied by means of the test device at West 58th St. and the latter at the testing station at East 140th St. Each of these devices is of European origin and each has an accredited standing both in this country and abroad.

"Fine screens with a slot of $\frac{1}{32}$ in. in width have been found at Dresden to remove about 2.5 cu.ft. of screenings per 1000 population daily. Similar results are being obtained at Daytona, Fla., with a screen having a slot $\frac{1}{16}$ in. in width.

"The testing station at West 58th St., Cleveland, showed a removal of only about one-half this amount, apparently due to the solid matters in the sewage being more thoroughly broken up or comminuted by the velocities of flow in the sewers before reaching the screen. Perhaps trade wastes also have a disintegrating effect upon the solid matters suspended in this sewage. However, the screenings will be increased somewhat by the drainage from the stockyards situated in the territory tributary to the Walworth Run diverting sewer.

Extra Clarification by Imhoff Tanks Unnecessary

"With Imhoff tanks, it is possible to make them of such size as to substantially equal the clarification produced by fine screens, or to build them of a size so as to produce a somewhat greater clarification. With neither fine screens or tanks is it possible to convert the sewage to a clear liquid as is proposed for the southerly plant, where very little river water is available for diluting the treated sewage.

"In my opinion, the additional clarification which it is possible to obtain with Imhoff tanks as compared with fine screens is not necessary at the lake-shore plants at Cleveland. The basis for this opinion is to be found in the sufficiency of fine screening to prevent the formation of a mat on the bottom of the lake, particles from which could be lifted by currents and brought ashore to the beaches. Currents on the lake bottom will in my judgment suitably disperse the sewage freed of coarse matters as it leaves the numerous openings of the submerged outlet pipe.

"Trade wastes at the westerly plant show a considerable amount of pickling liquors which should be curtailed so as not to interfere with the chlorination process for sterilization. This means that at the principal industrial establishments delivering pickling liquors into the sewers, storage facilities should be provided so that the wastes will be discharged say late at night so that all iron wastes will reach the plant within an interval of say one hour.

Screens Preferable to Imhoff Tank at This Site

"In my opinion, a screening plant from an engineering viewpoint is much preferable to an Imhoff tank at this site adjacent to the main western boulevard. It will be free of nuisance and should create a much better impression on the community. The screenings can be removed regularly in motor trucks and sent to the garbage plant or they can be incinerated daily at the screen plant. I prefer the former method, although the estimates of cost are based on the latter procedure.

"As to Imhoff tanks, I do not favor at this locality the accumulation of thousands of tons of putrefying solids and even if the tanks were markedly cheaper it is my opinion that it would be a less desirable installation locally than a fine screening plant."

The comparative costs for screens and for Imhoff tanks at the West 58th St. site, each capable of treating 24,000,000 gal. daily of dry-weather sewage and 64,000,000 gal. of storm flow, and with chlorination in both

cases 100 days per year, are as follows: Fine screenings, $318,032 for construction and $58,370 for annual capital charges and operating expenses; Imhoff tanks, $356,327 for construction and $53,720 for all annual charges.

An activated-sludge plant of 24,000,000 gal. dry-weather flow capacity at the West 58th St. site, but with sludge discharged into the lake instead of being recovered for fertilizer base, is estimated to cost $694,000 to build. Interest and depreciation are put at $47,020 a year and operation (four months in the year) at $26,150. This would make total annual charges of $75,170.

Activated-Sludge Process Not Recommended

The activated-sludge process is not recommended for West 58th St., because:

"1. Sufficient funds are not now available.

"2. Sufficient treatment for some time should be afforded by screening, chlorination and dispersion of the sewage into the lake through the new submerged multiple outlet pipe.

"3. Valuable local data on sludge handling at the garbage plant may be expected in the early future.

"4. Storm overflows at various points along the lake shore, due to the size of the marginal intercepting sewers, will always be a factor for perhaps 4% of the time in the aggregate during the bathing period. This lessens the value somewhat of high-grade purification of the sewage going into the lake, and requires special chlorinating devices and special attention to protect bathers following heavy showers, regardless of the high purification that this process involves. However, at some future date the indications are that this process should be considered for the lake-shore sites."

Postpone 284,000,000-Gal. East-Side Plant

The same reasoning as has been presented for the westerly site leads to recommending fine screens and chlorination four months a year at the easterly site, but owing to lack of funds a postponement of the building of this plant is advised. Its estimated cost is $900,000 for construction and $160,000 a year for annual charges.

A new outlet sewer at the easterly site, 78 in. in diameter, with multiple openings a half mile from shore, had been proposed before Mr. Fuller was called. He indorses it. The estimated cost is $175,000. When it has been provided, he recommends the extension of the present 72-in. outlet with a provision of multiple openings. He also advises chlorination plants for emergency use at 4 of the 27 storm overflows on the two lake-shore intercepting sewers. These, he says, should be made as nearly automatic as possible. Their estimated cost is $25,000 for construction and $5000 a year for operation.

Finally, Mr. Fuller recommends the construction of intercepting sewers to deliver sewage to the southerly or Cuyahoga River site. The estimated cost is $500,000. As most of the work will be in tunnel, contracts should be let at once.

Mr. Fulton states that "it would be desirable also to install promptly" chlorinating devices "at E. 140th St. for use following rains—at least on occasions when intestinal diseases are prevalent in the city." No estimates for the cost of this plant are given.

As Water Meters Increase, Water Consumption Falls

Statistics for 68 Cities Having More Than 11,000,000 Population Arranged in Groups Make a Remarkable Showing

By William R. Hill
Consulting Engineer, Albany, N. Y.

An increase in the number of meters in use always results in a saving of water that would otherwise be allowed to run to waste from defective fixtures, or by letting it run to obtain cooler water in summer, or to prevent it from freezing in the plumbing in the winter, or from other negligent causes. This will be shown by the result of the use of 930,839 meters in 1915 in 68 cities with an aggregate population of 11,275,238.

The great variety of local circumstances and conditions affecting the consumption of water in different cities renders a comparison of the influence of the use of meters on the consumption of water in one city with that in another of but little value. In order to make a reliable comparison of the influence of the use of meters, the 68 cities included in the accompanying table

THE USE OF WATER METERS IN 68 CITIES* OF THE UNITED STATES IN 1915 AND ITS EFFECT UPON WATER CONSUMPTION

Group	No. of Cities	Population per Group	Daily Consumption, Gallons: Total, Millions	Per Capita: Range	Per Capita: Average	No. of Services	No. of Meters	Per Cent. of Services Metered
1	4	379,198	18.60	45 to 55	49	43,502	41,109	94
2	8	1,307,341	85.88	56 to 70	66	193,057	173,410	89
3	8	926,252	71.23	71 to 80	77	149,781	122,165	81
4	13	1,096,729	97.03	81 to 95	88	170,882	128,571	75
5	7	1,083,068	112.33	96 to 110	104	180,039	125,271	69
6	7	1,408,465	159.74	111 to 120	113	238,291	144,497	60
7	8	1,588,716	203.72	121 to 130	128	271,327	64,266	24
8	9	1,491,518	206.49	131 to 150	138	291,517	55,450	19
9	4	1,993,951	351.66	151 to 200	176	432,583	76,100	17
Total,	68	11,275,238	1,306.68	45 to 200	116	1,970,979	930,839	47

* The cities in each of the nine groups are as follows:

Group No. 1: Brockton, Mass.; Fall River, Mass.; Lowell, Mass.; Covington, Ky.

Group No. 2: New Orleans, La.; Providence, R. I.; Hartford, Conn.; St., Paul, Minn.; Lynn, Mass.; Pawtucket, R. I.; Manchester, N. H.; Taunton, Mass.

Group No. 3: Minneapolis, Minn.; Worcester, Mass.; Paterson, N. J.; New Bedford, Mass.; Somerville, Mass.; Terre Haute, Ind.; Lincoln, Neb.; Sioux City, Ia.

Group No. 4: Columbus, Ohio; Memphis, Tenn.; Yonkers, N. Y.; Hoboken, N. J.; Cambridge, Mass.; Norfolk, Va.; Passaic, N. J.; Jacksonville, Fla.; Houston, Tex.; South Bend, Ind.; New Britain, Conn.; Little Rock, Ark.; Topeka, Kan.

Group No. 5: Newark, N. J.; Rochester, N. Y.; Richmond, Va.; Duluth, Minn.; Charleston, S. C.; Springfield, Mass.; Altoona, Penn.

Group No. 6: Boston, Mass.; Atlanta, Ga.; Toledo, Ohio; Omaha, Neb.; Harrisburg, Penn.; Holyoke, Mass.; Allentown, Penn.

Group No. 7: St. Louis, Mo.; Cincinnati, Ohio; Schenectady, N. Y.; Camden, N. J.; Portland, Me.; Reading, Penn.; Canton, Ohio; Binghamton, N. Y.

Group No. 8: Baltimore, Md.; Jersey City, N. J.; Portland, Ore.; Youngstown, Ohio; Peoria, Ill.; Savannah, Ga.; Mobile, Ala.; Lancaster, Penn.; Macon, Ga.

Group No. 9: Philadelphia, Penn.; Kansas City, Mo.; Kansas City, Kan.; Springfield, Ohio.

have been divided into nine groups in accordance with the quantity of water consumed per capita per day. Putting the cities in groups combines all the local circumstances and makes the conditions more general. A comparison of the consumption per capita per day in one group with that of another shows a remarkable uniformity in the decrease of consumption per capita, where the percentage of services metered is increased. The table shows a remarkable uniformity in the decrease in per capita consumption with the increase in the percentage of services metered. Taking the 68 cities as an aggregate, with the great population of 11,275,238, and with 47% of the services metered, the rate

of consumption, 116 gal. per capita per day, agrees very closely with the rate as fixed by dividing the cities into groups.

The rates charged for water in many cities are not equitable, the meter rates being too high. This causes the meter, in many instances, to be very unpopular.

Many medical men have erroneously reported that their use would threaten the health of communities. They do this without being able to refer to any instance on record of such an effect.

Break in Dam Closed Rapidly at Brainerd, Minn.

Old Dam Across Mississippi Breached February 12 Was Restored and Power Service Was Resumed April 16

ON FEB. 12 part of the old pulp-mill dam near the site of the Northwest Paper Co.'s new plant at Brainerd, Minn., gave away, causing the Mississippi River to make a detour to the west, carrying out more of the old structure and cutting its way through and washing out the westerly bank, 75 ft. high, a distance of 800 feet.

Representatives of George F. Hardy, consulting engineer, New York, the C. L. Pillsbury Co., Minneapolis, and N. F. Helmers, of the contracting firm of Siems, Helmers and Schaffner, St. Paul, at once made tentative plans for a structure to replace the break. The contract was awarded to the latter firm.

Working in the most severe winter weather, with the railways blocked by snowstorms, and in the face of the abnormal car shortage, 8000 yd. of rock and more than 500,000 ft. of timber, 10,000 ft. of piling and 12,000 yd. of earthwork were placed and the full head of 16 ft. developed by Apr. 12. The work was carried on day and night, being illuminated with arc lamps.



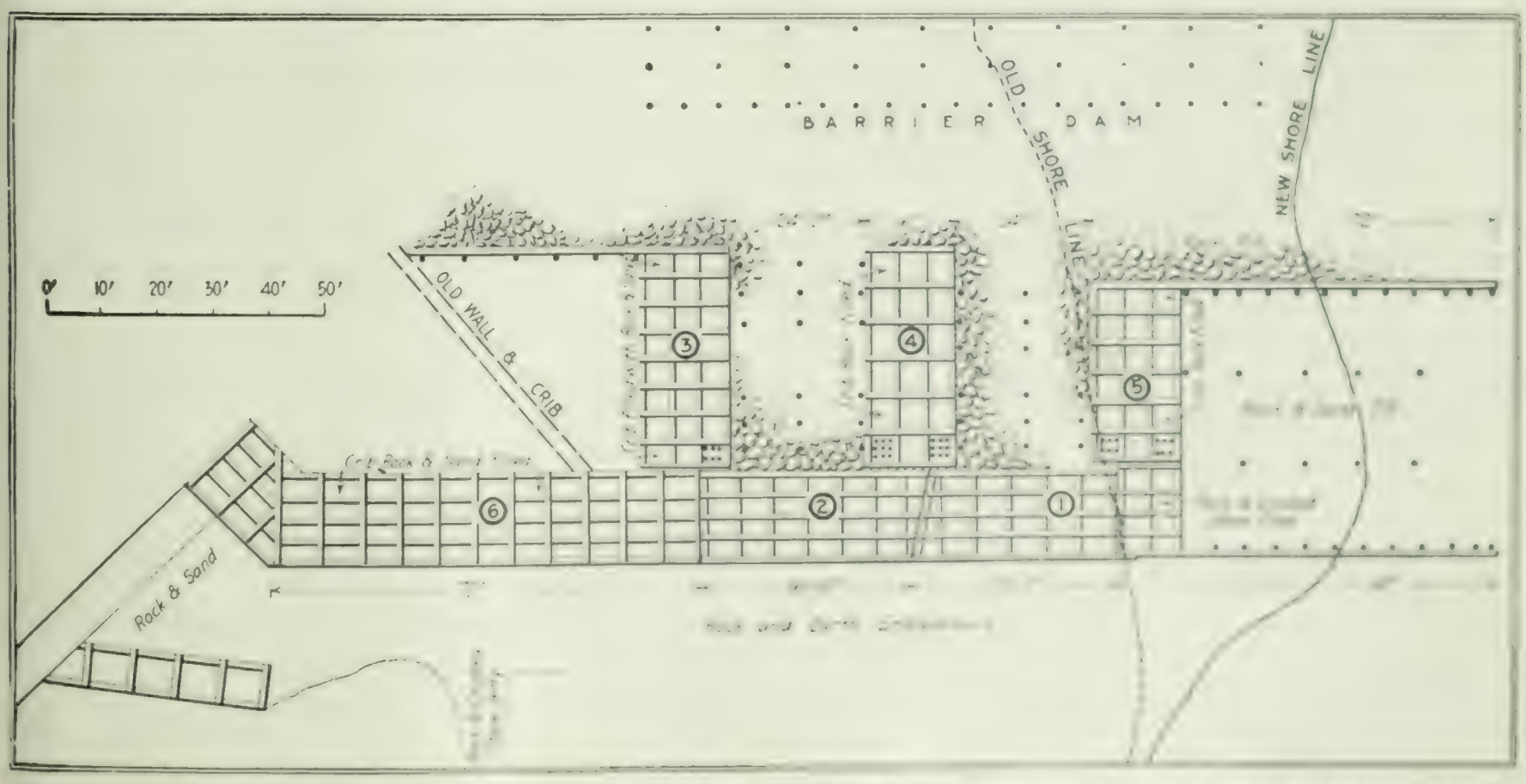
CLOSING THE BREAK IN THE DAM AT BRAINERD, MINN.

Not the least obstacle was the inaccessibility of the work, which necessitated the rebuilding of 100 ft. of trestle highway bridge 60 ft. high, and the reinforcing of 300 ft. more, the placing of two cableways, erection of two piledrivers and laying of a mile of track before work was under way.

A temporary barrier dam was first built out from the shore 110 ft. into the stream, across the washout, to retard the current. It consisted of random piling driven to refusal and filled around with rock. At the same time tons of rock were hauled across the bridge in 1½-yd. cars and deposited in the washout by skidding down the bank or unloaded from the 1-yd. skips of the cableways to pave the bottom of the river. Cribs 3, 4, 5 and 6 were then built and slid into position after cutting the necessary opening in the ice.

The two key cribs for closing the dam were floated into position Apr. 4, and filled with rock.

The work was carried on under the direction of N. F. Helmers, of the contracting company. D. Fairchild superintended the construction. H. Bennett, civil engineer, represented George F. Hardy, of New York, and the paper company's interests.



FIRST A BARRIER DAM WAS BUILT UPSTREAM, THEN CRIBS AND [illegible] TO CLOSE THE BREAK IN THE DAM

Useful Diagrams for the Design of Subway Sidewalls

Rolled-Steel Beams Required To Satisfy Specifications of City of Philadelphia Easily Selected—Method Eliminates Tedious Calculations for Bending Moments

By HENRY HYMAN
Assistant Engineer, City Transit Department, Philadelphia, Penn.

DIAGRAMS which eliminate the tedious calculation for bending moments and allow rapid selection of standard rolled beams for the sidewalls of subway construction have been developed by the writer in connection with the design of both the New York and the Philadelphia subways. The accompanying figures include such diagrams based upon the specifications of the City Transit Department of Philadelphia, but the explanation and formulas given will enable anyone to construct similar diagrams to suit other requirements. Of course, the bending moments due to other pressures than those used for the diagrams can easily be obtained by ratio.

Typical Construction Assumed

In the construction of subways and other rectangular subsurface structures, the sidewalls are generally built either of reinforced concrete or of rolled or built-up steel columns placed underneath the transverse roof beams. Thus the sidewall must sustain both direct stress due to the roof loads and the bending stress due to side pressure of the earth, or earth and water. Almost all of the required calculation can be avoided and great rapidity in designing can be obtained by the use of diagrams.

Fig. 1 is for the purpose of determining the bending moments on sidewalls due to earth pressure. In the design of subway sidewalls it is usual to assume the earth pressure acting as a fluid, adopting some safe value for equivalent fluid pressure. In the design of the New York subways, the Public Service Commission adopted an equivalent fluid pressure of $33h$ lb.

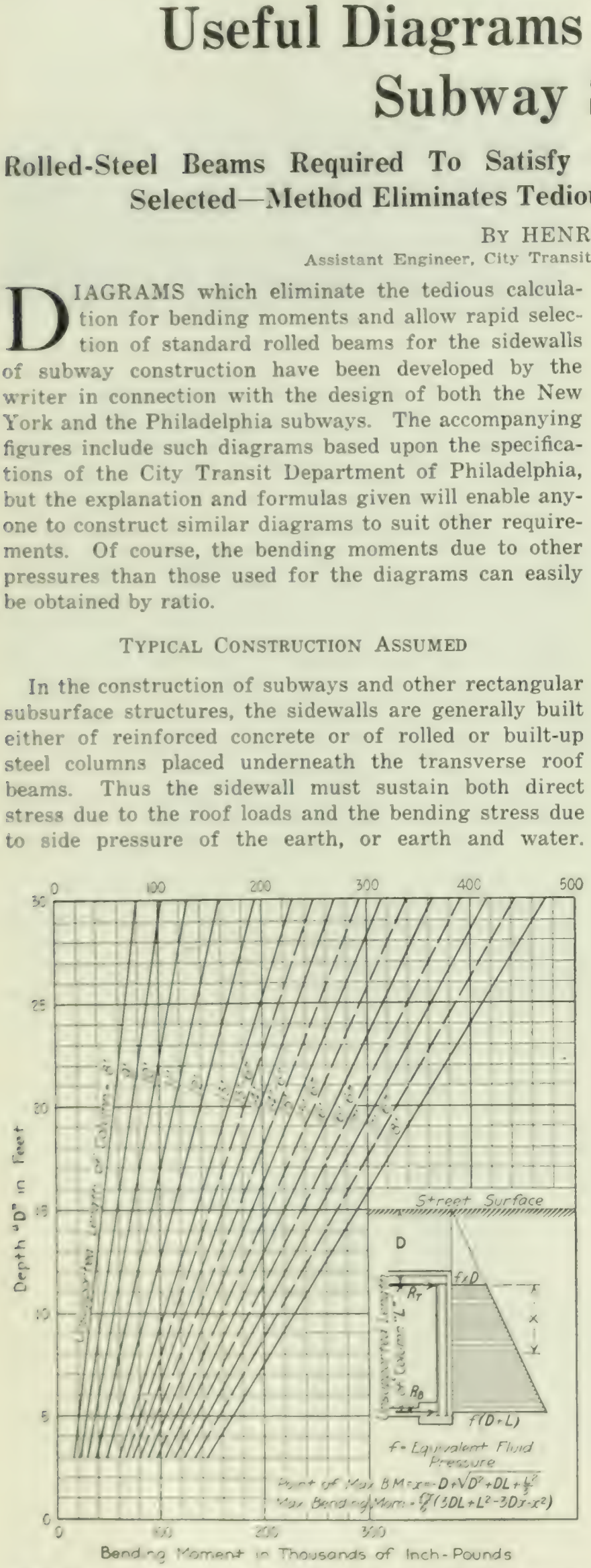


FIG. 1. BENDING MOMENTS DUE TO EARTH PRESSURE
Values are for 1 ft. width of wall and assumed equivalent pressure of $25h$ lb. per square foot

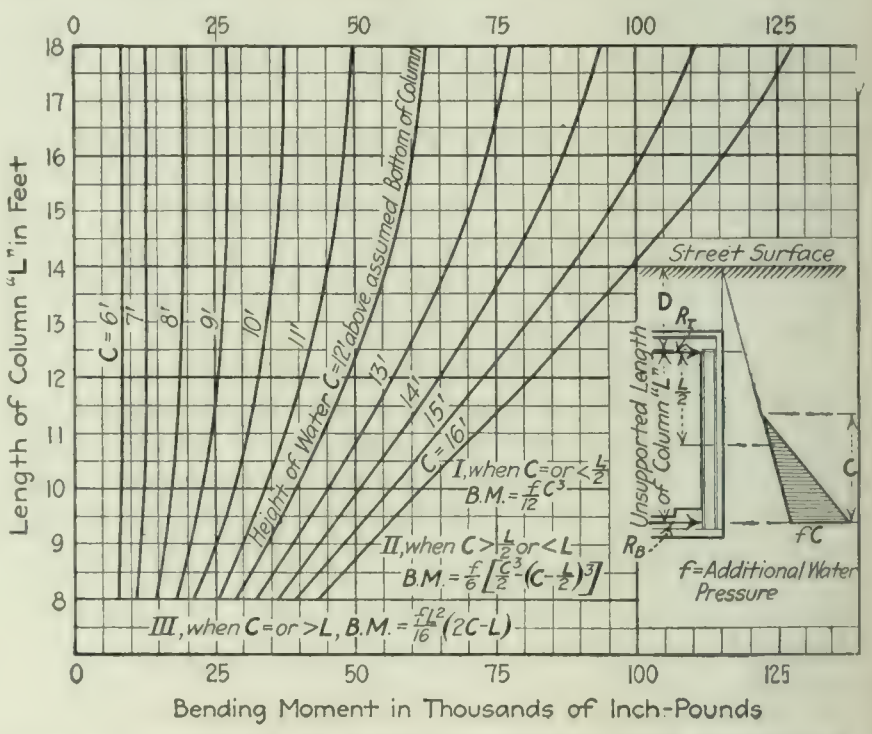


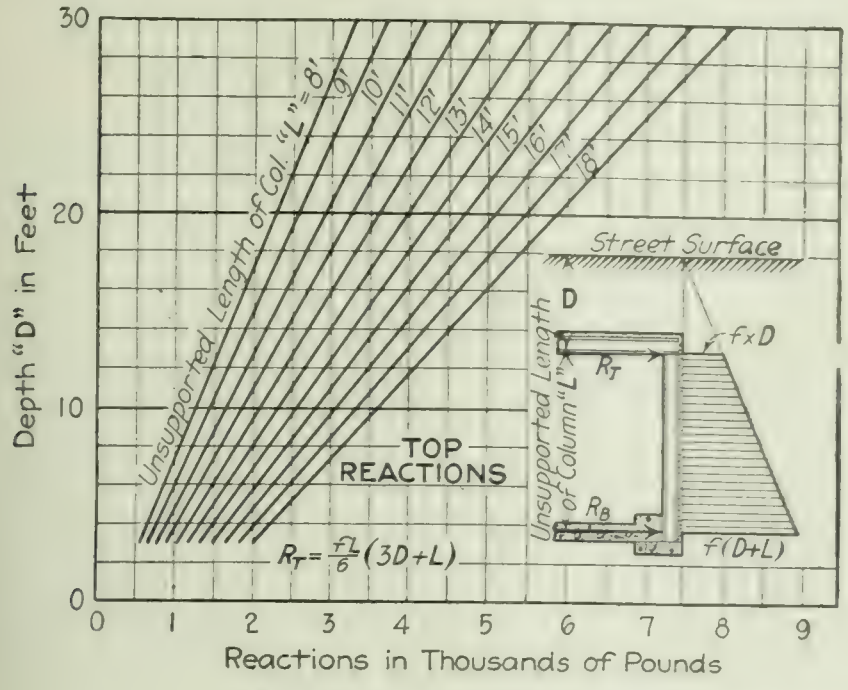
FIG. 2. BENDING MOMENTS DUE TO WATER PRESSURE
Values are for moments at center of column for 1 ft. width of wall and assumed water pressure of $37.5h$ lb. per square foot

per sq.ft., if h is head in feet, and in designing the proposed subways for the City of Philadelphia, the Department of City Transit is using an equivalent fluid pressure of $25h$ lb. per sq.ft.

Fig. 1 gives bending moments due to earth pressure for 1 lin.ft. of wall for an equivalent fluid pressure of $25h$ lb. per sq.ft., and from the formulas given on the diagram it is obvious that for any other pressure f the bending moments will be $f/25$ times the values obtained from the diagram. Thus, for an equivalent fluid pressure of $33h$ lb. per sq.ft., the bending moments will be 33/25 times the values obtained from the diagram.

Additional Moments Due to Water Pressure

Fig. 2 is for the purpose of determining the additional bending moments on sidewalls due to water pressure, when the structure is partly or entirely below water. The assumptions made in the design of subway sidewalls when the structure is below the waterline vary more widely than the assumptions for earth pressure



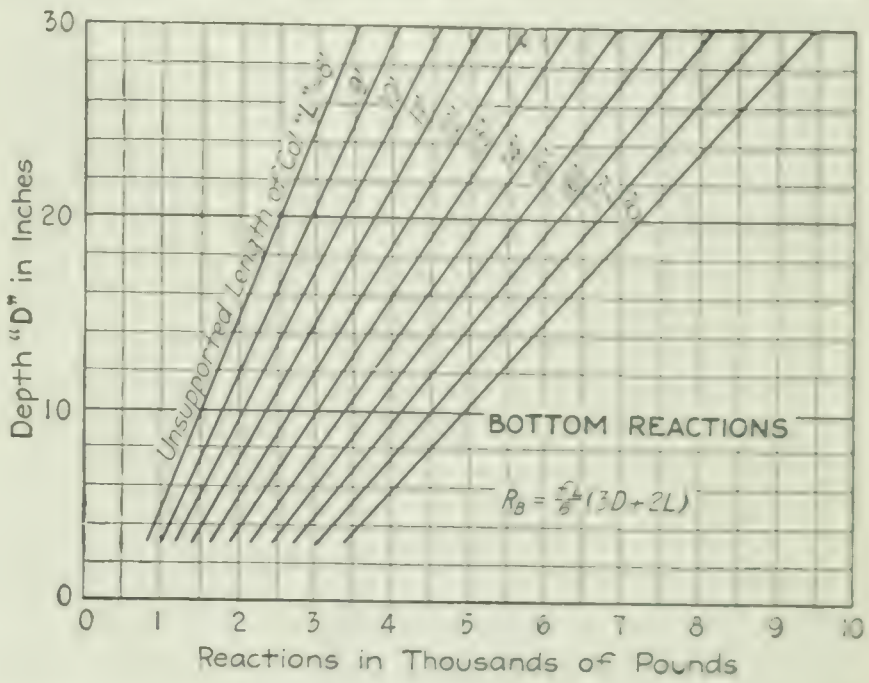


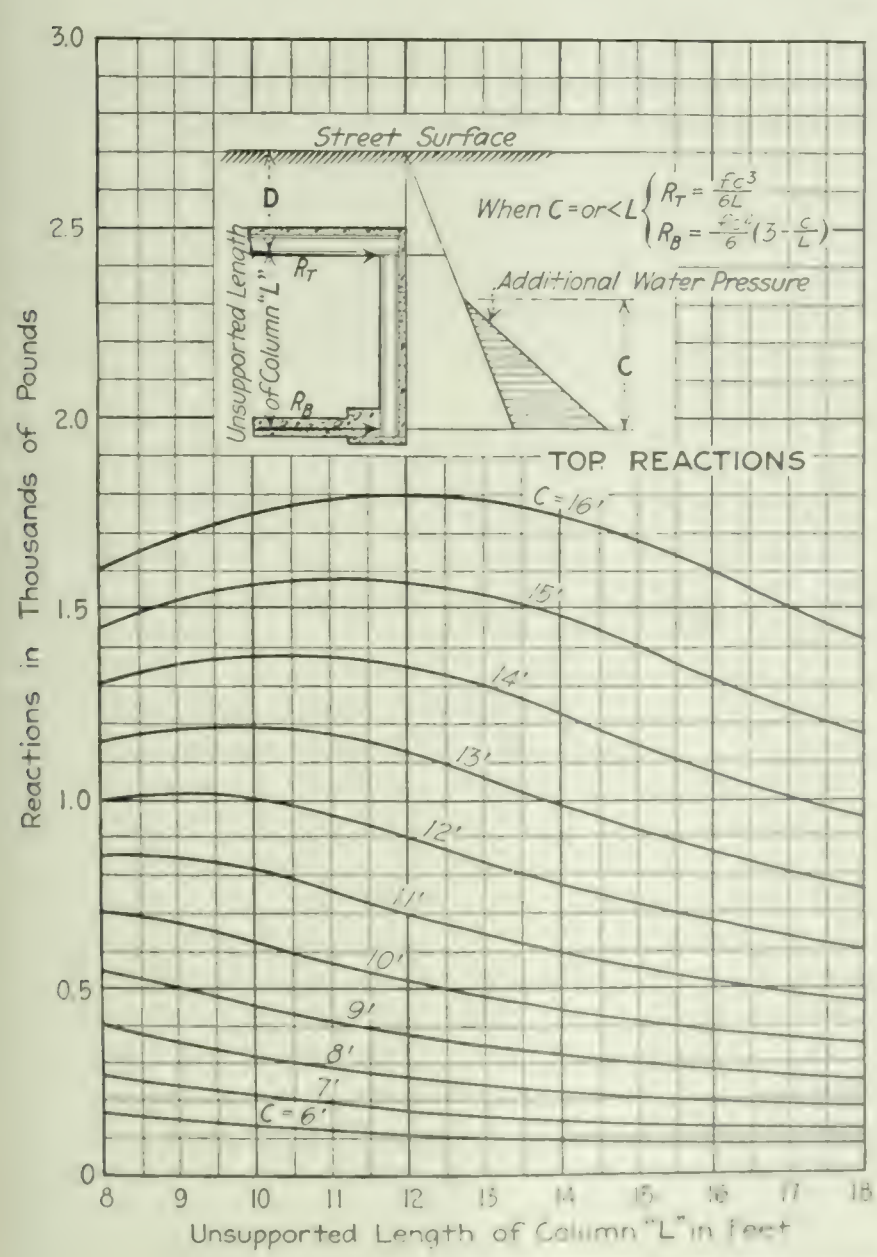
FIG. 3. REACTIONS AT TOP AND BOTTOM DUE TO EARTH PRESSURE

Values are for 1 ft. width of wall and assumed equivalent pressure of 25*h* lb. per square foot

above the waterline. The practice in New York is to assume in addition to a horizontal pressure of 33*h* lb. per sq.ft. for earth, a value of 62.5*h* lb. per sq.ft. for water pressure below the waterline. In Philadelphia the practice is to assume an additional pressure of 37.5*h* lb. per sq.ft. below water, thus making a total pressure of 62.5*h* lb. below waterline.

Fig. 2 gives the additional bending moment on 1 lin.ft. of wall for a water pressure of 37.5*h* lb. per square foot. As in the case of earth pressure, the bending moments due to any other value *f* will be *f*/37.5 times the values given in the diagram. The values derived from this diagram are of course to be added to the values obtained from Fig. 1 in order to obtain the total bending moments when both earth and water pressure exist.

It is to be noted that the values in this diagram represent not the maximum moments due to water pres-



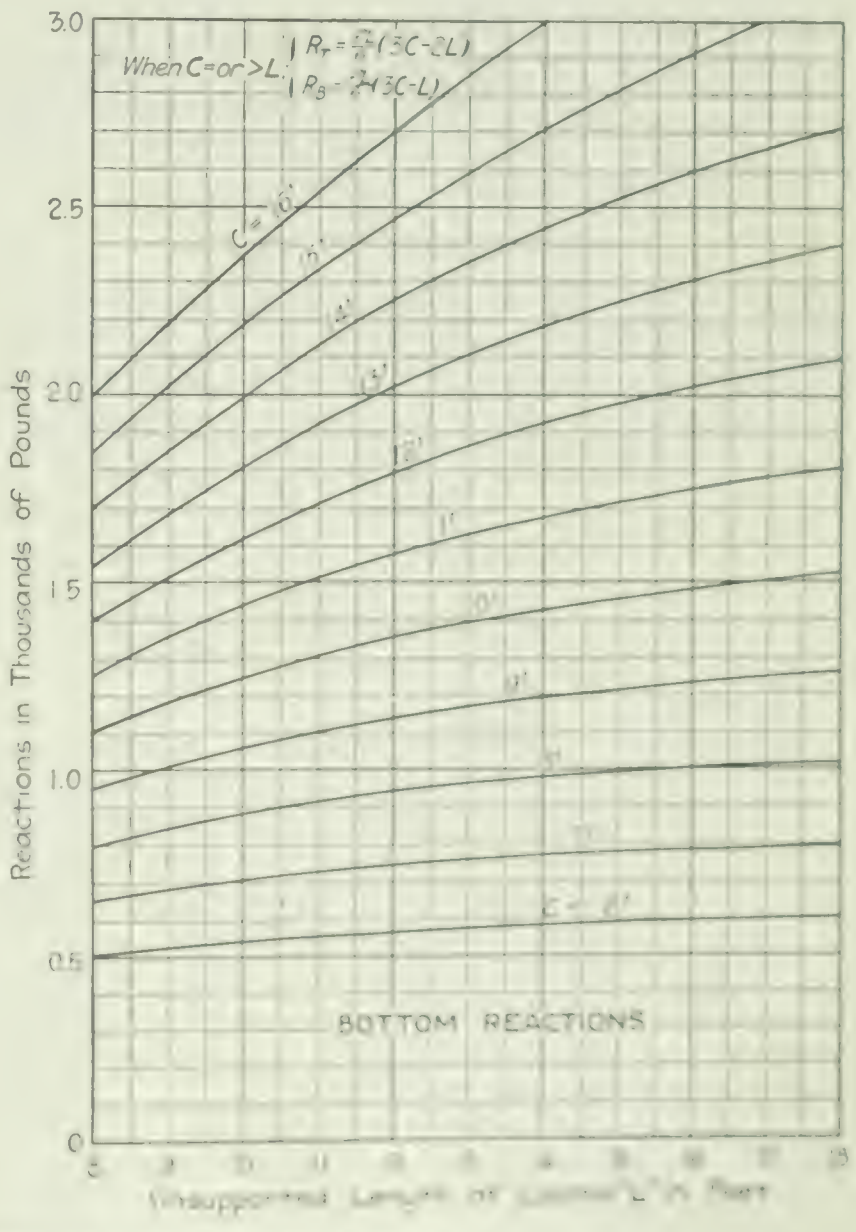


FIG. 4. REACTIONS AT TOP AND BOTTOM DUE TO WATER PRESSURE

Values are for 1 ft. width of wall and assumed water pressure of [illegible]

sure, but the moments at the center of the columns or sidewall. This is done so that the values will correspond with the values obtained in Fig. 1 (which are the maximum bending moments on the sidewall at a point which is located slightly below the center) so that the two may be added together in order to obtain the total moment due to pressure of both earth and water.

Diagrams for Reactions

Figs. 3 and 4 give the top and bottom reactions on the sidewall for 1 lin.ft. of wall for the same assumed earth and water pressures as are used in Figs. 1 and 2. As in the case of moments, the reactions at both top and bottom of sidewall or columns, for any other assumed values than those used, will vary in direct proportion. These reactions are not generally required in the design of the sidewall columns except when beams with their webs or built-up columns are used.

Fig. 5 gives the required section of standard steel beams for the sidewall, having previously determined from Figs. 1 and 2 the total bending moment, and knowing the direct load on the column under consideration. Values for direct, bending and combined unit stresses must be adopted before such a diagram is constructed.

The usual formula for the design of steel members under a combined direct and bending stress is

$$f = \frac{P}{A} + \frac{Mc}{I}$$

in which f is combined stress in pounds per square inch; P, direct load in pounds; A, area of column section in square inches; M, bending moment in pound-inches (as obtained from Diagrams 1 and 2); c, distance from neutral axis of column to extreme fiber in inches; and I, moment of inertia of column section.

Specified Unit Stresses

The term P/A in the above formula represents the stress in the column due to direct load, and the maximum value allowed for this stress is generally fixed by the column formula used. In the given diagram, Fig. 5, the allowable value for direct stress is

$$\frac{15{,}000}{1 + \frac{l^2}{13{,}500r^2}}$$

with a maximum value of 14,000 lb. per sq.in., which is that used by the Department of City Transit of Philadelphia.

The term Mc/I represents the stress in the column due to bending. The allowable value for this stress assumed for the purpose of this diagram is 20,000 lb. per sq.in. and the allowable value for the total combined stress f is 25,000 lb. per sq.in., these values being permitted by the Department of City Transit.

A similar diagram for any other values of direct, bending and combined fiber stresses and for any other sections than those adopted here can readily be constructed by noting the following:

1. The diagrams are straight lines, hence it is only necessary to figure two points for any section.

2. By assuming some value for direct load it is only necessary to compute from the above formula the bending moment that will bring the stress in the column up to the value adopted for combined unit stress, thus fixing one point on each line. In a similar manner by assuming another value for direct load another point on each line can be plotted.

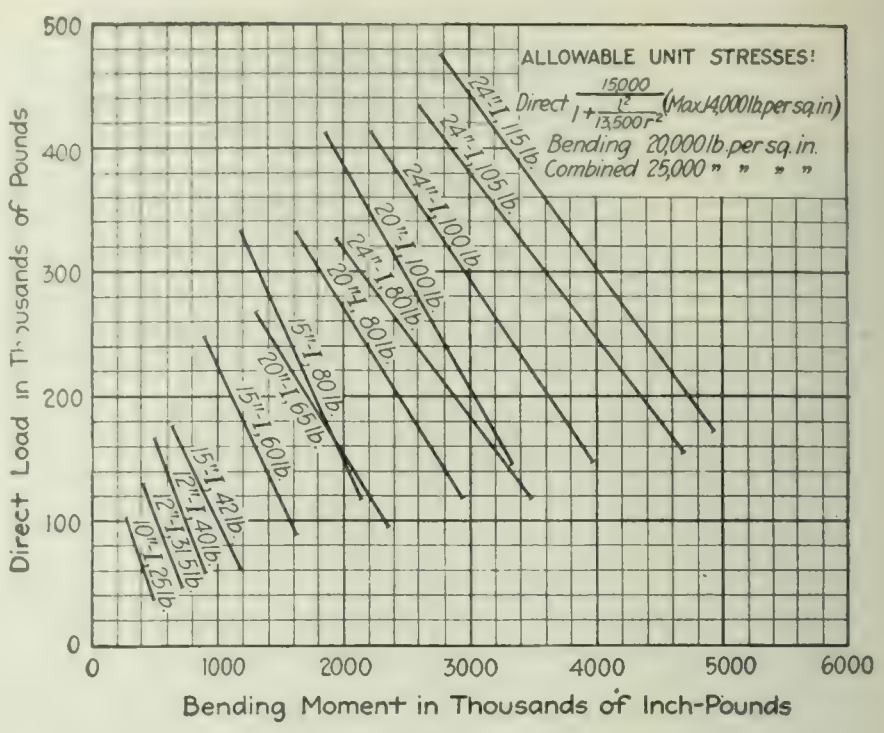


FIG. 5. STANDARD ROLLED BEAMS FOR SIDEWALL COLUMNS

3. The lower limit of each line is fixed by the unit stress that is assumed for bending and should not be extended beyond a bending-moment value equal to this fiber stress multiplied by the section modulus of the section.

4. The upper limit of each line is fixed by the unit stress that is assumed for direct load and should not be extended beyond a direct-load value equal to this fiber stress multiplied by the area of the section.

The values in Figs. 1 to 4 inclusive are for a width of wall equal to 1 ft. The values taken from the diagrams should therefore be multiplied by the distance between columns or bents, to derive the corresponding values to be used in choosing the required section of column from Fig. 5.

Industrial Use of Cleveland-Akron Road

The travel count recently made on the 40-mile road between Cleveland and Akron is of particular interest because the road is constructed for heavy travel and is paved with brick except for a section of about three miles. From 6 p.m. on May 18 to 6 p.m. on May 21, a period of 72 hours, 9804 vehicles passed over the road. These consisted of 11 loaded and 18 empty trucks rated at over 5 tons, 96 loaded and 45 empty trucks rated at 5 tons, 58 loaded and 47 empty trucks rated at 3 tons, 96 loaded and 136 empty trucks rated at 1½ tons, 9106 passenger automobiles, and 50 loaded and 141 empty horse-drawn vehicles. It will be seen that 5% of the motor vehicles were trucks, and the count showed that they carried 890 tons of goods, or 22 full carloads. If each of the passenger cars carried three persons, the total number moved during the 72 hours was about 180 railroad passenger-car loads, assuming 150 passengers to the car. This transportation service was rendered in a district where railway service is now severely strained, and a large industrial population in Akron is dependent on the road for shipping facilities.

Workmen's Compensation on War Construction Heavy Risk

Accidents in Cantonment Work May Run High Unless Care Is Taken—One Contractor Posts "Go Slow" Signs

By Chesla C. Sherlock
Secretary, Iowa Industrial Commission, Des Moines

With 16 national army cantonments to build at an extraordinary rate of speed and with each of the 16 contractors for this work pushing from four to six thousand men at top speed day and night, there is danger that industrial accidents will take heavy toll of the construction forces at a time when such labor is exceedingly scarce. Reliable statistics show that the majority of industrial accidents occur during so-called rush periods, and at least one insurance company of those carrying risks on cantonment work considers the hazard very serious.

Construction Naturally a Dangerous Occupation

Of course, no reliable figures are at hand to show what has occurred under similar circumstances, because such an undertaking was never attempted before. Predictions must be based upon what has happened in normal times, with an additional allowance for the fact that in times of great stress a larger percentage of industrial loss is to be expected. According to a special report of the Department of Labor of the State of New York, 1641 fatal accidents occurred in the construction and building trades of that state during a recent four-year period. This may seem a small fraction of the enormous industrial population of that state; but four times as many people are employed in factories in New York as are employed in the building and construction trades, and during the same period only 1285 fatal accidents occurred to factory workers. This included 204 fatalities resulting from three large factory fires. Similar statistics might be quoted for every state in the Union.

While the conditions which produce accidents are going to be present in nearly equal degree in the 16 different jurisdictions, the amounts that the injured workman will be entitled to recover will by no means be the same in the different cantonment centers. This is due to the difference in the working of the various state statutes. The Federal Government will have nothing whatever to do with reimbursing an injured man who is hurt while working in the cantonments. This is not a Federal question, but one to be determined by the state statute wherever the cantonment camps happen to be located. The Federal Government, while it has passed a compensation act, cannot be held for liability in these cases, for the reason that the employer is not the Federal Government, but the private contractor.

But aside from this point, if any unusual percentage of accidents occur, especially if there are a large number of fatalities, the burden thrown upon the insurance companies is going to be great; and these facts must be taken into consideration by contractors who are to have a part in this great activity.

One insurance adjuster who has considerable foresight said, in explaining the situation to the writer, "If we are to come out even on this proposition, I must exert every effort possible to prevent accidents. I am carrying the risk on the cantonment at ——, and I don't propose to have anyone know that I consider it a ticklish proposition. I have installed two tents at the camp, with five trained physicians in charge and twelve of the best nurses I could find. I have everything in those tents that human foresight could think of to care for those who are going to be injured. I have two ambulances in constant readiness to hurry badly injured workmen to the city hospital. I am going to do everything I can to save life and limb."

At one of the cantonments, the contractor in charge of the work has taken every precaution to prevent this waste. He has signs posted in every nook and corner of the city that is being constructed, which read:

Men Working
PLEASE GO SLOW
and
Help Us
Prevent Accidents

Compensation has been tried in normal times and found to be highly successful. If it is to meet the test in these times of war and world strife, the utmost effort must be exerted by those in authority to prevent carelessness and indifference growing up among workmen. These traits of character are, after all, the prime causes of industrial accidents.

It is necessary, if we are to emerge from this conflict in triumph, that our laboring forces be preserved intact to the last man. America's industrial health is too important to the world to allow a single man to be maimed or to lose his life when it could have been prevented by wise counsel and forethought.

Large Amount of Cracked Gasoline Being Used

Cracked, or synthetic, gasolines are being marketed in enormous quantities largely, if not altogether, in the form of blends with straight refinery and casing-head gasoline, according to a circular of the Bureau of Mines. Cracked gasolines are similar to straight refinery products in most physical and chemical properties, but differ chemically in containing varying percentages of unsaturated and aromatic hydrocarbons. It has been demonstrated that these constituents, if present in moderate proportion, do not decrease the value of a gasoline. Also, competent authorities generally concede that by proper engine equipment and adjustment it is possible to use unsaturated hydrocarbons in practically unlimited proportion, although extensive experimental proof of this does not seem to be available.

Effect of Creosoted Pipe on Drinking Water

Weekly samples of water conveyed through 8000 ft. of creosoted pipe at Wenatchee, Wash., are being analyzed to determine the effect of the creosote on water for drinking purposes and agricultural uses. The tests are being supervised by the Bureau of Industrial Research of the University of Washington, which is headed by Dr. H. K. Benson. A similar experiment was conducted at the university last year. At the end of 26 days no trace of creosote could be found in the water

SOCIETY SERVICE

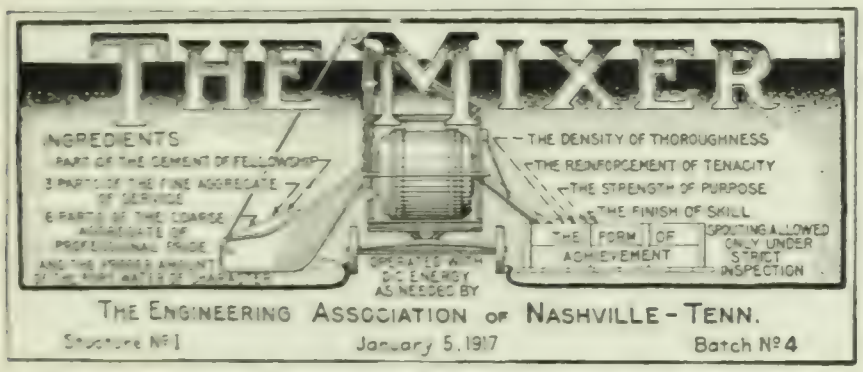
A Section Dealing with the Results of Teamwork by Technical Men

ELEMENTS OF SUCCESS AT NASHVILLE

Civic duties properly performed seem to be the ideal of the Engineering Association of Nashville, according to a letter from Hunter McDonald, president, giving additional data on the society's service to that printed in these columns June 28, p. 662. A list of the committees almost leads one to question whether the society is not an association of commerce: National water law, state topographic survey, smoke abatement, buildings and insurance, streets and highways, changes in city charter, uniform boiler law, city planning and nitrate plant.

Paragraphs from Mr. McDonald's letter indicate the trend of activities:

"Our present association since its organization, the beginning of this year, has been quite active in public



SOCIETY NOTICES HAVE MUCH TO DO WITH ATTENDANCE

affairs, making studies of state and local conditions and making recommendations as to wholesome laws and policies. We have not attempted to go into details, but have pointed out in general where advantageous changes and consequent economies might be effected. We have coöperated with state legislative committees in framing highway bills and the standard boiler-code law, and with the Nashville Commercial Club in framing desirable amendments to our city charter. We have succeeded in writing on our municipal statute books, by cooperation with the City Commission, a building code modeled after that of the National Board of Fire Underwriters, and requiring the enforcement of the American Society of Mechanical Engineers' boiler code within the city limits, and have brought about the extension of our sewer system so as to reach all districts.

"Our organization is recognized as an adjunct of the Commercial Club, although entirely independent of it in our support and opinions. We are called upon for representation on all joint civic movements.

"Looking backward it is difficult to see wherein our course could have been modified to advantage. Our successes have been due to constant watchfulness and personal and disinterested effort. Our failures have been due to the activities of self-seeking politicians who do not wish to have their 'special preserves' encroached upon.

"We have not yet devised a way to get proper publicity in our activities. Our local papers are willing to give their space to anything which lends itself to their particular lines of endeavor, but if it happens to differ with their views in any way, instead of getting their support we are suppressed.

"We have not attempted to bring about the appointment or election of individuals to public places. When called upon by the city authorities to recommend men we have done so with satisfaction to all concerned. Our attitude on this question has been to educate public sentiment up to the necessity of having public work executed in accordance with sound engineering principles. We have not advocated the elevation of engineers to any position, but we feel that when public sentiment appreciates the value of their services it will not be necessary to urge their appointment. We seek to retain public confidence by well-considered action, free from interested motives.

"We have not taken up the employment question in a business-like way, but we have done a good deal of quiet work in this connection with some satisfaction."

ENGINEERS SHOULD GIVE MORE ATTENTION TO PUBLIC ACTIVITIES

The engineer, and especially the young engineer, must give greater attention to public affairs, political activities, etc., and not confine himself to his professional activities. This was one of the strong points made in an address to the American Association of Engineers, at Chicago, on July 27, by William H. Finley, chief engineer of the Chicago & Northwestern Ry., and one of the new vice presidents of the association. Such a step is important in the interest of the engineering profession as well as in that of the individual engineer. The latter not only broadens his view of men and life, but helps to give publicity to his profession and to educate the business community and the public as to the true functions of engineering and the engineer. To quote Mr. Finley:

"The engineers must step into public activities before the technical men can attain the standing and recognition by the general public which other professions have. Above all, they must learn to advertise their work, and not publicly criticize the mistakes of their fellow engineers."

STATE CAPITAL CLUB FINDS LIMITATIONS

Among other community activities the Springfield (Ill.) Engineers' Club keeps its members informed regarding engineering features of public projects and has used the newspapers to explain its stand upon such projects where engineering features are involved. The result is that the engineer's viewpoint has been respected more than if no notice had been taken.

Looking backward, J. R. Hughes, the secretary, states that the club might have been more active in placing its members on public committees appointed by the Commercial Association to make a study of certain projects involving extensive engineering features investigated during the year. Intelligent interest, he adds, brought to the club any measure of success achieved. The club is not satisfied, however, that it gets enough publicity for engineering activities.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Faulty Joint Construction Causes Failure of Monolithic Brick Pavement

Sir—Several interesting failures, due to expansion, have recently occurred in the new monolithic brick pavement the construction of which was fully described in an article appearing in *Engineering News-Record*, Apr. 19, 1917, p. 130.

Following a cool spell of weather, a warm wave swept over the Puget Sound country and reached its maximum on June 13, 1917, when the Weather Bureau at Seattle, eight miles distant, recorded a temperature of 84°. Quite possibly it was a few degrees warmer at the location of the road, but no records are available.

Upon the afternoon of this day, evidence of failure in the road first became apparent. The majority of breaks have occurred in a stretch of the road built during the warm weather of 1916. Here, five breaks appeared at intervals of about 500 ft. Two other breaks in different sections of the road have developed since that date.

The following description of a typical break applies to all the cases observed thus far. The first evidence is the appearance of a very flat arch, noticeable by the raising of the brick above the line of the curb and becoming apparent to those crossing in automobiles. In one instance, when the crown of the arch had risen 2½ in. above the curb level, the span, as indicated by sounding of the surface, was 20 ft.

The passing of automobiles caused a vibration perceptible to one standing upon the brick, through the sense of touch rather than by any visible sign. As the pressure increased, the arch raised itself higher until the point of rupture was reached, when the break occurred with a loud report. This usually happened with the passing of some particularly heavy truck, or an automobile running at high speed. All the courses of bricks were then found to be separated from each other and from the base, as indicated in the accompanying photograph, which was taken after a failure, when a couple of courses had been removed and the rest separated to allow traffic to proceed pending repairs.

Upon removal of the loosened brick the sand-cement cushion was found to be adhering to the base, and its upper surface showed clear impressions of the bottoms of the bricks, with low ridges from ⅛ to ¼ in. in height, indicating the flow upward of the cushion between bricks under the weight of the roller. The bricks were usually unbroken, only about 50 new ones being needed to replace those which were ruptured in each broken area.

Each break occurred at a "cold joint" in the base, at the end of a day's run of concrete. It is interesting to mention that, when ending the day's run, it was the practice on this work *to feather or taper* the end of the base for a distance of a foot or more, instead of leaving the end vertical. Upon resuming the work, the feathered end of the base was well cleaned, painted with cement grout and concreting commenced at once.

When all the loosened bricks were removed from a break, the center line of the cleared area, usually about 10 ft. in width measured along the road, was found to be 2 ft. in advance of the center line of the joint in the base, apparently indicating that the base had ruptured along the plane of the joint above described and the newer part had slid upward above the old portion, thus raising the brick surface along this line and allowing the buckling to begin.

In repairing the breaks, provision was made in each instance for a bituminous expansion joint in the base and, to avoid holding up traffic for any length of time,



PAVING BRICK SEPARATED FROM CONCRETE BASE BY LAPPED JOINTS MOVING

pitch filler was used in all the joints of the brick when relaid, in place of the usual grout filling.

From the foregoing, it would seem that there is no such thing as "monolithic brick pavement" in the strict sense of the term, that the tapered form of joint used to finish off the day's run of concrete base may prove to be a destructive factor under compressive stresses due to temperature changes, and that brick laid without expansion joints is subject to the same laws as long columns unprovided with bracing. It would also appear that the base in this form of pavement is more susceptible to temperature changes than the type where the brick is laid upon a sand or cement-sand cushion.

All county work is under the direction of Samuel J. Humes, county engineer; C. E. Morford, principal assistant, who is directly in charge of construction, furnished the data for this description.

CHARLES P. MOWRY,
Office Deputy, King County Engineer.

Seattle, Wash.

[Proof of the above letter was submitted to W. C. Perkins, chief engineer of the Dunn Wire-Cut-Lug Brick Co., an authority on monolithic brick paving, for comment on King County's experience. Mr. Perkins' explanation follows.—Editor.]

Sir—It is rather difficult to give a correct explanation of any phenomenon of failure of construction in any pavement unless one can make a personal examination of the pavement; but reading the foregoing letter leads me to believe that the breaking of the pavement was mainly due to the method of making the joints in the concrete base at the end of the day's run. The tapered

joint allowed the concrete to slide or slip under thermal stresses and caused a breaking of the wearing surface.

A considerable mileage of monolithic roadways using wirecut lug brick has been constructed during the past two years and no trouble from heaving has occurred to my knowledge; we advocate the making of a vertical joint in the concrete base at the end of the day's work, and do not think it necessary, in fact we believe it a weakness, to use any expansion joint (transversely) in the base.

In reading the description of the building of the road under discussion (*Engineering News-Record*, Apr. 19, 1917), I note that in certain sections the bricks were laid flat and in other sections brick with sides V-scored were used. Under these circumstances, I cannot see how a true monolithic pavement could be obtained, for one of the essentials of a true monolithic pavement is the strong bonding together of the individual bricks, and this is obtainable only when there is a well-defined lug which automatically separates or spaces the bricks, allowing a free flow of the cement grout to the bottom of the brick.

Examinations of pavements where the bricks are laid flat, or where bar lugs were used instead of contact lugs, invariably show lack of penetration of the cement grout filler, and thus a weakening of the brick wearing surface results.

A brick road will not buckle if monolithic; that is to say, if all its parts are equally strong to resist thermal stress. The base will take care of its own strain and the brick wearing surface likewise if the individual units are well bonded together.

WM. C. PERKINS,
Chief Engineer Dunn Wire-Cut-Lug Brick Co.
Conneaut, Ohio.

Water-Hammer Formulas

Sir—The importance of water hammer in pipe lines for hydraulic developments is so great that it is surprising to find the great difference of opinion and general uncertainty of engineers in regard to this subject. A good example of this is the article by Barton M. Jones on p. 794 of *Engineering Record* for Dec. 30, 1916, and the comments on it by R. L. Hearn in the issue of Mar. 31, 1917. These gentlemen offer formulas which may differ from each other by over 500%.

All authorities have agreed on the formula for maximum water hammer:

$$h = \frac{a\,V}{g} \qquad (A)$$

where h is the rise of pressure in feet of water, caused by the sudden complete stopping of the water in the pipe, which is flowing at a velocity of V feet per second, and the velocity of a wave of pressure along the pipe is

$$a = \sqrt{\frac{g}{W\left(\frac{1}{K} + \frac{D}{Et}\right)}} \qquad (B)$$

where

g = Acceleration of gravity;
W = Weight of a unit volume of water;
K = Modulus of elasticity of water in compression;
D = Diameter of pipe;
t = Thickness of pipe walls;
E = Modulus of elasticity of pipe walls in tension.

All of the above must be measured in the same units; for convenience, take pounds, feet and seconds.

This maximum water hammer can only occur when the gate is closed in a time less or equal to $\frac{2L}{a}$, the time necessary for a pressure wave to travel the length of the pipe (L feet) and back to the gate. It is impossible for the water hammer to exceed this amount, as all the energy in the moving column has been expended when this pressure is reached. Any further rise would therefore violate the law of the conservation of energy (dead ends, etc., are not considered).

These facts have not only been proved theoretically many times, but have been checked by the extensive and most careful experiments of J. Joukovsky in Moscow, in 1897.

Inserting the values of K and E suggested by Mr. Jones, formula (B) becomes

$$a = \frac{47{,}200}{\sqrt{\frac{D}{t} + 102}} \qquad (C)$$

Two things have contributed to increase the confusion of engineers on the subject of water hammer: First, mistakes in copying standard formulas; second, using water-hammer formulas for cases for which the men who derived them never intended them.

An example of the first type is Mr. Jones' mistake in formula (C), which was noted in the *Engineering Record* for Jan. 13, 1917. A similar mistake occurs in one of the standard books on hydraulics, which gives D in feet and t in inches, rendering the formula useless. As no derivation for the formulas is given it is impossible to check them, and these mistakes, even though due to typographical errors or mistakes in copying, are just as serious for the engineers using the formulas as errors in theory.

An error of the second sort is the formula of Allievi, given by Mr. Hearn as applicable to all times of gate closing greater than $\frac{2L}{a}$, although Allievi never intended it to be used unless the time of gate closing was considerably greater than $\frac{2L}{a}$. This is apparent to any engineer who has taken the trouble to look up its derivation and may also be seen by inspection, as the formula contains no terms for E, t, K or d, and therefore manifestly cannot take account of the waves traveling along the penstock, which may have an important effect in ordinary closing of gates by a governor in 2 or 3 seconds.

A numerical example shows up the ridiculous results which may be obtained by using this formula. Allievi's formula is

$$h = \frac{NH}{2} - H\sqrt{\frac{N^2}{4} - N} \qquad (D)$$

where

$$N = \left(\frac{LV}{gTH}\right)^2$$

and

H = Static head in feet;
T = Time of closing gate in seconds.

Other symbols as noted above.

Take a penstock 10 ft. in diameter, ½ in. thick, 2000 ft. long, with water flowing at 6 ft. per sec. under a static head of 20 ft. at the gate. The velocity a computed by formula (B) or (C) is 2550 ft. per sec.; $\frac{2L}{a}$ is 1.57 sec. The maximum water hammer possible is, by formula (A), 475 feet.

Suppose the gate is closed in a time greater than $\frac{2L}{a}$, say 1.7 sec. We know that the water hammer will be almost 475 ft., but not quite as high as this figure. Using Allievi's formula (D) with $T = 1.7$, we get $h = 2440$ ft., which is impossible, and more than 500% too high.

Allievi's formula, however, may be accurate for very slow closing of gates, where the effect of the waves traveling up and down the pipe is negligible. But for such a case the simpler formula $h = \frac{LV}{gT}$ is usually sufficiently accurate.

Mr. Jones' formula for water hammer,

$$h = \frac{268{,}800\ Q}{144\ d^2 \sqrt{\frac{D}{t}} + 102} \qquad (E)$$

(D and t are here measured in feet) for times of closing equal to or less than $\frac{2L}{a}$ is identical with formula (A), $h = \frac{aV}{g}$. For slower closing it becomes

$$h = \frac{2\,LV}{g\,T} \qquad (F)$$

This formula is given by Joukovsky and by Mansfield Merriman, who says it is not applicable to all cases. It is correct only for times of gate closing close to $\frac{2L}{a}$, and for slow gate closing may be 100% in error. Although incorrect for slow closing, it is preferable to Allievi's formula, for it always gives results on the safe side, and is never more than 100% off. Allievi's formula, however, may give results for h varying from 60% to 500% of the true values.

The only general formula that the writer has seen which can be used for any time of closing equal to or greater than $\frac{2L}{a}$, is

$$h = \frac{L\,V}{g\left(T - \frac{L}{a}\right)} \qquad (G)$$

This becomes $h = \frac{aV}{g}$ for $T = \frac{2L}{a}$, and for the numerical case above gives 406 ft. rise. The writer derived this formula by simple methods, which are published along with a translation of Allievi's paper in the *Transactions* of the American Society of Civil Engineers, Vol. LXXIX, 1915, p. 238.

As Mr. Jones says, many pipe lines are designed without figuring the water hammer and with no intelligent attempt at putting the metal where it will do the most good. The writer would add that where the water hammer is figured it is generally figured wrong.

MINTON M. WARREN,
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New Ideas on Water Hammer

Sir—It ought to be of interest to many of your readers to convince themselves that Allievi's formula for the transmission-velocity of the pressure-change, which has been made use of in recent articles, such as for instance in *Engineering Record*, Dec. 30, 1916, and Jan. 13, 1917, has not been proved, and that, as a matter of fact, it cannot be proved and that consequently all further investigations based on said velocity-formula need correction.

The mistake happened as follows: Allievi puts

$$\frac{dc}{dt} = c\frac{dc}{dx} - g\frac{dy}{dx}$$

$$\frac{dc}{dx} = \frac{g}{a^2}\frac{dy}{dt}$$

He then considers the velocity c of the water to be negligible when compared with the transmission velocity a. He neglects $c\frac{dc}{dx}$ in the first equation, but omits to neglect $\frac{dc}{dx}$, which is c times smaller, in the second equation, which should read

$$0 = \frac{g}{a^2}\frac{dy}{dt}. \qquad (1)$$

The value a developed without regard to the velocity of the flow may be all right for such manifestations of sound as may accompany pressure-changes; however, as regards the transmission velocity of pressure-change itself, neither the velocity of the water nor the elastic qualities of water and pipe-metal can be neglected. A certain sudden pressure-change in the last lineal foot of pipe may be caused either by a sudden total shutdown while the normal water-velocity is very small, or by a sudden partial shutdown while the normal water-velocity is very much greater. In both cases appears the same increase of volume, say for instance 0.001 cu.ft. per lin.ft., from compression of the water column and the expansion of the pipe wall. This difference of volume must be filled up by the approaching water before the pressure-change can be transmitted to the foot length next beyond. If the pipe delivers 1 cu.ft. per sec., the transmission can therefore take place 10 times faster than in case only 0.1 cu.ft. per sec. were coming on. Therefore, the transmission velocity of a sudden pressure-change is: In the first case, $1 \div 0.001 = 1000$ ft.; in the second case, however, $0.1 \div 0.001 = 100$ ft.

Evidently Allievi's formula, which gives very little change for the transmission-velocity, requires correction.

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Sanitary Engineers in Civil Life Cannot Be Used

Colonel Reynolds, states the *Official Bulletin*, in charge of the newly created Medical Division of Sanitary Inspection, War Department, has received offers of assistance from a number of sanitary engineers in civil life. The work of the division, however, is entirely within the scope of the army, and at present it will be impossible to make use of men outside the service. The division will have charge of all sanitary matters pertaining to service in the field, such as kitchens, mess shelters, ice boxes and all sanitary appurtenances

ENGINEERING LITERATURE

A REVIEW OF BOOKS AND A LISTING OF NEW PUBLICATIONS

Valuable Contribution to Rate Making

REVIEWED BY LEONARD METCALF
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PUBLIC UTILITY RATES: A Discussion of the Principles and Practice Underlying Charges for Water, Gas, Electricity, Communication and Transportation Services—By Harry Barker, B.S., M. Am. Inst. E. E.; Associate Editor of "Engineering News-Record." New York: McGraw-Hill Book Co. London: Hill Publishing Co. Cloth; 6 x 9 in.; pp. xiv + 387. $4 net.

After eight years of collection, comparative analysis and study the author has brought to fruition his effort to present "a comprehensive discussion of (1) such corporation and municipal activities as affect service and rates, (2) the trend of public opinion and court and commission decisions, and (3) the most important engineering and economic problems involved. This he has done "in the hope" that the mere presentation, in one volume, of the diverse phases of rate making may be of service in provoking thought—"in spite of the inherent shortcomings of the text."

In its good style and thoroughly readable quality, the book reflects the author's experience as an editor of one of the most successful technical weeklies (*Engineering News*). Though it treats a highly technical subject, it does so in a manner to command the interest of the reader, introducing him with a brief and pertinent historic sketch to a logical presentation of th subject, adding breadth and perspective by a discriminating analysis of the essential differences in the rate-making problem of different utilities. Its chief value lies in the comparison of the differences in the nature and past solutions of the problem.

The subject of rate making is, and must always be, one for specialists, who have been through the mill of experience in building and operating public utilities and who have had, also, an instinctive interest in economic doctrines and their practical working out, under natural conditions and those of more or less arbitrary or legal restraint. Therefore, inasmuch as no man can hope to cover adequately all, or even several, of these highly specialized fields—of railroad, gas, or other utility rate making—a critical analysis of the underlying principles or past acts, which have governed or led up to existing rate schedules, has suggestive value to the expert, as well as interest to the student and general reader.

DEVELOPMENT OF REGULATION SLATED

Chapter I opens with a brief statement of the development of utility regulation. The second chapter draws a proper distinction—though sometimes elusive under actual conditions of service—between "product" and "service" companies and gives some definitions of rates and service. The third and fourth chapters discuss various rate bases, defining the equitable rate as "one by which the legitimate expenses, and reasonable profits, are fairly distributed upon the total service or product given," and illustrate methods of cost segregation.

Then follows an excellent résumé of the evaluation of property. In this, greater stress might have been given to the necessity of permitting a return sufficient to common capital. With the appreciation in property values which has taken place in the past two decades, or longer, stability of investment has increased and capital has been available even under declining nominal rates of return. Had property values been decreasing, however, existing rates of return would have proved inadequate.

Valuation as an engineering task, and the appraisal of land and water rights, are next taken up. The discussion of "cost of appraisal" is likely to prove very misleading, if applied to such highly individualized utilities as water-works, in which topography and natural conditions so largely modify the cost of the property and work involved in its evaluation. Some of the special problems and fallacies encountered are clearly and fairly set forth. The desirability of amortizing intangible and semi-intangible values is interestingly treated, though the difference between what has been and might have been, is not kept before the reader as clearly as desirable. Then follows sound discussion upon reasonable return, interest, compensation for risk and attention, and extra profits.

Chapter VIII, on depreciation, is clear and well expressed, sound and tolerant. Somewhat greater importance might well have been given to the dictates of experience and effect of normal operating conditions, in determining proper depreciation allowance requirements in an old stabilized plant, such as a water-works.

MUTUAL OBLIGATIONS OF PUBLIC AND CORPORATIONS

The mutual obligations of the public and its servant, the public-utility corporation, are well discussed in Chapter IX, on "Miscellaneous Problems Indirectly Related to Rate Making." The author's anxiety over the "vicious cost spiral, . . . the high cost of living . . . " might be calmed by a consideration of the consistent and progressive advance in costs, certainly from earliest biblical times to date.

The chapter on railway rates is perhaps the most absorbing chapter of the book. A reading of it suggests the almost hopeless complexity of competitive, in contradistinction to monopolistic, utility rate regulation and gives evidence of the past influence of the selfish human side of the problem.

Chapter XI sketches the growth in the express business at the expense of the railways and public, and the readjustment, reduction and simplification of the rate schedule on the block system, by the Interstate Commerce Commission, in 1913, with some increases two or three years later.

After an instructive outline of the growth and peculiarities of the street- and interurban-railway transportation business, and the difficulty of equitable comparison of revenue and statistics of one plant with those of another, methods of fixing fares are discussed. These include the Interstate Commerce Commission and American Electric Railway Association apportionment of

standard account items into fixed and movement costs; the Wisconsin Railroad Commission zone system; and the Cleveland experiment. The effect of peak loads, reasonable length of trips and the transfer problem are intelligently discussed. The treatment of the depreciation and retirance problem, as applied to this class of public utilities, is noteworthy.

The classification of water-works with utilities of the "product," rather than the "service" type, is more fancied than real, under operating conditions. In discussing water consumption, reference might well have been made to water-consumption gagings—such as those contained in a report of a special committee of the New England Water-Works Association (see *Jour.* N. E. W.-W. Assoc., Mar. 12, 1913, pp. 29-43)—rather than to sewage-flow gagings. In the discussion of fire protection reference should have been made to the admirable and pioneer effort of the Underwriters to determine a scientific basis for fire-hazard rating contained in "Standard Schedule for Grading Cities and Towns of the United States with Reference to Their Fire Defenses and Physical Conditions," prepared by the National Board of Fire Underwriters, New York City, and adopted by them Dec. 14, 1916.

The persistence of the uniform rate schedule in the gas field and the drift toward a juster recognition of classes of use are clearly set forth, with some references to the Louisville and new Baltimore schedules.

In the electric field the difficulty of fair comparison is clearly shown, in view of the tremendous variation in character and extent of local demand. Resident, Norwich, telephone, Wisconsin, Detroit, Canadian and the Rapp tariff systems are touched upon.

The last chapter, "Telephone Rate Making," is particularly suggestive in view of the character of the service and the length of public control, which have shown "the value of conservative capitalization combined with liberal provision for maintenance, development and retirance." Experience in this field is particularly worthy of study, as "The Bell system, while a natural monopoly, is unique among utilities in that the early conceptions of the organizers of the business seem to have been broad enough so that the same concern, or group of concerns, has accommodated the growth of succeeding years while keeping their procedures always economically sound enough to weather strange and unforeseen business conditions," and this growth has been enormous.

The book is a valuable contribution to the subject of rate making. It should be read by all interested in this field of work—the engineer, the operator, the legislator and the public-service commissioner. It should be particularly helpful to the young student.

Clearing and Grubbing

HANDBOOK OF CLEARING AND GRUBBING METHODS AND COST—By Halbert Powers Gillette, M. Am. Soc. C. E. New York: Clark Book Co., Inc. Leather; 5 x 8 in.; pp. 241; illustrated. $2.50 net.

This book is a collection of previously published information on the subject of clearing and grubbing for farms, railroad construction, reservoir sites and other purposes. Machines, tools and the uses of dynamite are described. Much cost information, which the author admits is not as full as he himself would like, is included. Some of the quotations and costs date well back into the last century. But then, the subject is one which has never inspired an extensive literature.

The English in which the book is written is regrettably careless. What is the good of preaching about the value of proper technical English when authors like Mr. Gillette continue to flood the profession with works in which adjectives are used promiscuously where adverbs are required? And why adorn a book with many such literary gems as the following? "It is true that many smaller roots can be torn up and rooted out by using a rooter plow that is manufactured by the different plow companies. . . . ."

A New Book on Hydro-Electric Practice

REVIEWED BY LEWIS F. MOODY

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AMERICAN HYDRO-ELECTRIC PRACTICE: A Compilation of Useful Data and Information on the Design, Construction and Operation of Hydro-Electric Systems from the Penstocks to Distribution Lines—By Capt. William T. Taylor, Equipment Officer, Royal Flying Corps, England. M. Am. Soc. M. E., etc., and Daniel H. Braymer, M. Am. Inst. E. E., Engineering Editor of "Electrical World." New York: McGraw-Hill Book Co., Inc. Cloth; 6 x 9 in.; pp. 439; many illustrations. $5 net.

Progress in hydraulic power engineering in this country in the last few years has outdistanced all the textbooks, and probably only those engineers active in this field appreciate the inadequate character of the available treatises on the subject. A new book on American hydro-electric practice will therefore be examined with interest by many engineers. The purpose of this review is to consider particularly the portions of the book which are devoted to hydraulic matters.

More than one-half of the volume is taken up with electrical subjects. The hydraulic material is given in the first two chapters and in a few tables and diagrams. This hydraulic material, as stated in the preface, has been largely supplied by Mr. Taylor. Besides reviewing this portion in a general way, the writer will take the opportunity to call attention to some of the serious errors noticed, in the effort to warn against mistakes which might result from them.

The work carries the subtitle, "A compilation of useful data and information on the design, construction and operation of hydro-electric systems from the penstocks to distribution lines," which well describes its scope. A considerable portion of the contents consists of articles which have appeared in technical journals, particularly descriptions of hydro-electric plants. The bringing together of this information is a useful feature. The book, however, suffers from the limitations of the second-hand nature of its contents and from its general plan. It is stated in the preface that "No attempt has been made to make this work a textbook on design in the sense that it should give the fundamentals on which the design and construction of parts of a hydro-electric system are based. It is, on the other hand, a compilation of the practical and essential features of design, construction and operation as worked out in many plants and systems, interpreted and arranged for convenient use and reference by plant designers, constructors and operating engineers."

The first chapter is entitled "General Survey of Water-Power Engineering." The first portion of the chapter gives a good discussion in condensed form of the determination of the available run-off; calculations of storage; and use of hydrographs, including an explana-

tion of the use of the mass diagram or "flow-summation curve," as it is called by the author. Losses in head in penstocks are briefly discussed, and the writer notices with approval the introduction of exponential formulas at this point.

The determination of the economical diameter of pipe lines is treated in a way which is suitable for water-supply systems and pipes for steady flow, but which is not adequate for turbine penstocks and pipe lines subject to surges and pressure variations. The statement that "the fixing of the diameter is subject to very close calculations" by methods which ignore the pressure variations and their effect on turbine regulation is not correct as a general proposition, and is inconsistent with the later statement that the "control of the water is a serious problem."

The subdivision on the "Effective Head of a Development" would be excellent if it were not stated that the friction head to be deducted from the gross head in determining the effective head on the turbine should include the "passages leading to and away from the wheel." The draft tube should be regarded as an integral part of the turbine, and the losses within it should be charged against the turbine.

Dangers of Second-Hand Information

Some of the dangers inherent in reworking second-hand information are instanced in the latter part of this chapter. The subdivision headed "Characteristics of Water Wheels" and those following have apparently been abstracted from sources not mentioned, one of which can be identified as a paper presented by H. Birchard Taylor before the Canadian Society of Civil Engineers, Jan. 15, 1914. Unfortunately, the references have not been quoted intact, and serious errors have been introduced by alterations or omissions. Thus, under the heading "Effective Draft Tubes for Water Wheels," which is probably intended to read "*Effect of* Draft Tubes. . ." the dangerously misleading statement occurs: "The placing of a wheel within the natural limit (34 ft.) from the elevation of tailrace-water is no indication of the proper elevation, because it is necessary to allow at least 3 to 4 ft. margin between the total draft-head and a perfect vacuum to prevent the breaking of the water column in the draft tube due to inertia effects of sudden changes of load such as those mentioned above." In this and the preceding sentences the important item of velocity head is entirely omitted, thus leaving a matter which is frequently misunderstood by engineers not directly engaged in waterwheel work in such shape that serious errors are likely to be committed by anyone accepting the implied statement that a wheel may be safely located 30 or 31 ft. above tailwater. The writer therefore wishes to clear up this matter, which can be done by quoting Mr. Taylor's paper more fully, as follows: "It is evident that should the total draft head, or the sum of the static draft head and the velocity head at the runner discharge, exceed the height of the water barometer, the continuity of flow of the water on leaving the runner is destroyed—therefore, the placing of a turbine simply within 34 ft. from the elevation of tailwater is no indication that the elevation has been properly chosen; for aside from the limitations outlined above, it is also necessary to allow at least 3 or 4 ft. margin between the total draft head and a perfect vacuum to prevent the breaking of the column of water in the draft tube due to inertia effects resulting from sudden changes of load on the turbines."

In the succeeding subdivision, headed "Speed Regulation of Water Wheels," there has evidently been an omission, causing the second paragraph to describe the operation of relief valves while ostensibly referring to governors, the subject of relief valves not having been mentioned.

Other difficulties arising from the use of borrowed material are noticeable. The statement that "*During the past two years* [italics mine] efficiencies of 89 to 92% have become quite common, while a maximum value of 93.7% has been secured" is surprising, until it is realized that this was taken from Mr. Taylor's paper, written over three years ago.

A lack of knowledge of the engineering principles underlying hydraulic turbine work seems to be indicated by several passages, such as the poor attempt to explain the specific-speed relation and its use, a subject which should be understood by anyone handling hydro-electric problems. There is confusion in the statement of the specific-speed formula, because the system of units is indicated in a misleading way. The only attempt to explain or derive the formula is in the following sentence: "The value $h^{\frac{5}{4}}$ as a factor for specific speed, N_s is from the assumption that two wheels of similar design and horsepower capacity will have varying speeds on different heads, as

$$h^{\frac{5}{4}} = h^{\frac{1}{4}} \times (h^{\frac{3}{4}})^{\frac{1}{2}} = h \times h^{\frac{1}{4}}."$$

The only reference to the theory of turbines and their operation is contained in the following two sentences: "It can be easily shown that the waterwheel horsepower varies as $h^{\frac{3}{2}}$ which is fundamental. Equally so is the formula [*sic*] $v = c\sqrt{2gh}$, one of the most important of hydraulic formulas as it enters into all calculations and designs of waterwheels." These bits of information will be enjoyed by hydraulic engineers.

Charts and Diagrams Mislead

The chapter contains a number of charts and diagrams, some of which the writer has endeavored to check with the following results: According to one diagram a 10,000-kw. single-runner turbine under 300 ft. head should operate at 130 r.p.m., while actually a speed of 360 r.p.m. would be adopted for such conditions. According to another chart, a 10,000-kw. runner under the same head of 300 ft. would operate at 2400 r.p.m. whereas actually a speed of 1200 r.p.m. or less would be used. From another chart a 5-ft. diameter penstock under a pressure head of 50 ft. would be made of $\frac{1}{16}$-in. steel.

The second chapter contains some useful abstracts of articles from the technical journals, describing various stations. A number of these descriptions could easily have been made of greater value by including some recent articles, bringing the descriptions more nearly up to date.

Other errors and misconceptions have been noted, but these need not be further enumerated, as it has been made reasonably clear that much reliance should not be placed on the material in the book without independently checking its accuracy.

Pioneer Work on Wharves and Piers

WHARVES AND PIERS: Their Design, Construction and Equipment—By Carleton Greene, A. B., C. E., M. Am. Soc. C. E. New York: McGraw-Hill Book Co. Cloth; 6 x 9 in.; pp. 248; 155 illustrations. $3 net.

In no branch of engineering have there been so many strides forward in the past decade as in the design and construction of wharves and piers for harbors. It was not so long ago that only one or two types were available for this kind of work. For permanent construction a fill was placed between stone retaining walls; for less permanent work, a wooden pile and timber wharf was built. With the advent of concrete and reinforced-concrete the variations in design multiplied almost beyond number, so that today the pier designer has at his command a great number of different variations, many of which will solve the same problem.

In spite of this great advance, or perhaps because of it, the literature on the subject is most meager. Practically everything that can be found on recent wharf and pier construction must be sought in the files of technical magazines and society publications. Mr. Greene has, therefore, done a considerable service for the profession in collecting the many types which appear in his new book. The book is frankly a catalog of standard designs. There appears little attempt to expand theory, but as a catalog, using that word in its best sense, there is little to be wished for.

The main section is devoted to the structure of the piers and wharves themselves. The following and less exhaustive part takes up the design of sheds for wharves and piers and a final and still less ambitious section is devoted to cargo-handling machinery. Finally, a number of detail costs afford some general information on that important subject.

Harriman and the Colorado River Break

THE SALTON SEA: An Account of Harriman's Fight with the Colorado River—By George Kennan. Cloth; 6 x 9 in.; pp. 106; illustrated. $1.

In the whole history of engineering struggles against the forces of nature the long hard fight to control the break in the Colorado River and save the Imperial Valley and its irrigation system from destruction stands unrivalled. The story has been outlined again and again and has been told in great technical detail. In the present volume it is briefly but amply detailed in a popular way by a master writer from the viewpoint of the great railroad financier and developer who provided the capital and the will power that enabled a notable group of engineers to turn the mighty floods of the Colorado back from their mad rush to the Salton Sea.

The author prepares for his main story by sketching the geologic and written history of the Salton Sink and surrounding lands far below sea level in what was once the upper part of the Gulf of California. The conversion of the desert into an oasis by irrigation is pictured. Then come the stories of "The Runaway River," the many failures and final engineering triumph in closing the break, and finally an account of the almost imperative order of ex-President Roosevelt to Harriman to close the breach and the failure of the attempts to get Congress to foot the bills incurred by the Southern Pacific in so doing.

The author draws freely and with full credit upon various sources of technical information, including H. T. Cory's paper (Trans. Am. Soc. C. E.) on "The Imperial Valley and the Salton Sink." Of course the whole story, coming from Mr. Kennan, is well told.

Street Work in Ontario Cities

REPORT ON STREET IMPROVEMENT IN ONTARIO—Toronto, Ont.: W. A. McLean, Deputy Minister of Highways. Paper; 6 x 10 in.; pp. 200; illustrated.

After some 20 pages on street planning and street improvements in general, this useful and interesting report presents "the progress of street improvement" in 21 cities and 11 towns of the Province of Ontario. Most of the municipalities included "were visited, the streets inspected, photographs taken and data concerning the improvement of the streets obtained." The data were collected and compiled by R. C. Muir and edited by G. Cameron Parker, of the Ontario Highway Department staff.

The general plan followed for each city is first to present an historical sketch of street improvements. Then the organization of the local street department is given and the methods of carrying on the work are described, including the equipment used. Types of pavements being laid are described, with extracts from specifications. There are also descriptions of notable street-improvement jobs. Curbs and sidewalks are taken up and methods of assessments outlined. Line drawings and photographs add to the value and interest of the report, which is a most creditable production.

Textbook of Topographical Drawing

TOPOGRAPHICAL DRAWING—By Edgar R. Steger, Professor of Drawing, United States Military Academy. New York: McGraw-Hill Book Co., Inc. Paper; 6 x 9 in.; pp. 119.

Designed "as a basis for a course of instruction and practice in topographical drawing," and written by a master in the art, this volume should make a broad appeal to instructors, students and draftsmen. After referring to the pioneer "standard conventional signs for the use of all map-making departments of the Government" adopted in 1912 by the United States Geographic Board (War Dept. Doc. No. 418, United States Geological Survey, Washington, D. C.) the author states that the present book attempts to "point the way to a satisfactory standard of practice"—which was left untouched in the pamphlet mentioned. After chapters on maps, instruments, methods, etc., designed for reading and reference, the author presents the practice of topographical drawing, lettering, conventional signs (four chapters) and map drawing. The presentation is simple, clear and practical.

Manufacture of Portland Cement

THE PORTLAND CEMENT INDUSTRY. A Practical Treatise on the Raising, Crushing and Subsequent Handling of Portland Cement Chalk, with Notes on Physical Properties. By William Alfred Bruce. London, New York, [illegible]: South Wales Institute of Engineers; Edward Arnold; Longmans, Green & Co. Cloth; 6 x 9 in.; pp. 168; illustrated.

The author of this book has had some experience in American portland cement mills and more recently in the English trade. In a prefatory paragraph he makes clear that he considers the American methods of manufacture of portland cement superior in many ways to those used in Great Britain or in Germany and makes a plea to the British industry to modernize its methods or else lose the markets of the world

The book itself is a very good categorical description of the manufacture of portland cement, with special detailed reference to the individual parts making up the cement mill. More attention is paid to the factory itself and to raw materials than to chemical investigations, although there are six chapters on the technique of testing.

Public Health and Sanitation

SANITATION PRACTICALLY APPLIED—By Harold Bacon Wood, M. D., Dr. P. H., Assistant Commissioner, West Virginia State Department of Health, formerly Director Mississippi State Board of Health Laboratory, Whole-Time Health Officer, Rochester, Minn., and Topeka, Kan. Cloth, 6 x 8 in., pp. 473; illustrated. $3 net.

The fundamental principles, and to a considerable degree the practice as well, of public health and sanitation are here presented in a sane and readable way. The book, says the author, "is intended primarily for the health officer and for the student of public health topics, but the employer, the employee, the teacher, the man in his own home or office or the municipal official may get some practical directions from it."

Broadly speaking, the book follows the general lines of the more recent and shorter public health manuals, with the omission of such matters as health board organization, laboratory methods and some of the more strictly medical aspects of public health. Statistics, the control of communicable diseases, child welfare, school hygiene, pure foods, clean milk, water-supplies, sewage disposal (with a few paragraphs on garbage and refuse), hygiene of the home and factory, the destruction of disease-bearing insects and health educational work are considered in succession.

The chapter on water-supplies includes a confusing discussion on whether a city should build water-works or sewers first. Under sewage disposal there are a number of statements which are likely to mislead the uninformed—a class for whom it may be assumed that the book is designed. A little revision here and there would clarify and correct these questionable passages in the new edition which a book so good in the main deserves at an early date.

Publications Received

In so far as possible the name of each publisher of books or pamphlets listed in these columns is given in each entry. If the book or pamphlet is for sale and the price is known by the editor, the price is stated in each entry. Where no price is given it does not necessarily follow that the book or pamphlet can be obtained without cost. Many, but not all, of the pamphlets, however, can be secured without cost at cost by inclosing postage. Persons who are in doubt as to the means to be pursued to obtain copies of the publications listed in these columns should apply for information to the stated publisher, or in case of books or papers seriously wanted, then to the author or other person indicated in the entry.

COMMERCE AND NAVIGATION OF THE UNITED STATES, 1916—Washington, D. C.: Bureau of Foreign and Domestic Commerce. Cloth; 9 x 12 in.; pp. 959. $1.50 from Superintendent of Documents.

COMMISSION ON BUILDING DISTRICTS AND RESTRICTIONS, Final Report June 2, 1916. New York City: Board of Estimate and Apportionment. Cloth; 7 x 10 in.; pp. 299; illustrated.

MANITOBA HYDROMETRIC SURVEY FOR 1915.—Ottawa, Ont.: Dominion Water-Power Branch. Paper; 6 x 9 in.; pp. 278; illustrated.

METER CALIBRATION: Hydraulic Laboratory Methods of Testing, and Practical Computations—By E. W. Lane. Washington, D. C.: Bureau of Mines. Paper, 6 x 9 in.; pp. 27; folding plate. 5 cents from Superintendent of Documents.

THE COUNTY: The Dark Continent of American Politics—By H. S. Gilbertson, New York: The National Short Ballot Association. Cloth; 6 x 8 in.; pp. 297. $2.

Designed to throw light on a hitherto neglected unit of government. The short ballot, county home rule, and the county manager plan are the chief reforms suggested. There is a brief chapter designed to show some of the inefficiency and corruption connected with the administration of roads and bridges by counties.

THE ELEMENTS OF HYDROLOGY—By Adolph F. Meyer, M. Am. Soc. C. E., Consulting Engineer, Associate Professor of Hydraulic Engineering, University of Minnesota. New York: John Wiley & Sons. Cloth; 6 x 9 in.; pp. 487; 287 illustrations, including some on folding plates. $4 net.

HANDBOOK OF SHIP CALCULATIONS, CONSTRUCTION AND OPERATION: A Book of Reference for Shipowners, Ship Officers, Ship and Engine Draftsmen, Marine Engineers, and Others Engaged in the Building and Operating of Ships. By Charles H. Hughes, Naval Architect and Engineer. New York: D. Appleton & Co. Flexible leather; 5 x 7 in.; pp. 739; illustrated. $5.

HIGHWAY IMPROVEMENT IN OREGON: Papers presented at a Conference for furthering the adoption of a Highway Code for Oregon held at Portland, Jan. 3 and 4, 1917: October, 1916, and January, 1917, numbers of "The Commonwealth Review." Eugene, Ore.: University of Oregon. Paper; 7 x 10 in.; pp. 482.

HOME SANITATION: The Improved Closet, the Small Sewer System, Sewage Disposal, the Protection and Improvement of Sanitary Conditions in the Home—By V. M. Ehlers, State Sanitary Engineer. Austin, Tex.: State Board of Health. Paper; 6 x 9 in.; pp. 34; illustrated.

INTERNATIONAL CABLE REGISTER OF THE WORLD: In Conjunction with Western Union Telegraphic Code. New York and London: International Cable Directory Co. Cloth; 8 x 10 in.; pp. 1242. $8 in conjunction with code.

Classified directory by cities, industries, materials, professions, etc., with alphabetical index of all registered telegraphic addresses—as "First Bank, Pocatello."

A MAJOR STREET PLAN FOR ST. LOUIS—By City Plan Commission of St. Louis, Mo., Harland Bartholomew, Engineer. Paper; 6 x 9 in.; pp. 86; illustrated.

A summary of this report appeared in "Engineering News-Record," July 19, 1917.

MASSACHUSETTS COMMISSION ON WATERWAYS AND PUBLIC LANDS, 1916.—Boston: The Commission. Cloth; 6 x 9 in.; pp. 167.

First report of this commission, which is a consolidation of the former Harbor and Land Commission of Massachusetts and the Directors of the Port of Boston.

MONTREAL AQUEDUCT: Comments by the Committee of the Ratepaying Engineers on the report on Aqueduct Enlargement, Montreal Water-Works, by the Board of Engineers—Montreal, Que.: Walter J. Francis (260 James St.), Secretary Committee. Paper; 6 x 9 in.; pp. 87.

PERMISSIBLE EXPLOSIVES: Tested Prior to Jan. 1, 1917—By Spencer P. Howell. Washington: Bureau of Mines. Paper; 6 x 9 in.; pp. 19.

PROBLEMS OF ST. LOUIS: Being a Description, from the City-Planning Standpoint, of Past and Present Tendencies of Growth with General Suggestions for Impending Issues and Necessary Future Improvements. The City Plan Commission, St. Louis, Mo.—By Harland Bartholomew, Engineer. St. Louis: The Commission. Paper; 6 x 9 in.; pp. 140; illustrated.

PURIFICATION OF TANNERY WASTES—By Harry B. Hommon, Sanitary Chemist, United States Public Health Service, Cincinnati, Ohio. Reprinted from "Journal of American Leather Association," July, 1917. Address the author. Paper; 6 x 9 in.; pp. 320.

Description and summary of results of tests at Luray, Va., and Cincinnati, and description of a permanent working-scale unit at Luray.

TUBE MILLING—By Algernon Del Mar. New York: McGraw-Hill Book Co. Cloth; 6 x 9 in.; pp. 159. $2.

Although this book is intended to describe the application of the tube mill to metallurgical problems, the occasional use of such mills in other types of engineering work, notably in cement manufacture, may make it of interest to some readers of this journal.

UNITED STATES ARTILLERY AMMUNITION: 3- to 6-in. Shrapnel Shells, 3- to 6-in. High Explosive Shells and Thin Cartridge Cases—By Ethan Viall, M. Am. Soc. M. E., Managing Editor "American Machinist." New York: McGraw-Hill Book Co. Cloth; 9 x 12 in.; pp. 98; 171 illustrations. $2.

A reprint of a series of highly detailed, profusely illustrated articles from the journal named above.

USE OF MEAN SEA LEVEL AS THE DATUM FOR ELEVATIONS—By E. Lester Jones, Superintendent United States Coast and Geodetic Survey, Washington, D. C. Paper; 6 x 9 in.; pp. 21. From Superintendent of Documents, 5 cents.

WAR INVENTIONS: A Survey of the Laws Relating to the Adoption of Inventions by the United States and Allied Governments, and Methods of Submitting Inventions of Military or Naval Value to the United States and Allied Governments—By Lawrence Langner. New York: The Author, 55 Liberty St. Paper; 5 x 8 in.; pp. 15. 25 cents.

CONCRETE ROADS: Report on the Present Position and Possible Future of Concrete Roads in this Country—By H. Percy Bounois, M. Inst. C. E. Westminster, England: Roads Improvement Association (15 Dartmouth St.). Paper; 5 x 8 in.; pp. 32. Sixpence.

THE TESTING OF ROAD OILS: Including Character of Oils and Methods of Examination—By F. L. Roman, Testing Engineer, Illinois State Highway Department, Springfield. Paper; 6 x 9 in.; pp. 29; illustrated.

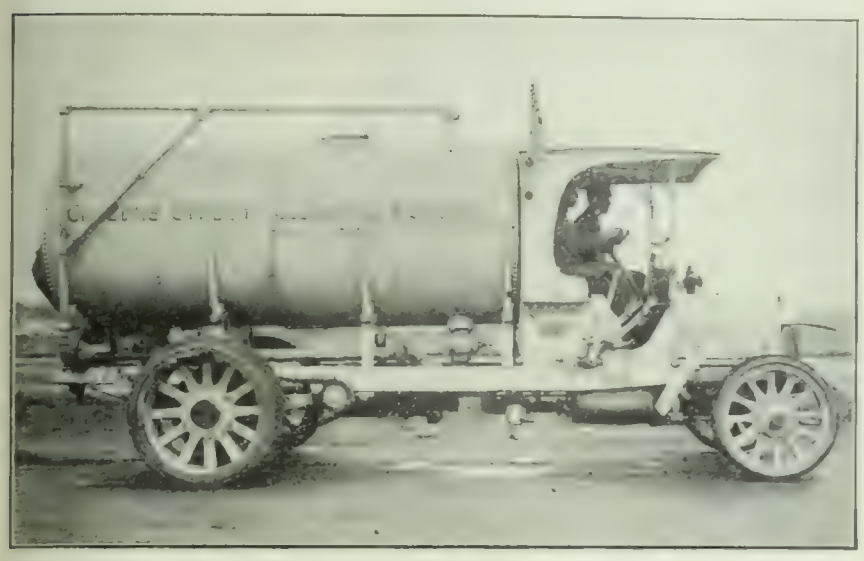
THE SEASONING OF WOOD—By Harold S. Betts, in charge, Office of Industrial Investigations, United States Forest Service. Paper; 6 x 9 in.; pp. 28; illustrated. 10c. from Superintendent of Documents, Washington, D. C.

THE ENGINEER IN FIELD AND OFFICE

A DEPARTMENT DEVOTED TO DETAILS OF THE DAY'S WORK

Sidewalks Flushed Over Tops of Parked Automobiles

THE DOWNTOWN sidewalks as well as the streets in Chicago are flushed every night by the Citizens Street Cleaning Bureau. To expedite the sidewalk work, there has recently been added to one of two tank



EXTENSION PIPE WHEN NOT IN USE FOLDS OVER TOP OF TANK

trucks a pipe extension to clear parked automobiles. It is connected to the discharge line from the pump with a stuffing-box joint and has a knee brace of the same 2½-in. pipe as the remainder of the line. A single outfit can flush the whole 72,000 sq.yd. of area in the territory covered in an 8-hour night at a cost of 20c. per 1000 sq.yd. It is usual, however, to let the two trucks work at the job, although from the second one the hose must be dragged behind vehicles near the curb. The remainder of the night's work is to flush the 120,000 sq.yd. of pavement. The fan nozzle is 6 in. wide and delivers a stream ½ in. thick. It is played toward the



PARKED AUTOMOBILES ARE NOT DISTURBED BY SIDEWALK FLUSHER

gutter and carries the dirt and surplus water ahead of it. No complaint of damage to walks or calking has been made.

When the second tank is equipped, the connection will be made near the front of the tank, so that there will be no danger of bending the pipe, should the truck run it into something when half-way extended.

The attachment was devised under the direction of Richard T. Fox, general manager of the Citizens Street Cleaning Bureau, by J. W. Ingels, superintendent.

Spokane Installs Low-Cost Street Signs

SIMPLE, legible, low-cost street signs are being installed in Spokane, Wash., as shown by the accompanying illustration. Each sign consists of two enameled porcelain plates secured to a creosoted wood base and held by a bracket, clamped to a lamp post. The wood base is so shaped as to make each nameplate rest at a slight angle with the vertical, so the street light from above casts no shadow on the nameplate. Each of the four plates attached to one lamp post costs $0.35, and the two brackets together cost $1.15, making a total cost of $2.55 for plates and brackets at a given corner. The cost of the wood and of erection is small. The signs were designed by Morton MacCartney, city engineer of Spokane.



SPOKANE USING STREET SIGNS LIKE THIS

Peaked Subgrade Provides a More Certain Underdrainage

By D. M. Belyea
County Highway Engineer, St. Claire County, Mich.

A CONCRETE or brick slab laid with a flat bottom upon a flat subgrade affords no possibility for underdrainage. As a result, seepage through the pavement at various points—such as expansion joints, along car rails, and through semiporous spots—keeps the subgrade moist and affords a good chance for frost upheav-



PEAKED SUBGRADE BROUGHT LEVEL WITH BASE OF GRAVEL ATTAINS TEST TWICE IS STRONG

als with the resultant cracking of the rigid surface. While there is but slight importance attached to such seepage if the construction is on a sandy or porous soil,

a clay or heavy soil brings about conditions which cannot be disregarded.

The ordinary precaution of laying a slab with a crowned bottom upon a crowned subgrade does not entirely alleviate these conditions, as the slab is laid directly upon the heavy soil, filling every crevice and blocking a free movement of the water from under the crust. The newer specifications, which require 2 or 3 in. of sand to be laid upon the flat subgrade, and upon this sand bed to lay a flat-bottomed slab, are undoubtedly an improvement, but it is questionable whether this method will prove to be entirely sufficient.

The writer is of the opinion that the subgrade should not be crowned, but peaked, as indicated in the illustration. On this a sand covering about 2 or 3 in. in thickness at the center can be well rolled to a flat surface. This will allow a free movement of the water between the bottom of the slab and the top of the impervious subgrade and should afford adequate protection against the troubles outlined in the foregoing.

Use Steam Jet To Clear Coagulant Lime

STEAM jets replace water injectors occasionally on the coagulant lines at the filtration plant in Evanston, Ill. As designed, the coagulant, after passing the orifice boxes, is forced by water ejectors 450 ft. through a 2-in. lead pipe to the point of application. Considerable trouble from the alum line clogging was experienced, until a year ago the commissioner of public works, I. S. Brower, had the steam connection made. After using steam for 15 or 20 min., coagulant is forced through the pipe in the usual manner with water. This cools the inside of the pipe rapidly, causing the scale to break away. Prior to this practice it was necessary to clean the steam line once a week. Once in two months is the interval of time since using the steam jet.

Limited Tests Show Effect of Hydrated Lime on Strength of Concrete

THE Bureau of Standards some time ago started an exhaustive series of tests looking into the effect of hydrated lime on concrete, as regards strength, consistency, watertightness and workability. A preliminary announcement by Warren E. Ensley and S. K. Kaczorowski, of the bureau, gives some conclusions, based on six months' tests, as to the effect on strength. The authors say that the results should be used with caution and are true only of hand-mixed, tamped concrete, of rather dry consistency and stored in a damp closet. There is no evidence at present to show the effect of the hydrate on concrete which is either machine mixed, poured or aged in air, and interpretation of the present conclusion to obtain such information is not justifiable.

The conclusions now made are: (1) The substitution of hydrated lime for cement causes, in general, a diminution of the compressive strength of the concrete. This is most pronounced with 1:2:4 concrete. (2) Hydrated lime causes a less diminution of strength in a 1:1½:3 concrete than in a 1:2:4. Results indicate that the sizing of the ingredients may be one of the important factors in determining the value of hydrated lime in concrete. (3) At least up to six months, there is no appreciable difference in behavior between high calcium and high magnesian hydrate. (4) The diminution of strength caused by hydrate when 1:1½:3 concrete is stored in air is not nearly so great as when the concrete is stored in the damp closet.

Large-Size Speedometer Pointer Shows Bad Places in Road

ON A ROAD in Occidental Negros, Philippine Islands, bad turns or grades are indicated by a novel roadside sign which simulates on a large scale the pointer of a speedometer. Indicated speeds are meas-



SIGN TELLS PHILIPPINE TOURISTS WHERE SLOW SPEED IS DESIRABLE

ures of the comparative danger of the road section to be approached. The view is reproduced from the *Bulletin* of the Philippine Bureau of Public Works.

Proposes New Overbreakage Payment Rule in Thorough-Cut Excavation

By A. B. B. Harris
Civil Engineer, Chicago

IF, IN railroad thorough-cut construction, the solid rock excavation be divided into two classes, (1) material within the slopes, (2) breakage, and if prices be fixed on both classes, the price on the latter (breakage) being sufficient to reimburse the contractor for handling this material but not large enough to warrant the excessive use of explosives, the result should be beneficial to both parties to the contract.

The railroad company will pay no more for the breakage than it is worth in the embankment, and the contractor can use enough powder to break the rock to the slopes, thus avoiding expensive trimming, without being up against the judgment of the engineer as to whether or not he will be paid for the material outside of the slopes.

This "in the judgment of the engineer" clause about the use of powder and breakage often leads to two bad results: First, loose stones are left hanging to the side of the cut, which should be taken down under construction, but are not and consequently have to be removed under operation. They frequently fall on the roadway and sometimes cause a serious wreck. Second, expensive controversies which may lead to more expensive lawsuits are the logical outcome of this "in the judgment of the engineer" clause.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Ohio Contractor Finds Trucks Indispensable on Road Work

SEIPLE & WOLF, contractors of Mahoning County, Ohio, state that had it not been for their fleet of 6 motor trucks, it would have been impossible to carry out the season's road work. Teams have been practically unprocurable at any price and sole reliance has been placed upon motor trucks.

After a number of years' experience and experiments, this firm has returned to the 5-ton truck. For a time 2½- and 3-ton trucks were bought, but it is now claimed that the larger truck is more economical, providing the roads are passable for it. The loading and operating costs, it is said, are but slightly different, and the larger load makes the 5-ton truck more economical.

This firm does not favor the use of trailers on ordinary road construction jobs because of the difficulty in handling them at the terminals. These opinions are based on the use of motor trucks for short hauls, that is, not over six or seven miles, or the service for which teams have been used a great deal up to the present time. The county authorities, on the other hand, own two 3½-ton road trucks and use three trailer dump-wagons to a truck and they consider the combination desirable.

Special Gang Does Fast Work in Laying Brick Pavement

FROM 800 to 1000 ft. of 16-ft. monolithic brick pavement a day is "going some," yet one contractor has found a way to do it. He is C. F. Green, of Marion, Ind., who has gotten together a fairly permanent gang of about twelve men who specialize in laying, rolling and grouting brick for the monolithic and cement-sand cushion types of brick pavement.

With this gang he takes subcontracts for that part of the work. The principal contractor lays the concrete foundation and the subcontractor follows as closely as working conditions will permit with the bricklaying. The subcontractor takes all the risk of delays to the concreting plant. Nevertheless, the scheme has worked out very well and both contractors appear to be profiting by it.

The two principal men of the gang, who can lay brick about as fast as it is possible to lay them, get 50 cents an hour, and the subcontractor is constantly on the job to see that the rest of the gang get the brick to them. A Mathews gravity conveyor helps in supplying them. The grouting is done by a process which makes for speed, if possibly not for the best joints. The grout is mixed in a large, square, two-wheel, flat-bottom trough or pan in one-bag batches. Two men with hoes do the mixing, and then the grout box is turned on end and the entire batch allowed to run out over the pavement where a single man with a 4-ft. squeegee does the spreading.

Steel Tanks Fabricated, Shipped and Erected in 30 Days

THE RECENT completion in record time of two 100,000-gal. elevated steel tanks 60 ft. high at Fort Oglethorpe, Ga., for the reserve officers' training camp in Chickamauga Park was made possible by standardizing the shop work, riding the shipments, and by



CONVEYOR AND TRAINED GANG FEED BRICK TO TWO [illegible]



MADE, SHIPPED 1000 MILES AND ERECTED—IN 30 DAYS

hard work on the part of the erection force. On May 16 the contract for these water towers, including the foundations, was awarded by the War Department. On June 14, 30 days later, both tanks were filled with water from the mains of the Chattanooga Water Co. and placed in service as an addition to the existing system, which consisted of one 200,000-gal. steel tank supplied with water pumped from wells.

Standardization of the details of these structures in the drawing room and shop made possible the shipment of the fabricated material within seven days after the receipt of the order, on May 23. The cars were labeled with the cards provided by the Quartermaster Department indicating that the shipment was government war material, and railroad officials were notified that it should not be delayed in transit. In addition to this, a traffic man rode the cars as far as Cincinnati where they were transferred to the Southern Ry. and routed to Chattanooga. From here they were shipped over the Central Railroad of Georgia to their destination, a siding three-quarters of a mile from the site in Chickamauga Park, arriving May 28.

Work on the foundations had meanwhile been rushed to completion. This included about 180 yd. of earth excavation and the placing of 90 yd. of concrete, all the materials for which had to be trucked about 11 miles from Chattanooga.

On Monday, May 28, the unloading of the steel from the cars was started and tools and equipment were transported to the site, where erection was begun at once. During this week, with one day out for rain, one tower, the bottom and six first ring sheets of one tank were erected and work on the second tower was started. This erection was greatly facilitated by the use of a gasoline hoisting engine. A portable gasoline compressed-air outfit was also set up and when the riveting started it was possible to keep four crews going on the two towers.

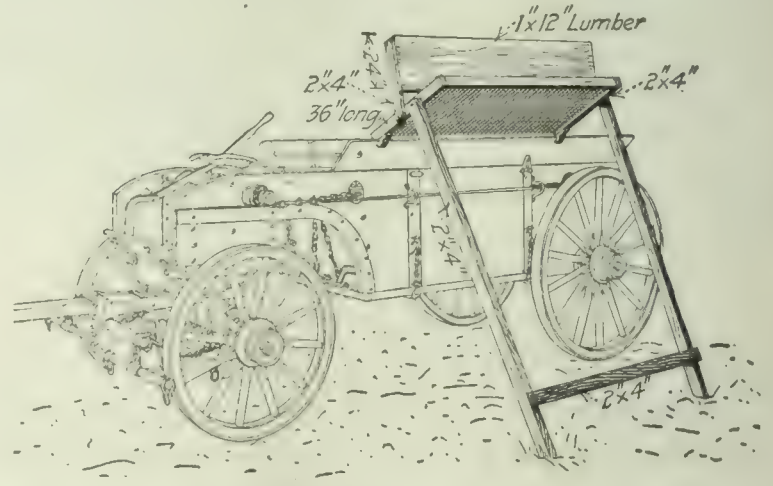
With the work already well organized, the force was doubled on June 4 by the addition of a crew of seven men and a foreman. Very satisfactory progress was reported, and with the exception of one rainy day, nothing was experienced to seriously hold up the schedule. On June 12 the tanks were connected to a 12-in. main of the Chattanooga Water Co., and on June 14 they were filled with water and ready for service.

Complete coöperation on the part of the officials in charge and long, hard shifts by the men in the field accomplished much to assure the successful completion of these structures within the required time. Capt. A. T. Dalton as acting quartermaster was in charge for the Government. Fred Palm handled the job in the field for the Pittsburgh-Des Moines Steel Co.

Target Improves Wagon-Side Screen

By F. M. Hough
Superintendent of Construction, U. S. Reclamation Service, El Paso, Texas

REFERRING to the wagon-side screen described by Donald A. Thomas in *Engineering News-Record* of July 19, p. 137, I would like to suggest the addition of a



TARGET OBVIATES THROWING GRAVEL ACROSS WAGON

target on the screen, as shown on the attached sketch. This does away with having to throw material across the wagon, and so keeps the material cleaner and lightens the labor. I have used this device with considerable saving in cost over screening on the ground

Pool Floor Built with Forms Slotted for Water Stops

By Richard R. Bradbury
East Pleasantville, N. Y.

FORMS slotted to hold the water stops between adjoining floor blocks were required in laying the floor of a large pool which forms one of the architectural adornments of the Kensico dam of the New York City water supply. This pool, which is 720 ft. long and 135 ft. wide, is partly in cut and partly on a rolled earth fill. It is surrounded by a wall 5 ft. thick, surmounted by cut-stone curbing, and its 8-in. concrete floor is laid on porous material with vitrified pipe underdrains. It was essential to make this floor as near watertight as possible. The floor was laid off in 9-ft. squares with a joint and water stop between adjacent squares.

One of the double-derrick travelers previously used in placing large stones in the dam was mounted facing

west on a track running east and west through the center of the pool. A service track coming in from the east end was laid north of this traveler track. Work was started by building the west end wall and carried east. Wall, cut-stone curb, piping, porous sub-foundation and concrete floor were all built together, the traveler leaving a completed structure behind it.

Forms for the floor slabs were made in the carpenter shop from 6 x 8-in. timbers. A longitudinal groove cut along one side of each of these timbers midway between the top and bottom provided a setting for the steel water-stop strip to be embedded in each block. Each of these form pieces was made separate, and a number of different lengths ranging from a little less than 9 ft. to about 9 ft. 11 in. were turned out, as the progress of the work required the form strips to be used sometimes between blocks already cast and sometimes to overlap adjacent blocks. Forms were first set for alternate blocks in each direction, and when these blocks were concreted and the forms removed this left water-stop strips embedded in the first blocks on both sides of the intermediate blocks in each direction. These could then be filled in, leaving holes in alternate rows in each direction on all sides of which the water-stop strip would be sticking out.

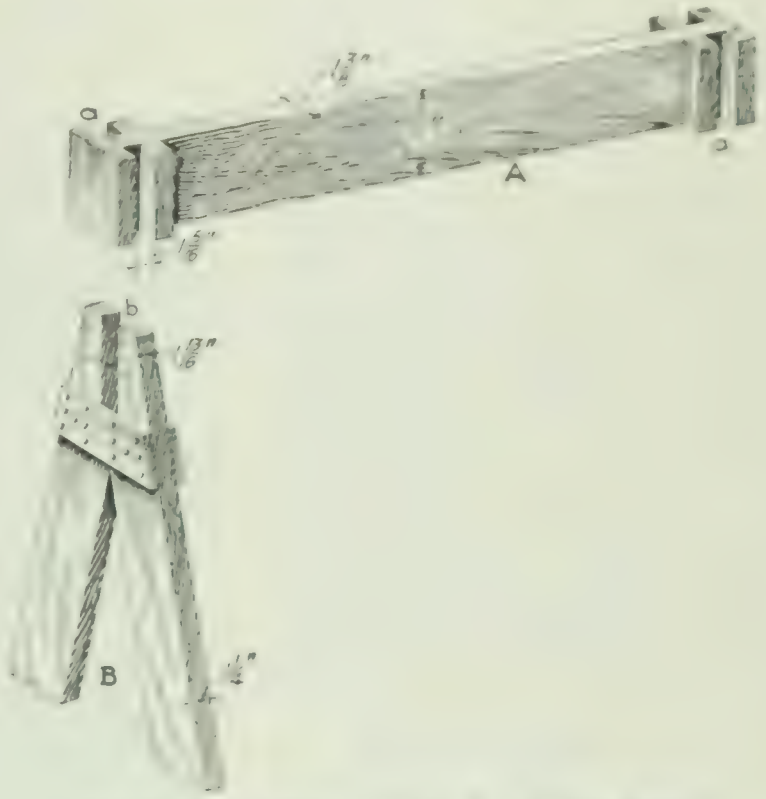
As used for the first blocks, the four sides of a form were clamped in place by clips with set screws just outside the forms at the corners. These screws gripped the water-stop strips, which were laid in long lengths, gridiron fashion, over the foundation before the first of the forms were set. The forms were wedged together by driving steel or wood wedges between the clips outside of the forms. Altogether about 350 form pieces were made, and as a rule about thirty blocks were formed with them at one time. The same pieces were used continuously throughout the work, and most of them lasted the job in good shape.

The work was done for the Board of Water Supply of New York City by H. S. Kerbaugh & Co., Inc.

Handy Trestle Easy To Move and Store

By Ernest Schwartz
Brooklyn, N. Y.

THE SKETCH shows a trestle which may be readily taken down and stored in small space and without danger of breakage. The top bar is provided with



TRESTLE OCCUPIES LITTLE SPACE WHEN KNOCKED DOWN

grooves at each end formed by nailing strips of wood on each side to a bare clearance for the upper ends of the legs. The legs are framed with a slot at the top which is a close fit for the top bar. This trestle, which has been found useful in shop practice, might prove economical on building construction, as the ordinary trestle is certainly difficult to store, besides deteriorating rapidly as a result of handling from place to place.



ALL WORK COMPLETED AS TRAVELER MOVED BACKWARD [illegible] AND HELD IN PLACE WHILE ALTERNATE [illegible]

NEWS OF THE WEEK

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

French Officer Discusses Engineer's Part in War

Captain Capart, of General Petain's Staff Tells of Selection of Consulting Engineers as Members of the General Staff

Consulting engineers are now being regularly appointed as members of the General Staff of the French Armies. This fact, significant of the appreciation in which technical advice is held, was stated during a recent interview between *Engineering News-Record's* representative and Capt. Gustave P. Capart, who is in the United States on a mission for the French Government as a member of the staff of General Petain. Captain Capart, during his period of active service on the Western front, had an opportunity of observing in detail the industrial and engineering operations demanded by modern warfare.

Transportation Varied

"This war," said Captain Capart, "is a problem of material, roads and transportation. The applications of means of transport are numerous and varied. There have been adopted progressively all of the systems which are known to the engineer; narrow-gage railways have become of very common usage. Cableways and telpherage systems have given extraordinarily valuable service on the front. One installation of this kind has permitted us to effect an economy of 600 mules per day at one point on the French front, and the Italian army employs similar installations with continued success. The motor truck plays a rôle which day by day becomes more important; the thousands of drivers and mechanicians and repairmen have, little by little, come to constitute an important organism of the army. Mechanical services are developing more and more. The employment of compressors, rock drills, trenching machines, etc., has tended to call for an increasing number of skilled workmen for these machines.

"In the zone evacuated by the enemy," according to Captain Capart, "there is an immense amount of restoration to be undertaken and we must be able to utilize a skilled personnel for the rebuilding of bridges and the construction of military works. The construction of great shelters, which are in reality subterranean buildings, is confided today to units which are as skilled as are the contractors' forces which construct subways in New York and who not only excavate but timber and construct concrete work, etc., and leave the shelters complete.

"In the engineer corps, specialization is too well known to call for special reference. Mining, bridge construction, trenching operations are today all works requiring special units. The military instructions of specialized regiments may be extremely limited and numerous regiments may be made ready in a very short period of time. The Government of the United States has comprehended fully the importance of organization along these lines. It is of common knowledge that the expedition of specialized regiments responds to urgent military needs, and it reflects one of the aptitudes of this country where you pass so rapidly from project to realization. But it is also desirable that it be known that we are very anxious to learn more of the American methods of work."

Officer of General Petain's Staff in United States on Mission for French Government



CAPTAIN G. CAPART

Industry After the War

The specialized American troops who are going to France, according to Captain Capart, will be the pioneers of American industry over there and will prepare the ground for the economic war which will be waged against the Central Powers tomorrow. A flow of business between America and her allies, he believes, should be the result of the present coöperation. In French industries American-made machines will replace those of German make.

"It must not be forgotten," Captain Capart concluded, "that the services of the troops in the rear are fully as important as those of the troops in the trenches, and that the soldier who lays track or who repairs a power line is fulfilling his duty as a soldier just as does the man who carries a rifle.

Government Barges Bring Coal to St. Paul

Fleet Carried 3100 Tons and Was Two Weeks in Transit—Equal to a 60-Car Train

On Aug. 12 the United States steamer "Nokomis" brought into St. Paul, Minn., six barges of Illinois coal which left St. Louis on July 30. This was an experimental trip up the Mississippi made under Federal auspices to test the possibilities of river transportation of coal. The Northern cities have been suffering from coal famine, largely due to the congestion on the railways, so the Government lent the use of six steel barges, the steamer and the crew of 35 men. Costs of the trip were carefully kept and are to be reported to the Secretary of War for study.

The tow was 530 ft. long, 105 ft. wide and drew 5 ft. of water. The 14-day trip comprised two days' delay for lack of pilot through the Rock Island rapids, 12 hours' delay from fog and 12 hours for repairs. The fleet started with 3100 tons of coal and 500 tons were burned on the trip, so that the delivery was 2600 tons—equal to a 60-car train.

At St. Paul the municipal coal- and ore-handling scheme reported some weeks ago has been changed so that only temporary handling structures will be built this year. The coal docks are on the municipally owned levee at the foot of Market St., about two miles upstream from the Terminal Bridge. They consist of a double-track unloading trestle built inside of and parallel to the harbor line along which coal barges stand to be unloaded by a locomotive crane, on a temporary floor on the land side. The capacity of this floor is 2500 tons. Cars and wagons are loaded out from this stockpile by the same means and switched or hauled to the various industries of the city. The unloaded coal barges will then drop down the river two miles to the Terminal Bridge and be loaded with iron ore for their trip south, from hoppers built into the floor of the bridge.

Engineer Corps Puts Premium on Efficiency

New Provisions for Mississippi Levee Work Give Contractor Half of Saving on Bid Field Cost

Due to the unusual conditions now prevailing, the Corps of Engineers, U. S. Army, will use a form of cost-plus-fee-plus-saving contract for Mississippi flood protection work which is expected to result in more economical and efficient work, and at the same time to prevent work being thrown into bankruptcy by unforeseen conditions. It is proposed to let the work on the basis of field cost to the contractor plus certain additional sums. Bidders will therefore state the outfit which they will place upon the work and the field cost per cubic yard for which they will undertake to do the work, subject to the following conditions:

1. That the contractor will furnish and place upon the work a complete outfit as stated in his proposal, and all labor and supplies necessary for its operation.

2. That the United States may at its discretion secure on such terms as it may be able to obtain any plant necessary to keep the contractor's outfit up to the strength agreed upon, or any supplies necessary for the efficient operation of the plant which the contractor may fail to provide, and may deduct the cost of such plant or supplies from any amounts due the contractor under paragraphs 5, 6 and 7 below.

3. That the contractor will actually operate his outfit at the expense of the United Sates.

4. That the United States will keep an account of all expenses incurred in operation and allow the amount of the same in estimates, but no allowance will be made for getting the outfit on the job or away from it.

5. That the United States will pay the contractor 25% over and above the price for which he undertook to do the work, provided the actual cost as determined and paid by the United States does not exceed the price bid.

6. That if the contractor performs his work for less than the amount stated in his bid, the United States will pay him in addition to the 25% specified in the preceding paragraph, one-half of the difference betwen actual field cost as determined by the United States, and the price stated in the bid.

7. That if the field cost exceeds that stated by the contractor in his proposal, the excess cost up to and including 10% of the cost stated in the proposal shall be deducted from amounts to be paid in accordance with paragraph 5.

8. That the United States reserves the right to require replacement of any piece of plant not considered suitable for the work to be done at the expense of the contractor; it being contemplated that only ordinary repairs to plant will be allowed in determining the cost.

The accompanying table shows what would happen under this contract in different cases, assuming a bid of 20c. a yard to have been successful on a 500,000-yd. levee contract. It is evident that up to the point where the work exceeds the estimate by 10%, there is every incentive to the contractor to save money. Unless unusual conditions, such as a great rise in the cost of labor, should occur, this is hardly expected to occur. It is pointed out that the form of contract will discourage abnormally low bids, and also discourage the contractor who lacks plant or experience, since any expense incurred at the order of the Government in improving his plant or methods must come out of his fee.

EXAMPLE SHOWS HOW NEW MISSISSIPPI LEVEE CONTRACT WILL OPERATE

	Work Done for Bid Price	Work Less Than Bid	Work Over Bid
Field cost of work	$100,000		
Contractor's fee, 25% of field cost	[illegible]	[illegible]	[illegible]
Contractor's fee, 12½% of saving		[illegible]	
Contractor's fee, 10% of [illegible]			10,000
Contractor's total compensation	[illegible]	[illegible]	[illegible]
Total cost to Government	[illegible]	[illegible]	[illegible]

Atlanta May Have Gravity Water-Supply

The City Council of Atlanta has unanimously adopted a resolution introduced by Councilman Jonas H. Ewing which provides for an investigation of the possibilities of a gravity water-supply through a 60-mile conduit. A hydro-electric plant is included in the project. The investigating committee comprises the superintendent of waterworks, the city electrical engineer, three members of the city board of consulting engineers, three members of the City Council and the mayor.

Union Gap Dam on Wapato Project Cost $144,264

The Government dam at Union Gap, near North Yakima, Wash., just completed by the United States Indian Reclamation Service, cost $144,264 according to the report of L. M. Holt, superintendent. The dam contains 7271 cu.yd. of concrete, the total length of the concrete sections is 620 ft. and of earth and riprap sections 1340 ft. The estimate for the concrete and reinforcement was $10 per cu.yd. and the actual cost was $9.65 per cu.yd. The dam contains the headgate of the Wapato Canal and is the first item of the permanent improvement which will lead to reclaiming an additional 70,000 acres on the Wapato project.

War Demand Deprives Vancouver of Much Needed Pipe

As a result of the Federal Government commandeering all water pipe, both wooden and steel, for war purposes, the improvements to the Vancouver water system, including the new 18-in. pipe line from the springs at Ellsworth, are at a standstill. The North Coast Power Co., which owns the local system, had contracted for all the pipe and was securing regular deliveries when the Federal order prevented further application of pipe to private contracts. About 4000 ft. of pipe is needed before the new line can be put into use.

The condition of the old pipe line is very poor, and owing to the demands made on the local system by new industries the shortage of pipe creates an emergency. Efforts are being made to have the Federal order altered.

All Men Asked To Register for War Service

Department of Labor Compiling United States Public Service Reserve List for War Work

The United States Department of Labor has organized the United States Public Service Reserve as a means of putting on record for ready access a list of all adult males who desire to find their place for effective service to the country in the war emergency and to make it easy for the Government to locate them when it needs help from men of their capacities. Blanks to fill out with the individual's qualifications are obtainable from the department at Washington, and when filled out are to be classified and filed there for reference. It will, therefore, form an official and, it is hoped, comprehensive substitute for the many isolated censuses which have been made by different organizations and which for the most part have done little else than to swell the archives of the organization itself.

The purpose of the Reserve is announced to be "to enable those who are not called into the army or navy to play their part in realizing the ideal of a whole nation organized to war for the safety of our country and the preservation of the civilization and the future peace of the world. It is a common meeting ground where men of all degrees of capacity and attainment may unite in devoting themselves to the service of our country and mankind."

Registrants in the Reserve will be given a button to wear. They will be under call for the specific kind of service for which they claim fitness, but are under no obligation to accept any particular call.

New Jersey Sues To Recover Riparian Lands

The New Jersey State Board of Commerce and Navigation has decided to institute 1600 suits to recover for the state riparian land alleged to be held illegally in various sections. The holdings represent various sized claims, but it is estimated that their value may reach $1,000,000. Among the defendants will be the Florence Iron Works on the Delaware River and the Pennsylvania Railroad Co. for the bridge it erected across the Hackensack River.

Engineering Council Active in Many Fields

Three Standing Committees Appointed—Special Attention To Be Given to War Inventions

Subsequent to the organization meeting held on June 27, 1917, the Engineering Council has held two other meetings, one on July 13 and on July 26. There have been appointed standing committees as follows:

1. On Public Affairs, comprising C. W. Baker, G. F. Swain, S. J. Jennings and E. W. Rice, Jr.

2. On Rules, comprising J. P. Channing, Clemens Herschel, N. A. Carle and D. S. Jacobus.

3. On Finance, comprising B. B. Thayer, I. E. Moultrop, Calvert Townley and Alexander C. Humphreys.

Many matters coming before the council, both from the several founder societies and from the council's predecessor, the Joint Conference Committee of National Engineering Societies, have been considered.

The council has also created a War Inventions Committee comprising H. W. Buck, A. M. Greene, Jr., and E. B. Kirkby, to coöperate with the Naval Advisory Board and other departments at Washington if desired in the promulgation to engineers of war problems now before the Government and for which there are opportunities for solution by means of inventions. It also created a committee comprising George J. Foran, E. B. Sturgis, A. S. McAllister and A. D. Flinn, which is to collect and compile such information regarding engineers of the country as will enable the committee to coöperate with the different departments of the Federal Government on request and to assist in supplying the Government's need for engineering services.

While the council comprises only members from the four founder societies, and of course can claim no right to speak for members of other societies nor for engineers at large, the council members feel that the body will not have accomplished the results for which it was created unless it early establishes means of cordial coöperation with engineers, organized or otherwise. Every effort toward this end is contemplated.

Reclamation of Arid Lands

The Reclamation Service of the Department of the Interior has recently sent out an invitation to individuals, citizens' associations, farmers' clubs and large landowners asking them to notify the department of any arid lands capable of development. Complete information is requested as to location, character and topography of the land, nearest source of water-supply, suggested methods of irrigating same, with approximate cost, probable number of users and any other data that might have a bearing on the subject. The department promises to facilitate quick action on promising projects.

Niagara Power Companies Divert Water in Excess of Permits

A committee of engineers, who have been investigating the use of Niagara River water by private power companies for the past few months, have reported to the Ontario Hydro-Electric Commission that there is and has been for some time an unauthorized diversion of water by the Electrical Development Co. and the Canadian Niagara Power Co. The amounts are considerably in excess of that which is permitted these companies to use for power development under their agreement with the Queen Victoria Park Commission. The Ontario Power Co., recently acquired by the Hydro-Electric Commission, is also found to have been using more water than authorized.

As a result of this report the Ontario Government has appointed a commission consisting of three High Court judges, Chief Justice Sir William Meredith and Justices Kelley and Sutherland, to investigate the practices of power development companies using provincial water for hydro-electric purposes. The commission has authority to set a price to be paid by any company for power taken beyond their limits.

Making Oregon Irrigation Bonds Attractive

The first application for the certification of bonds under the new Oregon district law has been made by the Payette-Oregon Slope Irrigation District. This project covers about 6000 acres of land along the Snake River in Malheur County, where the water is lifted by eight motor-driven centrifugal pumps and distributed in three levels of canals. The works are complete and about 75% of the land is under irrigation. Power is secured from the main line of the Idaho-Oregon Power Co. The project has been in successful operation for several years, and the Supreme Court has passed on the legality of proceedings leading to the original bond issue. The assets for the district are estimated to exceed $700,000 and the bonds asked to be certified amount to $225,000.

The new statute provides that irrigation district bonds may be certified by a board (the Irrigation Securities Commission, composed of the State Engineer, the Superintendent of Banks and the Attorney General) when the assets of the district are at least double the amount of bonds to be certified. Certified bonds are legal investments of all trust funds. The law was designed to separate gilt-edged irrigation bonds from those of a questionable nature or those depending for security on a satisfactory completion of a project.

New Jersey Sells No More Riparian Rights

The New Jersey Board of Commerce and Navigation has announced that it will sell no more riparian rights, but will execute long-term leases where waterfront holdings are desired.

Engineers Become General Officers in Army

Three Brigadiers and Seven Colonels from Corps of Engineers Promoted August 14

In the list of new major generals and brigadier generals in the National Army sent to the Senate by the President on Aug. 14 are the names of a number of former and present members of the Corps of Engineers. There are three new major generals: Harry F. Hodges, who was promoted to a brigadier of the line after his service at Panama; John Biddle, recently superintendent at West Point and since the beginning of the war promoted to a brigadier of the line; and Joseph E. Kuhn, head of the War College and, following a long period as observer at the front, recently made a brigadier.

The new brigadiers who were all colonels in the Engineer Corps are: Mason M. Patrick, Edward Burr, William C. Langfitt, Harry Taylor, Henry Jervey, Charles H. McKinstry and William V. Judson.

Chicago Sanitary District Adopts Budget

The Sanitary District of Chicago on July 23 adopted a budget of appropriations for the calendar year 1917 totaling $13,413,435. This is distributed among departments as follows: Engineering, $8,869,411; Illinois and Michigan Canal and Illinois River, $33,027; Law, Treasury, Real Estate, Police, and Board and Clerk of District, $3,264,336; Electricity, $1,273,660. The appropriation for the Department of Engineering includes $509,665 for salaries and wages and $6,440,920 for structures and improvements. In this latter item are $3,033,370 for channels, ditches, reservoirs and docks; $2,331,900 for sewers, tunnels and sewage purification structures; $722,850 for bridges and viaducts; $54,300 for paving and railway work, and $15,000 for locks, dams, breakwaters and cuts. Charles H. Sergel is president of the board of trustees; George M. Wisner is chief engineer.

Oregon Now Has Much Road Work on Hand

Counting road construction, bridge building and other work turned over to the highway commission by the various counties of the state for overseeing, the Oregon State Highway Commission has on hand work aggregating the sum of $2,200,000, which is nearly as much as the commission has done since its organization in 1913.

There is now under way or in proposals called for an aggregate of work in excess of $1,600,000. On July 6 the commission went to Portland to open bids on five jobs on the Columbia River highway in Columbia and Hood River Counties. This work amounts to about four hundred thousand dollars.

PERSONAL NOTES

LOREN T. PLUMMER is at present engaged on Government work at the new cantonment at Wrightstown.

R. E. VAN HORN, formerly connected with the Bureau of Sewage Design, Dayton, Ohio, has accepted a position with the Coventry Land and Improvement Co., of Akron, Ohio, as assistant engineer on municipal and allotment work, including the paving of all streets and the laying of sewers, water mains and cement sidewalks for a new development of about one mile square.

THOMAS B. POWELL, formerly of Powell & Clark, civil and mining engineers, will continue his private practice under his own name. J. P. CLARKE resigned from the firm to take care of personal business affairs in South Carolina.

GEORGE C. WENDLING has been promoted to assistant engineer in charge of the engineering work on the Nashville Division of the Louisville & Nashville R.R., with headquarters at Nashville.

FRANK R. DAVIS, formerly with the Rapid Transit Subway Construction Co. as assistant engineer, has recently become connected with the designing department of the Bureau of Yards and Docks, Washington, District of Columbia.

MAX J. WELCH recently returned from Peru, South America, and has accepted the position of chief draftsman during the construction of the new Traylor shipbuilding plant at Cornwells, Pennsylvania.

ARTHUR L. SHUMWAY, city engineer of Camas, Wash., has been assigned to the Tenth Engineers for immediate service in France.

R. M. COOMER, of the engineering and contracting firm of Coomer & Small, Sioux City, Iowa, has been commissioned as captain in the Engineer Officers' Reserve Corps and has been detailed for immediate duty in France.

ARTHUR LEDERER, formerly with the Sanitary District of Chicago, has been appointed director of the State Hygienic Laboratory of West Virginia, with headquarters at Morgantown.

T. A. OBERHELLMANN, formerly with the Parker-Russell Mining and Manufacturing Co., of St. Louis, is now with the Stacey Manufacturing Co., Cincinnati, engineers and builders of gasholders, tanks and gas-plant equipment.

G. HSI HU, who has been on the engineering staff of the Chicago, Milwaukee & St. Paul Ry., under E. R. WEBSTER, assistant engineer, has resigned to accept a position on the construction of the Chuchow-Chinchow Ry. for the Government of China. This is one of the lines being built by the Siems-Carey Syndicate. Mr. Hu is a graduate of Purdue University.

PROF. MILO F. KETCHUM, dean of the College of Engineering of the University of Colorado, was elected president of the Society for the Promotion of Engineering Education at the recent annual meeting of the society held at Washington, D. C. Professor Ketchum was instructor in civil engineering at the University of Illinois from 1895 to 1897, then becoming bridge and structural engineer for the Gillette-Herzog Manufacturing Co. In 1899 he was appointed assistant professor of civil engineering at the University of Illinois, which position he resigned to become contracting manager of the American Bridge Co., Kansas

Elected President of Society for the Promotion of Engineering Education



PROF. MILO F. KETCHUM

City, in 1903. In 1904 he became professor of civil engineering and in 1905 dean of the College of Engineering at the University of Colorado. Professor Ketchum was joint author, with Prof. W. D. Pence, of "The Surveying Manual" and sole author of "The Design of Steel Mill Buildings and the Calculation of Stresses in Frame Structures," "The Design of Walls, Bins and Grain Elevators," "The Design of Highway Bridges," "The Design of Mine Structures" and "The Structural Engineers' Handbook."

BENJAMIN F. CRESSON, JR., consulting engineer of the Board of Commerce and Navigation, is at present in Washington planning oversea terminals for the Government.

E. M. VAIL has been placed in charge of the new offices of the New Jersey State Highway Department recently opened in Plainfield. This office will be headquarters for the Northern Division.

JOHN LAWRENCE MAHER, assistant engineer in the office of the district engineer, maintenance-of-way, northwest district, Baltimore & Ohio Railroad Co., has been commissioned captain in the Engineer Officers' Reserve Corps, U. S. A., and is awaiting instructions from the adjutant general to report.

A. BALDWIN WOOD has been made consulting engineer of the Chicago Sanitary District. He will retain his position with the Sewerage and Water Board of New Orleans.

D. Q. MCCOMB, testing engineer with the Pittsburgh Testing Laboratory, Birmingham, Alabama, has been commissioned as captain, Engineer Officers' Reserve Corps. Mr. McComb was assistant engineer, Bureau of Public Works, Philippine Islands, on the construction and maintenance of highways, reinforced-concrete bridges, schools, etc., from 1910 to 1913, later having charge of all Government engineering work in the Province of La Union until 1915.

F. A. MOLITOR, consulting engineer, New York City, and major in the Engineer Officers' Reserve Corps, has recently been ordered to duty in Washington on the staff of the director general of railways, F. M. FELTON. This office is an adjunct of the Chief of Engineers, U. S. A., and has to do with the military railway and transportation problems in France.

JAY H. KELLER, consulting engineer, Portland, Ore., has been chosen to take the three months' intensive training at Annapolis preparatory to being commissioned in the navy.

H. H. BARTLETT has recently resigned as superintendent of maintenance of the Eastern Washtenaw Good Roads District, Michigan, to accept the position of office engineer in the engineer's office at Highland Park, Mich. Mr. Bartlett was formerly engineer in charge of the sanitary experiment station of the University of Michigan.

MAJ. R. KEITH COMPTON, who was called into the Federal service last Saturday, resigned the chairmanship of the Paving Commission of Baltimore. Major Compton will continue as a member of the commission and also as consulting engineer, having been granted an indefinite leave of absence. FRANK K. DUNCAN, principal assistant engineer of the commission, was placed in charge of outside construction work. Major Compton has been at the head of the commission since its organization in the summer of 1911, having been for a number of years one of the assistant city engineers.

CALEB MILLS SAVILLE has been appointed manager of the Hartford water-works in addition to his duties as chief engineer. This appointment is the result of a recent change in the city ordinances and places under Mr. Saville's direction all matters relating to engineering, construction, extension, operation, care and management of the water system. Mr. Saville was for 10 years division engineer on the Metropolitan Water-Works, Massachusetts, and for four years engineer in charge of the Third Division of the Panama Canal—being selected as chief engineer of the Hartford water-works in 1912. Since that time, besides the ordinary work of the department, design and construction of works for the

additional supply of the city has been under way which has cost upwards of $4,000,000 and includes several large dams, reservoirs, pipe lines, tunnels and conduits and filtration plants.

L. M. MITCHELL, who has had charge of the division engineering work for the Milwaukee & St. Louis R.R., has accepted the position as assistant engineer with the Illinois Central R.R., with headquarters in Chicago, working directly under A. L. DAVIS, office engineer.

BUSINESS NOTES

Boston Bank Opens South American Branch

For American manufacturers engaged in or contemplating the sale of their products in South America there is significance in the announcement that the First National Bank of Boston will open a branch at 501 Bartolome Mitre, Buenos Aires, Argentina. The branch will be under the management of Noel F. Tribe. Inquiries with regard to transacting business between this country and South America are solicited, and may be addressed to the home office at Boston or to the branch.

Smallest Diesel Engine in This Country Installed

What is claimed to be the smallest Diesel engine of American design and manufacture is one which the Fulton Manufacturing Co., of Erie, Penn., has recently shipped to the War Department. It is a 6-cylinder oil engine of the straight Diesel type, but is rated at only 100 hp. The engine is to be used in a dredge tender. The manufacturers claim that the 100-hp. engine can be operated on fuel oil for 40c. an hour as against a cost of about $3 an hour to run a similar powered gasoline engine.

Southern Pine Men Foresee Much Wooden Ship Building

The Southern Pine Association, of New Orleans, foresees an extensive demand for lumber as the result of a conference at Washington early this month between its members and the Federal Shipping Board. Plans were agreed upon tentatively, it is said, for Southern pine mills to cut timbers for approximately 200 ships for the nation's wooden fleet, in addition to the 63 for which the work of supplying lumber has been in progress for some weeks. The reorganized Shipping Board, it is claimed, will push the wooden shipbuilding program to the limit of the mills' ability to supply material. This will be in addition to constructing steel ships.

Southern pine manufacturers see in the plans of Chairman Edward N. Hurley and the members of the Shipping Board the basis for the establishment of a permanent ship, boat and barge building industry for the South, which will continue after the war.

Southern Exporter Comments on After-War Lumber Markets

"There is practically no building going on in Great Britain." This is the statement of E. R. DuMont, a lumber exporter, of New Orleans, who has recently returned to this country after spending seven months abroad. As to the possibility of an enormous demand for lumber after the cessation of hostilities, Mr. DuMont says that the demand will be exceedingly small during the first year of peace, owing to the reorganization of business, both from a financial and labor standpoint. When conditions begin to adjust themselves, however, Mr. DuMont foresees a steady increase in the demand for Southern yellow pine. At first, of course, the demand will be small owing to exceedingly high ocean freight rates.

The immediate wants of the allies on the western front in the way of lumber are now being supplied, it is said, from forests in France. It is estimated that they are cutting about 30,000,000 ft. or more per month.

NOTES FROM MAKERS OF PLANT AND EQUIPMENT

The Dodge Sales and Engineering Co., of Mishawaka, Ind., recently opened a branch warehouse and sales office at 522 First Ave., S. The branch is handling products manufactured exclusively by the Dodge Steel Pulley Corporation, of Oneida, N. Y. Charles N. Weinberg is in charge.

Charles H. Eglee, for many years associated with the management of the Aberthaw Construction Co., has established a contracting business in his own name. The C. H. Eglee Co., contractor, is located at 120 Milk St., Boston.

The Vulcanite Portland Cement Co. has opened an office at 161 Devonshire St., Boston, to serve the steadily increasing New England trade.

The Diamond Power Specialty Co., of Detroit, has established a plant at Detroit devoted exclusively to the production of soot blower units. The units will be made of Insuluminum, a product resulting from a heat-treating process for metals subject to unusual heat conditions. The General Electric Co. has granted to the Diamond Power Specialty Co. the exclusive rights as lessee to the use of this process.

The Ingersoll-Rand Co. announces the election of J. H. Jowett, formerly general sales manager, to the vice presidency of the company. J. D. Albin, formerly assistant general sales manager, has been promoted to general sales manager. Mr. Jowett and Mr. Albin will continue to make their headquarters at the company's New York office, 11 Broadway.

A. S. Lindstrom has been appointed general manager of the Thordarson Electric Manufacturing Co., of Chicago, effective Aug. 1. Mr. Lindstrom was in charge of the Thordarson exhibit in the Palace of Machinery at the San Francisco Exposition and conducted the experiments with the million-volt transformer which were carried on at that time. Since the exposition Mr. Lindstrom has represented the Thordarson company on the Pacific Coast.

The Denny Renton Clay and Coal Co., which has for some years maintained offices in the Bates Building, Portland, Ore., recently moved to the Chamber of Commerce Building.

The Falls Rivet Co., of Kent, Ohio, has taken over the entire plant and business of the Kent Machine Co. The Kent Machine Co. for the past 10 years has built and marketed concrete mixers. Under the new management this line will be continued and other products added from time to time. In the reorganization of the business the following officers have been elected: M. B. Garrison, president; W. S. Kent, vice president; Roy H. Smith, treasurer; Myles E. Ewing, secretary. The business will be operated separately and under the name of the Kent Machine Company.

The T. L. Smith Co. announced that business in its Detroit territory, formerly in the hands of J. A. McCarty, will henceforward be managed by J. W. Dopp & Co., 18 Columbia St., W. Mr. McCarty will continue in his former line of work as an associate of the Dopp company.

The Asbestos Protected Metal Co., of Pittsburgh, announces the temporary closing of its Cincinnati office, due to the fact that E. G. Irwin, Cincinnati manager, has entered the Ohio National Guard.

J. W. Stjernstedt, manager of the Western Engineering Sales Co., of San Francisco, has taken over the Pacific Coast agency for the Thordarson Transformer Co. and will maintain offices in the Rialto Building, San Francisco.

The Rochester Excavating Machinery Co., Inc., has moved its Rochester office to its new factory at Caledonia, N. Y., effective Aug. 1.

The Pulsometer Steam Pump Co., of Irvington, N. J., is making a big addition to its plant and installing new machinery and equipment, according to W. J. Berow, secretary of the company.

The Buff & Buff Manufacturing Co., of Boston, has purchased the plant formerly owned by R. Seelig Co. and will conduct it as an instrument repair shop.

The MacArthur Concrete Pile and Construction Co., Jersey City, N. J., has been incorporated to engage in the construction of foundations and pedestal piles. A. F. and J. H. MacArthur and F. H. Hitchcock, all of New York, are the incorporators.

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ENGINEERING NEWS-RECORD

A WEEKLY JOURNAL
DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

How An Engineer May Lose His Fee

THE business condition of the consulting engineer, already not the best, on account of low and uncertain fees, can be made worse by cutting off the fees altogether. Within the past week one engineer had just this experience, although there was the satisfaction that it was the decision of a regularly constituted judge which deprived him of his fee. The engineer had drawn plans for a piece of city work, being retained by the city for a specified percentage of the cost of construction. The work was not executed, so naturally there was no cost of construction. The result was that the city declined to pay and on suit the judge decided in the city's favor; more than this, he required the engineer to return a certain amount of money that he had received on account. The Board of Public Works had made the contract with the engineer, and the common council had apparently failed to approve the action, which the court held to be a fatal defect in the arrangement. But the decision also dwelt on the non-existence of a construction cost as a factor in the case. Thus, there seem to have been two reasons for loosing the fee.

Mean Sea Level As Universal Datum

IN THE MIDST of rushing war work it is interesting to receive a reminder of peace-time engineering efficiency from a Government department whose own present duties lie largely in aiding the military work. E. Lester Jones, superintendent of the Coast and Geodetic Survey, gives in a pamphlet just issued the results of an extended inquiry on the use of mean sea level as datum plane for elevations. Quite a number of cities, state bureaus, railways and other authorities refer all their elevations to this standard datum, and many others are working toward the same end. But arbitrary datum planes are still in the large majority. One way in which this is harmful is that confusion or error may result wherever surveys based on independent datums have to be connected. Mr. Jones' report thus points toward a chance for promoting the efficiency of engineering work—the adoption of mean sea level as universal datum plane in America. An extensive list of accurately determined altitudes is already available in a Government publication, but much more precise-leveling work needs to be done if a really adequate number of benchmarks is to be provided throughout the country. This will be work for after the war.

Factors in Tractive Resistance

THE REPORT of the tests made in California on the tractive resistance of various types of road surfaces—an account of which is given on p. 367 of this issue—should be read with the proper accent on the fact that the temperatures were unusually high, 105° F. being reached each day. The effect of this upon asphaltic mat surfaces should not be overlooked nor underweighed in any attempt to apply the conclusions to a locality where such extremes are not only unusual but unheard of. As a test-series, the results are too meagre to allow anything beyond the roughest classification of paved roads. But as a measure of the value of hard surfaces over dirt, macadam or graveled roads, the evidence is indisputable.

Special Problems on the Army Camp Contracts

ALTHOUGH all of the sixteen cantonments for the National Army had their origin in certain standard plans issued from Washington just before construction contracts were awarded, local conditions at the various sites have, in most cases, made each job different from the next. Open country, such as is found at Camp Dix, near Wrightstown, N. J., allowed the contractor to begin building operations without many preliminaries. At Yaphank, Long Island, where Camp Upton is being constructed, as described in the article on page 340, the case was entirely different. The ground at Yaphank is covered by a dense growth of scrub oak, pine, and underbrush, a condition which demanded a huge amount of clearing and grubbing before the more spectacular work of rushing the wooden barracks could be started. With the ground cleared, however, the contractor is endeavoring to speed up the building construction by framing the sides of the structures on the finished flooring and lifting them, when completed, from a horizontal into a vertical plane, thus eliminating the use of scaffolding. This scheme of construction, it is understood, has not been followed generally, at the other camps, where side walls and ends have been built upright instead of flat.

It would be highly instructive, therefore, to get comparative figures on the speeds and labor costs attainable by the use of these two construction methods. Just at present, however, everybody on the cantonment contracts is too busy for any such analysis.

Wanted—Students for Engineering Schools

ENGINEERING NEWS-RECORD has consistently urged holding all the technical students who have not actually or nearly completed their courses in the technical schools of the country, instead of encouraging their early entrance into the armies that are being raised. That stand was not popular among the men, who felt deprived of an equal chance with their fellows in sharing the honors of battle. But in the last analysis it called on them for a higher type of patriotism. We hold, moreover, that it is best temporarily to exempt from the draft those men who are actually following engineering, chemical and medical courses in American colleges—on the score of their higher usefulness after their studies have been completed.

More than a mere holding of the technical students in college is what we would now urge. We earnestly advocate a heavy enrollment in the entering classes of this and subsequent years.

But in urging that every proper influence be brought to bear upon qualified candidates to take up technical courses, we cannot unreservedly subscribe to propaganda which has recently been started. The arguments used to float this propaganda are: That after the war the whole world will have to be reconstructed by American engineers; that there is an appalling dearth of engineers abroad, and soon will be here; that European technical schools are completely paralyzed, and American schools bid fair to be; that the general demand for engineering service is beyond the supply in America; that engineering is sure to be the most lucrative profession in a few years.

In regard to all such claims we feel, from our own multiplied observation and contact with workers and work, that a vast amount of engineering effort will be needed in rebuilding within the theater of war, but the devastated areas are not such an appreciable percentage of the European built-up districts that all the engineers of the world will be engaged on rehabilitation for an indefinite time. War casualties among the engineers of other countries have been heavy, but the profession abroad is not reduced to uselessness through its reduction in numbers or in leaders. In America there are engineers for any class of work sufficient to meet all existing demands—except in certain industrial lines where the demand is apt to be more or less temporary. There is no conclusive evidence of such general improvement in the status and emoluments of engineers as warrants drawing men into this field.

Our conviction that entrance to the technical courses of our colleges should be stimulated to the maximum number that can be accommodated springs from our realization that the field for engineer efforts certainly will not be restricted and that a wide variety and great number of dire contingencies to our country can be provided against if the supply of technical graduates is normal or somewhat larger. Our conviction springs, also, from the feeling that the educational value of technical courses is as great as possibly can be secured from any higher education, and that they well train their graduates in mental processes and attitudes of great value in a business career.

In thus urging to greater efforts everyone who has any contact with or influence upon possible students, we would have greater emphasis than ever put on proper *qualifications*—an innate bent for things scientific, a creative imagination, and a peculiar sensibleness (so far as they can be recognized in a youth of 18), coupled with adequate preparation in general studies, mathematics and natural science.

Field Forces Doing Splendid Work on Cantonments

A SURVEY of the work under way at the cantonments for the national army affords the country cause for congratulation on the exceptional ability of the men selected to carry out the work and on the efficiency and accomplishments of the organizations built up at each of the sixteen locations. Single operations of such magnitude as to throw out of balance the national markets for such things as lumber and water pipe are so rare that the size of this undertaking is scarcely grasped even by the engineering public.

That work of this unusual character should be developed into full swing in the short space of time since it was authorized by Congress, and should be carried out, as this bids fair to be, within 2½ months, or at a rate approaching $800,000 a day, speaks well for the caliber of the material from which the construction forces have been drawn. The best of engineering and construction talent, however, could not have accomplished these results if the men selected to coördinate the various forces working at each site had not showed exceptional ability. Existing organizations of contracting, engineering and accounting firms have been brought together on work which was new to them in many of its aspects, and harmonized in a truly remarkable manner. The red tape which often in the past hampered operations undertaken by Government agencies has been cut without hesitation where it threatened the progress of the work. The first thought in the mind of each constructing quartermaster has been to get his cantonment finished in time for the country to use it. Small jealousies have been overridden and bickerings avoided by all concerned, in an effort to accomplish the task on time.

Of course sources of friction have developed here and there—no work of this size is ever achieved without them, but they have promptly been adjusted, and nowhere have been allowed to hamper the rapid progress of construction. The supply of materials has not always been perfect, due simply to the extraordinary quantity in which they had to be supplied; but the resourcefulness and energy exhibited in overcoming such difficulties has proved equal to every occasion.

It is further cause for congratulation that the resources of no section have failed to measure up to the emergency. Fears that the Northern firms would be unable to find labor; that the Southern work, hampered by summer heat, would not develop sufficient energy to push it to prompt completion; that the railroads and general contractors would not be able to organize the building work effectively; that the building contractors would find their city transportation methods unsuited to the open country; all have proved unfounded. Each force has found a way through the obstacles peculiar to its location.

The fact that, as soon as it is ready for them, the country will have adequate and almost ideal camps in which to train its great National Army is due to the skill and devotion of its engineering and construction forces, to wisdom of making the most of existing organizations, and to the fortunate selection of men of great personal ability to carry out the work.

Search the Scrap Piles

AMERICAN extravagance has not been confined to food and household supplies. In the rush for efficiency in output, much industrial machinery and equipment, or parts and supplies, has gone to the scrap pile for lack of adequate scrutiny with a view to its reclamation. The present unparalleled demand on our stores of metal, and the difficulties of freight transportation, are resulting in more repairing, less discarding, and wider utilization of shop odds and ends. There is coming, moreover, deeper and deeper search of scrap piles for accumulated pieces that may be salvaged. One notable instance of what may be done deserves more than passing notice—the accomplishment of oxyacetylene processes of cutting and welding, resulting from certain missionary activities of the sales promoters of commercial apparatus.

It is reported that at one Western mine, a three-months' supply of dollies and dies was secured by welding up the old ones in the discard—at a cost of only $1 each, compared with $9 for new ones. There was also found in the scrap, recoverable stamp stems enough to last three months. Short ends of tungsten steel were welded together and the supply replaced purchases for a year. Some oversized manganese-steel crusher plates costing $20 each were cut down by the gas flame and put to use. In a certain railroad shop there was a wealth of old locomotive drivers with cracked spokes. The cracks were welded and the wheels made to turn again. A shortage was experienced in boiler tubes for renewals, but in the tube junk there were sufficient good short lengths to be welded into tubes for all the engines awaiting renewals. Such instances could be multiplied; we look to see their number grow until they excite no surprise. The possibility of many similar conservation services is strong—as from aluminothermic welding of heavy pieces. The reclamation of the scrap pile has only started!

Will the Barge Canal Become a Ship Canal After All?

TO THOSE who followed the long and occasionally violent controversy between the ship and barge canal adherents of fifteen to twenty years ago there is an element of humor in the possible use of lake and ocean ships on the New York State Barge Canal. Certainly every one thought that the 1903 referendum definitely restricted the canal to 1000-ton barges which would have to be loaded and unloaded at the terminals, but apparently those who were responsible for the subsequent widening of the locks to pass the Welland canal traffic unwittingly made feasible the building of boats which can traverse both lake and canal, and even the ocean.

That some interests are considering this possibility is pointed out in the article on the canal navigation on page 348. Whether their schemes will be practicable remains to be seen. A ship design has been perfected which satisfies the requirements of ocean and lake safety and at the same time—by a dangerously narrow margin—is under the canal clearances. There is no doubt that the navigation end of the problem is solved, if one assumes the practicability of a dispatching system through the narrow stretches of the canal, but the economic advantage is not so sure. Only experience can tell whether the saving in transfer of bulk at the canal terminals will outweigh the increased fixed charges and expenses of the ship, particularly as its lake or ocean capacity seem to be so much larger than its canal capacity that some cargo transfer is necessary if the full load is to be carried in the wider waters. As an element in its favor at present and for some time in the future, the canal ship has a margin of economic safety in its possible use as an ocean carrier during the five months' winter shut-down of lake and canal.

For such companies as the General Electric the combined lake, canal and ocean boat has a further economic advantage. If workable it frees much freight from the delays and restrictions of railroad travel, which in these days of embargoes and car shortage is an important item.

In certain restricted circles there has been much argument about the possibility of operating ships for the dual service. This has been a particularly fertile field for the naval architects, who in their public discussions at least, have been unable to agree. Argument is about exhausted. The prospect of the use of the canal for ships must depend on actual experience; theoretical analysis is only just so much theory. The fact remains—and it may profitably be brought to the attention of the barge-canal enthusiasts of Buffalo and New York—that today, when the canal is in service in two of its branches and when the full completion is only one season away, the only ordered planning for shipping through the canal is coming from those who propose using it as a ship channel. Which, we repeat, adds an element of humor when one remembers the violent arguments of the late nineties.

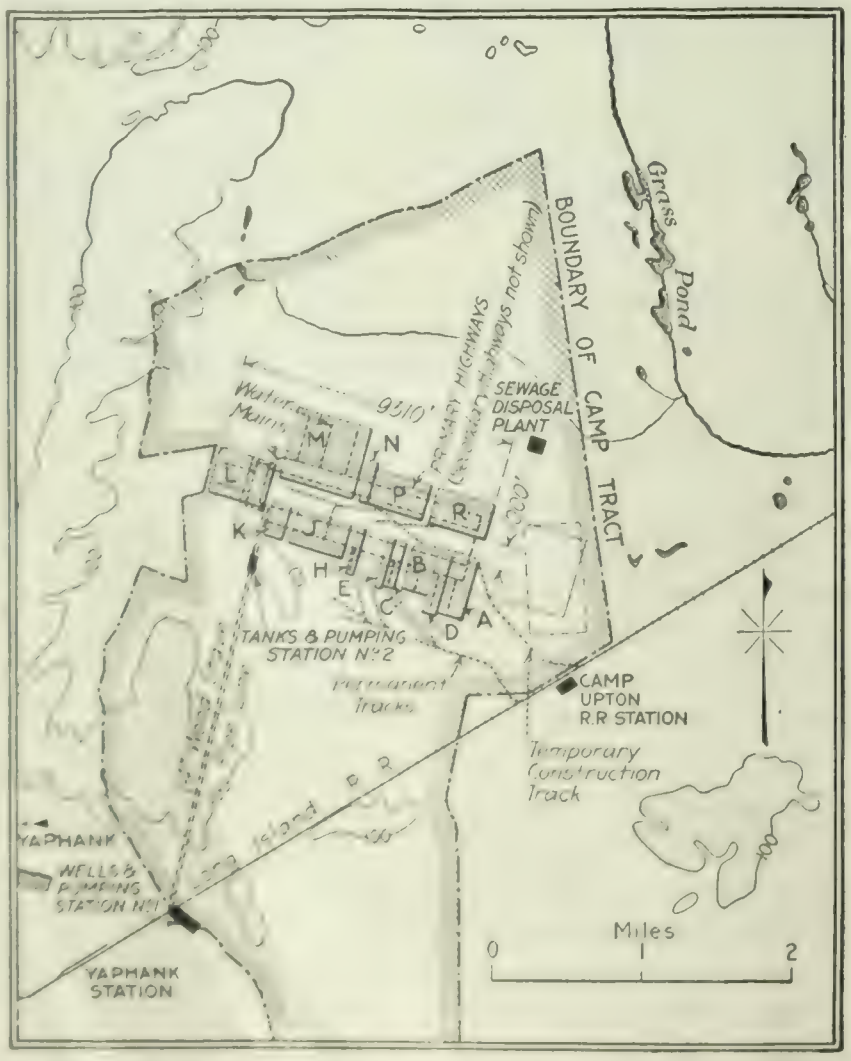
Engineering Team-Work Aids Rush Army Job at Camp Upton, N. Y.



Constructing Quartermaster and All of His Division Heads at Yaphank Cantonment Formerly Worked Together in Same Organization—Barracks Sides Built Flat and Raised to Place

By ROBERT K. TOMLIN, JR.
Managing Editor, "Engineering News-Record"

FOR Official Washington to put Yaphank, Long Island, "on the map" by naming it as the site for Camp Upton, one of the sixteen great cantonment cities for the National Army, was an extremely easy problem compared with that of putting this territory on the map, literally—a job upon which engineering and contracting forces, operating under the direction of the Quartermaster Department of the U. S. Army, have been engaged since the contract was signed June 25. These men are at work filling the stupendous order of producing a complete city for 40,000 inhabitants in only a few months' time, and they had practically nothing to start with except an 11,000-acre tract of land so densely covered with underbrush, scrub oak and pine, as to prevent the running of even the roughest sort of survey line until advance parties had chopped sighting lanes through the thick foliage. In fact, local conditions have really created two big jobs at Camp Upton—the first, getting ready to build; the second, actual building. When I visited the camp early this month the preliminary stage of the great construction project had been about completed; the first permanent wooden barracks structure was put under roof Aug. 3, although a number of smaller temporary structures had been completed previously.



OWING TO FLATNESS OF SITE IT WAS POSSIBLE TO GROUP BUILDINGS ACCORDING TO WAR DEPARTMENT'S STANDARD PLAN

How Work Is Organized

The organization of the engineering staff was the first task which confronted Major O'K. Myers, an engineer selected from civil life as Constructing Quartermaster to have supreme charge of the camp work. Prior to his entry into the Government service, Major Myers had seen extensive duty on New York City's Catskill Aqueduct, where the friends he made stood him in good stead in organizing the camp work. He arrived at Camp Upton—then a camp in name only—at 8 a. m., June 21, spent the day inspecting the site, and returned to New York that night to recruit an engineering staff capable of laying out and supervising construction operations involving the expenditure of several million dollars in only a few months' time. The fact that the first unit of the Catskill water system was completed recently was a fortunate one for the camp work on Long Island, for

it made available the services of experienced men from an organization which had won a national reputation for the excellence of its engineering personnel.

Five Subdivisions of Work

Major Myers' preliminary analysis of the construction problem indicated that it could be departmentalized under five main subdivisions, as follows: Executive, including inspection and valuation of materials and plant; buildings; sewers and sewage treatment; water supply; roads and surveys. A round-up of Major Myers' acquaintances produced men qualified by training and experience to assume at once charge of each department of the skeleton organization. D. W. Howes was chosen as the Constructing Quartermaster's deputy and given the title "Engineer of Construction." It is noteworthy that every department head has, at some time or other, been engaged in the Catskill Aqueduct construction. The accompanying chart shows the general scheme of organization.



SIDES OF BARRACKS ARE FRAMED AND SHEATHED WHILE LYING FLAT ON FINISHED FLOOR AND THEN—

With these men as a nucleus, the subordinate positions were quickly filled. The rush character of the work made it out of the question to go through the usual time-consuming process of civil-service examination. A man is hired on authorization from the Constructing Quartermaster. The camp work is not a training school for young engineers, and if a man cannot jump right into the work assigned him he is replaced by someone who can.

The important thing about the engineering organization at Camp Upton is its smooth-running quality—remarkable in a brand-new machine. The resulting teamwork, however, is due to the fact that all of the department heads had worked together on the Aqueduct, and were schooled in a single system of administration and office and field routine.

In addition to his regular staff, the Constructing Quartermaster is authorized to employ other engineers in consulting capacities. As the diagram shows, he receives the benefit of the advice of experts on water-supply and sewerage, heating, electric lighting, and roads.

The site of Camp Upton is along the backbone of Long Island, about 60 miles distant from the Pennsylvania R.R. terminal in New York City. It is about two miles north of the single-track line of the Long Island R.R., and is a comparatively flat area covered with a dense undergrowth of scrub oak and pine, which has made the work of preparing a topographical survey an extremely difficult and tedious task. The only map of the territory available was one of the standard sheets of the U. S. Geological Survey, on which the 20-ft. contour intervals were not close enough to be of much practical value in arriving at a detailed location of the vast wooden city.

Topographical Map the First Need

Before work could be planned, therefore, it was necessary to secure a large-scale topographical map, and on June 23 the first field party, recruited in New York, had set out with equipment to secure the desired information. The general method of procedure was to mark up the area in 500-ft. squares, chop sighting lines

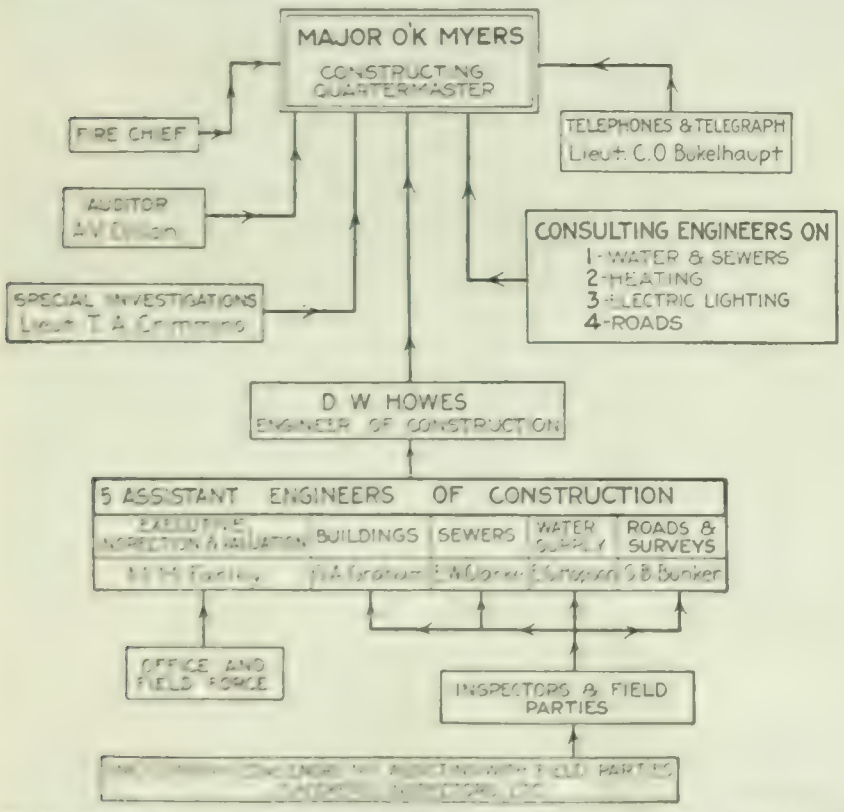

ALL HANDS RAISE THE FINISHED WALL INTO A VERTICAL POSITION—THIS SCHEME OF CONSTRUCTION ELIMINATES ALL SCAFFOLDING

through the brush along these rectangular coördinates, and take topography with transit and stadia. As a result of these operations, it was found necessary to change the tentative location of the camp which the Constructing Quartermaster had originally selected on the basis of the first small-scale map. The new location will place all buildings on areas well above ground water and will effect important savings in the delivery of sewage to the treatment works by eliminating a considerable amount of pumping.

The final location of the cantonment buildings is shown upon the accompanying plan. Owing to the flatness of the country it was possible to follow almost exactly the standard camp layout of the War Department as described in *Engineering News-Record* of July 5, page 8. The buildings will be arranged in groups to form a figure U, with legs almost 2 miles long and an open space or aisle 1000 ft. wide, running down the center. On a hill near the center of this expanse will be located the headquarters of the Commanding Officer.

Transportation a Big Problem

There are practically no local conditions favorable to rapid construction on a large scale. All material must come in over the single-track line of the Long Island R.R. The few vehicle roads in the vicinity of the camp were merely narrow country roads, unsurfaced, and have already been deeply rutted by the unexpected volume of motor-truck traffic which they have been called upon to carry. The road between the railroad station and the camp has been widened and road hones



THE ENGINEERING WORK AT CAMP UPTON IS DEPARTMENTALIZED UNDER FIVE MAIN DIVISIONS—ALL DIVISION HEADS HAD PREVIOUSLY WORKED TOGETHER IN THE SAME ORGANIZATION

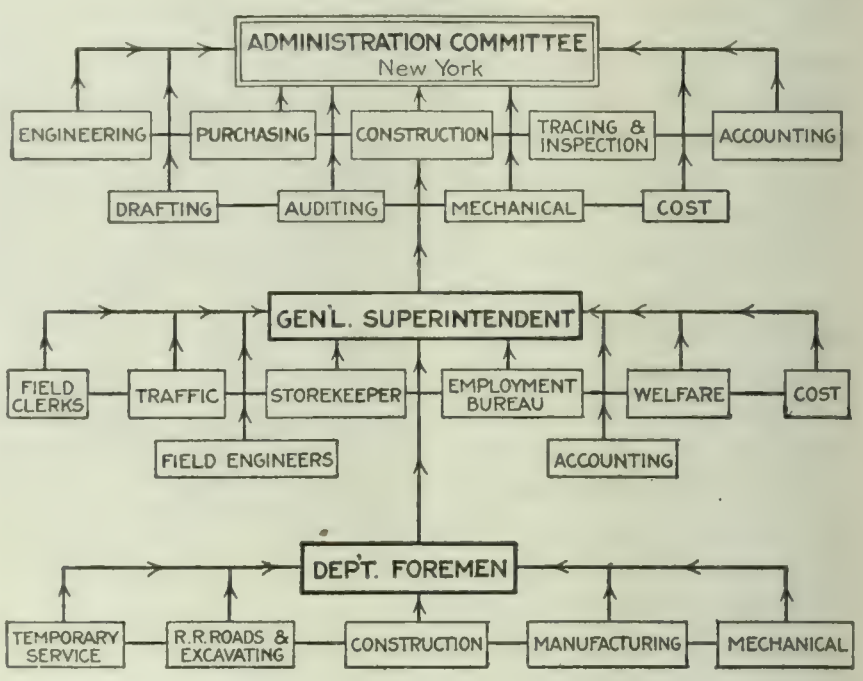
are sent over it periodically, but at the time of my visit to camp the solution of the big road problem had not advanced very far.

There is, of course, no local supply of materials or labor, and no facilities for housing the men. The plan is to billet the contractor's forces in the barrack buildings, as fast as they can be completed, but the 1600 men which the Thompson-Starrett Co. had on the job early this month were living in canvas tents.

The water-supply problem, which caused so much trouble at Camp Whitman, N. Y., when the New York militia forces were mobilized last year for service on the Mexican Border, is a comparatively simple one at Camp Upton, for wells already sunk indicate a plentiful supply of ground water of excellent quality adjacent to the camp site.

Terms of Contract

Like all the other National Army cantonments, the Camp Upton work was let on a percentage basis. The terms of these contracts were explained in *Engineering*



HOW THE CONTRACTOR HAS ORGANIZED HIS FORCES

News-Record, July 5, page 43. In no case is the total percentage payment to exceed $250,000.

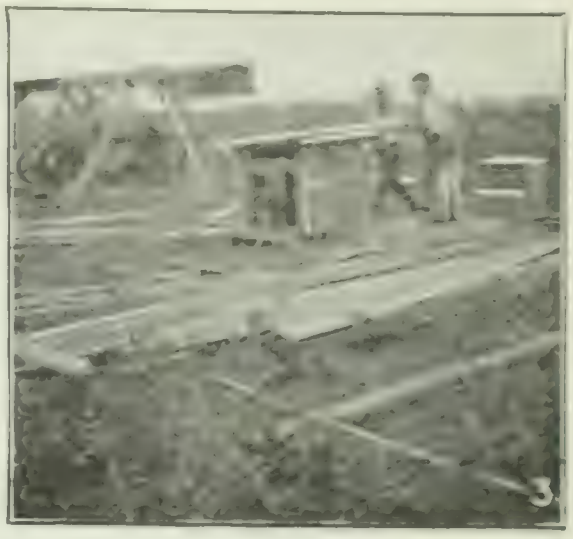
The contractor is paid whenever materials are delivered and vouchers prepared and submitted to the Constructing Quartermaster. This may be daily. The idea is to take advantage of discounts. There is a monthly payment to take care of small items and to clean up the books. The Constructing Quartermaster makes the payments to the contractor, reimbursing him for the cost of the work and cost of material, plus a sum equal to 3½ per cent. on these two items. The remainder of the fee above 3½ per cent., depending on the total cost of the completed work, is withheld and will be paid upon final completion of the work.

Rental Allowances

Except in unavoidable cases, the practice of subletting work is prohibited, in order to prevent two profits for the same work. Each contract contains a schedule of rental rates for equipment. A few of the daily rates specified are as follows: Clamshell bucket, $2; boiler and two-drum engine, $3; dump wagon, 25c.; narrow-gage locomotive, $5; mixer, with boiler, side loader, $4; 10-in. centrifugal pump, $3; drop pile-driver, $1.50; rail per ton, 6c.; steam shovel, $30; transits, 50c.; automobiles, $5. The Government stands all expense connected with the equipment, including freight and repairs. It is expected that the ultimate cost of the Camp Upton work will be between $3,000,000 and $4,000,000.

On Aug. 2 the Thompson-Starrett Co., for whom A. G. Moulton is acting as general superintendent, had about 1600 men on its payroll, although this number will be









Seven Stages in the Construction of Wooden Barracks

1. Batterboards for buildings are set accurately by survey parties. 2. Lumber is delivered to job by motortrucks. 3. Portable sawmills trim lumber as required. 4. Into these holes go the chestnut posts which serve as foundations for barracks. 5. This is the first stage of construction—putting on flooring and building sidewalks in horizontal position. 6. Sides up and roof beams in place. 7. Building complete, except for doors and windows

increased to about 12,000 when the work gets into full swing. All labor is supplied through the contracting company's special New York office on West 32nd St. The General Superintendent at the camp sends in his requisitions for labor to the New York office and the men, as fast as they can be secured, are shipped out to the job, sometimes in special cars or train.

Double Check on Men's Time

The system in force for keeping track of costs involves a double check on the labor force, once by representatives of the Quartermaster Department and once by the contractor. The two forces of checkers make their rounds separately, and each workman's card is punched twice daily. The labor force works one 10-hour shift a day, although at times it is necessary to employ night crews to unload material from railroad cars. Common labor is paid $3.75 a day, 75c. of this amount being required for three meals a day at the commissary housed by a big circus tent.

Building Wooden Barracks

For the delivery of lumber and other materials used in the construction of the barracks buildings, there have been built two railroad sidings from the Long Island track, one for permanent camp service and the other only for the construction period. The latter extends approximately along the longitudinal axis of the huge letter U which will be formed by the completed structures, as shown in the plan. Freight cars are spotted on this siding as near the building construction as possible, and the lumber is unloaded and carried to the various points of use by motor trucks and teams. For this service a United States Army motor-truck company, consisting of about thirty Peerless trucks, is available for the contractor's use. In addition, a number of horse-drawn wagons have been provided, as well as lighter Autocar trucks. An experiment is being made in the use of industrial tracks and cars for the delivery of lumber and other supplies from the freight cars to the points of building construction, but at the time the work

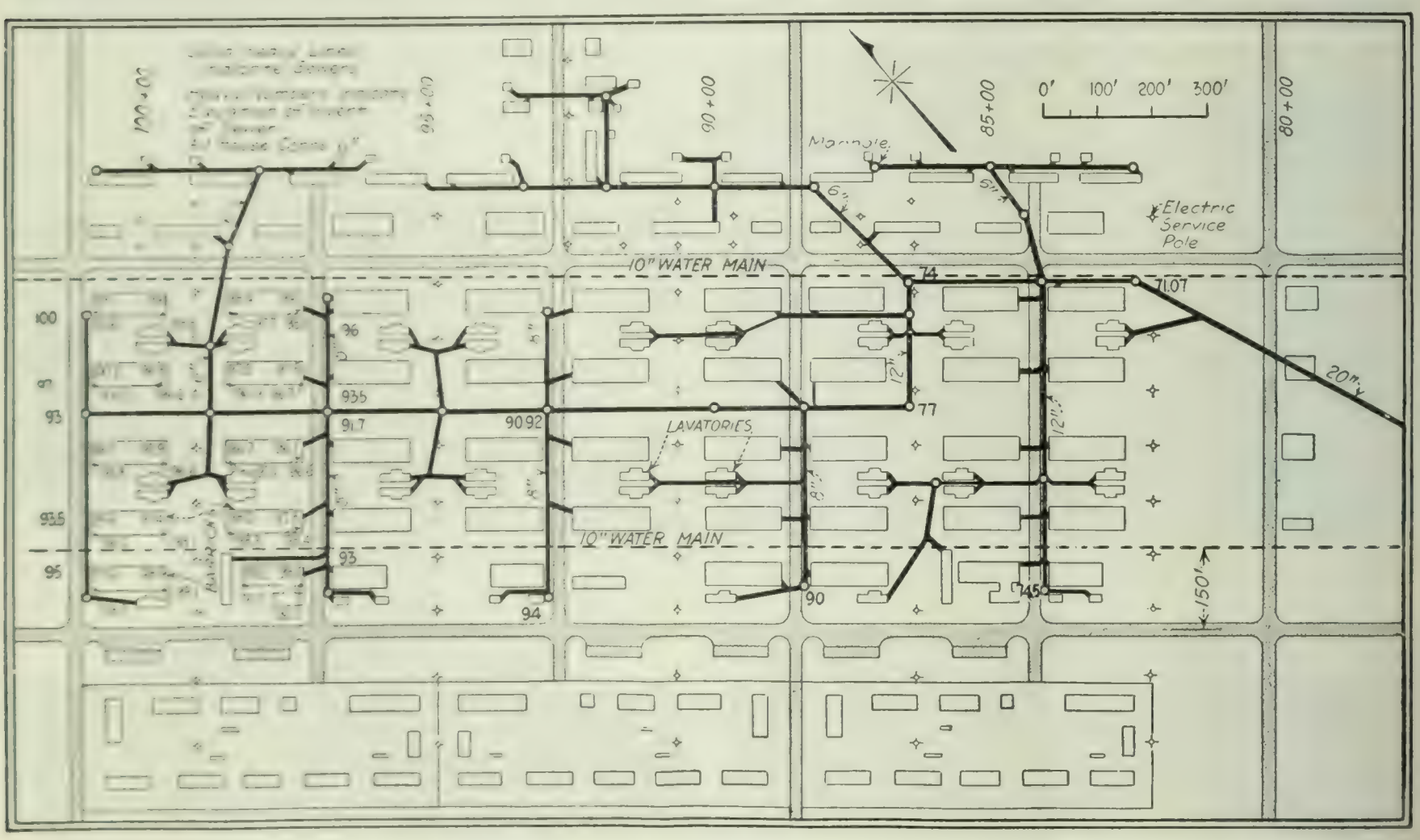
was visited the transportation system had not been developed to a point which would indicate the relative merits of motor-truck and industrial-railway transportation.

Barracks Sides Built Flat on Finished Floor Are Raised to Vertical Position

The standard barracks unit, two stories high, measures 140 x 43 ft. in plan, overall, and its details are shown in the drawings reproduced in *Engineering News-Record* of July 5, page 9. In constructing them, the Thompson-Starrett Co. has adopted a scheme which eliminates the use of scaffolding. Wooden posts are sunk in holes several feet deep to carry the sills and floor joists. The next operation is the laying of the rough flooring. Upon this flooring the two sides of the structure are framed, and upon the studding, lying flat on the floor of the building, tar paper and the wooden sheathing for the sides is nailed. In other words, the sides of the building are put together, complete, in a horizontal position rather than in the vertical position which they occupy in the completed structure. When the pair of side walls is finished, snubbing lines are attached, at intervals, along the outer edge, as the wall lies flat on the flooring, workmen are lined along the inner edge every few feet and at a given signal raise the wall upward into its vertical position, where it is held by a temporary bracing until the other side wall and the end walls can be raised into place in the same way. This scheme of construction, according to the contractor's representative, is a great time saver, as it not only does away with the use of scaffolding but also secures faster work on the part of the carpenters, who are enabled to do all framing and nailing of siding boards at ground level. The construction of the buildings is in charge of G. A. Graham, assistant engineer of construction.

Water Supply Through Wood-Stave Pipe

The camp water supply will be obtained from fifteen 8-in. driven wells located about 3 miles from the nearest camp building, as shown on the accompanying plan. Tests have indicated that each well can be counted upon for a minimum output of 150 gal. per minute. A pumping plant of three centrifugal units delivers into a 14-in. wood-stave pipeline 13,200 ft. long, extending uphill to four elevated tanks of redwood, each having a capacity of 200,000 gal. The lift is about 125 feet.



TYPICAL ARRANGEMENT OF VITRIFIED PIPE SEWERS FOR A THREE-REGIMENT GROUP OF BUILDINGS

Although the elevated tanks are high enough to supply most of the camp area by gravity, it was decided to increase the pressure to cover periods of maximum use and for fire-protection purposes. With this end in view, a booster station is provided below the elevated tanks.

All of the water-supply system will be distributed through wood-stave pipe, with a minimum cover of 2 ft. to provide against freezing and against crushing by heavy motor-truck loads. The trench for the pressure line uphill from the pumping station No. 1 is being dug by a Parsons trench excavator. This machine, reinforced by others, will also be used on the distribution system and on the trenches for the sewerage system. The construction of the water-supply system is in charge of E. G. Hopson, assistant engineer of construction.

Sewerage and Sewage Treatment

The sewerage system is designed to handle a maximum flow of 10 cu.ft per second. It will consist of vitrified clay pipe, from 8 to 30 in. in diameter. About

one-half of the flow will have to be pumped. The United States Army makes certain standard assumptions regarding the amount of sewage produced by military units, which is summarized in Table I. This table is based on the assumption that the maximum flow from the entire cantonment at any time will be equal to the maximum flow from one brigade plus the normal flow from all other units. Trunk and outfall sewers severally should be designed on this basis, according to War Department instructions. For example, if there are two trunk sewers, one receiving sewage from five

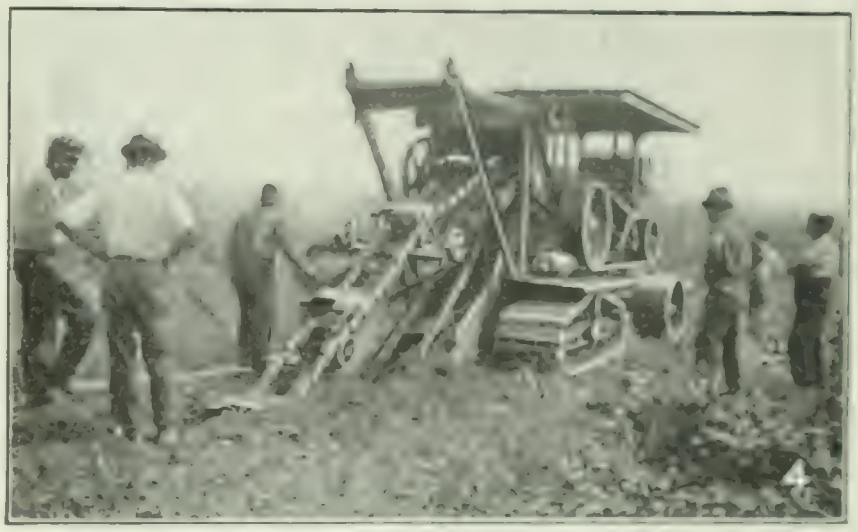


Getting Water Supply to Camp

1. UNLOADING WOOD-STAVE PIPE
2. PUTTING DOWN 8-INCH WELLS
3. MOTOR TRANSPORT FOR PIPE DELIVERY
4. TRENCHING FOR PIPE LINE







units and the other from seven units, these trunk sewers will have respective capacities of 5.5 and 6.5 cu.ft. per sec., while the outfall sewer receiving the flow from both trunk lines should have a capacity of 9 cu.ft. per second.

TABLE I. SEWER DATA, U. S. ARMY SPECIFICATIONS

Regts. of Infantry	Flow, Cu.Ft. per Sec.	Regts. of Infantry	Flow, Cu.Ft. per Sec.
1	1.5	8	7.0
2	2.0	9	7.5
3	4.5	10	8.0
4	5.0	11	8.5
5	5.5	12	9.0
6	6.0	13	9.5
7	6.5	14	10.0

The grades at which the sewers are laid are such as to produce a velocity of 2½ ft. per sec., which is considered to be self-cleansing. The regiment of infantry is the basic unit used in army camp sewer design.

Typical Sewer Layout

A typical arrangement of sewers for a three-regiment group of buildings is shown in the accompanying drawing. The house connections are uniformly 6 in. in diameter, the branch lines 8 in., and in this case the connecting mains 12 in. The latter deliver into a 30-in. outfall line. The buildings are so arranged that the kitchens are all on the street ends, thus allowing for economy in the use of pipe.

The pipe will be laid in trenches excavated by machine as soon as the building operations have progressed sufficiently to allow the trenching work to proceed. The pipe will be laid with cement joints and with a minimum earth cover of 2 ft. At road crossings, where heavy motor-truck loads are liable to be superimposed upon the tile pipe, the latter will be encased in shells of concrete. An important detail of the design is that both sewer and water-supply lines are offset from the roads, so that the maintenance and repair of the subsurface structures will not block highway traffic.

The following minimum grades have been established for the sewer lines: 6-in. diameter, 0.5 per cent.; 12-in. diameter, 0.23 per cent.; 20-in. diameter, 0.14 per cent.; 30-in. diameter, 0.07 per cent.

Sewage Treatment Plant

The disposal plant is located about one-half mile northeast of camp, and consists of duplicate covered septic tanks, each 100 x 25 ft. in plan and 8 ft. deep. These tanks are of standard design furnished by the Quartermaster Department of the army. In each tank are four hopper-bottomed pockets, from which the accumulated sludge will be discharged by gravity onto sludge-drying beds. As a matter of fact, it is expected that the plant will be called upon to deal with very small quantities of sludge, inasmuch as the bulk of the solids will be fecal matter, which will break up and decompose.

The tank effluent will be distributed by wooden troughs to thirty acres of slow-sand filter with 6- and 8-in. under-drains leading to a nearby swamp. The filter area will be divided into beds approximately 1 acre in area. The filter beds will utilize the natural layers of sand to at least a depth of 6 ft., through which the settled sewage will pass. The construction of sewerage systems and disposal works is in charge of E. W. Clarke, assistant engineer of construction.

How Materials Are Checked

The adoption of the percentage form of contract for all of the Government cantonment work has necessitated the installation on each job of a systematic method of auditing by expert accountants. There is a central auditing bureau in Washington and a field auditor for each contract; the Camp Upton work is in charge of A. V. Dillon. In order that a check on materials may be had, the contractor is required to submit three copies of all orders for materials or supplies. One of these goes to the material inspector, one to the receiving clerk, who checks the quantities, and the third to the voucher clerk for the field auditor's files. On the third copy all prices and extensions are verified.

The contractor must sort out invoices immediately on their receipt and give the right of way through clerical channels to those on which a cash discount may be had. Duplicates of invoices go to the field auditor, and are, by his staff, compared with the original orders. The latter, meantime, have been checked as to prices and extensions, so that there is practically no delay in certifying to the correctness of any invoice. If the order is not complete, the field auditor makes up dummy receiving sheets, and when enough of these dummies have been made to account for the entire order, the bills are O. K.'d.

When the contractor accumulates twenty or more invoices he makes up a voucher sheet and presents it for reimbursement, having already paid the sums represented by the various invoices.

At the end of each month the contractor submits a statement of labor and materials, which is checked from the field auditor's records. Payment includes the balance due plus 3½ per cent. on all money paid to the contractor during the month. The remainder of the percentage fee due the contractor is retained until the work is completed.

When a piece of heavy machinery is received on the job it is immediately evaluated by representatives of the Constructing Quartermaster and a rental value fixed. If the rental paid at any time shall equal the total valuation of the machine, further rental stops and the machine becomes the property of the Government. Another contract stipulation is that the Government may take over any machine by paying the difference between its assessed valuation and the rent already paid.

Roads

A separate contract for road construction within and adjacent to the camp site was let to the Barrett Co. The camp site will be served by systems of primary and secondary roads, each of 34-ft. width. These roads, of which the primary system includes eight miles and the secondary system twelve miles, will be tar-surfaced by the penetration method. It will be necessary to import all stone, as no local supply is available. Practically no drainage troubles are anticipated, as the Long Island soil is sandy and surface water will seep through it readily. All roads, however, will be built above the normal ground level, with water mains and sewers at the sides. It is expected that these roads, when the site becomes an army training camp, will be subjected to exceedingly heavy motor-truck traffic, and a maintenance force will be kept on the work continuously. The road work is being handled for the Quartermaster Department by S. B. Bunker.

A New Kind of "Government Job"

By the time this article appears, building construction, which had hardly got under way early this month, will be in full swing. The fact that 25,000,000 ft. of lumber will be used for the barracks, storehouses, and other structures, and that a complete water-supply system, sewerage system, and disposal works, and a network of bituminous-surfaced roads, are required, gives one some idea of the task which the engineers and contractors are facing. The man who has always regarded "Government jobs" as sinecures gets a rude shock when this sign confronts him on the door of the engineer's shack:

> MEMORANDUM
> Office hours of this organization are as follows:
> 8 a.m. to 6 p.m.
> Field parties are expected to be out in the field during these hours. Inspectors' hours in the field are to correspond to the contractor's working hours.
> (Signed) D. W. HOWES,
> Engineer of Construction.

In the early days of the job, a new draftsman approached M. M. Farley, assistant engineer in charge of all field-office work:

"What style of lettering do you want on this drawing?" he asked.

"Anything that I can read and that you can do the quickest," Farley replied.

And there you have the spirit of the Camp Upton job.

No Refinements on War-Zone Roads

The refinements of road building receive scanty attention along the battle line in France. In the early days attempts were made to use telford foundations in damp places, where suitable stone could be obtained. The stones were set on edge and wedged with small stones. In ordinary times such a foundation is then consolidated by running a roller over it. But behind the trenches no roller could be used. It would rarely have been possible to get it there and it would have been too much in the way of guns and ammunition wagons to be allowed there in the rush of a forward movement. So instead of a roller with broad wheels, the much narrower wheels of heavy gun carriages and limbers were dragged over the stones and hammered them down into the mud. Had it been possible to cover the stones immediately with broken bricks or building refuse the foundation might have proved satisfactory, but under the existing conditions it was a hopeless failure. So instead of wedging the stones upright, the army road builders finally laid them flat. The traffic shook these flat stones down quickly—more being placed on top.

Water-Pipe Blowout Undermines an Elevated-Railway Column

Paved Street Is Undisturbed and Elevated Railway Only Slightly Depressed by Cavern Forty Feet Long

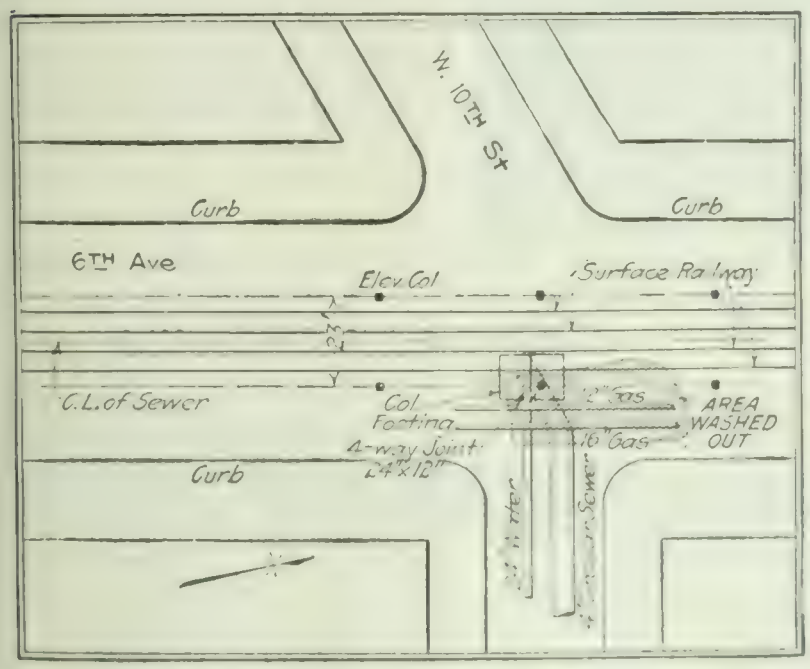
By James F. Fouhy
Section Engineer, Public Service Commission, New York City

A RECENT water-pipe blowout under an elevated-railway column in New York City was surprising in that a cavern some 43 ft. long and 5 to 15 ft. wide was dug out underneath the heavy paving of the street and was not discovered until a public-works inspector detected it in tracing the cause of the flooding of a near-by cellar. A slight settlement of the column was noticed, but not enough to cause any effect on the elevated-railway traffic.

At the corner of 10th St. and Sixth Ave., a 4-ft. circular brick sewer of many years' standing runs diagonally across the line of the Sixth Ave. elevated through the footing of one of the railway columns. A 24-in. water main passes through the sewer just under the railway. A 24 x 12-in. four-way on this low-pressure water main had a blowout, and the water escaping demolished the encircling sewer and carried away the surrounding earth, opening up a cavern about 43 x 15 ft. in plan. As stated above, no sign of the disturbance was noticeable on the street. The pavement of 3-in. sheet asphalt on 8 in. of concrete remained in place, carrying the heavy street load until the cavern was discovered. Traffic was immediately suspended on the elevated railroad and on the adjacent street. An examination of the subsurface condition was made and provisions immediately begun for shoring.



CAVERN CAUSED BY WATER-MAIN BLOWOUT UNDER RAILWAY COLUMN FOOTING

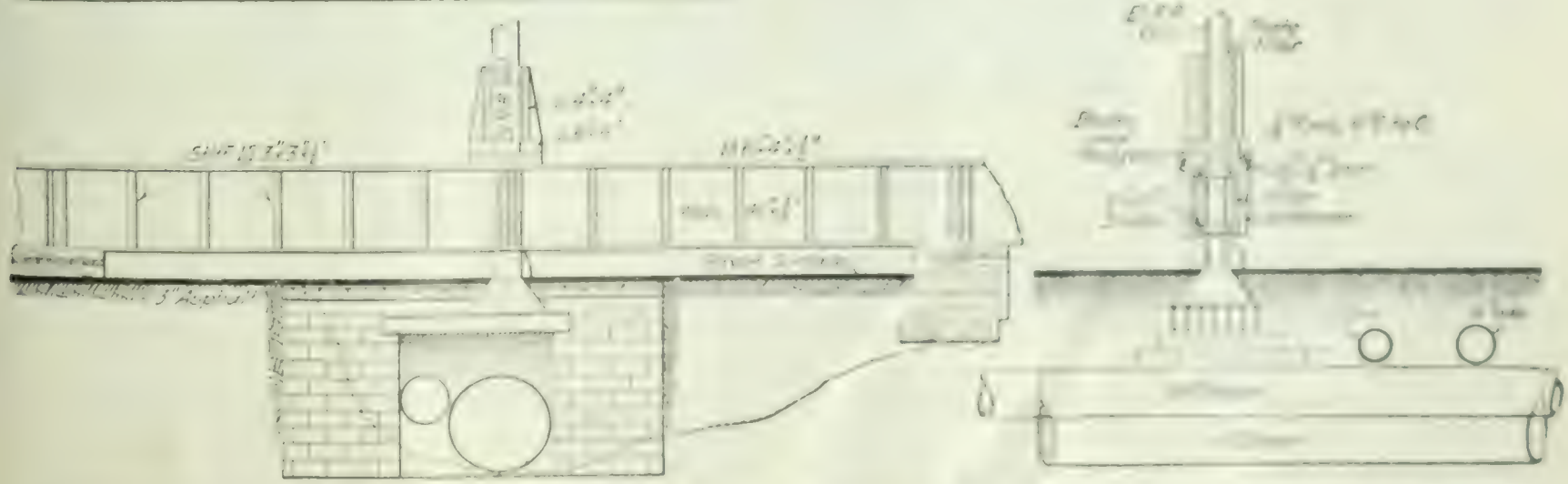


Location of Column and Mains

The accompanying plan shows the location of the column and its footing and the near-by water, gas and sewer line. In the original construction, as shown there, I-beams supported on piers located on either side of the sewers distributed the elevated-column load to the ground.

In the repair, heavy girders were placed spanning the cavern and supported on blocking on the street and partly in the cave-in. The column was then jacked onto these girders through the medium of riveted outstanding angles and plates. The shoring was completed and the elevated-railway service resumed at 4 a.m. of the day following the washout—that is about 12 hours after the cave was discovered. Trains, however, were obliged to pass over the settled column at a much reduced speed. It is fortunate the trouble was discovered early in the afternoon, for elevated-road traffic is much heavier beginning about 5 p.m., when the headway between trains is much reduced. At such a time a serious accident might have occurred.

In the reconstruction the curve has been taken out of the sewer, and it is carried west on a straight line to connect with the Sixth Ave. trunk sewer.



WATER-PIPE BLOWOUT UNDERMINES ELEVATED RAILWAY COLUMN—STREET REMAINS UNDISTURBED

What Are the Prospects of Navigation on the New York Barge Canal?

Full Depth Is Practically Available from Lakes Ontario and Champlain to Tidewater and Many Terminals Are Ready, but Lack of Boats and Public Interest Postpones Use at Critical Time

BY FRANK C. WIGHT
Associate Editor, Engineering News-Record

THESE are promising times for the inland waterway. The traditional opposition to its use, whether based on sound economics or on personal profit, has faded away before the overwhelming demand for freight carriers and the insufficiency of the railroad. Governmental assistance is active; and railway obstruction, if not passive, is at least less forceful than in the past. If success for inland-waterway transportation is ever to be possible, it should be now.

It so happens that the New York State Barge Canal—historically and economically the most important artificial waterway in the country—is nearly completed at this time. As a piece of engineering, that canal has had the wide publicity among engineers befitting one of the largest projects of the generation. As a navigation unit, little has been said about it, because until recently its navigable stretches have been incomplete and scattered. Report on the present conditions of the canal and the prospects for its completion, with the conditions of navigation now and in the immediate future, should be of timely interest.

The Barge Canal, authorized by a vote of the people of the state in 1903, connects Lakes Erie, Ontario and Champlain with tidewater by a water channel capable of carrying boats and barges up to 2000 tons capacity. The main line extends from the Niagara River at Tonawanda, east to the Hudson at Waterford; the Oswego branch provides a connection from the main line just west of Oneida Lake down to Lake Ontario at Oswego; the Champlain branch carries over a summit level between Whitehall, on Lake Champlain, and the Hudson River. A branch ties in Lakes Seneca and Cayuga.

Throughout the whole canal length, a total of 440 miles, the minimum depth is 12 ft. and the minimum sections vary as follows: In rock, 94-ft. bottom width for full depth; in earth, 75-ft. bottom width, with 1 on 2 side slopes, giving a 123-ft. surface width; in rivers, 200-ft. bottom width for full depth. The locks, of which there are 57, are 311 ft. long, 12 ft. deep over miter sills, and 45 ft. wide. Overhead clearances are fixed at a minimum of 15½ ft. above the water level.

The entire design and construction of the canal system has been under the direction of the State Engineer and Surveyor, which office has been held by F. A. Van Alstyne, 1904 to 1906, Frederick Skene from 1907 to 1908, Frank M. Williams from 1909 to 1910 and 1915 to the present, and by John A. Bensel from 1911 to 1914.

The canal follows the general route of the original New York State canals, with the important exception that wherever possible the existing rivers are utilized



THIS IS A LAND CUT SECTION OF THE CANAL WHERE THE WATER SURFACE IS 123 FEET WIDE AND THE BOTTOM WIDTH ONLY 75 FEET



THE SAME BOATS THAT NAVIGATE THIS HUDSON RIVER SECTION MUST ALSO PASS THROUGH THE NARROW WATERWAY ABOVE

in place of the land cut of the early day. About 72% of the whole system is in river or lake channel. The main line approximates in line the old Erie Canal, work on which was started at Rome just 100 years ago. Instead of starting at Buffalo, however, as the old Erie Canal did, traffic will follow the Niagara River up to Tonawanda, where the Barge Canal starts. From Tonawanda east to Palmyra the canal is practically an enlargement of the old Erie Canal, which was dug in a land cut, with the exception of a section at Rochester where the new canal passes a few miles south of the city, utilizing the Genesee River for a branch connection down to Rochester.

Eastern Section in Canalized Rivers

From Palmyra east to the Hudson numerous rivers are canalized for the most part, although in straightening bad curves in some short sections land cuts had to be made. Going east, the first rivers are the Clyde and the Seneca; the latter empties into the Oswego River at Three Rivers, and from that point north the Oswego Canal continues to Lake Ontario as a canalization of the river. From Three Rivers to Oneida Lake the Oneida River is followed and a long, open navigable waterway afforded through the lake to Sylvan Beach, where a land cut and a small creek are utilized to just beyond Rome, from which point the Mohawk River and its tributaries are canalized clear down to Crescent, just northwest of Waterford, where a flight of five high locks drops the canal into the Hudson.

The old Erie Canal from Clyde east to Rome is in a more southerly location, passing through Syracuse, which in the new system will be reached by a branch through Onondaga Lake. From Rome to Cohoes the Erie Canal is south of the Mohawk River and reaches the Hudson River through a long flight of locks at Cohoes. The Champlain Canal is a canalization of the Hudson River as far north as Fort Edward, from which point it utilizes small streams and land cuts down to Whitehall, on Lake Champlain. The Cayuga and Seneca Canal, connecting up the lakes bearing those names with



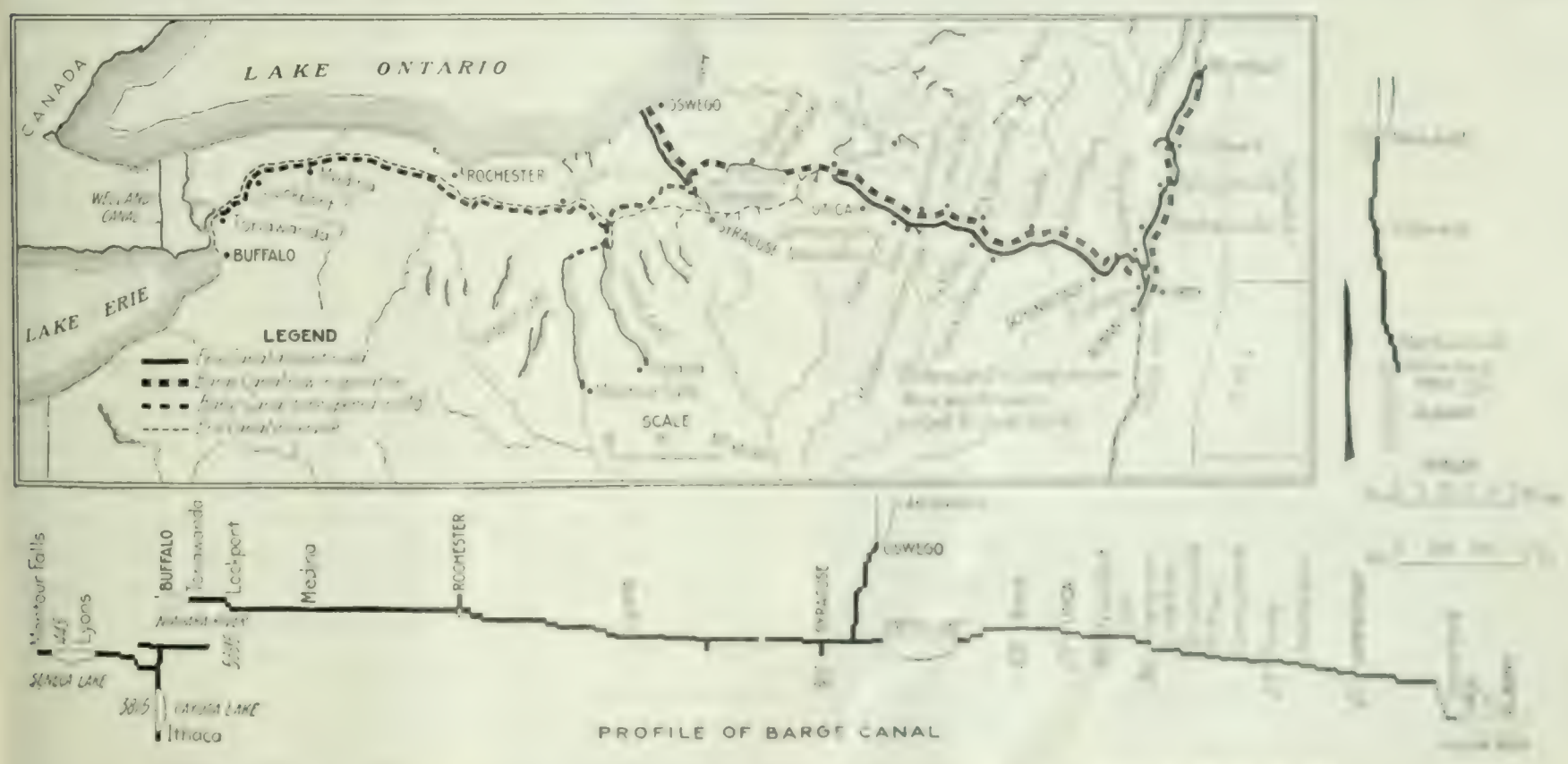
THE ALBANY RIVER TERMINAL IS A TYPICAL WALL

the main-line canal, is a canalization of the Seneca River and enlargements of old canals existing on about the same line.

As will be noticed from the profile, the canal drops by a series of locks from Lake Erie to the low level north of Syracuse where the Oswego Canal drops still farther to Lake Ontario. The summit level east of the Oswego Canal is at the Rome level, which is fed by the Delta reservoir northeast of Rome. The Rome-Hudson section is still further fed by a reservoir at Hinckley, north of Herkimer.

Condition of the Canal Today

The new system is now open for its designed width and for a draft of 8 ft. from Lakes Ontario and Champlain to tidewater. That is, the Champlain Canal is open for its full length; the Oswego and Erie Canals



MAP SHOWS THE CONDITION OF THE NEW YORK STATE CANAL



AT TROY THE RAILROAD TRACKS ARE RIGHT ALONGSIDE THE TERMINAL DOCKWALL ON THE HUDSON

are open from thence eastward to the Hudson. In these sections the designed depth of 12 ft. is available at all but a few places where shoals have appeared since the full depth was made. On this account the Superintendent of Public Works has never changed the 8 ft. draft restriction made at the opening of navigation this year.

From Rome, west to Lake Erie, canal navigation still follows the old Erie Canal. That canal is in operation from the junction lock in Rome to a junction lock at Mohawk, just west of Herkimer, but is utilized there for only local traffic or for water-supply purposes. From the junction lock at New London, just west of Rome, the Erie Canal is in operation along the old line to Buffalo with an allowable depth of 6½ feet.

The section of the Barge Canal west of Rome is held up by several local pieces of construction, all of which are to be completed with the opening of navigation in 1918. These pieces of work are some railroad crossing revisions around Tonawanda, the Genesee River improvements at Rochester, some channel enlargements at Lyons and Clyde, and the removal of the old aqueduct carrying the Erie Canal across the Barge Canal at Montezuma, north of Cayuga Lake. Practically all the structures on the whole Barge Canal are now completed.

Many of the Terminals are Completed

Terminals on the old canal system were of minor importance. On the new waterway, however, with its prospective large boats and power towing, the facilities for transferring freight to land assume great importance. The original vote did not provide enough money for the very necessary terminals to the canal, so in 1911 through a referendum the State of New York appropriated $19,800,000 to be spent on terminals. With this sum and with other money diverted from the original appropriation, terminal construction has been proceeding during the past four to five years.

The terminals are of two general types, the marginal dock wall and the pier. In the dug canal and in the rivers a marginal wall in a slightly widened section of waterway is the standard. In lakes, however, and around New York City, where transshipment from larger boats to canal boats is to be expected, typical piers have been designed and built. These terminals are located all along the canal and also in and around New York City and up along Lake Champlain. Applications have been made for some terminals along the Hudson River below Albany, but so far none have been commenced.

At present a considerable number of marginal terminals are in use though not entirely equipped. They are located at Albany, Troy, Mechanicsville, Schuylerville, Thompson, Fort Edward, Whitehall, Crescent, Schenectady, Amsterdam, Fonda, St. Johnsville, Fort Plain, Little Falls, Herkimer, Ilion, Frankfort, Utica, Rome, Cleveland, Eastport, Ithaca, Lyons, Medina, Lockport and Tonawanda. Other marginal terminals are under construction at Mott Haven in New York City, Cohoes, Canajoharie, Oswego, Rochester and Buffalo.

Pier terminals have been completed at Plattsburg and Port Henry on Lake Champlain, and Oswego on Lake Ontario. There are under construction the revision and reconstruction of Pier 6 on the East River of New York City, and new piers at Gowanus Bay in Brooklyn, N. Y.; Rouses Point on Lake Champlain, Syracuse on Lake Onondaga, and Buffalo on Lake Erie. Some other terminals are under design and probably will be put under construction during the coming season.

Little Terminal Machinery Has Been Installed

In all of these terminals what has been completed is merely the structure; that is, a wall or a pier, in some cases paved, but in most cases only filled, immediately adjacent to deep water, with its approach just as the local authorities were pleased to leave it—in some cases in very poor condition. As far as equipment is concerned, nothing has been installed except a few small derricks, mostly hand controlled, and in a number of terminals a temporary wooden freighthouse, painted in every case a conspicuous yellow which distinguishes it in any group of buildings. Bids have recently been opened for some package-freight handlers to be installed in a few loca

tions, where such freight is expected, and designs are under way for more elaborate freight-handling machinery. Installing this machinery and constructing permanent freighthouses, however, are being deferred until prices reduce somewhat and traffic seems to demand such improvement.

The terminal facilities are so far deficient in their relation to rail connection. In Troy, the dock wall is fortunate in its location, in that it has the tracks of two railroads immediately alongside, so that the transfer of freight can be readily and cheaply made from rail to boat. The wall at Buffalo, too, will be carried up to rail connection, and it is possible to develop rail connection to the Syracuse piers now under construction. At the other locations, however, rail connections have not been provided. It is of course hoped that in the future the terminals in most of the cities will be tied up to railway connections, so that the canal may be used to serve not only the canal banks, but also through localities not on the canal.

Towing by towboats is necessary on the canal, as there are no towpaths. While the state provides towboats which can be rented at a fixed charge (determined so as not to make a profit, but merely to take care of necessary expenses), it is expected that a large part of the travel on the canal will be by towboats owned by the operators. No charges are made for the use of the canal, except for towing. The terminal charges are designed not to make money, but to afford some control over the use of the terminals, which otherwise might be turned into mere storage stations.

State Control of the Canal Is Assured

The operation of the canal will be under the direction of the Superintendent of Public Works, as is the operation of all the other canals in the state. He maintains the canal in a state of structural efficiency, keeps the channel to the proper depth and width, mans the locks and dams, operates the state-owned towboats, and superintends and operates the terminals.

By far the most important job before the superintendent in the immediate future is the work which will come under the jurisdiction of a new officer to be known as Canal Traffic Manager. This is a position which formerly did not exist, but which the necessities of traffic and rail competition make necessary if the new canal system is to be of its expected value. The new officer will be in charge at first of publicity. He will make the canal known to the people of the state, who, strangely enough, do not seem to realize its existence. He will, through whatever means are available, try to encourage individuals to use the canal. He will, working through boards of trade, chambers of commerce and the city governments, try to get individual cities to encourage their citizens to use the canal and build proper approaches to the terminals provided by the state. It will be his further duty to encourage the organization of corporations owning and operating a large number of boats and, finally, to get business for the canal just as does the freight agent for his railroad.

This officer was only appointed a few weeks ago, and he has not as yet been able to do more than organize his office and plan a campaign. It is unlikely that his work will begin to tell until next season.

The preparation for the use of the Barge Canal is tied up to a question which involves the very existence of an enlarged canal. What type of boat is to be used?

In the years before the referendum of 1903 there was an historic fight between the barge-canal and the ship-canal adherents, between those who wanted the canal to carry 1000-ton barges from Buffalo to tidewater and those who wanted a deep waterway capable of floating a seaworthy ship which could navigate both lake and ocean. The former scheme demanded transshipment at lake and ocean ports and naturally had the greatest number of advocates in Buffalo and New York, where transshipment charges would be paid. The latter involved a tremendous amount of expensive construction and would have benefited the general economic condition of the country rather than of New York State or any of its cities. The barge canal won out.

What Boats Are Being Built?

As originally planned, that canal had the same water sections as have been built. The locks, however, were only 28 ft. wide. The water section and the lock section were both predicated on the use of a 1000-ton barge of 25-ft. beam and drawing 10 ft. of water, allowing the usual assumption in canal design of 2 ft. of water below the keel. Such a section has a ratio of 1:4½ to the minimum cross-section of the canal proper. For the Erie Canal the ratio was 1:3.4; in the 1840 enlargement of that canal it was 1:4. The barges which it was assumed would be built then, would have fair clearance in the lock and would be able to pass each other in the narrowest section of the canal proper.

After the first designs were made, but before construction had started, locks were changed so as to have a width of 45 ft., which is the width of the old Welland Canal locks, although those locks have a depth over miter sills of 14 ft. against the 12 ft. of the New York State Barge Canal. Ostensibly, the reason given for this change was to permit the passage through the Barge Canal via Oswego of all except the most heavily loaded vessels which could pass through the Welland Canal. In effect, the change automatically enlarged the capacity of the Barge Canal, partly in fact, but more in the minds of those who were planning for its use. It made practicable the use of a barge of a capacity of at least 2000 tons. It did more; it opened up again the possibility of a ship canal, which had been buried a decade ago.



THIS SEAWORTHY SHIP MAY USE THE BARGE CANAL

The result is that there has been a revival of interest in the possibility of building ships which will traverse lake, canal, river and ocean; which can, in effect, load at Duluth and deliver in New York or any ocean port.

The General Electric Co. has had one of its engineers working for some time on a project to utilize a combination lake-and-canal steamer, which will be able to travel between all of the General Electric Co.'s plants; that is, from Cleveland through the canal to Schenectady, thence out into the Hudson and the ocean to Lynn and Norfolk. The project has reached an advanced stage, but no boats have as yet been built. A design recently published in the *General Electric Review* shows a boat 260 ft. long, 43 ft. in beam and of 10- to 17-ft. draft, which is represented as being able to carry a cargo from Duluth to any point on the Atlantic Coast. Such a boat will have hatches and side ports to facilitate the handling of package freight and will also be available for bulk freight. The speed will be 10 knots with 750 hp. applied by electric motors to twin screws, the engines being driven by Scotch boilers over oil burners, furnishing steam to a Curtis turbo-generator.

According to the article, the dead-weight carrying capacity would be roughly 1200 tons on 10-ft. draft, 3000 tons on 17-ft. draft, and available space for cargo would be about 85,000 cu.ft., or the equivalent of 50 box-cars. The General Electric Co.'s program also calls for coal barges to be drawn in tows, for fast 150-ton boats running between Schenectady and New York on short-schedule service. A plan is also proposed by the company for a terminal unit at Schenectady which is to be lined on both sides by walls somewhat after the nature of a lock and the boat, warped into the terminal, to be loaded and unloaded from a 120-ton gantry crane traveling on the two side walls.

One Large Ship Has Been Built

A second project of the same sort, though somewhat of a mystery, is still part way toward development. This is a ship, similar in type to that proposed by the General Electric Co., which has been built by the McDougal-Duluth Co., of Duluth, Minn., and which has already made one trip from Duluth to Montreal through the Welland and other Canadian canal systems. This ship, a view of which is shown, is 258 ft. long, 43 ft. in beam and of 23-ft. molded depth, and will carry 2400 tons on a 14-ft. and 1800 tons on a 12-ft. draft. It is steam-driven and is designed for lake and ocean travel. It has been certified and insured to go anywhere. This ship has a side clearance of 2 ft. through the locks and a vertical clearance (leaving off railing and upper works) of but 2½ ft. under bridges when drawing 10 ft. of water.

The Barge Canal will have 12 ft. of water, but it is intended not to permit traffic of boats drawing much over 10 ft. of water, so that the boat will have to be loaded quite light to go through the canal. The upper works—that is, the cabin, funnel and forward pilot house—are all removable and will be stowed away during the canal passage. The greatest secrecy is being preserved over this craft, but the report is that it is to be used for grain transportation from Duluth, through the Great Lakes and the Welland Canal down the Oswego branch to New York.

It should be noticed that such boats as the ones described have less capacity for canal travel than for lake and that two such boats, just clearing the locks, cannot pass in the land-cut sections of the canal.

The prospects for many new or enlarged barges fit to traverse the Barge Canal are very slight. Boat building for the Erie Canal has not been a prosperous business in the recent past. Most of the shipping being used on that canal is old and decrepit, some little of it with power haul, but most of it using the historic mule. Of course, such boats as already exist can be used on the new Barge Canal in tows of larger number than could pass through the old Erie Canal locks, and it is the desire of the state officials to encourage the use of such boats as much as possible. The great demand for lighters in and around New York Harbor, however, has almost depleted the Erie Canal of its floating stock. A boat goes down the canal under the charge of its captain and owner, reaches New York Harbor and is immediately put in service for lighterage use at a compensation higher than the owner can get by taking it through the canal.

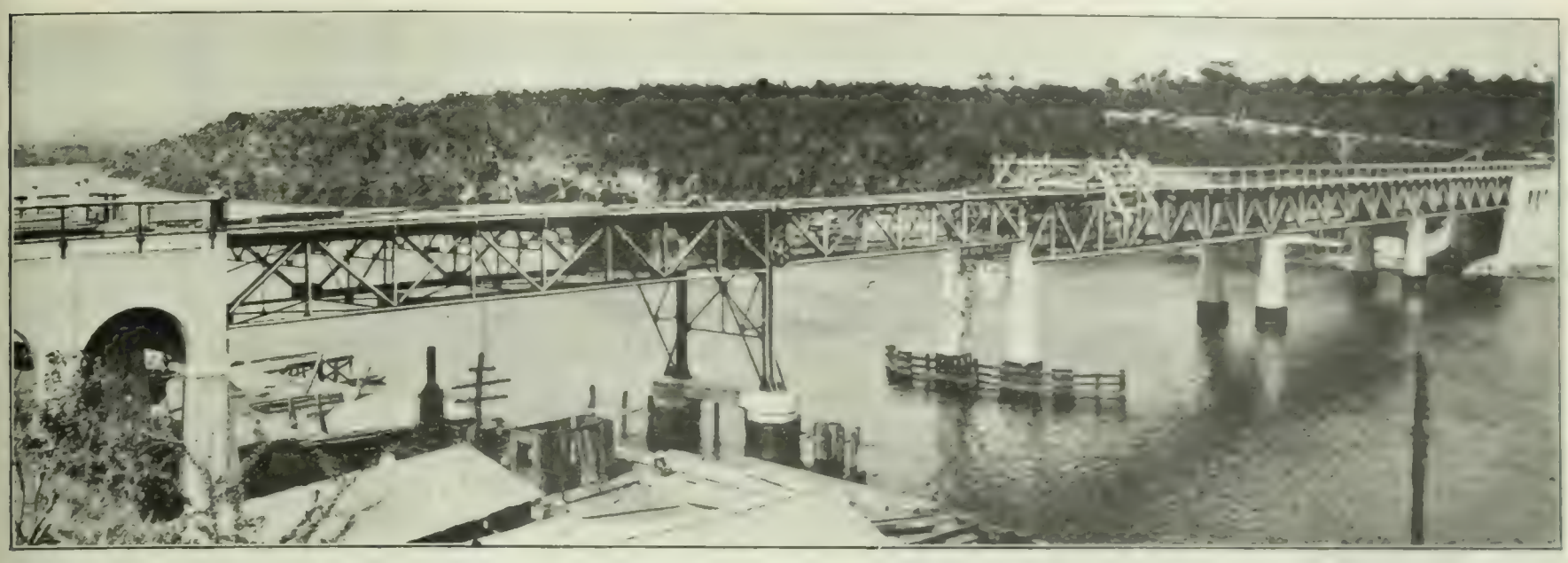
Some few wooden barges of a size profitable to carry through the Barge Canal are under construction, and it is understood that certain steel barges will soon be put on the ways. Steel barges now cost about $60 a ton against $15 a ton in normal times, so that little can be expected toward the construction of such boats, unless the Federal Government steps in to reduce prices.

Freight-Handling Business Needs Reform

The business of handling freight on the old canal was was most primitive. For the most part the boats were owned by their captains, who operated as freelances. Conditions are little better today. In some ways they are worse, because so many of the boats are not now on the canal. There is, however, one large concern engaged in freight handling and forwarding in the new canal. This company owns a number of boats of small size and contemplates building more of the Barge Canal dimensions. It has offices and warehouses where business may be transacted in a manner approaching what is hoped will prevail on the completed canal.

With this one exception any freight shipping on the canal this year can be conducted only by those who are acquainted with the elementary means available. It will be the hardest kind of a job for an ordinary shipper to find boats or to be sure that his freight will have safe or certain transportation. The last legislature passed bills guaranteeing control of the shipping by the Public Service Commission and making mandatory a joint way bill for canal and rail routing so that businesslike transportation conditions should now prevail on the canal system, provided the state officers succeed in persuading men to go into the freight-handling business and other men to make an effort to avail themselves of the lower freight rates canal shipments should offer.

For the present year, however, there is small promise that the New York State Barge Canal will carry even as much freight as has the Erie Canal during recent years. Whether publicity can overcome apathy, and whether the facilities produced by the state will be made use of, remain as yet to be seen. Meanwhile, there is doubtless another pretty fight brewing between the ship and the barge advocates.



Building a Bridge Under Adverse Conditions in San Domingo

Lack of Local Material and of Skilled Labor Do Not Prevent Scheduled Completion of Modern Steel Highway Bridge Across River Into Which Columbus Sailed

By E. S. NEEDHAM
Formerly of Department of Public Works, Santo Domingo

A BRIDGE which was started under the lax overhead conditions peculiar to the equatorial Latin-American republic, continued through a revolution and completed under American military control would naturally seem to offer some differences in construction experiences from those normal to the United States. Such a bridge was recently completed across the Ozama River at Santo Domingo City, and in many incidental features was out of the ordinary. It is worth describing because, in spite of obstructions due to local conditions, the construction was carried out according to schedule.

The bridge is on historic ground. Standing on it and looking toward the sea, there appears on the left bank the ruins of the first chapel in the New World, and opposite on the right are the old fort and the ruins of the palace of Don Diego Columbus, son of the great admiral. In the right foreground is the famous tree to which Christopher Columbus is said to have moored his ships. On the site there had been low-level bridges for many years, but all had been washed away by successive storms. The new bridge, at the high level, contains a modern bascule span which will allow shipping to develop above the bridge site. Small craft can pass under the bascule, the free height above water being 30 ft. The bascule is 85 ft. long and the clear channel is 74 ft. between fenders. Approaching the bascule from the Santo Domingo side is a 98-ft. steel span, and from the other or Daurte side are three 140-ft. steel spans. The total length of steel spans is 610 ft.; reinforced-concrete approaches add to the length 50 ft. on the Duarte side and 66 ft. on the Santo Domingo side, making a total length of 726 ft., or about 220 meters over all. The width of the roadway between curbs is 19 ft., but the design provides for future sidewalks.

During the whole construction the builders were confronted with lack of plant and tools and the reluctance on the part of the native workmen to keep in repair such equipment as there was. Many delays were caused by plant failures due to carelessness or to the poor quality of material that was to be had in the local market. Many tools had to be improvised; for example, the contractor did not have a bar bender and one had to be built from scrap material. Due to the lack of skilled mechanics, ways and means within the capacity of the native workman had to be adopted and often the crudest methods of work used, rather than risk a failure of modern practice.

The Dominican laborer is capable of good results and is willing to learn. The skilled workman has not learned to follow a blueprint, and it was necessary, especially in building forms to make picture sketches of the separate parts for the carpenters, which took considerable personal supervision.

Native Divers Were Used

On one pier excavation had to be made by divers. With only the scantiest apparatus, the work was done successfully, though slowly, for the divers, almost without exception, were recruited from among the natives and were induced to go down by the prospect of good wages.

Difficult as it was to be sure of delivery of material from the United States, it was even more difficult to get native timber which was used in the bridge floor and is known as "candelon." Although there were forests of it not 100 miles away, the crude methods of hauling and the lack of mills to cut it, made it almost impracticable. Without highways or railroads to transport it, it came in small cargoes by coastwise sailing vessels and after 18 months of effort enough was procured for the bridge—some fifty or sixty thousand feet board measure.

The three concrete piers supporting the 140-ft. spans are of the cylinder type with reinforced-concrete pile

foundations. The bases extend 3 or 4 ft. below the river bottom, and the bridge seats are at El. 26 above mean sea level. The depth of water is about 20 ft. and increases but a foot or two from tides and floods. The river bed consists of alternate layers of black sand and blue and yellow clays, overlying gravel and black clay and at a depth of 90 ft. a stratum of very hard gray clay. Wooden test piles indicating the stratum of gravel determined the lengths for foundation piling.

The concrete piles were of 14-in. octagonal section, ranging in length from 10 meters to 16½ meters, of 1:2:3 concrete precast in the usual manner. The



GROUP OF CONCRETE PILES DRIVEN INSIDE OF STEEL SHELL JUST REMOVED

reinforcing consisted of eight ¾-in. square twisted bars with ¼-in. square spiral hooping of 12-in. pitch and on an occasional flat ring punch with holes to assist in spacing the main bars. A special basket reinforcement was placed at the head of the pile, consisting of several turns of the same ¼-in. steel at 1½-in. pitch. The effectiveness of this basket in keeping the pile head intact during driving is shown in one of the veins. The driving was done with a No. 3 Warrington steam hammer—having a weight of hammer of 1800 pounds.

In two piers there are 15 and 18 piles respectively in each of the two cylinders of 9-ft. diameter. The cylinders of the third pier are 8 ft. in diameter with 11 piles in each. These take the maximum direct load per pile, which, considering buoyant forces, was figured at 22 tons per pile.

The driving was done in advance of placing the cylinders, and various devices were used to prevent the piles from being driven outside of the required circle. The best results were obtained when the piles were placed through a guide at the surface of the water, made up of two concentric cylinders 5 ft. deep, with spacing blocks between. The pier cylinders were dropped over the pile heads and weighted down about 8 ft. through mud and silt into a clay stratum and were then pumped dry without difficulty with a 3½-in. Pulsometer. Experience showed that the cylinders, which were made of $\frac{5}{16}$-in. plates, would not sustain the pressure from the water without, and, to prevent buckling, timber bracing was used inside in the form of triangles which allowed a comfortable space in the center for excavating and concreting.

Pier Stability Increased in Novel Manner

Old rails were used in the pier bases as reinforcing and to bond the pile heads into the pier concrete. The reinforcing in the cross-girder at the top of the pier was designed to transmit a shock from one shaft to the other, and the continuity of reinforcing throughout tends to make the whole pier act as a unit for stability in the direction of the current.

To increase the stability of the piers in the direction of the center line of bridge, there are buried in the bridge seats wrought-iron billets projecting vertically between the ends of the trusses; and the trusses are connected one to the other by 2-in. round steel half-links which pass through slotted holes in the top chord. By this arrangement, a shock is transmitted from any one pier to two others, and in an extreme case the pier which would receive the blow would not be in danger of being knocked out from under the trusses. The bearing plates have slotted holes for expansion, but no sliding occurs on the cast-steel bases, as the piers yield to the movement of the spans.

Open Caissons Used on One Pier

The conditions at the pier supporting the bascule and 98-ft. span approaching from the westerly end of the bridge required a different type of foundation. No piles were used, there being a good bearing at El. 22, consisting of loose coral limestone rock compacted with yellow clay, known as "caliche," which is typical of the river banks and surrounding country. After considerable dredging, open caissons were put down and excavation continued by divers, pumping out being impossible owing to the limited plant and extreme porosity of the material encountered. The caissons were made of 12-ft. 8-in. diameter cylinders concreted around 8-ft. cylinders to which were added the 8-ft. cylinders which formed the shafts of the pier. They were assembled complete on board a scow; wooden bulkheads closed their bottoms and enabled them to float when launched into the water. After being located and sunk into position, the bulkheads were removed by divers; and as the excavation proceeded, the caissons were further lowered by weighting down. Concrete was placed through the water with a wooden bottom-dump bucket of 15 cu. ft. capacity. After filling the base the shaft cylinder was pumped out and concreted in the dry.

All of the pier concrete is of 1:3:5 mixture. The stone was all hand broken, the coral limestone in the vicinity being quite easy to break with a small hammer. The native women at times gather up the loose rock near-by and join in the breaking at 10c. per barrel.

All of the steel spans are riveted deck trusses, designed to carry a 20-ton road roller or a uniform load of 80 lb. per sq.ft., 15% being added to the live-load stresses for impact and unit stresses allowed as per American Railway Engineering Association specifications. The floor is of native hardwood, 3 x 8 plants of

"candelon" laid with ½-in. joints on 5 x 5-in. nailing strips of "baria." All fastenings are galvanized iron.

The lift span is a Strauss trunnion bascule, the main bearings of which are supported from the pier on steel columns. The counterweight contains 40 cubic meters of concrete, reinforced to carry the load into a steel frame which is suspended on bearings from the heel end of the bascule truss. The counterweight was built in its lowest position, the bascule being erected in the open position to accommodate river traffic. To avoid placing the floor while the bascule was in the vertical position, the counterweight was built with large temporary pockets; and when the span was lowered, the pockets were filled as the weight of the floor was added. The machinery for operating the span consists of shafting and gearing which drive a pinion engaging a rack bolted to the structural steel. The machinery is hand operated; four men on the bridge floor working a capstan can open or close the span in 10 minutes.

For the erection of the steel spans, a 3-ton Terry & Tench "jinniwink" derrick was used. The steel, except the bascule, was erected on falsework, and the derrick was moved out over the stringers as the erection proceeded. The same rig without the A-frame was used as a gin pole to erect the bascule in the open position. The floating equipment for building the foundations was all in one unit—a scow 30 x 50 ft., on which were mounted the boiler and derrick engine. The 58-ft. boom cleared the top of the piledriving leads mounted on the front end of the scow. A concrete mixer was put on board when concreting piers, the derrick handling the concrete with a bucket holding 9 cubic feet.

The bridge was built under the direction of A. J. Collett, Director General of Public Works for the Dominican Government. The Strauss Bascule Bridge Co., of Chicago, was the consulting engineer on the design of the superstructure. The general contractor was Sr. Jose Turull, of Santo Domingo. The superstructure was furnished and erected by C. D. Ridgway, Jr., of the Leonard Construction Co. The steel was fabricated at the Belmont Iron Works, Philadelphia, and the machinery by the Earle Gear and Machinery Co. The writer was engineer in charge during the period of construction.

Finding and Stopping Pollution of Austin Water-Supply

Surface Drainage and Lack of Sewers Are Charged with Infection of Filter Gallery—General Clean-Up Made

By Julian Montgomery
Lately City Sanitary Engineer, Austin, Tex.

THE necessity for careful supervision of the quality of a city's water-supply is shown by recent experiences at Austin, Tex., where it was found that water from filter galleries was being polluted by several unsanitary conditions. These are now being remedied, and hereafter it is expected that close watch of the character of the supply will be kept with the aid of a laboratory.

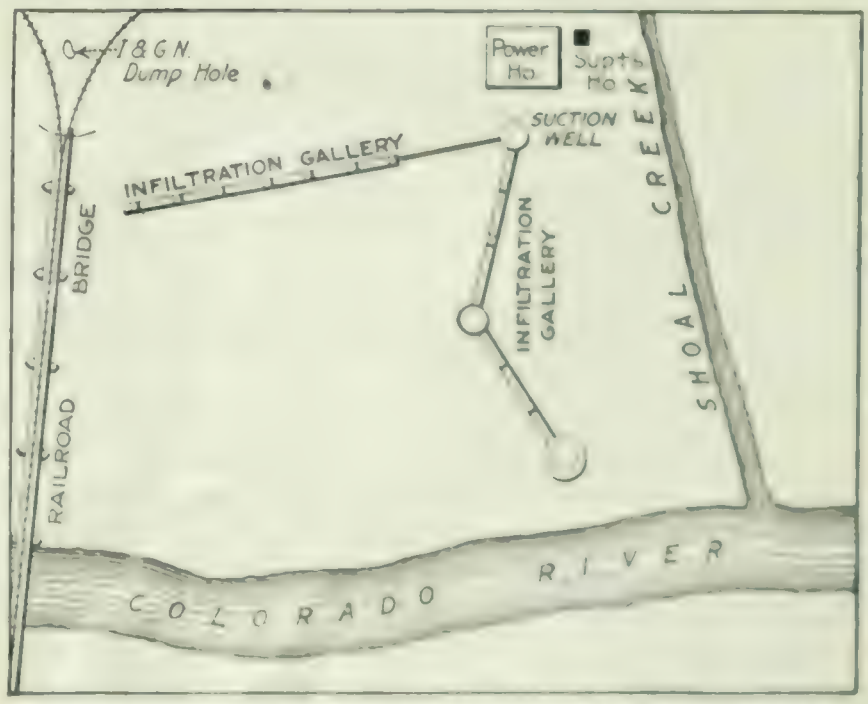
Since 1911, the water-supply of Austin, Tex., has been collected by reinforced-concrete infiltration galleries placed along the north beach of the Colorado River about 15 ft. below the low-water stage of the river. Two pumping stations are maintained. The main station is supplied by two galleries. One gallery is nearly parallel to the river; the other is at right angles with the river and connects two concrete wells somewhat deeper than the galleries. Both galleries drain into a suction well, as shown by the accompanying plan. The auxiliary pumping station is located farther up the river. This station is supplied by one infiltration gallery, at right angles with the river bed, and is operated only when the supply at the main station is inadequate.

The whole State of Texas suffered from dry weather in 1916. During the latter part of August of that year, the continued drought became so severe that rice growers below Austin obtained permission to drain the lake impounded by the Austin dam. Shortly afterward a large number of dead fish were noticed in the water below the dam. This was considered so significant of the impurity of the water that steps were taken immediately to examine the city water to determine whether it was contaminated to any extent whatever. The first tests, made by the State Board of Health and Food and Drug Department, gave such adverse results that further tests were made to confirm them. All tests showed the water from the filter galleries to be contaminated.

Investigation of Sources of Contamination

Following this interpretation of the analyses, steps were taken at once to determine the source, or sources, of contamination and to supply an immediate and effective remedy. It was realized that because of the different locations of the two pumping stations there could be separate sources of contamination of the water supplied by each station.

The investigation included the digging of test holes along the sand beach and the getting of samples of the material and water; the making of chemical tests to determine if the river water entered the galleries directly through cracks in the lower concrete well, or



LOCATION OF FILTER GALLERIES, AUSTIN, TEXAS

otherwise; examination of the stagnant pools along the beach; examination of dry closets and cesspools in adjacent territory, and examination of the dumping grounds of the International & Great Northern R.R.

It was found that at low stages the raw river water is fairly good. The large storage reservoir furnished by the Austin dam is directly responsible for this. It is during high stages of the river, and especially when the lake is drained, that contamination is most likely.

Surface Drainage Pollution

At the main station, after a study of the data acquired from all the investigations, it was concluded that the principal source of contamination was the surface drainage from the dumping ground of the International & Great Northern R.R. and the few houses on the near side of Shoal Creek. This dumping ground lies between the two railroad embankments forming the north approach to the railroad bridge. A small pond of water is usually present. This pond is practically always covered with a thick heavy oil which is drained from the cars. Pullmans are often stationed on either side of this pond and much waste water enters the pond from that source. Stockyards also drain into it.

Ordinarily it would seem that the oil which had drained into the pond would possess considerable sterilizing value. Investigation proved this not to be true. Tests made at various times showed as many as 228,000 bacteria per c.c., of which 17,000 were acid-forming and 1000 gas-forming bacteria.

Pond Located Above Filter Galleries

This pond is situated at an elevation considerably above the filter galleries, and water from this point very easily could percolate through the gravel railroad embankment to the west end of the north gallery. Several weep holes in the west end of this gallery are stained, and on different occasions water has been found entering the gallery through them when it was not entering at any other point of the same elevation.

Following a rain which occurred while the investigation was in progress, tests brought out the fact that certain organisms contained in the pond were found in the north gallery but not in the south. The groundwater level is higher in the north gallery, and probably much of the contamination in the south one is derived from it.

There are not many houses on the watershed of Shoal Creek that could be a source of contamination for the main station. At the same time many people, mostly Mexicans, are continually passing along the railroad, which is just north of the power house and parallel to the river. The territory is fairly remote from the residence district, and the few houses are scattered. Consequently a good opportunity is offered for satisfying the demands of nature.

Of the two stations, the water-supply from the auxiliary station was found to be in the worse condition. The investigations showed that the most probable source of contamination of the water-supply at this station was the surface drainage from a large, unsewered district, inhabited mostly by negroes. During light rains the surface flow comes upon the sand beach but does not reach the river. Consequently a great deal of filth and waste is deposited near the galleries.

The long intervals of rest between the short times that the auxiliary station is in use are favorable to the growth of bacteria. This could account for the worse condition of the water at that station. Another notable fact disclosed by the investigation is that rains increase the bacterial count at both stations.

Means of Preventing Pollution

At the first signs of contamination, before the final results of the preliminary investigations were available, an emergency hypochlorite plant was installed. This was kept in use until a chlorine control apparatus could be obtained. Since the installation of this apparatus, daily tests have shown the absence of B. coli from the city water.

In addition to the foregoing, the city was granted by the State Legislature a 25-year lease of the sand beach on which both plants are situated. This lease goes into effect Aug. 6 of this year and abrogates all other leases of private parties to remove gravel from the beach. The lease was obtained primarily so that the city could properly protect the water-supply. As long as gravel was allowed to be excavated and removed from the beach the filter material was impaired and water was allowed to collect in the excavated pits. The terms of the lease provide that no gravel shall be removed from the beach for commercial purposes. The consideration is $2500 per year.

It is the intention of the city to restore the beach as far as practicable to its former topography. All underbrush will be cleared off and the surface leveled by plowing. Creeks and gullies will be opened up to drain directly into the river. The beach will be policed properly to prevent the future deposit of any filth or waste.

All cesspools in the district tributary to the sand beach are to be drained, disinfected and permanently closed. For those places that cannot connect to the sewers and desire to use the plumbing fixtures installed for the cesspools, a water-tight concrete chamber will be used and the contents treated with a powerful caustic.

Cast-Iron Intercepting Sewer Proposed

Plans have been prepared for a cast-iron intercepting sanitary sewer main to extend along this beach and out through the unsewered negro district. All houses and stores will be compelled to connect to it.

Proper safeguarding of the water-supply demands that other measures be used to prevent contamination while the sewer lines are being constructed. For the places that have privies and cannot connect to the present system, it is proposed to install a bucket system. Most of the privies can be remodeled into flyproof sanitary closets. This bucket system could be extended to care for all parts of Austin that the present sewerage system does not serve, and should be made a permanent branch of the system.

It is thought that with the above remedies, in connection with a laboratory for complete water analysis, Austin will be assured a pure water-supplpy.

The investigation was directed by Dr. W. B. Collins, state health officer; V. M. Ehlers, state sanitary engineer; Prof. R. G. Tyler, of the University of Texas; M. C. Welborn, city engineer, and the writer. The writer also made the survey for and designed the proposed intercepting sewer.

Drainage-Basin and Crop Studies Aid Water-Supply Estimates

Survey of Culture and Soil Will Lead to Estimates of Losses by Plant Interception and Transpiration and by Soil Evaporation—Most of the Evaporation Formulas Now Used Are in Error

By ROBERT E. HORTON
Consulting Hydraulic Engineer, Albany, N. Y.
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This is the last of three notable articles by the author, developing the scientific attack of the important problem of forecasting water yield for power, municipal supply or irrigation. The other two were published in "Engineering News-Record" of June 7, p. 490, and August 2, p. 211. In the present article is described a new kind of survey to be made, and the use of the data thus derived.—Editor.

WITH this article the writer will terminate the suggestions that he started out to make in the hope of helping other engineers to secure more dependable estimates of water available for given power, domestic-supply and irrigation projects. Three phases indeed will have been touched upon, but the subjects have not been at all fully covered. Moreover, it did not seem possible, within the space that a weekly journal should allot to such a series, to give examples of computations based on the principles set forth. The sole object has remained to suggest methods and lines of study likely to lead to safer results.

Inspection of a Drainage Basin for the Purpose of Securing Data

Inspection of a drainage basin for the purpose of securing data to form the basis of judgment in estimating the low-water flow, average yield or flood discharge may be made to furnish valuable data, but it must be carried out along well-planned lines. The writer has known of an inspection being made by a number of engineers for the purpose of forming an opinion as to the low-water yield of a stream, and the principal stops were made at liquor emporiums; no notes were taken, and the resulting estimate was, as might have been expected, greatly exaggerated.

The method of inspection will depend somewhat upon the character of the data available and the results to be obtained. Where there are several railroads traversing the drainage basin, a considerable part of the inspection can often be made by local trains; preferably, two persons should work together, one sitting on each side. A better inspection may be made by automobile, traveling at a speed of not over 20 miles per hour. In making inspection by automobile, three persons are needed—one as pilot to keep track of the location of car and direct its course, one as observer, and one as recorder. In a basin 40 miles wide by 80 miles long, a traverse of four roads longitudinally and an equal number transversely will usually give good results. Such an inspection of seemingly similar basins will often reveal surprising differences in culture and soil conditions.

The best available map of the area should be secured, Government topographic maps always being preferred. The inspector should have before him a map of the drainage basin on a stiff board. The inspector should also prepare beforehand a schedule containing columns having headings corresponding to the different types of crops, cultural and soil conditions that it is expected will be encountered within the basin, with a few blank columns for special conditions. For example, in a region where the principal agriculture comprises the growth of wheat or rye, and corn, oats or potatoes, in rotation with hay and pasture, there should be headings for each of these crops, together with additional column headings for stubble and permanent meadow, and fallow or new plowed ground, depending on the season of the year when inspection is being made, together with headings for forest and orchard.

Character of Culture Noted

In traversing a road or railroad, the observer notes in proper columns the character of the culture on every field that comes within his range of vision. As a rule, where crops are produced in rotation, the average size of fields will be about the same. If there is marked difference in the size of fields, as, for example, in the case of orchards, this should be noted, and an estimate of the relative sizes of fields should be made. In this way a very large number of fields can be listed in a single day, and experience in comparison with Government agricultural statistics shows that a reasonably accurate estimate of the cultural conditions can thus be arrived at.

If there are marked variations in soil, and the valuable soil maps of the United States Department of Agriculture are not available, the regions covered by the principal different types of soil should be outlined on the map as they are encountered. Similarly, marked variations in the surface hard rocks may be of importance, as, for example, where a region changes from shale to limestone. Often these data can be obtained directly from existing geologic maps. It is often possible to judge from the topography and from road and railroad cuts the depth below surface at which the rock lies. These facts should also be noted.

Groundwater Measured

In view of the great importance of groundwater in relation to low-water flow and the general regimen of streams, it is always desirable that an inspection be made by some methods such that stops may be made from time to time, in regions where there are surface wells, to determine the depth of the groundwater. In-

quiries should also be made as to the amount of fluctution in groundwater level. In a dug well, the depth to groundwater can be readily measured with a metallic tape, chalked near the lower end.

As to forests, if extensive, their location and approximate boundaries should be marked on the map as far as they can be observed. If there are merely isolated patches of woodland in a region generally clear, they may be noted in a separate column the same as fields; but it is necessary to estimate the average size of the patches.

With a pair of prismatic binoculars the culture on an area of several square miles may often be inspected and tabulated from a single well-chosen viewpoint. For the purpose served by such a field inspection of a drainage basin, there is in general little hydrologic difference in effect between forests of different types or between forests and dense brush land. It is well, however, to make general notes as to the character of the wooded areas, whether deciduous or coniferous trees or brush, and whether dense or sparse. Liberal use of abbreviations will facilitate rapid note-taking.

Boundaries and Lakes

The agreement between the actual position of the watershed line or boundary of the drainage basin and its location on the map should be noted and any errors corrected. This is especially important in the case of small drainage basins where errors occasionally occur, even in the Government topographic maps, which may be of great relative importance.

If there are large lakes or marshes, at least an approximate cross-section of the outlet of each should be obtained and, in general, a measurement made of the discharge, and data obtained as to the range of natural fluctuation in water level. Such data will form a basis for estimating the supply to the stream from natural storage.

Stream-channel storage is also of importance, both in relation to flood discharge and low-water flow. From good maps the length of the stream channels can be approximately estimated. In the course of the inspection the average width and depth of the stream channels between banks should be approximately estimated and noted. This will form a basis of estimating the total supply to the stream from channel storage for a given change in water level.

Evidences of any important watershed leakage should be noted, especially on small drainage basins. If the underground and surficial divides do not coincide, estimates of yield based on surface conditions alone may be grossly in error. The absence or existence of artesian wells and springs, the dip of sedimentary rocks and the depth of extensive drift deposits, especially near the watershed lines, are of importance in this connection.

Importance of Cultural Conditions

Hitherto in estimating run-off in the absence of gagings, the only physiographic, meteorologic or cultural factors taken into account have been precipitation, slope and temperature. Slope, as pointed out by the writer (*Trans.* Am. Soc. C. E., Vol. 79, p. 1170) is of much less importance in relation to run-off than in relation to floods. *The importance of cultural conditions has not been in general fully appreciated heretofore.*

Consider, for example, two similar areas, one covered, say, with corn, and another with wheat. For the corn area, the crop is at maximum development during July, August and September. The soil is usually loose and open, so there is little surface run-off. Probably 10 or 15% of the rainfall is ordinarily intercepted by the plants and evaporated without even reaching the ground.

The transpiration loss is very large, but owing to mulch, shading and protection from wind, direct soil evaporation is small. Wheat ground is either plowed for sowing a new crop or else is covered only with stubble and perhaps a subsequent growth of grass during the months when the corn is at its maximum development. During these months the soil in wheat stubble is hard packed or baked; surface run-off is increased; there is little infiltration, interception or transpiration, but free wind action and imperviousness of the soil facilitate soil surface evaporation. Many other examples might be cited, but it seems evident enough that the hydrologic conditions are profoundly modified by the character of culture and vegetation, especially during the critical low-water months of the summer season.

Three-Fold Division of Water Losses

This example suggests a three-fold division of water losses: (1) Interception; (2) transpiration; (3) soil surface evaporation.

Interception—Except in the writer's practice, interception seems never to have been considered as a separate item. It is not surprising that overestimates of run-off based on rainfall have been common, when this factor, which experience shows may reduce the precipitation reaching the ground by 15 to 35% has been commonly overlooked or considered only indirectly. There are numerous data available on interception by trees, but more extended data are needed as to interception by growing crops.

Transpiration—There has been a common belief that transpiration is a special case of evaporation and need not or could not be separately considered in estimating water losses or run-off. Probably the maximum transpiration for a given plant is at times limited by the evaporation conditions. At other times, transpiration rate is much less. Meyer has attempted to estimate transpiration losses as a function of temperature. Correlation studies by J. Warren Smith and others show that the development of a given crop in a given year is often as much a function of rainfall and rainfall distribution as of temperature. The best indicator of water losses by transpiration generally available is probably the result of direct observation as to the state of development of the crop or the amount of dry matter developed.

A determination of the transpiration losses by this method involves three factors: (a) The area covered by a given kind of vegetation; (b) the average crop yield per acre, and (c) the transpiration depth in inches per unit or crop yield. The first data are obtained from inspection or agricultural statistics. The

second can generally be obtained from crop reports for a given date or from agricultural statistics for a given year. Data as to transportation losses in terms of crop yield are now being somewhat rapidly accumulated. Many such data are summarized in recent bulletins of the United States Department of Agriculture. This method of estimating transpiration is admittedly approximate, but has at least the merit of being founded on matters capable of direct observation.

Evaporation—A common practice among engineers has been to assume the evaporation rate from water surfaces in a drainage basin to be equal to that measured at the nearest station where an evaporation record has been kept. Extensive study of evaporation records and processes has led the writer to the conclusion that, while some of the existing records probably show the evaporation rate from broad water surfaces with approximate accuracy, yet many and probably the large majority of such records, while often correct for the conditions under which they were taken, cannot be applied either to broad water surfaces or to evaporation from moist soils.

The projection of the rim of the evaporation pan above the water surface injects a serious error into the result. The temperature of water in an evaporation pan is rarely the same as the temperature of a natural water surface or of moist soil. An area factor is involved which is not constant even for the same pan.

Most Evaporation Formulas in Error

Most existing evaporation formulas are in error in that they involve a linear factor for wind correction such that wind effect apparently increases indefinitely as the wind velocity increases. It has been proved experimentally, and is indicated by physical considerations, that since the wind can do no more than to remove the water vapor as fast as it is emitted from the liquid surface, there is a maximum or limiting value of the wind factor corresponding to each water surface temperature. Apparently, this value corresponds to a wind velocity of about 15 miles per hour.

In view of the difficulty of duplicating natural conditions in the use of atmometers, the writer is inclined to agree with Bigelow that calculation is to be preferred to evaporometer records in most cases for estimation of evaporation rate from moist soils or broad water surfaces. A formula for calculating the evaporation rate in any locality from meteorologic data generally available has already been presented in a separate paper (*Engineering News-Record*, Apr. 26, 1917) and need not be discussed here.

It seems to have been generally assumed that evaporation increases with altitude. Evaporation is controlled jointly by the temperature of the evaporating surface, the amount of vapor present in the air, and the wind velocity. In some cases barometric pressure may also be important. Temperature is the most important factor. This decreases with increased altitude. Unless the effect of decreased temperature happens to be more than offset by reduced vapor pressure and increased wind velocity, then the evaporation from natural water and land surfaces will generally decrease instead of increasing with increased altitude, although there may be a certain elevation at which the natural evaporation rate is a maximum and up to which it increases and above which it decreases. This conclusion seems to be confirmed by experiments on Mt. Whitney with similar evaporation pans exposed at different altitudes. The subject is one that requires careful study, and bald conclusions which are contrary to well-known physical facts have often been reached as to the evaporation losses from drainage basins.

The evaporation loss from the soil surface is the product of two factors—evaporation rate and evaporation opportunity. This second is a term involving the degree and duration of moisture of the soil. In general, the evaporation opportunity is less than unity, and consequently the evaporation loss from a soil area is less than that from free water surface subject to the same conditions of evaporation rate.

Assuming that the evaporation rate throughout a given season has been determined by calculation, the evaporation opportunity may also be approximately estimated from the consideration of the character of culture and from the frequency and average interval of occurrence of storms. During rain, the evaporation opportunity for soils is unity. After rain has ceased, it decreases rapidly, approximately in accordance with the inverse exponential law, often rapidly approaching a constant minimum so that the evaporation opportunity remains small and nearly constant during most of the interval between rains.

Many data regarding evaporation from soil surfaces are now available, and a fairly close estimate by judgment based on such data may often be made without calculations.

Winter Run-off

In winter when the ground is blanketed with snow, the water loss conditions are much simplified. Transpiration is eliminated, evaporation opportunity is unity, and the range of temperature of the evaporating surface is more nearly constant. The run-off is, however, complicated by snow storage to such an extent as to make full treatment here impracticable. Temperature is a controlling factor, and the run-off time unit becomes then the interval between successive thaws. Not only is there no direct relation between precipitation and run-off in the same time unit, but the uncertainties of precipitation records are greatly increased.

Many gaging records show winter run-off in excess of the measured precipitation. This is probably due in part to deficiencies in the catch of rain gages when used to measure snowfall. However, especially in earlier records of stream flow and to a considerable extent at the present time, there is a tendency toward errors in excess of the true values. Sometimes there is a continuous supply to streams from previously stored groundwater with but little replenishment of the groundwater storage during winter months. This also tends to increase the measured run-off relative to the amount of measured precipitation. Snow surveys for the purpose of determining the water equivalent of accumulated snow storage just before spring thaws set in afford the most reliable basis of estimating the available water-supply from winter precipitation.

This discussion thus far has related to the determination of precipitation and water losses. The difference between these factors for any time period does not represent the actual yield of a drainage basin, but only

represents the precipitation which remains available to supply the streams after losses are deducted. The actual yield is this quantity as modified by groundwater storage and supply to the stream.

An ingenious method of correcting the available supply for groundwater and surface storage has been devised by Vermeule and improved by Parker. In applying this method, it is assumed that the curve of relation between groundwater stage and the supply to the stream conforms to some one of three given types, and the method rests further on the assumption that there is a certain maximum and minimum groundwater storage which is approximately constant for all basins of the same type. If actual and accurate gagings of a stream are available for a period of, say, 10 to 20 days during which time no rain has fallen, then a groundwater supply constant can be calculated for the drainage basin and a curve of groundwater supply can be constructed for the basin in question. Thus the necessity of assuming a groundwater curve is eliminated.

The estimation of the minimum yield of a drainage basin in the absence of actual gagings is a difficult matter. It generally involves the problem of finding what the stream yield would be from natural storage alone during the longest period of no rainfall ever likely to occur during the months of maximum water losses.

Even long-continued gagings may not show directly what the yield of a stream would be during a rainless period of, say, 30 or 50 days, unless such a drought period happens to have actually occurred while the gagings were in progress. To attempt an estimate of the minimum flow of a stream—in other words, its flow during periods of no rainfall—by basing such an estimate on rainfall as the only factor is the height of absurdity. Where minimum flow is to be determined, accurate gagings should always be made if possible covering a period of 10 to 20 days without rainfall.

With gagings such as described, the time relation between groundwater supply and duration of drought can be established, and the rate of supply to the stream from groundwater alone after a period of drought having any chosen duration can be estimated with considerable accuracy. It is not necessary that the gagings should be taken during a low-water period; they answer nearly as well if taken when groundwater and other storage is filled, provided there is no coincident rain.

Many engineers have considered short or fragmentary gagings as of little value, but used as above described they may become of great value. This is the only method known to the writer by which even an approximately correct estimate of the low-water flow of a stream can be arrived at in the absence of long-continued gagings of the same or a similar adjacent stream.

Road Maintenance Important in Maine

Particular stress is being laid on maintenance work this year in the State of Maine. The State Highway Commission has employed about 400 patrolmen to look after 3300 or 3400 miles of roads. Of this total, about 1500 miles is improved state or state-aid highway, while the rest is unimproved roads. All the road under patrol, however, is main thoroughfare or principal market road. Paul D. Sargent, chief engineer, is in charge.

Freezing Ground Acts Like Hydraulic Jack

Heaving and Settling Back of Piers of Railroad Bridge Over City Street Lead to Interesting Deduction

By H. J. Gilkey
Chicago

Some 16-ton concrete piers which were heaved this past winter by as much as 3 in. and subsequently settled back to their original elevation came under the writer's observation. This most unusual and extreme condition cannot be explained by ordinary frost action, but can be accounted for by the piers becoming the pistons of hydraulic jacks in which frost produced the moving pressure.

This occurred in an important Middle-West city at a street ("A") where a bridge was being built by one



FIG. 1. INDIRECT FROST ACTION HEAVED PIERS AS MUCH AS 3 INCHES

of the large trunk lines in the course of track-elevation work. Some heaving also occurred at an adjacent street, "B." The abutments and piers at both streets were poured during the summer and autumn of 1916. The bridge steel could not be placed until the following season, hence the piers and abutments carried no load other than their own dead weight.

Moderate Foundation Loads but Poor Drainage

At "A" street the side piers weigh 31,000 lb., which includes the steel I-beam grillage embedded in them for the column base to rest upon. The center piers weigh 36,000 lb. each. The side piers are 8 ft. square on the bottom, and the center piers 8½ ft. square. They rest upon solid blue-clay strata, and the unit load of both center and side piers on the foundation is about 500 lb. per sq.ft. The abutments are at the same bottom elevation as the side piers, which is 9 in. higher than the bottom of the center piers. The unit weight of the abutments is 1630 lb. per sq.ft. There was no heaving or settling of the abutments.

At this street, where the most heaving occurred, only the center and south rows of piers were appreciably affected. The north side of the street was fairly well drained and much drier than the south side; all conditions were favorable to waterlogging on the south side of the street. The street itself has a depression of

6 ft. to the subgrade of the pavement and so makes a natural hollow for the collection of water. In November, 1916, an 8-in. water main was lowered on the south side of the street. The backfill was thoroughly flooded to prevent future settlement. Cold weather set in and there was no opportunity for drying out. Drainage to the sewer was very slight.

The bottom of the north side piers was about 4¼ ft. below the ground surface, of the center piers 4 ft., and of the south piers 3½ ft.

Piers Found Heaved in Early Spring

The grillages (embedded in the concrete) were all set with extreme care and were checked and re-checked for elevation. From the latter part of November, 1916, no further levels were taken until Mar. 15, 1917. The discovery was then made that the south row of piers had heaved by amounts varying from 0.07 to 0.22 ft., or 2¾ in. The center row showed heaving ranging from 0.01 to 0.09 ft., or 1⅛ in. The north row showed nothing in excess of ¼ to ⅛ in., most of which could have been in the original setting.

After this was discovered, levels were taken at the four corners and center of each grillage plate at intervals of 3 to 5 days. As the ground thawed the piers settled back into position until the highest corner of any grillage was but 0.06 ft., or ¾-in. above what it should be. A settlement of as much as 0.18 ft. or 2⅛ in. is shown.

Probably no Expansion of Freezing Ground Under Footings

The question, of course, arises as to how this action took place. It seems safe to assume that freezing was the cause. The usual explanation is that the frost simply penetrated to a level below the bottom of the piers and heaved them by direct action, but this does not seem adequate for the following reasons:

(1) It is very doubtful if the frost penetrated as low as the bottom of the piers. Notwithstanding the unusually severe winter, it is probable that the adjoining abutments were more or less of a protection.

(2) If the frost did penetrate to below the bottom of the piers there could not have been more than from 6 in. to 1 ft. of frost at the most. This thickness of frost could not possibly heave a pier nearly 3 in. Water expands about $\frac{1}{10}$ of its volume upon freezing. The expansion of water-soaked soil would not be greatly in excess of this if as much. That would mean but 0.1 ft. upheaval for a whole foot of frost under the pier.

The writer is rather inclined to attribute the rising to action similar to that of an hydraulic jack. The pier would be analogous to the piston of the jack and the water or semi-fluid mud is forced under the pier by the pressure from the freezing expanding strata nearer the surface. The accompanying sketch will illustrate.

Let *AB* represent the surface of the ground. Suppose the ground to freeze to a depth *d*, such that the frozen layer becomes rigid and unyielding. Let the frost then penetrate to an additional depth *e*. The layer *e* expands in freezing. It exerts a pressure both upward and downward. The frozen mass *d* is unyielding and if the weight of the pier is less than the force required to break the rigid layer, the water and semi-fluid clay will be forced upward like a piston. Such an action would account for any amount of heaving.

The experience at "B" street certainly disproves the theory of direct frost action under the pier and seems to agree well with the explanation offered.

At this street, where there is practically no depression, only 3 or 4 piers out of a total of 42 (14 in a row) were found to have been raised. These varied from ⅛ in. to 1¼ in., only one pier having been heaved the latter amount. But at this street the bottom of no pier was less than 5½ ft. below the ground surface. It is certain that no frost penetrated to that depth. So far as the writer can see, the preceding explanation is the only possible one that could cover the "B" street situation.

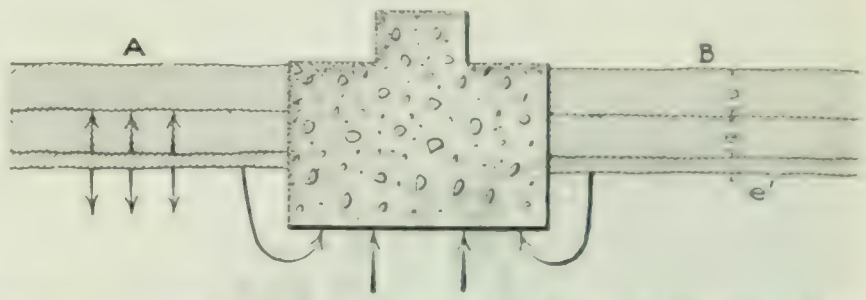


FIG. 2. PIERS WERE PLUNGERS IN A BIG NATURAL JACK

It is unfortunate that test borings for depth of frost penetration were not made at both streets in order that more exact information might be had on this point.

In concluding it might be well to add that the pouring of piers and leaving them to remain unloaded for one or more seasons has not been unusual in this work. Neither have any of the conditions such as the depression and water-soaked condition of the subway differed from those in several that have been previously constructed. In many instances the piers were built for several years before the bridge steel was erected upon them. But in no case has any upheaval such as the preceding been discovered.

This might be due to one of two causes: (1) The steel was usually placed in the spring or summer season and the piers might have heaved and settled again without being detected, or (2) the unusual severity of the past winter may have caused the disturbance. Several of the engineers in charge of other track elevation work in the locality were consulted when the discovery was first made and none of them reported anything like this in his experience.

However, the chief engineer of one of the street railway companies recently stated that nearly all the track-elevation bridges in the locality raised in the winter and lowered in the summer and that the street cars had as much as 2 or 3 in. of extra clearance during the winter months.

Side-Hill Fill Held in Place by Existing Trees

In the construction of one of the roads in the northern part of New York State the side-hill fill has to be made over a wooded area. The usual procedure in such cases is to cut off the timber, leaving the ground clear before beginning to make the fill. In this case it has been decided to leave the trees standing on the supposition that by so doing the fill will be less apt to slip. The only clearing of trees which will be allowed will be in the space included between shoulder lines.

Structural Shop Has Well-Planned Framing and Layout

Four-Year-Old Company Increases Warehouse and Adds 2500-Ton-a-Month Fabricating Shop Where Special Attention Is Paid to Routing and Lighting



FIG. 1. FABRICATING SHOP, 130 x 500 FEET IN PLAN, IS ADDED TO STEEL COMPANY'S PLANT AT BUFFALO

THE FERGUSON Steel & Iron Co., of Buffalo, N. Y., has a short but crowded history. It was founded in 1913 mainly as a warehouse business, furnishing stock material and simple fabrications in and around the city of Buffalo. The first structure was a steel building 165 ft. wide and 100 ft. long. The next year it was doubled in length, and in the two succeeding years the additions shown in the accompanying drawing were successively made, until at the beginning of the present year the main shop and warehouse was a building 600 x 165 ft. with numerous adjoining offices and a large-material yard occupying about 5 acres.

While the warehousing business had meanwhile grown the structural fabricating plant had developed beyond expectation. Special attention was paid to small structural jobs and immediate delivery both of these jobs and of stock when required. Increase of business in the present year required a further extension of the plant and this extension was so large it was thought best to entirely rearrange the layout. When started in 1913 the output of the works was about 30 tons per month. The new plant will have a capacity of 2500 tons per month of fabricated material, and about 2000 tons per month of warehouse material. The total area of the present site is about 25 acres.

One of the drawings shows the new plant layout and the relation of the new to the old plant as developed. An entirely new fabricating shop, 130 ft. wide and 500 ft. long, is being added at one end at right angles to the old building, and an extension of 160 ft. is being made to square the old building into the new. The entire old building is to be used for warehouse storage, the addition to the new building in the corner for the temporary storage of warehouse material cut to length en route to the fabricating shop, and the new building entirely as a fabricating shop. In the warehouse will be stored in proper distribution all of small structural shapes and reinforcing material. In the storage yard, north of the warehouse, the large structural shapes will continue to be stored. The entrance to the whole works is from a siding of the nearby New York Central R.R., which siding parallels the new shop, passes by the storage area, and into the warehouse.

The addition to the old warehouse is similar in design to that building. That is, it has a center 83-ft. truss span with two side trusses 41 ft. each, forming continuous roof slopes from a center ridge. The walls have an upper and lower row of glass in steel sashes, with intermediate iron siding. The shop floor is controlled from a longitudinal traveling crane running on girder tracks framed to the middle columns.

Fabricating Shop Has New Type of Frame

The new shop is of a different type developed by the engineers of the Ferguson company, to provide a maximum of light with a minimum of weight. The central section, 90 x 500 ft., is adjoined by a lean-to 40 x 500 ft. on one side and is in the near future to be adjoined on the other side by a 60-ft. wide section to be used as a girder shop. For the thirteen 20-ft. bays nearest

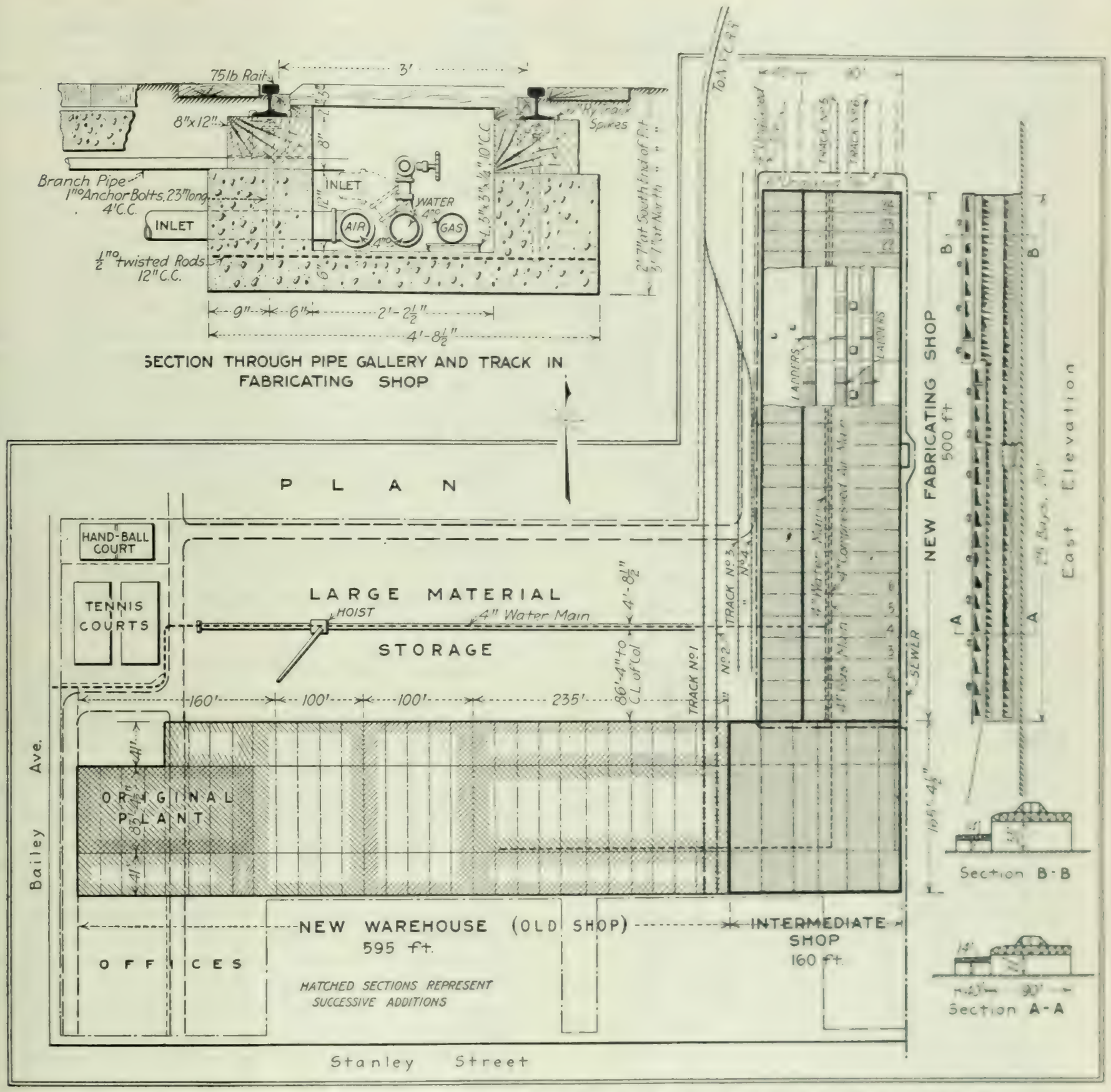


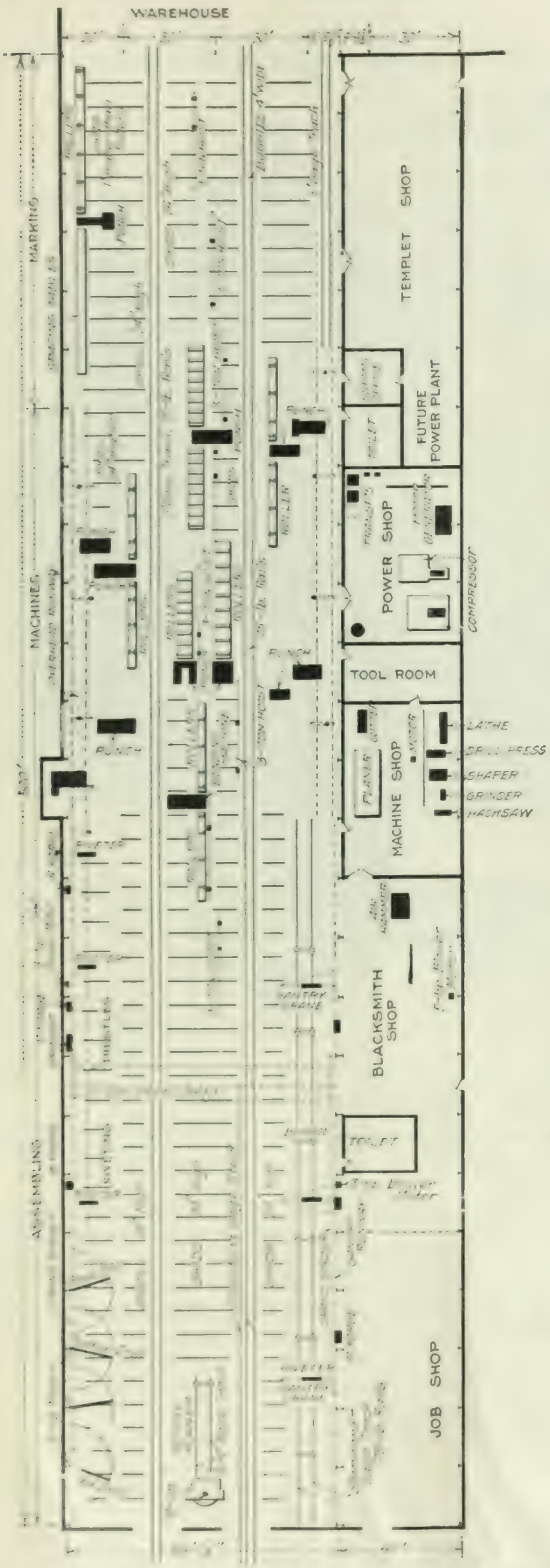
FIG. 2. HOW THE FERGUSON STEEL AND IRON CO. HAS GROWN IN THE PAST FOUR YEARS

the warehouse, which is the piece fabrication section of the shop, the main roof is carried, with a clearance of 22 ft., on a truss simple in layout except for the extreme slope at the lean-to end and the 11 ft. monitor over the central four panels. The sloping sides of the monitor and of the main truss are provided with glass. The lean-to roof is carried on a simple truss with gradually sloping upper chord. The far eight 20-ft. bays of the main shop are spanned by a similar type of truss, but the clearance is 33 ft. and this section of the shop is to be used for assembling material.

On the east side of the building provision is made, by the construction of column footings, for the future erection of the girder shop. For this shop the column footings have been already built large enough, but the columns themselves will be additional members probably fastened to the existing columns.

The type of roof truss building designed proved to be quite economical and from 10 to 15% lighter for the same capacity than the ordinary high-and-low-bay type used for fabricating shops. The new design runs about 20 lb. per sq.ft. of floor area. In addition, it gives a high degree of illumination, at a cost not much higher than the old type of small window and steel siding. At present prices glass in steel sash costs about 50c. per sq.ft. and the 2-in. concrete wall about 35c. Old type corrugated siding used to run about 9c. but now is nearer 30c. and wood sash cost just the same as steel.

The side-walls are of upper and lower steel sashes with glass, the sash being of the Lightwell type, made by the Lightwell Steel Sash Co. A pedestal wall connects the column footings and an intermediate wall space between the sash is of 2-in. concrete plastered on wire mesh. A similar wall closes the opening be-



HOW TOOLS ARE LAID OUT IN THE NEW FERGUSON STEEL AND IRON CO.'S SHOP

tween the high and low roof. The roof of both the monitor and the main truss is the Carey five-ply roofing type, while the lights in the sloping sides of the monitor and the truss are of glass framed into steel shapes designed and fabricated by the Ferguson company.

Transverse Cranes are a Feature

A feature of the fabricating shop is the crane equipment. The first twelve bays from the warehouse and of the low section of the shop are controlled by transverse 3-ton cranes traveling longitudinally on girders which themselves travel transversely on the lower chords of the roof trussing. These cranes are in every other bay and their traveling girders overhang far enough into each intermediate bay so as to completely cover the shop floor. The detail of the crane and its method of travel are shown in the drawings. This crane can pick up any of the smaller material in the fabricating areas on either side of the central track, where it is skidded or rolled down the shop toward the assembly end.

For the four bays beyond this there are two transverse cranes of the same type but of 5-ton capacity which carry material to the first assembly bay where control is had by a 15-ton longitudinal crane traveling on girders framed to the high columns of the building.

Additional crane service is had by cantilever cranes on both sides of the shop, which cranes control the various punches and riveters which line the side, and besides these there are to be numerous hook cranes which can be fastened to any part of the structure. These particularly are used in the various shops. Finally, there is to be a gantry crane outside the far end of the assembly shop to handle material to cars or storage. All hoists and cranes have electric control, the 15-ton cranes from a cage, the others from the ground.

All the cranes use direct current and all of the machines alternating current. The former is generated in the company's own power house, the latter purchased from a local company. By using direct current, better crane service is expected and at the same time an earlier completion of the shop was assured because it was found impossible to purchase a.c. 25 cycle motors for delivery at an early date.

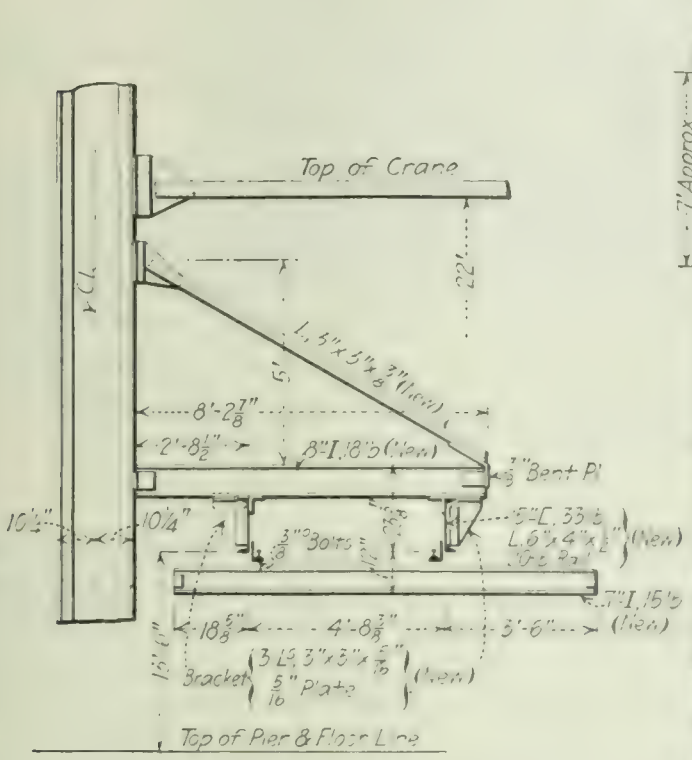
In addition to the crane control, two main line standard-gage tracks enter the far end of the shop and extend through the assembly floor. Gantleted with these are narrow-gage tracks which run clear through into the warehouse. These tracks run on concrete walls forming the pipe trenches where all the heating and air pipes are placed. An additional narrow-gage track runs alongside the lean-to wall into the warehouse.

Structural Framing is Simple

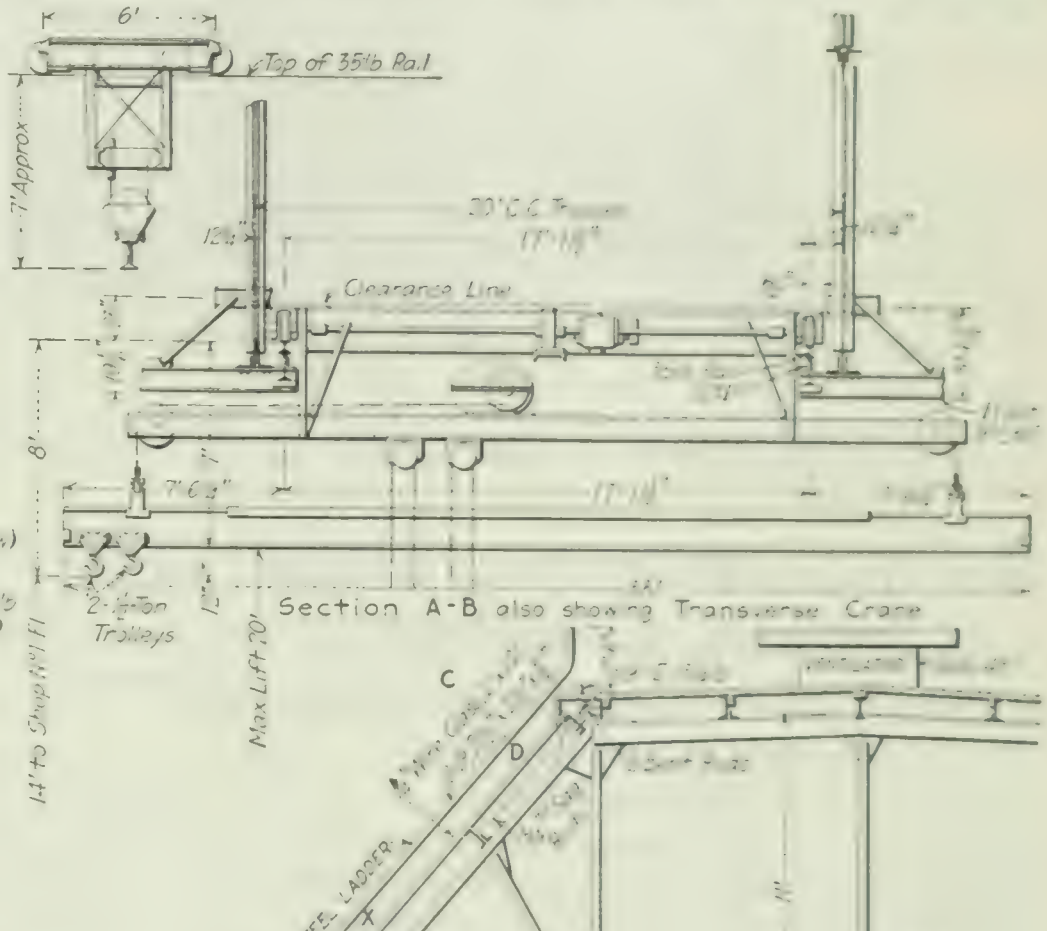
The structural framing of the shop building is quite simple. The low columns are of outstanding angles with a 15-in. web and the high columns of the same type with an additional flange channel under the crane girder. The truss itself is of double angles. All of the steelwork was designed to carry the various hoists and cranes as laid out but in addition the columns were made extra strong to take care of loading from hook hoists which may be attached at any place. There are

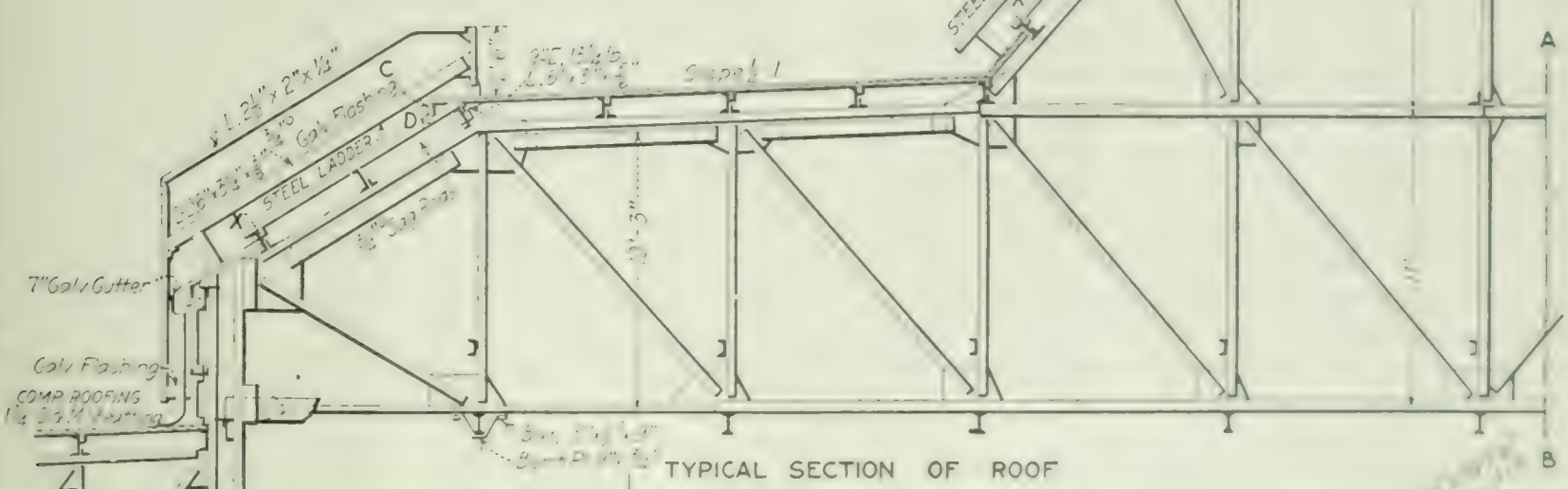
about 625 tons of steel in the shop and 275 tons in the new corner to the warehouse.

Tool disposition in the shop is shown in a drawing. The layout has been carefully made so as to facilitate movement through the plant. Thus warehouse material—which incidentally is bought and paid for by the fabricating shop just as though it were an outside purchaser—is sawed to length there and moved into the common corner section. From there it is moved, by crane or hoist, to the rollers or tracks on either side of the shop and punched. Pending further movement it is stored in the central space between the narrow-

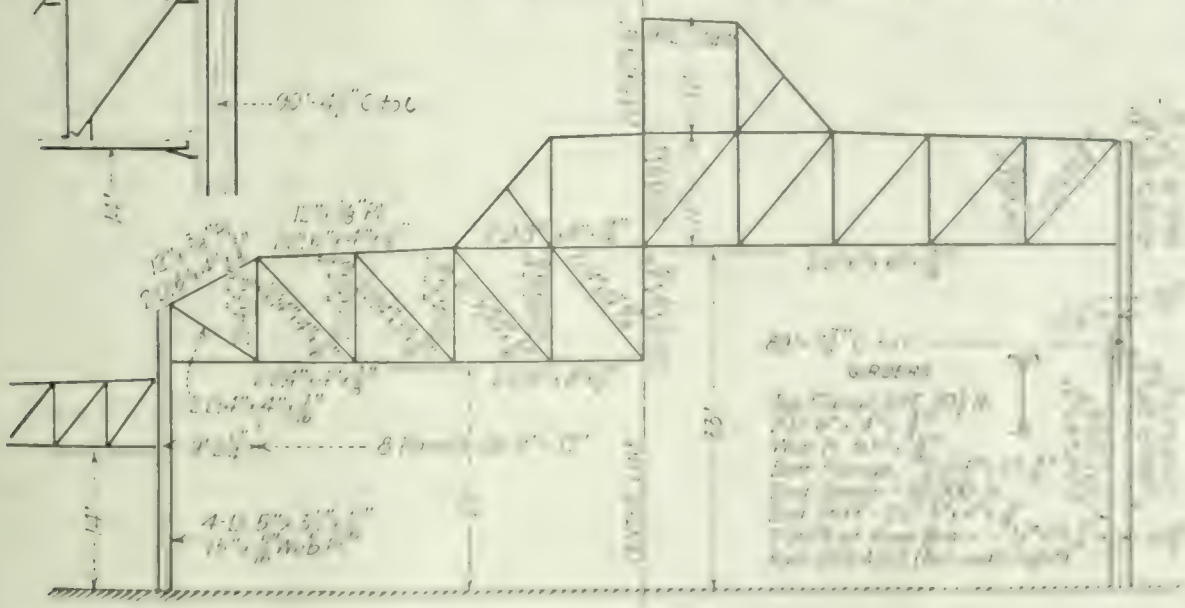


CANTILEVER CRANE AT SIDES OF SHOP





TYPICAL SECTION OF ROOF



Half Section Looking



Section C-D

SECTIONS THROUGH STRUCTURAL SHOP

FIG. 1. DETAILS OF THE FRAMING OF THE FABRICATING SHOP

gage trucks. When required it is skidded through or by the jaw punch, in the middle section, to the angle shear or bending machine also in the center section or to the riveters on either side. The central space is then again used for storage until the 15-ton longitudinal crane picks the pieces up for assembly in the far end of the shop, where are also located the radial drills and the planer.

Separate Shops in the Lean-To

In the lean-to are located, successively from the warehouse end, the templet shop, the power house (although for the present power is purchased) the power shop, the tool room, the machine shop, the blacksmith shop and the job shop. This latter is an important feature of the plant, turning out small local jobs for quick delivery at relatively high tonnage price. The templet room floor is matched maple flooring running diagonally so as not to permit the cracks to coincide with the markings when pieces are laid out parellel with the walls. In the future, when wood paving blocks are somewhat cheaper in price it is hoped to pave the entire shop floor with such blocks. For the present a packed earth floor will be used.

The shop floor is remarkably well-lighted from the roof and outside walls. Partitions between main shop and lean-to are also largely of glass in steel-frame thus permitting the outside illumination from that side also. It is expected that the shop will be heated by hot-air blasts opening at or near each machine.

The Ferguson Steel & Iron Co. was founded by James E. Ferguson, who is President of the company. The new plant was designed and built under his direction and under the supervision of Thomas Leach, Chief Engineer of the company. The contractor for all of the work except the structural steel and its erection, which was done by the Ferguson Co., is John W. Cowper Co., of Buffalo.

War Orders Divert Freight from Railroads to Highways

Connecticut Legislature Appropriates Fund of $6,500,000 To Be Spent on State Roads During Next Two Years

ENORMOUS increases in the shipment of freight by motor truck instead of rail, owing to car shortage and railway embargoes on various classes of materials, are subjecting the state roads of Connecticut to such extraordinary wear and tear that the state legislature has provided funds to the amount of $6,500,000 to be expended on roads during the two years commencing October, 1917. All this money is to be raised by taxation, none by bond issues. Except for a million dollars, which is to be spent for certain bridges and in eliminating dangerous grade crossings, this fund will be used for the construction and maintenance of roads and at the discretion of the Highway Commission. There are no strings tied to its expenditure.

Big Shipments from Munitions Plants

The policy of building durable pavements on trunk line roads will be continued. The wisdom of this policy has already been demonstrated, for the state's roads have felt the effects of the great munition plants at Bridgeport, Waterbury, New Haven and Hartford, which have furnished more transportation business than the existing railway facilities can handle. Business of all kinds has had to resort to motor trucks. Intrastate freight shipment by this means has increased by leaps and bounds. In the first six months of this year more than twice as many commercial vehicles have been licensed as were licensed during the whole of 1915, and one-third more than were licensed during the whole of last year.

New Motor-Truck Regulations

The regulation of this enormous motor-truck traffic and the part of the burden of road maintenance it must bear is fixed by a law recently enacted. Registration fees are based on capacity and vary from $15 for 1-ton vehicles to $200 for 8 tons. Speeds must be limited to 15 miles per hour. All trucks must have rubber tires and be marked with their carrying capacity.

Commissioner Bennett's Views

In the face of these evidences of the increasing commercial importance of the roads, State Highway Commissioner Charles J. Bennett, in an interview with a representative of *Engineering News-Record*, said: "There can be no let-up of either construction or maintenance. The building of concrete, asphaltic concrete and other long-lived types of pavements will continue. In one town near Hartford we have under construction a mile of sheet asphalt on a 5-in. concrete base, because the intensity of motor-truck traffic demanded a durable city-street pavement and the availability of a Hartford contractor's sheet-asphalt experience and construction plant made this type the most suitable and economical.

"Construction difficulties," Commissioner Bennett continued, "are many. Structural steel for bridges is practically unobtainable, but this condition is being met by a more extensive use of the concrete arch bridge, both plain and reinforced. A bridge of this type which has been started at Derby will cost a quarter of a million dollars. The price of concrete has increased during the past few months to 30% above any previous price. Labor, however, is more easily obtained than a year ago. Since the additions to the munition plants have been completed, unskilled construction labor is not so much in demand. The price of labor, however, is unprecedented—from $2.50 to $3 a day, to be paid rain or shine."

At the present time there are about thirty contracts for road construction in force in Connecticut aggregating about $750,000; for bridge construction, about $500,000; for grade-crossing elimination work, $86,000.

There is one disappointing feature in Connecticut's road-construction program. In spite of the fact that the engineers of the Highway Commission are given large sums to spend on their work, the legislators at Hartford failed to make any provision for increased salaries.



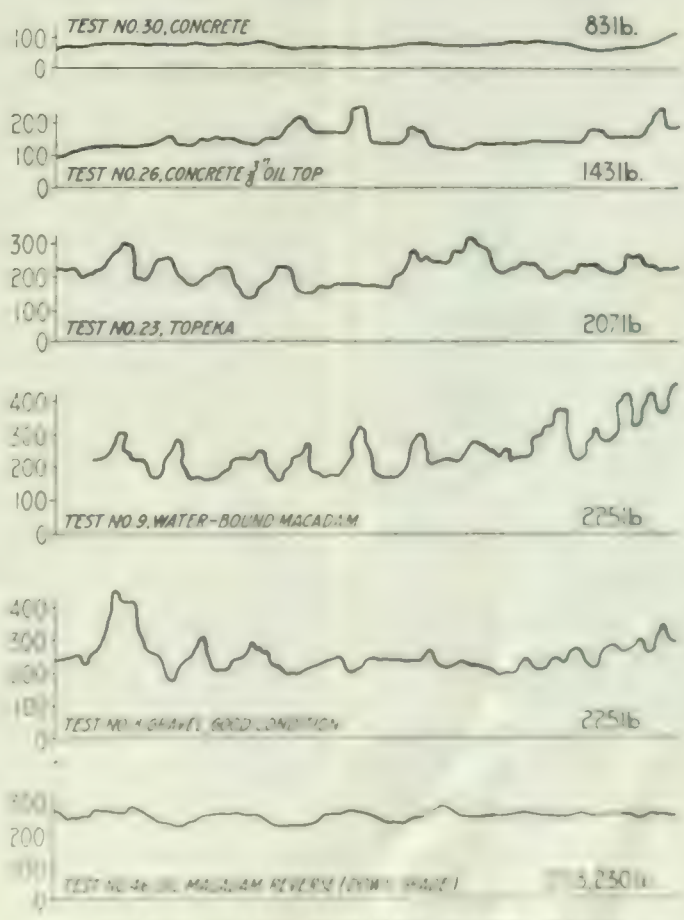
How the Surface of a Road Affects Tractive Effort

Unsurfaced Concrete Gives Best Results in California Tests with Steel Tired Wagon—Various Surfaces Compared by Special Tests Using a New Type of Recording Dynamometer

A SERIES of tests has just been completed in California which was planned to determine the tractive effort required to move vehicles over various types of roads. The results are to be used in an educational movement calculated to enlist the aid of the farmer, particularly in the good-roads movement. Tests of a similar character which were previously made, notably by the U. S. Office of Public Roads and Rural Engineering, afforded no data suited to California conditions or which could be used as the starting point for the further series of tests in tire wear and gasoline consumption which is contemplated. So the Good Roads Bureau of the California Automobile Association decided to carry out a series of tests, and for the series just completed secured the coöperation of the Agricultural Engineering Division of the University of California.

In planning the tests, it was decided to concentrate effort on securing constant conditions for a short length of time during which measurements could be made, rather than to make long runs and average the results. This policy was considered the best where experiments were to be made on the open highways and on several types of roads. One vehicle was therefore equipped and moved at the same speed over the various road surfaces to be compared. For this service a standard farm wagon was selected, equipped with steel axles of equal length and 38- and 46-in. wheels in front and rear, respectively, all wheels having 4-in. tires. The gross load was 3 tons, consisting of rice in sacks. The speed was kept very close to 2.4 miles per hour, and tests were run on level grades or, where slight grades were unavoidable, test runs were made in both directions and results averaged. At the time of the tests the usual sunny summer weather obtained, with maximum temperature of 105°.

The tractive effort was measured by a small dynamometer attached to the tongue of the wagon, which recorded the momentary pull at all times during the test runs and the total pull for the test period. This device, shown attached to the wagon tongue in one of the accompanying illustrations, makes its record over a measured distance, taken as 50 ft. in these tests. The measurement of distance is accomplished by unwinding a cord of definite length from a drum within the device. In a 50-ft. run an error of 6 in. in cord length, due to stretching or any other cause, would introduce an error of only 1% in the result. By careful measurement of the cord and occasional checking, it is kept to within a fraction of an inch of exact length and thus distance error is negligible.



DYNAMOMETER CURVES VARY MUCH

The record of tractive effort is made by the pencil actuated by a lever attached to the strong spring compressed by the pull. The integrating device operates on the planimeter principle, but as the measuring wheel makes one revolution for each 4 in. and

can be read to one-thousandth of a revolution, the instrument is 10 to 20 times as sensitive as the ordinary planimeter. As the integrating device shows in different form the same result as that traced by the pencil if desired, a check of the two results may be made by taking the area of the curve with a planimeter and dividing by the length of run.

Results Favor Unsurfaced Concrete

As shown by the accompanying table and curves, the resistance encountered on oiled surfaces was considerably more than on concrete. It was pointed out that this difference would be less at lower temperature, but the tests were made under normal conditions in the central California valleys, where the summer temperatures are frequently as high as 115° F. in the shade. Of course special conditions of temperature, whether higher or lower, would affect results.

It is also noted that the base supporting oiled surfaces affected the amount of tractive effort required. For example, tests 22 and 23, in which a concrete base was involved, showed less resistance than tests 18 to 20, in which the surface was on plank. The reason assigned for this difference is that the warm air gained access to the under side of the top dressing through the more or less pervious plank, as well as directly affecting the surface proper, while in the case of the concrete base, where the air had access only to the surface proper, less softening resulted. Another cause assigned as partly responsible for the increased resistance on the plank base was the yielding of the plank, which resulted in a continuous "uphill pull."

TYPICAL RESULTS FOR VARIOUS SURFACES

Test No.	Kind of Road	Condition of Road	Location	Tract. Resist. Total	Tract. Resist. Per Ton
29–30–31	Concrete (unsurfaced)	Smooth, excellent	Near Davis	83.0	27.6
*11–12	Concrete (unsurfaced)	Smooth, excellent	Near Davis	90.0	30.0
26–27–28	Concrete (⅛ in. surface asphaltic oil and screenings	Smooth, excellent	Near Davis	147.6	49.2
13–14	Concrete (⅛ in. surface asphaltic oil and screenings)	Smooth, excellent	Near Davis	155.0	51.6
9–10	Macadam, (water-bound)	Smooth, excellent	Near Davis	193.0	64.3
22–23	Topeka on concrete	Smooth, excellent	Near Davis	205.5	68.5
8	Gravel	Compact, good condition	Near Davis	225.0	75.0
†45–48	Oil macadam	Good, new	Near Sacramento	234.5	78.2
‡46–47	Oil macadam	Good, new	Near Sacramento	244.0	81.3
33	Gravel	Packed, in good condition	Near Davis	247.0	82.3
18–19–20	Topeka on plank	Good condition, soft, wagon left marks	On Causeway near Davis	265.0	88.3
34	Earth road	Firm, 1½-in. fine loose dust	Near Davis	276.0	92.0
24–25	Topeka on plank	Good conditon, but soft	Near Davis	278.0	92 6
1–2–5	Earth road	Dust ¼ to 2 in.	Near Davis	298.0	99 3
3–4	Earth	Mud, stiff, firm underneath	Near Davis	654.0	218.0
6–7	Gravel	Loose, not packed	Near Davis	789.0	263.0

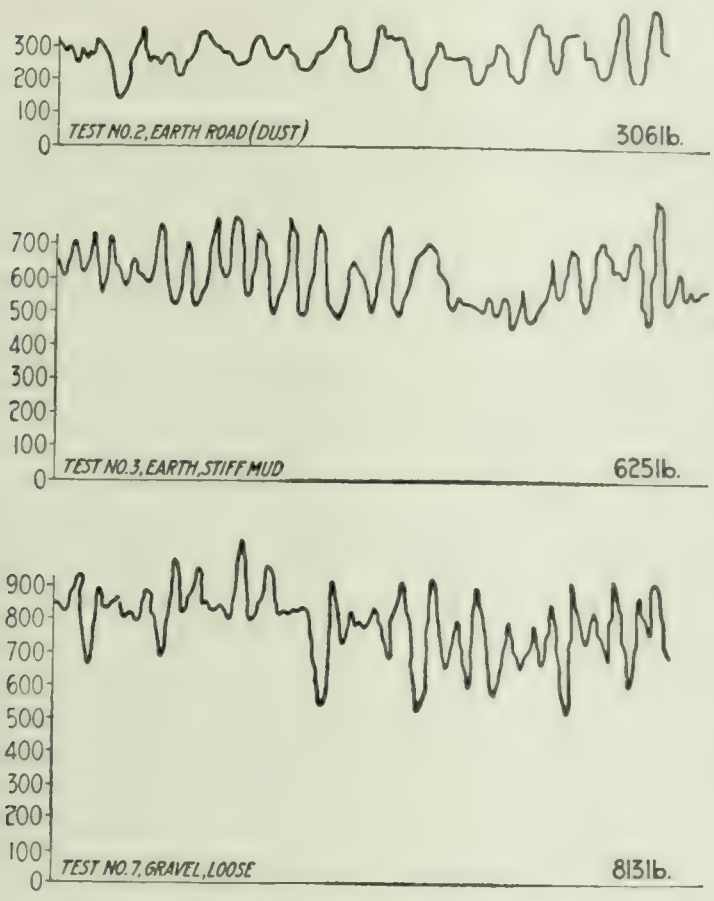
* Graphic record indicates that the load was being accelerated when test was started. † Drawn with motor truck at 2½ miles per hour. ‡ Drawn with motor truck at 5 miles per hour.



SOFT-SURFACES ADD MUCH TO REQUIRED TRACTIVE EFFORT

Record of effort is made by pencil actuated by pull on evener. Distance measured by unwinding cord of definite length

The supervision of the tests has been in the hands of Prof. J. B. Davidson, of the University of California, who is the inventor of the dynamometer. A popular-



CURVES FOR TESTS NOS. 2, 3 AND 7

ized report of the results of the tests, adapted for use in good roads propaganda, has been prepared by Ben Blow, California State Automobile Association, San Francisco.

A Traffic Average of Twenty-Eight Vehicles Per Minute

The average daily traffic on Fifth Ave., New York City, between 41st and 42nd Sts. between 8 a.m. and 6 p.m., is 16,960 vehicles—8513 vehicles northbound and 8447 vehicles southbound. Included in the total of 16,960 vehicles are 1296 motor busses, 130 per hour in both directions. The traffic averages twenty-eight vehicles a minute. At any point where this census was taken Fifth Ave. is fifty-five feet wide, which theoretically at least, permits the movement of six lines of vehicles. The count showed that passenger motor vehicles composed about two-thirds of the traffic, but these included the ponderous motor busses, which are heavier than most commercial motor cars.

The pavement carrying this enormous weight of traffic consists of sheet asphalt, 1½-in. close binder and 1½-in. top on a 6-in. concrete base. It was laid in 1913, replacing a similar pavement, which was seventeen years of age. The analysis of the top mixture used in this pavement shows a high percentage of bitumen and a correspondingly high proportion of fine material. An average of 11.7% asphalt was maintained throughout. The asphalt was of natural lake origin and carried a high per centage of portland cement filler.
While the surface is frequently broken due to the usual causes, the repairs are satisfactory and generally unobjectionable.

Letters to the Editor

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

The Engineer Title

Sir—When we speak of a lawyer, a preacher, a doctor or an architect, it is readily understood what vocation is referred to. Not so when an engineer is mentioned. Generally it is understood that a man who operates a steam engine is meant, one who does little more than turn on and off the steam. When the Buffalo fire-tug engine operators demanded an increase in pay and then quit, the newspapers teemed with articles headed by big scareheads: "ENGINEERS QUIT," "MARINE ENGINEERS ABANDON POSTS," "THE CASE OF THE ENGINEERS," the word ENGINEER being given unusual prominence.

If the word "engineering" is worth perpetuating, then persons practicing it should be called engineers, not the operators of engines. A steam drill is an engine, yet we do not call the runner or operator an engineer, but a drill runner; the same with dredges, steam shovels and elevators. Why should locomotive runners or drivers be called engineers?

It would seem proper that the creator of the engineering appliances should be called the engineer. Would the janitor be called an architect because he looks after a finished building? If, on the other hand, we associate the engineer with the steam engine, why should we say "bridge engineer." A bridge is certainly not an engine; more properly it is a contrivance.

As the word "engineer" now has a fixed and proper meaning, namely, persons engaged in the science of engineering, it behooves the engineering journals to eliminate as much as possible from their pages the use of this word when speaking of engine operators, runners or drivers. To call a tug engine operator a "marine engineer" is the height of absurdity. EMILE LOW.

Buffalo, N. Y.

Bituminous Foundations for Sheet Asphalt Surfaces

Sir—The comments, in your issue of July 26, p. 178, of H. W. Skidmore, construction engineer, Department of Public Works, Oak Park, Ill., on Lester Kirschbraun's able article commending bituminous-concrete foundations for sheet-asphalt surfaces (see *Engineering News-Record*, June 21, p. 591), makes reference to the paving contractor and chides that lowly, modest individual for not placing his ideas under the limelight more frequently, as does the engineer. It might interest Mr. Skidmore and others to know that asphalt-paving contractors in the South are interested in the bituminous-concrete foundation, and have published a specification of the same, and are endeavoring to "educate" Mr. Skidmore's brethern in the engineering profession regarding the merits of this proposition.

Washington, D. C., has many old and successful pavements laid on bituminous-concrete foundations, some over 30 years in service. It is likewise noticeable that

some of the best asphalt pavements laid on cement-concrete base in the same city have a mix in the base of 1:4:10 as against the customary 1:3:6 mix. These latter pavements were laid years ago under the paving administration of Dr. A. W. Dow.

The advantages of the bituminous-concrete base for sheet-asphalt wearing surfaces are fully covered in the Kirschbraun paper. There are additional advantages to the asphalt-paving contractor in that he can perform all his work with one organization—that of his asphalt plant and asphalt-paving gang—reducing expenses and saving time. Moreover, the work can be completed quicker. Base can be laid one day, sheet surface the next, and the third day the street opened to traffic.

Contractors are fully aware that cement-concrete foundations crack, and these cracks carry upward through the asphalt wearing surface, no matter how carefully the cement-concrete foundation and the asphalt wearing surface have been constructed. The contractor has been obliged to repair too many of these cracks under his five-year maintenance guaranty not to know it. He knows, too, that cement-concrete foundations for pavements draw water up from the subgrade and that this moisture in time has a tendency to disintegrate the bottom of the bituminous wearing surface. Such wearing surfaces wear from the top, but disintegrate from the bottom. The thoroughly waterproof bituminous-concrete foundation absolutely protects the asphalt wearing surface from moisture action from below, because asphalt is a well-known waterproofing agent.

The foregoing facts are very respectfully referred to S. H. Lea, city engineer, Charlotte, N. C., who in your issue of July 12, 1917, opposed the arguments set forth by Kirschbraun. Lea claims a cement-concrete base is preferable to a bituminous-concrete foundation, because he says the cement concrete provides a "firm unyielding foundation acting as a bridge over soft spots in sub-base." The answer to this is that "soft spots in the sub-base" ought to be made sound before any kind of foundation is laid. Moreover, hidden weak spots in the sub-base are disclosed under the action of rolling a bituminous-concrete foundation, whereas cement-concrete foundations are not rolled and, therefore, hidden weak spots in the sub-base are ordinarily not disclosed until the pavement is completed, and then by the action of traffic.

Mr. Lea likewise referred to the article of Professor Smith, of the University of Michigan, which relates how cement-concrete pavement foundations "suck up water" from the ground beneath—as an authoritative answer to his second contention that cement concrete furnishes "freedom from injury by water or dampness."

The pavements Mr. Lea refers to in his home city of Charlotte, N. C., which served with the least degree of satisfaction, were laid many years ago, on a rolled stone base, and this type of construction must not be confounded with the plant-mixed bituminous-concrete foundation, advocated by Kirschbraun, George C. Warren, of Boston, and other leaders in the bituminous-paving industry. Many paving contractors are also advocates of this type of construction. L. B. West, president, West Construction Co., Chattanooga, Tenn., has had 27 years' personal, practical asphalt-paving experience and informs the writer that he agrees with Kirschbraun in every particular.

GEORGE B. MCGRATH,
General Manager, Southern Purchasing Co.
Chattanooga, Tenn.

Sir—In reading Mr. Kirschbraun's article on "Bituminous Foundations for Sheet-Asphalt Surfaces," in *Engineering News-Record* of June 21, p. 591, I was reminded, by his reference to "a perfectly good asphalt pavement," of some paving work in the City of Chicago, which came directly under my observation, late in the summer of 1916.

The street in question had been paved with macadam, which was removed before the concrete base was laid. The stone obtained from this macadam base was screened to remove the fine particles, and this same stone, without any further cleaning, formed the greater part of the coarse aggregate for the concrete base for the new pavement. Each individual stone was almost completely covered with a film of dirt, and the whole was utterly unfit for use. After this concrete base had been in place for 10 days, it was possible to pull these stones out with the fingers wherever the base was rough enough to allow one to get hold of them.

The amount of cement used in this work was correct for a 1:3:6 mixture, but the mixing was poor, as it was unusual for a batch to remain in the mixer for more than one minute.

In view of these facts, I could not help wondering if the failure of the paving referred to by Mr. Kirschbraun was not due to faulty construction, rather than faulty design.

H. W. ROBERTS.
Chicago.

Training City Managers

Sir—The article on "Training City Managers," by Murray P. Horowitz, in your issue of Aug. 2, is timely. It indicates the close relationship between sanitary and municipal engineering and municipal government. Students who have been trained as sanitary engineers have, after entering practice, often found that their work in sanitation was bound inextricably with problems of municipal finance, administration and politics.

In the large majority of cities under the city-manager form of government, the city manager is a civil engineer. The reason probably is that the civil engineer, of all municipal employees, has had the best scientific training along broad lines. There have been until recently few other municipal employees with special training and experience in administrative work. The health officer generally has been a physician in private practice, with little experience in public health work. The chief of police is sometimes a capable officer, rising from the ranks, but often is appointed without reference to his ability to protect the public or to his knowledge of penology. The city clerk has had a clerical training and generally has had little executive responsibility. The city attorney may or may not have had the business or executive training required. But the city engineer has been required not only to know the physical characteristics of his city and to plan and design public improvements, but he has also had to employ and manage men, to purchase materials

on precise specifications, to devise an accounting system, to keep cost records, to coöperate with the health officer in sanitary improvements, to work with the city attorney on contracts and bond issues, to work with the assessor on special assessments and often to prepare building ordinances which require the coöperation of the Fire Department. He also has had the difficult work of meeting public opinion or public apathy.

Of all the municipal problems which demand public attention, probably none are more important than those of transportation, both external and internal. These are essentially of an engineering nature. Franchises and valuations depend largely upon the physical properties, of which the engineer has first-hand knowledge.

The introduction of the idea of business and efficiency into city government has brought forth a realization in the form of the city-manager form of government, and the engineer has been forced into the field because he has been found to meet the requirements more nearly than any person of other training.

The paper written by Mr. Horowitz is therefore a timely reminder of the trend in city government and the broader opportunity which is open to city engineers who may prepare themselves by study of the municipal problems lying outside of the narrower fields of engineering strictly limited to physical problems. It calls attention to the fact that the engineer is a greater potential power for good government than has generally been realized by the public.

If one will scan the catalogs or bulletins of the leading universities, he will see that a student may avail himself of a range of interesting and profitable courses in the social sciences and engineering in many institutions. Engineering faculties in some of the state universities have recognized this development and have made special arrangements for the training under discussion.

FREDERICK BASS,
Department of Civil Engineering, University of Minnesota.

The Wilson Ave. Tunnel, Chicago

Sir—In your article on "Making Surveys for Land and Lake Tunnel at Chicago," in *Engineering News-Record* of July 26, 1917, you state that the Wilson Ave. Tunnel is being built by city day labor under the direction of H. W. Clausen. Permit me to inform you that this tunnel is built by day labor on the recommendation and under the direction of the city engineer, who is held responsible for this work. Mr. Clausen is one of ten division heads reporting to the city engineer, and is placed in direct charge of this work by the city engineer.

JOHN ERICSON,
Chicago, Ill. City Engineer.

Everglades Drainage District Considered Merits of Engineers

Sir—On p. 237 of *Engineering News-Record*, issue of Aug. 2, 1917, I note a news item, "Everglades Drainage District Gets Engineer." From the concluding paragraph of that item it would appear that the district selected its engineer on the basis of competitive bids for engineering services. This is misleading. The district did receive proposals from several different engineers, but that of Isham Randolph & Co. was not the lowest. The selection of engineers for the district was not made on the basis of competitive bids, but was made after the district had thoroughly considered the merits of different firms according to their own views.

We have always felt that competitive bidding among engineers was a practice to be discouraged, and I am sure that you will be interested in knowing that on a project of this magnitude, unfair methods were not employed.

GEORGE B. HILLS,
Engineer Manager, Isham Randolph & Co.
Jacksonville, Fla.

Market St. Bridge at Chattanooga

Sir: In your issue of July 26, 1917, p. 170, I note an article referring to the Market St. Bridge at Chattanooga. This article contains certain errors of fact to which the attention of your readers should be called.

This bridge was designed by the writer and with the exception of the bascule was built under his direction and supervision. The steel bascule span was designed by the Scherzer Rolling Lift Bridge Co., under the direction of the writer.

J. E. Greiner was not retained as advisory engineer until February, 1916, by which time the concrete was three-fourths completed and part of the steel had actually been fabricated.

The general contractors for the masonry were the Vang Construction Co., of Cumberland, Md., and for the structural steel span, the Toledo Bridge and Crane Co., of Toledo, Ohio, who employed the Kelly-Atkinson Co. to do the erection work.

B. H. DAVIS,
New York City. Consulting Engineer.

To Counteract Settlement of Approach Fills

Sir—When bridges are built with high abutments in paved roads or streets and the pavement is laid on the approaches very soon after the completion of the bridge—a procedure which is often hardly avoidable—there is usually much trouble with the settlement of the filling adjacent to the abutment, which makes a very unpleasant bump for automobilists and others.

To mitigate that evil I would suggest that a ledge be formed in the rear of the back wall in such a position that the concrete foundation for the paving may rest thereon. This concrete foundation should be cut about fifteen (15) feet back of the back wall, or more if much settlement is anticipated, and strongly reinforced so that the slab thus formed will bridge over the cavity left by the settlement of the filling and thus form a kind of a ramp instead of the usual bump. Of course when the filling has thoroughly settled the paving should be removed and the filling brought up to grade and proper pavement constructed. It is often advisable, where traffic must be reëstablished as soon as possible to pave the roadway temporarily with broken stone with a top dressing of gravel or screenings, or a stone block pavement on a gravel foundation. These pavements are easily built up or repaired as the settlement proceeds and this road can be kept in very fair condition. This requires, of course, an organization equipped to make repairs promptly at the proper time.

WILLIS WHITED, Bridge Engineer,
Pennsylvania State Highway Department.
Harrisburg, Penn.

THE ENGINEER IN FIELD AND OFFICE

A DEPARTMENT DEVOTED TO DETAILS OF THE DAY'S WORK

Old Stone Arch Has Curious Wing Walls

A masonry arch bridge built in 1871 at La Salle, Ill., has a peculiar arrangement of stone in its wing walls. As shown in the view, these walls are arched in plan and elevation, forming a part of a dome-like surface in which the stone are laid with beds normal to the top slope of the wall. These stones, laid almost as voussoirs



WING WALLS OF FORTY-SIX-YEAR-OLD ARCH HAVE DOME-LIKE SHAPE

of an arch, are flat and of nearly uniform size. The arch itself, as well as the wing walls, is of limestone, laid in cement mortar.

The bridge, carrying a country road across Vermilion Creek, is locally reputed to be the work of E. C. Hegeler, the famous zinc metallurgist, who lived in La Salle. It is stated that the curve of the intrados is a true catenary, determined by suspending a log chain of suitable length and measuring the ordinates. The span is 75 ft., the rise 15 ft., and the uniform thickness of the rib 3 feet.

Concealed Wood Strips for Transverse Joints in Concrete Pavement

By S. E. Fitch

Senior Assistant Engineer, New York State Highway Department

MANY of the troubles attending the use of transverse joints in concrete pavements can be avoided by installing at the bottom of the slab a ⅜-in. wooden strip of about half the depth of the concrete. In this manner planes of weakness where transverse cracking may concentrate, are definitely located.

Four joints of this type were installed under the writer's direction in 1915, and withstood the following winter without cracking, although fine hair cracks appeared in June, 1916. These cracks were very narrow and followed a zigzag line around the individual stones of the concrete directly over the wooden strip. The zigzag cracks nowhere departed more than 2 in. from a straight line. These cracks were exposed to traffic all summer, and no spalling of any kind has been noticed.

The result was so satisfactory that in 1916 the writer installed 10 consecutive joints of the same type on each of two roads. These have gone through one winter and are now in excellent shape. Fine hair cracks have appeared over most of the joints, but the fact that the pavement has not yet cracked over a few indicates that the slabs might have been made somewhat longer than 30 ft. in this particular locality. In no case has the pavement cracked, except over the wooden strips.

Several Advantages Are Secured

The advantages obtained by this method over other types of joints are: (1) No spalling along the joints; (2) no interference with screeding or floating, and a much smoother pavement; (3) the joints are cheaper and easier to install, the wood may be of cheap material and need not be creosoted; (4) better appearance of the road.

The advantages of this method over no joints at all are that by choosing the proper length of slab to correspond to the width of pavement and to climatic conditions the cracks will be minimized and will run square across the pavement at regular intervals instead of occurring haphazard and running in every direction.

It is absolutely necessary that the top of the joint be kept below the surface of the slab a sufficient distance to give body enough to the concrete over it to prevent spalling. This minimum depth has not yet been definitely determined, but from observations already made, a distance of 2½ in. near the edges and 3½ in. near the center of the pavement seems to work out very well. Should this distance be much greater, it probably would necessitate decreasing the length of the slab in order to insure the cracking at the joints only.

A simple way to prevent the rising of the wooden joints up through the concrete is to drive short pegs at intervals of about 7 ft. across the road and nail through the strip into the pegs. Bent wires hooked over the joint would answer the same purpose. The strips should be installed by means of a taper installing board in the usual manner.

While no spalling has occurred on any of the joints mentioned, it is realized that "one swallow does not make a summer," and it may prove to be advisable to treat these cracks with a small amount of bituminous material as soon as they appear, especially on roads of heavy traffic. So far as these experiments go, the writer believes that the resulting fine cracks are as satisfactory joints as he has yet seen.

Cast-Iron Pipe Connects Wood-Stave Pipe with Concrete Structures

THE connection of a wood-stave pipe with a concrete structure is a troublesome detail. Quite often the end of the pipe is inserted into a socket left in the concrete. Subsequently the ring left around the pipe is grouted. While this method is still in use it has been the cause of some failures in wooden siphons in Wyoming, for the repair cannot be made easily when necessary to replace the staves.

One engineer handles the problem by embedding a cast-iron pipe in the concrete and then fitting the wood pipe over it. To make a water-tight joint and one that permits expansion and contraction, the cast-iron pipe is wrapped with tar-soaked oakum for a distance of 4 ft. Beginning at a point 15 ft. from the end of the pipe, the internal diameter of the wood pipe is increased by tapered staves to fit the outside of the wrapped pipe.

Unusual Road Drainage

A few miles east of Wooster, Ohio, on the Lincoln Highway, is an unusual solution of a road-drainage problem. The road from Wooster east at this point dips from a comparatively level stretch to a grade of some 6 to 8% (which is being paved with monolithic brick). Across the ridge where the road begins to dip is an intersecting road at right angles. At this point there was evidently a culvert pipe on both sides, while open ditches were provided for drainage of the side hill and to carry considerable accumulated water from the more level place above.

To avoid scouring on the deep side ditches on the improved road, about a 30-in. corrugated-iron culvert pipe extending from the crest of the hill to a creek at the foot of the hill (about 300 ft.) has been installed. Apparently it is not intended to be covered. Drainage water from the level stretch on the opposite side of the road passes through a culvert pipe at the crest and then is conducted diagonally across the roadbed into the large culvert pipe by a segmental cast-iron culvert pipe, forming the unusual-looking structure shown in the accompanying view.



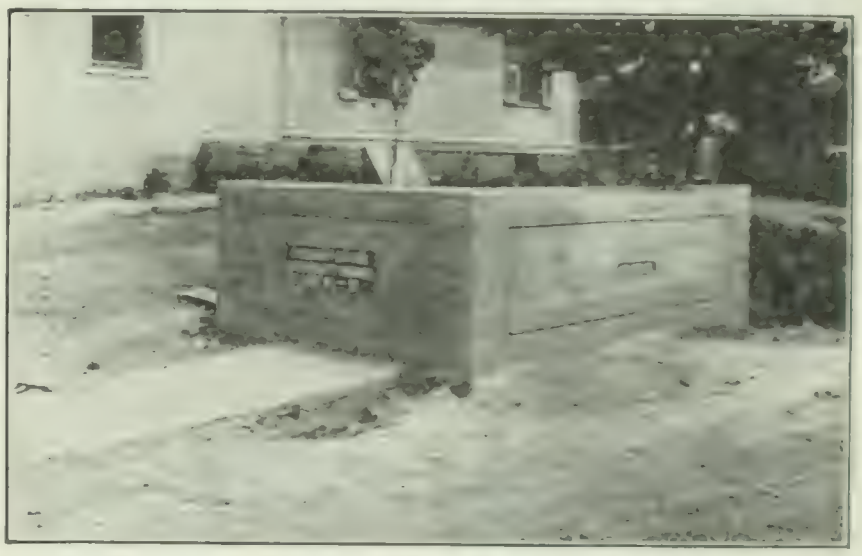
UNUSUAL DRAINAGE, LINCOLN HIGHWAY, OHIO

Street Signs Show House Numbers

It is sometimes hard, even to one who is acquainted with a city's streets, to tell from the corner signs just how near he is to the particular house number he is seeking. If the seeker is in a street car, the situation is aggravated. Particularly is this so in cities where the house numbers bear no relation to the distance of the cross-streets from a meridian street. The new style of street sign adopted by Cincinnati, Ohio, avoids this difficulty. All streets having car lines are now supplied with the new signs, which show on a separate panel the numbers of the corner houses. This is an admirable advance over the design used for the more important street signs of New York City, which show the crossing street in smaller-size lettering above the indicated street.

Every Culvert Has Its Number on a Cast-Iron Plate

HAMILTON COUNTY, Ohio, of which Cincinnati is the county seat, places a cast-iron sign with the name of the highway and the number of the culvert on the parapet and wing-walls of every culvert. The accompanying illustration shows a culvert at the intersection of two roads, the Cincinnati-Dayton intercounty highway and the road at right angles, Kemper Road. The number of the culvert is 18. These signs are a great convenience to tourists and also assist the office record system.



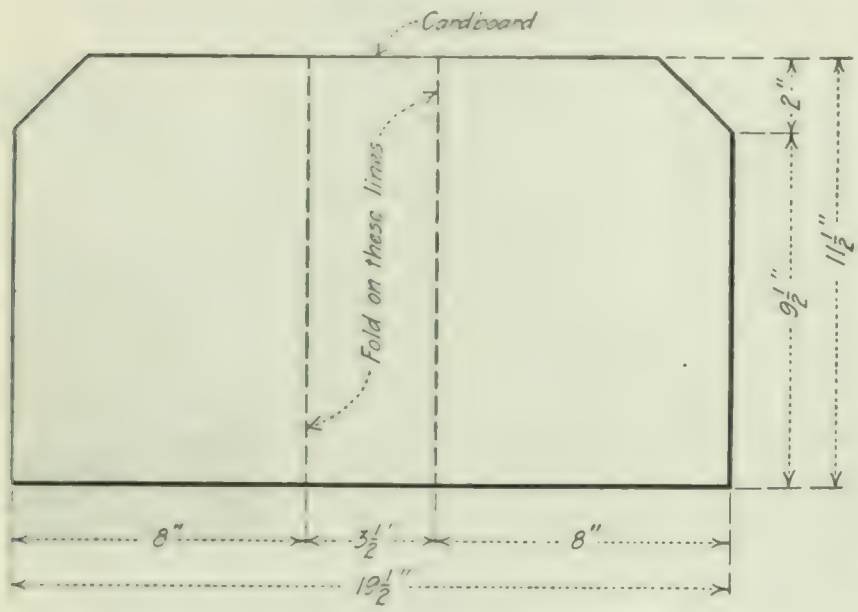
NUMBER OF CULVERT AND NAME OF ROAD HELP OFFICIALS AND TOURISTS

Pamphlets Indexed and Filed by Simple System

PAMPHLETS in great variety, principally bulletins and reports, are available in constantly increasing number and comprise a very important class of current literature. The value of the information which they contain is, however, considerably lessened if they are not indexed and filed in a manner which facilitates easy reference to their contents. Indexing and filing pamphlets by the following plan has been found to be a simple matter and to give satisfactory results as to convenience of reference.

As soon as convenient after receiving, the pamphlet is read, or at least inspected to ascertain the character and scope of its contents. As this is being done such index cards as are thought desirable are written. For this purpose the writer prefers to use very thin 3-in. x 5-in. cards ruled horizontally and made up in pads. For this and general notebook purposes it is convenient to carry a number of these cards in a loose-leaf notebook.

The index cards are then placed together in the pamphlet until it proves convenient to assign serial numbers to the pamphlets for filing purposes. A simple record of the pamphlet numbers assigned is kept by filing with the pamphlets a 6-in. x 9-in. card on which the last serial number assigned is noted each time. It has been found most convenient to place the numbers on the upper right-hand corner of the index cards and on the upper left-hand corner of the pamphlet cover. This numbering may be done by hand, though a numbering machine does the work more neatly and quickly. A very satisfactory substitute is a rubber-stamp numberer, similar in construction to the familiar band dater.



FILING BOX IS EASILY MADE

The pamphlets are then filed in the order of their serial numbers from left to right on shelves or in bookcases. A decidedly neater appearance is given the collection when filed in pamphlet boxes. It will be found a simple matter to make up these boxes as needed after the construction indicated in the illustration. Where heavy cardboard is used, the bending is facilitated by making a very light knife cut on the fold lines. A neat appearance, as well as a stronger box, results when the exposed edges are bound with gummed cloth tape or the gummed paper strips used in binding lantern slides. Each pamphlet box should carry a serial number as well as a number corresponding to the highest serial number of the pamphlets that are filed in the box.

In the writer's opinion the filing of pamphlets by arbitrary serial numbers is far more simple, elastic and generally satisfactory than any attempt to classify or group these publications according to their subject matter. And any system of indexing, to be satisfactory, demands the personal attention of the person who is to make use of it, as the average office help cannot be expected to do indexing of this sort with any satisfactory degree of intelligence.

Formulas for Emergency Disinfection with Hypochlorite

By Joseph Doman
Assistant Sanitary Engineer, California State Board of Health

Although liquid chlorine is being substituted for hypochlorite in modern water-purification plants, hypochlorite is more adaptable for emergency or temporary purposes, due mainly to ease in obtaining the chemical and low cost of installation. In such cases the formulas in the accompanying table will be found simple and useful for the rapid calculation of dosage and operating quantities. While it is always advisable to have the bleach and main solution tested for availabe chlorine, this is often omitted, giving rise to three different methods of operation.

The formulas have been grouped so as to apply to all of these methods. In Group I, in the table, the available chlorine in the main solution is known; that in the bleach may or may not be known. In Group II, only the available chlorine in the bleach is known. In Group III, the available chlorine is unknown in both bleach and main solution. In this case, approximate dosage in terms of chlorine may be obtained by assuming a value for the available chlorine in the bleach and using formulas in Group II.

It is interesting to note that with slight changes in the notation given beneath the table and eliminating formulas involving the term P, the equations in the table can be applied to other chemical treatments, such as lime, alum, soda ash and the like. The notation should be modified so that A = amount of chemical applied to raw water, p.p.m.; D = amount of chemical applied to raw water, pounds per 1,000,000 gal.

Adding to the above modifications, the term C = chlorine applied to raw water, pounds per 24 hours, the following formulas apply to liquid-chlorine practice: $D = 10{,}000\ C/G$ and $A = D/8.33$.

OPERATING FORMULAS* FOR HYPOCHLORITE DISINFECTION

Quantity Sought	Equivalent to Quantity Sought — Group I	Group II	Group III
D	$\frac{10{,}000\ AH}{L}$	$\frac{833\,A}{P}$	$\frac{10{,}000\ HR}{G}$
A	$\frac{LR}{G}$ or $\frac{DL}{10{,}000\,H}$	$\frac{DP}{833}$	.....
R	$\frac{AG}{L}$	$\frac{AG}{12\,PH}$	$\frac{DG}{10{,}000\,H}$
H	$\frac{L}{12\,P}$	$\frac{AG}{12\,PR}$	$\frac{DG}{10{,}000\,R}$ or 8.33 S
L	12 PH	12 PH or AG or 100 SP / R	

* Formulas for Group III apply to Group II. Formulas for Groups II and III apply to Group I. The notation is as follows:

A = Available chlorine applied to raw water, p.p.m.;
D = Bleach applied to raw water, lb. per 1,000,000 gal.;
R = Rate of application of dosing solution, gals. per 24-hour day;
G = Rate of flow of treated water, gal per day;
H = Strength of dosing solution, lb. bleach per 100 gal.;
S = Strength of dosing solution, per cent.;
P = Available chlorine in bleach, per cent.;
L = Available chlorine in dosing solution, p.p.m

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Simple Jacking Platform Facilitates Bridge-Pier Replacement

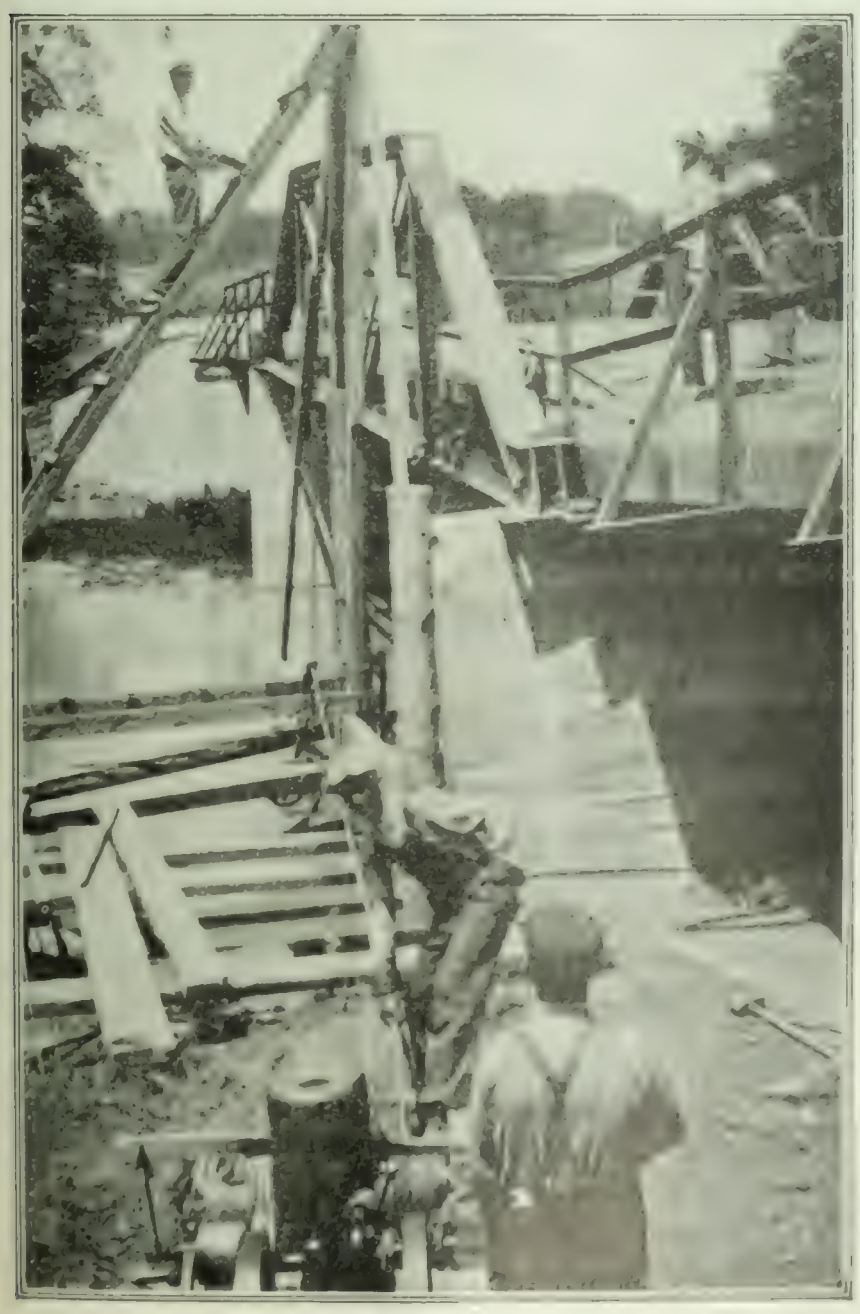
By R. T. Brown
County Highway Engineer, Lexington, N. C.

TO REPLACE a pier undermined by a heavy flood in 1916, the bridge shown in the photograph was jacked up and held by supporting it from a platform made by letting the flanges of I-beams into the opposite sides of pile supports, and clamping them with bolts. This took the bearing off the bolts and saved complicated framing. The bridge was rather heavy, consisting of a 50-ft. pony truss and two 36-ft. girder spans. The bridge carried a 16-ft. concrete roadway 5 in. thick.

The flood referred to undermined one pier so that it settled 6 in. at one end and 18 in. at the other. This threw the bridge slightly downstream. The floor, however, which was well reinforced, was scarcely cracked. Four piles about 30 ft. long were driven around the settled pier with a 660-lb. hammer to a penetration of about ½ in. per blow. These piles were spaced so as not to interfere with the replacement of the old pier.



FLANGES OF PLATFORM BEAMS LET INTO PILES



BRIDGE SETTLED AND MOVED SIDEWISE

Two 15-in. I-beams with their flanges let into the piles were then bolted transversely to the roadway. Bearing on these I-beams, and with their flanges also let into the piles, were two 8-in. beams parallel to the axis of the bridge. Another set of beams was bolted to the piles in the same way lower down to carry a jacking platform. From this platform, by means of two 60-ton hydraulic jacks, the bridge was raised to its proper position and blocked from the upper set of beams. The old pier was then removed with small charges of dynamite. Holes were next cut in the concrete floor of the bridge to permit driving foundation piles for a new pier. These holes were left open and used later to pour the concrete for the new pier.

In this way, what promised at first to be a very difficult job was safely completed at low cost and without interrupting traffic on the bridge at any time. The work was carried on under the direction of the writer as engineer and D. T. Beish as superintendent.

Shovel on Wide-Span Carriage Saves Labor in Laying Big Concrete Pipe

JAMES O'Donnell & Sons, general contractors, of Vincennes, Ind., are saving labor in laying large pre-cast concrete sewer pipe by using a steam shovel with a wide carriage traveling on a timber track both to complete the trenching and to handle, with a special hook, the 84- and 72-in. diameter 4-ft. sections of 6-in. concrete pipe, which weigh from 5 to 6 tons apiece. With a crew of five men 40 ft. of this sewer is regularly completed in a day at Columbus, Ohio.

The excavation for a trench 15 or more feet deep is made after first breaking a long stretch of pavement over the trench with a 1000-lb. cast-iron ball

handled by an Osgood No. 18 shovel with the dipper and dipper boom removed, using only the hoisting tackle. This is very efficient for breaking the concrete base of the brick pavement encountered.

The first 6 or 8 ft. of the trench excavation is then taken out with a Keystone shovel rigged with an elbow boom. Two men are required to operate this machine. Following not more than 100 ft. behind comes the Osgood shovel, specially mounted on an I-beam truck having four very wide flanged wheels. These wheels travel on a track of 12 x 12's laid well back from the edges of the trench. The gage of this track is 18 ft. The scheme of moving the shovel in this manner is claimed to be original with this contractor, the usual method being to have the shovel mounted over the trench on a platform of 12 x 12's, which must be laid in advance as the shovel moves. The balance of the excavation left by the Keystone shovel is removed with a clamshell bucket. The operation of the shovel with bucket attachment requires the services of a third man. Two other men work in the trench sheeting it and cleaning it to grade.

As soon as the trench has advanced far enough to place two or more sections of pipe, the clamshell bucket is detached from the shovel boom and is replaced by a yoke which is used to lift the sections of pipe. The pipe is placed in final position by the shovel alone. The ease with which the shovel can be moved longitudinally makes the most delicate adjustment of the sections of pipe possible. The yoke for holding the pipe is made of two pieces of I-beam fastened together at one end by another section of I-beam filler about 7-in. high. This forms a U-shaped yoke, one leg of which goes inside the pipe. The other leg carries three eyebolts to which the hoisting line is attached. Two lines are attached which meet about 3 ft. above the yoke. The three eyebolts and shackles permit one of the lines to be moved from one eyebolt to another if it interferes with the cross-bracing of the trench, without releasing the pipe. The use of the three eyebolts and two hoisting lines make it possible to exert considerable leverage on the pipe and thus make a very snug-fitting joint.

The pipe, made under patents owned by the Independent Concrete Pipe Co., of Indianapolis, is cast on the street at the point where it is to be used. It is reinforced with ¼-in. steel wire hoops which are held on four slotted steel uprights. The work is part of the extensive new sewer construction being carried out under the direction of City Engineer Maetzel.



SHOVEL MOUNTED ON WIDE CARRIAGE FINISHES TRENCH AND HANDLES CONCRETE PIPE TO PLACE

Small Tail Gate in Dump-Body Truck Spreads Stone in Ruts

THE STATE highway engineer of Tennessee has devised a method of dumping stone or gravel in wheel ruts by using a small tail gate which lets the material out in a narrow stream. The county of which Nashville is the center owns a Kelly-Springfield 5-ton truck with a detachable steel dump body. In addition to the usual tailboard, an 18-in. wide by 12-in. high opening has been made, with a sliding door, so that instead of dumping the stone the full width of the truck, only an 18-in. wide stream may be discharged. The truck is then driven so as to center over the rut to be filled and the elevation of the body and the speed of the truck adjusted so as to give just the right amount of gravel or stone to fill the rut.

Steam Shovel Wrecks Deep Basement and Loads Motor Trucks on Street

ONE HUNDRED 5-yd. truck loads of material a day were hauled from an 8-story building in the Chicago loop district which was wrecked recently. The trucks were loaded at street level by a Bucyrus steam shovel provided with an extra-long dipper stick. Ordinary wrecking operations removed the floors above the street level, but everything below, including masonry basement walls, partitions and débris, was handled with the steam shovel. The W. J. Newman Co. was the contractor.



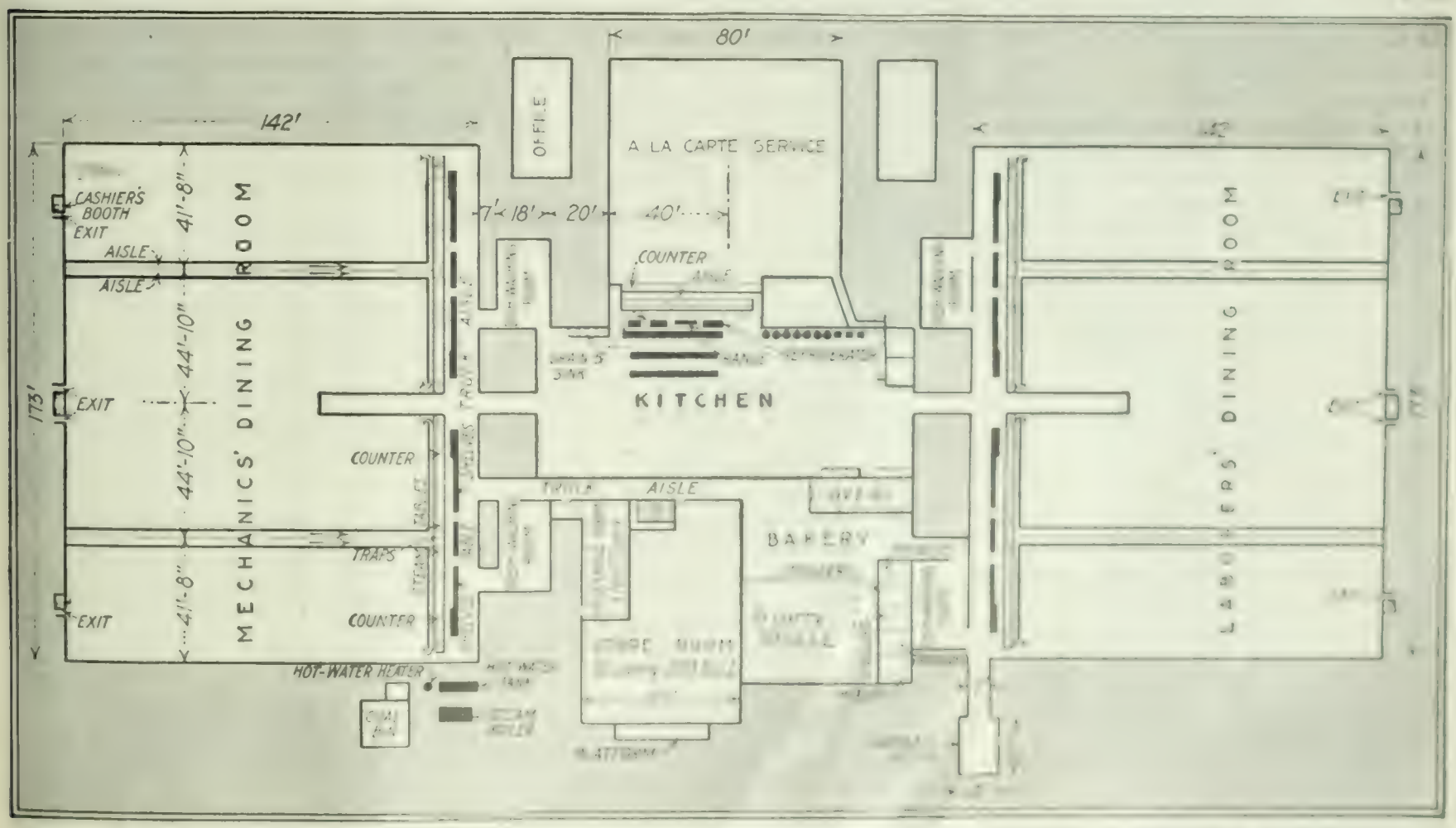
STEAM SHOVEL EXCAVATES OLD BASEMENT 21 FEET DEEP

Cafeteria Idea Works Well in 3000-Man Contractor's Camp

SELF-SERVICE for the pipefitter, carpenter and trench digger is the order of the day in the contractor's commissary at the new army cantonment at Ayer, Mass. Moreover, the men receive their full wages and pay cash for their own meals, or buy meal tickets. The number of men required to operate the dining-room is reduced, the waste is cut down, and the entire commissary is kept under better control.

It might be argued by those used to dashing into the long dining-hall at the sound of the dinner gong to find a meal all ready spread out on the table for them, that self-service would not only take up the entire time allowed for meals, but would make it impossible to feed a large number of men within the time available. On the contrary, however, two cash registers and "loading" counters have already proved ample for handling 2500 men at a meal. Before the completion of wooden dining halls, the men took their meals on trays to tables under a pair of large tents as a temporary expedient.

This innovation in the accepted process of feeding contractor's men is due to the management of Baldwin's, Inc., a large restaurant firm, consulted on the subject by Fred T. Ley & Co., contractors for the cantonment, which is being built for the U. S. Government under the direction of Captain Edward Canfield, Jr., constructing quartermaster of this cantonment.



MEN PASS DOWN CENTER AISLES PAST SERVING COUNTERS AND OUT AROUND AISLES INTO DINING HALLS

NEWS OF THE WEEK

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

Chicago Wants More Through-Route Streets

Association Has Been Organized To Promote Plans Now Before Improvements Board

An association to promote the opening of certain streets to form additional through routes has been organized in Chicago. The improvements are already under consideration by the Board of Local Improvements and the Chicago Plan Commission. The most important work desired is the extension of Ogden Ave. This is a diagonal street in the southwest district, but ends at Union Park, on the west side. By extending it 2½ miles to Lincoln Park, it would give a direct connection between crowded tenement districts and the lake front and also a more direct route for much team traffic which now has to go through the congested business district. It is proposed to make the extension 108 ft. wide. Surveys for this have been started by the Board of Local Improvements, and will occupy several months. Until these are completed, the location and cost cannot be decided definitely.

Another improvement is a link in Ashland Ave., across the north branch of the Chicago River, to connect the north and south sections of this thoroughfare. The opening up of Robey St. to form a continuous thoroughfare includes similar crossings of both the north and south branches of the river. Subways for street-car lines at these three points have been proposed by the local Commission on Transportation, but if the Board of Local Improvements undertakes these extensions it will be with the idea of developing a complete street in each case, and subway work will be avoided if possible. However, the Ashland Ave. and Robey St. extensions cannot be considered by the board until the surveys for the Ogden Ave. extension have been completed.

Large Grading Project Proposed for San Francisco

A plan for the removal, at a cost of approximately $4,000,000, of Rincon Hill, an eminence in San Francisco near the waterfront on the south side of Market St., was recently submitted to the Board of Supervisors by H. A. Mason, ordinance expert of the Board of Public Works. By grading the hill, according to this plan, 40 acres which are not now valuable would be added to the area available for manufacturing and warehouse uses.

A part of the scheme is that the material taken out could be used to fill in the vicinity of Islais Creek so as to add about 60 acres to the waterfront land there. The estimated value of all lands thus made available is about $6,000,000. The expense would be defrayed through assessment districts, plans for which are included in an ordinance drawn up to accompany the report.

A public hearing will be held at an early date under the auspices of the Lands and Tunnels, Commercial Development and Finance Committees of the Board of Supervisors, to which the matter has been referred.

Oregon Will Make New Roads Wider

Two decisions made recently by the State Highway Commission of Oregon were, first, to build all paved roads 16 ft. instead of 12 ft. wide, and, second, to urge the Government to develop the economic roads before the strictly scenic roads are improved.

Paving contracts heretofore awarded by the commission were for 12-ft. pavements. From all parts of the state there has been complaint that 12 ft. is too narrow and a 16-ft. width has been demanded.

Want Men for Possible Second Lumberjack Regiment

The regiment of lumbermen, officially known as the Tenth Engineers (Forest) and nicknamed the "Lumberjack Regiment," has been recruited to full strength, and the Forest Service, which has been securing the men, has been notified by the War Department to list no more candidates for service with this regiment. In anticipation, however, of a possible call soon for another regiment of the same character, the listing officers all over the country have been instructed to continue listing names of suitable men who may be summoned when needed.

The "Lumberjack Regiment" is not a fighting force, but will be employed in woods operations in France, getting out material for army use. The recruits are now being assembled in Washington, where they are drilled daily by the officers assigned to command them. Colonel Woodruff, of the regular army, who will head the regiment, is in charge and, with the assistance of a staff made up of practical lumbermen and foresters, is providing an equipment of the most up-to-date character for the type of woods operations called for in the list of the experience of the allies. The regiment will take with it both stationary and portable sawmills, with everything necessary for logging and sawmill work and for transporting the product.

Attempt To Cut Off San Diego Water-Supply Failed

Authorities Have Clues to Identity of Persons Who Dynamited Supply Conduit

Editorial Correspondence

A futile attempt to cut off the water-supply of San Diego, Calif., and the military bases at Fort Rosecrans and the Camp Kearney cantonment by dynamiting the 40-in. wood-stave supply conduit was made at 11 p.m., Aug. 17. The net result was two broken staves, which were replaced in seven hours. Meanwhile water was drawn from an emergency reservoir. The authorities have clues by means of which they expect to apprehend the miscreants.

One Railroad Official Urges Waterway Use

The vice president of the Chicago, Burlington & Quincy R.R. has sent a letter to the freight representatives of his company in which he strongly urges them to do everything in their power to promote the use of inland waterways for freight transportation. The main parts of the letter follow:

"There is every indication that for some time to come the traffic offered for transportation in this country will be in excess of the capacity of the rail facilities which are available. I want to reiterate to you, and through you to our representatives generally, that it is the earnest desire of the management that every opportunity be taken to assist in the development of the practical use of the waterways.

"We have been rather disappointed that since the issuance of the Railroad War Board's bulletin No. 18, under date of June 22, there has apparently been very little done in perfecting arrangements for larger interchange of traffic between the water and rail lines in this territory, and I wish that, if you have not already done so, you would at once make it plain to all the steamboat companies, also to chambers of commerce and other organizations interested in water transportation development, that we wish to extend our cooperation.

"Some of the steamship people, shippers and the public generally have in the past been inclined to the view that the railroads would by all means in their power discourage the use of water facilities by making low competitive rates and through refusal to participate in joint rates and through billing arrangements, declining to build tracks to docks, etc., and we want, if possible, to have this view changed as quickly as possible."

Court Announces Findings in Water Rate Case

Spring Valley Water Co., of San Francisco, Master Decides, Is Entitled to $2,250,000 Impounded Rate Money

The Spring Valley Water Co., of San Francisco, is entitled to the $2,250,000 impounded rate money held by the United States District Court, according to a report recently made by H. M. Wright, master in chancery. This report will be filed Sept. 7 with Judge Van Fleet, of the United States District Court, for his approval or rejection. Meantime the city is preparing objections to the findings and there is likelihood of a long legal contest, probably carrying the case into the United States Supreme Court.

In 1907 the Board of Supervisors of San Francisco fixed rates at which the private company should sell water, and which decreased by about 19% the rates established by ordinance in 1902. In 1908 the 1902 rates were reënacted with slight modifications. These rates continued in effect until the early part of 1915. Immediately after the passage of the 1908 ordinance the Spring Valley company filed an injunction suit in the United States District Court, claiming that the ordinance fixed charges too low and that in effect its property was being confiscated under the guise of regulation.

A temporary injunction was then granted under which the company was allowed to charge a rate not to exceed 15% in advance of the scale fixed by the supervisors—this 15% difference to be impounded until the final adjudication of the matter, when the money would either go to the water company or be returned to the taxpayers. Each year since 1907 the company has filed a similar injunction suit and a similar temporary restraining order has been issued.

Master Makes Report

The report of the master in chancery just issued announces that the guiding principle in the inquiry was the rule laid down by the United States Supreme Court that rate-fixing ordinances to be valid must allow "a fair return upon the fair value of the property used and useful in the service of the public." Upon the basis of the actual revenue collected, including the 15% additional impounded by the court, it was found that the actual interest return varied from a minimum of 2.8% in 1907 to a maximum of 5.15% in 1914, and that the minimum fair rate of return which the water company should have received during these years was 7 per cent.

An inspection of all properties owned by the company was made by the master in chancery, and a valuation was placed upon it which ranged from an average of $67 an acre for lands surrounding the Alameda County sources to $1250 for the reservoir lands in San Mateo County. The total value placed on real estate was $12,930,000. A valuation of $21,537,000 was placed upon the company's structures, including dams, pipe, pumping stations, etc., in addition to which an appraisal of $3,400,000 was added to cover the going value of the property. At $90,000 per million gallons daily the water rights were figured in as $3,060,000. The difference between the total of these items, about $41,000,000, and the $34,000,000, which was the price for which the properties were offered to the city, is accounted for by the fact that certain lands were reserved in the tender extended the city.

Allowance for Depreciation

It is notable that the master's estimate of the water rights of the company ranged from $75,000 per million gallons daily in 1907 to $90,000 per million gallons daily in 1914. The value he placed on gross reproduction cost, given in the foregoing as $21,537,000, included 14% overhead and 12% interest during construction. This sum was depreciated to cover accrued depreciation in the structures by 13%, or $2,800,000, leaving the net or depreciated reproduction cost estimate $18,737,000. The master's allowance for annual depreciation reserve was based upon the compound interest method known as the equal-annual-payment method which gave amounts ranging from $156,000 in 1907 to $232,000 in 1914. In determining the operating expenses, all charitable donations by the company, all expenditures in opposing the Hetch Hetchy project and the present litigation were deducted.

The taking of testimony before Judge Wright began in July, 1915, and continued without interruption for 10 months. The evidence, comprising over 11,000 printed pages and about 237 maps and documents, is one of the most voluminous records ever presented in the San Francisco District Court.

St. Louis Gets Coal for $1.90 at Mine After a $2.75 Bid

The City of St. Louis recently advertised for bids on furnishing its supply of coal for the ensuing year. Over 120,000 tons are required for the waterworks and a large additional amount for the city institutions. The lowest bid received was $2.75 per ton at the mines in the Illinois field. Later, after a conference with the bidders, a part of the supply was offered for $2.12 at the mine. Last week an order was placed for 20,000 tons for two city institutions at $2 a ton at the mine, but no additional amount could be secured at this price. The city comptroller therefore opened negotiations directly with the mine owners and has now contracted for the entire output from the mine in the Belleville district at $1.90 a ton. The contract also carries option for the purchase of the mine by the city at a stipulated price, should the city consider it advisable to continue in the coal business.

Pennsylvania Highway Head Resigns by Request

Governor's Real Object in Asking for Resignation Alleged To Be Political Move

Favoritism and partisan politics are alleged by Frank B. Black, state highway commissioner of Pennsylvania, to be the reason why Governor Brumbaugh asked him to resign. In tendering his resignation, effective Aug. 15, Mr. Black characterizes some of the reasons advanced by the governor as "ridiculously small and insignificant"; alleges that the governor wished road funds distributed among the counties by favoritism rather than according to public interest, and then accuses the governor and his political associates of trying to turn the highway department into a political machine. The last part of Mr. Black's letter of resignation and accusation is as follows:

"The way I look at this proposition is that all the statements made by you are made with a view of beclouding the real issue for requesting my resignation. It has been my aim to run the department along business lines instead of being used as a political asset.

"I have refused consistently, as is well known both to yourself and your close political associates, to turn the department into a political machine. At your own personal order, contrary to the judgment and advice of the department, I appointed four superintendents whose appointments were insisted upon by you solely for political reasons, to take the place of men of experience, and in each case these appointees very soon realized their inability to handle the work and resigned voluntarily, which simply illustrates what it would mean if the work of the department were handled along political lines.

"Continuous efforts have been made during my administration to force changes and removals for political reasons, the practice of which I could not countenance. Such methods tend to completely demoralize any organization; cannot help but cause financial loss in handling work, because of constantly changing ineffective and inefficient personnel, and in this way the department must lose the confidence of the taxpaying public.

"Inasmuch as every indication points to the fact that it is your idea that the work of the highway department should be handled along political lines, without regard to the public's interests, it affords me great pleasure to tender my resignation, effective Aug. 15, as I do not care to be associated in any way, shape or form with works so handled.

Mr. Black was appointed by Governor Brumbaugh in August, 1916, to succeed R. J. Cunningham, recently deceased. At the time of his appointment Mr. Black was a member of the State Commission of Agriculture and was classed as a "business man," who had not held public office until he assumed the position just named.

Geological Survey To Mark and Develop Watering Places

To make the desert regions of the western part of the United States more accessible by locating their widely separated watering places and erecting hundreds of sign posts to give directions and distances to the watering places is a project recently undertaken by the United States Geological Survey, Department of the Interior. The project involves also the work of making accurate maps showing the locations of the watering places, of preparing guides describing them and giving the distances between them, of selecting well sites and of developing watering places (so far as money available will permit) in localities where water is most needed and where the geologic investigations indicate that underground supplies can be obtained.

In recent years the water-supply geologists of the Geological Survey have developed methods of locating ground water in arid regions from surface indications and of estimating the depth to water and the approximate annual yield of the underground reservoirs. These methods will be applied and further developed in connection with the survey of desert watering places.

A number of survey parties are now being organized in Washington and will in a few weeks be at work in the most arid parts of Arizona, California and Nevada. Each party will consist of a geologist and one or more assistants and will be provided with an automobile and camping outfit.

Mining Engineers Will Meet at St. Louis

The American Institute of Mining Engineers will hold a meeting at St. Louis, Oct. 8-11. As a part of the meeting there will be trips to the zinc-mining district of Joplin and Webb City, Mo., and the oil fields and refineries near Tulsa, Okla.; also to the coal fields of southern Illinois and those near Pittsburg, Kan. The latter are open-cut works, operated by steam shovels.

Adopts Electrically Operated Pumps for Sewage

The Sanitary District of Chicago has decided to adopt electrically operated pumping equipment for the new Calumet sewage pumping station at 127th St. and Michigan Ave. This is in connection with the Calumet intercepting sewer, which will carry the sewage now discharged into the Grand Calumet River and Calumet Lake. The station will pump the sewage into the Calumet-Sag Canal, a feeder of the Chicago main drainage canal. The district has invited bids on plans previously prepared. After receiving a report from A. B. Wood, of New Orleans, La., on the power to be used and the design of the pumps, and after considering recommendations by the chief engineer and the electrical engineer, it withdrew this invitation. Mr. Wood has now been appointed consulting engineer in the preparation of plans and specifications for the Calumet sewage pumping station and also the sewage pumping stations in connection with the Evanston and the Des Plaines Valley intercepting sewers, also in the remodeling of the present 95th St. station. Mr. Wood was the designer of the large electrically operated screw-pumps of the New Orleans drainage system.

Twin Cities Lay Water Pipe Though Costly

The decision of the Minneapolis Water-Works Department to make no extensions this season on account of the high cost of pipe has been overruled by the petition of property owners who want water mains regardless of cost. A total of 9.63 miles of 6-, 8- and 12-in. main will be purchased at $66 per ton and laid this season. The larger part of this will be laid in the Lake Harriet residence district, in which there has been a phenomenal building boom—also regardless of cost.

Last year Minneapolis paid $28 per ton. It is estimated that the increase in labor cost this year is 12%. The cost of water mains is assessed to the property owners. Heretofore this has amounted to a maximum of 90c. a front foot, all of which had to be paid in one payment. It is estimated that the cost of the pipe laid this year will exceed $1.30 per front foot.

In the adjoining city of St. Paul, purchases were made early in the spring for 10 miles of extensions, of which 6 miles have been laid at a premium of $25,000 over last year's prices. Extensions there are paid for by a tax of 10c. per front foot per year for 10 years.

Port Authorities Will Meet Next Month in Cleveland

The annual convention of the National Association of Port Authorities will be held Sept. 11-14 at Cleveland. The first day only will be given to the reading of papers, of which six are scheduled. The second day will be devoted to the discussion of the resolution adopted a year ago at Montreal, calling for a full investigation by the Interstate Commerce Commission of terminal and port conditions. Cleveland's harbor facilities will be inspected on the third day, and committee reports and the business meeting will occupy the fourth.

The full program of the convention can be secured from W. J. Barney, secretary of the association, 110 West 40th St., New York City.

Pennsylvania City Has Trouble Letting Percentage Work

Sewer work to total $120,000 in cost, of which $50,000 was available to be spent at once, almost went begging at Reading, Penn., last month because contractors appeared to be unwilling to bid on the work on a percentage basis. Bids were asked, according to Edmund B. Ulrich, city engineer, for furnishing all materials, supplies, labor, team hire and supervision for doing a certain portion of the work at cost, plus a bid per cent. This per cent. was to cover the repair, rental, etc., on plant and equipment, and the necessary tools for the performance of the work. The sewer in question is a 20-in. diameter sanitary main to be constructed in rock tunnel below street level.

At the first letting there were no bids in accordance with the advertisement, but one firm sent in a cost-plus-per-cent. offer. At the second letting, for which bids were asked on a unit basis as well as a cost plus per cent., personal letters were written to a dozen firms describing minutely the character of the work and offering plans and specifications. Six replies were received and three bids tendered, two firms offering unit prices and cost-plus-per-cent. terms, while one submitted cost plus per cent. only.

It is said that one obstruction to letting work in this way is the fact that bonding companies, for various reasons, will not agree to qualify for this class of work.

Railroads Plan for Country's Largest Troop Movement

Plans for the largest troop movement in the history of the United States are being perfected by the American Railway Association at the request of the Government. Altogether 687,000 men, states Fairfax Harrison, president of the Railroads' War Board, will have to be transported to the various cantonments. The movement will start Sept. 5, and between then and Sept. 9, 200,000 men will be moved to their camps. The second movement of the same size will begin Sept. 19 and a third on Oct. 3. At the same time the railroads are asked to move 350,000 members of the National Guard to their training camps.

To give a conception of the magnitude of the undertaking, it is stated that to move one field army of 80,000 men requires 6229 cars, made up into 336 trains.

Lakewood City Engineer Quickly Reinstated in Office

"Not proven" was the prompt decision of the Civil Service Commission of Lakewood, Ohio, in the case of E. A. Fisher, city engineer, who was peremptorily removed from office by N. C. Cotafish, director of public works, a short time ago. In Director Cotafish's note discharging the city engineer no reason was given except absence from the city on a Saturday and Sunday without consulting the director, and "the good of the service." Subsequently the director filed "charges" as a ground for the removal. These all had to do with local routine matters. The Civil Service Commission heard testimony for a day from the director, the city engineer and a few others. It then declared all the charges unfounded or insufficient.

Government Will Create Bureau To Study Ceramics

The establishment of a mining experiment station at Columbus, Ohio, under the jurisdiction of the Bureau of Mines, the station to represent the ceramic industry of the United States, has been authorized by Franklin K. Lane, Secretary of the Interior. Located at Columbus, the center of the clay-working and allied industries, the bureau can work in coöperation with the School of Ceramics at Ohio State University.

Director Van H. Manning, of the Bureau of Mines, in recommending that the subject of ceramics be taken up at this station, said, in part: "No industry in this country offers more opportunity for constructive effort and new development than does the ceramic industry. Moreover, the clay-working and allied industries represent one-third of all capital invested in crude mineral industries and are, therefore, entitled to the same consideration as other industries now under study by the Government. . . . In the clay-working industries, as in many other mineral industries, the utilization of low-grade materials is now imperative in order to prevent exhaustion of those high-grade materials, which if exhausted would leave us at the mercy of foreign countries.

"In the ceramic industry the fuel consumed represents approximately 20% of the value of the wares produced, and as a rule a great deal of this fuel is unnecessarily wasted. Hence, the value of the fuel wasted is very large, and the lessening of this waste demands immediate study. Moreover, the manufacturing waste, due to faulty methods or practice, is very great, and at the present time there is no means of subsequently recovering this waste. It is believed that an enormous saving can be effected in the clay-working industry."

Government Will Require Warehouses

A great number of warehouses at various points will have to be built by the Government very soon, according to a recent report in the Official Bulletin. These are mainly to be at ocean terminals to take care of the congestion of supplies across the Atlantic, although some of them probably will be at inland centers where railway communication permits the assembly of goods for further transportation to the ocean terminals. This work is in charge of the Storage Committee of the General Munitions Board, of which M. L. Cooke is chairman.

This committe is endeavoring to introduce system into distribution methods in an effort to eliminate congestion, delay and double haulage, factors that seriously embarrass transportation systems in European countries engaged in the world war. Its aim is to simplify assemblage and storage of supplies required by the army or otherwise necessary to the prosecution of the war. In addition to the construction of warehouses, the committe will urge upon manufacturers the advisability of storage at the point of fabrication, where they will wait requisition for forwarding. It is proposed to establish points of local assembling at which goods in less than carload lots will be temporarily stored and full carloads made up for shipment.

Cleveland Still Wrestling with City Coal Problem

For the third time within a few months Cleveland, Ohio, has been unable to get satisfactory bids for 15,000 tons of coal for its garbage-reduction works. On the former occasions the bids were considered too high, but on the third call there were no bids at all. The purchase of a coal mine to supply all the needs of the city is under consideration. Prof. H. E. Nold, Ohio State University, is serving the city as coal expert.

Thames River Bridge Substructure Cost Over a Million

Construction of the piers and abutments for the new Thames River Bridge at New London, on the New York, New Haven & Hartford R.R., is completed, according to official announcement. The westerly three piers were sunk by open dredging, the depth of the two adjacent to the channel being 130 ft. below water. The east pier is a pneumatic caisson pier with three circular caissons. Holbrook, Cabot & Rollins Corporation, of Boston, carried out the work. The cost exceeds a million dollars.

The spans of the new bridge will be, from west to east, 185 ft., 330 ft., 212 ft., 330 ft. and 330 ft. The 212-ft. span contains a bascule draw. The superstructure is already contracted for. It will be built of silicon steel and will weigh about 5525 tons. Deliveries are practically impossible now, and work on the superstructure has not progressed.

The old Thames River Bridge, which is to be turned over to the State of Connecticut for highway use, contains a 503-ft. swing span; at the time of its construction in 1889 it was the longest swing-span in existence. The piers of the old bridge rest on wooden piles.

Montclair Paving Contract Readvertised

A quarter-million dollar contract for warrenite paving on Park St. and Bellevue Ave., Montclair, N. J., having been taken into the courts on a writ of certiorari by the lowest bidder, the Town Commission decided not to contest the case, the judge declared the award illegal and later the commission set Aug. 14 as the date for receiving new bids for warrenite alone, with the provision that the contractor receiving the award shall do the work. The original call for bids permitted tendering on other material than warrenite. The lowest bidder proposed the Topeka specifications.

Draftsmen and Clerks Wanted by Engineer Corps

Good Salaries as Well as Most Expenses Provided for Service in France

Service in Europe at good pay with the United States Engineer Corps is open to skilled clerks, stenographers, typewriters, bookkeepers and draftsmen. A notice sent out by the United States Department of Labor says:

"Wanted by the United States Engineer Corps for service in Europe, 150 clerks qualified as stenographers, typewriters, bookkeepers and general clerks, salary $1000 to $1200, in addition to which rations, quarters, medical and surgical treatment and transportation furnished. Also 50 draftsmen, topographical, architectural and mechanical, salary $1500 to $1800 per annum, dependent on experience and qualifications, in addition to quarters, rations and medical attention."

In three weeks the men selected will go into service. Applications should be addressed to the Chief of Engineers, U. S. A., Washington, or should be filed with P. A. Donohue, inspector in charge of the United States Employment Service, Room 8, United States Barge Office, New York. Men of conscript age are not desired.

Springfield Sells Garbage to Farmers for Hogs

Beginning Aug. 1, the City of Springfield, Mass., will collect all garbage and deliver it to farmers at two transfer stations. The farmers will feed it to hogs. The city will be paid $1 a ton or, where wagons are transferred between the city and the farmers, 2c. per cu.ft. For sometime the Merg Reduction Co. disposed of all garbage delivered to it by the city, without charge. The plant was declared to be a nuisance by the court and on June 30, 1916, it was closed. For a time the garbage was buried. Then farmers began to take some of it and feed it to hogs. Later the city began delivering it to the farmers at transfer stations. Under the new plan the city will resume the entire collection of garbage, granting no licenses for its transportation through the streets. F. H. Clark is superintendent of streets and engineering.

Donates Engineer to Red Cross

The engineering firm of Stone & Webster, of Boston, has donated the services of one of its engineers, Ernest McCullough, to the American Red Cross. Mr. McCullough was a major of engineers in the Officers' Reserve Corps and upon his selection by his firm the Secretary of War ordered him to active duty in his rank and ordered him to report to the chairman of the Red Cross to accompany Maj. Grayson M. P. Murphy to France in connection with the work of the American Red Cross. Major McCullough is now in Paris.

PERSONAL NOTES

W. B. REED, formerly assistant city engineer of Roanoke, Va., has been appointed city manager of Portsmouth, Va., for a term of three years. His salary has been fixed at $4000, $4500 and $5000 for the first, second and third years respectively.

E. B. WALKER, JR., until recently with Reolds Farms Co., Lansing, Mich., in capacity of chief engineer on development of 27,000 acres of Florida land, including the City of Oldsmar, has accepted the position as engineer in charge of the Myrtle Hill Cemetery, Tampa, Florida.

F. C. HERRMANN consulting engineer, San Francisco, who is directing construction work now under way for the Modesto Irrigation District, has been appointed consulting engineer of the Turlock Irrigation District for the purpose of working out the drainage problems of that district. The two districts lie on adjacent areas in the San Joaquin Valley of California.

WILLIAM WATERS, of the firm of Baker, Carpenter & Waters, consulting engineers, San Francisco, has been appointed superintendent on the construction work at Camp Fremont, Menlo Park, California.

W. L. SHARP, civil engineer, Oregon City, Ore., who was a member of the engineering force which had charge of the Oregon City water system, under H. A. RANDS, has been appointed second lieutenant in the 18th Engineers Company, now in camp at American Lake, Washington.

F. R. TRUESDELL, who for the past three years has been employed in the valuation department of the Chicago & Northwestern Ry., has gone to the Michigan Central R.R. as assistant engineer, in the office of the division engineer at Jackson, Michigan.

E. M. KLING, consulting engineer for the Laconia Car Co., of Laconia, N. H., for the past 34 years, has tendered his resignation.

WILLIAM WREN HAY, junior engineer, United States Engineer Department, has been ordered for duty to France. For more than four years he was engaged in various works in Montreal and western Canada—particularly with the Canadian Pacific Ry. and the City of Calgary. For the past two years and a half he has been engaged in work for the Southern Department of the United States Army at Fort Sam Houston, Tex., and afterward at El Paso.

WILLIAM L. SACKETT has been appointed superintendent of waterways in the new State Department of Public Works and Buildings of Illinois. Mr. Sackett's headquarters will be at Springfield.

L. E. AYRES has accepted the position of principal assistant engineer with Gardner S. Williams, consulting engineer, Ann Arbor, Mich. Mr. Ayres has severed his connection with the consulting board for the Belle Isle bridge at Detroit.

R. K. HOLLAND and H. K. HOLLAND, who were formerly with Gardner S. Williams, consulting engineer, as principal assistant engineer and advising engineer respectively, have opened an office as consulting engineers at Ann Arbor, Michigan.

LEE H. POWELL, formerly chief engineer of Drainage District No. 1, Jacksonville, Tex., has been appointed city engineer of Tyler, Tex., being retained as consulting engineer on his previous work. B. RAINEY has been appointed to the place vacated by Mr. Powell.

S. L. CHURCH, supervisor of the Pennsylvania R.R. at Lancaster, Penn., has been appointed division engineer of the Delaware division, with headquarters at Wilmington, Delaware.

L. A. DOWNS, general superintendent of the Southern lines of the Illinois Central R.R., with headquarters at New Orleans, has been transferred to Chicago and will have charge of the Northern lines, embracing the Chicago terminal and the Illinois, Indiana and Springfield divisions. The Illinois Central has divided its lines north of the Ohio River into two grand divisions, the Western division comprising the Wisconsin, Minnesota and Iowa divisions.

S. H. LEA, formerly city engineer of Charlotte, N. C., is now associated with K. C. Gaynor, consulting engineer, Sioux City, Iowa.

CHESTER ALLISON has been engaged as engineer for the Calo-Verde Joint Levee District in California. Mr. Allison served for several years as chief engineer of the Imperial Irrigation District during the receivership of W. A. Holabird, having entered the employ of the district as a rodman and working up to the position of chief engineer. His first duty in the new position will be to start the work of preparing an estimate for a bond issue of approximately $650,000 to complete the levee system.

GEORGE H. WILLITS, who has been connected with the firm of Bartholow-Willits Engineering Co. for the past three years, has been appointed city engineer of Galveston, Tex., succeeding Albertus T. Vickey.

F. M. RINGELEY, who was graduated from the University of Texas in 1914, has been engaged as manager of the Bartholow-Willits Engineering Co., succeeding George H. Willits.

T. R. SWISS, city engineer of Vicksburg, Miss., has resigned to accept a commission in the Engineer Officers' Reserve Corps. At the time Mr. Swiss's resignation was accepted, a motion was made before the Board of Aldermen that he be reinstated in his present position upon his permanent return to civil life.

WALTER L. HENWOOD, vice president of Lathrop, Shea & Henwood Co., Scranton, Penn., has received a commission as major, Engineer Officers' Reserve Corps, and is now engaged as constructing quartermaster of the cantonment at Camp Wheeler, Macon, Georgia.

ALEXANDER ROSS, civil engineer, of Seattle, Wash., died at his home in that city recently after an illness of over a year.

H. P. LETTON, sanitary engineer at the United States Marine Hospital, Chicago, has received a year's leave of absence to become chief of the Bureau of Sanitary Engineering of the Nebraska State Board of Health, at Lincoln, Nebraska.

KENNETH CASE, of the engineering force of the Alaskan Engineering Commission, has been made resident engineer in charge of Residency No. 4 on the Fairbanks Division. He relieves H. J. CHANDLER, who has been detailed to Lignite Creek, to locate a branch line to the coal fields.

A. O. JOHNSON, civil engineer, of Portland, Ore., died at Weed, Calif., July 14, at the age of 38. Since graduating from Stanford University in 1910 Mr. Johnson had been employed at Cordova, Alaska, and on the North Bank and Oregon electric lines in Oregon.

BUSINESS NEWS

Blaw Enters the Mixer Field

A. W. Ransome, who for nearly 20 years has been closely identified with the development and manufacture of concrete machinery, has joined the Blaw-Knox Co., of Pittsburgh. During the past two years Mr. Ransome has been developing and putting into practice sundry improved patents on concrete machinery, all of which have been purchased by the Blaw-Knox Co. and will be marketed and further developed under his direction as manager and chief engineer of the mixer department.

Business Men Call Big Patriotic War Convention

An emergency call has gone forth from the Chamber of Commerce of the United States to the business men of the country for a great war convention to be held at Atlantic City, Sept. 17-21. A principal topic of discussion will be the duty that business owes the Government in war. There will come the question of how the business of the country may render even greater service in winning the war. This will include what may be done to control prices, how priority may be most quickly and effectively established, how greater efficiency in land and water transportation shall be developed, how we may best provide for and protect our

forces on land and sea and those dependent upon them at home, and what steps may be taken for better education of the nation on the issues at stake.

Ways and means by which business must readily adjust itself to the conditions produced by the war will be considered. Also there will come the questions of how to provide for business enterprises not essential to the nation in wartime, food conservation, its special importance to business men, industrial relations and employment problems, and foreign trade, banking and credit in wartime.

Of particular interest will be the readjustment after the war for which business must prepare. This will include the question as to what will be the course of prices on raw materials and finished products after the war, how we shall plan for replacing our men in industry after they return from the war and what new responsibilities in international relations may be expected after the war.

Appointed on Fleet Corporation

W. J. Haynen, an experienced Southern lumberman, has been appointed to a position with the Emergency Fleet Corporation, while C. M. Morford has been appointed in the Bureau of Supplies and Accounts, which bureau is the purchasing office for the Navy Department.

Safety Congress and Exposition in New York Next Month

What is expected to be the largest safety and sanitation congress ever held has been called to take place in the Grand Central Palace, New York City, Sept. 10-15. Delegates from all over the world are to attend to discuss matters pertaining to the promotion and standardization of safety methods in factories, railroads and the various industries in which hazardous occupations are found.

Coincident with the congress there will be staged the largest Safety and Sanitation Exposition yet held, three large floors of the Grand Central Palace being used.

Great Increase inr Ion-Ore Production in 1916

The iron ore mined in the United States in 1916 reached a total of 75,167,672 gross tons, the greatest annual output ever made. The shipments from the mines were 77,870,553 gross tons, valued at $181,902,277. The quantity mined in 1916 was more than 19,600,000 tons greater than that mined in 1915. The increases in quantity and in value in 1916 amounted to about 40 and 80% respectively. The average value per ton at the mines in 1916 was $2.34, as against $1.83 in 1915. These figures, which were compiled under the direction of E. F. Burchard, of the United States Geological Survey, Department of the Interior, include for 1916 only iron ore containing less than 5% of manganese.

The production of pig iron, including ferro-alloys, was 39,434,797 gross tons in 1916, compared with 29,916,213 gross tons in 1915, an increase of 32%, according to figures published by the American Iron and Steel Institute, Feb. 24, 1917. The pig iron, exclusive of ferro-alloys, sold or used in 1915, according to reports of producers to the United States Geological Survey, amounted to 39,126,324 gross tons, valued at $663,478,118, compared with 30,384,486 gross tons, valued at $401,409,604, in 1915, a gain of 29% in quantity and 65% in value. The average price per ton at furnaces in 1916 as reported to the survey was $16.96, compared with $13.21 in 1915, an increase of 28 per cent.

Board To Adjust Labor Disputes in Industrial Plants

The Council of National Defense has announced its decision to create a labor adjustment commission of nine members to have jurisdiction over all disputes concerning wages or conditions of employment in all establishments having contracts with the Government.

Contracts for 39 Wooden Hulls and 9 Steel Ships Let

Contracts were issued last week by the Emergency Fleet Corporation for the construction of 39 wooden hulls, six standard 8800-ton Robert Dollar type steel ships and three steel 6000-ton cargo-carrying steamers. For military reasons the names and locations of the contractors were withheld, but the contracts were distributed among 12 shipbuilders.

The total amount represented by the 48 contracts is $22,465,320. The cost of the wooden hulls was placed at $300,000 each, the 8800-ton steamers at $1,364,000 each and the three cargo-carrying steamers at $908,440 each.

Form for War Contracts Is Recommended by Officials

The Department of Commerce authorizes the following:

As the result of conferences extending over two months, the interdepartmental cost conference has made public its recommendations that where fair prices can be obtained, war contracts should be in the form of straight purchase-and-sale contracts at fixed prices, that the cost-plus contract may be necessary where the production involves difficult and complicated manufacturing effort or conditions which cannot be clearly foreseen, and that in cost-plus contracts a fixed profit of a definite sum of money per article be agreed upon as far as possible, instead of the percentage of cost.

The conference was organized by Secretary Redfield and Burwell S. Cutler, acting chief of the Bureau of Foreign and Domestic Commerce, of the Department of Commerce, and representatives of the most interested Government bodies took part.

Notes from

MAKERS OF PLANT AND EQUIPMENT

The Garford Motor Truck Co., of Lima, Ohio, announces that its Houston, Tex., business will henceforth be in charge of the Houston Buick Sales Company.

The American Steel Export Co. has appointed Walter R. Morris assistant traffic manager, with headquarters in the Woolworth Building, New York.

C. E. Leslie has been appointed advertising manager of the Emerson-Brantingham Implement Co., Rockford, Ill. Mr. Leslie was formerly in the advertising department of Fairbanks, Morse & Company.

Y. L. Yepson, advertising manager of the National Fire Proofing Co., Pittsburgh, has been elected second vice president and manager of sales.

The Westinghouse Electric and Manufacturing Co. has promoted W. J. Longmore, formerly purchasing agent of the company at the East Pittsburgh works, to be general purchasing agent, with headquarters at Pittsburgh, Penn., where he will have supervision of the purchases of the company as a whole, with special supervision over those involving contracts for material used by both the electric and machine works. Charles G. Taylor, formerly assistant purchasing agent, has been promoted to the position of purchasing agent at East Pittsburgh, where he has headquarters, and also of the Shadyside, Cleveland and Newark works. A. W. Fullerton, formerly purchasing agent of the Westinghouse Machine Co., which is now known as the machine works of the Westinghouse Electric and Manufacturing Co., has been appointed purchasing agent of the machine works at East Pittsburgh, Trafford and Essington, with headquarters at the first-named place.

The Abell-Howe Co., Chicago, has been incorporated to provide for the expansion of the sales and engineering organization inaugurated some months ago by Oliver J. Abell, 565 Washington Boulevard, that city. Among the products to be sold exclusively through the Abell-Howe Co. are American high-speed chain and Howe one-man detachable tongue trucks. Oliver J. Abell is president and treasurer of the new company, Glenn C. Howe is vice president and C. E. Kane secretary.

The Standard Steel Castings Co., of Cleveland, Ohio, incorporated in 1912 for $125,000, has just increased its capital stock to $1,000,000. A new foundry and machine shop, now under construction, will be devoted exclusively to the manufacture and production of steel and iron wheels. This installation will cost approximately $750,000.

C. S. Vought, assistant general manager of sales of the American Steel Export Co., New York, sailed for France on Aug. 7, to attend to business for the company. Mr. Vought will be absent about 60 days.

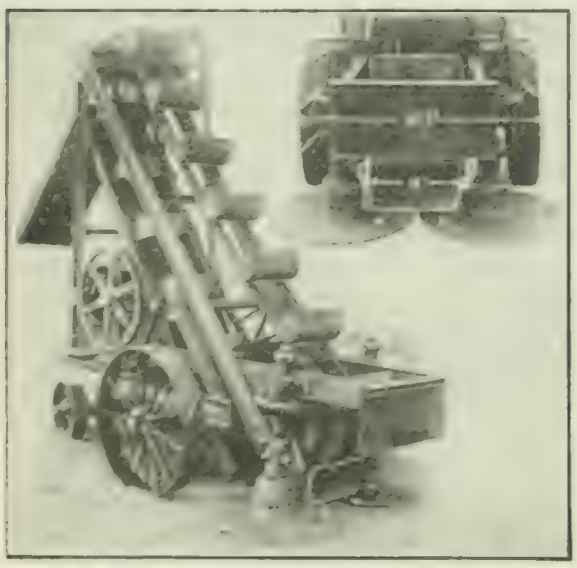
Warren Webster & Co. have appointed S. E. Vance as Washington district manager, with offices at 301 Southern Building.

Stanley W. Hull, 3729 Prospect Ave., Cleveland, has organized a new mechanical drafting service company for inventors and manufacturers, known as S. W. Hull & Co. For the past 10 years he has had experience in the engineering department of plants of the General Electric Co., Westinghouse Church Kerr & Co. and Brown Hoisting Machinery Company.

APPLIANCES AND MATERIALS

A Self-Feeding Wagon Loader

A new self-propelled power-driven elevator for loading sand, stone, gravel, coal, cinders, etc., from ground piles into wagons has been perfected by the Barber-Greene Co., of Aurora, Ill. The notable feature of the loader is an attachment for feeding the material into the elevator buckets, doing away with hand shoveling. There are two horizontal revolving disks close to the ground and these slide in under the pile



TWO DISKS FORCE MATERIAL FROM STOCKPILE TO ELEVATOR BUCKETS

and heap the material up where the buckets pick it up. Patents are pending.

These machines are furnished with gasoline-engine or electric-motor drive and are rated to handle 60 tons per hour.

Recording Irrigation Meter Registers Acre-Feet

A recording irrigation meter, with a straight-reading dial showing total water passed in acre-feet, is offered by the Hydrometric Co., Central Building, Los Angeles, Calif. The meter may be used in a ditch or in a closed conduit. The water enters one side of a two-compartment meter box and passes out the other side with very slight loss of head. The entering side of the box converges to a throat and contains corrugated diaphragms leading to a vane hung in the throat. The diaphragms are designed to break up eddies. The vane is connected by means of a vertical brass rod to a gear train properly cased and provided with a straight-reading dial. There is a tool-steel ball bearing in a brass cup between the brass rod and the gear train. After the water passes the vane and throat, it goes upward through the other compartment of the meter box and on its way through the ditch or pipe, as the case may be. The meter stand is of cast iron. The meter box is of "Armco" iron. The device has been named "The Water Watch."

New Gasoline Rock Drill Appears

A new design of gasoline-driven rock drill developed by L. L. Scott, 1104 Bank of Commerce Building, St. Louis, Mo., is being put on the market by Mr. Scott.

The drill operates on the hammer principle. A hollow hexagon drill steel is used and the water for cooling the engine is run through the hollow steel



NEW GASOLINE DRILL HAS DOUBLE PISTON

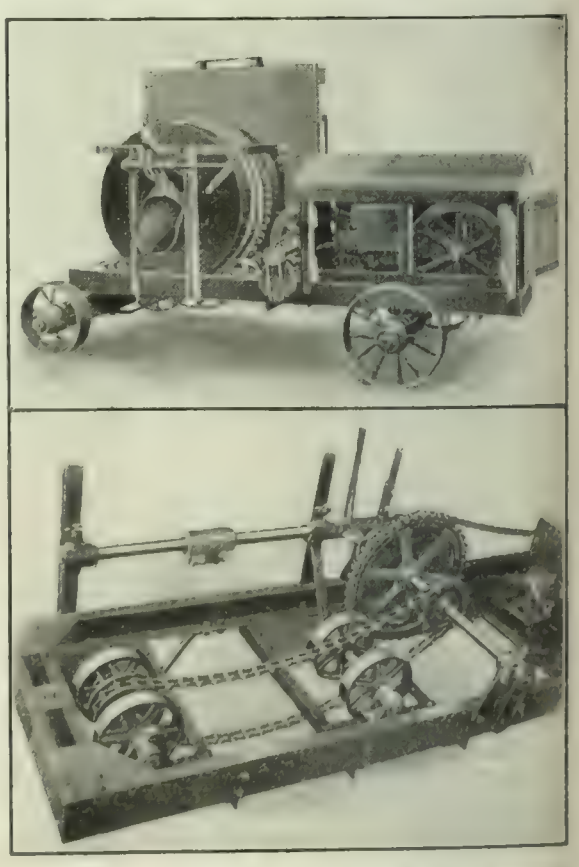
to the bottom of the drill hole. About 800 blows per minute are struck. The engine is a simple single-cylinder two-cycle unit and is free from valves, gears and cams. The hammer is moved directly by explosive pressure and strikes a free blow. There are two pistons, one contained within the other. The outside piston is the hammer and has no mechanical connection with the inside piston, which latter is connected to the crankshaft through connecting-rods. An explosion takes place with every down stroke, driving the two pistons downward. The hammer piston strikes its blow on a tappet at about 60° before the crankshaft has reached its lower dead center; the inside piston moves on (independent of the hammer piston) with the crankshaft. This inner piston uncovers air ports in the hammer piston and on the back stroke (caused by the momentum of the flywheels) the hammer is picked up on a cushion of air. Ball and roller bearings are used on the crankshaft and rotation shaft. The drill steel is rotated step by step by a special "compound" gear—no ratchets being used to get intermittent rotation. A standard double-thread worm is cut in half, and adjacent threads are connected by a straight no-pitch thread. The worm wheel is standard, with the exception that one side of each tooth is cut straight. The compound worm is driven by means of a chain and sprockets from the crankshaft. The worm wheel which is attached to the chuck rotates during one-half revolution of the worm and is stationary during one-half revolution. The rotation of the drill steel takes place only on the up stroke of the hammer.

One size of machine has been developed; this drills holes up to 12 ft. in depth, and weighs 200 lb. Gasoline is supplied from a small steel pressure tank—a pressure of 2 lb. is pumped up by hand twice per day. Electric ignition (Atwater-Kent) is used.

One of these drills operating at the Glencoe Lime and Cement Co., St. Louis, Mo., has drilled 68 ft. in a 9-hour day, using 2 gal. of gasoline and ¼ pint of cylinder oil. The rock was hard limestone.

New Idea in Chain-Driven Mixers

A radically new design of concrete-mixer drive has been evolved by the T. L. Smith Co., of Milwaukee, Wis. The drum is chain driven and carries a sprocket ring, but the chain does not go around the drum. Instead, it goes under the truck frame, as shown in the accompanying view, around an idler on the roller shaft and back under the drum sprocket. It is claimed that wear and stretch of the chain can never be enough so that there will be trouble, and that the lifting tendency of the



DESIGNED TO ELIMINATE STRETCH AND WEAR

chain reduces wear on rollers and roller bearings.

This machine (known as No. 7-S) has a 45 x 31-in. drum, a power loader of 10-cu.ft. capacity, an 18-gal. water tank, and is furnished with 5-hp. steam or gasoline engine. Without power equipment it weighs 3410 pounds.

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ENGINEERING NEWS-RECORD

A WEEKLY JOURNAL
DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

Cars Are Being Better Loaded

ENCOURAGING reports come from the Railroads' War Board to the effect that shippers are heeding the plea made some weeks ago and are loading cars in such a way as to eliminate waste space. It is estimated that during the month of July the saving so effected was equivalent to 120,000 cars. In other ways, also, the shippers and shippers' associations are coöperating with the railroads. There has been a more or less widespread undercurrent of feeling that better loading was virtually impossible—that human nature and habit could not be thus quickly changed. It is especially fortunate that this has been proved false for the reason that there is every indication that the railroads will have more traffic than ever this fall. We must all still be on the lookout to help "keep the cars moving."

A Weak Provision of a Good Act

OKLAHOMA has taken a long step forward in giving its State Department of Health sanitary control of public water-supplies and sewage disposal. Unfortunately the act outlined on page 393 is weak in that appeal from orders or decisions of the department may be made to county courts. That is, after the department has considered plans for new water-works or sewerage systems, or after it has ordered changes to be made in existing water-works, then the jurisdiction over these highly technical matters may be shifted on appeal from men chosen for their technical knowledge and judgment to the justice of a district court, chosen for quite other reasons—which may be good and sufficient, but do not insure competency to deal with questions of sanitation and public health. Moreover, the appeal also lies from state to county jurisdiction; from a state-wide to a local viewpoint, with all the local influences and prejudices against state control. A better plan prevails in some other states. Where other legislatures have been unwilling to make the state department of health supreme some of them have either provided for endorsement of state department of health orders by the governor and attorney-general or else for arbitration by a board of engineers. The least that the Oklahoma legislature should have done would have been to authorize appeals to the State Supreme Court. Instead, it did next to the worst thing, which would have been to permit a dissatisfied city or company to appeal to the city court or handiest justice of the peace.

The Main Point for the Engineering School Restated

SHALL the young man go to an engineering school? The question is a particularly anxious one this year. We pointed out the situation in these columns on page 338 of our issue of Aug. 23, but there are so many voices speaking eagerly on the subject just now that the main point on which the case must rest needs clear restatement. The truly successful engineering career demands of its votary a love for the work and achievements of the engineer. It demands also a natural aptitude; the creative imagination, the ability to visualize details, the inclination to calculate rather than merely to suggest, a bent for solid practical doing, and instinctive appreciation of natural laws. All these are important, though the love for the work is supreme among them. They are important this year, as they were before. Every standard that the possible engineering student must measure up to is the same as it was two years ago or five or ten years ago. No temporary artificial state exists to modify the basis for choice—or if it should be thought to exist, the wise father or son ought to disregard it. If the future engineer hopes to secure permanent happiness and success, his reason for choosing the profession must be based on grounds that are permanently valid. The world's engineering needs will not be better met or more quickly satisfied if a misguided parent or adviser diverts a good medical student into the mediocrity of a poorly chosen engineering career. More technical students are desired, but they are to be secured by stimulating wider interest—not by enrolling the less fit.

Why Not a Single City Engineering Department?

FEW CITIES centralize their engineering work in a single department. Why? The answer is not hard to find, although it rests on shifty excuses instead of sound reason. The chief excuses are that engineering work has grown in a spasmodic, haphazard way and never been coördinated or consolidated, and that each city department can get better results by having its own engineer. The first excuse only goes to show the urgent need for a change. The second exhibits a narrow viewpoint which puts the good of the parts above and at variance with that of the whole. When now and then a city bestirs itself to reorganize its engineering work, as did Sacramento recently, it seems passing strange to hear it cried in the same breath an end

neering department and an entirely independent street department, the latter with an engineering staff of its own, as outlined on page 297 of our issue of Aug. 16. Barring quite improbable local conditions, there seems to be no reason why the superintendent of streets at Sacramento should not be a deputy city engineer and the field engineers, the draftsmen and other employees be added to the city engineer's staff. The ordinances creating the departments of engineering and of streets have so many good points that it seems a pity that a single department was not created.

Throttling Competition on Sewer Construction

TIEING up $8,000,000 of sewer construction to brick alone against the advice of the engineer-commissioner of public works, the city engineer, and a majority of its own sewer committee, as has just been done at Detroit by a 28 to 8 vote of the Common Council, can be explained in only one way: Effective competition is not desired. Citizens and taxpayers of Detroit will do well to insist on opening sewer specifications to concrete, reinforced concrete and segment block, as is done elsewhere and as has been advised by the engineering department of the city and by the Detroit Bureau of Governmental Research, whose clear and forcible statement of this case, reprinted on page 428, makes interesting reading.

Co-operative Purchasing of Road Material by County Boards

WITH vast orders being placed by the Government and others, the wants of the small consumer are likely to be overlooked, and one means of relieving the situation is to combine these small orders so as to make an impressive aggregate that will attract producers. Having in view this object, concerted action in the purchase of materials for county road and bridge work has been decided upon by the county supervisors of Iowa, following the suggestion of Mr. MacDonald, chief engineer of the State Highway Commission, who at a recent meeting of the State Association of County Supervisors strongly advocated adherence to the program for road improvement, in spite of present conditions. He pointed out, however, the difficulties in obtaining the necessary materials when ordered in small lots, and to remedy this proposed that the association form a committee to collect the estimated requirements of individual counties for lumber, steel, cement, sand and gravel, etc. The committee would then locate supplies of these materials and secure bids, which would be submitted to the county officials. Thus the aggregate amount would be large enough to attract the attention of large producers at a distance, and with a six-months allowance for delivery, very reasonable prices should be secured. Further, by placing orders six months in advance the material could be shipped as might be convenient, and then stored. Under present conditions, small shipments are hard to get, and are not unlikely to be diverted to meet emergency orders. Action was at once taken to organize an executive committee composed of one supervisor from each congressional district. This committee is to ascertain from the several counties their requirements for materials for 1918. These estimates will be grouped and bids obtained.

A weak point in the arrangement is the lack of assurance to bidders that material will be purchased in the quantities estimated. The committee will have no authority to place orders or contracts for any county, and actual purchase must be made by the authorities of the several counties. It might be difficult to get action from such a number of counties as to make an aggregate large enough to secure favorable terms. To meet this difficulty, it might be possible for the counties to authorize this committee, or perhaps the State Highway Commission, to purchase and distribute the materials. But local authorities are generally averse to delegating their powers. However, it is significant that the county supervisors so readily appreciated the possibilities of coöperative buying, and it may be that when the time comes to purchase they will back their estimates by actual orders.

Professional Questions Call for Study

YEARS ago engineers lived up to many principles of conduct that now are plainly obsolete. They did not advertise, for one thing. It was unprofessional to make publicity. They never sought a retainer, but waited for the client to come to them. Modern consulting engineers would starve on such a platform—we say platform rather than code, which sounds unchangeable and dogmatic.

Some engineers do starve, or nearly so, by adhering to the old principles. That is a loss to the nation, since their less conservative brethern are often, also, less able; only in business acumen do they excel. To equalize conditions, there is needed a public discussion of questions bearing on professional principles, so that all may come to recognize clearly how they may honorably depart from the rigid rules of older times.

But also, while some engineers are overconservative, others are perhaps overliberal in their principle. They seem to believe in Kipling's "anything for business, an' we're growing old!" Here again the open discussion of professional questions has a chance to prove helpful.

Attempts have been made by one or two engineering societies to bring about discussion and adjudication of such questions. A most promising method for achieving the desired result! Yet it has not proved effective. Why? Perhaps those who know how the executive affairs of a large society must be handled can supply an explanation. But we have little need of learning why, in the face of the fact that no effective result has been reached. Professional questions are still as open

and unsettled as ever, in spite of the work of societies and committees.

A prime difficulty in the matter is that two kinds of questions come up. Some are concerned with expediency alone—the question of whether safe and sound relations between engineer, client and public are maintained under the particular procedure in question. Others, however, involve general considerations of probity; for example, the question whether a certain action does not amount to false pretense, or to bad faith with a brother engineer, possibly.

Everybody is competent to recognize the right way in matters of plain honesty. Certainly every engineer can see straight in this respect. So we may pass by the cases involving a clean-cut moral issue, for they involve no particular question. They may be useful to illustrate complications arising in practice, but that is all.

Those cases in which expediency is the crucial question are of widest interest, however. Few engineers can avoid being involved now and then in a case of this kind, and in every instance they experience doubt and uncertainty. They would be helped, we believe, by contemplating numerous other cases—by having the opportunity to study real questions arising in the experience of other engineers.

Engineering News-Record is willing to open its columns to brief, impersonal statements of such cases. It can offer the aid of publicity to bring about the needed mutual enlightenment. Its editors will undertake to receive full statements of cases involving questions as to professional propriety or good practice, and to prepare from each an abstracted impersonal statement, bare of names and localities, but preserving the essence of the issue.

To this end we request that readers who have encountered in their recent experience questions regarding professional conduct communicate with us and thus assist in bringing before their colleagues a collection of practical problems on which each may base his own study of the subject and out of which he may draw his own rules of professional ethics.

Continued Construction the Safe Course

OUR development has never been ahead of the needs of the times. What we build is that which the moment's need calls forth; in neither service nor production is a reserve of capacity ever provided. Municipal and state public works—the public's household equipment—are always below the level of physical needs. In exactly the same way manufacturing facilities, while up to a normal market, ever remain below maximum demand. Railways, too, are adequate only for moderate traffic and become congested at the first approach of a heavy crop or of any abnormal traffic demand.

Our country grows steadily. We build all the time, without interruption, more works and factories, more railway track and terminals, more cars and more ships. We must build them for the needs of yesterday and today. Capital and time have never been available to build for tomorrow.

This is the *normal* need for construction—to keep up with growth, to make up deficiencies as they develop In this war year of 1917, however, there is vastly intensified growth and need for growth. We are speeding up in every department of American life. We are striving for both greater efficiency and greater capacity: the use of more hands, more machines, more buildings and more brains than ever before. Such are the facts at the present moment and such will they be for a long time to come. The situation calls imperatively for more construction.

To repeat: We have never built ahead, but always for the needs of the day alone. Yet now under the emergency stress of an unprecedented period, many men throughout the country ask the question, "Can we not get along for a time on the facilities provided in the past, on the building and construction that we did yesterday?" In the opinion of *Engineering News-Record,* the answer is an emphatic No!

We are at the beginning of a hard job. Our national muscles are already taking the strain, and they have a long day of steady work before them. The body that supports them must furnish more nourishment and strength. Every fiber must do its part and must be fit for its part. But no undeveloped or atrophied organ can do its proper work.

In the past a city that was backward, that temporized in public improvements and provided its citizens with less efficient living facilities than they needed, did not bring any vital loss to the country; the city itself stayed back in the march of progress, but the nation as a whole was not affected. Today the bad streets that retard and stop traffic and the poor water and sewer systems that produce sickness mean just so much of a check to the nation's efforts.

Out in the dry West, where the irrigation water provided by wise foresight has raised heavy crops, food supplies in quantities may become a loss because the growing districts are not tied into the nation's life by enough railway lines and cars. More broad-gage planning is needed to assure that next year this particular organ of our body politic will not be isolated from the general blood current. Engineers must plan and build, or the farmers next year will not be encouraged to plant beyond a minimum.

Local and particular instances may be multiplied indefinitely. But every one of them merely reflects the broad and universal need throughout the country for continued and active work by the engineer and the constructor. Brains and hands and capital must be put into the work of construction in greater quantity and with greater efficiency than ever before. Any step that tends to check or paralyze the country's construction activities is a serious mistake that will not easily be forgiven in years to come.

Commandeer Organizations for Illinois Cantonment Construction

Rockford Camp Progresses Rapidly from Start—Ideal Location on Quick-Draining Glacial Drift—Contractor's Force of 6000 Housed and Fed in Permanent Barracks

By W. W. DeBerard
Western Editor, "Engineering News-Record"



THIRTY TO FIFTY CARS OF LUMBER "MELT" AWAY EVERY DAY, SO NO LARGE AMOUNT IS PILED

ONLY by commandeering men with organizations could the rapid progress being made on the cantonment for the Eleventh National Army Division at Rockford, Ill., be accomplished. All of the larger activities of this future city to train 38,000 men are in charge of men who bring their whole organizations with them. The single individual does not count for much when millions must be spent in a few weeks. Under the commanding officer are the military, supervising engineers, sanitary, constructing and auditing divisions. As yet the military units are comparatively small in number, a company of engineers assisting the consulting staff, one of motor trucks assisting the contractor in handling material and four of infantry for guarding the grounds, mainly against fire hazard. The supervising engineers have a staff of 40 men who are attempting to keep the layout at least a day ahead of the construction forces. Working with the supervising staff is the consulting architect, a practical city-planner. The contractor's staff consists of a skeleton of his own organization augmented by men selected from railways and other large corporations. The auditing department for the Government is supplied by the American Audit Co. to check in and out all men, materials and equipment used by the contractor.

In actual construction the cantonment has little of interest to engineers, for tried designs only are permitted. The story lies almost entirely in method of procedure and ways of handling material. Both are largely dependent upon organization.

Located on the terminal glacial moraine, Camp Grant, as it is officially named, lies 6 miles south of Rockford on the outside of a sharp bend of the Rock River. It is a rich, sandy farm-land plateau, 35 ft. above the river,



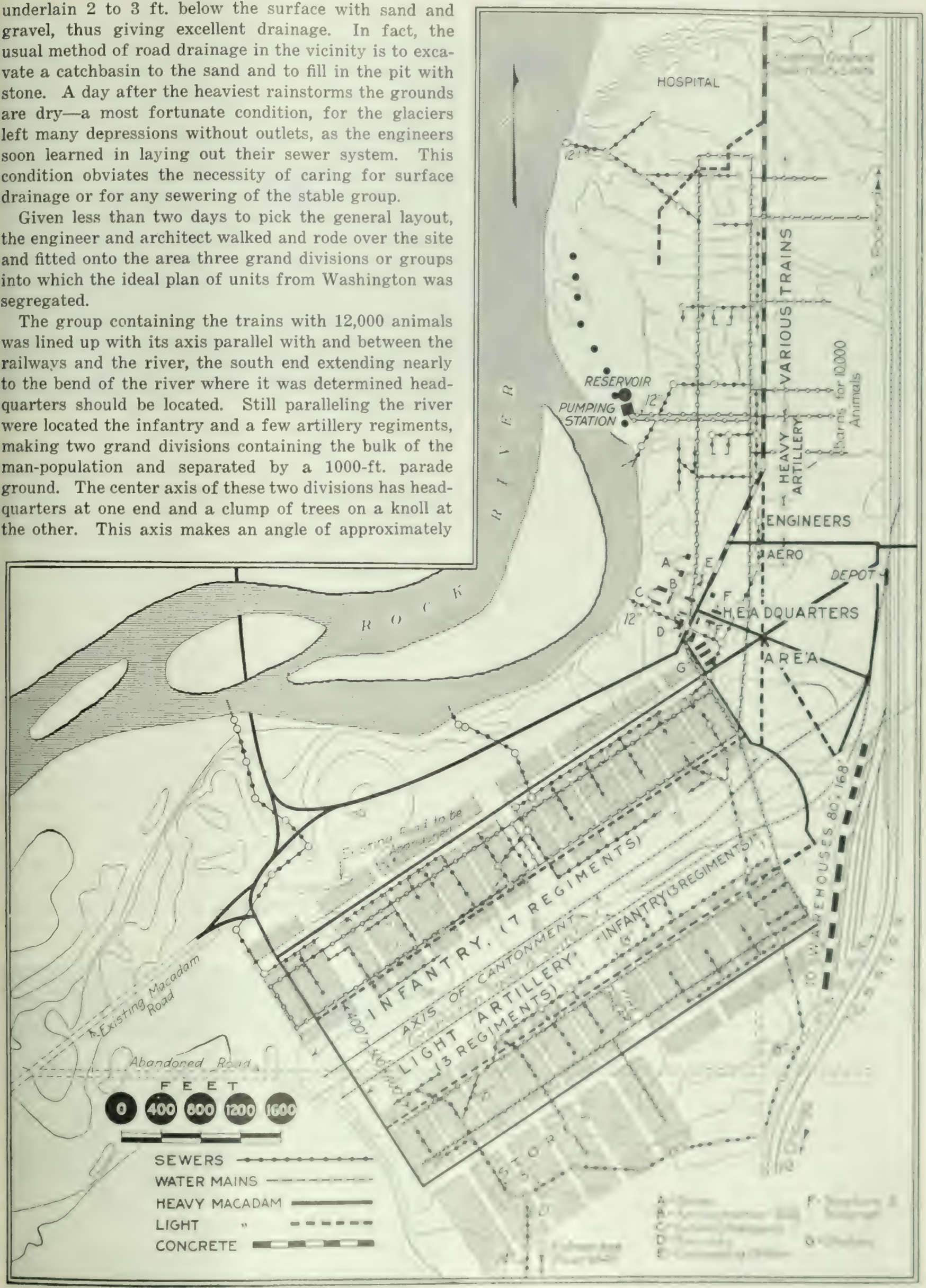


WOODEN TRACKS FOR USE IN WET WEATHER LEAD BACK TO THE INDIVIDUAL UNITS

underlain 2 to 3 ft. below the surface with sand and gravel, thus giving excellent drainage. In fact, the usual method of road drainage in the vicinity is to excavate a catchbasin to the sand and to fill in the pit with stone. A day after the heaviest rainstorms the grounds are dry—a most fortunate condition, for the glaciers left many depressions without outlets, as the engineers soon learned in laying out their sewer system. This condition obviates the necessity of caring for surface drainage or for any sewering of the stable group.

Given less than two days to pick the general layout, the engineer and architect walked and rode over the site and fitted onto the area three grand divisions or groups into which the ideal plan of units from Washington was segregated.

The group containing the trains with 12,000 animals was lined up with its axis parallel with and between the railways and the river, the south end extending nearly to the bend of the river where it was determined headquarters should be located. Still paralleling the river were located the infantry and a few artillery regiments, making two grand divisions containing the bulk of the man-population and separated by a 1000-ft. parade ground. The center axis of these two divisions has headquarters at one end and a clump of trees on a knoll at the other. This axis makes an angle of approximately



LAYOUT AND UTILITIES AT THE [illegible]



THREE ROWS OF BARRACKS FOUR DEEP MAKE AN INFANTRY REGIMENTAL UNIT

120 deg. with that of the first division. A fringe of trees approximately ⅛ mile wide lines the river bank. This has been preserved for park purposes, and practically all trees surrounding farmhouses will be saved by slight shifting of structures without breaking up the general orderly lines of the buildings. The more desirable farmhouses will be utilized for officers' quarters. Haphazard placing of buildings to obscure desirable outlooks down streets between units has been avoided if possible, and many other similar schemes of the city-planner to influence consciously or subconsciously the mind of the soldier-to-be have been kept in mind. Headquarters with its apple-orchard avenue of approach to the general's mansion and numerous other well-placed axes on the headquarters layout require constant attention on the ground and frequent consultation with the engineers.

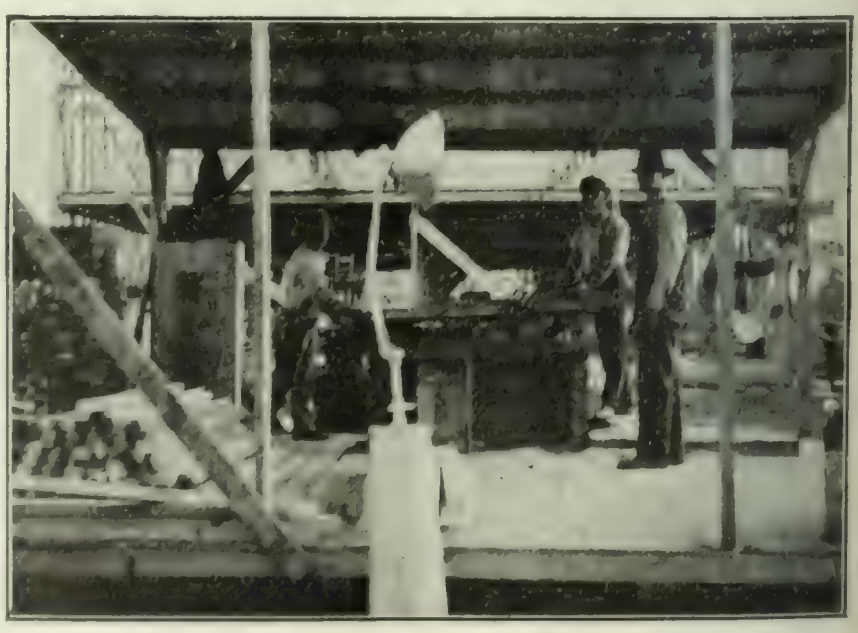
Water-Supply Problem

No great difficulties attend the securing of a deep-well water-supply, for water-bearing St. Peter's limestone is reached at 400 ft. Eight wells are going in on a flat near the river. Three drilling outfits are at work, and six will be employed. Three air compressors of 2000 cu.ft. per min. capacity will lift the water to a surface concrete reservoir of 150,000-gal. capacity. Air was chosen because of its flexibility, should sufficient water be found in the gravel at 200 ft., or should it be found necessary to increase the depth of the wells beyond 400 ft. The plan is to go down only so far as necessary to get the required amounts. Possibly four or five wells will be sufficient, but all are connected to the same air line. There are two Alberger centrifugal pumps of 1000 gal. per min. capacity, and two American Well Works centrifugal pumps of 1000 and 750 gal. capacity, all motor driven. These will pump into the distribution system on which, near the center of consumption, is being erected a 250,000-gal. steel tank purchased from the Chicago Bridge and Iron Works. It is 150 ft. high. There was an alternative of using three separate wooden tanks until the steel one was found in stock.

The distribution system consists of loops around each of the grand divisions with 150 hydrants at 500-ft. intervals. Each regimental unit is supplied according to standard plans from Washington. In fact, no departure is being made from standards, and it is the commanding officer's creed to initiate no innovations in any of the work. No short-cuts or "stunts" are being tried for the first time. No man with a new-fangled machine, no matter how plausible, gets any satisfaction at Camp Grant.

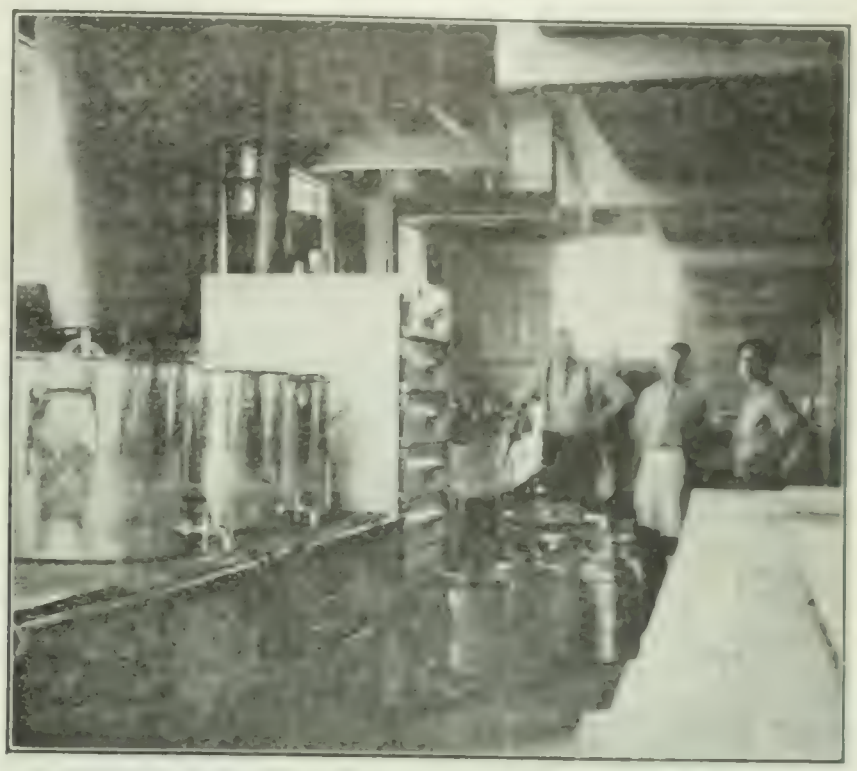
Sewer System Made Shallow To Fit Machined Trenches

Not often is a 23-mile sewer system revamped overnight because on trial it is found that the deep trenches cave in. That is what happened at Camp Grant, for on trial it was found that a long cut of about 2000 ft. with maximum cut of 13 ft. caved badly when the depth exceeded 7 ft. The original plan was to collect everything into one sewer and carry the sewage away from the Rock River watershed into the watershed of the Kishwaukee River, which joins the former about 1 mile below camp, to an outlet at the junction of the two rivers. This would conserve the Kishwaukee for bathing. After it was found that the cut could not be made without



FIVE GASOLINE-DRIVEN SAWS ACCOMPANYING EACH UNIT WORK AT NIGHT CUTTING TO TEMPLETS





FOUR HUNDRED ARE FED FROM EACH ARMY BARRACK KITCHEN

elaborate bracing, all grades were raised and five additional outlets provided directly into the Rock River opposite camp. As this stream receives all the sewage of Rockford, its use for domestic purposes will be prohibited anyway.

With the shallower cutting the material is an ideal trench-machine job, and already one Austin outfit has made a record of 1700 ft. per 9-hour day. The schedule calls for 2500 ft. per day for three machines. On July 18, two miles of trench had been opened, 13 cars of pipe had just been unloaded, and 70 of the 150 cars required were on the way. Unloading proceeds at night, Carbic flares furnishing the light.

Local Materials for Roads

Of the 22 miles of road within the reservation, 7½ miles will be heavy macadam 18 ft. wide, 8 in. thick at the center and 6 in. at the sides; 3¼ miles will be graveled from a pit on the reservation, and the remaining mileage will be graded earth roads which can be maintained in good condition with a small amount of care. The gravel is fine and needs a little binder clay.

For the distribution of the 332 cars of stone, 1½-ton Velie army trucks will be tried, although the bodies are stationary and the time element in unloading may make their use infeasible. However, the captain in charge of the motor-truck company claims that loads can be shoveled off in 5 min. The engineers contemplate building an inverted hopper as a false bottom to facilitate unloading. On the natural farm lands the trucks mire down in wet weather, making their use impracticable for about a day after a storm.

The county will open, Aug. 1, a concrete road leading from the city limits to the camp. The city is rushing to completion by the same date a strip 18 ft. wide of monolithic brick nine blocks long, to connect with existing hard pavements. A detour at present over several miles of earth road has prevented little trucking to camp from town. This second road will be concreted to the city limits as soon as the main road (Kishwaukee) is opened. A third proposed route is to utilize a macadam road down the opposite side of the river and to bridge it at the camp site by a ponton until the county can build a steel structure. Capt. C. C. Saner, of Company A, Illinois Engineers, is investigating the foundations for the steel structure and will build the ponton if authorized.

Transportation Problem Big

With the building operations scattered over an area more than 2½ miles in length, one of the first things to do was to build a railroad to serve each of the grand divisions. The Chicago, Burlington & Quincy R.R. Co. detailed C. J. McCarthy, division engineer of the Rockford division, to lay out and build from plans decided upon on the grounds by the commanding officer, contractor and himself, for the railway company. In general, the scheme consists of main tracks with switches in front of each grand division, but far enough away so that the 25,000,000 ft. of lumber and other materials might be piled in front of each of the various units and still leave sufficient space so that the fire hazard would be a minimum. A fire-department chief, four men and apparatus have been furnished by the City of Rockford, to still further protect the lumber and completed buildings.

So far the lumber has "melted" away so fast under the contractor's forces that no respectable piles are noted in front of any particular unit. The auditor's report on July 25 shows that the following quantities were handled less than four weeks from the beginning of active construction: Carloads of lumber unloaded (July 25), 54; total to date, 674; en route, 263; cars of miscellaneous material unloaded (July 25), 10; total to date, 248. No one of the units was entirely complete, but 36 barracks were substantially so, and work was under way on as many more. The railroad layout is shown in one of the drawings. Some of the curves otherwise unexplainable are due to topography, as no cuts or fills were feasible on such short notice.

Transportation of material back to the building sites from the switches is by army motor trucks, by teams and by Improved Lorry cars drawn by teams over wood tracks. The latter method is not much used except immediately after rainstorms, when the teams and trucks mire down, but have exceptional value because of the unusual number of rainstorms during the early opera-

tions. Only a portion of the 33 trucks are used at this short-haul work, as they are reserved as much as possible for the long hauls, such as delivering pipe and road material. Teams do the greater portion of the lumber hauling.

The contractor has erected large warehouses along the switch tracks for cement, plumbing supplies, electrical equipment, etc. Complete materials for a single regimental unit are ordered separately and unloaded opposite the unit where they are to be utilized, so that no great piles are anywhere visible.





IRON COTS, MATTRESSES AND BLANKETS ARE FURNISHED THE MEN WHO MOVED FROM TENTS INTO BARRACKS AS FAST AS THE LATTER WERE BUILT

While the troops will not arrive until Sept. 1, the quartermaster expects to begin storing immense quantities on Aug. 1. For this reason, work is being pushed on ten 80 x 168-ft. warehouses on a site adjacent to the existing railway tracks where there will be at least six team tracks and main track with spurs to each.

Contractor's Organization

Several executive officers of the contractors are on the ground continuously from 12 to 20 hours per day. In the construction division under them are a general superintendent and an assistant. Under these two men are field superintendents in direct charge of the building operations of a single regimental unit. The number of these men will be increased to keep up with the pace set by the railroads in getting material on the ground. Each unit is working under a different-colored flag for easy identification, and rivalry as to breaking schedule records is fostered down the line in each unit organization. Each superintendent has a general foreman in charge of several buildings, and each building has one or more carpenter foremen. For the utilities, such as water mains, water-supply, sewers, electrical installations and plumbing, there are superintendents in addition to the building superintendents in charge reporting to the general superintendent. Each of these divisions has its own estimating staff in the office and distributing staff in the field. The superintendents may consult these men directly in getting information as to layouts, materials, checking bills and shortages, without going to the general superintendent. A head estimator and assistants check all division estimators' figures and put the bills of materials in shape for final ordering—all of which goes through a chief clerk and then to the buyers. The Government auditors keep track of time and material and handle the accounts. The contractor has a bookkeeping department, for he must actually pay the men and material bills from payrolls and vouchers received from the Government auditors.

A camp superintendent under the chief clerk houses and feeds the force, which will be increased ultimately to 8000 just as soon as the permanent barracks are completed for them, contractor's tents and temporary shacks being provided only for the first 700. For each barrack there is a clerk to check the 400 men in and out, a chief clerk, assistants and waiters. All the people on the work—laborers, visitors and officials—have brass checks issued to them. Each man carries a disk indicating to what barrack he is assigned in order to avoid confusion, and four times a day they must give the number to the auditor's force, small portable checkhouses being provided at suitable intervals.

An inspection of the half-dozen dining halls in operation July 20, when 2500 men were fed, and a sample of the meals indicate that the contractor will lose no men on this account. In fact, Chicago restaurants looked decidedly uninteresting after a "square" in camp. Iron cots, mattresses, and blankets spaced much as they will be for the soldiers, are placed on the second floors above the mess halls.

The rapidity of increase in the contractor's operations the first week is shown by the number of men at work beginning July 1: 32, 425, 762, 727, 1103, 1230 and 1175. On July 17 there were 2703, on July 19, 2860 and on July 25, 5800. Until this date men have drifted in because of newspaper publicity.

The wage scale and condition as to overtime prevalent in the vicinity are paid.

Sanitation Handled by Medical Corps, U. S. A.

Arriving on the ground 10 days after the building operations began, Capt. H. C. Mitchie inaugurated immediately the regular army precautions for handling camps. He has a division of 50 men constructing latrines in advance of building construction, a division of disposal and a fly squad. Urine is collected in garbage cans, dumped into tank wagons and discharged into the river below camp. Another wagon group limes and burns latrine contents daily. The fly squad, in addition to

continual inspection, uses swatters, fly paper, traps and chemicals to reduce to a minimum any chance of infection by the fly route. About 20 bbl. of garbage are collected daily by La Forge & Son, who operate a reduction plant in Rockford. Combustible material is burned by the fire department.

PERSONNEL

Maj. D. H. Sawyer, formerly a member of Sawyer Brothers, consulting engineers, of Spokane and Seattle, Wash., is constructing quartermaster. Detailed to him from Company A, Illinois Engineers, are Lieut. D. A. Tomlinson as adjutant and Lieut. W. H. Dean as chief draftsman. J. M. Moloney, civil engineer, has charge of all building operations for the quartermaster.

Alvord & Burdick are the supervising engineers for sewers, water-supply and roads. They have A. T. Luce in charge of the fieldwork and D. H. Maxwell in charge of the office work. E. H. Bennett, of the Chicago City Plan Commission, is the consulting architect, assisted by C. E. Howard, of Syracuse, N. Y.

The Bates & Rogers Construction Co. has the contract and has put its whole organization at the disposal of the Government. E. S. Holland and E. P. Lenahan, vice-presidents, are on the work continually. F. L. Copeland and E. S. Whitney are general superintendents. In spite of the rapidity with which the camp force was organized and work started, the contractor's organization has been working smoothly and effectively, and much credit is given to it for the speed of progress.

French Military Roads Given Excessive Crown When Reconstructed

In reconstructing French roads for military purposes, where they have not been damaged by war operations, it is sometimes possible to afford considerable relief to traffic by widening them. In carrying on the work in mountainous sections subject to heavy rainfall, where it is necessary to have the surface dry out as quickly as possible, the roads are sometimes given considerable crown, to shed the water into the ditches. This crown causes much complaint from drivers, for it results in considerable skidding, but the transportation authorities believe it is better to dry off the road promptly, even at the loss of a few trucks by accident, than to have it stay soft, damp and easily cut up for some time after each rainfall. Another interesting feature in the improvement of these roads is seen at some of the little hamlets where the roadway is confined between houses, so that widening of it is impracticable. Here detours are built around the hamlets, sometimes narrow so as to take only the traffic passing one way, and sometimes wide enough for traffic in both directions. There are some of these narrow roads which it is impracticable to widen rapidly, and in such cases traffic in one direction is routed over them and a new road built to accommodate the traffic in the other direction. It has also been necessary in places where narrow bridges would cause a congestion of traffic on a wide road, to widen the bridge or build another beside it. Some of these bridges are by no means so strong as might be desired for concentrated military traffic and the ways in which they are cribbed and braced include every expedient engineering ingenuity can suggest.

Oklahoma Steps Forward

Water-Works and Sewerage Plans Must Be Approved by State Board of Health Before Letting Contracts

PROGRESSIVE legislation vesting the Oklahoma State Board of Health with the sanitary control of water-supply and sewerage systems was enacted by the last session of the legislature of that state. After the act goes into effect (June 30, 1918) no contracts for new water-works or sewerage systems or for changes in or extensions to old systems of either class, except extensions of water-distribution pipe, can be made without filing plans with the State Board of Health and getting the approval of that body. The board is also given power to order changes in water-supply and sewerage systems necessary for the protection of public health.

Violations of the provisions of the act are made misdemeanors and are subject to penalties of from $25 to $50. If water is supplied or sewage discharged without the required permit, then each day of violation constitutes a separate offense. In case a contract is let for water-works improvements without a permit from the State Board of Health or in case any construction work of any sort for supplying water is done without a permit having been issued by the State Board of Health, the fine will not be less than $500 for each offense.

MUST FILE PLANS

Every owner of existing public water-supplies is required to file with the State Board of Health a certified copy of the plans and surveys of the works and a description of the source from which the water-supply is taken. Every owner of a "sanitary sewer system" must file with the board "a report of such system," giving such information as the board may require.

Complaints regarding the sanitary quality of any water supplied to the public for domestic or drinking purposes may be made by the mayor of any city, the president or chairman of any board of trustees of any incorporated town, by any county officer, or by any local board of health. It will then be the duty of the State Board of Health to investigate the character of the water-supply complained of and if the board has reason to believe that the water is dangerous to health it may order "such change in the source or sources of said water-supply, or in the manner of storage, purification of treatment of said supply before delivered to the consumer, or both, as may be necessary in its judgment to safeguard the public health." The owners of any such supply under complaint and investigation must supply whatever information is demanded by the State Board of Health, and must comply with the order of the board when issued.

SCOPE OF ACT

The act does not apply to the discharge of sewage from sewerage systems in operation and discharging sewage into the waters of the state on July 1, 1915, but the act will apply to extensions to such systems after that date and it will prohibit "the discharge of any sewage which upon investigation by the State Board of Health, as hereinafter provided, shall be found to be polluting the waters of the state in a manner prejudicial

to the health of the inhabitants thereof." The subsequent provision mentioned above provides for investigation of complaints of sewage pollution by municipal and county authorities in the same general way as has already been outlined for investigations in regard to the unsanitary character of water-supplies. After investigations of such complaints, or after investigations made on its own initiative, by the State Board of Health, if the board concludes that sewage discharge is prejudicial to the public health, changes deemed necessary by the board in the interest of public health may be ordered.

Owners of sewerage systems may apply to the State Board of Health for permits to discharge sewage into any of the waters of the state and the board may give such permits when it is the unanimous opinion of the board "that the general interest of the public health would be subserved thereby." Such permits must stipulate the conditions under which the discharge may be permitted, the time during which the discharge may be made, and the permits are subject to modification and revocation by the board at any time after investigation and hearing, provided notice is given to all parties and interests. No permit shall be granted under this provision of the act to anyone who has failed to file with the board the required report already mentioned.

The act defines sewage as "any substance that contains any discharges from the bodies of human beings or animals, or chemical or other wastes from domestic manufacturing or other forms of industry."

How Appeals Are Handled

Appeals from orders of the State Board of Health disapproving plans for water-works or for sewerage or sewage disposal, or ordering changes in such plans, and also appeals from the order of the board to make changes in existing water-supplies, may be made to the district court of the county in which the water-works or sewerage system is located whenever the owners of any such water-works or sewerage system believe that the action of the board is "illegal, or unjust, or unreasonable." Such appeals must be taken within 30 days after the order is made. The court must hear such appeals promptly and must "render a decision approving, setting aside, or modifying said order, or fixing the terms upon which the said permit shall be granted, and stating the reasons therefor."

The State Engineer is required by the act to delegate one of his assistants to help the State Board of Health in making any necessary investigations required by the act, as well as to assist in passing upon plans submitted for approval.

Dr. John W. Duke is health commissioner and Dr. C. J. Kendle is assistant health commissioner of Oklahoma, with offices at Guthrie.

A Three-Shift Water Laboratory

To secure better control of the operations of the water-purification works of Toledo, Ohio, the laboratories were operated throughout the 24 hours last year, says R. W. Furman, chemist in charge, in his report for 1916. Samples for chemical analysis were taken every two hours and for bacterial examination every eight hours. Composite chemical samples were then prepared for daily, weekly and monthly tests.

Test Wells for Alaska Bridge Sunk Through Ice

Wash-Drill Boring Rig Is Hauled 160 Miles by Railway, Sleds and Dog-Teams—Outfit Housed in Tent

SINKING test wells for the location of a bridge site in Alaska furnished some hard winter work for the Alaska Engineering Commission. The site is at the proposed crossing of the Susitna River by the Government railway, and is about 147 miles north of Anchorage. The main line is laid out to cross the Susitna River diagonally, striking the north bank just above the mouth of the Indian River. The railway runs nearly due north and the angle of crossing is about 30°.

Wash-Drill Rig and Work

The work was carried out during January to March, 1917. The drill tests for foundations were of a preliminary nature, and were made with a wash drill operated by hand power. To provide against freezing, the entire output was housed in a tent on a 14x20 ft. platform on skids, and a wood-burning heater and hot-water tank were installed within. The drilling was done from this platform on top of the ice. Only on the coldest days was it found necessary to thaw out the pump and water pipes. One of the accompanying views shows this tent being moved across the open channel of the river on a temporary bridge of cottonwood saplings.

The equipment for this drill work, including all supplies, amounted to about four tons. Half of this was moved from Anchorage to the bridge site, a distance of 159 miles by trail and constructed road. The rest was moved 16 miles from Dead Horse Hill storehouse to the bridge site. Transportation was made from Anchorage to Matanuska by the railway of the Alaskan Engineering Commission, 36 miles; from Matanuska to Dead Horse Hill by bob sleds and double-enders, 107 miles; and from Dead Horse Hill to bridge site by dog teams, 16 miles. Heavy snow prevailed throughout the first part of the trip, making traveling very slow, and about three weeks were consumed in transporting equipment and supplies. A party of 11 men was taken and was away from Anchorage for 2½ months.

Results of the Drilling

From the nature of the surrounding country it had been thought that hard formation would be encountered, not more than 15 ft. below the bed of the river. On this assumption the proposed design was for three 200-ft. steel-truss spans on concrete piers and abutments, with a 210-ft. trestle approach at the north end. The south approach would be in a cut. Test pits at the south abutment and drill tests at the north abutment and both channel piers showed no hard formation within reasonable depths.

The deepest test hole was sunk 53 ft. below bed of river. It showed from top to bottom 12 ft. of gravel and boulders, 29 ft. of fine sand and clay, 8 ft. of hard packed sand and gravel and 4 ft. of sand. The hole ended on a boulder.

The ice in this river jams badly when it breaks up in the spring. Ice jams have been known to raise ordinary



DRILLING TEST HOLES FOR RAILWAY BRIDGE FOUNDATIONS IN ALASKA
A—Transporting rig and material on double-ender sled. B—Transporting on dog-team sled. C—Men carrying A-frame of drill to bridge site. D—Drill house being moved across open channel of river

high water over 10 ft. at the bridge site. This would be about 11 ft. below base of rail on the proposed bridge, which is nearly 20 ft. above high-water level. To reduce the possibility of choking the river by two channel piers, it is now proposed to have two 300-ft. steel truss spans on concrete abutments over the channel of the river, and a 210-ft. framed trestle approach at the north end to give plenty of opening for flood water. The increased cost of steelwork is more than balanced by avoiding the construction of one large channel pier.

The work described above was done under the authority of W. J. H. Fogelstrom, Bridge Engineer for the Alaskan Engineering Commission. F. H. Chapin was in charge of the drilling party. As this crossing proved so difficult, and as it is practically impossible to procure steel for the truss spans, the Commission has sent out another location party to find an easier crossing. This party is in charge of Fred Browne. It is thought that if such a crossing can be found, it will probably be of advantage to adopt it.

Paid Foremen Superintend Road Tax-Workers In Alabama

One of the greatest sources of waste in local road work is due to the practice of allowing male taxpayers to work out their road taxes in many states. They do this when it best suits them, not when the roads need their attention the most. The work is often performed without proper supervision and a competent supervisor is often without any authority to compel good work. The state highway engineer of Alabama, W. S. Keller, reports that results good in comparison with the usual results from working out road taxes have been obtained in several counties in his state by placing the work in the hands of a few steadily employed foremen, who give all their time to it. These foremen are furnished with two or three teams with regular drivers, wagons, scrapers, grading machines, split-log drags, and the necessary small tools, and as many miles of road are assigned to each as he can work. A census is taken in each foreman's territory early in the year of all men subject to road duty. He is furnished with a list of names and is required to work every man who has not paid the required tax into the county treasury in lieu of his services. No foreman is allowed, under penalty of dismissal, to receive cash from work hands.

Edmonton Utilities Make Good Showing

For the first half of 1917 the public utilities of Edmonton, Alberta, earned $365,537 over operation and maintenance expenses, or $2000 a day. The surplus was distributed as follows: Electric light and power, $145,152; telephone, $92,165; water-works, $87,782; street railway, $42,488. Interest and depreciation charges are not reported. A. G. Harrison is city commissioner.

Worcester Owns and Operates a Model Garbage-Disposal Piggery

City Collects Garbage and Hauls It Many Miles to Poor Farm Where It Is Fed to Hogs—Under Modern Sanitary Conditions—Fish Offal Is Buried—Many Cost Data Are Given



By FREDERIC BONNET, JR.
Professor of Chemistry and Sanitation, Worcester Polytechnic Institute, Worcester, Mass.

AT THIS TIME, when every effort is being made to conserve our food resources, much interest is being shown in the economical disposal of garbage. So many requests have recently been made for information regarding the operation of Worcester's municipal pig farm that it was thought best to prepare and publish the following data from which it may be seen how one city, after many years of experience, is now turning garbage into a valuable food product and at the same time just about paying the cost of garbage collection.

Worcester is one of the old and well established cities of New England with a population of about 175,000. It is an industrial city with many diversified industries but with no unusual characteristics. Its foreign population, according to the census 1910, is only 33.5%.

In 1872 (population 44,000) the superintendent of the municipal poor farm began sending a wagon into the city now and then to collect enough garbage to feed the pigs. The work developed with the growth of the city until today about 70% of the garbage of Worcester (20 to 30 tons per day) is taken to the Home Farm and fed to 2000 to 3000 pigs. The garbage disposal has developed and continued along this one line for a longer time than has usually been the case in American municipalities. There has been a striking absence of unwise and unsuccessful experiment.

The Home Farm proper consists of 376 acres owned by the city. In addition, the city leases a farm of 220 acres, at a rental of $1500 a year. The farm is located in the northeastern part of the city. To get to it, the garbage teams coming from the center of the city have to pass over a ridge about 140 ft. high.

The city is divided into 21 districts from which the garbage is collected twice a week without charge to the householders or business men. There is also a special collection for the fish offal and rotten eggs from markets and commission houses, which collection is made daily in special cans with tight-fitting covers. These cans are provided by the dealers. Since this material is not fed to swine but is buried, as described later, no revenue is derived from it and it is a direct tax on the scavenger department of $1760 per year.

Hitherto, most of the hotel, restaurant and hospital garbage was privately collected, but owing to the recent falling off of the quantity and quality of the garbage, more of this is gradually being collected by the city. Some private collectors also obtain the privilege of collecting in certain outlying districts. All such collectors must first obtain a license from the Board of Health (Chapter 75, Revised Laws, Rule 22), and this is only given by the board after consultation with the superintendent of the Home Farm, who includes in his duties the supervision of the scavenger department, the sole purpose of which department is the collection and disposal of the garbage collected by the city. The arrangement with private collectors has not been wholly satisfactory.

For the city collectors, one load is considered a day's work. Each collector unloads his wagon and washes it. He also beds down his horses and curries them.

The feeding is not done by the collectors but by a farm employee especially assigned to this task.

The teams leave the Home Farm at 7 a.m. and have on an average a 13-mile haul daily (maximum 18 and minimum 10). It requires from 2 to 4 hours to make a load. Owing to the fact that Worcester has practically no alleys the average time per house collection is 1.65 minutes (maximum, 3.9; minimum, 0.4).

Separate Collection of Garbage

The rules of the Board of Health require "the individual householder to provide a suitable water-tight covered receptacle to keep garbage and swill until the same is removed by the city scavengers. This receptacle shall be kept covered at all times—it shall be kept on the ground floor and be convenient of access. No person shall deposit in the garbage—any tin cans, water (dish water not excepted), ashes, glass, sweepings, oyster or clam shells, sawdust, cork-dust, old boots or shoes, dead animals, etc."

These rules have been quite well understood and Worcester's garbage has in consequence been quite clean.

The garbage collected by the scavenger department has all been weighed at the Home Farm since May, 1914. The figures, which show a falling off in the amount produced, are given in Table I. A garbage inspector was appointed on May 1, 1917, whose duty it is to look after all collection complaints and to see



THE OLD PIGGERY AND MANURE PILES HAVE GONE

that collections, especially by private licensed collectors, are properly made. Owing to the high price of pork much garbage was stolen before the inspector was appointed, the amount of garbage dropping at one time from about 20 tons per day to 12.

Feeding to Hogs Economical and Sanitary

The garbage as collected is hauled to the Home Farm, weighed, and fed to a herd of 2000 to 3000 swine. As this system developed from small beginnings, the old farming methods were followed to within quite recent times. With the growth of the city these methods gave rise to considerable complaint because of odor. As a result a commission was appointed in 1914 to investigate and report. The commission consisted of the writer as chairman, the superintendent of the Home Farm and a member of the overseers of the poor under whose jurisdiction the Home Farm and Scavenger Department lie. This commission, after investigating all methods of disposal, concluded: "That disposal by feeding is the most economical method; that the greatest intrinsic value of the garbage, the feeding value, is made use of; that the garbage of Worcester can



THE NEW PIGGERY WAS BUILT IN 1913 AT A COST OF $3000 AND HAS A CENTRAL DRIVEWAY

not only be disposed of without cost but that the revenue from the sale of hogs has almost been sufficient to pay for collection."

The commission also made recommendations as to the conduct of the piggeries, feeding methods and the disposal of the manure, cleanings from the pens, the fish offal, prevention of flies and the breeding of rats. The commission was also interested to find whether there was any justification for the statement quite often made that hogs fed on municipal garbage are unfit for human food. They could find no justification whatever for such a statement.

Opinions of Sanitary Experts

Dr. Charles V. Chapin, the well-known health officer of Providence, R. I., stated in one of his annual reports that: "Feeding garbage to swine will not cause disease either in Providence or in the towns to which it is removed. In an experience of 19 years, I have never found a case of sickness that could thus be explained." Robert Spurr Weston, of Boston, has had to deal with the garbage disposal of a large sanitorium for tuberculosis patients. He states: "After considering the use of a small crematory or the burying of the garbage it was decided that it was wasteful to throw away so much good table refuse of high feeding value when animals could dispose of it at a profit. Careful post mortem examinations of the swine have failed to disclose any lesions due to infection and the experiment coincides with that of other corporations."

Dr. Edward Cahill of the Massachusetts Bureau of Animal Industry states that 95% of all the hogs of Massachusetts are garbage fed. Many more references might be cited to show that in the opinion of the highest sanitary experts garbage-fed hogs are in no way a menace to the public health. The fact that garbage-fed hogs bring the same price as other hogs shows that there is no discrimination against them by packers. It is quite conclusively shown also, in the

TABLE I TONS OF GARBAGE COLLECTED PER MONTH AT WORCESTER, MASS., 1914 TO 1916 *

Year	Jan	Feb	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Av. Tons per Day
1914					634.6	656 4	686.8	834.3	938.7	769.8	674.6	711.2	29.65
1915	7[illegible]0 8	538 8	625 2	589 2	596 8	582 4	675.2	686.7	856.3	676.3	568 1	563.6	26.42
1916	557 8	49[illegible]6	524 5	548 2	630 9	616.1	630.7	683.2	738.7	675.5	554.9	567.5	23.02

* No record kept before May, 1914

figures for hogs sold from the Worcester pig farm. Of 2276 hogs sold to a packing house only 11 were condemned by the United States Government meat inspectors, an average of only 0.48%, which is much lower than on hogs shipped in from the West to the same packing company.

Operation of Garbage Piggery

The following description of the operation applies to Worcester's garbage-disposal plant as now operated under the able direction of Thomas Horne, superintendent, who has aided the writer in the preparation of this paper. The garbage as it comes to the farm is neither washed nor steamed. Washing is uneconomical because so much valuable food material is washed away and wasted; it is unnecessary since no material advantage is gained thereby. Cooking or steaming the garbage has been found by experience to be bad since the garbage is thereby made more acid than it ordinarily is and substances are incorporated in the food which are harmful to the hog and which would not



THE OUT-DOOR HOGS ARE WAITING TO GET TO THE WOODEN FEEDING PLATFORMS

be eaten in the raw garbage. A hog is more capable of picking over and culling garbage than any man or machine can be.

Pigs are kept with the sow in individual pens until they are six weeks old, although the pigs begin to eat garbage when about three weeks old. Boars are castrated when about five weeks old and are then left with the mother another week. The pigs remain in pens until they are about 6 months old and are fed from troughs. They then weigh about 75 to 100 lb.

Inoculation Against Cholera

The entire stock is treated by the so-called double-treatment method (virus and serum). Pigs 5 to 6 weeks old are inoculated with serum only. This treatment carries them for about 7 weeks when, at a weight of about 40 to 50 lb., they are given the double treatment, virus and serum. State veterinarians under the State Bureau of Animal Industry do this work free of charge, the department merely paying for the serum and virus used and for the necessary help. The cost of treatment depends upon the size of the animal since more serum is used the larger it is.

The serum costs 1¾c. per c.c. and about 20 c.c. are used for a 40 to 50-lb. hog, live weight, so that the



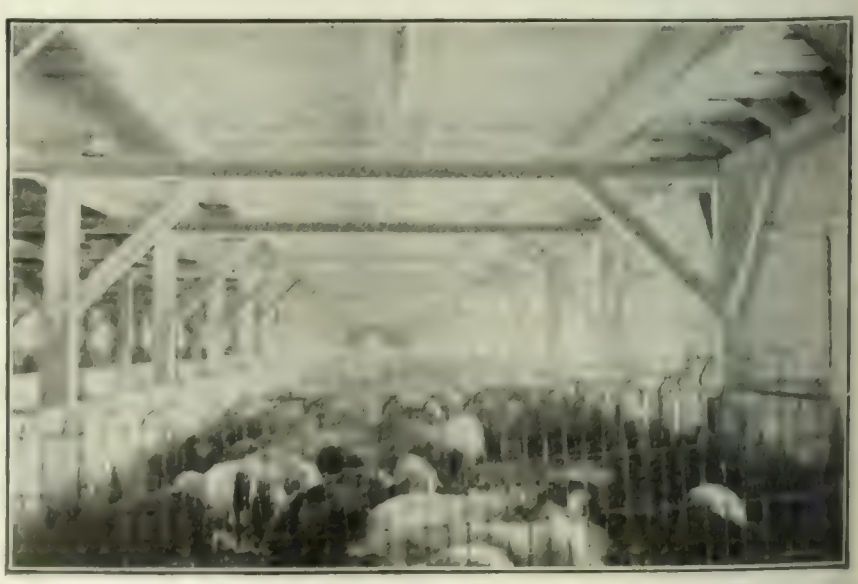
THE GARBAGE IS COLLECTED IN 2½-YARD TIGHT WOODEN WAGONS COSTING ABOUT $250 EACH

The garbage is first thrown into the front end of the wagon. A heavy canvas cover is gradually unrolled and tied down as the wagon fills

total cost of treatment exclusive of help is therefore about 70c. per pig. The place for injection (between the hind legs) is scrubbed with soap and water containing lysol or similar disinfectant and swabbed with tincture of iodine after puncture. Not one hog in 500 is lost and there is no trouble from ulcer formation if the inoculation is properly done. One veterinary with five helpers can treat 250 pigs of 40- to 50-lb. weight in a day.

To prevent itch the hogs are all sprayed about once in six weeks with a mixture of 3 parts of kerosene and 1 part of turpentine.

In February, 1915, the herd of swine at the Home Farm were visited by the dreaded hoof-and-mouth disease which was probably carried by crows from an infected herd of cattle nearby to the hogs fed out of doors. Federal and state authorities took charge of



PIGGERY NO. 6 SHOWS TYPE OF CONSTRUCTION

Note the wire partitions between the pens

the quarantine and the killing of some 2360 animals. The Federal Government paid one-half the assessed value of the infected animals and the state the other half. After killing, these animals were buried in pits with lime. Those not infected were killed for pork. The farm was not restocked until the following September. It is interesting to note that the disease did not infect the Home Farm herd of cattle. During this interval the garbage was dumped in a hollow on the farm and covered with loam. In June swarms of flies developed from this dump but by the use of traps, a kerosene-turpentine spray (3 to 1) and creosote spray, they were destroyed and kept under control.

After the hoof-and-mouth disease great pains were taken to rid the premises of rats. Poison, traps, shooting and "building out" were all employed. Many of the older buildings were condemned by the commission because they harbored so many rats. These rodents not only steal garbage but may prove a menace to the herd should they become infected. The only remedy for controlling them is by persistently killing them in every way possible and building them out. Crows are also a menace to the herd, as Worcester has discovered to her sorrow, and their presence on pig farms should be discouraged.

Out-of-Door Feeding Platforms

After six months the pigs which have grown to shoats are turned out into hog lots (100 pigs to about 3 acres) with out-of-door feeding platforms made in 8 x 8-ft. sections of 2-in. plank. These are mounted on skids and have a half round timber on two sides to prevent the garbage being pushed off. The cost per section was $7, with farm labor. Several sections are placed end to end and when the ground around the platforms becomes fouled the sections are skidded to another location and the ground at the former location plowed up. By this means the garbage trampled into the ground is kept from decaying and producing foul



CONCRETE PITS ARE USED FOR COMPOSTING
The material is thrown in from the back and top. The boards which close the opening have been removed for hauling the compost away for use as fertilizer.

odors. The platforms are shovel cleaned daily and the material removed is composted or buried. The hogs are kept for about 15 months, when they are sold. They then weigh 250 to 300 lb. The last lot sold (May,



THE LARGER HOGS ARE PLACED ON A V-SHAPED TABLE FOR INOCULATION AGAINST CHOLERA

1917) brought 16.35c. per lb. on the hoof or 21c. per lb. dressed.

The sows are bred by turning about 300 of them into the same lot with about 30 boars for about five weeks. This makes it possible to control the farrowing so that there may be a sufficient number of pens. The first lot of brood sows are put with the boars from about Oct. 20, until Dec. 1. This brings the farrowing at the end of January, February and early March. After a month or six weeks a second lot of sows are bred and so on. During farrowing and sometimes during inoculation a little grain and middlings are fed. Boars are rarely kept more than two years and only prolific sows that are good mothers are kept for repeated breeding.

Old and New Pig Houses and Other Buildings

Up to 1914, there were 12 pig houses scattered about the farm. Seven of these were old piggeries or shelter sheds for outside hogs and have been torn down or are being used for other purposes. At present there are four pig houses in use, the dimensions of which are given in Table II, and two shelter houses. To provide additional pens for late spring farrowing 100 small portable take-down colony houses have been built at a cost of $20 each. These have proven excellent.

TABLE II. PRINCIPAL DIMENSIONS OF GARBAGE PIGGERIES AT WORCESTER HOME FARM



The pens are cleaned out daily. The cleanings, which consist of pig manure, urine, uneaten garbage and soiled bedding are carted away to the compost heap, which is inclosed by concrete walls. The cleanings, when not properly handled, may give trouble from odor. The commission already mentioned experimented with this material and found that when composted in layers with an equal volume of dry top soil, the rotten manure odor was wholly destroyed and only a slight musty odor remained after 10 days. The cleanings are quite wet and unless spread alternately in fairly thin layers with dry soil it takes a much longer time to mineralize the odor-giving substances. Objectionable odors may be carried a considerable distance when uncomposted material is spread on the ground as fertilizer, while the composted material is unobjectionable.

Since the bad odors are probably highly nitrogenous, composting by retaining these substances and mineralizing them would tend to increase the fertilizing value of the manure. About five cords of cleanings are produced daily (1500 to 1600 cords per year) and have a value of about $4 a cord as fertilizer at the farm. The Home Farm has never bought fertilizer in any material quantity for its farm land or truck garden and the scavenger department has never been credited with the value of the pig manure from the piggeries. There are two caretakers in each piggery except No. 11, which has one. One caretaker can care for about 250 to 300 pigs a day—feed them, bed them and clean out the pens.

Out-Door Hogs Improve the Farm

The out-door hogs are utilized in cleaning off the scrub from waste land and improving it. They chew and rip off the bark of practically all deciduous trees and thus kill them but coniferous trees are not touched. After chewing and stripping the bark they burrow around the roots, chew this bark and uproot the smaller stumps. In a remarkably short time (about two seasons) the scrub disappears and only the larger stumps must be pulled out before plowing is possible. Most of the cleared land of the Home Farm has thus been cleared and made into a very productive farm. Hog growers claim and it has been the experience at Worcester that such scrub acts somewhat as a tonic for the hogs and keeps them in good condition.

TABLE III. YEARLY COST OF GARBAGE COLLECTION AT WORCESTER, INCLUDING CAPITAL CHARGES

1 [illegible], $45 per month		$540
1 [illegible] $42 per month		504
1 [illegible] $2 50 per day (not found)		780
21 [illegible], $37 per month		9,324
6 Helpers, $35 per month		2,520
29 [illegible], 52 weeks, $5 60		8,445
44 [illegible] board $27 per month		14,256
		$36,368
Interest on Investment		
2 [illegible], $800 each	$40	
[illegible]	80	
[illegible]	50	
[illegible]	76	
[illegible]	32	
[illegible]	$278	
[illegible]		$6,116
[illegible]		$42,785

TABLE IV. COST OF GARBAGE DISPOSAL PER YEAR AT WORCESTER, INCLUDING CAPITAL CHARGES

7 [illegible]	
2 [illegible] @ $37 per month	$4,440
1 [illegible]	
[illegible] help	1,320
[illegible]	2,640
[illegible] (gas, disinfectants)	3,040
[illegible] foreman, office	2 560
[illegible]	1,000
[illegible] $13,000	650
[illegible] 200 [illegible] @ $20 $40,000	2,000
[illegible]	$17,650

* [illegible] 2,000 hogs are a necessary minimum for 20 [illegible]

In September, 1915, when the farm was restocked after the hoof-and-mouth disease, 1,200 shoats of an average weight under 20 lb., 100 sows and 5 boars were purchased for $7,700. All the garbage collected was not consumed by this herd and additional stock was purchased which brought up the total stock purchased to about $10,000.

From September, 1915, to January, 1917, $16,000 worth of pork was sold, and from Jan. 1 to June, 1917, $21,000 worth of pork was sold. There is on hand at the present time stock valued at $50,200.

Tables III and IV give the cost of collection and disposal for one year. Table V shows the operating cost and income of the scavenger department over a number of years. Including the years 1902 and 1910, which showed a clear profit over and above the cost of collection, the average net cost of disposal per year for 19 years was $10,169, or $0.074 per capita per year. From Tables III and IV it will also be seen that the total cost of collection and disposal per year is $60,435. About 1500 swine are sold each year and with the present price of pork will bring about $40 each or a total of $60,000. This will just about pay for the cost of collection and disposal. Table VI gives the estimated first cost of building and stocking a 20 to 30-ton garbage piggery.

The feeding method is very plastic and no part of the plant is idle or running below capacity part of the year. When the quantity of garbage becomes less hogs are sold off, and as the quantity increases, the herd increases to take care of it. In winter there are about 2000 swine on the farm and in summer 3500. About 100 to 150 pigs, depending upon size, will consume one ton of garbage per day.

Experience has shown that feeding garbage to hogs is the most economical and satisfactory method of disposal at Worcester and that it can be done in a sanitary manner without appreciable odor if given intelligent care.

TABLE V. YEARLY QUANTITIES OF GARBAGE COLLECTED, NUMBER OF PIGS AND FINANCIAL RESULTS AT WORCESTER, 1898 TO 1916

	Garbage Collected per Day			No. of Pigs on Nov. 30 of	Financial Summaries for Each Year			
Year	Loads	Cubic Yards	Tons	Ea. Yr.	Total Expenditures	Total Receipts	Net Cost	Net Profit
1898					$14,804 34	$7,674 02	$7,130 32	.....
1899					17,109 00	10,641.52	6,467.48	.....
1900	19	52.8	...	....	17,715.21	11,947.91	5,767.30	.....
1901	19.	52.8	...	....	18,935 86	13,933.03	5,002.83	.....
1902	19	52.8	....	....	18,765.03	18,766.99	.....	$1.96
1903	19	52.8	....	....	18,140.57	11,941.55	6,199.02	.....
1904	21	57.5	...	....	22,326 02	7,327.00	14,999.02	.....
1905	21	57.5	....	....	20,515.83	12,539.20	7,976.63	.....
1906	21	57.5	31.5	....	23,525.49	19,321.00	4,204.49	.....
1907	.	....	....	2,850	30,491.93	24,830.71	5,661.22	.....
1908	.	....	....	....	34,475.73	24,321.22	10,154.51	.....
1909	..	....	....	....	37,737.79	29,257.25	8,480.54	.....
1910	.	....	....	....	37,039.68	43,224.25	.....	4,184.57
1911	..	....	....	1,388	41,121.74	25,579.58	15,542.16	.....
1912	.	....	....	2,057	45,750.28	22,863.27	22,887.01	.....
1913	.	....	....	2,167	53,109.10	38,376.11	14,732.99	.....
1914	.	....	28.4	2,502	53,325.62	38,838.67	14,486.95	.....
1915	21	52.5	22.2	1,300	55,718.43	39,994.36	15,724.07	.....
*1916	21	....	23.03	....	57,680.03	16,692.99	40,987.04	.....

* Note.—Hoof-and-mouth disease. For 5 months in 1915 the garbage was buried. Farm restocked late in 1915 and early in 1916.

TABLE VI. ESTIMATED COST OF GARBAGE PIGGERY WITH CAPACITY OF 20 TO 30 TONS A DAY

Based on Conditions Existing at Worcester, Mass. Land Not Included.

Four buildings with a pen capacity of about 300 pens, 6x12 ft., including small heating plant for one house, water-supply, drainage, platforms and fencing		$30,000
3 horses, wagons and sleds for disposal work		1,500
Stock on hand June, 1917:		
1,100 swine @ $30	$33,000	
100 sows @ $25	2,500	
800 shoats (50–100 lb.) @ $12	9,600	
900 pigs @ $5	4,500	
30 boars @ $20	600	50,200
Total		$81,700

Small Circular Concrete Bins Used for Storage of Cement

Universal Mill at Duluth Has New Pockets Designed for Hydrostatic Pressure of 25 Pounds per Square Foot.

REINFORCED-CONCRETE bins for the storage of cement, similar in design to the more common grain-elevator bin, have just been completed for the Duluth mill of the Universal Portland Cement Co. This type was adopted after studies showed that small bins had greater flexibility of operation and that the circular design was more economical than the rectangular.

The structure as built consists of 27 circular bins, each 33 ft. in diameter by 50 ft. high, with two packing rooms having car sheds, or canopies, a loading platform on each side, a superstructure for the conveying machinery to the bins, and tunnels underneath for conveying cement from bins to packing rooms.

The bins are grouped in three rows and are separated into two batteries by one of the packing rooms, one battery of 18 and one of 9 bins. Fourteen interspaces formed by the meeting of outer wall surfaces are also utilized for storage. The 27 circular bins have a capacity of 10,300 bbl. each, while the 14 interspace bins have a capacity of 2200 bbl. each, thus making a total storage capacity slightly in excess of the desired 300,000 barrels.

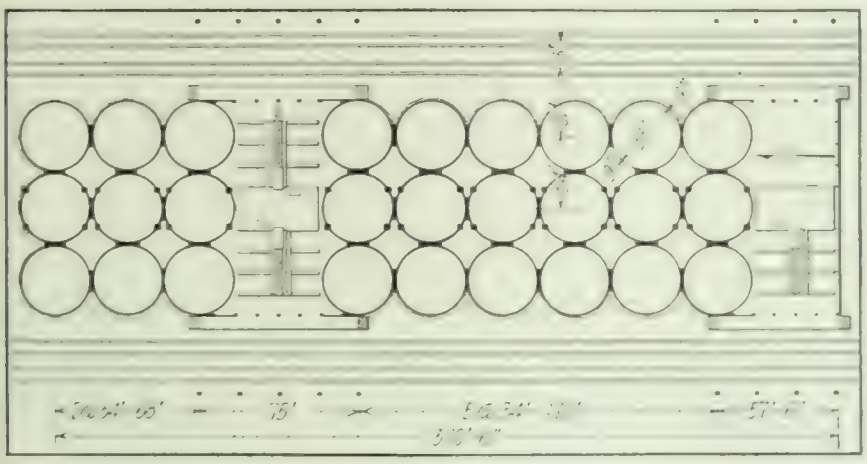


FIG. 1

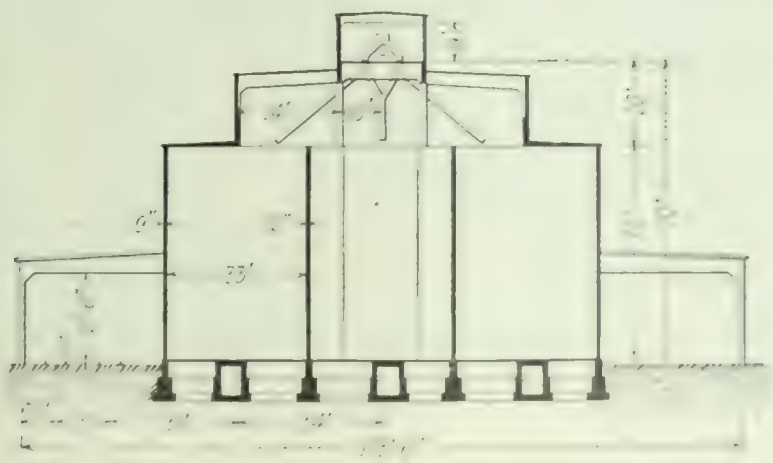


FIG 2

DETAILS OF LAYOUT OF UNIVERSAL PORTLAND CEMENT CONCRETE CEMENT STORAGE BINS

The bin walls have a uniform thickness of 9 in. except where they intersect, at which point they are 12 in. thick. Angles at the intersection are filled in to a distance of 5 ft. on each side of the center line. The horizontal reinforcement consists of ¾-in. rods for the first 25 ft. from the foundations, ⅝-in. rods for the next 10 ft. and ½-in. rods for the remaining 15 ft. Three rods are used to complete the circle, rods being lapped 4 ft. at each splice. All laps are staggered. The ¾-in. rods are spaced 4 in. apart for the first 10 ft. of the bin walls, 5 in. apart for the next 10 ft. and 6 in. for the next 5 ft.; the ⅝-in. rods are spaced 5 in. apart for the first 5 ft. and 6 in. for the next 5 ft.; the ½-in. rods are spaced 5 in. apart for the first 5 ft. and 8 in. for the remaining 10 ft. The vertical reinforcement consists of ½-in. rods spaced 2 ft. 6 in. apart—standard practice being followed closely.



NEW CEMENT STORAGE BINS BUILT OF REINFORCED CONCRETE

As shown in the drawing, the bins are founded on footing courses, which was more economical than a slab foundation, but not as satisfactory in stability. In future work, unless the ground is of very solid formation, it is probable that a continuous slab footing will be used.

Experiments Determine Design Pressures

As a result of experiments, the company concluded that, although cement maintains a more or less stable angle of repose, conditions arise to prevent a uniform flowing action during discharge or withdrawal from the bottom of the bin, and the cement is likely to remain or hang in a vertical position, or possibly even "undercut." It was further concluded from these experiments that a wall designed to withstand a hydrostatic pressure of 20 lb. per sq.ft. is ample to take care of any likely variations of pressure that will occur in bins of the usual dimensions and, say, of 40,000-bbl. capacity. The design of an earlier stockhouse was based on a hydrostatic pressure of 20 lb. per sq.ft. and no visible sign of overstraining has developed in this structure during the time it has been in operation. However, with circular bins of less diameter and greater height, a design based on a pressure of 25 lb. was deemed advisable, due to the changed conditions.

Operating Equipment Details

Tunnels, one of which is beneath the center of each row of bins, are built in conjunction with the foundations. They contain the screw conveyors that move the cement from the bins to the elevators leading to the packing-machine hoppers in the packing rooms. The roofs of the tunnels form a part of the bin floor and have five openings to each bin, through which the cement flows to the screw conveyors. As the tunnel roofs are subjected to the pressure of the overhead cement, they are reinforced with ¾-in. bars spaced 4 in. c. to c. To resist the upward thrust of the ground, the bottom, or floor, of the tunnels is also reinforced.

Spaces between the tunnels and bin foundations are filled in with earth, on which the bin floors are placed, allowance being made for subsequent settlement from the weight of the cement. Surmounting the bins is a double-decked reinforced-concrete superstructure that houses the belt-conveying apparatus and the spouts that distribute the cement to the various bins as it comes from the finishing mill. This design provides a narrow upper deck, or monitor, for the conveyor belt and a broader lower section to give sufficient incline for the spouts to the two outer rows of bins. To relieve the bin walls of some of the dead-load, pilasters were built in conjunction with the walls of the middle row of bins from the foundation to the superstructure.

Over the packing room, the superstructure is carried on reinforced-concrete girders spanning 48 ft. from center to center. As the length of the structure is 388 ft. and the extremes in temperature are considerable, provision for expansion was made at the central packing room by means of sliding joints where the girders rest on the supporting columns. The roof of this building consists of reinforced-concrete slabs, cast in place.

The packing rooms, which house the packing equipment, consisting of automatic packing machines and hoppers, are of the same general layout, except that the one between the bins may receive cement from either side and has two elevators, while the end packing room receives from one side only. Beneath each is a basement containing the driving machinery for the screw conveyors in the tunnels and the cross screw conveyors that carry the cement from any of the tunnel screw conveyors to a bucket elevator, by which it is delivered to the second floor of the packing room.

All conveying machinery in the tunnels, basements and packing rooms is driven by electric motors direct-connected to speed reducers that drive the conveyors at the proper speed. By this method the driving mechanism is simplified and the number of moving parts greatly reduced, thereby lessening the hazard of injury to the operators.

The end packing room has a slanting roof of structural steel covered with cement tile. Should the storage capacity of the plant be increased at a future date, the extension will be built from this packing room; and this type of roof admits of easy alteration.

The stockhouse was designed by the company's own enginering department, which also furnished the specifications and all detail drawings for its erection. It was erected by Haglin-Stahr Co., of Minneapolis.

Government Supplies Will Get Right-of-Way

During the next few months it is estimated that more than 100,000 cars will be needed for government purposes. Under the plans agreed upon by the Railroads' War Board and representatives of the Government, the Government will give advance notice to the War Board's Commission on Car Service whenever orders are placed for more than ten carloads of materials or supplies. The Government will also issue where necessary through its authorized representatives orders to the railroads on which the supplies are to be shipped instructing them to provide the number of cars ordered within the time specified and at the shipping points designated.

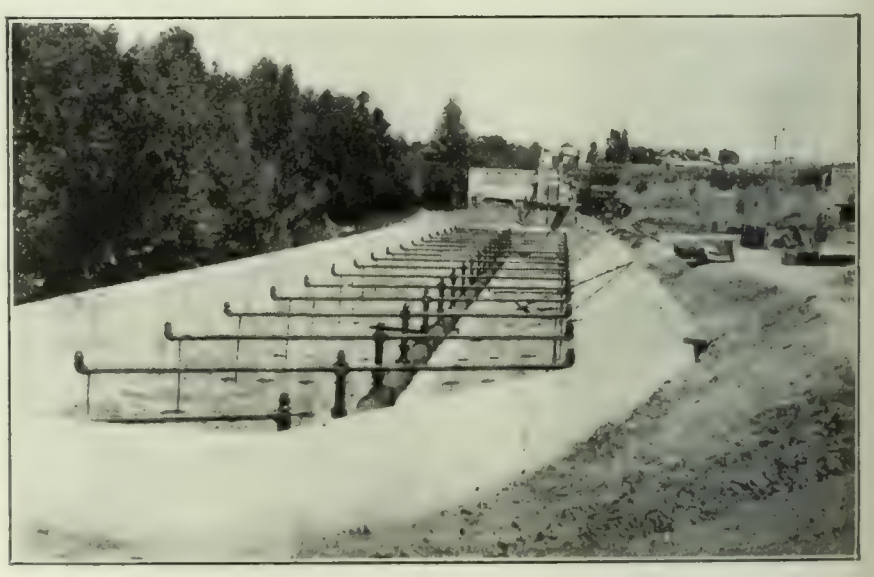
Remodeling a Small Sewage Works in California

Stream-Pollution Suit Leads To Replacing Makeshift Filter with Sprinkling Filter—Final Settling Tank Added

THE new sprinkling filter at Reedley, Calif, shown in in the accompanying views, replaces a makeshift filter constructed in 1914. An Imhoff tank has been retained in use, a dosing chamber remodeled and a final settling tank added.

The original filter was merely an excavation about 160 x 25 ft., and 18 in. deep, in a narrow strip of land between the county road and the Kings River, into which its effluent discharged. This location was selected because it was the only point to which there was gravity flow all the way. Hence the peculiar relation of length to width. The bottom of the filter had drains of 4-in. tile spaced about 20 ft., with a ventilating riser at the end of each row. The filter material was just a little coarser than ¼-in. screenings. The distribution was by means of perforated 6-in. galvanized sheet-metal pipe.

An injunction was sought by Kings County to prevent discharge of sewage into Kings River. The City of Reedley finally had the injunction stayed by agreeing to enlist the aid of the State Board of Health in working out a satisfactory scheme. The board found the Kings River to be a beautiful stream whose banks were favorite camp sites for fruit-pickers, while the water is used for irrigation. Accordingly, the city was advised that complete exclusion of the sewage from the stream, or treatment to the point of stability, would be required. During the season of low flow, sterilization of the effluent would also be necessary unless the city found it possible to spread the sewage over sand-bars along the stream. After different plans had been considered, a modern sprinkling filter was recommended as the least expensive.



SPRINKLING FILTER READY FOR FILLING

In November, 1915, the California State Board of Health prepared the basic drawings, which were then turned over to the city's consulting engineer, Chris. P. Jensen. The filter was put into operation in October, 1916. It is 30 x 180 ft., and 5 ft. deep, with crushed stone of 1- to 2½-in. size.

The most interesting feature of the plant is the utilization of the old dosing tank. While this is several feet



SPRINKLING FILTER IN OPERATION

too high to provide for uniform distribution at low head, it was made usable by constructing a vertical stack 2 ft. wide and 4 ft. long, at the outlet of one of the siphons. This has its floor on a level with the nozzles and 4½ ft. below the bottom of the existing dosing chamber. The head builds up in this stack to about 4½ ft. above the nozzles. There are 51 circular-spray Taylor nozzles. A test for uniformity of distribution shows fairly satisfactory results, as indicated by the accompanying table.

DISTRIBUTION TESTS OF CIRCULAR TAYLOR NOZZLES

Per Cent. of Average Dose	—Per Cent. of Area Receiving Dose— Test 1	Test 2	Test 3	Amplification of Test No. 3
20 to 50	36	0		
50 to 150	52	85	100	
150 to 200	12	15		
90 to 100				52
100 to 110				28
110 to 120				20

Excellent results have so far been obtained in clarification, stability and bacterial removal, the total suspended matter being reduced from 85 to 3 parts per million, putrescibility absent at least 20 days, and bacterial efficiency about 82%. The sewage now flows over the sand-bar and has no effect whatever upon the river. A one-story final settling tank, designed on the septic-tank principle, is provided to hold back the material released when unloading.

The population of Reedley is about 1700. The average daily sewage flow is 140,000 gal. The settling period in the Imhoff tank is 5.5 hours; frequency of dosing, 24 min.; time of dosing, 3 to 5 min. The rate of filtration is 1,140,000 gal. per day on 0.123 acre. Though the filter is adjacent to a country road having considerable traffic, no complaints have been made to the authorities. The installation is thought to be the most successful plant in California for complete sewage treatment.

Waterbound Macadam at Providence

The construction of waterbound macadam streets in Providence has been abandoned, except in cases of unusually light traffic, in accordance with a recommendation by Walter F. Slade, commissioner of public works. In the future, Mr. Slade states, bituminous macadam or other more durable pavement will be used, as the traffic conditions may demand. Mr. Slade informs us that: "In conformity with such recommendation, the city is now building more durable pavements as fast as the highway appropriation will permit."

Camp Management Helps To Solve California Labor Problems

Desirable Men Attracted by Good Food and Living Conditions More Than by Prospect of Easy Work

INDUSTRIAL opportunities in Eastern states have made heavy draft upon skilled labor available in the West, while the call to arms from countries at war has been drawing foreign labor from construction camps in all quarters. Thus on the Pacific Coast the shortage of common labor is increasing in importance, and construction superintendents are making special efforts to meet the situation.

The usual spirit of restlessness among the men is more manifest than ever, and a crew cannot be kept at work unless more attention is given to camp management than was formerly necessary. An important conclusion which is now being generally accepted is that if a camp affords plenty of good food and good living conditions, the men will remain rather than go to a camp where the work is easier, but general conditions are not so good.



THESE MARRIED QUARTERS RENT FOR THREE TO FIVE DOLLARS A MONTH, INCLUDING WATER AND LIGHT

The Difference That Good Camps Make

On a construction job in California, where about 1000 laborers are employed, there is an excellent opportunity to compare what good and bad camp conditions will do under the same labor requirement, because part of the work is being done by the owners on the day-labor basis with very carefully managed camps, while a number of the smaller contractors have extremely poor camp conditions.

On this work a considerable percentage of the men employed by the contractors stay on the job only four or five days, and the average service they get from a man is between one and two months. On the other hand, in the camps managed on the day-labor basis, where practically the same kind of work is done by laborers of the same nationality, the average length of service is six months. Moreover, a large percentage of the men



LARGE STRUCTURE CONTAINS MESS HALL AND CLUBROOMS—TYPICAL BUNKHOUSES AT LEFT

from the day-labor camps who "go out to spend their stake" at intervals return again to the same camps, so that many of them have been on the work with occasional absences for two or three years.

The difference in conditions is largely one of policy. In the contractors' camps tents are usually pitched on the ground, without floors or screens, and only such temporary camp work as is absolutely essential is done. The food is of an inferior quality and often not well prepared. On the other hand, in the owner's camps comfortable bunkhouses are built of rough lumber and equipped with screened doors and windows; or where tents are used, floors and wainscoting are provided, and screens are put in.

Moreover, in the day-labor camps careful attention is given to sanitary conditions, and men are employed only after passing a physical examination calculated to discover any contagious diseases or unfitness for the work. In the case of cooks and cookees, the requirements are more exacting, and the physical examination includes tests for heart or lung trouble and venereal diseases. It is notable that 30% of those applying for kitchen positions on this work were unable to pass.

All these measures involve a greater first cost, naturally, but are believed to be good investments. The owners can do work for an average of 75%, it is claimed, of what it costs the contractors, this difference being entirely a matter of efficiency of organization.

Keeping "Johnson" Happy

In studying the conditions under which the men work best, the peculiarities of the particular kind of labor employed have to be considered. A large percentage of laborers in California construction camps are Swedes. In one camp of about 65 there were 17 men named Johnson. The time-keeper avoided confusion in making out pay checks by assigning a new middle initial to all Johnsons with the same initials. For example, three Johnsons who signed John T. were made John X., John Y. and John Z. respectively. This was near enough the true name to satisfy the owner, and letters taken from the end of the alphabet at once indicated to the auditing department that the unusual initial was for purposes of identification.

Perhaps the most important element to be considered in keeping the men well satisfied is in getting them to take pride in their work. In order to do this, friendly rivalry between gangs working on the same kind of work is encouraged, and progress is either posted as an announcement or is reported to the foreman so that it may become generally known among the men. Where a bonus is offered, as in the case of tunnel driving, this is added to pay checks only if the man has been on the job for the specified 60 or 90 days.

On one of the jobs above referred to, taken as a typical camp, it was found that 90% of the laborers periodically go to town to spend their savings. The problem is to keep the men as well contented as possible while they remain on the job.

A hospital plan adopted on a large job recently undertaken in California is to deduct a hospital fee of 75c. per month from each man's pay and to contract with a doctor at $1 per month per man for all medical and surgical attention. It was decided to establish a single base hospital with two branch hospitals to take care of the 2500 men to be employed. This decision was made on the belief that it was better to take the injured to well-equipped points rather than to place greater emphasis on the attention at each of the many construction camps where at best only inferior equipment would be available.

By having the contracting doctor or his deputies make the physical examination of all men applying for positions, the responsibility for employing only the physically fit rested upon the man who would be the first to lose if they later proved to be otherwise. The difference between the 75c. per month paid by each man and the $1 per month which the doctor receives is made up by a reduction in the casualty insurance fees which are paid under the employers' liability act. This reduction was agreed to by the insurance company upon being relieved of the work which the doctor takes over

Points in Steel-Bridge Maintenance

Safety Assured by Watching Camber Curve—Stronger Lateral and Portal Systems Lengthen Life of Bridge—Experience on the Santa Fe

SO LONG as the deflection or camber curve of a steel bridge is regular, says A. F. Robinson, bridge engineer of the Atchison, Topeka & San Fé Ry., relatively high unit stresses in trusses are no ground for serious alarm. The deflections can be observed by sitting on a pier or abutment and watching the successive panel points while a train passes over; irregular or localized deflection can be located by eye.

It is important to notice whether two corresponding points on opposite sides of the span deflect equally. If they do, and if the entire curve of maximum deflection shows no sharp angles, it is pretty certain that no member or detail is taxed much more than any other. Whether the curve stays above the horizontal or is straight or droops is immaterial. The determining matter is whether or not it is smooth.

In many years' experience on the Santa Fé system few spans have been taken out on account of excessive stress in the body of a truss member. The immediate reason in every case of replacement was weakness of floor, laterals or truss details.

An instructive case in recent experience is that of the road's Des Moines River bridge, a structure of six 150-ft. deck spans located in a sag, where all trains cross at high speed. The spans were of pin-connected type and had lateral and sway systems made of rod diagonals. The bridge fairly danced under trains.



BRIDGES OF EARLY DESIGN WITH LIGHT PORTALS OFTEN LACK STIFFNESS

The calculated stresses in the main members did not exceed 16,000 to 17,000 lb. per sq.in. net, yet it was impossible to hold the laterals and counters tight for any great length of time, although they did not have bent end connections. Local conditions made the maintenance of falsework for any extended period impracticable. The spans were therefore taken out and new ones installed. The new bridge is also pin-connected, but it has ballasted floor and riveted laterals and sways. It is as steady as a full-riveted bridge.

While the exact amount of deflection is not considered a deciding factor, but rather the regularity of the curve, there have been a few instances of replacement on account of excessive deflections. In one such case—a 164-ft. span in California, between Barstow and San Bernardino—the division operating officials complained of excessive deflection when heavy Mallets began to operate over it. It was said to be too "soft."

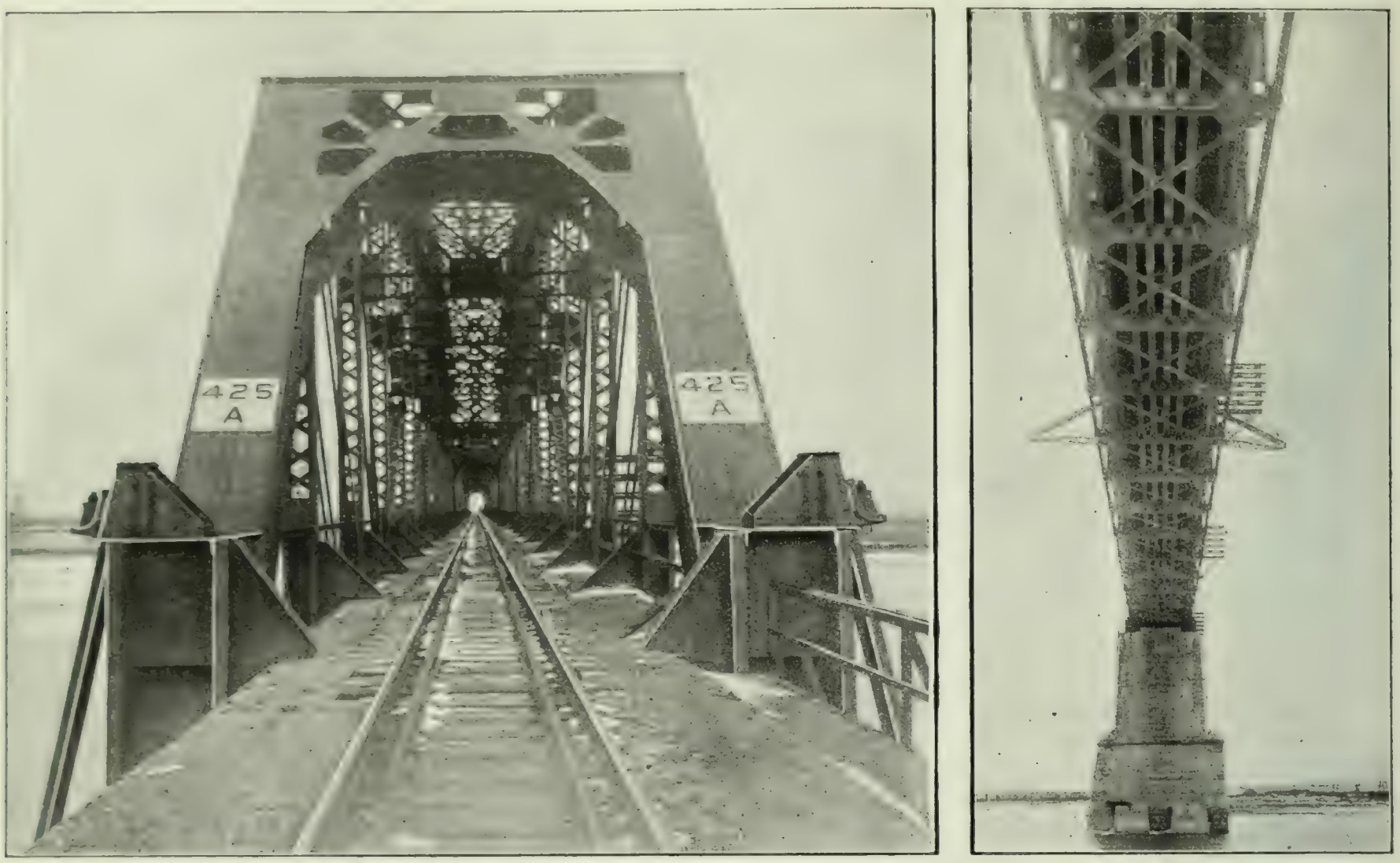
The stress calculations showed that, while some main members had stresses higher than allowable under the standard specification, yet the span ought to be satisfactory for several years more, or until specific trouble was found. There being eight or nine similar spans elsewhere on the line, it would be logical to replace all of them if a single one were condemned.

A maximum deflection of about 2 in. was reported; when this was questioned, more careful observations





HEAVY FLOOR CONSTRUCTION MAKES THESE BRIDGES [illegible] LATERALS OF [illegible]



HEAVY PORTAL AND LATERAL SYSTEMS GIVE HIGH ENDURANCE—SIBLEY BRIDGE OVER MISSOURI RIVER

were made by the local officials and the deflection reported as 1¾ in.—still extremely high for so short a span. When the bridge engineer went over the structure, he did not find a single loose rivet or a faulty detail. His personal inspection showed that the reported deflection occurred at midspan. The span seemed to squat right down under the train, but came up again fully, and the camber curve was smooth and regular.

On these facts it was decided that the span was safe. Nevertheless, in this particular case a new bridge was ordered, as the Operating Department's objections were thought to be a sufficient reason for immediate renewal.

Loose rivets have given very little trouble on the Santa Fé. They are apt to be found in the floor framing here as well as on other roads, however.

One exceptional case of rivet trouble in the floor is the flange riveting of an end floor-beam which carries a tie in a drawspan. Most of the flange rivets have been loosened by the pounding of trains coming on from the abutment. This kind of trouble is being forestalled in new designs by providing stringer extensions so as to maintain the regular tie spacing.

Loose rivets are found most frequently in the stringer hitches, but some also occur in the floor-beam connections. Practically all floor-beams are fastened to the posts by face connections. While these theoretically involve tension on the upper rivets, no special trouble from loose rivets has developed there. This may in part be credited to the low unit stresses used in floor steelwork —18,000 lb. per sq.in. on net section of floor-beam flanges and 4000 lb. per sq.in. shear on field rivets.

Another factor in the matter, however, is the heavy roadway that is used on the system. No bridge is designed for a roadway dead-load of less than 1400 lb. per lin.ft. per track. Further, during the past 15 years no open-floor bridge has been built on the main line. As is well known to railway-bridge men, the solid timber type of deck with ballast track support has had its most extensive use by far on the Santa Fé, and Mr. Robinson is considered the originator and principal backer of this type of floor.

Lattice bars of compression members have not proved to be points of weakness, during the past dozen years or so at least. In this period the practice of the system has been to use very heavy latticing. Many members that in ordinary detailing are likely to be latticed with 3 x ⅜-in. bars have 6 x ⅝-in. bars on the Santa Fé, and two-rivet or four-rivet connections.

Another experience of the last decade is that heavy portal construction is worth while. The light portals of prior times occasionally showed weakness; in conjunction with light lateral systems they produce excessive sway and vibration under traffic. The cause of this may be found probably in the old standard practice of proportioning laterals and portals to resist a given wind force, while the real attack is the effect of traffic.

By proportioning for a fixed wind pressure, the lateral strength is made to vary with span length; and short spans thus are apt to become too weak laterally, since the train effect does not necessarily vary in direct ratio to span. With these conditions in mind, the Santa Fé provides lateral and portal systems designed to hold the bridge steady under traffic rather than to resist a fixed wind force. The actual calculation for any particular bridge is based on an assumed wind load, but the amount of this load is varied to suit the case. It is never less than 1000 lb. per lin.ft. of bridge, and of this about 70% in all cases is applied at the floor level.

Serial Bonds for Road Building Save Money

Tables and Diagrams Show That Sinking-Fund and Annuity Methods Cost Taxpayers Many Millions

By M. O. ELDRIDGE
Office of Public Roads and Rural Engineering, Washington, D. C.

DEFINITE comparisons between the ultimate costs of different types of bond show that the serial type is most desirable. Especially in local road-improvement work, where the sinking funds lead to many troubles, serial bonds are greatly to be preferred. The tables and charts given herewith make it possible for anyone to verify the conclusions.

Bond issues ought to be resorted to only where they cannot be avoided. It should be a fundamental rule in the financial operations of a county or township that all current expenses, such as for the maintenance of roads, be paid from the proceeds of an annual tax levy. Furthermore, if a township or county is able to levy a sufficient tax to improve all of the roads required in a reasonable length of time without imposing too great a burden on the taxpayers, it should by all means adopt this course.

The only defense that can be offered for a local bond issue rests upon the common-sense principles of payment by installment and of capitalizing undeveloped resources. If a system of roads is to be built, it is usually of common advantage that the people who may be called upon to pay the bills should be permitted to distribute their contributions over a period of years and that all who share in the benefits should also share in the burdens.

Engineering Considerations of Road-Building Economics

Before a community invests its money in a system of roads, it should consider the traffic area of the road or roads to be improved; the present and future traffic in ton-miles per annum, the estimated cost of hauling per ton-mile at present and what it probably will be reduced to by the improvement; the roads to be improved; the approximate cost of the improvement as borne out by surveys and estimates made by a competent highway engineer; the probable effects of the improvement on farm values, school consolidation and attendance, community betterment and the rural delivery of the mails; and whether the work can be carried on by direct taxation or whether it is desirable to resort to credit.

A comprehensive study of these facts will enable a community to determine whether it can afford to invest its money in good roads, how much it can invest profitably, how many miles of road it should build, what type of roads it would be most economical to construct, which roads should be improved first, and whether it would be wise to proceed under a cash basis or whether it would be best to issue bonds.

If the people decide that it would be wise to issue bonds and distribute the burden over a period of years, then they should determine with careful forethought what kind of bonds should be issued, whether long-term or short-term, whether sinking-fund, annuity or serial bonds, and what taxes should be imposed in order to extinguish the debt.

Financial Status of Community Should Be Carefully Weighed

In determining the question of term or life of a bond issue, consideration should be given not only to the character of the improvement to be financed, but also to the ability of the township or county to dispose of the debt as quickly as possible, without imposing too great a burden upon the taxpayers. The indebtedness should be liquidated at a rate at least equivalent to the depreciation of the improvements thus financed. The payments should be so distributed over a period of years as to avoid the two extremes of excessive or confiscatory levies on the one hand to pay off the debt too quickly, and the extension on the other hand of the debt beyond the life of the utility, in order to obtain a low annual tax rate. A revenue measure that makes sudden and rapid changes in the rates of taxation is the occasion of unnecessary inconvenience and vexation to the taxpayer.

Many road bonds are issued for terms of 30 years and over in order to obtain a low annual charge for interest and principal. An examination of the chart, Fig. 1, and Tables I, II and III will show that very little advantage is gained by fixing the term of a bond longer than 25 or 30 years. On the other hand, if bonds are paid off earlier than 20 or 25 years, the average annual

Total Costs of Three Kinds of Bond

TABLE IV. TOTAL COST OF SINKING-FUND BOND

Total cost of a $100,000 sinking-fund bond bearing 3, 4, 5 or 6% interest, with sinking fund drawing 3½%, and maturing at different periods from 5 to 50 years.

Term in Years	3%	4%	5%	6%
5	108,241	113,241	118,241	123,241
10	115,241	125,241	135,241	145,241
15	122,738	137,738	152,738	167,738
20	130,722	150,722	170,722	190,722
25	139,185	164,185	189,185	214,185
30	148,114	178,114	208,114	238,114
35	157,494	192,494	227,494	262,494
40	167,309	207,309	247,309	287,309
45	177,540	222,540	267,540	312,540
50	188,169	238,169	288,169	338,169

TABLE V. TOTAL COST OF ANNUITY BOND

Total cost of a $100,000 annuity bond bearing 3, 4, 5 or 6% interest, and maturing at different periods from 5 to 50 years

Term in Years	3%	4%	5%	6%
5	109,177	112,316	115,487	118,698
10	117,236	123,291	129,[illegible]	[illegible]
15	125,650	134,912	144,[illegible]	[illegible]
20	134,431	147,163	160,485	[illegible]
25	143,570	160,[illegible]	177,[illegible]	[illegible]
30	153,058	173,[illegible]	[illegible]	[illegible]
35	162,888	187,521	213,751	241,409
40	173,050	202,094	[illegible]	[illegible]
45	183,833	217,181	253,178	[illegible]
50	194,327	232,751	[illegible]	[illegible]

TABLE VI. TOTAL COST OF SERIAL BOND

[illegible]

Term in Years	3%	4%	5%	6%
5	109,000	[illegible]	[illegible]	[illegible]
10	[illegible]	[illegible]	[illegible]	[illegible]
15	124,000	132,000	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	165,000	[illegible]
[illegible]	[illegible]	162,000	[illegible]	[illegible]
[illegible]	[illegible]	172,000	190,000	[illegible]
40	161,500	182,000	202,500	[illegible]
45	[illegible]	192,000	[illegible]	238,000
50	176,500	202,000	[illegible]	[illegible]

cost of interest and principal will be so high as to necessitate the levy of an annual tax which might in some cases be considered excessive.

Term and Character of Bonds Should Be Limited by Statute

In some of the states, during the past few years the term and character of bonds have been fixed by statute. In Maryland, for instance, state bonds for public roads must be paid off in 15 years, even though the roads con-

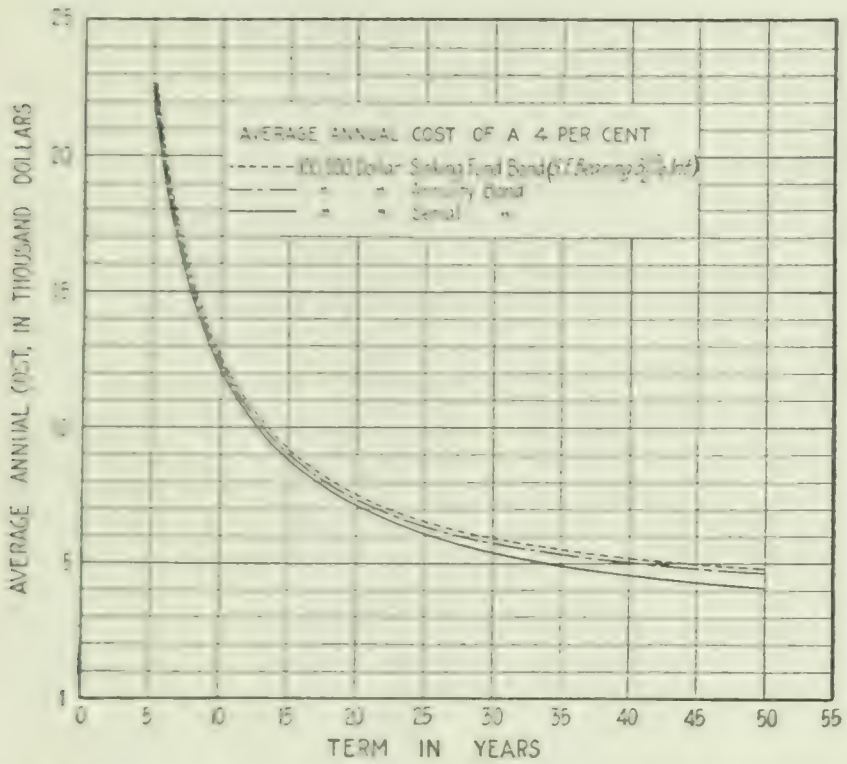


FIG. 1. LITTLE ADVANTAGE IS GAINED THROUGH BONDS RUNNING MORE THAN 25 YEARS

structed from the proceeds are the most permanent and durable that it is possible to build. The method of bond amortization adopted by Maryland is referred to by the legislature as the Serial Annuity plan. Of $1,500,000 bonds bearing date of Aug. 1, 1916, Series A, amounting to $90,000, becomes due Aug. 1, 1919; Series B, amounting to $94,000, becomes due Aug. 1, 1920. Each year the amount retired exceeds the amount retired the previous year, so that the last payment, Series M, which becomes due on Aug. 1, 1931 (15 years from the date of issue), amounts to $144,000. The interest on the outstanding indebtedness is paid each year; the total payments are practically the same each year. The same method of retirement was also adopted for the $1,500,000, bearing date of Feb. 1, 1917.

Bonds Limited to Life of Improvement

New Jersey and Delaware are the only states in which the terms of bonds is limited to the probable life of the improvement for which the bonds are issued. The term of municipal bonds in New Jersey is fixed by the law of 1916 as follows: For stone, concrete and iron bridges, 30 years; for roads and streets built of concrete 6 in. thick or of block of any material or sheet asphalt laid on concrete foundation, 20 years; for bituminous concrete construction, 15 years; for waterbound macadam, penetration method, 10 years; and for gravel, 5 years. The New Jersey law also provides that all bonds shall be paid in annual installments, commencing not more than 2 years from the date of issue—in other words, deferred serial bonds. In Delaware 40-year sinking-fund bonds may be issued for state highways, provided they are constructed with such materials that with proper maintenance they may be expected to last 40 years.

Between 1882 and 1912 the method for bond retirement (sinking fund or serial) was optional in the State of Massachusetts. Since 1912 the use of sinking funds has been prohibited, the serial bond has been made compulsory and the maximum term has been reduced from 30 to 15 years.

Between 1894 and 1904 the state highway bonds of Massachusetts were issued with sinking-fund provisions. From 1905 to the present time, serial or deferred serial bonds have been issued. All of these bonds, amounting to about $8,700,000, bear not less than 3% and not more than 4% interest.

California Issues 50-Year Bonds

California state highway bonds authorized in 1910, and amounting to $18,000,000, were issued as deferred serials, with the maximum term of 50 years. Additional state highway bonds, amounting to $15,000,000, authorized in 1916, are to be issued under the same conditions.

The $2,000,000 state highway loan authorized by the legislature of Utah during the early part of 1917 is to be retired by the serial method and in not to exceed 20 years.

As indicated above, the tendency in some of the states during the past few years has been to adopt serial bonds and to reduce the term of the debt somewhat in proportion to the life of the improvement. The case of New York, however, may be cited as a striking exception to this tendency. The New York state highway bonds authorized in 1906 and 1912 respectively, for a total of $100,000,000, were issued with sinking-fund provisions. These bonds bear from 3 to 4½% interest, and are to run 50 years before any of the bonds are retired.

Types of Bonds

The various types of bond may be briefly described as follows:

Sinking-Fund Bonds—Under the sinking-fund plan, none of the bonds are retirable until the end of a definite period, and the entire sum raised bears interest for the entire life of the bond. The county or municipality pays interest on the money so borrowed and in addition sets aside each year, as a sinking fund, an amount which when invested at compound interest will be sufficient to retire all the bonds when they become due.

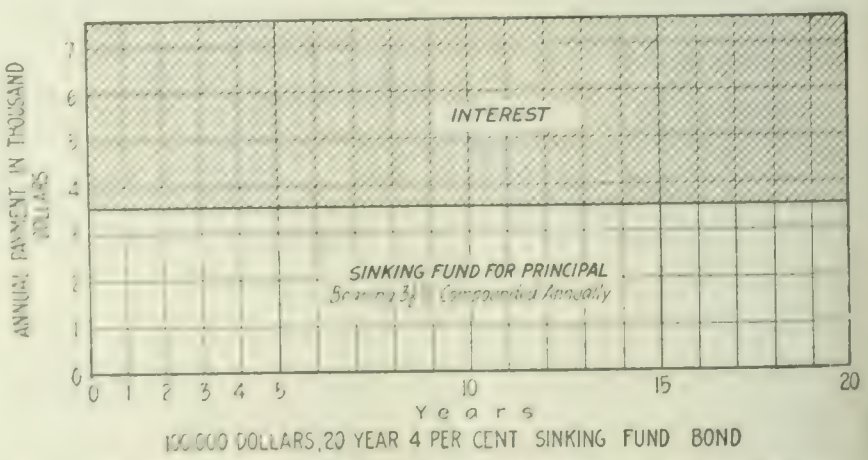


FIG. 2. SINKING FUND BONDS BEAR INTEREST ON FULL SUM FOR WHOLE LIFE

The method of disposing of a 20-year sinking-fund bond is shown graphically by the chart, Fig. 2.

In this particular case the bonds bear 4% interest and the sinking fund brings 3½%, compounded annually. The annual payment for interest amounts to $4000, or a total of $80,000, and the annual deposit for sinking fund amounts to $3536.10, or a total of $70,722, making a grand total for interest and sinking fund $150,722.

Annuity Bonds—The annuity bond is similar to the method employed by home buyers in large cities, by which they pay a fixed amount each month, a portion of which is used to pay interest, and the balance is applied on the mortgage. The annuity method is similar to the sinking-fund method in that the total outlay for the payment of interest and principal remains constant each year from the time the bonds are issued until they are paid off. The amount paid for interest, however, is relatively large at first, and consequently the annual payment on the principal is relatively small; but as the principal is gradually paid off the annual interest charges diminish. This is brought out graphically in Fig. 3, which represents a $100,000 4% 20-year annuity bond.

In this case the total outlay for interest and principal the first year would be $7358, of which $4000 would be for interest and $3358 for principal. The second year

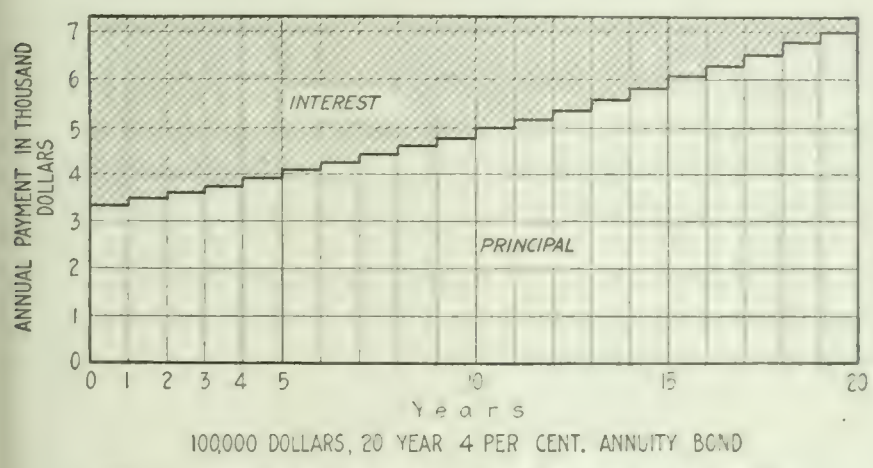


FIG. 3. INTEREST PAYMENTS DECREASE ON ANNUITY BONDS

the interest would amount to $3866, and the payment on principal would be $3492.50, and so on to the twentieth year, when $283 would be the interest charge, and $7075 would be the final payment on principal, making in all $147,163.50, of which $47,163.50 would be the interest charge.

The formulas used in computing bond issues by the sinking-fund and annuity methods are contained in Bulletin No. 136 of the United States Department of Agriculture, which may be easily obtained.

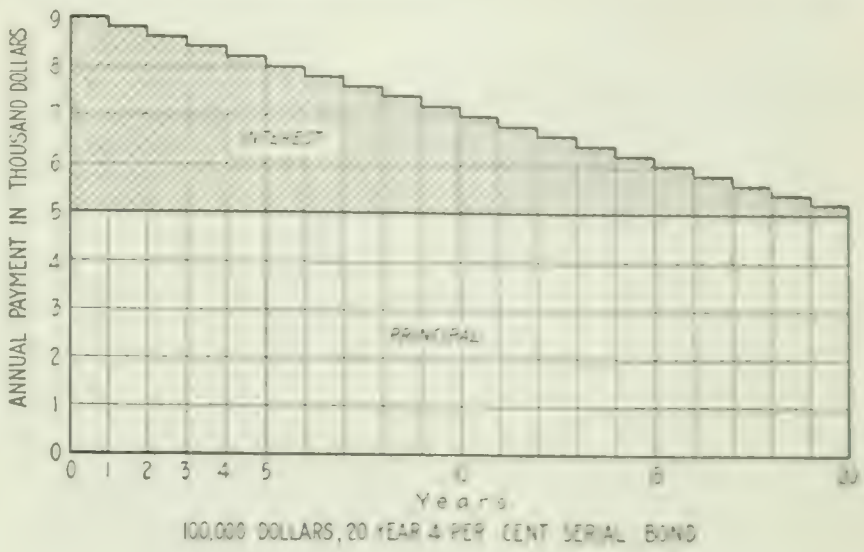


FIG. 4. SERIAL BONDS LESSEN INTEREST PAYMENTS

Serial Bonds—In the codicil to Benjamin Franklin's will, written in 1789, he left $5000 each to the cities of Philadelphia and Boston, to be invested for two centuries, the income to be lent to young married artificers. These loans were to be repaid in ten equal annual installments, with interest at 5% per annum. Thus Benjamin Franklin was one of the first to recognize the economy and desirability of serial-bond retirement. If the principle laid down by Franklin for the retirement of personal debts were more frequently applied to the retirement of public debts, both state and local, millions of dollars would be saved annually to the taxpayers of the United States.

Under the serial plan a certain amount of the bonds is retired each year, the interest on the remaining amount outstanding is paid, and the bonds retired cease to be an interest charge on the community. The method of retiring $100,000 of 20-year 4% serial bonds is shown graphically by Fig. 4.

In this case, $5000 would be paid on principal each year. The interest for the first year would be $4000; for the second year, $3800, and so on, decreasing by $200 each year, until the twentieth year, when $5000 on principal and $200 on interest would dispose of the debt. The total outlay would be $142,000, of which $42,000 would be for interest.

From the above it will be seen that when a county issues 20-year bonds under the conditions given, it would save $3559 for each $100,000, by using the annuity method, or $8722 by using the serial method, instead of the sinking-fund method; but when the interest rate is higher than 4% and the term is longer than 20 years the saving would be considerably greater.

A set of curves showing the total cost of $100,000 of bonds bearing interest at 3, 4, 5 and 6% by these three

Annual Costs of Three Kinds of Bond

TABLE I ANNUAL COST OF SINKING-FUND BOND

Average annual cost of a $100,000 sinking-fund bond bearing 3, 4, 5 or 6% interest, with sinking fund drawing 3½% interest, and bonds maturing at different periods from 5 to 50 years

Term in Years	3%	4%	5%	6%
5	21,648	22,648	23,648	24,648
10	11,524	12,524	13,524	14,524
15	8,183	9,183	10,183	11,183
20	6,536	7,536	8,536	9,536
25	5,567	6,567	7,567	8,567
30	4,937	5,937	6,937	7,937
35	4,500	5,500	6,500	7,500
40	4,183	5,183	6,183	7,183
45	3,945	4,945	5,945	6,945
50	3,763	4,763	5,763	6,763

TABLE II ANNUAL COST OF ANNUITY BOND

Average annual cost of a $100,000 [illegible]

Term in Years				
5			22,463	
10				
15				
20				
25	5,743			
30	5,102			
35	4,654			
40	4,326			
45	4,086			
50	3,887			6,344

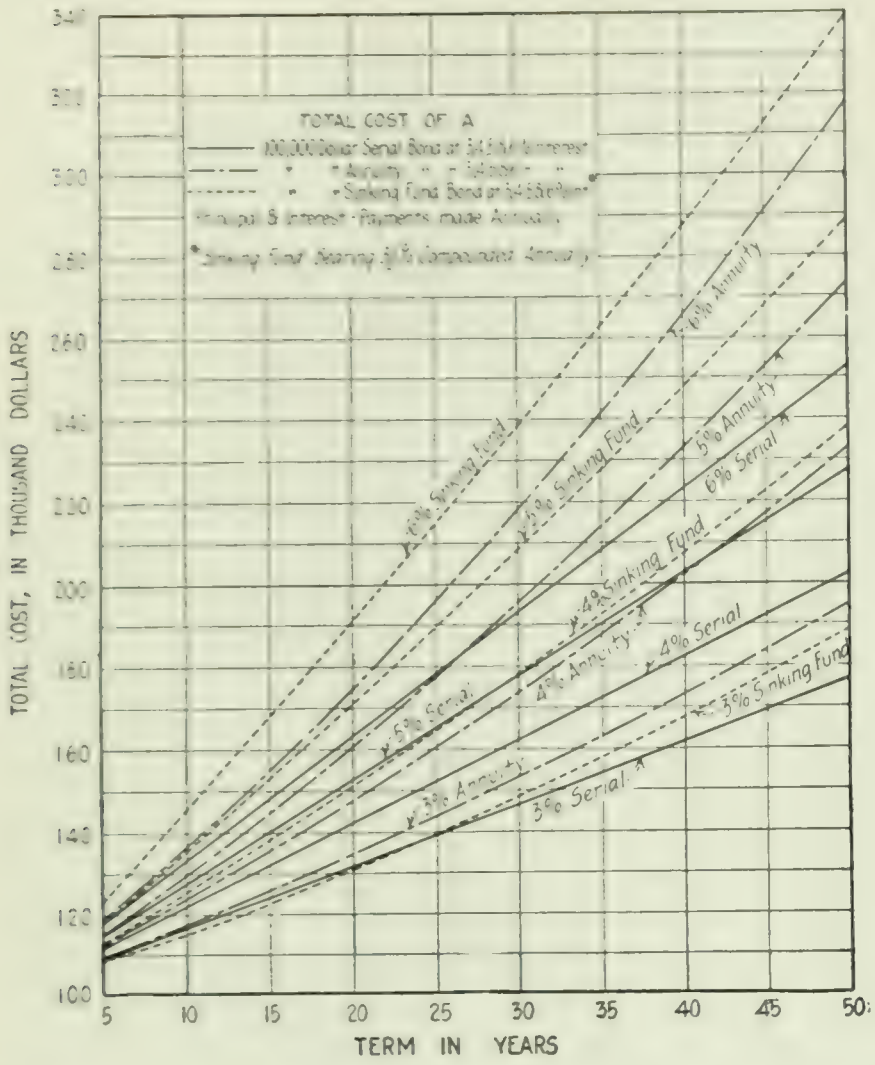


FIG. 5. RELATIVE COSTS OF VARIOUS BOND TYPES

methods to be paid off at the end of any year from the fifth to the fiftieth year is shown by Fig. 5. The sinking-fund bond curves are computed on the theory that the sinking fund brings 3½% interest compounded annually. The economy of the serial bond is strikingly shown by these curves. The exact figures on which the curves are based are presented in Tables 4, 5 and 6.

An examination of the curves will show that a serial bond bearing 5% interest will cost approximately the same if paid off at the end of the forty-first year as a 4% annuity bond retired at the same time. If the bonds are paid off at any time after the forty-first year, the 4% annuity bond would be more expensive than the 5% serial. The 5% serial will cost approximately the same as the 4% sinking fund, if they are both paid off at the end of the twenty-eighth year.

Why the Sinking-Fund Method Is Bad

The chief objection to the sinking-fund bond is that its principles are so frequently violated, sometimes wilfully and deliberately, and sometimes through ignorance. The strongest argument against sinking-fund bonds is the wanton mismanagement which so frequently accompanies the handling of the sinking funds. It is not uncommon for counties to issue long-term sinking-fund bonds without providing a sinking fund for the retirement of the bonds when they may become due, and at the end of the term to issue refunding bonds on the same basis. In such cases, the total outlay for interest, before the debt can be canceled, may amount to twice or three times the original cost of the work performed.

No individual could acquire a sound financial reputation in the community, if he continually renewed his indebtedness. The same is also true to a certain extent of a corporation or a body politic. That millions of dollars of refunding bonds are issued annually in the United States is a proof that the sinking-fund method of financing is unsound.

Danger of Mishandling the Sinking Fund

Numerous cases might be cited of counties and municipalities which have made poor use or no use at all of the sinking fund. The existence of a sinking fund is a constant temptation to local officials to use it for purposes other than the purposes for which it was intended. The sinking fund will not progress satisfactorily unless it receives constant and careful attention, which may not always be possible in counties where local officials are frequently changed. Hon. John Weeks, of Massachusetts, in a speech in the United States Senate on Feb. 22, 1917, made the statement: "Public sinking funds have proved too precarious for sound financing."

If a county has issued sinking-fund bonds, it should make it an inflexible rule to deposit annually in the sinking fund a pro rata amount sufficient to retire the bonds at maturity. If a sinking fund is created by the law that creates the debt, a public creditor has an assured method of securing payment, and if the sinking fund is created this usually necessitates the levying of an annual tax for the purpose. Unless required by law, the levying of this tax is frequently overlooked by public officials who desire to establish a reputation for economy; and even if the tax is levied and a sinking fund is established, the funds in many cases have not been properly and promptly invested, while in other cases the funds have been used to pay current expenses, or for other improvements, and when the day of reckoning comes insufficient funds, or no funds at all, are available to meet the obligation.

Some Features of Serial Bonds

About the only advantage which the sinking-fund bond has over the serial bond is that the annual payments for interest and principal remain constant each year from the date of issue to the date of payment. The annuity bond, however, possesses the same advantage, and at the same time is not so expensive as the sinking-fund bond, although more expensive than the serial bond.

Under either the sinking-fund or the annuity plan, a uniform tax rate covering a period of years will pay the interest and retire the bonds as they become due, provided the assessed valuation remains constant. However, as taxable valuations usually increase rapidly after extensive improvements have been made, there does not appear to be any particular advantage in a uniform tax rate. The rate will naturally adjust itself to the valuation and to the needs of the community.

The only real disadvantage of a serial bond is that the annual payment for principal and interest is relatively large at first, necessitating a relatively high tax rate, which, however, is gradually reduced to a minimum as the bonds are paid off. But the economy of the serial bond far outweighs this disadvantage.

It is generally believed that a sinking-fund bond will sell to better advantage than a serial bond. That this is not always true, however, is shown by the fact that the first issue of New York City serials, made in 1915

and amounting to $24,000,000, obtained a higher premium than a 50-year sinking-fund issue of $46,000,000 floated at the same time.

The selling price of a bond depends upon several factors. If a bond bears 5% interest and the bond buyer wishes to make 5% interest on his investment, he cannot afford to pay more than par. Under such circumstances the bond would naturally sell at par. If he wishes to make more than 5%, he cannot afford to pay as much as par, in which case the bond would sell at a discount; while if he is willing to make less than 5%, he can afford to pay a premium. The amount of premium that he can afford to pay will depend upon the term, the interest rate, the character of the bonds, the condition of the bond market and the degree of credit or security which the community selling the bonds can offer.

Example Shows Value of Serial Bonds

Assuming an issue of $100,000, 20-year bonds, bearing 5% interest, and that the bond buyer is willing to make 4½% interest net, which condition may be considered typical, then the bond buyer can afford to pay a premium of about $3884, if the bonds are issued as serials, or $6504, where the loan is paid off at the end of the term, such as a sinking-fund bond. Tables VII and VIII show the premium which the bond buyer can pay where he is willing to net from 4 to 5½% interest on bonds which bear from 4 to 5½% interest for each of the two types above referred to, where the term is 20 and 25 years. These figures are based on formulas contained in Bulletin 136 of the United States Department of Agriculture and on the theory that the interest is paid annually.

TABLE VII. PREMIUM ON BONDS RETIRED AT EXPIRATION

Premiums on $100,000 bonds which are retired at the end of 20 or 25 years, with interest paid annually

Term of Bond	Interest Rate of Bond	If Bond Buyer Nets 4%	4½%	5%	5½%
20	4%	0	$6,503.97*	$12,462.21*	$17,925.57*
20	4½	$6,795.16	0	6,231.10*	11,950.38*
20	5	13,590.33	6,503.97	0	5,975.19*
20	5½	20,385.49	13,007.94	6,231.10	0
25	4	0	7,414.10*	14,093.94*	20,121.89*
25	4½	7,811.04	0	7,046.97*	13,413.93*
25	5	15,622.08	7,414.10	0	6,706.96*
25	5½	23,433.12	14,828.21	7,046.97	0

* Discount.

It will be seen from the above that sinking-fund bonds possess, in the cases referred to, a slight advantage over serial bonds, in so far as the premium is concerned. But by subtracting the premiums from the total cost in both cases it appears that the serial bond still has the advantage from the taxpayer's standpoint. For instance, if the premiums are deducted, the total cost of the 20-year 5% serial above referred to is $15,602 less than the 20-year straight terminable bond, and for the 25-year bond the serial has the advantage over the straight terminable by $21,292 for each $100,000 of bonds issued.

Sinking-Fund Bonds Are Still Widely Used

The most desirable and economical type of bond for county road and bridge work appears to be the serial form. It is not always advisable, however, to begin paying off a bond the first year of the loan. The financial obligations of a county should be so arranged as to make the burden comparatively light at the very outset, thus giving the people a chance to develop their resources, adjust themselves to the new conditions and realize some of the advantages from the improvements before beginning to liquidate the debt. This may be done by deferring the first payment from three to six years. Even if this is done and the interest on the debt before liquidation begins is added to the total cost, the serial bond is ordinarily more economical than the sinking-fund bond.

TABLE VIII PREMIUM ON BONDS RETIRED ANNUALLY

Premiums on $100,000 [illegible] equal annual payments with interest paid annually

Term of Bond	Interest Rate of Bond	4%	4½%	5%	5½%
20	4%	0	$3 [illegible]	$7 [illegible]	$1 [illegible]
20	4½	$4,006 05	0	3,768 [illegible]	7 [illegible]
20	5	8,012 09	3,884 48	0	3 [illegible]
20	5½	12,018 14	7,768 96	3,768 89	0
25	4	0	4,520 80*	8,724 84*	12 [illegible]
25	4½	4,688 96	0	4,362 42*	8 [illegible]
25	5	9,377 92	4,520 80	0	4 [illegible]
25	5½	14,066 88	9,041 59	4,362 42	0

* Discount.

There are only 10 states in which serial bonds are specifically provided by law for local road and bridge work. The general bonding laws of 15 states provide for sinking-fund bonds, and in four of them the bonds may be issued subject to call. In 13 states the laws are indefinite as to the class of bonds that may be issued. There are 10 states in which practically no bonds are issued for local road and bridge purposes.

On Jan. 1, 1915, the total local road and bridge bonds outstanding in the United States, exclusive of cities, amounted to approximately $230,000,000. It is estimated that at least $160,000,000 of these bonds were of the sinking-fund variety; that the average term was 25 years; and that the average rate of interest was 5%. If these bonds had been issued as serials, for the same term and bearing the same rate of interest, it would have resulted in a total saving of approximately $42,000,000, or an average annual saving of $1,680,000.

Grade Separation or Protected Grade-Crossing

From an economic point of view a railway grade-crossing protected by an interlocking plant and signals may be more advantageous than a separation of grades. This was a decision in the location of the new cutoff of the Northern Pacific Ry. between Logan and Bozeman, described in the *Engineering News-Record* of July 19. A correspondent in calling attention to the grade crossing suggested that it appeared as though this might be avoided easily by changing either the location of the new line or the profile of the old line, at a cost probably well within 5% of the total cost of the improvement.

In reply to this, H. E. Stevens, Chief Engineer of the Northern Pacific Ry., states that this point was considered very carefully and that several preliminary lines were run. It is possible to make a grade separation at an expense of about $175,000. But as the new line is for freight operation only, and the crossing is fully protected by an interlocking plant and the automatic block signals on the existing line, the company did not consider this additional expense was justified. The separation can be made equally well at a later time, in case the density of traffic should increase to such an extent as to warrant the large expenditure involved.

Army Cantonment at Louisville Laid Out Like Suburban Development

Planning of Roads, Sewers, Water-Works and Proper Orientation of Buildings Required Much Preliminary Engineering—Water Supply Obtained from City of Louisville's System

By NATHAN C. ROCKWOOD
Associate Editor, "Engineering News-Record"

WHEN the National Army camp site just outside the city limits of Louisville, Ky., was decided upon, there existed only a United States Geological Survey map of the county on a scale of 1000 ft. to the inch. The topography of this site, known as Camp Taylor, is more irregular and picturesque than that of most of the other camp sites and therefore required correspondingly more preliminary engineering. This work was done in the astonishingly short period of 12 days, between June 18 and July 1.

Work from Map Enlargement

In order that construction work might start immediately, the Geological Survey map was enlarged by photostat to a scale of 400 ft. to the inch. On this photostat map the main features of the cantonment were blocked out; that is, the location of groups of buildings and the main scheme for streets and sewers. From this rough plan some of the buildings and main trunk sewers were staked out and construction work begun. In the meantime an engineering corps of fifty men was put into the field under the supervision of James B. Wilson, superintendent and chief engineer of the Louisville Water Co., who is consulting engineer in charge.

Working with transit and stadia, these men completed in 12 days a topographic survey of 2300 acres of rough country in and surrounding the camp site.

Almost as fast as the notes were recorded, they were plotted by a squad of draftsmen on two maps, one on a scale of 400 ft. to the inch and the other on 200 ft. to the inch. The field men worked from 8 a.m. until dusk, and the draftsmen worked until 10 p.m. The draftsmen were paid at the rate of 50c. per hour, three chief draftsmen 75c. an hour.

At the end of the 12 days the two 5-ft. contour maps were completed and the 200-ft. to the inch map was adopted as the working plan. A reproduction of this map was published in *Engineering News-Record* of July 26, p. 154. Since this first plan was completed, revisions have been made, but the main scheme as shown on that plan has been generally carried out.

Some Real City Planning

Unlike most of the other cantonment sites, the topography of the Louisville camp gave an opportunity to develop some real city planning; and H. P. Kelsey, of Cambridge, Mass., has given his whole time to this work for several weeks. He lives on the job and has taken great pains to see that his plans are carried out. These plans have involved not only utility, but, so far as commensurate with rapidity and economy of construction, attractiveness in the scheme of building layout. Trees and grass plots are plentiful and the site is such as to require little or no attention to artificial surface drainage by unsightly and mosquito-breeding open ditches.

The buildings in many cases are on grassy knolls, and with trees and little valleys the landscape is probably one of the most attractive to be found in any of the army cantonments. All these features have been considered in Mr. Kelsey's layout, notwithstanding the fact that work has been pushed at top speed. The object has been accomplished only by constant revisions of the original layout before starting construction.



THE CAMP SITE OFFERED UNUSUAL OPPORTUNITIES FOR LANDSCAPE TREATMENT

Sewerage System Complicated by Hills and Valleys

The work of planning in a few days a complete sewerage system for a city of 50,000 on rolling ground, covering an area of 2300 acres, was no small undertaking. Since the main drainage and outfall system had been decided upon, work was begun before the completion of the topographic survey. Even after the 5-ft. contour map was completed, a great deal of field work was necessary on the sewer lines before these could be actually staked out satisfactorily.

The method of sewer construction was as follows: From the 5-ft. contour map profiles of proposed sewers



UNLOADING YARDS AT CAMP TAYLOR AND PORTION OF THE ROAD SYSTEM

were plotted and their approximate locations fixed. Field parties were then sent out with these approximate locations, and the exact line was adjusted to the ground so as to give as little cutting as possible; but in some instances 8- to 12-ft. cuts have been necessary. In other instances the original location of the sewers has been changed to avoid any considerable amount of rock cutting. All trenching has been done by hand.

The main drainage of the camp is taken up at the boundary of the cantonment site by a sewer constructed by Jefferson County at a cost in the neighborhood of $50,000. This is a 24-in. pipe sewer, extending for a distance of about one mile, and a 30-in. segmental tile-block sewer continuing another mile, through the Beargrass Creek Valley to a junction with the Beargrass intercepting sewer of the City of Louisville. Segmental tile block were used in this case because pipe of that size was almost impossible to obtain at the time it was needed. This mile of larger sewer is to take the drainage of one of the city suburbs, but the remaining part of the sewer was built only for the cantonment.

The water-supply of the camp is furnished by a 12-in. main connected with the city mains of the Louisville Water Co., a municipally owned corporation. The 12-in. main leads to a 200,000-gal. storage reservoir of four wood-stave tanks. From these the water is pumped directly into the camp mains by centrifugal pumps. The water mains of the camp site proper are practically all of wood-stave pipe. The main connecting to the city water-supply is cast iron, and all the fittings at the pumping station are, of course, cast iron. The pumping station itself is set enough below ground so that no elbows are required in the pump discharge, the pumps being set at the same level as the outgoing mains. This was done chiefly to save using any special fittings, which at this time are extremely difficult to get.



THE CAMP ROADS HAVE A 6-INCH MACADAM BASE AND A 2-INCH ASPHALTIC CONCRETE SURFACE

Ten Miles of Asphalt Pavements

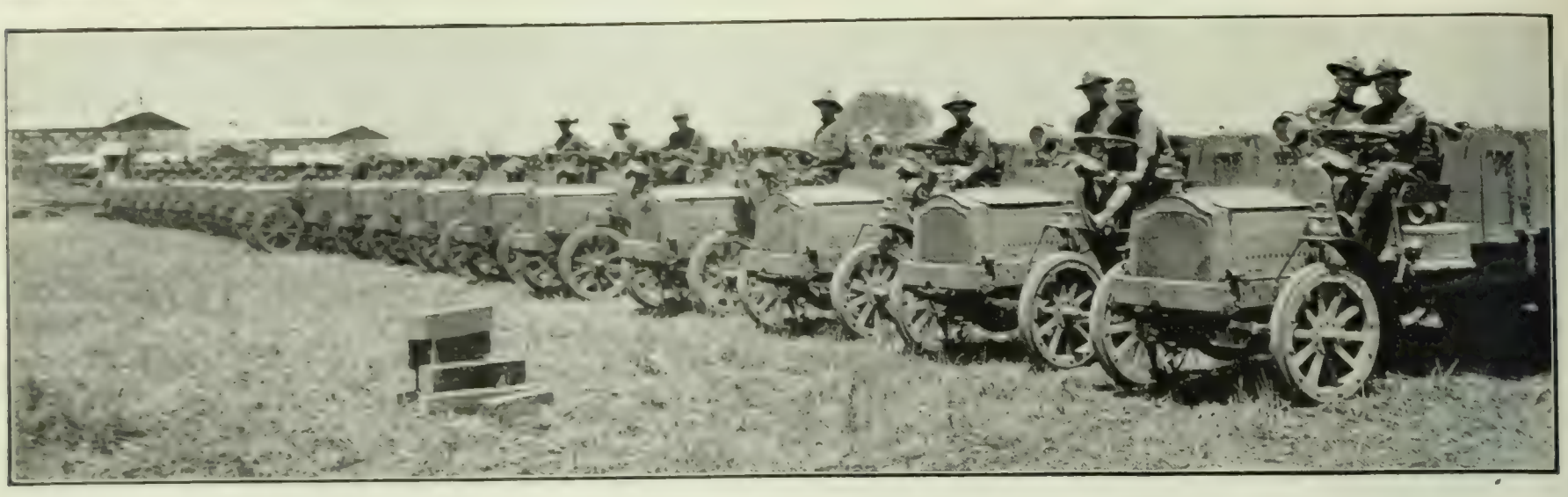
There are 5 miles of 18-ft. main roads in the camp site and 5 miles of 16-ft. secondary roads, not including company streets. The secondary roads in every case lead to the rear of the barracks. Besides these there are three existing county roads which border or cross the cantonment site, but these will be largely superseded by the new and more direct roads.

The cantonment roads are constructed of a base of 6-in. waterbound limestone macadam with a 2-in. asphaltic concrete surface. It has been found in many cases that 6 in. of base is not sufficient, and more than this has been used where necessary.

There are two quarries and two stone-crushing plants on the cantonment site, capable of producing about 700 cu.yd. of crushed rock per day. The asphaltic concrete mixture is furnished by a Louisville paving company, and is trucked to the camp site from the city. Both Bermudez and Mexican asphalts of from 40 to 60 penetration have been used.

On some of the roads grades as high as 8% have been necessary. In no instance have sewers or water mains been laid under the pavements except at crossings. The estimated cost of these pavements was $12,000 per mile, but the actual cost has run 30% above this estimate.

The roads of this cantonment are an essential part of it, for all transportation within the camp is by motor trucks and teams. Construction materials are brought to one end of the site and are moved over the roads of the cantonment. The United States Army Quarter-



THE U. S. ARMY QUARTERMASTER DEPARTMENT HAS SIXTY 1½-TON MOTOR TRUCKS ON THE JOB

master Department alone has sixty 1½-ton Packard motor trucks on the job, and practically every available motor truck in Louisville has been in the service of the contractor during construction.

The construction of the roads of the camp is under the supervision of W. F. Brooks, detailed for this work by the U. S. Office of Public Roads and Rural Engineering. The contractor for the road work is the Henry Bickel Co., of Louisville.

The contractors for the main part of the cantonment, Mason & Hanger, of Lexington and Richmond, Ky., have organized the work under a general superintendent, T. E. Coleman, into 22 sections, each section in charge of a superintendent. Under each superintendent is a boss carpenter. The sewer construction is looked after by a superintendent of the sewer division, P. W. Earley. The contractor's office engineer is W. E. Gore, formerly an architect of Louisville. The chief engineer for the contractor is A. J. Sackett. For the Government Maj. F. E. Lamphere is constructing quartermaster.

During the first week in August, when work had been organized to its maximum efficiency, fully 5000 men were employed on construction. Wages paid are somewhat less than those paid farther north, being 30c. an hour for ordinary labor, 50c. an hour for carpenters, and $7 a day for team and driver.

Toledo Has High-Pressure Fire Protection System

Motor-Driven, Five-Stage Centrifugal Pumps Force River Water at 300 Lb. Pressure Through Four Miles of Pipe

EARLY in the present year the City of Toledo, Ohio, put in operation a high-pressure fire-protection service covering 140 acres of the business district of the city, affording the most modern protection that was available.

The good-looking pumping station shown herewith is conspicuously located on the Maumee River close by the Maumee bridge. For the sake of appearance and to gain space to house a municipal department, a second story was added to the building. Otherwise its roof would have been but little above the bridge level. The building is 65 x 90 ft. in plan, with bearing walls of brick and reinforced-concrete floors. In most details the construction follows standard practice.

Four motor-driven five-stage Allis-Chalmers centrifugal pumps have been installed, and space for two more is provided. Each pump has a capacity of 2000 gal. per minute against a pressure of 300 lb., at about 1500 r.p.m. The motors are rated at 550 hp. each. Current is bought by the city. Venturi meters with recording rate-of-flow and total-flow gages have been set in each of the two 16-in. discharge mains. Raw water is taken from the Maumee River, and complete separation is maintained at all times between the regular system and the high-pressure lines.

The distribution system includes 22,500 ft. of 10-, 12- and 16-in. extra-heavy (Class G, Am. W.-W. Assoc.) cast-iron pipe. There are 67 post hydrants, each with four independently gated 3½-in. outlets, with double caps reducing to 2½ inches.



THE LOCATION OF THE PUMPING STATION DEMANDED A GOOD-LOOKING STRUCTURE

The cost of the pumping station was as follows: Land, $20,000; substructure, $50,549; superstructure, $57,542; machinery and equipment, $62,834; total, $190,924.

T. R. Cook is water commissioner and George N. Schoonmaker construction engineer. The W. J. Sherman Co., Toledo, prepared the plans for the station.

Raise 4 Miles of Line To Eliminate 21 Grade Crossings

Northern Pacific Work at Spokane, Nearly Completed, Improves Profile but Involves 2-Mile Runoff at West End

AN ASCENDING ruling grade, uncompensated for curvature, as the west approach has added materially to the cost to the Northern Pacific Ry. of eliminating its grade crossings at Spokane, Wash. Holding to the same ruling grade, but with compensation for curvature, the runoff extends 10,000 ft. beyond the last grade crossing on the former profile and involves an average elevation for two tracks of about 10 ft. Through the heart of the city, where the crossings were numerous, the average fill is about 16 ft., the street grades at most of the 21 bridges being changed but slightly. The work has been under way for four years and is nearly completed. It has cost approximately $2,500,000.

The accompanying map and profile show the main outlines of the work. The Northern Pacific as originally built followed the contour of the ground very closely through Spokane, the town being some distance from the tracks. Now, however, the business section of the city is very close to the railroad and extends from Division St. to Cedar St. At the time the improvement was started a number of the grade crossings were very busy, the worst being at Division St. and Sprague Ave., where a double-track street-car line crossed the throat of a freightyard. The main tracks through the business section were flanked by industries. At Fourth Ave., going westward, the line broke into a descent of the valley of Hangman Creek, following a steep hillside.

The new profile gives an easy approach at the east end, alongside the freightyard, smooths out the irregularities through the business section and begins the descent along Hangman Creek at an elevation of about 9 ft. above the old profile at Fourth Ave. This is increased to 12 ft. at the bottom of the grade.

Most of the 24 bridges are of reinforced concrete. Some of them are of steel or combinations of steel and concrete, because of restricted clearance on the skew of the crossings. The extent of the street approaches is indicated by the shading.

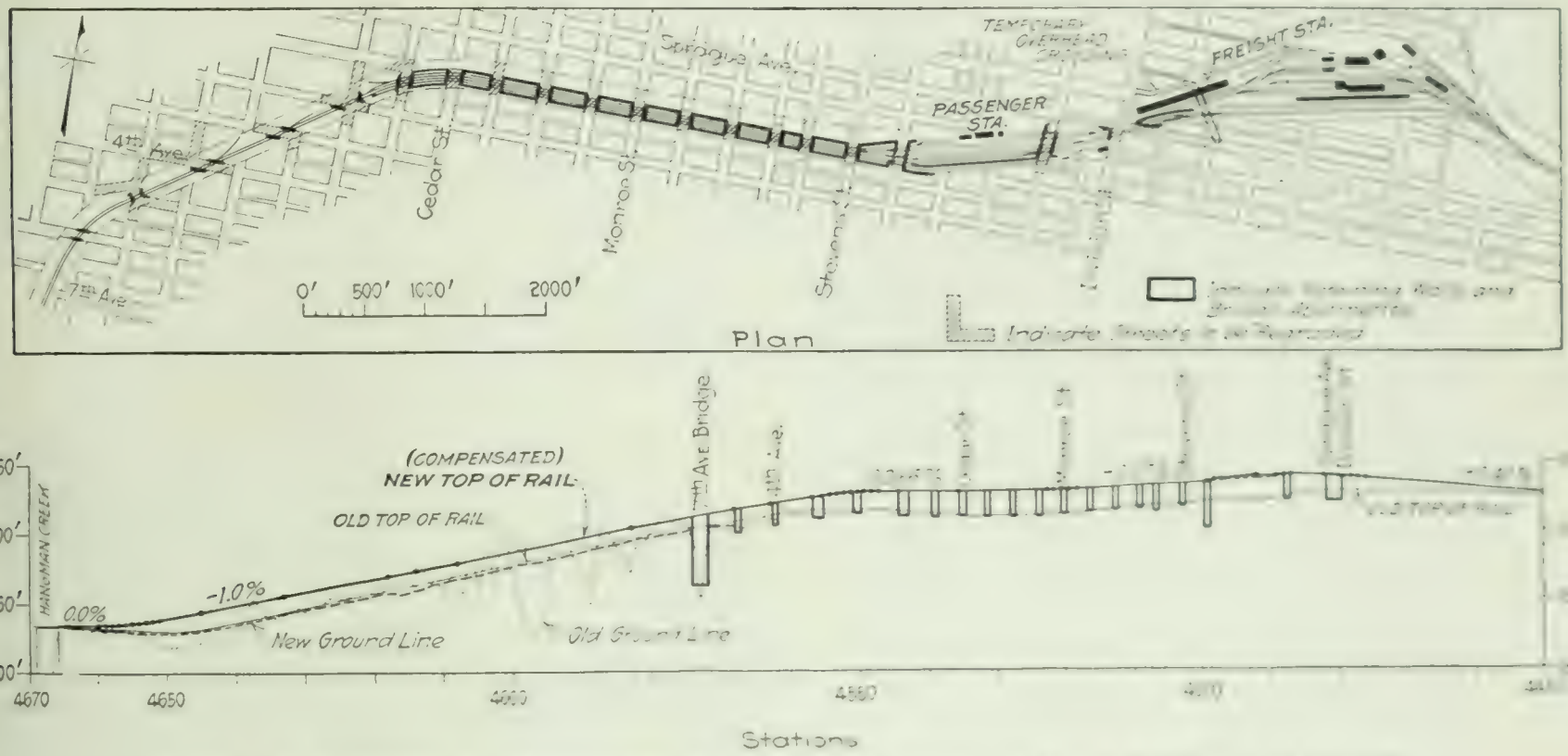
The company has a 225-ft. right-of-way through the city. All but a 113-ft. strip is under lease to industries, however, and to accommodate these industries it was necessary to make the fill wide enough for six tracks —a switching track and an industry track each side of the two mains—hold the fill with retaining walls and adapt the industries to the use of the outside tracks. The west connections with the local freightyards were cut off by the difference in elevation. The old passenger station has been slightly remodeled to accommodate the new grade.

All Work Under Traffic

All of the construction work was done under traffic. Main-line traffic was carried on two tracks, which, as work progressed, were shifted from one side of the fill to the other. Service to the industries was maintained by three tracks at the extreme edges of the right-of-way, two on the south side and one on the north, the retaining walls being located at minimum clearance inside these tracks. The main tracks were shifted to one side of the strip between walls, and the opposite walls and half of the bridges were built. Then a temporary pile trestle was built alongside the wall and the fill on this side made. After the main tracks were shifted to the top of the new fill the same procedure was followed for the other side.

At the freightyard a pile bridge 1200 ft. long, passing over the freighthouse, was built to carry street cars and the heavy vehicular traffic of Sprague Ave. Its location is indicated on the plan.

Construction was begun in November, 1912, on the Hangman hill grade raise. A contract for all concrete work and street grading was let in January, 1913, but soon after this work started injunction proceedings by abutting property owners held it up for about two years.



PLAN AND PROFILE OF NORTHERN PACIFIC GRADE-SEPARATION WORK AT SPOKANE



TWO TRACKS UP, THE OTHERS DOWN—ABUTTING INDUSTRIES HAMPER CONSTRUCTION OPERATIONS

The work is now, as previously stated, nearly completed.

The W. J. Hoy Co., of St. Paul, is the general contractor. The concrete work has been sublet to the Pacific Concrete Placing Co., of San Francisco. The track work and railroad grading are being done by company forces. The work has been done under the supervision of W. L. Darling and his successor, H. E. Stevens, as chief engineer of the Northern Pacific Ry. Mr. Stevens, when bridge engineer, had charge of the drawing up of the bridge plans, while M. F. Clements, who last November succeeded Mr. Stevens as bridge engineer, was before that assistant engineer in direct charge of the construction.

Prison Labor and Slag Surfacing Solve Ohio Road Problem

Mahoning County Overcomes Labor Shortage in Road Work by Using Convicts—Blast-Furnace Slag Makes Good Surfacing

MAHONING County, Ohio, has found a practicable way to meet labor shortage. All able-bodied prisoners in the county jail with sentences of from 10 days to 3 months are given jobs on the county roads. About 60 prisoners are thus employed continuously. The guards are sheriffs' deputies who also act as road foremen; in fact, they are picked because of their practical knowledge of road construction. The prisoners are taken back and forth from the jail to their work every day in motor trucks. It costs the county about 98c. per day for the support of the prisoners, and the county pays them $1.50 a day for their labor, giving them a better opportunity to work off their fines than in any other way.

The efficiency of this labor on waterbound macadam construction is said by the county engineer, Ett S. Smith, to be practically equal to that of the county's regular force-account gangs; but whether this is characteristic of the efficiency of present-day labor in general or merely an extraordinary degree of efficiency in prison labor is not clear. Once in a while the prisoners voluntarily stick to the roadwork when they are given their liberty, for they have an opportunity of earning 35c. an hour by doing so.

Early in the season an experiment was made of letting out prison labor to contractors, but the experiment proved unsuccessful and all the work is now done by the county in the same manner as force-account work, except that the foremen (or guards) are armed with shotguns to compel the laborers to stick to their jobs. About two guards are required to a gang of 20 men.

The employment of county prisoners for highway construction was made possible by a state law which went into effect about a year ago, and the county commissioners of Mahoning County have been among the first to take advantage of this law.

Meeting at the onset of the season's work with bids of $35,000 a mile for brick pavement construction and



MAHONING COUNTY PRISONERS ON THEIR WAY TO ROADWORK

with correspondingly high prices for concrete work, the county commissioners and their engineer decided to devote all their energies to the construction of waterbound and bituminous macadam roads, making use of the enormous amount of blast-furnace slag which is produced in this district. It was decided that the all-important thing to accomplish was to get hard surfaces on as many of the rural roads as possible and to use the



GANG OF 20 PRISONERS ON MAHONING COUNTY ROADWORK

most economical construction under the present conditions.

The intention is to ultimately resurface the macadam with brick or concrete, as has already been successfully done on a number of the older improved roads. Several excellent brick pavements in the county have been constructed on old slag macadam bases and a sand bedding or cushion. Many of the old macadam roads are also being resurfaced with 2 in. of tar concrete. Altogether, some 30 contracts have been let the present season in this county, and work is proceeding at a practically normal rate.

The use of slag makes it possible to get material for macadam, which in less fortunate parts of the state is as difficult to get as are shipments of brick and other construction materials. The only reason why the contractors on the Mahoning County roadwork get their material promptly is because all the steel mills in this vicinity use the pit method of slag disposal, and the slag must be removed constantly to keep the plants going, so that very powerful interests are at work to bring about prompt railway service.

Water-Filtration Costs at Grand Rapids Increased 31% in a Year

The total operating cost of water filtration at Grand Rapids, Mich., was 31.1% higher in 1916-17 than in the previous year, but an increase of 13.6% in pumpage reduced the cost per 1,000,000 gal. to 15.6% higher than it was in 1915-16. Higher prices for labor and chemicals and an 85% increase in the alum rate contributed to the higher cost.

The use of more alum, says Walter A. Sperry, chief chemist of the filter plant, in his annual report, was due to "continued efforts to secure a more satisfactory water" and also to "more severe seasonal changes this spring as compared with last."

Lime cost $6.49 per ton in 1916-17 as compared with $5.81 the year before; alum, $21.92 compared with $19.98 in 1915-16 and $17 in both 1914-15 and 1913-14; hypochlorite of calcium, $4.32 in 1916-17 compared with $2.24 in 1915-16, $1.70 in 1914-15, and $1.75 in 1913-14.

The percentage of wash water for 1916-17 was 2.1%, as an average for the whole year, the range being from 3.2% in August to 1.6% in September and in February. In the previous year the wash water was 1.9%, in 1914-15, 2.1%, and in 1913-14, 3% of water treated.

The net cost of filtration in 1916-17 was $15.20 per million gallons, compared with $13.12 the previous year, and $11.57 the year before. The figure $15.20 was divided as follows: Wages, $4.35; chemicals, $7.53; electric current, $2.31; supplies and repairs, $1.

Tunnel from Below To Build Diversion Dam

In This Self-Cleansing Dam in Hawaii the Main Wall Was Formed by Successive Tunnels Filled with Concrete

IN BUILDING diversion dams on certain flashy streams in the Hawaiian Islands great difficulty has been found in keeping headgates clear of boulders, gravel, sand and other débris carried down by floods. Ordinary diversion dams are often totally covered up in a few minutes by tons and tons of matter which takes days to remove. In some cases even, where the gorge is a wide one, the owner finds his diversion dam covered up and the stream bed moved several hundred feet away.

In looking over some such dams, a Hawaiian engineer, J. C. Foss, Jr., of Hilo, Hawaii, came across a small dam built by a ranchman where a downstream pool operated to relieve this difficulty. This ranchman had found natural water holes located at the foot of small waterfalls, which holes stored a limited amount of water. When a dam was thrown across the lower end of the water hole to make an increased reservoir, the next storm flow would deposit boulders and gravel in the hole, often completely filling it. The rancher solved the problem by raising the crest of the waterfall at the same time he raised the water-hole dam below. He found that it worked out best to raise the waterfall crest three times as much as he raised the dam, as the débris would be given additional acceleration and be carried into and out of the water hole at storm times. When the stream subsided and stopped carrying débris, the water holes would be left clean and filled with water.

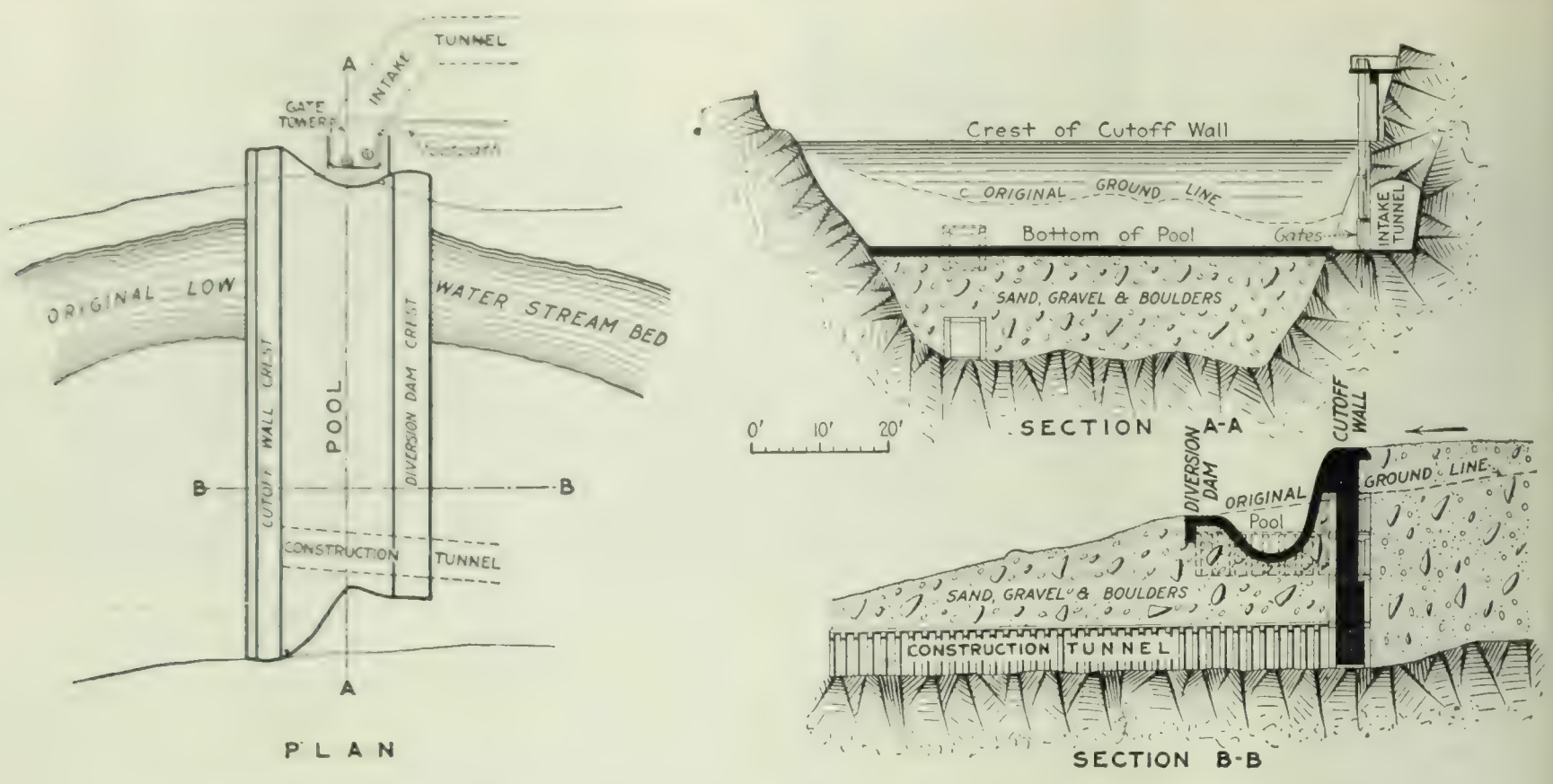
Poor Subsurface Prevented Open Trench

It occurred to Mr. Foss that this type of dam might be used on a larger diversion dam which he was then building. He then proceeded to utilize the scheme described below.

At this site there were frequent floods, about twice a week, and the stream carried heavy boulders, brush and gravel when flooded. The formation at the dam site was a very porous rock, sand, gravel and boulder mixture, extending down to bedrock about 25 ft. below. In normal conditions the loss of water through this stream bed amounted to nearly 20%, a very serious loss at the headgate.

The first idea was to dig a trench across the gorge, fill that with concrete elevated above the normal ground level, and then prepare a pool below the elevated crest so formed. It was soon found, however, that the frequent floods made this construction quite difficult, particularly as there was no satisfactory way of carrying the water around the excavation. It was then that the idea of building the dam from a tunnel below was hit upon.

A tunnel 6 x 6½ ft. in section was started at bedrock well away from the running stream and about 75 ft. downstream from the proposed dam. On bedrock for a floor and with heavy timbering, it was run up the ledge until it reached the cutoff-wall site. Here it was



SELF-CLEANSING DAM IS BUILT BY SUCCESSIVE TUNNELS ONE ON TOP OF THE OTHER

headed across stream, still following the ledge for a bottom, until reaching the other side of the gulch. This tunnel had to be run very carefully on account of the looseness of the material encountered, and great care had to be taken in blasting. At best, the tunnel operation was quite dangerous.

Cross-Tunnel Filled with Concrete

After making proper provision for draining the water, the section of the tunnel at the cutoff-wall site was completely filled with concrete across the gorge, the upper part being placed with heavy irregular protruding stones to make a bond for the next row of concrete. This made the bottom course of the cutoff dam. A stope was then run up to a level above the first cross-tunnel and a higher tunnel carried across the cutoff wall just above the old. The top lagging of the lower tunnel served for the floor of the new one. This second tunnel proved to be more easily excavated than the first, in that the floor was even and enough space had been left between the top lagging and the concrete to take care of most of the water inflow. After the excavation was completed, the lagging and top timbers on the floor were taken up and concrete placed as before.

In running a third tunnel on top of the second, great trouble was encountered in taking care of the water. It could only be worked when the stream was low and could be diverted to one side away from the excavating. Days when the stream was high or at flood, work had to be abandoned. In placing the concrete in this tunnel a water-tight plank floor had to be placed one foot away from the upstream timbers to allow the water to be drained behind it. The section of the concrete was therefore cut down one foot in width. This arrangement was a great help in draining the water while running the next course, and in the judgment of Mr. Foss time and money would have been saved in the first two courses if the same idea had been introduced.

On top of the third lift of tunnel cross-wall, a fourth wall was placed in covered open trench. The top course, which brought the wall up to the stream bed, had to be done in short sections of from 10 to 20 ft. by trenching and immediately filling with concrete.

The next step in construction was the excavating for the pool and diversion dam proper. After starting this excavation, it was decided to return to the cutoff wall and complete the crest, a procedure which aided greatly in keeping the excavation below from filling with débris during floods, but which caused a great deal of anxiety because the engineer was afraid that the pressure back of the wall and the removing of material in front during heavy floods might prove its destruction. The work on the diversion dam, apron and paving the pool was rushed in sections as much as possible, even to working 24 hours a day when the stream was low.

Before the gates into the intake tunnel were placed, careful observation was made as to the action of the diversion-dam scheme under flood water. This was satisfactory as far as leaving the pool clear after a storm was concerned, but just at what elevation to place the higher gate and where to place it so as to get water during floods when the lower gate was shut down was a problem. It was found that the stream did not commence carrying boulders and gravel until the water had risen to over two feet on the lower crest. The upper gate was, therefore, located so as not to side-track boulders going over the diversion dam and at the same time take in enough water to keep the required continuous flow in the ditch.

The only fault found in the completed job was handling such floating débris as ferns, branches of trees, etc. Different kinds of screens placed at the gates all proved to be more trouble than good, so they were removed at this location and placed about 1000 ft. down the intake tunnel line at a suitable crosscut and overflow weir, where they were easily accessible to the ditch tender.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Guarding Against Overstressed Counters in Designing Bridges

Sir—In your issue of July 5, you publish a letter describing a method of designing bridges to guard against overstressed counters. About 11 years ago the writer, then Assistant Bridge Engineer of a great railway system, faced the same problem; namely, developing a set of standard designs in which all bridges of all types would be stressed to an established limit in all parts by the same future increased live-load. The method adopted was to use a basic unit stress of 22,000 lb. per sq.in. for dead-load and 16,000 for live-load and impact.

In practice some of the men added (algebraically) eight-elevenths of the dead-load to the live-load and impact, designing for this sum at 16,000 lb. per sq.in. All the formulas for compression, short cuts for bending, combined load, etc., could then be used without modification. Other men of the department preferred to use the dead-load with eleven-eighths of the live-load and impact at 22,000 lb. per sq.in.; the results were the same. In applying this method to counters eight-elevenths of the direct dead-load shear was considered as acting against the counter live-load shear, or the full dead-load against eleven-eighths of the counter live-load shear, so that future requirements were theoretically provided for.

Any discussion of such a provision for the future is somewhat academic, as it depends for its truth upon a proportional increase of the live-load on the same wheel diagram as that in use at the time the design is prepared. The introduction of the Mallet type of locomotive and of power applied to the wheels of the tender, as well as the increasing use of electric power for heavy duty, have in a great measure annulled the benefits of these efforts to provide for what was then the unknown future. But inasmuch as the structure built today is not for today's use alone, but for many years to come, provision for that future use according to the best indications of the tendency of growth is good practice.

P. E. STEVENS,
Consulting Engineer.

St. Paul, Minn.

Well Constructed Farm Entrance Drains Are an Economic Necessity

Sir—I note on p. 181, issue of July 26, an article by Donald A. Thomas, of the Michigan State Highway Department, relative to culverts at farm approaches to improved roads. I believe that the suggestions offered are very good and that the question of such culverts should be governed by fixed standards.

In Adams County, Indiana, we have 700 miles of improved roads serving a total area of 337 square miles. In this area we have 2353 farms nearly all of which have one or more approaches to improved roads. The approaches and culverts are built and maintained by the land owners under the supervision of the highway superintendent. We have found that a 10-in. pipe is the minimum-size culvert that will keep clean. Most culverts are cast or corrugated pipe, as the vitrified or land tile pipes soon break down.

Some of the pipes offered are inadequate; for instance, a 4-in. gas pipe is deemed sufficient by the land owner to carry the water in side drains draining a half mile of road. These installations are condemned by the highway superintendent; and on refusal of the land owner to provide adequate drainage, the entire approach is graded out and the drain maintained as an open ditch. This usually has the desired effect.

The new state highway commission law provides a penalty of $5 to $25 for obstructing the side drains of any state highway, or building approaches that interfere with the highway or the drainage thereof. This penalty is to be collected in the name of the state by a civil action and will no doubt have a good influence on land owners on other than state roads.

R. T. LONGSHORE,
Deputy County Engineer,
Adams County, Indiana.

Decatur, Ind.

Why the Railroads Have Not Checked the Hobo

SIR:—The editorial, "Why Can't the Railroads Check the Hobo?" which appeared on page 147 of *Engineering News-Record* for July 26 last, is fairly easy to answer from the railroad standpoint. The various railroads have at different times tried to abate the hobo nuisance, but they have never received assistance from any Governmental authority, and are powerless to combat a virtual combination of local police and hobo. If a hobo is arrested by railroad police and turned over to the local police, the latter make it plain that they do not want him. In fact, the local tramp problem is supposed to be solved when the police make it so hot for them that they catch a freight train out of town. Each community requires the hobo to move on, and any effort on the part of the railroad to prevent him from doing so is frowned upon. If the commission headed by Daniel Willard is sufficiently clothed with authority or through patriotic appeal can gain the coöperation of local authorities in abating the bo nuisance, it will find the railroads ready to do their part. I have known a gang of hobos to cut the air hose and put a freight train out of control because the crew stopped the train and put them off. There are many cases where trainmen were injured in fights with tramps when trying to prevent them from riding. The hobo problem is not one for the railroads to solve, but is a social one requiring the efforts of no less a community than the state, better all the states.

Out on the Union Pacific and other Western roads the bo problem is more acute than in the East, and it was here that I came in intimate contact with it. It would seem proper that those engineers who do not know (including the editor) should be set right.

E. C. REYARD.

Cleveland, Ohio.

[Not unmindful of the difficulties outlined above, at the time this editorial was written, it yet seemed that

the best chance to secure concerted action to abate this nuisance was offered by the existence for the first time of a railroad commission with nation-wide authority and close contact with the Government. The initiative must be taken by this commission, as the town governments are so numerous and so utterly unrelated that they can hardly be expected to take concerted action of their own motion.—Editor.]

Bituminous Foundations for Sheet-Asphalt Surfaces

Sir—H. W. Skidmore, engineer, Department of Public Works of Oak Park, Ill., concludes his very able letter on p. 178, issue of July 26, with: "Paving is the contractor's business, not the engineer's particularly. Why should he not come forward with his ideas now and then?"

It is very gratifying to hear from engineers of Mr. Skidmore's broad views who are willing to learn even from a contractor, but our experience has been, as a rule, that suggestions from contractors on the methods of constructing pavements usually meet with direct opposition from the engineering profession. We do not say the best of the engineering profession, because we do not believe this is a fact, but the engineer, like the doctor and lawyer, is supposed to advise his client, and his client is supposed to take his advice. Therefore it becomes necessary, if bituminous-concrete foundations are adopted to any extent, that they come through the engineering profession with what assistance the contractors can offer for carrying out their ideas.

Mr. Kirschbraun's article on page 591 of the issue of June 21, 1917, is a wonderful step forward in this direction, and we predict that in a very few years engineers will be looking backward to this article as the foundation for the biggest step forward in the improvement of bituminous pavements that has been taken in the last 25 years, as it shows practical thought and study coming from a man who has practical construction ideas as well as engineering and general experience.

Summing up the results that can be obtained from the use of bituminous-concrete foundations in comparison with cement concrete, every experienced engineer and contractor must agree that the comparison is as follows:

1. Bituminous foundations laid one day can be completed with the asphalt surface on the following day and the work opened up for traffic almost immediately. Cement concrete must be allowed to set for a week or ten days.

2. Bituminous foundations require only one organization and equipment, whereas cement concrete requires additional equipment and a different organization and the work is necessarily slower in progress.

3. Bituminous foundations mean the elimination of an expensive binder course, thereby deducting 35 to 45% per square yard from the cost of the pavement and even with a binder course it has shown, under extremely heavy traffic, that this binder course of from 1 in. to 1½ in. in depth has not sufficient stiffening ability to absolutely prevent shoving and rolling of the surface.

As a further fact, every civil and chemical engineer and contractor of experience knows, as Mr. Kirschbraun stated, that the heavy and intense traffic on an asphalt surface laid over a hard unyielding foundation is like the pounding of a plastic material on an anvil, whereas the bituminous base gives sufficiently to overcome this crushing force.

Mr. Kirschbraun's statement that "cracks in the foundation of concrete appear in the asphalt surface" is absolutely true, and they would be absolutely obviated with a bituminous base. Further, the statement that "asphalt pavements disintegrate from the concrete base upward" instead of from the surface down, as some engineers—mostly laymen—seem to believe, is true.

When it comes to repairs of the ordinary city street the bituminous base has a big advantage over the cement concrete base in that the base and surface removed can be immediately reheated, retamped into the trench and the bond is absolute and permanent in a few hours, and the replaced trench is ready for traffic.

After 27 years following the game of bituminous paving, and after many discussions with contractors of greater experience and ability, the writer's conclusion is that if the engineers will provide specifications for practical bituminous concrete foundations for asphalt wearing surfaces it will meet with the heartiest coöperation of all asphalt contractors of experience and will solve at least 75% of all the asphalt paving problems—the only exception being where the character of the sub-soil is such that it is not self-sustaining and needs to be made more rigid by the use of portland cement. This can be accomplished by the use of a base of say 3 in. of portland cement, over which will be laid the base proper of bituminous concrete. In rare cases only, however, will this be found necessary.

Any engineer will be repaid by reading Mr. Kirschbraun's article and pasting it in his scrap book for ready reference, as the engineering profession must unquestionably awaken to the fact that this class of foundation is absolutely necessary for long-lived bituminous pavements.

L. B. WEST.
Chattanooga, Tenn. The West Construction Co.

How To Use Limestone Screenings in Concrete

Sir—For several years there has been considerable discussion as to the value of limestone screenings in concrete. The adverse points usually brought forth are that they contain considerable dust and that the particles are coated with an almost invisible material which prevents proper bond. On the other hand there are many examples of first-class concrete in which limestone screenings have been used.

To eliminate the factor of chance, special study should be given to the character of the mix when the fine aggregate consists of limestone screenings. Much will necessarily depend upon the hardness of the limestone which from the screenings are obtained. If the screenings are washed and pass the usual specifications, standard practice can be maintained with perfect safety and with results equal to those obtainable with first-class sand. Crusher-run screenings contain too much dust and fine material to secure the best results—often 25% of such screenings passes through a 100-mesh sieve. With the ordinary proportions, concrete made from these screenings

will be weak and porous unless mixed more thoroughly than usual with sand as fine aggregate. When the water is added, there is a tendency for the fine aggregate to "ball up."

To overcome the effects of this fine material, certain things must be done. Either increase the richness of the mixture or increase the mixing time and allow the forms to remain on the concrete for additional time. Increasing the amount of cement may not correct the trouble without extra mixing.

An example of the class of concrete which can be secured when these points are taken into consideration is found in the Cline Road near Indiana Harbor, Ind. This road, built over two years ago of a 1:1½:3 mixture has proved of unusually excellent quality, although the screenings used contained considerable dust. Good results are no doubt in part due to the use of coarse aggregate ranging in size from 2 in. down to ¼ in.

W. M. KINNEY.
Chicago, Ill. Universal Portland Cement Co.

Wants Better Attention to Repair Part Orders

Sir—A situation has recently been brought to my attention which I believe would be worthy of space in your publication, and might possibly stir up something for the betterment of both contractors and manufacturers, in these days when we are hearing so much about efficiency.

I have had occasion in the last month to write three different factories for repair parts, one a pump company, one a gas engine company and one a manufacturer of jacks. With each of these orders it has taken two or three weeks to get even so far as making them understand what I want.

The first manufacturer sent a part that it was almost impossible to have broken and that any one should have known was not what I described. This I returned and sent a sketch showing what I wanted. In a few days I got a reply from the district office saying the order had been turned over to them, and if I would take the matter up with them, they would take it back to the factory and have them ship the part. This was done, and after two weeks' waiting since I took the case up with the district office I have not even heard further from the order.

In the second case I wrote requesting immediate shipment of parts and giving the number and horsepower of the engine. After about 10 days I got a request for the number of the engine before they could ship the parts, in spite of the fact that I had given this on the original order.

In the third case I wrote describing the part and giving a sketch with dimensions of what I wanted. The part sent was nothing like the part needed. Now, to a man out on a job often in need of parts in a hurry and not having all the information that might be kept in an office these little things mean a lot. The inconvenience and delay costs more than the parts, and such treatment is not likely to induce purchasing of more equipment from the same firm.

I am not taking this up from any other standpoint than one of coöperation, and no doubt there are cases in which I might have been more careful in ordering: but in those mentioned I was as explicit as could be. I try to keep part catalogs, when they can be obtained from the manufacturers of the equipment I have, and to anticipate replacements, but there certainly are times when a little intelligence on the part of the sales or shipping departments would greatly help working conditions all around. L. W. SHIPMAN,

Shipman, Lincoln & Welch, General Contractors.
Phillipsburg, Penn.

Army Sanitary Corps Created

A sanitary corps under the Medical Department of the Army has been provided for in an order of the War Department recently approved by Secretary Baker. The corps will include experts in sanitation, bacteriology and sanitary engineering, and men skilled in the work of supply, transportation and storage required in connection with the work of the Medical Department of the Army. Officers of the corps will be provided by assigning officers of the Medical Reserve Corps or by the appointment of citizens of the United States found under regulations established by the Secretary of War to possess the necessary knowledge. There will be no grade in the Sanitary Corps above that of major. The number of officers in the corps may be about equal to but not exceed one for every thousand of the total strength of the military forces authorized from time to time by law.



White Tile Decorates Concrete Bridge

In Hamilton County, Ohio, rather artistic effects are being attained in reinforced-concrete girder bridges by the use of ornamental white tile. In this bridge the structure is of concrete, with the usual gray concrete tone, but the railing and lamp posts are of white tile. W. H. Boeh, of Cincinnati, is county engineer.

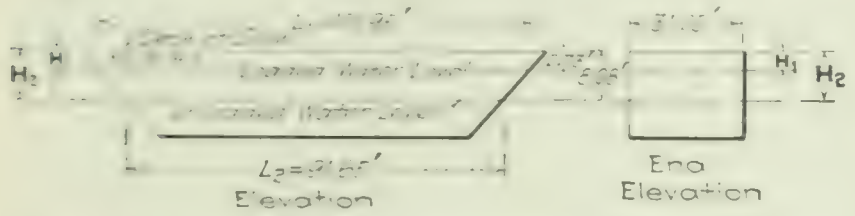
THE ENGINEER IN FIELD AND OFFICE

A DEPARTMENT DEVOTED TO DETAILS OF THE DAY'S WORK

Measure Riprap Yardage on Scows by Average Voids and Displacement

BY J. H. SAWKINS
Jersey City, N. J.

IF IN determining the yardage of rock that is delivered on scows, the average percentage of voids of the particular class of rock is used in connection with a displacement measurement of the loaded scow, a much better and fairer method is established than by taking



DISPLACEMENT MEASUREMENT OF SCOW NUMBER 51 H.S.

				Remarks	
101 70	91 60	2 58	7 88	Density Salt Water	1 024
102 20	91 70	2 15	7 85	Density Syenite	2.8
		2 94	8 19		
		3 23	8 41		
101 95	91 65	2 73	8 08	Averages	

V_1 = Vol. Salt Water Displaced = (101.95 − 91.65) ÷ 2 × 5.35 × 31.25
= 16183.8 cu.ft.
V_2 = Equivalent Vol. Fresh Water Displaced = 16183.8 × 1.024 = 16571.2 cu.ft.
V_3 = Vol. Solid Stone = 5918.3 cu.ft.
V_4 = Vol. Stone by "Average End Method" = 11763.5 cu.ft.
Voids = 5845.2 cu.ft. Percentage Voids = 50.3%
"Percentage Factor" = 11763.5 ÷ 5918.3 = 1.99

QUICKER AND MORE ACCURATE THAN CROSS-SECTIONING

cross-sections of the pile and calculating the cubical content by the "average end area" method. This last is very rough, especially when the individual pieces of stone vary from 2 to 6 tons apiece, rendering it very difficult, if not impossible, to cross-section the pile with any reasonable degree of accuracy.

The average percentage of voids being practically a constant figure for any particular grade of rock, it is only necessary to obtain the displacement of the loaded scows as they are delivered on the work, correcting for any list that the scow may have when loaded and for the amount of water that may be in the hull. However, if measurements are taken from the deck to the top of the water at the four corners of the scow, most of these errors, as well as that due to the roughness of the water, are reduced to a minimum.

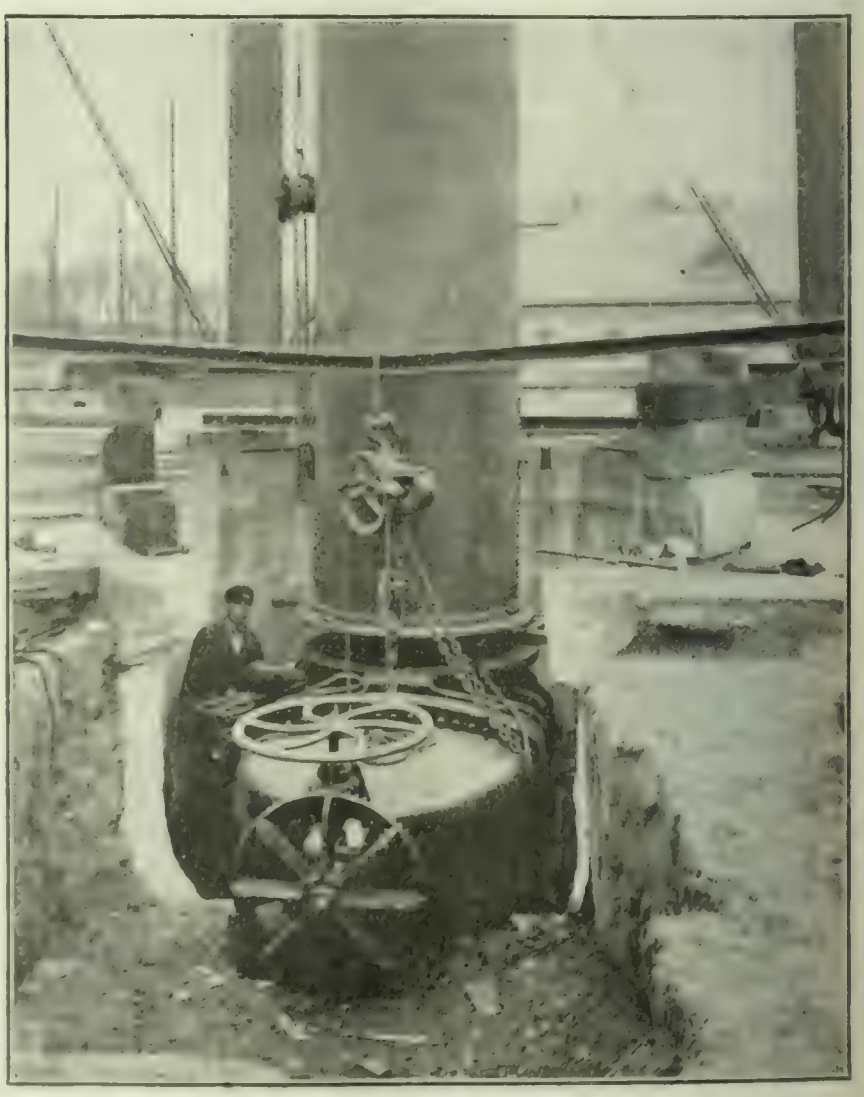
The specific gravity of the rock can easily be determined by rough measurements or by reference to handbooks giving the specific gravity of the various common kinds of rock. It will be sufficiently accurate to use the figure 1.024 for the density of salt water and to measure by cross-sectioning the yardage of about 25 scows before adopting a final figure for the percentage factor. As an instance of the accuracy of this method, on a certain job the stone on 50 scows was cross-sectioned, and it was found that the factor calculated from the measurements of the first 25 scows differed only about 0.01 from that for the remaining 25.

This method was used successfully to measure the yardage placed for the construction of a bulkhead and dock for the Mexican Petroleum Co., at Carteret, N. J., for which work Henry Speers, New York City, was the contractor. On this particular work it was found that the factor for rock varying in weight from 1 to 6 tons, with a specific gravity of 2.8, was 2; that is, the percentage of voids was 50%. Only a little experience with this method will convince anyone of its value.

48-In. Valve Connection Placed on a 52-In. Tank-Riser Pipe

THE very large elevated water tank at the filtration plant of the Louisville Water Co., Louisville, Ky., was originally installed without a valve between the 48-in. water-main connection and the 52-in. riser pipe. The steel riser pipe recently commenced to show signs of deterioration, and it was decided to put in a valve at the base so that the riser could be cut out for repairs without interference with the connecting mains.

The method of procedure was as follows: The expansion-joint connection at the cylindrical bottom of the tank was fixed so that there would be no movement. This was done by taking out every other bolt in the flange connection and inserting plates of steel which would completely prevent the riser pipe from moving.



PLACING 48-INCH VALVE IN WATER-TANK RISER PIPE

Four ¾-in. steel cables were then attached to the tops of the four steel tower legs and extended down about two-thirds the length of the riser pipe to which they were fastened. In the middle of each cable was a steamboat ratchet or turnbuckle which permitted each cable to be given the proper tension. The weight of the riser pipe was thus carried by the framework of the tower.

Below the last riveted joint in the riser pipe a length was measured which, allowing for a new row of rivets, would just equal the height of the valve to be inserted. An oxyacetylene torch was then used to cut off the riser pipe at this point. The section of pipe to be removed was taken out, and the shortened bottom length of 52-in. pipe was raised a few inches inside the section above by chain hoists, as shown in the accompanying view.

The valve was then moved into place and the bottom section of the riser pipe lowered upon it. Holes were drilled in the new bottom section of the riser pipe for the rivet and the connection completed. James B. Wilson is superintendent and chief engineer of the Louisville Water Co., under whose direction the work was done.

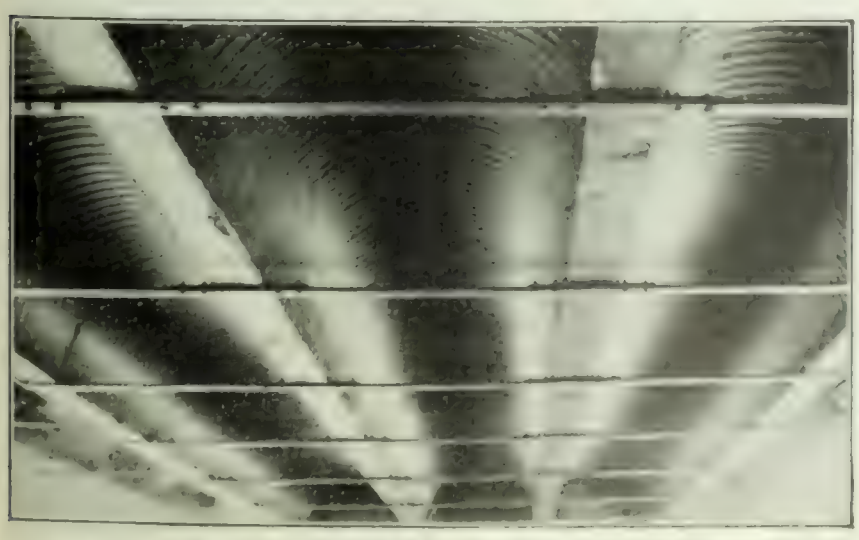
Set Slope Stakes a Foot Outside

By L. M. Mitchell
Assistant Engineer, Minneapolis & St. Louis Railway, Oskaloosa, Iowa

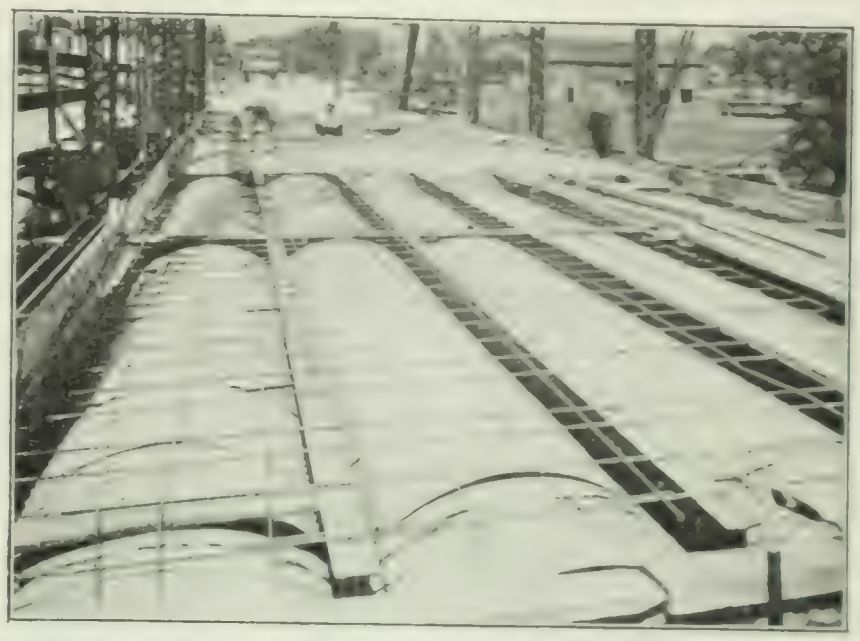
A DEVIATION from the usual manner of setting slope stakes for railroad grading has been used successfully by the writer. Instead of the stake being driven slanting at the toe of the embankment or top of the cut, it is moved out one foot farther and driven down straight. Thus, each center-line stake is practically referenced by two hubs, which are much less likely to be displaced than if set at the edge of the slope. If the contractor is advised of the method of setting the stakes, it has proved easy and convenient for him to make his measurements accordingly.

Culvert Pipe Used as Basis for Floor System to Bridges

A REVERSION to an old system of highway bridge floor, with some modern variations, is seen in the use of corrugated iron culvert pipe forming the basis for concrete arch floor spans. In the old designs light gage corrugated steel in the new type half sections of heavy-gage culvert iron is used, with additional reinforcement of the concrete floor against expansion.



UNDERSIDE OF COLORADO BRIDGE FLOOR WHERE CULVERT HALF ROUNDS ARE USED AS FORMS



CONCRETE FLOOR OF OHIO BRIDGE TO BE PLACED ON CULVERT SECTIONS AS FORMS

One view shows such a floor as installed on a through-truss bridge in Hamilton County, Ohio. For this bridge the culvert forms span between the bottom flanges of I-beam stringers which are framed into floor-beams. The other view shows the under side of the floor of a deck-girder bridge at Boulder, Colo. Here the main girders, 41-ft. span, are of reinforced concrete and the floor, a concrete slab reinforced against expansion with ¾-in. rounds on 10-in. centers in both directions, is coured on half-culvert sections spanning steel 24-in. I-beams which are spaced 4 ft. apart and placed parallel to the main girders and span between the abutments. In this bridge the I-beam stringers are stiffened by cross-braces of steel bars, as shown.

Cleaning Water-Settling Basins at Grand Rapids

By Walter A. Sperry
Chemist, Water-Filtration Plant, Grand Rapids, Mich.

A CHANGE in the method of cleaning the settling basins of the water-purification plant at Grand Rapids, Mich., has materially lessened the amount of labor required and made it less hard and unpleasant. The change was simple and like all simple arangements has worked wonderfully well.

Our two basins together are approximately 100 x 200 ft. in plan, divided into 14 parallel bays by "round-the-end" baffle walls spaced about 15 ft. apart. At the lower end of each pair of bays is a small pump connecting to the general drain for all the basins leading back to the river. Along the opposite or back end of these same bays there runs a 6-in. city pressure main and also a 16-in. line connecting with the chamber receiving the raw water from the pumps. On the pressure main and the raw-water main are valves and gates, respectively, supplying flushing water for each pair of bays.

These basins are some 12 ft. deep. Under ordinary conditions from 8 to 10 ft. of sludge collected over half to one-third the area of these basins every one to one and one-half to two months, according to the time of the year.

The removal of this sludge was a large problem, especially in the winter time. It required four or five men working all day in rubber suits, many times standing in water and sludge up to the hips, and it required a long day for the cleaning of each of the two basins. It was a job to be dreaded. It was hard on the men even under summer conditions, and required a great deal of hose that rapidly deteriorated by being dragged back and forth over the rough concrete floors of the basins.

By way of remedy, 2½-in. pipe was laid the full length of each bay, drilled with ½-in. holes on the horizontal diameter, spaced 2 ft. apart and staggered so that there would be a jet of water for every foot of pipe on opposite sides. This was connected behind the valve on the city pressure line so that either or both could be used and so that the pressure could be turned onto the piping system from the lawn above.

The basin which is to be cleaned is cut out, the pressure turned on for a half hour or so, and then the drains are opened and the whole allowed to work—usually overnight. It is then only necessary for two men to work perhaps one or two hours, and sometimes not that long, with a hose from the top to clean up some of the worst of the corners.

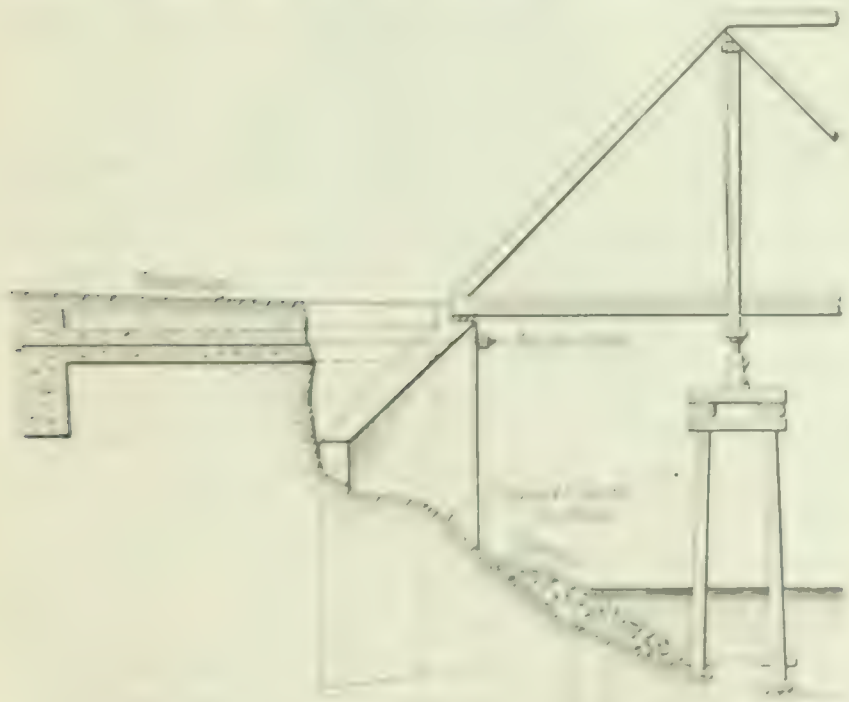
The cleaning is not as thorough as when done by going into the basins with the hose lines but it is good enough, and it works equally well under both summer and winter conditions.

Slipping Bridge Abutment Saved

By R. T. Brown

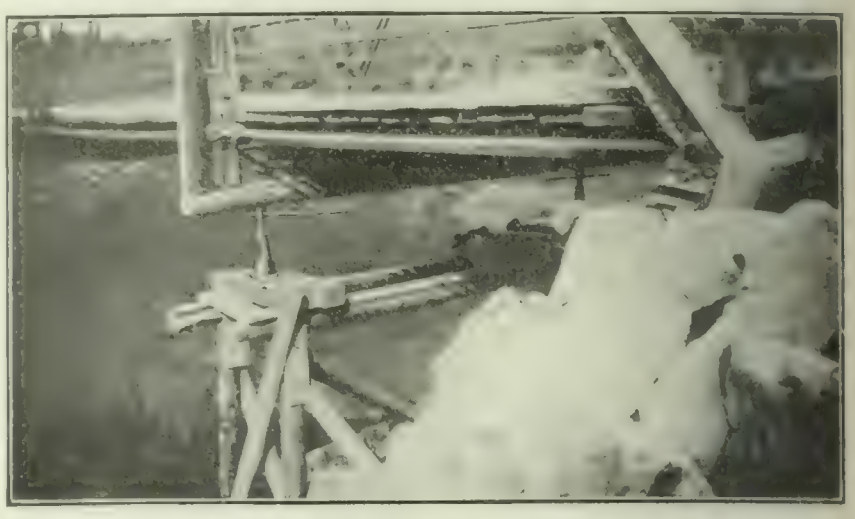
Highway Engineer, Davidson County, Lexington, N. C.

A CASUAL inspection of the 100-ft. steel highway bridge which was built some time ago without engineering supervision showed that the anchor bolts were bent and the shoes were pressed tightly against them. There was no information available as to the



exact location of the abutment or as to the batter of the faces, but it was very easily seen that one of the abutments had moved. An investigation indicated that while one abutment rested on hardpan or rock, the other—which is about 18 ft. high above water level and of unknown depth below—probably rests on a fine sandy loam. The stream channel shifting had eroded this deeply.

To prevent further erosion, two lines of piles were driven near the toe of the slope and the whole slope



BRIDGE RAISED BY JACKS PLACED UNDER FIRST PANEL POINT

covered with a heavy riprap of stone. Holes were drilled through the abutment near the juncture of the wings and face, and 1½-in. rods, 34 ft. long, were placed in trenches running back along the roadway. These rods were incased in concrete for their entire length and anchored to concrete deadmen at the end.

To further strengthen the abutment, a narrow trench was dug along its back and filled with concrete—the extra width providing sufficient breadth to receive the bearing when it was replaced in its proper position.

When the concrete at this point was hardened sufficiently, the nuts were tightened on the tie-rods, a new anchor bolt hole drilled and the bolt grouted in. To lift the bridge while widening the seat beams, struts made of pine logs flattened on two sides were attached at the first panel points, as is indicated in the line drawings. A beam rested on top of these struts and passed under the top chord. The bottom chords, stiffened by means of 4 x 6 timbers inserted between the floor-beams, completed the provisions against reversed stresses. While an attempt was made, contrary to instructions, to lift the bridge before the stiffeners had been placed, which resulted in the I-bars buckling slightly, no accident occurred during the repair, and traffic was maintained over the bridge during the job.

New Wireless Station in Alaska

A permanent wireless station at the City of Anchorage, to replace the present temporary plant, is being erected by the Alaskan Engineering Commission. It is located on Government Hill, and involves the erection of two 200-ft. fir masts, carrying a six-wire aërial with a spread of 30 x 400 ft. The building will contain an operating room, generating room and living quarters for two men. A 2-kw. 500-cycle transmitting apparatus and one of the latest types of receiver with supersensitive audion detectors and amplifiers will be included in the operating equipment. For the present power will be obtained from the alternating plant in the terminal yards. The apparatus now in use has an operating radius toward the sea of about 500 miles.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Home-Made Unloaders Save Time on California Road Work

THE time required for loading motor trucks with sand or gravel shipped in gondola cars has been cut down on road work in California by a home-made device used like the car unloaders now on the market, and termed a loading box. The boxes are used as temporary receptacles into which the material is shoveled from the car while the trucks are going to and from the job. Two or more loading boxes are set on the edge of each car, two having a capacity sufficient to load a 3½-cu.yd. truck. When the truck is in position the contents of the two boxes can be dumped into it in four or five minutes.

The boxes are made up of 2-in. plank strengthened at corners with strap iron and provided with a door at one end which can be opened when the box is dumped. By means of a long lever, a 4 x 4 which extends entirely across the car and rests on the opposite side, it is easy to tilt the boxes for dumping although the center of gravity is far enough inside of the car edge to give the box stability while the men are shoveling into it. The sides of the boxes converge slightly toward the end in which door is placed, so that the material flows out freely when tilted to dumping position.

By varying the number of boxes and shovelers according to the truck haul and number of trucks employed, it is possible to keep motor truck delay at the point of loading down to a minimum. When the car sides are lower than the height required to dump by gravity into the truck, a false side is built up to the desired height by a simple timber frame and the loading boxes are rested on this as they would be on the side of the car were it of suitable height.

The scheme has been developed and is being used by the California Highway Commission of which A. B. Fletcher is chief engineer.

Sledge Hammer Used To Break Down Arch of Old Brick Sewer

A SLEDGE HAMMER was found to be the best thing to use to break down the arch of an old 11-ft. circular brick sewer, which is being rebuilt for a length of several hundred feet in Cincinnati, by P. Foley, contractor.

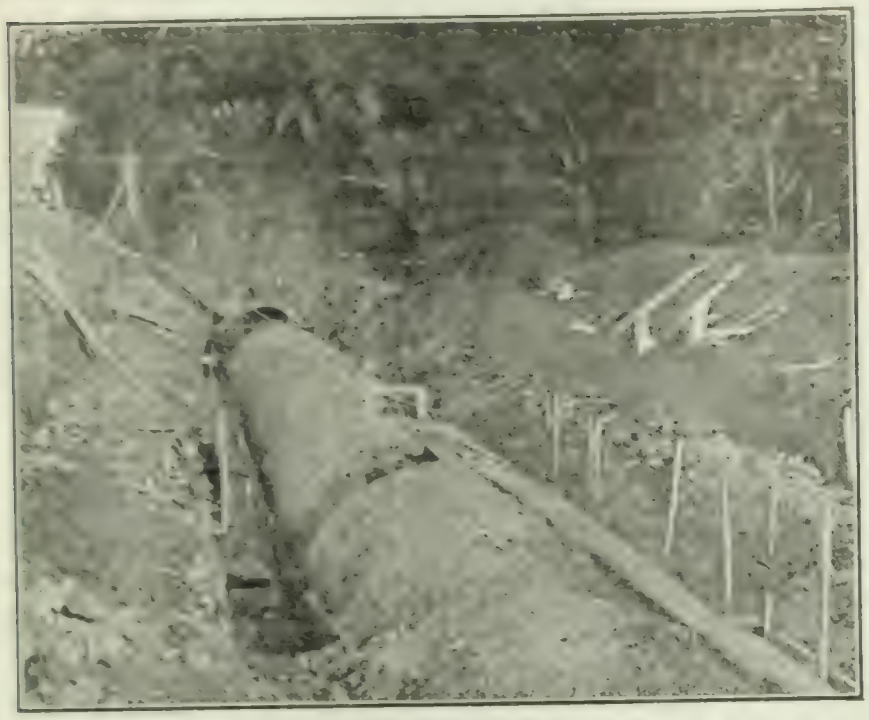
The job consisted of knocking off the arch of the sewer from the springing line up, and building vertical walls and a slab roof of reinforced concrete. The concrete is also carried down the outside of the invert a distance of 2 ft. for strengthening purposes.

After figuring on the use of air hammers and other methods, the contractor concluded that the use of sledge hammers would be cheapest and best for breaking down the arch. He uses his men for this work when they have nothing else to do. A man at 30c. an hour can break down 10 ft. of arch in a day of eight hours. The contractor builds a plank platform through the old sewer at the level of the springing line. The débris falls onto this platform and is then shoveled out. He dug his trench wide enough so that he could throw the débris outside without interfering with the new construction work.

The old sewer passes beneath the Miami and Erie Canal, built in 1847. On breaking into the embankment



HOME-MADE UNLOADERS [illegible]



WIDE TRENCH MADE ROOM FOR DEBRIS FROM SEWER ARCH

of this canal the contractor found that the sewer was laid inside of an old stone culvert, with a 3-ft. ring laid in lime mortar. This he had to remove in order to enlarge the upper part of the old sewer. The resistence of the old culvert was not known when the contract for this work was let. It remains to be seen whether the city will allow him extra for taking out the old culvert.

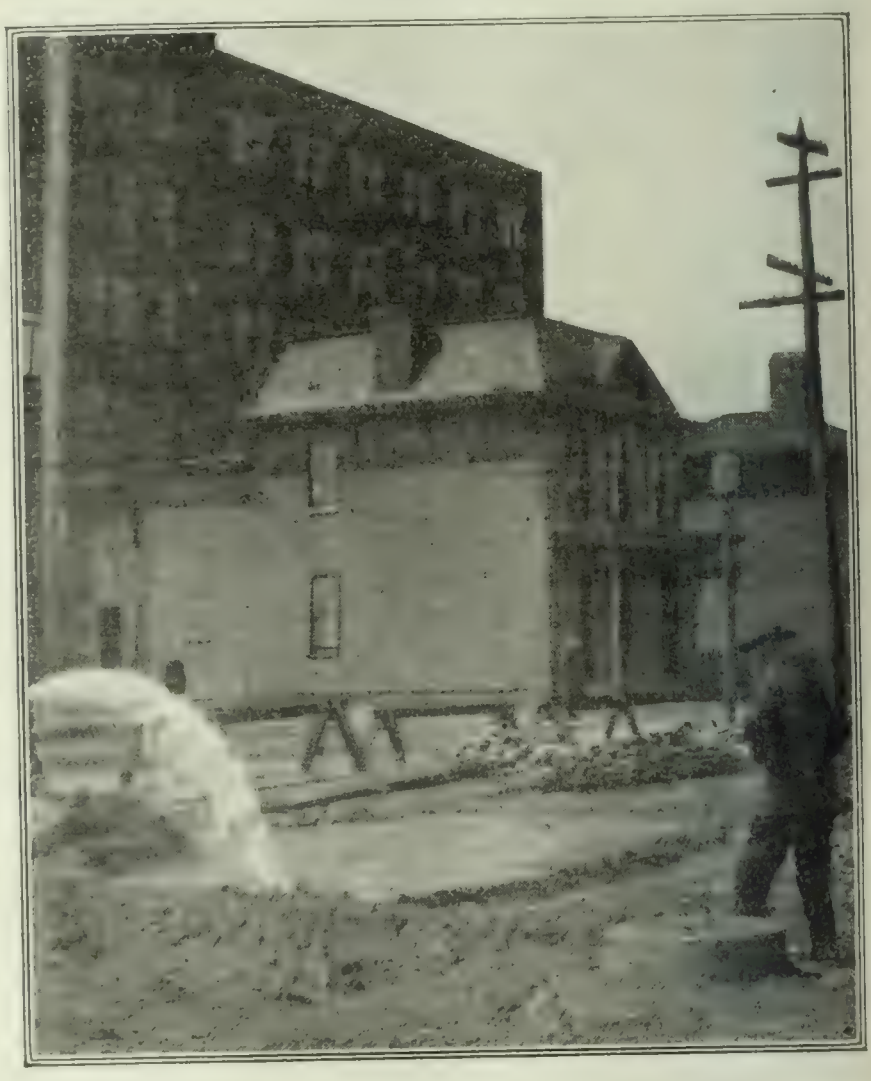
Find Untamped Holes in Street Subgrade by Ponding

HIDDEN holes in a street about to be paved are located in Cleveland by ponding, which will disclose any untamped areas by washing dirt down into the cavity.

When the grading of a street is practically complete puddle dams are built and filled to a depth of at least 12 in. The length of time that water should stay in the pond varies considerably with the different kinds of soil. In coarse sand or gravel it will normally run out in less than a day, and in some kinds of clay it will evaporate instead of running out. In the latter case the water is let out after about 48 hours. The holes do not always show up as the one in the picture has, but their presence may be known by the rapidity with which the water runs out. Careful use of this method,



PLACE WHERE WATER FOUND A CAVITY



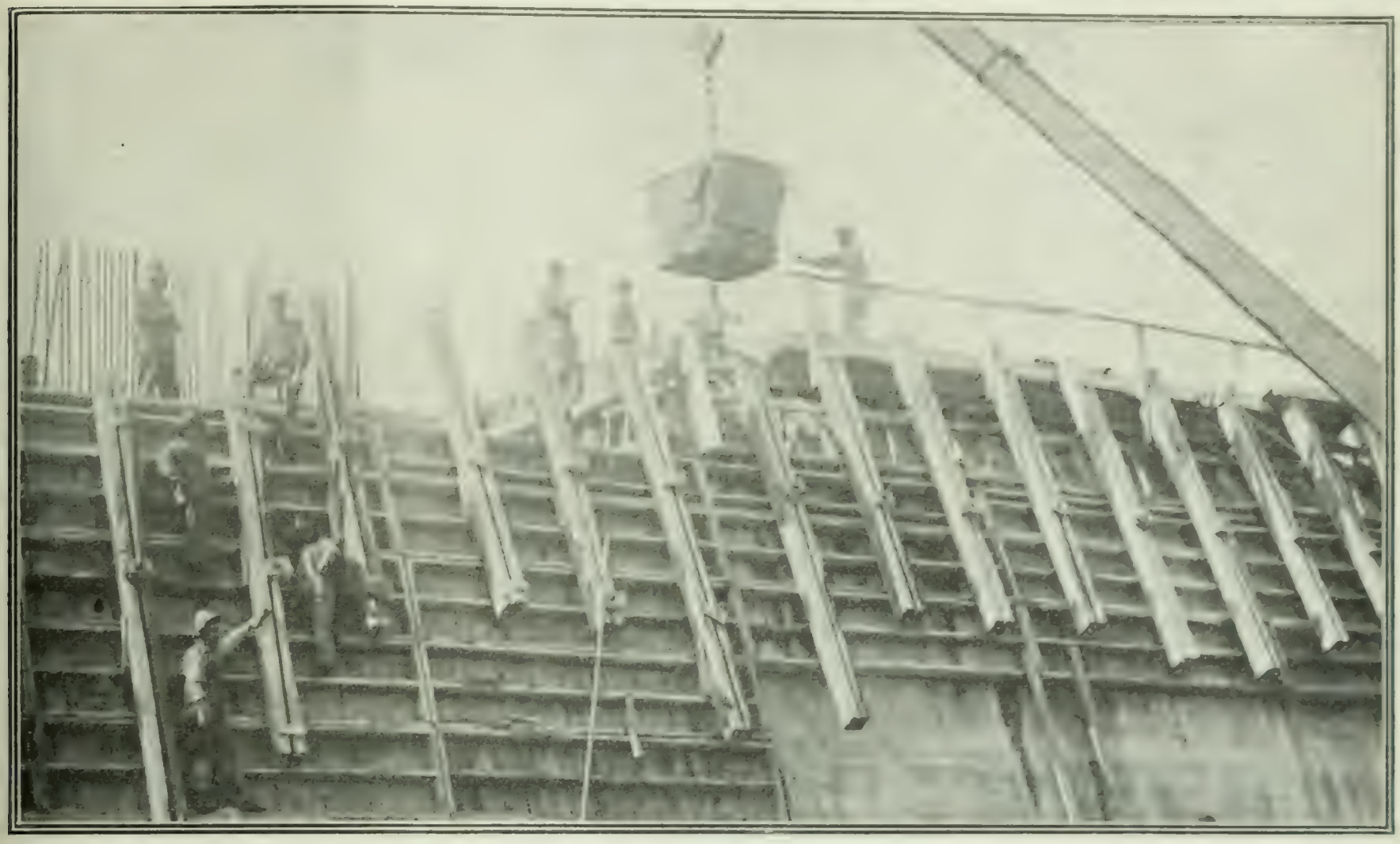
PUDDLE DAMS FILLED FROM HYDRANTS

even in the hands of an inexperienced man will, it is claimed by those who have tried it, disclose most of the holes, while nearly all may be discovered in a minimum of time by one whose experience with the different soils gives him something on which to base his judgment.

Sliding Cantilevered Studding in Forms for Canadian Dam

CANTILEVERED vertical studding which does not have to be taken down to set the next lift of forms is used to support the forms for La Loutre dam, being built on the upper St. Maurice River by the St. Maurice Construction Co., for the Quebec Streams Commission. By the use of such supports the interior spaces where concrete is being deposited are kept clear of all tie rods. Two pieces of timber on edge are held parallel and 1 in. apart, being double bolted through a space block at the upper end. This arrangement gives a slot the whole length of the support, so that it can be slid vertically upward for another lift of concrete. In this respect the scheme differs from previous forms of same type, a good example of which were those used at the Welland Ship Canal, and described on page 511 of the *Engineering Record* for Oct. 21, 1916.

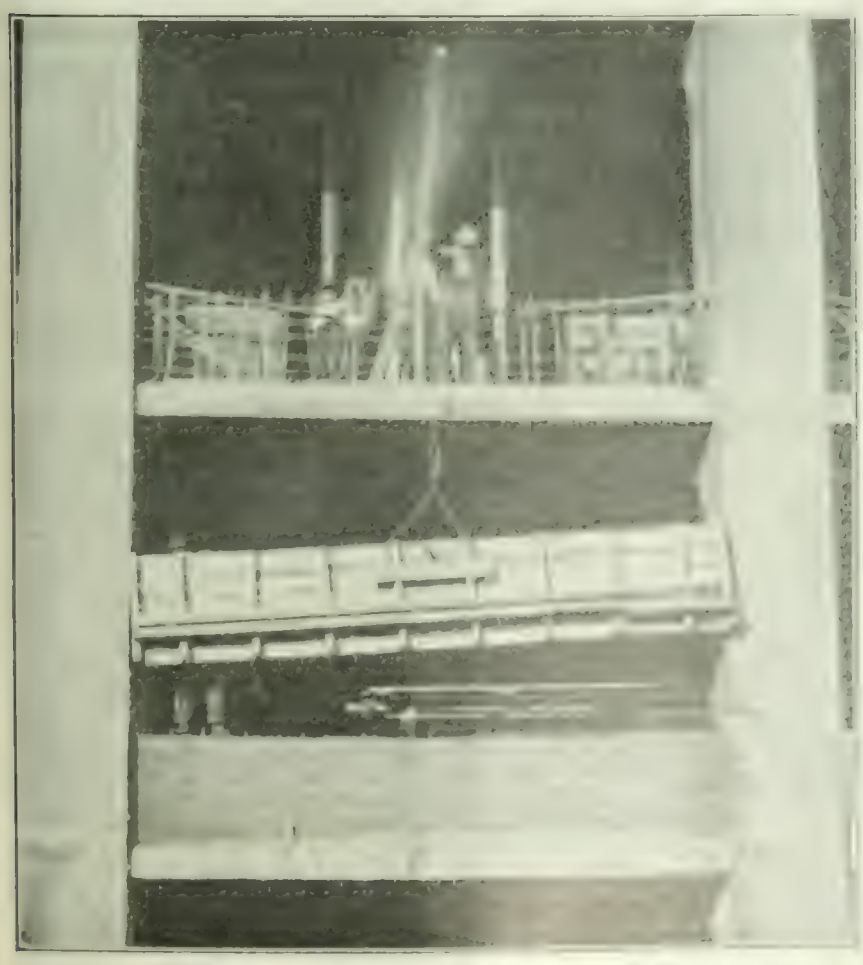
The holding bolts are tightened when the form and support are in place for proper alignment. If there is any overhanging, the heel or lower end of the support



CANTILEVER SUPPORTS SLIDE UP ON BOLTS WHEN FORMS ARE RESET

is blocked outward. Form framing here is horizontal and lagging is vertical.

Holding bolts 1 in. in diameter are spaced at 2-ft. intervals. The bolts are wrapped in a sleeve made of paper which has been dipped in tar and dried. At the inner end is a 3 x 3 x $\frac{5}{16}$-in. plate. Very little difficulty has been found in screwing the bolts out. Large square washers at the end span both timbers of the support.



LIGHT-WHEELED DERRICK [illegible] CURTAIN WALL FORMS

Build Curtain Walls with Simple Forms After Concreting Floors

By J. G. Grossman

Superintendent, Peter Keeler Building Co., Fort Edward, N. Y.

ON CONCRETE building work, where it is not necessary to pour the curtain walls monolithic with the columns and slabs, the writer has found it economical to start at the bottom and carry work up with one set of forms, raising the slabs outside the building with a small derrick as shown in the photograph. This derrick was mounted on a small four-wheeled platform and needed no guys. However, a strut from the back part of the platform to the floor slab above was usually placed to insure its stability. A two-part fall of ½-in. wire rope was used, the derrick being operated by a crab.

The inside and outside slabs of the curtain wall forms were held together at the bottom by bolts, while a ladder yoke such as was described by the writer in the *Engineering News-Record* for July 5, 1917, page 41, secured the forms at the top.

One Week Only from Tree to Roof-Tree

An indication of the speed with which materials are being moved is contained in a report from the cantonment at Louisville, Ky. Administration buildings there were built from lumber cut in a Mississippi pine forest the week before. The trees were felled on Saturday, hewn-down on Sunday, loaded on freight cars on Monday, and delivered at the Louisville site on Wednesday morning. An army of [illegible] carpenters completed the transformation from forest to Government building just one week from the day the trees had been felled. This is probably a record in work of this extent.

NEWS OF THE WEEK

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

Sticks to Brick for Sewers

Against Advice of Engineers—Detroit Council Refuses to Open Sewer Specifications

About to enter upon the first half of $16,000,000 of sewer construction, the city engineer of Detroit, with the approval of the engineer-commissioner of public works, attempted to open the local specifications to other material than brick, but has been balked by the Common Council, as stated in *The Public's Business*, issued by the Detroit Bureau of Municipal Research, under the heading:

FACTS CONCERNING COMPETITION IN SEWER CONSTRUCTION:

"Brick has been used in Detroit sewers for the past 60 years, and the present specifications require that brick only be used in sewers of over 30 in. diameter.

"The largest sewer contractors of Detroit are said to be interested in local brick manufacture.

"Reorganization of sewer methods began Dec. 29, 1916, when Clarence W. Hubbell, an engineer of recognized competency, was appointed city engineer.

"Revision of specifications covering sewer construction was undertaken Jan. 15, 1917. It was desired to include several types of construction—brick, segment block, reinforced concrete, monolithic concrete, etc.—in order that there might be real competition.

"Eight million dollars was authorized for sewer construction by the Board of Estimates and the Common Council on May 1. This sum is part of a $16,000,000 program, and is more than the present sewer system has cost to date.

"To feel out sentiment on the use of other material than brick, contracts for the Evans Ave. were submitted to Council on June 6. The bids were $30,133 and $29,779 for brick and $25,771 for segment block. The city engineer recommended accepting the lowest bid, which meant a saving of $4008, or 14%, on this small job.

"A favorable attitude on the Evans Ave. sewer was taken by the Sewer Committee. Later, the corporation counsel ruled that segment block could not be bid upon under the present specifications.

"Anticipating the revised specifications, the Sewer Committee took a junket beginning July 31. They visited Cleveland, Akron, Columbus and Cincinnati, where they found 'wide-open' specifications, active competition and segment block and concrete in successful use.

Divided Opinion As to Canada's Railway Situation

Opinion is divided in Canada as to the desirability of the Government taking over the Canadian Northern Ry., in accordance with the plan announced in these columns Aug. 9, p. 285, at the same time advancing $7,500,000 to the Grand Trunk Pacific Ry. to help it through its immediate difficulties. The Toronto *Monetary Times*, which favors the minority report of A. H. Smith, of the Royal Commission, argues that the scheme now proposed, while failing to solve the main problem, would effectually block progress on it for some time to come.

Force Account Road Contracts Held Legal in Oregon

The attorney general of the State of Oregon recently held that it would be legal for the State Highway Commission to award highway contracts by force account. Recently the commission rejected all bids for a road contract in eastern Oregon and desired to let the contract to the Warren Construction Co., of Portland, by force account, the company to furnish all materials, equipment and help, and to be paid a certain percentage of the cost as profit.

Testing Ten Makes of Water Meters

Ten different makes of water meters are being tested by Reeves J. Newsom, superintendent of water-works, Lynn, Mass., preparatory to buying 7000 meters in order to meter the remaining half of the consumers. It is reported that a part of the program is to let all the meters freeze when cold enough weather comes and then compare results upon their anatomy and physiology.

"Revised specifications were submitted to Council Aug. 14 and referred to the Sewer Committee, which now has them under consideration.

"The next move is up to the Common Council. In the meantime, we wanted you to know the facts."

Excuses given by the majority members of the Council for this action are that they wish to have only material of approved merit used in sewer construction; and that "in every city where we found the segment block in use, we also found an intertwining of interests between the city officials and segment block makers."

The reason for opening the specifications, to quote again from *The Public's Business*, is to get "competing contractors with competing materials."

Study Modern Maintenance Methods for Roads

Bulletin Bearing on This Subject Being Prepared by Office of Public Roads

For some years it has been the hope of the Office of Public Roads that a careful study of the latest methods of highway maintenance could be made and by the preparation of a carefully constructed bulletin bearing on this subject that maintenance methods throughout the United States could be more or less standardized. This idea originated with E. W. James, inspector for the Eastern district, and was recently put into active force by the assignment of the undersigned to assist Mr. James in making the proposed study and preparing the subject matter for the bulletin. The work is being done under the direction of J. E. Pennybacker, chief of economics.

The present purpose is to visit all state highway departments where maintenance methods have been highly developed and to make a thorough study of the systems of organization which have been developed and the actual field methods in use in caring for the various types of pavement. Cost accounting systems, records, etc., are also being studied and it is hoped that from the data collected definite recommendations as to these matters can be made.

An effort is also being made to permit the manufacturers of important road materials to make suggestions as to their proper maintenance, but it will, naturally, be impossible to call on everyone who may be interested in this matter, and it is suggested that any who desire to insure consideration of their views correspond with Mr. Pennybacker.—*G. L. Harrison.*

Goethals Engineer for New York Port Commission

The two commissions appointed by Governor Edge, of New Jersey, and Governor Whitman, of New York, to investigate conditions at the Port of New York were organized Aug. 22. Gen. George W. Goethals was appointed chief consulting engineer. The work of the joint commission will pertain to all matters affecting the development of the Port of New York, with all territory contiguous to the port. It is stated that the railroads will be consulted about terminal plans, etc., as will storage warehouse and steamship companies. The commissions will report to the legislatures of their respective states. The offices of the joint board are at 115 Broadway, New York City.

Will Spend $8,500,000 for Port Improvements

Chile Asks American Contractors for Bids on Harbor Works To Hold Nitrate Business

The Government of Chile will expend $8,500,000 in the improvement of Antofagasta, the principal port for the export of sodium nitrate. Chile's nitrate business has grown greatly because of the war's cutting off the German supply from other nations and also because the manufacture of munitions has increased the demand for saltpetre. One of the objects of Antofagasta improvement is to equip Chile to hold this greater nitrate business after the war is over.

The Chilean Government has turned to the United States to have this work done and bids have been asked of American contractors for the construction of the waterfront improvements, as well as bids for taking up the loan the Government will make to finance the undertaking.

A request for bids prepared by the Chilean Embassy says:

"The Government of Chile asks public bids for the contract of the foundation work for the improvement of the port of Antofagasta, at a price not above £1,700,000."

Referring to the financing of the project, the advertisement says:

"The parties interested in these bids can also present with the proposal for the construction of the port works another bid to take charge of the loan of £1,700,000, authorized by law No. 3132, on Sept. 4, 1916, the proceeds of which will be invested in the payment of the works above mentioned. The bonds of this loan will earn 6% interest and they will have an accumulative amortization of 2 per cent.

"The payments can be made in installments according to arrangements during the progress of the work. The proposal for the placement of the loan will be only accepted jointly with the one of construction, but this latter may be accepted independently of the former one. The Government reserves, notwithstanding, the right of contracting the loan separate from the contract of construction. In equal condition it will favor that proposal offering also the placement of the loan."

All particulars may be obtained from the Chilean Embassy in Washington or from the consulate general of Chile in New York.

Los Angeles Building Concrete Road for Motor Trucks

A special road for motor trucks is under construction in California. It runs from Los Angeles to the harbor at San Pedro, a distance of 13 miles, and has a width of 40 ft. The road foundation is of water-bound macadam upon which is placed solid concrete to a depth of 8 in., with a bituminous top surface. It is estimated that the road will cost $365,106.

St. Louis' Garbage Problem Further Complicated

Recent Proposal of Chicago Chemist May Reduce Initial as Well as Operating Cost

The garbage situation in St. Louis has been further complicated by the proposal of Dr. J. M. Hirsh, a Chicago chemist. Dr. Hirsh appeared before the Board of Aldermen, and also before the Board of Public Service, presenting a new scheme for the reduction of garbage by steaming in the presence of certain chemicals, the nature of which was not revealed. He claimed to be able to produce completely desiccated and odorless solid matter and a liquid very high in valuable grease and capable of further reduction at a low cost. He further claimed that the necessary plant for this work could be built for about $200,000 as compared with $680,000 for the Cobwell plant. Dr. Hirsh was permitted to make a demonstration on a small scale, which showed very satisfactory results.

Another ordinance was introduced providing for the construction of an experimental plant for the Hirsh system at a cost of about $17,000, Dr. Hirsh to give bond to refund this amount if unable to produce satisfactory results. Both this ordinance and the ordinance for the Cobwell system plant are still pending.

New Haven Starts New England's Largest Freight Yard

Work has been started by the New York, New Haven & Hartford R.R. at Montowese, near New Haven, Conn., on what is to be the largest railroad freight yard in New England. Its purpose is to meet the needs of a traffic that has outgrown the numerous smaller yards on the company's various lines radiating from New Haven. Trains from all of these lines will be classified for all destinations at the new yard.

Details of the design are not yet available. It is, however, to be a hump yard, and there are to be two main sections, one for eastbound and northbound, the other for westbound and southbound traffic. Each section will in turn have three units—receiving, classification and departure. The eastbound and northbound classification unit will contain 25 tracks; the other classification unit 15 tracks.

Other features include a 16-stall engine house and a large transfer station on the platforms of which motor trucks and trailers will be used. There will also be a complete separation of grades at Air Line Junction.

No City Manager for Bridgeport

The proposed commission-manager charter for Bridgeport, Conn., noted on page 214 of our issue of Aug. 2, 1917, was defeated on Aug. 14 by a vote of 2898 to 931, with 650 ballots given out but unused. Only one-fifth of the registered voters went to the polls.

Extraordinary Improvement in Car Supply

Railroads' War Board Reduces Shortage by 75 Per Cent. 30,000 Cars for Cantonment Work

Reports received by the Railroads' War Board show that the railroads of the country, in their coöperative efforts to give to the country the greatest possible amount of freight service, have effected an extraordinary improvement in freight car supply.

These reports show that the excess of unfilled car requisitions over idle cars, or what is ordinarily but inaccurately termed car shortage, was only one-fourth as great on Aug. 1, 1917, as on May 1, 1917.

Car Shortage Reduced

The excess of unfilled car requisitions on May 1 was 148,627; on June 1 it was 106,649; on July 1 it was 77,682; and on Aug. 1 it had been reduced to 33,776.

This result has been accomplished at a time when the railroads are supplying from 15 to 20% more freight service with the same number of cars than was being given this time last year, for the railroads handled in July a tremendous increase in both Government and commercial traffic.

The movement of cantonment supplies alone occupied the full services of more than 30,000 cars. There was also an extraordinarily heavy demand for cars to transport food products, as well as materials to and from munition factories.

Result of Coöperation

The result above achieved has been accomplished by coöperation with the railroads of shippers, regulating bodies and the public generally. This coöperation has made possible the intensive loading of freight cars, prompter unloading, the eliminating of a large amount of unnecessary passenger train service and an opportunity generally to utilize the railroad plant efficiently.

The aim of the railroads at the present time is to put each car to the greatest possible use, to have empty cars placed where they are most needed, to prevent overlapping and unnecessary service—in other words, to make the entire railroad system of the United States the most effective possible transportation agency in winning this war.

Savannah Will Annul Contract for Kayton Canal

Steps were taken by Savannah, Ga., to annul the contract with the Carolina Construction Co. for the construction of the Kayton Canal, work on which has been suspended. It is proposed to have the city take over the plant and complete the canal, which is about 50% finished, according to E. R. Conant, chief engineer of the city, who has inspected the work. A report made two weeks ago indicated that the work was about 75% completed. The contract involves about $400,000.

Personal Notes

A. O. Powell, consulting engineer, Seattle, Wash., has been commissioned major in the Engineer Officers' Reserve Corps and has been ordered to New York for assignment to duty.

A. N. Eason and A. N. Garland, of Seattle, have formed a contracting firm to be known as Eason & Garland, with offices in the Greene Building.

Calvin W. Hendrick has resigned as chief engineer of the City of Baltimore on the ground that his private affairs demand all his time. Mr. Hendrick was chief engineer of the Baltimore Sewerage Commission during the construction of the immense sewerage and sewage-disposal system from 1905 to 1916, when he became chief engineer of the city. The latter position was created with a view of having a single directing and coördinating head for all the engineering work of the city, who would also serve as technical adviser to the mayor. It is reported that the vacancy will not be filled by Mayor Preston. The position paid $7000 a year.

A. P. McCarton, resident engineer in charge of the raising of the Big Creek Dam at Huntington Lake, California, has received a commission as first lieutenant, Engineer Officers' Reserve Corps.

Shirley Baker, of the firm of Baker, Carpenter & Waters, San Francisco, is in charge of the Government pipe-laying contract at Palo Alto, Calif. This work involves the laying of a total of 27 miles of water pipe, chiefly wood stave.

A. B. Fletcher, chief engineer of the California Highway Commission, has been appointed president of the State Reclamation Board by Governor Stephens. Mr. Fletcher succeeds V. S. McClatchy, retired, and his appointment becomes effective Oct. 1. It is understood that the new appointment will not affect Mr. Fletcher's position with the Highway Commission.

Dr. Henry M. Payne, consulting mining engineer, will remove his office from the Woolworth Building, New York City, to the Chamber of Commerce Building, Pittsburgh, Penn., where he will assume the position of assistant to the president of the Bertha and affiliated coal companies.

T. J. Skillman, division engineer of the Monongahela Division of the Pennsylvania R.R. at Pittsburgh, has been appointed division engineer, office of the principal assistant engineer, New Jersey Division, with headquarters at New York City; and W. M. Greene, division engineer of the Delaware Division at Wilmington, Del., has been appointed division engineer, to succeed Mr. Skillman.

H. W. McAleenan, formerly assistant construction engineer of the Illinois Traction System, with headquarters at Peoria, Ill., is now with the Minnesota Utility Co., in the capacity of construction engineer, with headquarters at Chisolm, Minesota.

Herbert Cantwell, formerly construction engineer with T. L. Tomlines, paper mill engineer, Watertown, N. Y., is at present engaged as construction engineer for the Fargo Engineering Co., Jackson, Michigan.

Tollef B. Monniche, engineer of docks, Panama Canal, has resigned and expects to take a six months' vacation in El Boquete, Republic of Panama. Mr. Monniche was in charge of the design and construction of the Christobal terminal piers, and previous to this work was the designing engineer for the Isthmian Canal Commission, in charge of the design and erection of the emergency dams on the canal.

Business News

Commission to Adjust Labor Disputes in Ship Building

An agreement entered into Aug. 25 by representatives of the Navy Department, the Emergency Fleet Corporation and of the American Federation of Labor provides for the rapid and peaceable adjustment of all labor disputes in shipyards throughout the country in order that the work of ship construction in public and private yards may continue throughout the war without danger of serious interruption.

The labor chiefs and Government officials who signed the agreement, among whom are the presidents of the great international unions, believe that the strike in New York can now be speedily settled and the great strike on the Pacific Coast, which has been hourly threatened since Aug. 14, averted.

Commission To Be Created

The agreement calls for the immediate creation of an adjustment commission which will consist of three, four or five members, according to the nature of the problem to be solved.

The President has designated V. Everitt Macy, of New York, president of the National Civil Federation, as chairman of commission.

Samuel Gompers, president of the American Federation of Labor, will name the second member of the commission, and the Emergency Fleet Corporation will designate the third. Where Navy work is in whole or in part concerned, Assistant Secretary of the Navy F. D. Roosevelt will sit as a member of the board.

Local Labor Represented

When trouble on a large scale is threatened in private shipyards a representative of local labor and of local shipping interests will sit as members of the commission with full voting powers.

In the event of a tie, when Assistant Secretary Roosevelt's presence raises the membership to four, the deciding vote will be cast by the Secretary of War as chairman of the Council of National Defense.

Germany as an Industrial Competitor After the War

The cosmopolitan point of view that has been acquired by the German trader is emphasized in a report which has been issued by the Bureau of Foreign and Domestic Commerce, Department of Commerce, on "German Foreign-Trade Organization." The facts in Teutonic commercial history that are presented in this volume show how thorough are the methods that have been employed for more than half a century, and how earnestly that nation is preparing to reach out into the world markets as soon as the war is ended.

The author of the report is Chauncey D. Snow, assistant chief of the Bureau of Foreign and Domestic Commerce, who was in Germany at the time that the war broke out, investigating industrial conditions in that country. He has made use of original material based upon personal contact with the organization and methods of commerce in Germany and other countries, but for the most part his purpose was to bring together in one volume material on German trade and industry which the bureau had already published in various special reports, with some new and pertinent statistics.

Copies of the publication, "Miscellaneous Series No. 57," may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., or from the district offices of the Bureau at 20c. each.

Federal Child Labor Law Effective September 1

The new Federal Child Labor law takes effect Sept. 1. Hereafter no child under 14 may be employed in any factory, mill, workshop or cannery in the United States whose products are to be shipped in interstate commerce, and no child under 16 in any mine or quarry. The working day of children 14 and 15 years of age in factories may not be longer than 8 hours and they may not be employed between 7 p.m. and 6 a.m.

Labor Situation in Northwest Lumber Industry Grows Serious

Many contracts have been placed by the United States Shipping Board for wooden ships to be constructed in the Northwest, and progress in these yards is dependent upon the lumber supply from near-by mills. Many of these mills have been shut down because of labor troubles and the situation has become so serious that, on Aug. 18. Governor Lister, of Washington, wired to President Wilson as follows:

"For some weeks there has been a most unsatisfactory condition existing in the lumber industry in the Northwest. Many of the logging camps and lumber mills are closed and thousands of men are unemployed as a result of the strike now going on. The State Council of Defense, aided by many public-spirited citizens, has endeavored to bring about an adjustment, without success. The Secretary of War, speaking for the Council of National Defense, has suggested a solution which has not been accepted. On Thursday last I presented a plan of settlement and find that it does not meet with the approval of the operators.

BUT FEW MILLS OPERATING

"It is claimed by the operators that a sufficient number of plants are running to supply Government demands. They say, however, that this demand does not exceed 7½% of the normal output of the plants. I personally feel that during this crisis we are not performing our full duty unless we also operate the mills and camps to supply the 92½% general demand.

"Every plan thus far suggested to bring about an adjustment of the differences has failed and I am telegraphing to suggest the appointment of a commission by you to make a complete investigation covering the lumber industry of the States of Washington, Idaho and Oregon; this commission to have the power to call for information relating to the cost of operation, wages paid to employees, living conditions of employees, the prices now being obtained for lumber, sales conditions in competitive territory; in fact, to cover all lines of investigation that might furnish information which would result in obtaining a proper basis in again bringing about normal conditions in this industry.

COMMISSION SUGGESTED

"If the plan suggested appeals to you, a joint Federal and state commission might be appointed with one member representing each of the States of Oregon, Idaho and Washington, the representative member from each state to be appointed by the governor of the state.

"I suggest the above plan to you only after it appears that every other possible method of bringing about a settlement of the differences has been tried and failed. Should the plan meet with your approval, may I suggest early action? If present conditions continue the situation is certain to become more grave."

Railroad War Board Again Appeals for Car Economy

Because the demand for freight cars is greater today than ever before in the history of the country, and is increasing daily, the Commission on Car Service of the Railroads' War Board has issued a second appeal asking still further coöperation from both shippers and receivers of freight.

The commission states that the ability of the railroads to move crops depends largely upon the full loading of cars and the elimination of all delay in loading and unloading them.

The movement of lumber to the cantonments and the shipping yards has monopolized the use of more than 100,000 cars and made serious inroads into the supply that under normal conditions would handle the movement of crops and food products. To offset this handicap and secure the maximum amount of service from the cars that the Nation is dependent upon for the transportation of food supplies, the following suggestions are made to shippers and receivers:

SUGGESTIONS TO SHIPPERS

Unload promptly all loaded cars received.

Load promptly all outgoing cars and release them immediately to the railroad.

Anticipate disposition of freight before its arrival.

Do not order special types of cars when ordinary types will serve.

Eliminate use of railway equipment when tonnage can be handled by motor trucks or wagon.

Load all cars to their full carrying capacity.

HOW TO LOAD CARS

The Commission on Car Service points out that there are six ways in which the loading of cars to their full carrying capacity can be achieved, and enumerates them as follows:

More careful supervision of loading.

Producers and buyers agreeing to disregard established trade units and increase the units as a war measure.

Waiving rights in regard to minimum weights under tariff and traffic regulations.

Buyers increasing their orders so as to fill the car, and producers disposing of their output on a basis of full carrying capacity of equipment furnished.

Buyers who cannot handle larger quantities clubbing together with other buyers to make full capacity cars.

Showing customers who desire, merely as a matter of convenience, smaller units than maximum how they can help the general situation by enduring inconvenience.

HEAVY TRAFFIC INDICATED

Reports from practically all parts of the country indicate that the movement of grain and food products is going to be especially heavy during the next few months. As more than 600,000 recruits for the draft army will have to be transported to the cantonments next month and as similar unusual traffic movements produced by the war are pending and threatening severe congestion, the Railroads' War Board feels that everyone should coöperate in the movement of freight.

Fleet Corporation Places Two Orders for Ship Lumber

Orders for 16 units or ship schedules were placed with the Southern Pine Emergency Bureau during the week ending Aug. 6 by the Emergency Fleet Corporation with the coöperative assistance of the Committee on Lumber of the Council of National Defense. Four hardwood units were placed with the Hardwood Manufacturers' Emergency Bureau, recently organized in Cincinnati, Ohio, to facilitate the handling of Government orders for hardwoods.

The hardwood schedules are being gotten out at an average price of $100 per thousand feet.

Notes from

MAKERS OF PLANT AND EQUIPMENT

The Blaw-Knox Co., Pittsburgh, Penn., is the result of a recent consolidation of the Blaw Steel Construction Co. and the Knox Pressed and Welded Steel Co. Albert C. Lehman, formerly president of the Blaw company, becomes president of the Blaw-Knox Company.

The Federal Motor Truck Co. announces the election of W. C. Rowley, for some time a member of the board of directors, to vice president in charge of sales, succeeding J. F. Bowman, resigned. Mr. Rowley assumed his new duties Aug. 16.

TRADE PUBLICATIONS

A new 80-page catalog describing various types of cranes has been received from the Whiting Foundry Equipment Co., Harvey, Illinois.

The C. F. Pease Co., 213 Institute Place, Chicago, Ill., has issued a new pamphlet describing drafting-room equipment, including drawing tables, filing cases, triangles, etc.

"Some Users of Troy Trailers" is the title of a folder received from the Troy Wagon Works Co., Troy, Ohio.

Spraco pneumatic painting equipment is described in a folder issued by the Spray Engineering Co., 93 Federal St., Boston, Massachusetts.

Link-Belt "TT" class roller chains for tractors and trucks are described in Book No. 320 received from the Link-Belt Co., Chicago, Illinois.

The Ingersoll-Rand Co., 11 Broadway, New York, is sending out four new bulletins describing "Little David" pneumatic chipping, caulking and scaling hammers, "Imperial" motor holsts and stationary motors, "Crown" core breakers, air receivers, pressure tanks and moisture traps.

The following subjects are covered in new publications of manufacturers:

Manifold Drier-tor System—The New York Blue Printing Co., 102-104 Centre St., New York.

Roller Chains for Tractors and Trucks—Link-Belt Co., Chicago.

Some Facts About Chain Drives—Link-Belt Co., Chicago.

Rock Drill, Tappet Type—Chicago Pneumatic Tool Co., Fisher Building, Chicago.

Outdoor Metering Outfits—General Electric Co., Schenectady, New York.

Internal Combustion Locomotives—The Baldwin Locomotive Works, Philadelphia.

Hoisting Machinery for Industrial Works—Shepard Electric Crane and Hoist Co., Montour Falls, New York.

Hollow Metal Windows and Fireproof Doors—Herrmann & Grace Co., 671-689 Bergen St., Brooklyn, New York.

Oxy-Acetylene Welding Apparatus—The Imperial Brass Manufacturing Co., 1200 West Harrison St., Chicago.

Wire Rope Lubrication—The Texas Company, Houston, Texas.

Sewage Ejector for Industrial Plants—Pacific Flush-Tank Co., Singer Building, New York.

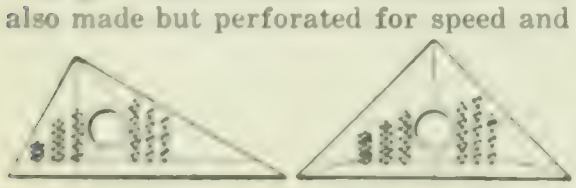
Trailers and Semi-Trailers—Watson Wagon Co., Canastota, New York.

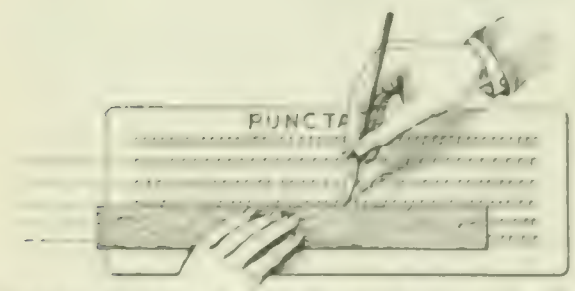
APPLIANCES AND MATERIALS

Drawing Board Novelties Help the Draftsman and Student

An aid to drawing various broken lines is being furnished by the C. F. Pease Co., 166 West Adams St., Chicago, carrying the trade name "Punctator." It consists of a thin sheet of transparent celluloid, 4 x 11 in., with six series of openings through which evenly spaced dots and dashes may be variously drawn.

Regular-style celluloid triangles are also made but perforated for speed and





PERFORATED PLATES AND TRIANGLES HELP SPEED DRAFTING

uniformity in laying out guide and slope lines for lettering as shown in the accompanying sketch. Cross lines are scored on these triangles so as to obtain 15°, 30°, 45°, 60°, 75° and 90° slope lines and to square the lettering triangle with the work.

Automatic Dump Cars Are Still Further Improved

The Western Wheeled Scraper Co. has recently furnished the Oliver Mining Co., Hibbing, Minn., a large number of 20-cu.yd. automatic dump cars of the type shown in the view. These all-steel cars are so made that each one may be dumped separately and in either direction, or all may be dumped at one time from the cab of the locomotive. The air cylinders for supplying the power for dumping has a much greater clearance above the rail than former cars of same type. The cars operate very quickly and have sufficient power for dumping no matter how heavily or unevenly they may be loaded. All parts of the air-dumping apparatus are so made that they cannot be clogged with material falling from the car, nor is



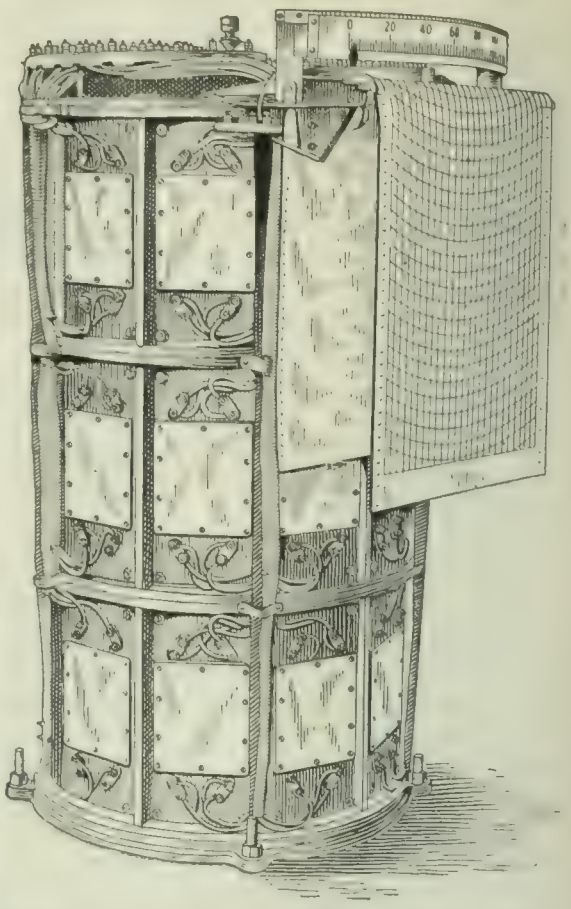
A 20-YD. AUTOMATIC DUMP CAR, WITH PROTECTED AIR DUMP

there any place where water can be held until it freezes and prevents operation. The cars are equipped with 100,000-lb. capacity M. C. B. trucks.

World's Largest Recording Meter Has 250,000-kw. Capacity

A totalizing electric power meter has recently been built by the Esterline Co., of Indianapolis, of a capacity to show the combined output of the 30 generators in the Keokuk station of the Mississippi River Power Co. The specifications, as shown by the Stone & Webster Management Corporation (the administrators of this plant) called for high degree of accuracy; freedom from appreciable errors of varying voltage, frequency, power factor and temperature; and sufficient damping to prevent overshooting.

The construction is shown in the accompanying sketch. The instrument frame is in three vertical sections and has 30 panels in each of which is the stationary element of a polyphase induction meter. Each of these unit meters in turn comprises two single-phase elements. Each tier of meter stators reacts on a common pair of horizontal aluminum rotor vanes, all six being mounted on one staff to which is connected the indicating pointer and recording pen. The charts used are printed in 12-hour lengths and are fed at 3 in. per hour over two rollers—one of which carries driving pins and is rotated by a solenoid-operated ratchet connected to the electric clock system of the plant.



HUGE GRAPHIC POWER METER HAS THIRTY UNITS

The instrument is installed in the bench board in front of the station operator's desk and the indicator and chart are always before him.

End-Dump Hoisting Body Now Made for Trailers

A new type of body for tractor trailers has been brought out by the Archer Iron Works, Western Ave. and 34th Place, Chicago—a 4-yd. steel hopper with rear door, tilted by a 5-ton hand hoist for rear-end dumping. On the front of the trailer frame is a pair of channel columns which carry gears for lifting the rack on a T-frame; on the arms of the T are shears over which



NEW TRAILER BODY HAS HOIST FOR END DUMPING

pass cables fastened to the hoist frame and reaching angles on the front of the body. The outfit is shown in the accompanying view mounted on a Troy trailer. One man, it is claimed, can raise the loaded body to a 45° angle in 2 minutes.

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Coöperation Among Water-Works Associations

THE growing spirit of coöperation among water-works associations is good to see. It has been shown chiefly by joint committee work. A notable example was the getting together of the American and New England committees on a tentative draft of cast-iron pipe specifications, which has the great merit of combining two "standard" specifications in one. All other committees of the two associations, created with the same general objects in view, might get together in like manner. This should be kept in mind at the meeting of the New England Water-Works Association at Hartford, next week.

What Next with Cast-Iron Pipe Specifications?

THE next move in the users-against-maker's deadlock over cast-iron pipe specifications, dealt with at length in *Engineering News-Record* of May 31 and July 19, falls to the New England Water-Works Association What that move should be depends largely upon whether the manufacturers continue to try to block the game or come on the stage like good sports, discuss the recommendations of the majority of the joint committee on their merits and accept the outcome in a spirit of true coöperation. One thing is certain: A single standard specification there should be. The appointment of manufacturers on the committees of the two associations shows a desire on the part of those who use pipe and pay the bill to get the benefit of their viewpoint, but not to give them choice between dictation and veto. *Engineering News-Record* looks for a change of attitude, a willingness to discuss and coöperate, on the part of the pipe makers at the Hartford Convention.

A Heated Question— Crematory, Incinerator or Burnery?

THE Cremation Association of America is said to have "again protested" against the use of the words "cremate" or "incinerate" to denote garbage disposal by burning. It urges that both terms should be confined to the cremation of human bodies. When it comes to burning, what does any human body care what term is used to describe the process? If the association persists that this is no light matter, it may be replied that, whatever the name used for the process, the end result is ashes. If the association still persists against garbage men using either crematory or incinerator when it has the high-sounding term crematorium all to itself, then it should submit a substitute. Why not burnery?

Machines Dig Camp Water and Sewer Trenches

TRENCHING machines for quick work! That was the conclusion of engineers and contractors at many of the army cantonments where speed in a world contest was the first requisite. One engineer reported a round dozen trenching machines in use at a single camp with another dozen expected on the scene in a few days. Imagine how 24 trenching machines would make the dirt fly! The variety of trenching machines in use was a striking feature of trench work at another camp. Every trench machine maker is being given an unexcelled opportunity to show what his machine can do. Hundreds of engineers and contractors and public officials are watching the game. Results are being accomplished and mentally noted which are bound to increase the use of trench machines on all sorts of ditch digging in future sewer, water, gas, drainage and irrigation work. If anyone finds time to keep cost records, so much more to the good.

Getting Around a Footless Law

FOR some reason one of the statutes of the State of Ohio requires that on public work bids must be asked for under three contracts: One, for furnishing all labor; two, for furnishing all materials; three, for furnishing both material and labor. For building work where a great number of appliances and fittings are used, there is a remote chance that this might effect some saving in eliminating contractors' profits on purchased material, but on engineering structures any attempts to separate labor and material will probably fail. Certainly few contractors would care to submit bids on labor and material which would add up to their bid on the total, even in the doubtful contingency that the dividing line between the two were well defined under the law. In one case, at least, the authorities recognize the futility of the law. The current advertisement for the new bridge at Akron is accompanied by a statement of the prosecuting attorney of Summit County to the effect that contractors on public work in Ohio are in the habit of bidding the same amount on

all three contracts. They are, then, according to the attorney, certain that if their bid is accepted it will be a bid for the material after it has been placed in the structure by means of the labor expended upon it, and the statement adds: "This method has been frequently followed and no objection has been taken to it."

Wanted—Hydraulic Data on Baffled Flow

OPERATORS of water-purification plants having highly baffled basins and also of sewage tanks with baffles and unusual-shaped courses of travel are finding that the designers' estimates of flow are not always realized. In the Baltimore sewage tanks the baffles are flooded out, and in the Cleveland water-purification plant the chemical-mixing baffles reduce the head so much that at least half of the number have been removed. A novel way out of the difficulty for a small plant was evolved at Napoleon, Ohio, by Clark & Goodwillie, of Toledo. Motor-driven ship propellers in a bell-mouth pipe were used to force the water backward from the forward compartments. About three times the nominal amount flowing is so moved, two or four compartments being used. Mr. Goodwillie states that the scheme works perfectly in a small plant, but he has grave doubts as to its practicability in a large one. Experiments on a small scale can be made at such testing stations as the one recently put into operation at the Detroit water-works, but operators in charge of large units where any unusual hydraulic conditions exist have an excellent chance to extend the engineers' fund of hydraulic information.

Henry Ford, the Road Promoter

THOUSANDS of acres of rich farming land in sections of Kentucky, Tennessee and West Virginia and some of the other southern mountain states are even today as absolutely inaccessible as they were when the country was settled 150 years ago. It is almost impossible to go east or west across the states of either Kentucky or Tennessee in a road vehicle. The chief concern of the state highway officials of these states is to interest the people in road improvement, for, once out of the urban valley sections, there is no road improvement sentiment. The mountaineers are content to exist just as they and their ancestors have existed for a century and a half ago. A great deal of good has been done by the Dixie, Jefferson and Jackson Highway associations in arousing local interest in getting a much advertised through route. But even the work of these associations would have amounted to little had it not been for Henry Ford, manufacturer of cheap automobiles; for local highway officials state that it was not until "flivvers" began to be owned and used in the mountains that the necessity of passable roads came home to the natives. Till then a pair of mules and a dilapidated wagon hauled over the stumps in the woods formed the only means of transportation which many of the natives had any knowledge of and certainly any experience with.

Much glory has been given this or that individual as the father of the good roads movement and as the original promoter of improved highways, but to Henry Ford belongs the honor and glory of having furnished the only good roads argument which hundreds of thousands of people in the backwoods sections of the country are capable of absorbing.

Illinois Public Works Not Headed by Engineer

OPPORTUNITY to place an engineer as head of the new Department of Public Works and Buildings was lost in the recent reorganization of the governmental administration of Illinois. This department has to deal essentially with engineering work. The advisability and advantages of appointing an engineer as the director of the department were presented to Governor Lowden, but he selected a lawyer for the position. It is no disparagement to the best of lawyers to say that they lack the technical knowledge necessary for the most efficient administration of such a department. A lawyer may have plenty of engineers under him, but their expert advice and recommendations are subject to the control of his inexpert knowledge and opinions.

Apparently the Governor held the antiquated and obsolete notion that the engineer is a super-hired-man employed to make calculations and plans, and to supervise work under construction. It is unfortunate that the Governor did not see that the engineer is by training and experience specially qualified for executive and administrative duties. Not every engineer, of course, has these particular qualifications, any more than every lawyer is qualified to be a judge. But there were plenty of engineers available who were competent to fill this position with benefit to the state.

War Upsets Utilities Appraisal

THE valuation of water-works and other public utility property has been demoralized by war. The actual value of the plants themselves has not been upset—that is to say reduced—but once accepted processes of finding out what that value is have become of uncertain worth.

Valuation of physical property has been based on, among other things, an inventory of tangible assets, a list of unit prices prevailing for the previous five or ten years, and judgment of the weight to be given to the product of these two factors. In the past two or three years the whole fabric of unit prices has been torn to shreds, and the foundations of judgment have been upset. While old economic and industrial conditions have been overturned, we have not yet established a new order. To illustrate, the cost of cast-iron pipe reflects the enormous demand for iron and steel products for munitions and ships. Cast-iron pipe will not always cost as much as it does now, but probably it will not return to its former basis for many years. Railways and industries have curtailed their demand for iron and

steel, but with the return of peace they will come into the market heavily to satisfy accumulated needs, and this will tend to prevent a rapid descent of prices.

The minimum below which the appraisal figure cannot descend seems to be fixed, for a long time to come, as a figure based on prices prevailing at the outbreak of war. The maximum above which the appraisals cannot rise may possibly be found if the Government continues its price-fixing far enough to cover the item of labor. What figure between these limits will be acceptable depends on whether "value" is defined as a rate basis or as a condemnation price, on what local conditions affect the claim of the owners to unearned increments, etc. The safest procedure at the present juncture seems to be to take the value based on prices at the outset of the war and to increase this value as judgment indicates will allow an approach to the stable basis of new peace prices. It must be recognized, however, that at best such appraisals must be uncertain. The situation calls for a tolerant spirit in all dealings between utilities and commission representatives of the public.

How Water-Works May Raise Trees as Well as Supply Water

THOUSANDS of acres of land are owned by the water-works of the country for the sanitary protection of their water-supplies. The area should be increased many-fold. Such lands produce water, but with notable exceptions they yield no crops. Cultivation of these water-gathering grounds would be objectionable for obvious reasons, and from the nature of the case would often be impracticable.

There is one crop that can be raised on water-works drainage areas without cultivation and with benefit rather than injury to the water-supply. Moreover, it is a crop requiring so long a period for its maturity as to make it far more practicable for a municipality or private corporation than for individual land owners. And it is a crop in constant and increasing demand at rapidly mounting prices. Trees, we hardly need say, are this crop.

The country over, a goodly number of water-works have gone into forestry. Some are making improvement cuttings, some are planting waste lands and others are doing both. In reforesting, considering both the number of water-works engaged and the magnitude of some of the operations, it is not surprising that New York State leads, for its Conservation Commission has been supplying nursery stock to all applicants at cost for half a decade and New York City has been reforesting its water-gathering grounds on a large scale. A summary of New York State operations in which the Conservation Commission has coöperated appears on page 463 of this issue. That New York State may soon be outdone by Pennsylvania, at least in number of water-works engaged in reforesting, may be seen by the statement in *Engineering News-Record* of May 10, 1917, page 297, that as a result of a campaign begun this year by the commissioner of forestry of that state, 26 water-works had put in orders for 446,000 seedlings to be supplied from the state nursery.

The Massachusetts Metropolitan Water District has done notable work in reforesting for a number of years past. Recently, the Baltimore Water Department has entered upon like work on a large scale. Among private corporations, the New Haven Water Co. has done much creditable work, both in reforesting and improvement cutting. It has a forestry department which devotes itself solely to growing and marketing trees. According to a paper by Prof. J. W. Toumey, director Yale School of Forestry, published in the *Journal* of the New England Water-Works Association for June, 1917, the New Haven Water Co. has a fixed policy of planting 250,000 trees a year and since it began collecting accurate data, nine years ago, has spent $37,000 on forestry work and is $9,000 ahead, after paying all expenses. From the discussion following Professor Toumey's paper, it appears that two other New England water-works, Holyoke, Mass., and Nashua, N. H., are alive to the benefits of forestry. In each case, the improvement of existing forests affords winter work for water-works employees who would otherwise be idle or forced to look elsewhere for employment. The various forestry operations of the Pennichuck Water Co. of Nashua were described and pictured in an article in *Engineering News* of Sept. 7, 1916, page 472. The examples of forestry work cited are only some out of many that might be named.

Although the direct money returns from reforesting are long deferred the first cost is small, the annual charges during the non-productive period are trifling and the ultimate revenue highly promising—especially in view of the rapid increases in the price of timber.

Almost immediate benefits come from reforesting. The surface of the land is protected from erosion, which alone would be of immense benefit in vast areas of the country. The seasonal run-off is equalized—however much or little floods may be lessened and the total water yields affected.

The choice of trees and methods for forestry work depends largely upon local conditions, demanding intelligent study. This need scare no community or water company from taking up forestry. Besides consulting and practicing foresters, there are in many states efficient forestry departments, eager to give advice or more substantial aid. The U. S. Forest Service stands ready to help in various ways. There are also a number of schools of forestry whose services may be enlisted, and there are books which may be had for a trifle and bulletins for the asking.

A more fascinating study and a more pleasureable occupation than forestry is hard to find. To the municipality or water company owning or whose founden duty it is to acquire forested or forestable lands, growing tree crops deserves the most careful consideration—all the more careful in these days of decreasing timber and of increasing attention to everything that will protect and conserve public water-supplies.

New Jersey's Big Cantonment City Will Have Surface Water Supply



Fine Sand and Clay at Camp Dix an Objection to Wells—Pumping Plant Feeds Three-Mile Force Main—Both Cast-Iron and Wood-Stave Pipe Are Used—Many Trenching Machines at Work

By ROBERT K. TOMLIN, Jr.
Managing Editor, "Engineering News-Record"

A SURFACE-WATER supply, instead of a ground-water supply such as is being installed at most of the other fifteen cantonments for the National Army, is the outstanding feature of the Camp Dix project at Wrightstown, N. J. When the plans for the camp were in the formative stage the intention was to secure water from artesian wells, but a careful study of ground-water conditions by Hazen, Whipple & Fuller, who were retained by Col. Harry O. Williams, Constructing Quartermaster, as engineers for the camp water-supply and sewerage work, led to the decision to take the supply, for the present at least, from Rancocas Creek through a cast-iron force main 17,000 ft. long to a point from which the distribution to the barracks and other buildings could be made through a system of wood-stave and cast-iron mains. As the camp site is elevated, the pumping lift is about 280 ft.

A Real Water-Works Problem

To one who has not visited any of the cantonments now under construction, the term "camp water supply" belittles the work that is being done. It suggests some makeshift project, requiring little, if any, real engineering—a job which any handy man can do. To gain a true perception of the water-supply problem, it must be realized at the outset that the so-called National Army "camps" are, in fact, full sized cities. When construction is finished, Camp Dix, for example, will need water for about 40,000 men and 25,000 animals. There will be block after block of wooden barracks, lavatories, administration buildings, storehouses, and various other structures all equipped with up-to-date plumbing fixtures, and requiring water for fire protection. The engineer's estimate placed the average daily consumption at 2,500,000 gal., but the system is designed for a peak load at the rate of 7,500,000 gal. daily for short periods. As far as the water supply is concerned, therefore, one must think, not in terms of the old town pump, but of municipal water-works on a large scale.

Fine Sand An Objection to Wells

Although the camp site is located on sandy soil, with water obtainable from deep wells, the sand is very fine, having a size of only about 0.11 mm. and is cut by bands of impervious clay and marl. This condition, Mr. Hazen concluded, would be unfavorable for a ground-water supply, inasmuch as the fine material would seriously impede the underground flow to the wells during periods of maximum draft. At Camp Upton, N. Y., described in *Engineering News-Record*, Aug. 23, page 340, the Long Island sand grains are of much larger size than those at Camp Dix, and conditions for a



FIELD SHED UNDER WHICH PLUMBERS THREAD PIPE AND ADJUST HOUSE CONNECTIONS



BUILDING SETTINGS FOR BOILERS AT THE MAIN PUMPING STATION ON RANCOCAS CREEK

Installing the Water-Supply System at Camp Dix, N. J.



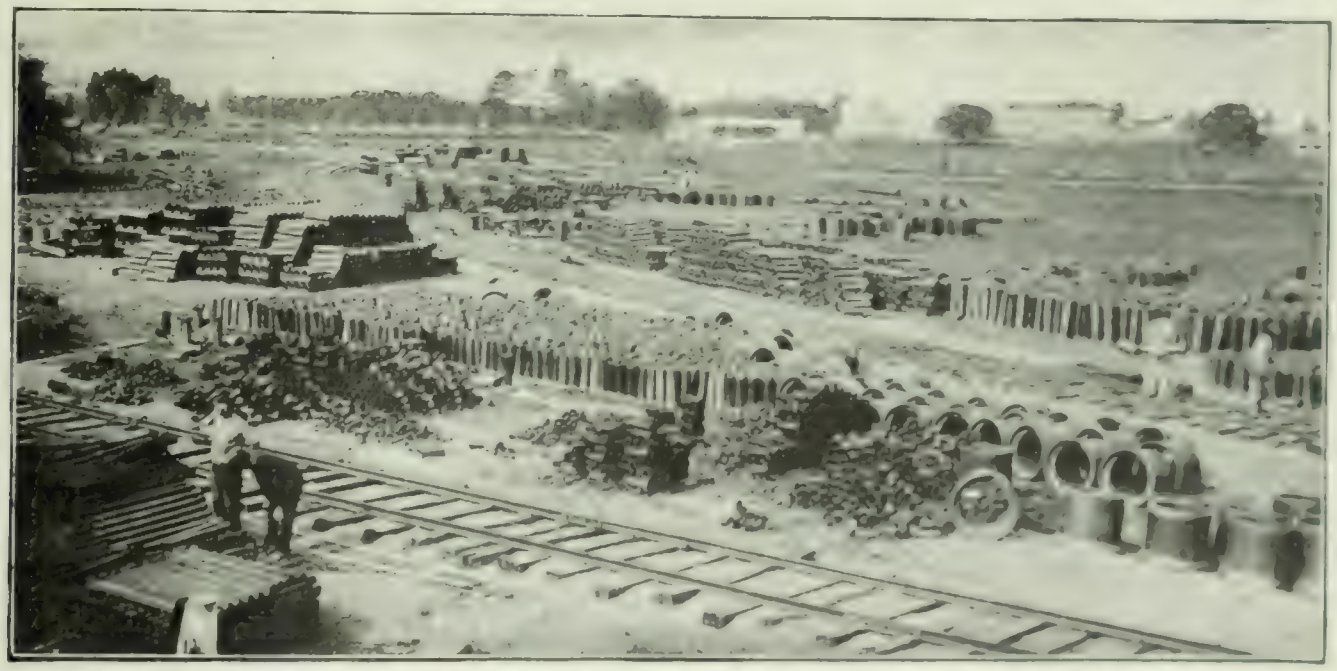
CAST-IRON FORCE MAIN WHICH CARRIES THE MAIN SUPPLY



ALLEN HAZEN (RIGHT) AND HIS PARTNER, WESTON E. FULLER, WHO ARE IN CHARGE OF ALL WATER-SUPPLY AND SEWERAGE WORK AT CAMP DIX



MANY TRENCHING MACHINES ARE USED ON THE WORK



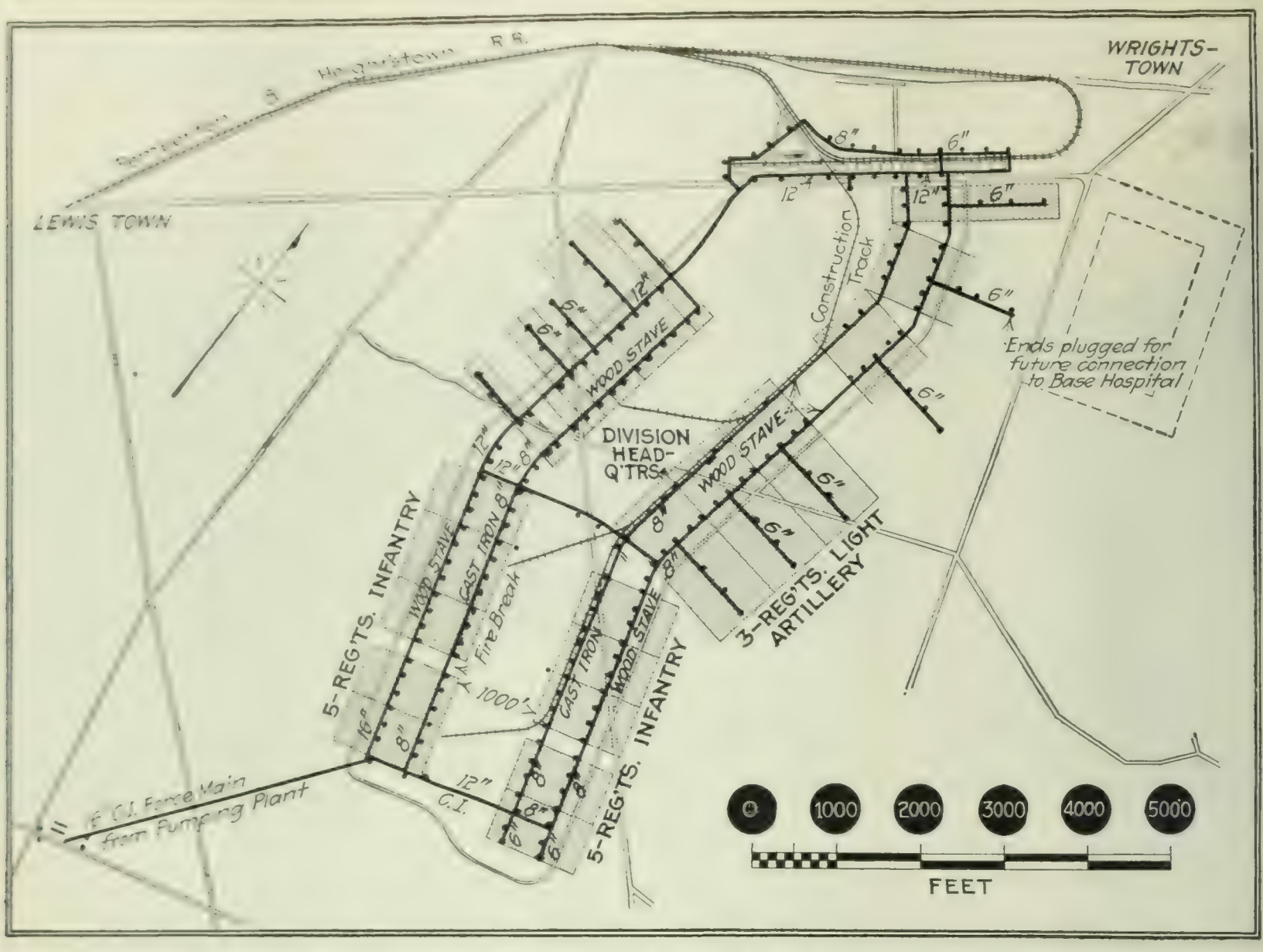
TILE PIPE FOR THE SEWERAGE SYSTEM, AND CAST-IRON AND WOOD-STAVE PIPE FOR THE WATER-SUPPLY ARE UNLOADED AT A STORAGE YARD NEAR THE RAILROAD SIDING



PIPE LAYING FOLLOWS CLOSELY AFTER THE TRENCHING MACHINE



THESE [illegible] ARE FOR TEMPORARY USE [illegible]



CAMP LAYOUT, SHOWING THE WATER MAIN CONNECTIONS

ground-water supply are almost ideal. Then, too, the time element at Camp Dix was a consideration of prime importance. Troops were scheduled to arrive early this month, and the water supply had to be ready for them. Artesian wells would have to be several hundred feet deep to strike suitable water-bearing strata, and much time would be required to drive them. Information as to the required depth was furnished by State Geologist Kummel, who has for years collected data in regard to New Jersey wells, and his judgment has been confirmed by one test well authorized at the start and which has not yet reached its full depth.

Water-Works of Simple Design

Simplicity is the essence of the water-works design at Camp Dix. The intake at Rancocas Creek is merely a short length of pipe extending into the suction well of the pumping station. No diverting dam or other elaborate structure is required. The pumping station comprises duplicate boilers, and three centrifugal pumping units, each with a capacity of 1,500,000 gal. per day. These pumps, as previously noted, deliver into a 16-in. cast-iron force main, 17,000 ft. long. This connects with the distribution system, consisting of four main lines with various branch lines and cross connections, the pipe ranging from 6 to 16 in. in diameter, extending through the camp site for a distance of about 2 miles. At the further end, at one of the highest points in the camp site and about 5 miles from the pumping station, is an elevated steel tank holding 200,000 gal. A Venturi meter will record the flow at the pumping station and liquid chlorine apparatus of the Wallace & Tiernan type will be installed to sterilize the raw water, although the drainage area of the creek, about 72 sq. miles, is nearly uninhabited and the chances of pollution are small.

Both Wood-Stave and Metal Pipe Used

Although the original intention was to use wood-stave pipe exclusively for the water-works system, delays in delivery of this material, which was shipped from the Pacific Coast, made it necessary to purchase supplies of cast-iron pipe in local markets, in order not to delay the work. The wood-stave pipe is now being received and laid. The regular procedure on the cantonment contracts is for the larger supplies to be purchased through a central bureau in Washington. When wood-stave pipe failed to arrive, the Washington authorities ordered cast-iron pipe from various foundries. Specials and other supplies were ordered in part in the same way, but as the work has proceeded such supplies have been located by the engineers wherever they could be purchased for the quickest delivery. Some of the pipe that is used is pipe that has been rejected for minor defects by certain city water-works departments for which they had been made and has been accepted for the camp work where it was essentially sound and suitable for temporary service. In one case a special lot of pipe was purchased at considerably less than the usual rate.

There is nothing special about the laying of the cast-iron mains unless it be that practically all of the trench



JOINTING THE 16-INCH FORCE MAIN

work is done by machine. There are a number of Parsons, Austin, and Buckeye outfits on the work of trenching both for water main and sewers. The minimum earth cover over the water mains is 3 ft.

How Wood Pipe Is Laid

The wood pipe is from 6 to 16 in. in diameter. It is laid in a trench only slightly larger than the pipe, some places not more than 4 in. wider than the normal diameter of the pipe. The joints are made by driving the spigot end into the wooden socket which is made like the pipe, being wound with wire. Before driving the pipe a wooden plug is placed in the open end so as to protect the pipe. The driving is done by two men swinging a heavy log used as a maul. The men stand above the trench with ropes attached to the maul and swing it back and forth several times before striking the plug in the pipe. The operation is repeated until the shoulder of the spigot comes home on the socket.

Connections with the hydrants and at the junctions of pipe lines are made by using ordinary cast-iron specials, into the ends of which are placed special bell and spigot pieces of cast-iron pipe about 2 ft. long. The bells on these pieces have straight and smooth sides to receive the spigot of the wood pipe. Special precautions were taken to have these bells true to size and shape and smooth; graphite is used on the cores in order to secure a smooth surface.

Service connections are made by inserting into the wood an ordinary corporation cock made with a wood thread. Several bends are placed on the service pipe immediately following the corporation cock in order to give flexibility and to prevent contraction or movement of the service pipe disturbing the joint between the corporation cock and the wood pipe. Slight curvature of the lines is made in the wood pipe bends; where greater bends are required, cast-iron specials are used.

The entire water-works system will require about 90,000 ft. of pipe 6 in. and larger, of which approximately two-thirds will be wood-stave and one-third cast-iron. Connections between the wood and metal pipe will be made by a special casting about 24 in. long. All of the stave pipe is of redwood from the State of California, and is wire wound at the point of manufacture. There will also be about 8500 ft. of galvanized steel pipe 2 in. and smaller for service connections.

As a measure of protection in case of fire, and for meeting conditions of maximum consumption, an auxiliary pumping plant has been established on the camp grounds. It consists of two centrifugal pumps and three wooden tanks each of 200,000 gal. capacity. The tanks are elevated and occupy a small knoll, which is the highest point of the area to be served with water.

This system will not ordinarily be used, but is held for emergencies. The tanks are not high enough to give a working pressure, but in case of need the pumps will be started and the water held in reserve forced into the pipes.

Personnel

Assisting Mr. Hazen in the design and supervision of the Camp Dix water-supply and sewerage work, is his partner, Weston E. Fuller, who is acting as resident engineer on the work, supported by a corps of assistants recruited from the New York office of the firm and elsewhere, and including several experienced water-works men who are glad to do their bit in this way. Colonel Williams, Constructing Quartermaster, had general supervision over the entire camp construction project up to Aug. 22, when Capt. T. H. Skinner, his able principal assistant, succeeded him.

Gives a New Method of Making Right-of-Way Computations

By P. E. Stevens
Consulting Engineer, St. Paul, Minn.

In the issue of July 12, 1917, p. 84, a long table is published as a shortcut for finding the length along the right-of-way line, where the corresponding length along the center line is known. This is doubtless quicker than the old method cited (I have never tried this old one) but why use any such "old method"?

If D is the distance along the center line of the curve, A the angle of deflection in degrees between the tangents at the two ends of D, and O the offset to the right-of-way or other parallel line, then the distance along said parallel may be found from the following formula:

$$x = D - \frac{\pi AO}{180} \quad \frac{AO}{57.2958} \quad 0.0175AO$$

Applying this to the example given by Mr. Sanow, we have the following data: $D = 254.9$, $A = 12.103$, $O = 33$ ft. Substituting,

$$x = 254.9 - \frac{12.103 \quad 33}{57.3}$$

and by using a 10-in. slide rule we find (in about 30 sec.)

$$x = 254.9 + 6.97 = 261.87$$

or

$$254.9 - 6.97 = 247.93$$

Comparing this with the result obtained by your correspondent, we find a typographical error. Investigation shows that the value of x does not agree with $\log x$, and should be 261.872 instead of 261.787 as given.

It will be observed that the formula given here does not contain the radius of curvature. It therefore applies without modification to any curve of any radius or any combination of compound or reverse curves, or to curves connected by easements or by intermediate tangents, or to distances measured partly on tangent and partly on curve. Moreover, this formula can be solved in about forty-five seconds with a 10-in. slide rule, giving in most cases two decimal places.

Filtration Controls Typhoid at Niagara Falls

Mechanical Filters and Hypochlorite Reduce High Typhoid Rate to Minimum and Save $500,000 Yearly

By Charles B. Burdick
Of Alvord & Burdick, Sanitary Engineers, Chicago

In a long list of discreditable typhoid records, that of Niagara Falls, N. Y., in times past was one of the worst. Since the introduction of water filtration in 1912, typhoid practically has been eliminated. The raw water is so heavily polluted and the benefits from its purification have been so marked, that it will be worth while briefly to record the conditions that surround the problem, the degree of the pollution, and a measurement of benefits brought about by filtration and chlorination.



THE POINTS SHOWN ARE LOCATED 5 TO 20 MILES ABOVE THE WATER INTAKES OF NIAGARA FALLS

To the casual observer, the pollution of the Niagara River is not evident. Generally, the water has a good appearance. It is only turbid after protracted gales on Lake Erie. It is, however, more heavily polluted with fresh sewage than any other water upon the Great Lakes system, and there are few places in this country, if any, where water of heavier contamination is purified for the supply of a municipality.

The City of Niagara Falls is supplied by two water-works systems, both deriving their supplies from the river. Both plants treat the water by mechanical filtration, and both filter plants went into service in the year 1912. The greater part of the city is supplied from the municipal plant, the intake for which is well above the city. (See map.) The water is taken out 2000 ft. from shore, substantially in mid-stream. The New York Water Co. draws its supply from a power canal near the center of the city. Both intakes are above the outlets of the local municipal sewers.

Extent of Pollution

Within twenty miles upstream from the intakes, the sewage from nearly half a million people reaches the river. The average flow of the Niagara River is some 210,000 sec.-ft. or about 470 sec.-ft. per 1000 population. From the nuisance standpoint the pollution is negligible. The time of travel from sewer outlets to water intakes averages less than 24 hours, and the filters doubtless handle a very large number of dangerous germs.

As would be expected, the heavy pollution is evident in the analyses of the raw water. The International Joint Commission, in its progress report of 1914, on the pollution of boundary waters, contains a series of observations upon this water. Below Buffalo, and above the Falls, the pollution is quite variable, and, although heavy everywhere, it is not evenly distributed, but varies in intensity and in location, depending principally upon the wind, particularly the Lake Erie storms.

For comparative purposes, the Commission has compared the polluted waters by the so-called Phelps method, the principal basis of comparison being the number of B. coli per 100 c.c. of water. In the vicinity of the Niagara Falls intake, B. coli is always present in numbers ranging from 150 to 20,000 per 100 c.c. Probably the heaviest pollution generally passes between the intake and the shore, for it nearly all reaches the river on the American bank, and the sewage evidently is not very thoroughly mixed with the water until after passing the falls and the rapids below the water-works intakes.

Water-Filtration Plants at Niagara Falls

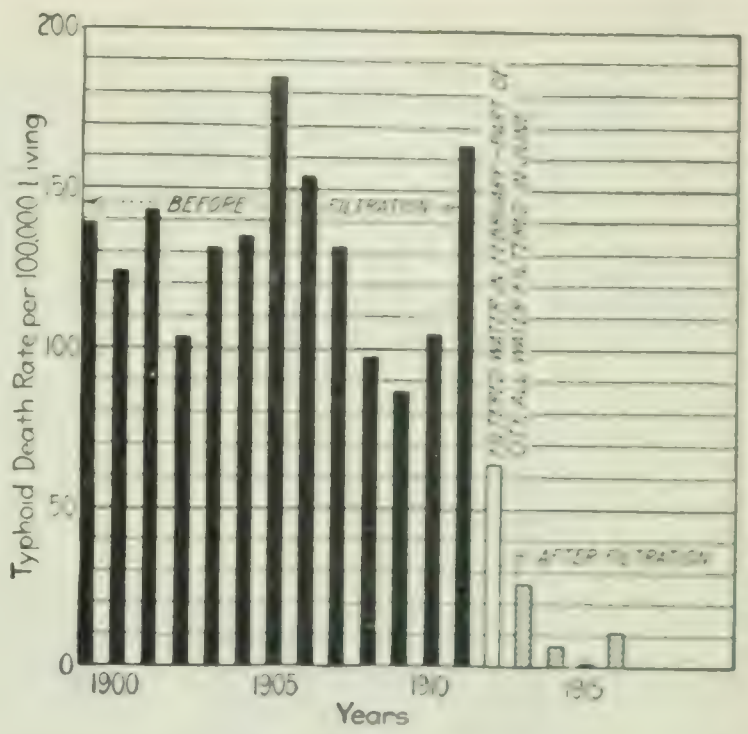
There is nothing out of the ordinary in the water-filtration plants that have accomplished the great typhoid reduction at Niagara Falls. Essentially, they are similar to the modern gravity mechanical filtration plants that have been so successfully applied to American waters during the past fifteen years.

The municipal plant has a capacity of 16,000,000 gal. per day, and is operated very closely to its rated capacity. The tremendous use of water is in part accounted for by the very heavy industrial consumption in the electro-chemical works utilizing the available cheap electricity. No doubt there is also a very large waste. The water is treated with sulphate of alumina and subsided for an average period of three hours, treated with hypochlorite of calcium, filtered, and then pumped to the distribution system by direct pressure without exposing the water to the atmosphere. The plant was built by the Norwood Engineering Co., Florence, Mass., under the advice of Alvord & Burdick, consulting engineers. W. D. Robins was resident engineer for the Water Board during construction. The plant is operated under the direction of a resident bacteriologist and chemist.

The filtration works of the New York Water Co. are similar to those of the municipality. The water is treated with alum and hypochlorite. The filters are of the reinforced-concrete gravity type.

The typhoid statistics speak for the result of water filtration. For more than ten years prior to 1912, there had never been less than 22 and from that to 55 deaths per annum in a city which grew from 17,000 to 33,000 in population during the period before the introduction of filters. The average typhoid mortality for the period 1899 to 1911 was 131 per annum per 100,000 living population.

The entire city was not supplied with filtered water until the middle of 1912, but the effect upon the typhoid death rate was immediate (see diagram). In 1915 there was not a single death from typhoid fever in the City of Niagara Falls. No deaths occured in 1917 up to May. In the four years following filtration, the average death rate has been 11 per 100,000 of people living. Half of these deaths occurred the first year after filtration was installed. In the past three years there have been eight deaths, which is an average mortality of 5.3 per 100,000 of living.



FILTRATION AND HYPOCHLORITE SENT TYPHOID WAY DOWN AT NIAGARA FALLS

Results Expressed in Money

With the present population of 50,000, and the typhoid death rate for four years preceding filtration (113), there would be an average of 57 deaths per year. The average number of typhoid deaths in the present city of 50,000 people since the installation of filtration, has been a fraction less than six, thus effecting a saving of 51 lives per year, which, at $10,000, would amount to $510,000 per year.

Oregon Will Limit Use of Water for Irrigation

Following Engineering Advice State Water Board Correlates Use of Water with Actual Irrigation Conditions

By Percy A. Cupper
Assistant State Engineer, Salem, Oregon

In *Engineering News* of July 6, 1916, there appeared an article entitled "State Engineer's River Survey Guides Water Adjudicators," which was descriptive of a survey and investigation of Wallowa River and its tributaries. It was pointed out that the report based upon this survey and investigation could, and probably would, be the basis of the determination of the relative rights to the use of water.

At a recent meeting the board entered its findings determining the nature, extent and priority of all rights to the use of the waters of this stream. It is interesting to note that the engineering report was followed in practically every detail, notwithstanding that it called for what is believed to be an unprecedented limitation on the use of the water. It was found that rotation was practiced under the larger ditches, and also that the aggregate capacity of the ditches exceeded the flow of the stream during the irrigation season. To fix the head of water to be diverted would prevent the irrigators from continuing their present practice of irrigation, and would also prevent the use of the peak of the floods which required the maximum capacity of all ditches to handle.

In order to take care of this situation it was determined that not to exceed 1½ acre-feet per acre should be diverted during any period of 30 days prior to Aug. 1 of each year, and during the remainder of the irrigation season not to exceed 1 acre-foot per acre. This limitation is applicable to only a part of the stream system, most of the remainder being limited to 1 acre-foot per acre in a period of 30 days prior to Aug. 1, and 1 acre-foot thereafter; while from one stream of regular flow the rights are limited to 1/40 cu.ft. per second per acre. The irrigation season extends from May 1 to Oct. 1.

While this might seem to indicate a very low duty of water, very little use is made of the water during May except in unusual seasons. By fixing the maximum amount in acre-feet, greater flexibility is given to the distribution of the water by the administrative officials having this in charge. It is thus possible to utilize the full capacity of the ditches and make use of all water that is flowing in the ditches up to the full capacity of the canals. The use of water by rotation is also made possible.

This is the first decree entered by the State Water Board of Oregon in which a limitation has been placed on the quantity of water to be used in any period less than the entire irrigation season, except as it has been fixed by a limitation on the rate of flow. It is believed that the finding of the Board in this case has taken into account actual irrigation conditions to an extent not heretofore attempted. This has been made possible through the reliable engineering information secured, which goes to show the importance of accurate engineering data in the judicial determination of questions of this nature.

Nebraska Has State-Aid Road Plan

All the roads that are to be built in Nebraska in 1918 with the assistance of state and federal funds have now been located. The total estimated cost is $1,200,000 and it is expected that the state will be ready to award contracts in January. County-bridge contracts to be let in October aggregate $215,000, of which half will be paid by the state. Geo. E. Johnson, of Lincoln, Neb., is state engineer.

One Hundred Concrete Dwellings Built as One Contract Job

Standardized Designs, Steel Forms and Contract Methods Similar to Those Used on Large Construction Permit Completion of One House Every Three Days



EVER since Thomas A. Edison electrified the lay world a few years ago with the announcement that he was going to pour a concrete house complete in an hour or so, the possibilities of rapid and cheap group dwelling construction have had a popular appeal. Unfortunately, most of the efforts along this line have been little more practicable than was Mr. Edison's scheme, but in Donora, Penn., the Aberthaw Construction Co., of Boston, Mass, is now successfully completing for the American Steel and Wire Co., a group of concrete dwellings which are at the same time cheap, serviceable and of good appearance.

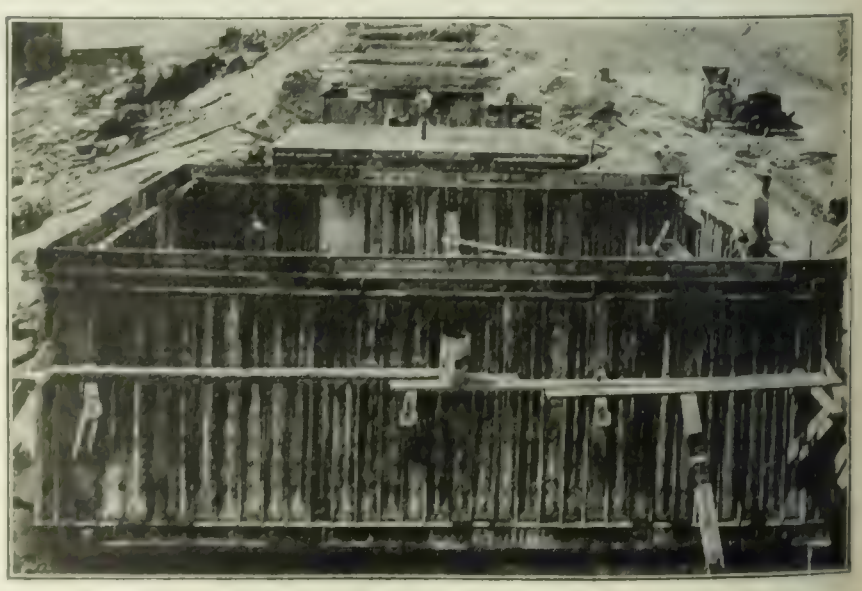
The success of the work is due primarily to the application of orderly contract methods to a design which was well worked out in the first place. The contractor did not come on the job until after some few houses had been completed, at great trouble and expense, by a contractor of less experience. So it is fair to assume that the methods now used are of at least as much importance as the original design. In fact, the contractor considers that in future developments changes in design could be profitably made.

Eight Types of House All Somewhat Alike

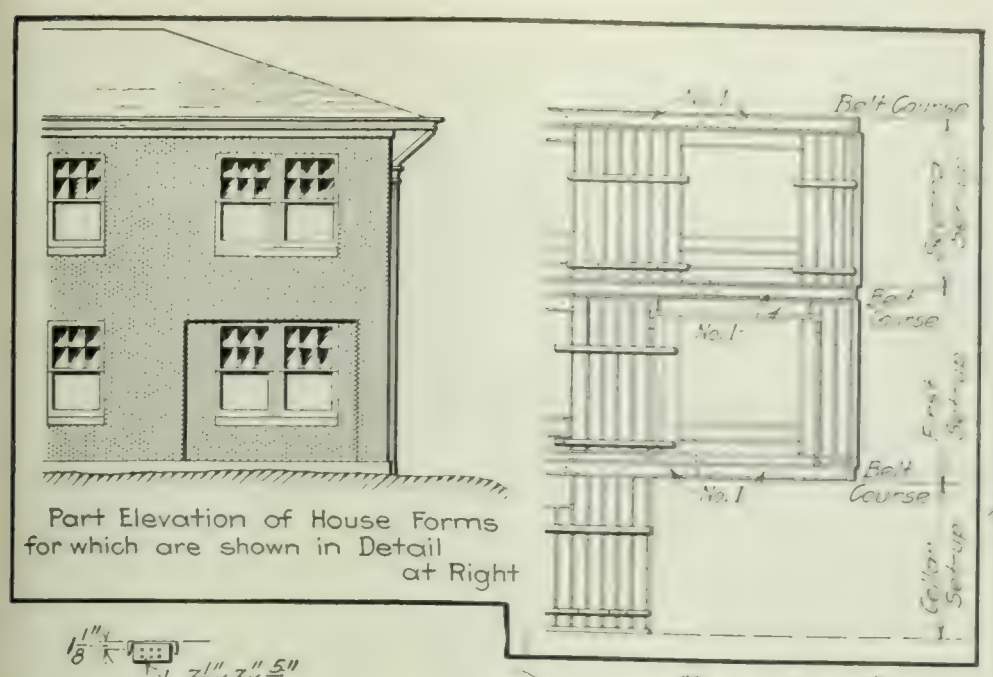
The site of the development is about 40 miles outside of Pittsburgh and is located on a steep hill above the Monongahela River. The property has been laid out into 156 lots, of which 100 are now being built upon and the remainder will follow next year. Grading was done and streets laid out by the American Steel and Wire Co., concurrently with the house building. The streets will all be paved with concrete, and granolithic sidewalks will be laid

The houses were designed by the Lambie Concrete House Corporation, of Boston, Mass. Eight different styles of houses are being built, containing some four, some five, and some six rooms, all with a bath and cellar. Of these, a few are being built in pairs with party walls, and the rest are all detached. The contract prices for a house complete range from $2000 to $3300, but such costs are based on prices of some time ago and can hardly be used for present comparison. The costs include gas furnaces and cooking ranges, electric lighting and the usual improved kitchen and bathroom equipment. The average floor area is 26 x 26 feet.

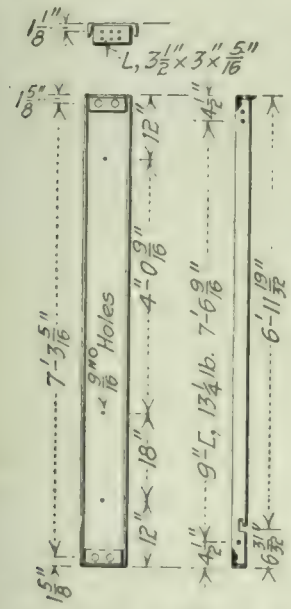
Typical house layouts are shown. They are all of the box type with 6-in. solid concrete walls reinforced vertically on both faces and horizontally on the outer face with straight rods, with an intermediate partition wall cutting down the floor spans to 12 to 15 ft. The floors are of the ribbed reinforced-concrete type, with the ribs or beams spanning between the outer and interior walls. These ribs are left exposed in the cellar, but in the other floors plaster board is nailed to strips left in the concrete and a finish plaster coat made. The buildings are finished at the top with a reinforced-concrete cornice in which a gutter is formed, and on top of the concrete ceilings a roof is built up of spruce framing covered with asbestos slate so that the whole



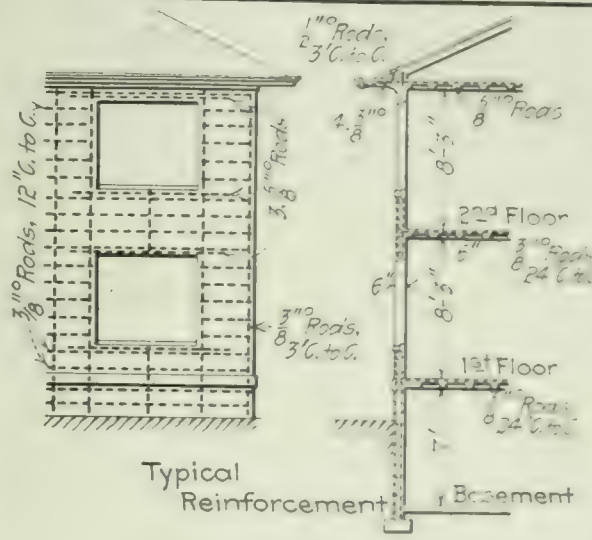
LOOKING UP A ROW UNDER CONSTRUCTION



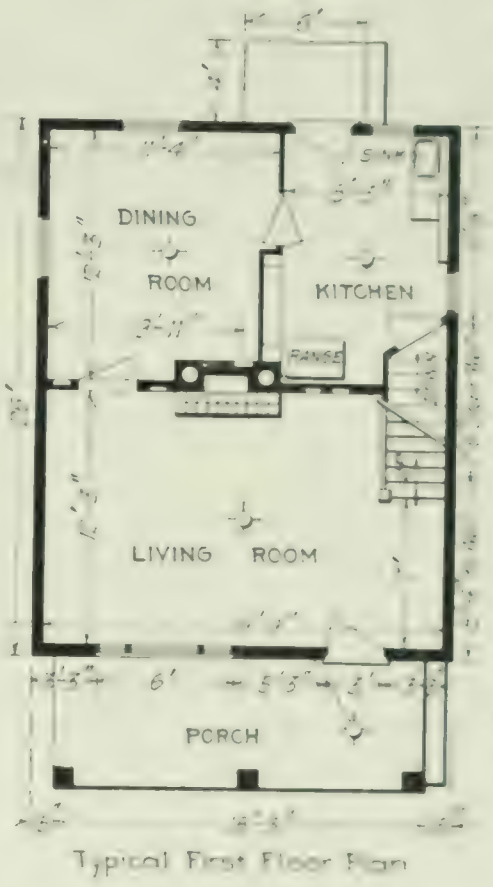




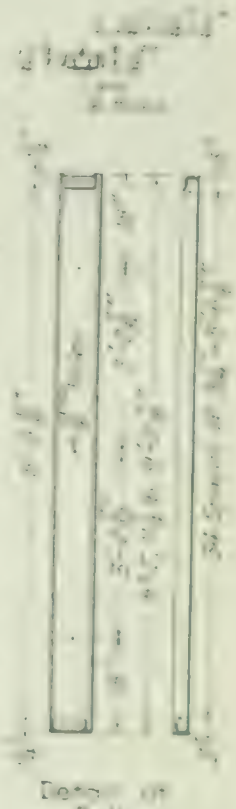
Detail of Plate No. 1



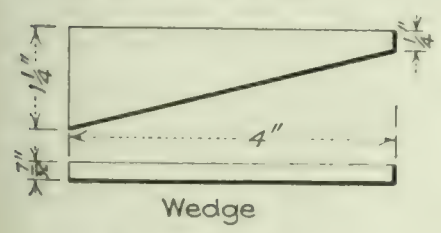
Typical Reinforcement



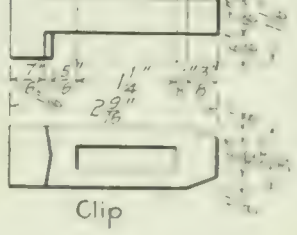
Typical First Floor Plan



Detail of Belt Course Form



Wedge



Clip

HOW THE HOUSES WERE DETAILED AND REINFORCED AND HOW THE STEEL FORMS WERE APPLIED

of the exterior of the building, with the exception of this frame, the wooden window and door frames, and wood stairs, is fire-resisting.

Special Steel Forms Effectively Used

An important factor in the effectiveness of the work is the forms. These are of the special steel channel type patented by the Lambie Concrete House Corporation. They consist of 9-in. channels set up vertically and connected together with clips and wedges passed through slotted holes in the flanges of the channels. At the corner of the building a 4 x 4-in. steel angle is set up, and the forms are lined up longitudinally by means of a steel channel used to form a belt course. This not only fastens the forms of the lower floor, but is bolted into the floor reinforcement and remains in place for a support for the second-story forms and is only stripped at the last when all the concrete is poured. The steel wall forms also support the floor forms, which are steel domes, arrangement being made by which the steel channels on which the domes are laid are bolted to the inner side of the steel wall forms. The cornice has to be built inside special wood forms supported, as shown in some of the views, by wooden struts reaching down to the belt-course channel form.

The cellars were excavated with a steam shovel which went down a street, taking out a strip the depth of the houses. The space between the walls of the houses is backfilled after the cellar walls are placed. The digging was in hardpan with some shale, but all of it was taken out by the steam shovel.

Forms Moved from One House to Next

The construction of the houses proper is done in groups, to fit the number of sets of forms, which are taken down as soon as possible and moved on to the next group.

The usual method is to set the forms for one story—wall and floor together—and then to pour the concrete for this section all at once. The progress of the job is limited by the setting of the concrete. To form, pour and strip each story takes about seven days. Working at this rate, the house of two floors and cellar is completely concreted in three weeks, and with the twelve sets of forms on the job, twelve houses are concreted in this period. After this the plumbing, heating, plaster-



FORMS ARE USED ON ONE ROW AT A TIME. CORNICES HAVE TO BE SUPPORTED ON STRUTS DOWN TO BELT FORMS

ing, roofing and finish are done, which take about five weeks more, so that the houses are being completed at the rate of twelve in the first eight weeks and twelve every three weeks thereafter.

During the months of May, June and July the progress made was as follows: 28 complete houses (counting double houses as one) were concreted in 12½ weeks, or at the rate of a house every three days. In the last month quite a number of houses were concreted very quickly—that is, from the day starting erecting basement wall forms on the footings, to and including the day the roofs were concreted. The last houses have gone up as follows: Two in 13 calendar days, one of which could have been done in 12, except for shortage of sand, 2 in 14 days, 5 in 15 days, 2 in 16 days, 2 in 17 days, 3 in 19 days, 1 in 20 days, and 1 in 21 days. Under ordinary conditions these houses could have been built with one set of forms.

Concrete Tower Replaced by Small Hoists

In the original contract for the houses, concrete was placed from a high stationary tower, with a chute. This proved inefficient, because of the number of moves that had to be made to control the whole housing area. There is so small an amount of concrete in each house, 125 cu.yd. on the average, and the houses are so scattered that the cost per yard of concrete was materially increased by the cost of the tower erection and construction. After a long study of different methods the Aberthaw company decided on small mobile concrete mixers, which could be placed alongside each house during concrete placing, and small hoists on each building.

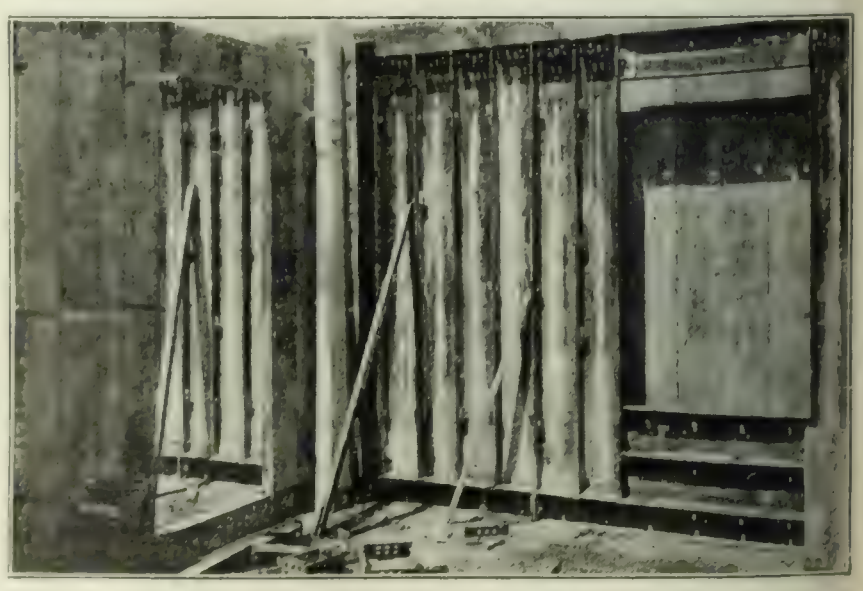
The plant consists of three Koehring "Dandie" one-bag gasoline-driven mixers, two of which are equipped with side loaders, three Sasgen circle swing derricks; two Novo gasoline-driven hoists, which control derrick and mixer. The slag aggregate, and sand, as well as the cement, are delivered to the mixer by means of a truck which brings the material from Aberthaw's unloading yard, located in the yard of the American Steel and Wire Company.

The Sasgen derrick is not used for pouring the basement and first floor, but is used for all concreting above that. It is bolted securely to the best course on one corner of the building, and the concrete is hoisted in concrete buggies or wheelbarrows. Better results have been obtained with the buggies than with the wheelbarrows. Each wheelbarrow has a hook bolted to the front end and is lifted by the derrick by means of three steel arms with rings on the ends, two of which hitch to the handles and the third into the hook on the barrow, so that it is lifted completely and level onto the floor.

How the Organization Works

The organization on the job is a superintendent, assistant superintendent, civil engineer, material clerk, two cost clerks, timekeeper, planning department and stenographer. The formwork is under supervision of one carpenter foreman, five squad bosses, two stripping foremen, two move foremen, one reinforcing steel boss, one finish carpentry boss, three concrete bosses and one excavation boss.

It was found advisable to have a squad boss in charge of the carpenters and helpers working on each house.



STEEL CHANNELS BOLTED TOGETHER USED AS FORMS

This boss has four carpenters and four helpers on the smaller houses; and on the large double houses, up to seven carpenters and seven helpers. The work has been most economically done when the carpenters and helpers worked in pairs—that is, each carpenter has a helper to assist him in moving the forms, etc. It will be noticed that the reinforcing steel boss comes under the carpenter foremen. This has been found desirable, as the steel must be placed rapidly whenever the carpenters are ready for it. The planning department on the job lays out progress each day for the next three days and shows which foreman is to erect forms on each house and which concrete gang will pour them.



ON LEFT, EARLY METHOD OF SPOUTING CONCRETE FROM TOWER. ON RIGHT, LIFTING CONCRETE BARROWS BY DERRICK ON HOUSE FORM

Five Carpenter Gangs Erect Forms

The number of men in a concrete gang varies from 13 to 15, according to the type of house and the amount of concrete to be poured. The number of gangs at work at the same time is five carpenter gangs erecting forms, two concrete gangs concreting forms, two stripping gangs stripping forms, one concrete gang concreting footings, pavings, porch floors, floor steps, chimneys, etc., one digging gang, and one finish carpentry gang, doing the furring, roof framing and roof boarding, erecting door and window frames, sash doors, inside and outside trim, stair laying, floors, etc.

On a large-type 6-room house group this force has taken approximately 1½ days to erect basement walls and first-floor forms, including all boxes, window frames, flues, etc. Concreting basement walls takes about 2½ hours, and 1½ hours to pour the floor. Stripping and erecting the basement wall forms on the first story takes 1½ to 2 days. The stripping of the first-story walls and erecting the second story and putting on the floor takes about 1½ days, but the putting on of the cornice is a slower operation and adds from half a day to a day to this. Concreting the walls takes about 2½ hours, and the roof about the same length of time.

Detail Costs Are Given

The steel reinforcement varies from 1½ tons in the smallest type of single houses to three tons in the largest type of double houses. The labor on wall steel has cost to date $11.90 a ton and the floor steel or beam steel $7.50 a ton. The cost of labor on wall forms to date has been $4.30 a hundred square feet and the stripping has been $2.10. This does not include the moving of forms onto the lots, which has cost about $55 per house, or about $1.25 per 100 sq.ft. of wall.

The quantities of concrete per house vary from 145 cu.yd. for the largest double house down to 85 for the smaller single houses. This includes all walls and floors, footings, pavings, porches and chimneys. At the present time it is costing about $2.25 per cu.yd. to place the concrete in the first- and second-story walls, which are 6-in. walls, and it costs the same for the floor slabs. The smaller houses have about 15 cu.yd. of concrete in the first- or second-story walls, and 6 cu.yd. of concrete in the first and second floors. The roof, including the cornice, has about 10 cu.yd. The cost of erecting the formwork, including handling, stripping and cleaning, is averaging about 50c. per sq.ft. As no lumber is required for the wall forms, this is doubtless considerably cheaper than work of this class could be done in wood.

Water-Borne Typhoid at Charleston

The water-supply of Charleston, W. Va., is held responsible for an outbreak of typhoid fever in that city in May and June, 1917, according to a report by Dr. A. W. Freeman, epidemiologist, U. S. Public Health Service, printed in *Public Health Reports* for Aug. 17.

Associated with Doctor Freeman in the investigation of the outbreak were Earle B. Phelps, professor of chemistry, and E. E. Smith, sanitary bacteriologist, U. S. Public Health Service, and Dr. H. B. Wood, assistant commissioner of health of West Virginia. From May 1 to June 25, typhoid cases numbering 127 were reported or discovered, of which 12 were diagnosed as typhoid by the attending physicians and seven as paratyphoid or probable paratyphoid. The only common source of probable infection was the public water-supply. Sections of the city supplied by private wells "were markedly free" from typhoid, as were sections which were "unsewered, and in which surface privies are common." The investigators recommended that a competent bacteriologist be employed by the city, that the operation of the water-works be put in his control, that coagulants be applied daily at the filtration plant and that the water be treated with about 0.5 p.p.m. of chlorine.

Large Blast Accurately Places 897,000 Tons of Rock

Proportioning a 48-Ton Explosive Charge To Shatter Quarry Face Deeply Without Loss of Material at Corona, Calif.

THE Temescal Rock Co., of Corona, Calif., in a single blast recently broke up 897,000 tons of rock for its crushing plant without losing any of the shattered material over the edge of the 100-ft. bench that serves as the quarry floor. This was accomplished by a system of tunnels so driven that charges of quick-acting explosive would throw out the toe of the quarry face before the force of the remainder of the 48-ton charge was developed. Thus a barrier was formed which served to retain the major portion of the shattered material.

The rock from this quarry is crushed for use in concrete and is an altered rhyolite of eruptive origin, very dense and hard. The formation was solid, the strata inclining into the quarry face at about 16°. Tests of quarry specimens showed a weight of 167 lb. per cu.ft. and tensile and compressive strengths 2245 and 39,500 lb. per sq.in. respectively.

Location of Charges

The duplicate tunnel systems were driven at the quarry-floor level, in each of which 18 explosive charges were placed. The tunnels were 3 x 3½ ft. in section and all powder pockets were of such size as to allow 1⅝ cu.ft. of space for each 100 lb. of powder in the charge. The tunnels were driven 140 ft. into the quarry face, and the charges were placed in drifts at right angles to the tunnels, as shown in the accompanying sketch. In the first, or outer, drifts the powder pockets were sunk 4 ft. below the quarry-floor level. In the second drifts the pockets were 2 ft. below the quarry floor, and in the third or last drifts the pockets were at quarry-floor grade.

The quantity and the grade of the several charges are given in the following table. Note that charges 13 to 18 consisted of the quick-acting explosive calculated to move the toe of the slope face first. The 60% powder is simply the priming charge.

QUANTITY AND GRADE OF BLASTING CHARGES

Load No.	Powder Charges Tunnel No. 1 Grade and Quantity 60%	40%	25%	Tunnel No. 2 Grade and Quantity 60%	40%	25%
1	50		4,150	50		4,300
2	50		3,650	50		3,850
3	50		3,800	50		3,900
4	50		4,450	50		3,550
5	50		4,050	50		3,300
6	50		4,750	50		4,150
7	50		3,250	50		3,100
8	50		3,100	50		2,900
9	50		3,200	50		2,950
10	50		2,950	50		2,700
11	50		3,100	50		2,800
12	50		3,350	50		3,200
13	50	550		50	900	
14	50	850		50	850	
15	50	800		50	800	
16	50	800		50	750	
17	50	850		50	700	
18	50	950		50	850	
Total	900	4,800	43,800	900	4,850	40,700
Grand Total		95,950 lb.				

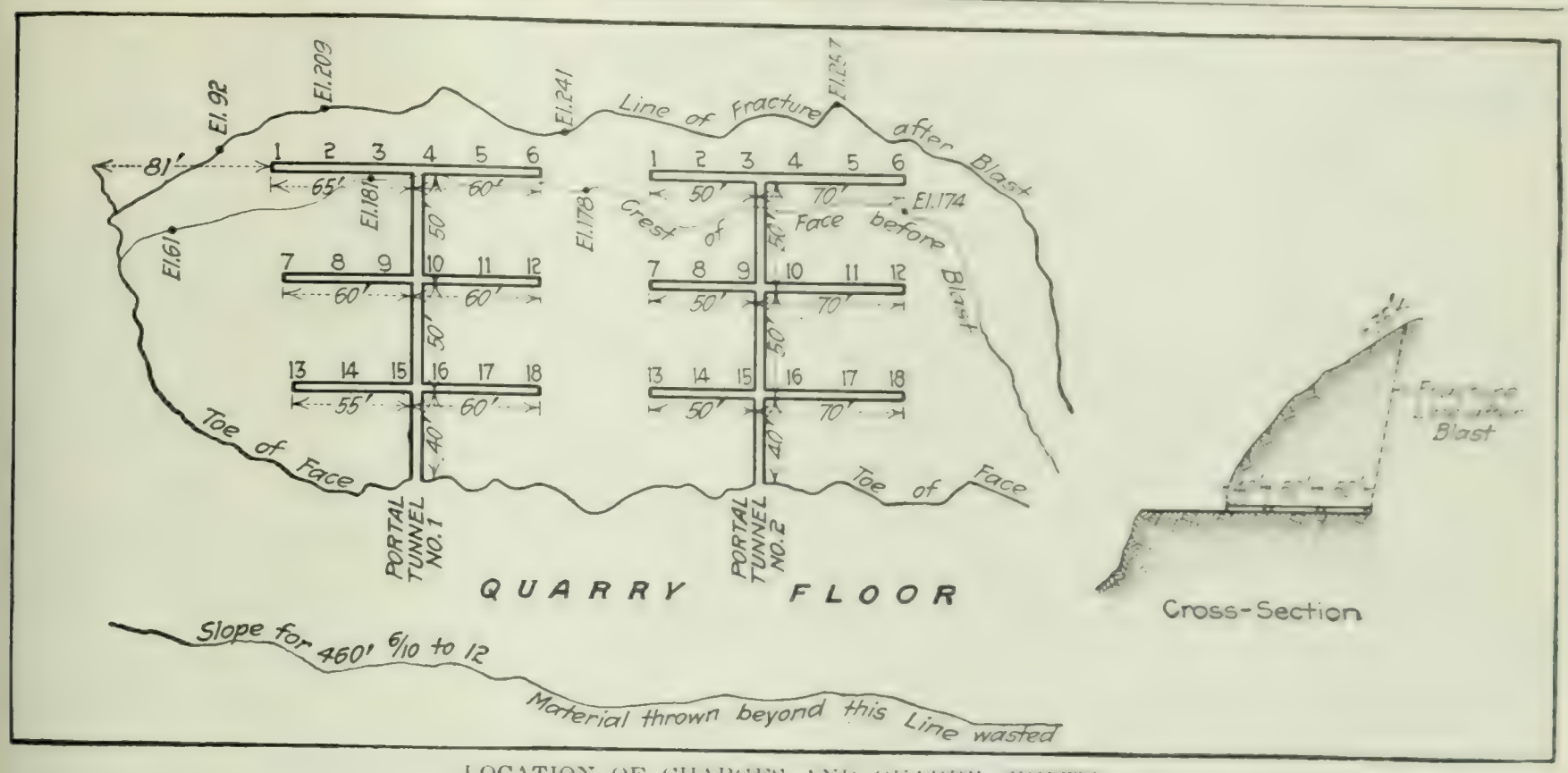
In firing these charges the detonator known as Bickford cordeau, which is chiefly trinitrotoluol, incased in a ⅜-in. tube, was used. A single No. 8 cap detonated all the charges simultaneously. This cap was attached to one end of the line of cordeau, which was strung through the tunnels, each branch terminating in a 20-ft. coil embedded in the charge.

Cost 2¼c. per Ton

Measurements of the slope after the blast led to the estimate that the 897,000 tons of rock had been shattered by the blast. So effective was the work of the powder that only a slight amount of secondary shooting would be required to prepare the rock for the crusher—probably about one ton of 40% powder for bulldozing each 100,000 tons of rock.



NO ROCK WAS LOST OVER THE EMBANKMENT DUE TO SPECIAL METHODS OF LOADING AND FIRING



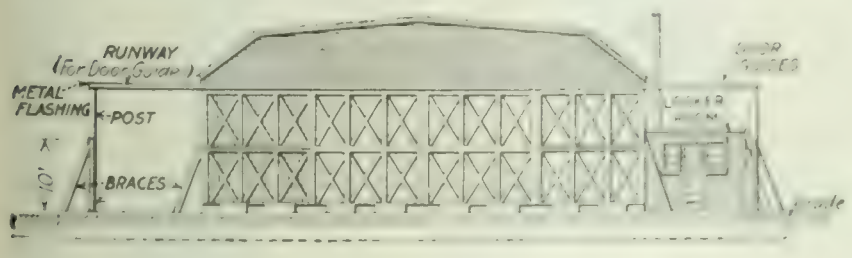
LOCATION OF CHARGES AND QUARRY CRESTS

The cost of driving 1000 ft. of tunnel at $5 per foot was $5000. The cost of the explosive was $14,808, to which was added $96.72 for 1860 ft. of cordeau. Loading, tamping and incidental expenses amounted to $603, so that the total cost of the blast was $20,508, or about 2½c. per ton. The tunnel work and the placing of the charges was done under the direction of J. C. Costello (who supplied the foregoing information) and J. C. Cushing, engineers for the California Trojan Powder Company.

Long Timber Truss Hangar Roofs Have No Knee-Braces

Airplane Sheds in United States Army Camp Require Special Details of Construction and Door Equipment

ROOF trusses of 66-ft. span, with no knee-brace connections to the columns, are used in the hangars or airplane sheds of the Selfridge aviation camp, near Mt. Clemens, Mich. These sheds must have all the clear



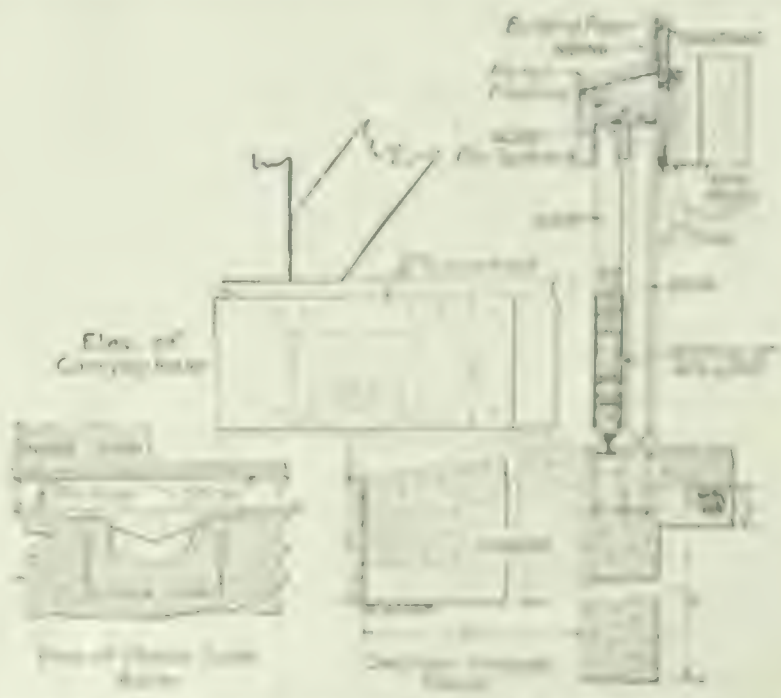
DOORS HAVE OVERHEAD GUIDES

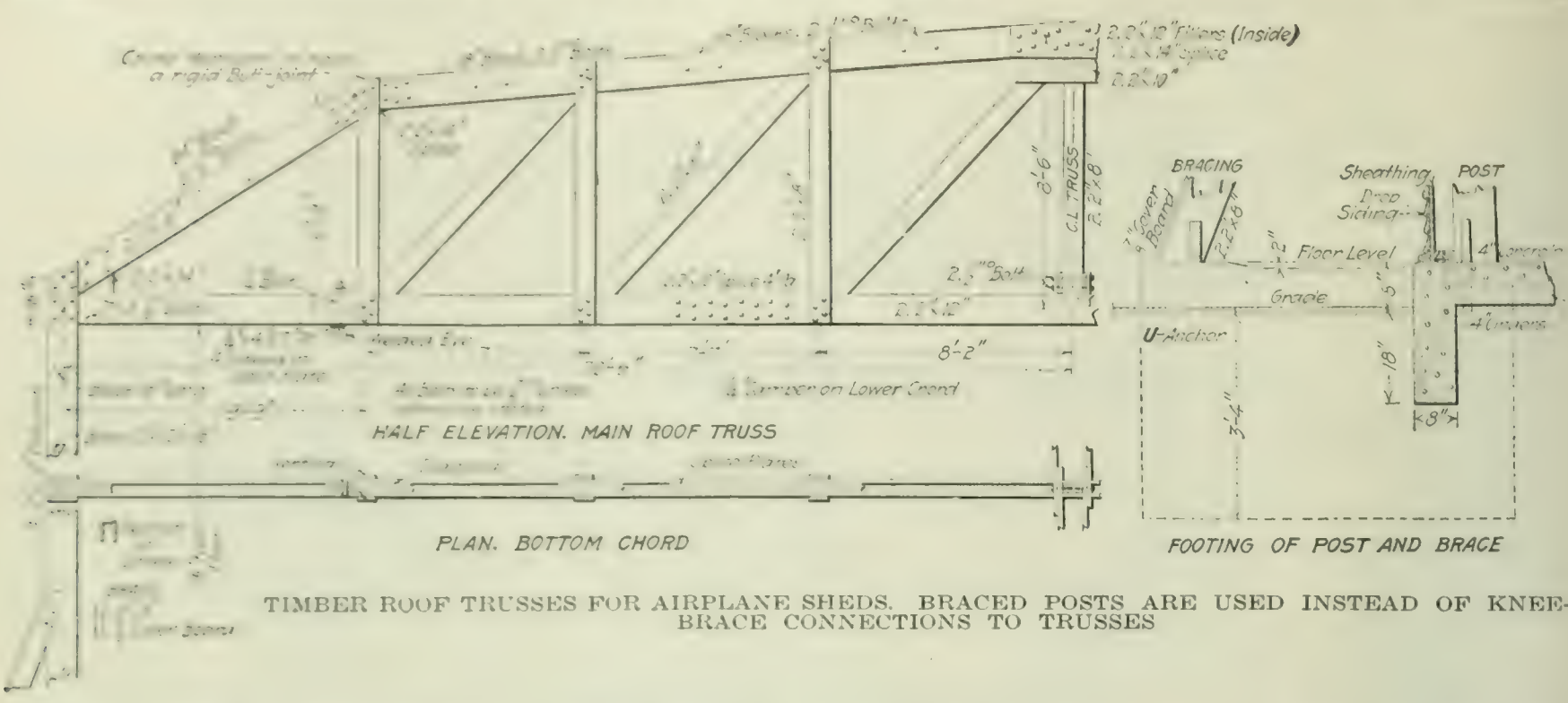
space possible, and knee-braces would have formed obstructions. The necessary lateral stability is given therefore by outside braces against the posts.

Each post is made up of four 2 x 12-in. planks, the two outer planks being separated 2 in. from the inner ones by means of spacing blocks. The brace consists of two planks 2 x 8 in., having their ends fitted between the planks of the post, and having a ⅞-in. cover board on the outside. The posts rest on the concrete floor of the shed, and the braces on concrete footings, as shown. The posts and trusses are spaced 15 ft. c. to c. The sheds are 66 x 120 ft., widened to 81 ft. at the middle by a lean-to locker-room 15 ft. wide, on one side. There is a 4-in. concrete floor on 4 in. of cinders, and the floor extends 3 ft. beyond the ends.

The roof trusses have all members composed of pairs of planks. The chords and end posts have 2 x 12-in. planks spaced 4 in. apart so that their ends fit between the planks of the posts, as noted above. The web members are pairs of 2 x 8-in. planks, the diagonals fitting between the chord planks while the verticals are on the outside. The parts are put together with ⅞-in. bolts and 40- and 20-penny nails. For slinging the airplanes there are ¾-in. eye-bolts in the bottom chord. Longitudinal struts are spiked against the middle posts of the trusses. Purlins 2 ft. c. to c., composed of pairs of 2 x 8-in. planks, rest on the trusses and carry the roof sheathing.

To facilitate moving the airplanes in and out of the shed, the entire cross-sectional area of the building (be-





TIMBER ROOF TRUSSES FOR AIRPLANE SHEDS. BRACED POSTS ARE USED INSTEAD OF KNEE-BRACE CONNECTIONS TO TRUSSES

low the trusses) is made available by double pairs of timber rolling doors. These are carried by 9-in. grooved rollers running on 8-lb. rails anchored to the floor and end wall. They have Hyatt flexible roller-bearing bushings. The doors are guided by horizontal truck rollers at the middle and top. Those at the middle ride against friction strips on the doors themselves (as the panels overlap). Those at the top ride against the center tongue of an overhead runway. To carry the doors clear of the building, these runways extend about 16 ft., their ends being supported by 8 x 8-in. posts, with 6 x 6-in. braces on three sides, as shown in accompanying cut.

These buildings were designed by Albert Kahn, architect, of Detroit. They were built by the Walbridge & Aldinger Co., of Detroit, who were the contractors for the construction of this camp.

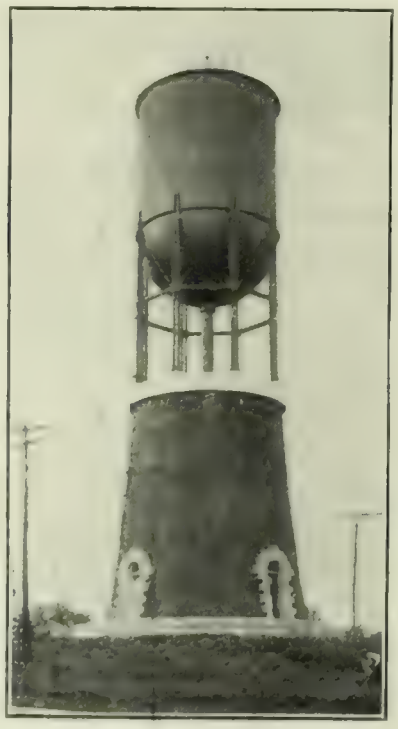
New Steel Water Tank Put on Base of Old Brick Tower

Brick Support and Casing of Old Steel Shell Had Cracked Badly, but New Structure Preserves Lower Part

AN UNUSUAL water-tower design, to meet special conditions, is shown by the accompanying before-and-after views. The original water-works system of Maryville, Mo., built in 1886, had a steel standpipe. This failed in the early part of 1893 and was replaced by an elevated steel tank supported by a brick tower. The tank was 18½ ft. in diameter and 60 ft. high. Its base was supported by a brick dome built into the 18-in. wall of the tower and filled in above to make a horizontal base to the tank about 100 ft. from the ground. Above the level of the tank bottom the wall was thinner, serving simply to conceal the tank. The brick tower was 24 ft. in outside diameter at the top, with the lower part flaring to a diameter of about 40 ft.

The side of the tank was 15 in. inside the 18-in. inclosing wall of the tower. The load caused serious vertical cracks in the upper part of the brick wall when the tank was filled. It was found possible to maintain the structure in service—the tank only half full.

The city purchased the water from the Maryville Water Co. in 1913, at which time the improvements proposed included a new water tower. The cracks had at that time widened considerably, but the city authorities desired to retain the brick tower for the sake of its appearance. A proposal was made to build a steel tower on the inside, but this plan was too costly. In the compromise design adopted, and shown herewith, the lower and substantial part of the brick tower is retained for



NEW STEEL TANK AND STEEL TOWER ON BASE OF OLD BRICK TOWER REPLACE OLD STEEL TANK IN TOP OF ORIGINAL TOWER



a height of 50 ft. above the ground. This is surmounted by a steel and reinforced-concrete circular girder and roof. Steel posts support a 150,000-gal. steel tank, 27 ft. in diameter.

The combined height of the steel tower and tank is 61 ft., making a total height of 111 ft. The entire job of reconstruction was done by the Chicago Bridge & Iron Co. The work was completed early in 1914. The engineer for the improvement of the water-works was Hiram Phillips, of St. Louis, Mo.

Irrigating Flume Built with the Cement-Gun

Self-Supporting Flume with 2-In. Walls Built Up on Inside Forms—130 Linear Feet per 8-Hour Shift

CONSTRUCTION is now under way on a 6-mile line of 4 x 6-ft. flume which will convey the high-level water-supply for the Lindsay-Strathmore irrigation district in the San Joaquin Valley of California. The route follows along a side hill which has an average slope of 16°, and it was found possible to locate the flume for the most part on bench cut. Before selecting the design to be adopted, experiments were made with full-size sections. As a result of these it was decided to build a cement mortar flume with 2-in. walls, reinforced by wire longitudinal strips of wire mesh.

The walls were topped with beams which are connected at 8-ft. intervals by transverse struts consisting of ¾-in. square rods incased in 2 x 2-in. concrete blocks for protection against rust. These struts were cast in a yard and delivered ready for putting in place, but the longitudinal beams were cast in place by hand, using forms braced from the outside.

Proper Lap in Reinforcing Important

The side walls are reinforced with No. 6 woven wire mesh with 4-in. spacing both ways. The upper edge of the reinforcing in the side walls is bent around the ¾-in. bars which reinforce the longitudinal beam 4 in. deep and 6 in. wide. The floors, which are 2½ in. thick on solid cut, are reinforced with No. 12 woven wire mesh with 5 x 9-in. spacing. This reinforcing is laced to the side reinforcing with No. 10 wire. The reinforcing mesh comes in rolls 5 ft. wide, which allows enough for attaching to the beam reinforcing on top and lapping the floor reinforcing at the bottom.

At the beginning of the work, sand, cement and lime were placed in piles 100 ft. apart along the flume line. It was soon found, however, that by spacing the materials at 50-ft. intervals the capacity of the plant was increased 15%, and this spacing was thereafter used. Materials were delivered to the work by two 5-ton motor trucks operating on the bench ahead of the flume. The use of the bench as a roadway was considered an advantage in helping to pack down the fills.

The Cement-Gun Train

The cement-gun was found to operate most economically when within 50 ft. of the point of application. To keep it within this range, a narrow-gage track was laid parallel to the flume and just below it, and the gun is moved along this track. Two trailers were attached to the truck on which the gun was mounted. The one next the gun carries a 4 x 6-ft. box, 1 ft. deep, and is equipped with an inclined screen, while the rear truck serves as a measuring box into which cement, sand and lime are placed in proper proportions, mixed dry and shoveled through the screen into the forward box. From the forward box it is shoveled into the gun hopper as required. The mix consists of one part cement plus 10% hydrated lime and 4½ parts of coarse sand.

A compact type of gas-engine-driven air compressor supplied by the cement-gun manufacturers provides air at 45-lb. pressure for operating the gun. This equipment is kept on the bench ahead of the flume, and a 2-in. pipe parallels the flume with taps every 100 ft. With this equipment the operators claim that about 25% additional capacity is secured through operating an additional nozzle so that throughout the work only one nozzle has been served by the gun. Water for the gun is supplied from a 2 x 3-in. double cylinder pump driven by gas engine and attached to the gun train. It



ROUTE FOLLOWS A HILLSIDE

was found that the two rubber nozzles, one at the discharge end of the hose and one between the gun and the hose, required replacement after about every 300 cu.yd. of material.

Wood Forms Used Repeatedly

In starting a new section of the work the wood forms for the walls are first set up, and the reinforcing is attached to them. Inside forms only are used and are made up in 8-ft. sections from 1-in. tongue and groove flooring, well studded and braced. A wood block is used



ONLY INSIDE FORMS ARE USED

to keep the forms the required distance above the grades. The forms are kept well oiled and after having built 1½ miles of flume were still in good shape. About 500 lin.ft. of forms are in use, and the cost of repairing these on the first 1½ miles of flume was $28. Six standard curves are used, these being of 25-, 50-, 100-, 150-, 200-, 250-ft. radii respectively. The forms for these curves are made up of light steel plate fastened over a wood framework. In the use of these steel forms it is notable that considerable difficulty was experienced in making the cement adhere to the steel surface, enough to prevent "overhang."

The reinforcement in the walls is placed 1¼ in. from the inner face of the flume. This spacing is maintained by 1¼ x ½-in. bars placed between the form and the reinforcing wire, which are removed when the concrete is shot up to this depth. The side walls are shot first and immediately followed by the beam, which is poured by hand into a form clamped to the wall form. Material for this beam is provided by mixing the rebound or wastage from the side walls with 33⅓% of cement. This rebound is caught on canvas previously placed along the bottom of the wall form. The forms are left on 24 hours and, finally, after their removal, the floor slab is shot with the gun.

Finished Flume Kept Full

Near the upper end of the flume, water from wells is pumped into it and allowed to flow down to a bulkhead near the point where work is under way. The flume is bulkheaded at close intervals with a light wooden bulkhead faced with gunite, so that the mortar is kept wet during the setting period and water is always at hand for the gun and for hosing exposed surfaces. Permanent radial breast gates are provided at approximately one-mile intervals, so that after the flume is in operation its contents can be conserved in case of a shutdown. These were not made automatic, as it was not believed that this additional expense was warranted.

On the completion of a section of the flume a bulkhead is placed at the downstream end and a hole cut in the bulkhead of the preceding day's work to admit the water. Previous to this, immediately after the side walls are constructed, burlap is hung over the walls and is sprinkled with a hose during the day time until this section of the flume is completed and the water admitted. With this procedure the curing has been effected without developing any cracks whatever.

To reduce the likelihood of cracks caused by settling, the thickness of the bottom slab is increased to 3 in.

over fills and the reinforcement is here made the same size as that used in the walls. The fills, however, are not over 10 ft. in height and average about 6 ft. They were placed about 8 months ahead of flume construction and before the rainy season was over. Specifications called for wetting and tamping in thin layers. However, on those fills which showed considerable settlement, the flume was supported on three longitudinal beams running down to solid material. Culverts were placed for all watercourses, and cross drains of 6-in. sewer tile were put under the flume at 400-ft. intervals to take care of all drainage from above the bench.

The gun crews work 8 hours per day, the crews usually being made up as follows: One gun operator; 1 nozzleman; 1 nozzleman assistant; 1 compressor operator; 1 laborer shoveling sand, etc.; 2 laborers



CREW PLACED 130 LIN.FT. PER SHIFT

screening; 4 laborers mixing and turning material; 10 laborers finishing grade and wrecking forms; 4 men placing steel; 3 men setting forms.

This crew can place about 130 lin.ft. of flume, or 147 cu.yd., per 8-hour day. The side walls are shot in two layers. The first layer, which comes up to and covers the reinforcement, is 1½ in. thick; and after this has set for 20 min., the final outside layer of ½-in. thickness is applied. In shooting these walls it is found that the rebound which collects on the canvas strips at their base amounts to about 10% of the material which adheres to the forms. In remixing this rebound for use in the longitudinal beams it is considered as inert sand, although doubtless it has a certain per cent. of cement content. The crew which remixes this rebound follows the gun crew immediately, so that there is no time for initial set to have taken place between the two operations.

The flume was designed and constructed under the supervision of Stephen E. Kieffer, M. Am. Soc. C. E., consulting engineer, of San Francisco. The contract for the work is held by James Kennedy, of Los Angeles.

Harlem River Draw Is 389 Ft. Long

The swing bridge of the New York Central Railroad across the Harlem River, which was repaired by the unusual pin bushing method described in our issue of Aug. 9, has a swing span 389 ft. long, instead of 310, as by error marked on the drawing shown on p. 245.

Well Yields Different Water After Being Sealed a Year

Peculiar Phenomenon in Saratoga Springs District — Change from Soda to Salt Water with Burst Upon Pumping

BY CHARLES G. ANTHONY
Chief Engineer, State Reservation, Saratoga Springs, N. Y.

AMONG the many interesting natural phenomena observed in the series of studies in the mineral water basin of Saratoga Springs conducted during the last few years, the following changes in the character of the yield of a deep well within a year after it was drilled may be noted.

In 1914 a 6-in. drill hole was sunk to a depth of 420 ft. at Saratoga Springs for purposes of experiment and observation. The drill passed through a heavy deposit of drift and Hudson River shales and terminated in limestone. The well was dry for 150 ft. Below this depth an abundance of water was found.

As soon as the shales were penetrated, a strong odor of sulphuretted hydrogen gas became apparent. A few hours after the appearance of water in the hole, the water bubbled and effervesced as do all the Saratoga mineral waters. The other springs and wells in this basin show large quantities of CO_2 gas with now and then a trace of sulphuretted hydrogen, while the experimental bore showed large quantities of sulphuretted hydrogen and just a trace of CO_2 gas.

When a vessel was filled with the thick muck brought up by the sand bucket, the mass exhibited a curious behavior, rising and flowing over the edges of the vessel like batter until a large collection of gas that had formed in the interior of the mass came to the surface and passed off into the atmosphere. The contents of the vessel then seemed to collapse and sink to about one-



A SPOUTING STREAM OF SALTY WATER ISSUING FROM THE PIPE OF THE NEIGHBORING WELL

half of its original volume. At short intervals this mass would again overflow the vessel until it was practically empty. The chemist found the gases thus given off to be mainly sulphuretted hydrogen with a small admixture of hydro-carbon gases.

After reaching a depth of 420 ft. the well was thoroughly sand bucketed and pumped until a clear, sparkling sample was obtained. The result of an analysis was a complete surprise, for the water had very few of the characteristics of the Saratoga waters. The water was quite devoid of chloride of sodium but carried a very large amount of sodium bicarbonate. All of the other springs show sodium chloride ranging from a minimum of 2091 to a maximum of 10,646 p.p.m., yet not a trace could be found in this water.

The well was pumped to capacity (10 gal. per min.) for a few days, then closed by means of a cap placed at the top of the 6-in. casing.

Analysis Unchanged at First

A year later the well was opened, a deep-well pump installed and by means of rubber seals the well was pumped in successive 20-ft. sections. Yields from 0 to 10 gal. per min. were found, but a complete analysis showed the water to be the same as that analyzed the year before.

On the eighth day after pumping started the well belched forth great quantities of CO_2 gas, the tubing and seals were thrown high in the air and were shortly followed by a 6-in. stream of frothy water that spouted over the tops of the neighboring pine trees. A separator was installed and careful measurement showed a ratio of 120 volumes of gas to 1 volume of water. An analysis of this water showed that the mineralization had doubled and that the water then contained 5707 p.p.m. of sodium chloride and no sodium bicarbonate. The total mineral contents at this time were 10,419 p.p.m., against 6533 a year before.

States Spend $33,087,410 for Roads

Out of a total outlay of $85,099,088 for permanent improvements by the 48 states of the Union within the year, $33,087,410 went for the construction of new roads and the permanent improvement of existing highways. The figures given are from a report on the "Financial Statistics of States, 1916," compiled under the direction of Starke M. Grogan, chief statistician for statistics of states and cities, which will be published by S. L. Rogers, U. S. Bureau of the Census, Washington, D. C. More than half of the road outlays covered by the total given were made in two states, New York having spent $10,742,913 and California $7,706,376. Maryland expended $3,563,697. The circular issued by the Bureau of the Census says further: "Only 21 states—Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Ohio, Michigan, Minnesota, Maryland, Louisiana, Montana, Idaho, New Mexico, Arizona, Utah, Washington, Oregon and California—expended money directly on the construction and improvement of roads during the fiscal year, but a number of the other states apportioned sums to counties, municipalities, etc., which were spent in the construction and improvement of roads."

Los Angeles Sets Large Velocity Meter in Open Conduit

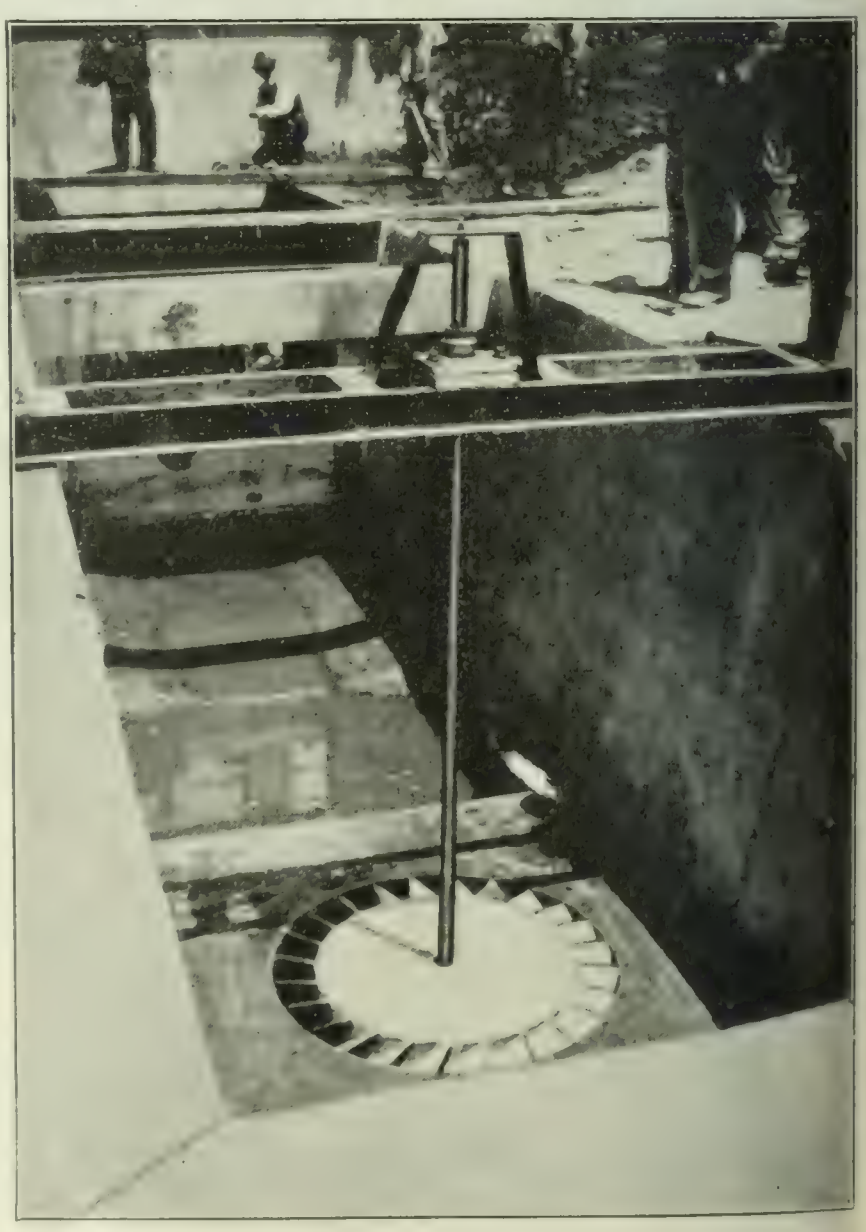
Costing $800, It Registers on Less Than One Second-Foot, Showing an Efficiency Greater Than 98 Per Cent.

By J. E. Phillips

Engineering Department, Bureau of Water-Works and Supply, City of Los Angeles

THE NECESSITY for some means of accurately measuring and recording the daily amount of water supplied to the City of Los Angeles, Calif., through the several main trunk lines led to the construction and installation of a large meter at the south portal of Franklin tunnel where the aqueduct supply enters the Upper Franklin reservoir. It was designed by William Mulholland, chief engineer of the Los Angeles City Water Department, and built and installed under the supervision of Fred J. Fischer, chief mechanical engineer.

The meter operates on much the same principle as the so-called velocity-crest meters, its size and the results obtained with it being the main features of interest. It was placed in an uncovered, concrete-lined conduit, at which point the quantity of water at present passing varies from 10 to 50 or more sec.-ft. The value of the meter as a measuring device depended upon whether or not, between the above limits, a constant quantity of water would pass the meter per revolution of the propeller wheels. The results obtained with the one in-



METER IN PLACE BEFORE WATER TURNED THROUGH

stalled have been so gratifying that the department has two more now under construction and several additional ones contemplated.

The meter is very simple in construction. It consists essentially of two horizontal propeller wheels, 4 ft. in diameter, fastened 18 in. apart to a 2-in. diameter vertical steel shaft supported at top and bottom by thrust and lateral ball bearings to minimize friction. A concrete housing for the wheels is constructed in such a manner as to divide the water which enters the meter —one part passing downward through the upper wheel and the other part passing upward through the lower wheel. The discharge is through a lateral opening between the wheels. A meter register attached to the upper end of the shaft records the water passed.

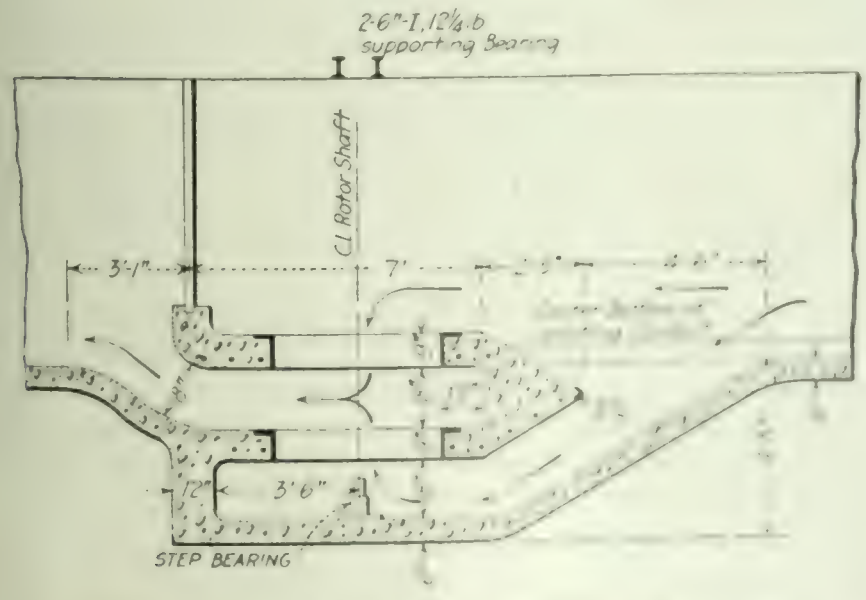
The propeller wheels are built of galvanized sheet metal in the form of hollow drums, with cast-iron hubs. These drums are 3 ft. in diameter and 9 in. thick. To the circumference of each drum there are fastened 24 galvanized sheet-metal propeller blades by means of 1½-in. angles. These blades are given a pitch of about 40°. The drums were made water-tight by soldering the joints, the size given being such that the weight of water displaced is about equal to the weight of the wheels and shaft. The cast-iron step bearing and the lower end of the steel shaft are fitted with bronze plugs between which a 2-in. diameter agate ball operates to take the thrust. Roller steel collar and thrust bearings are used at the top support, which consists of two 6-in. I-beams laid transversely to the conduit.

The meter was rated by means of a 5-ft. weir placed in the conduit downstream from the meter. The head on the weir was read by means of a hook gage, provided with a vernier reading to thousandths of a foot. Two observers with stop watches noted the time for 10 revolutions of the meter while a third observer read the hook gage, both at the beginning and the end of the count, the mean of the two gage readings being used in case the two readings varied. About 80 observations were taken, covering a range of flow of water from 0 to 38.5 sec.-ft. The meter began to revolve when the weir showed a flow of 0.06 sec.-ft.

The results of the observations when platted on cross-section paper showed a straight line, the average quantity of water passing the meter per revolution being 84 cu.ft. None of the readings varied more than 2% from the average. The larger of these variations were due to inaccuracies in the reading of the hook gage, as surges occurred at times in the weir approach, making accurate reading impossible. The loss of head in the meter for 38½ sec.-ft. was 1.25 ft. This loss can be decreased somewhat by increasing the size of opening between the propeller blades and by spacing the wheels farther apart.



THE TWO METER WHEELS ASSEMBLED IN THE SHOP



THE METER IS SET IN A CONCRETE HOUSING

Water passes down through the upper wheel and up through the lower wheel, neither of which is visible, and is discharged laterally between the two wheels

The cost of the meter installed was about $800. A considerable portion of this cost was due to the construction of a temporary bypass for handling the water during installation of the meter.

Finishing Concrete Roads with a Roller

New specifications for concrete roads in Florida contain the following paragraph on surface finishing:

"The surface of the concrete shall be struck off for the entire width of the pavement, and from back to back of integral curbs when used by means of a template or strike board. Any holes left by removing any materials or device used in constructing the joint shall be filled immediately with concrete from the latest batch deposited. The concrete for a distance of 18 in. out from the curb line shall be finished with a steel trowel. After the concrete has been brought to a true surface, it is to be immediately rolled with a light steel roller made of ¼-in. sheet steel, the roller to be 8 in. in diameter, 5 to 8 ft. long; a number of these rollers to be provided—some longer, some shorter. They shall be attached to a long pole so that all portions of the surface of the pavement may be rolled without the necessity for the workman to step upon the finished work. The rolling shall continue until free water ceases to flush to the surface. The roller shall be so manipulated as to carry the free water from the finished portions of the work onto the unfinished portions. After rolling the surface is to be finished by dragging a canvas belt or by other means satisfactory to the engineer so as to produce an even-texture surface and one which is rough to the touch. When finished the surface of the pavement shall be free from depressions of any quality or any kind and shall not vary within 5 ft. more than ¼ in. from the specified contour."

Diagrams Facilitate the Design of Concrete Forms

After Systematic Study of Conditions the Sizes of Members May Be Readily Traced from Standardized Curves

By A. Norman Laird
Instructor in Civil Engineering, Toledo University, Toledo, Ohio

FOR THE PURPOSE of readily designing wooden forms for concrete work, the writer has prepared a set of curves which can be simply applied to formwork for floor slabs, beams, girders, columns and walls, laid out according to the general details shown in Fig. 1.

The curves which are shown in Figs. 2 to 6 are divided into three sections—Figs. 2 and 3 for the design of sheathing, Figs. 4 and 5 for the design of beams, and Fig. 6 for the design of struts. In using the table for beams and sheathing, the procedure is identical; that is, a unit stress for the timber is assumed, and entering the diagram at the lower right-hand corner, the proper size of the form member is found by following vertically to the proper head of the concrete and then horizontally to the proper timber size for a given span or depth.

The curves take into account the semi-continuity of the sheathing. Since formwork is temporary, it will safely bear higher loads without excessive deflection of the permanent member similarly loaded. For such members as slabs, beams and girders, the usual safe timber unit stresses should be assumed, but for columns, walls, etc., where no construction loads will materially increase the total, a unit stress 50% higher than the normal working timber stress should be used, limited by a maximum value of 1200 lb. per sq.in. The weight of the concrete has been assumed as 150 lb. per cu.ft., and the excess over what the concrete probably will weigh will take care of the load of the sheathing and the supporting joists. If a definite heavy concentrated load is to be placed on the formwork during construction, it must be taken care of by computing the bending moment and then referring to Fig. 4 for the proper size and member.

The head of concrete to be used in the curves is the actual depth of the member, limited however by the depth to be poured in one hour. In the design of column forms, using the full depth of concrete, there is a slight error on the side of safety because the loading on the sheathing is not uniform between supports. This, however, is small and may be neglected. In the cases of walls this error will not enter, provided the entire depth is not poured in one hour. This is because the point of maximum pressure will move higher as the pouring is continued, and it will tend to approach uniform loading.

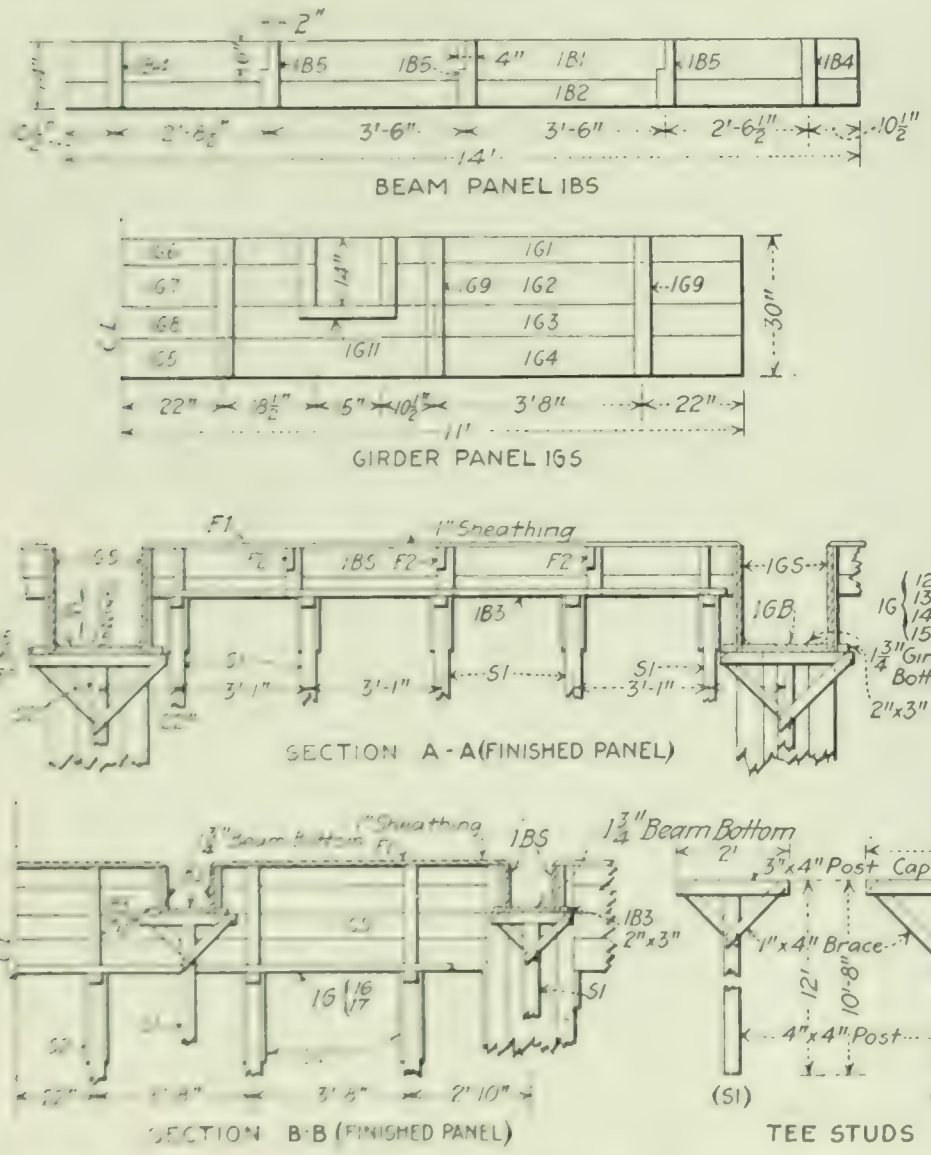


FIG. 1. TYPICAL LAYOUT OF FORMS FOR WHICH DESIGN CURVES ARE MADE

Deflection Should Be Considered

After determining sizes from the diagram, the maximum allowable deflection (usually considered $\frac{1}{4}$ in.) should be taken into account in the design. In case a span determined for a given case exceeds the allowable span for the maximum deflection as shown in Table II herewith, the deflection will govern and the span found in the deflection table should be used.

In designing sheathing, the direction of laying it should be considered. In the case of narrow panels, sheathing should be placed lengthwise for economy, and in square panels it may be run in either direction. In any other panel, however, the sheathing should be tried in both directions.

A considerable difference in materials is often found in cutting the lumber to better advantage in a more economical arrangement of supporting joists and studs. Joists should be designed for a load of $P_1 = 150\ hs$, where h is the head of concrete and s_1 is the span of the

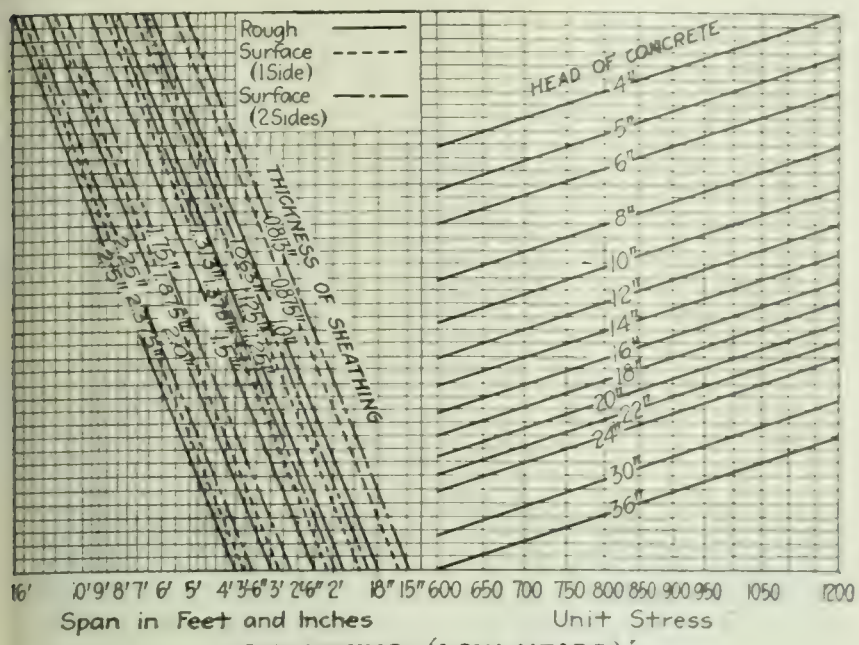


Fig. 2

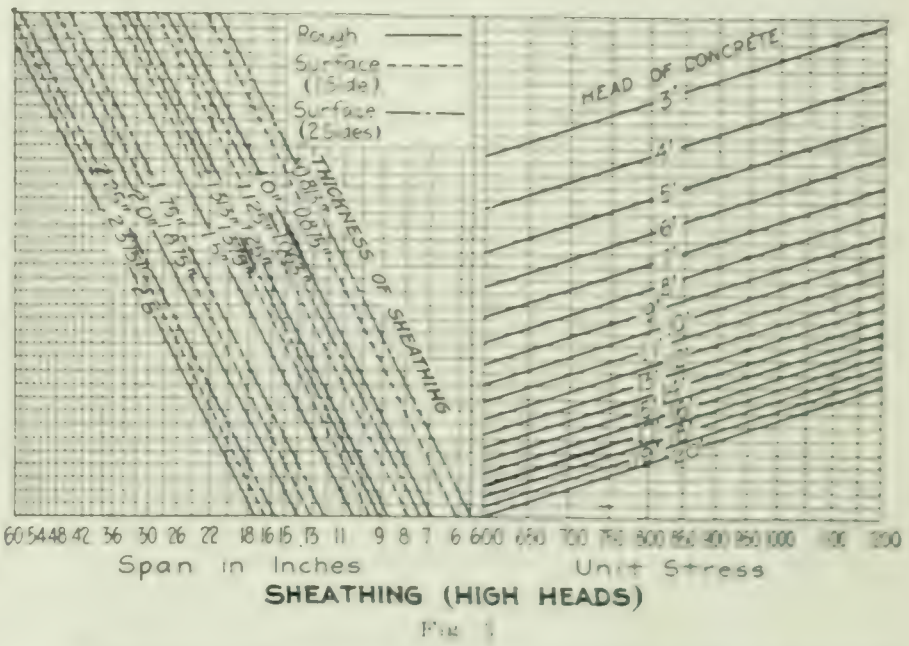


Fig. 1

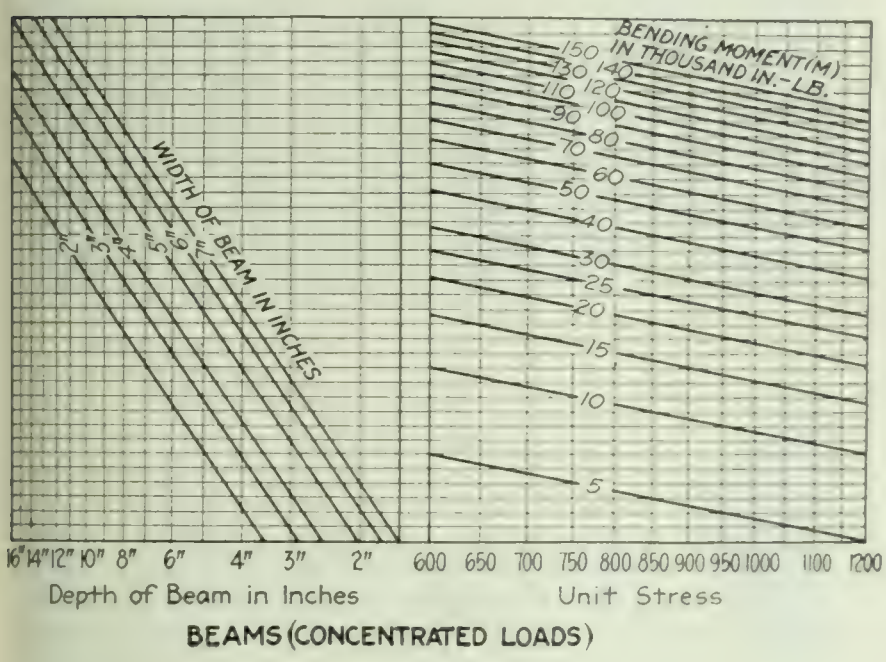


Fig. 4

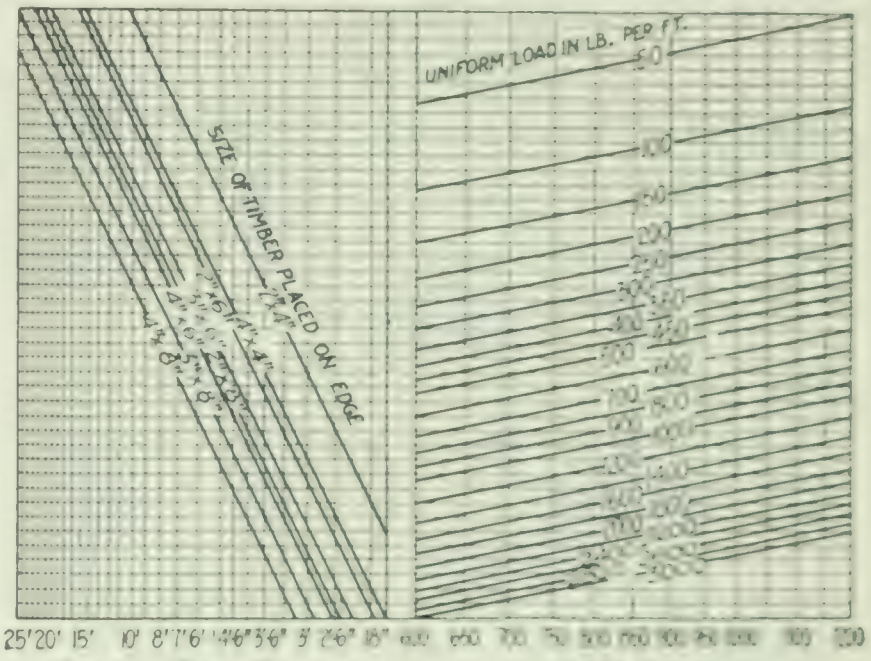


Fig. 5

DIAGRAMS TO BE USED IN DESIGNING BEAMS AND SHEATHING

sheathing in feet. Sizes of joists and the span length s_1 can be taken from either Fig. 4 or Fig. 5. In some cases it may be found economical to support the joist on beams. The span length must be assumed and the bending moment determined. The size required will then be found in Fig. 4.

In finally tabulating the design, the board measure should be recorded for each step, using commercial

TABLE I. BOARD MEASURE PER LINEAR FOOT

Thick. in In.	Width in In. 1	1¼	1½	2	3	4	6	8	10	12
1	0 083	0 1	0 125	0 167	0 25	0 33	0 5	0 667	0 833	1 0
1¼	0 1	0 12	1 156	0 208	0 313	0 417	0 625	0 833	1 043	1 25
1½	0 125	0 156	0 188	0 25	0 375	0 5	0 75	1 0	1 25	1 5
2	0 167	0 208	0 25	0 33	0 5	0 667	1 0	1 333	1 667	2 0
3	0 25	0 313	0 375	0 5	0 75	1 0	1 5	2 0	2 5	3 0
4	0 33	0 417	0 5	0 667	1 0	1 333	2 0	2 667	3 333	4 0
6	0 5	0.625	0.75	1 0	1 5	2 0	3 0	4 0	5 0	6 0
8	0 667	0 833	1 0	1 33	2 0	2 667	4 0	5 33	6 667	8 0
10	0.833	1.04	1.25	1.667	2 5	3 333	5 0	6 667	8 333	10 0

TABLE II. PRACTICAL ALLOWABLE SPAN IN FEET AND INCHES FOR DEFLECTION = 0.25 INCHES. STRESS IN POUNDS PER SQUARE INCH

Thick. in. In.	600		700		800		900		1000		1100		1200	
	Ft.	In	Ft	In	Ft	In	Ft	In	Ft	In	Ft	In	Ft	In
1	4	10	4	7	4	3	4	0	3	10	3	8	3	6
1 25	5	6	5	1	4	9	4	6	4	3	4	0	3	10
1 5	6	0	5	7	5	2	4	11	4	8	4	5	4	2
1 75	6	6	6	0	5	7	5	4	5	1	4	10	4	7
2	6	11	6	5	6	0	5	8	5	5	5	2	4	11
2 5	7	9	7	2	6	8	6	4	6	0	5	8	5	6
3	8	6	7	10	7	4	6	11	6	7	6	3	6	0
4	9	10	9	1	8	6	8	0	7	7	7	3	6	11
6	12	0	11	1	10	5	9	10	9	4	8	10	8	6
8	13	10	12	10	12	0	11	4	10	9	10	3	9	10
10	15	6	14	4	13	5	12	8	12	0	11	3	11	0

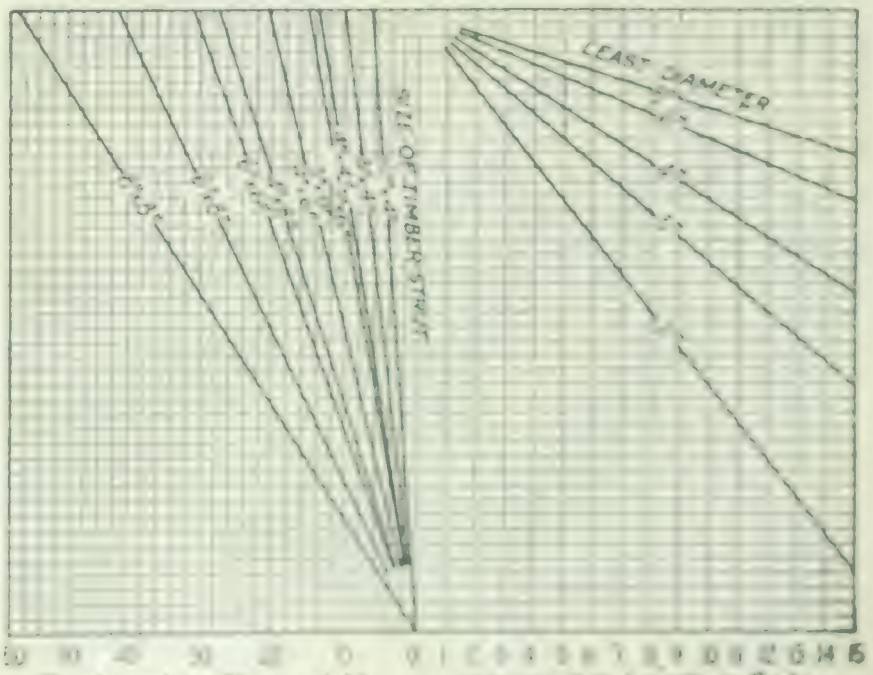


FIG. 6. TABLE STRUT DIMENSIONS FROM THESE FORMULAS

lengths as indicated in Table I. The final choice of sizes to be used should be made by a man familiar with the construction work after the above results are tabulated. After making a sketch layout of the type of forms the tabulation made during a design should be referred to and the exact length worked out in detail. Care should be used in selecting the width of boards for panels, etc., to avoid ripping and other special cutting.

A series of drawings should be made, similar to those shown in Fig. 1, including the assembly, panel details and lumber schedule. Some system of numbering which will indicate where each piece of material in the schedule belongs should be used. The construction work can then be divided into three parts: Cutting lumber, building panels, and the erecting, each of which should be carried on by a separate group of workmen. It is, of course, apparent that companies engaged in a large amount of concrete work will be able to standardize their formwork, and may, therefore, dispense with a considerable amount of the detail designing shown to be necessary.

Apportion Concrete Mixture on Road Job at Loading Hoppers

Motor Trucks Make 7 Miles per Hour—Three Hopper Industrial Cars Connect Storage with Mixer

INDUSTRIAL cars, each carrying three hopper bodies and filled with gravel and cement at a loading station built in the street, form a new equipment for handling road material. They were used on the Kensington Road concrete pavement in Grosse Point, a village immediately east of Detroit. As the contractor's equipment consisted of a ½-yd. cube mixer with caterpillar traction and boom discharge, the use of the ordinary 1-yd. side-dump cars was not feasible. He made up in his shop, therefore, three bodies as shown in one of the photographs. The uncertainty of getting cement and material regularly and the desire not to haul over the sub-base, led to the concentration of the material at one end of the section of pavement, which is 3400 ft. long.

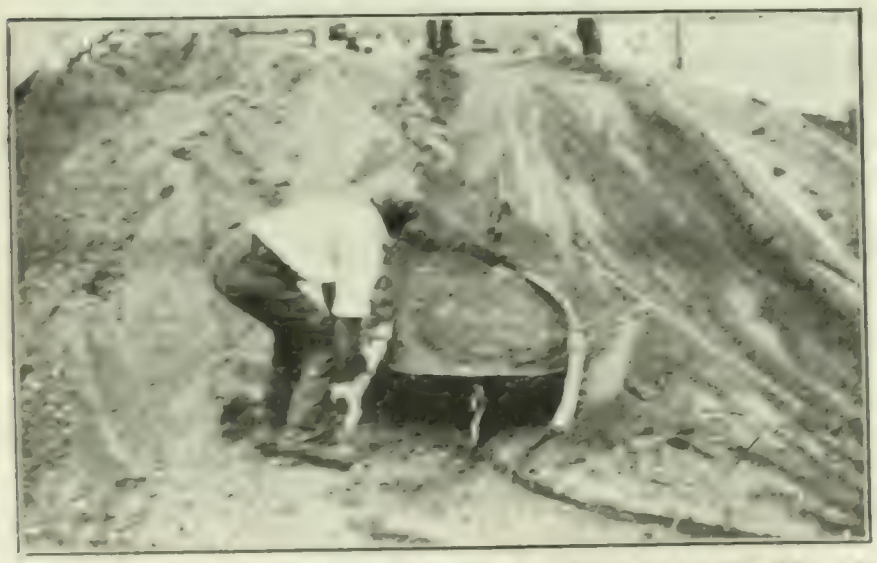
The layout at the loading station consisted of two elevated cement hoppers, one over each track. Back of one was a hopper for the sand and gravel, which is pit-run screened, and back of the other was a hopper for crushed granite. Cement was stored under tarpaulins and in a small shed on an adjacent vacant lot, and was hauled by barrow up an incline to the hoppers. Bulk cement was used at first, but the irregularity in getting gravel made storage of cement essential. This could not well be provided for on such a small job, so bagged material was used for all but the carloads.





INDIVIDUAL BATCHES ALL MADE UP EXPEDITE MIXER CHARGING





A 3½-TON MOTOR TRUCK AND A SLIP SCRAPER ON AN ENDLESS CABLE KEEP BINS FULL

Leading to the end of the material bins is an incline, up which the gravel and stone are pulled by an ordinary slip scraper attached to an endless cable operated by a two-drum Mundy hoist. These bins have three slide gates so that the three bodies of a car can be loaded at one time. The cars are then pulled forward and receive a measured amount of cement.

Material was hauled about 3½ miles from a wharf where it is loaded either from bins or by clamshell buckets directly into 5-ton trucks. Three trucks were

just able to keep the outfit going. The contractor rented two machines, a Federal and a G. M. C., and kept his own Packard on the same work, except for odd jobs which averaged at least one day per week. The trucks made from 50 to 75 miles per day, averaging about one round trip of 8 miles per hour. The bodies held 135 cu.ft. level, but only 4 cu.yd. was loaded.

Progress of Mixer Crew

Progress made by the mixer crew of 14 to 16 men averaged eight slabs 30 ft. long and 25 ft. between curbs. The pavement is a 5-in. two-course, reinforced-concrete slab with a 2-in. finish of rich mix with granite aggregate. A move was made for every 15 ft. of the lower course, the loop of the industrial track—super-elevated—being pulled back so that the outside rail was 18 in. from the charging skip when the latter was let down. One horse was kept handy to pull the cars around the curve and three more to haul the cars. At the material bins were 15 men distributed as follows: 1 engineman at hoist; 1 handling slip; 2 tending gravel bins; 2 opening cement bags; 5 loading and handling cars below; 2 hauling cement; 1 cleaning and bundling bags, and 1 foreman.

Clarence Raymond was superintendent for R. D. Baker, the contractor, until transferred to another job, when R. H. Baker took his place.

London Tips More Than Half Its Refuse

Greater London disposes of 58% of its mixed garbage and refuse by tipping or dumping and only 42% by destructors, according to a recent paper presented by Reginald Brown before the Institution of Municipal and County Engineers. Inner London has 62% of its refuse removed out of the district by rail or barges, carts 3% to dumps and sends only 35% to destructors. Outer London dumps 46% within its own area, ships 1% away by barge and rail and sends 53% to destructors.

Concreting Plant Has Novel Way of Handling Cement

Cement Delivered from Shed to Mixer by Gravity Tramway—Sand and Stone Unloaded from River to Same Mixer

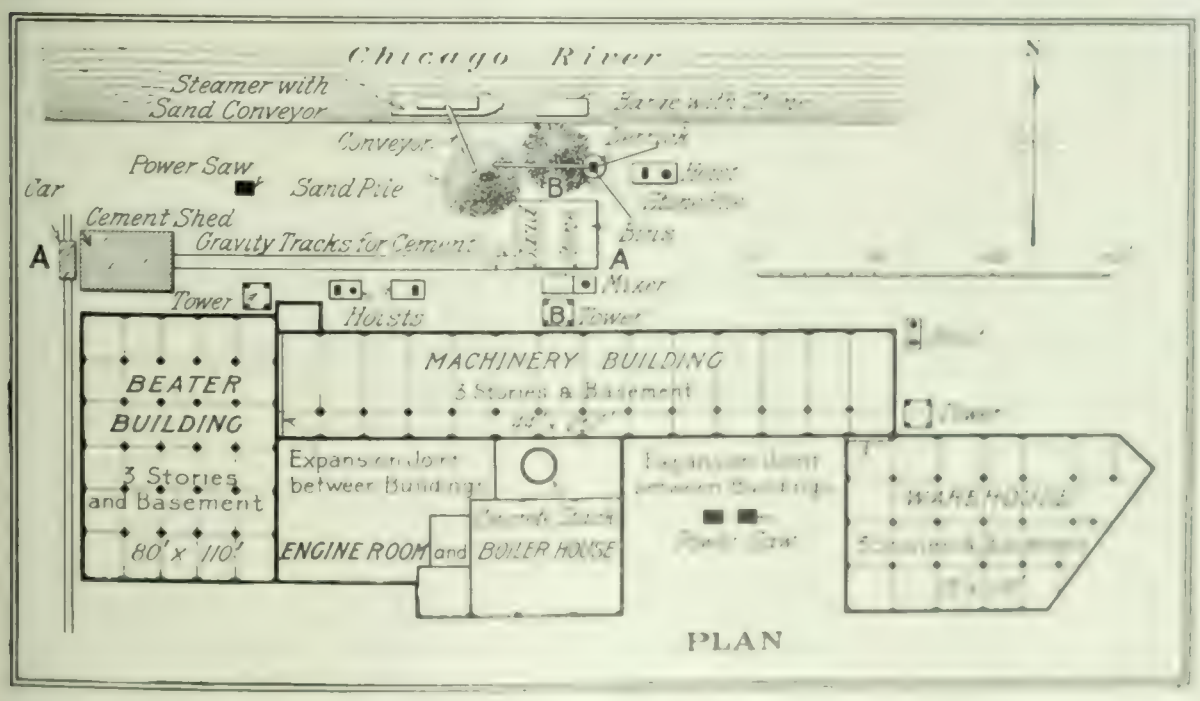
By W. Stuart Tait

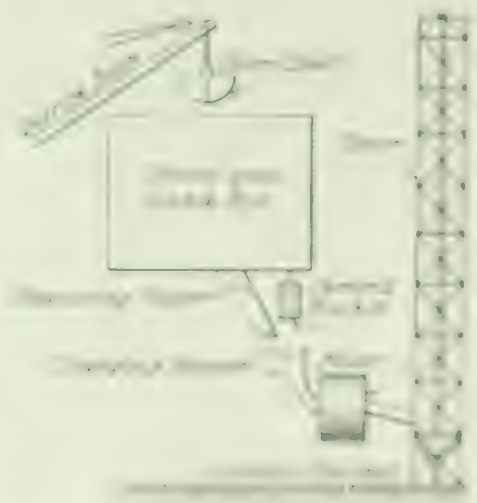
Vice President and Chief Engineer, Concrete-Steel Products Co., Chicago.

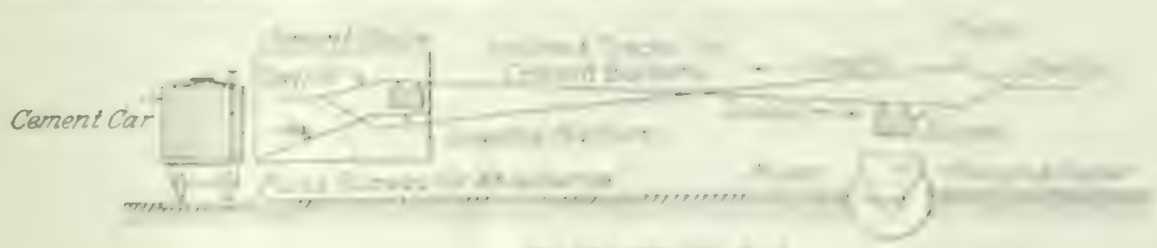
INTERESTING methods of handling materials are employed in the construction plant of the paper mill of the Chicago Mill and Lumber Co. at Chicago. The plant is adjacent to the north branch of the Chicago River. It was found that crushed stone and torpedo sand could be delivered most economically by means of barges on the river, while on the other hand, the cement could be more economically delivered by rail. The accompanying view and plan show the general arrangement adopted for the concreting plant.

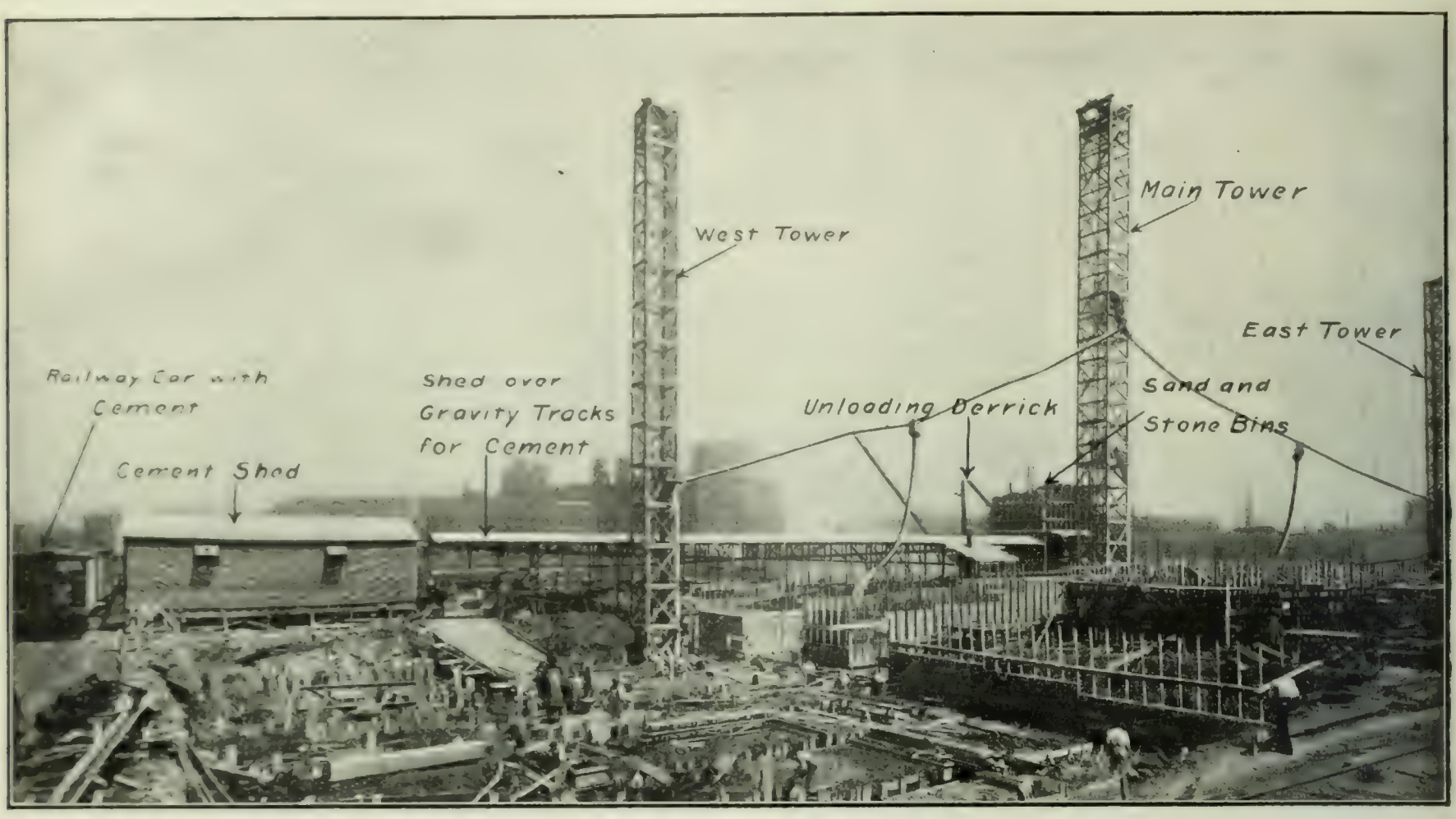
The crushed stone was brought to the site in barges having a capacity of 185 cu.yd. and was unloaded from these by means of a stiffleg derrick with 1-yd. clamshell bucket. This derrick unloaded the stone directly into the elevated stone bin or into the reserve pile. The torpedo sand was unloaded from the hopper dredge or sand-sucker by means of an inclined "Hydro" belt conveyor on a boom forming part of the equipment of the boat. The conveyor could deliver the sand about 30 ft. from the side of the boat and at an elevation of about 30 ft. above the ground. The derrick and clamshell bucket noted above picked up the sand from this point and placed it in the sand bin.

On account of the layout of railway tracks adjacent to the building, the cement shed had to be at the northwest corner of the building, as shown. The cement car was set alongside this shed and there unloaded. Two inclined tracks, one for delivering this cement in buckets









CONCRETING PLANT FOR LARGE PAPER MILL IN CHICAGO

from the storehouse to the charging hopper, and the other for returning the empty cement bucket, were installed between the cement house and the concrete mixer. These are shown in the drawing of the layout of the plant.

The filled cement bucket traveled by gravity from the cement house to the charging hopper of the mixer, and a lever controlling the bottom of this car dumped the six-bag load directly into the hopper. The empty car was then pushed over a switch and hump to the return track and transferred back to the cement house by gravity. This novel arrangement worked in a very satisfactory manner. The track consisted of the ordinary type of barn-door track with the cement car hung from a trolley traveling upon this.

A ¾-yd. Marsh-Capron mixer was used, and discharged into a Lakewood bucket. This bucket carried the concrete up the main tower to a maximum height of 185 ft., discharging into a bucket provided with a two-way gate for distributing the concrete to spouts leading to the two subsidiary towers. The concrete was all placed by spouting directly into the forms. The smaller towers were built to carry the chutes and to serve as cage towers in which lumber, brick, etc., are hoisted.

With the layout illustrated, a capacity of 400 yd. of concrete per day of eight hours was easily placed. The building work proper was completed in five months. Construction work was started about July 15, 1916, and the concrete structures were practically completed by Dec. 15, 1916. The paper mill was put in operation in the middle of June, 1917.

Louis Guenzel was the architect for these buildings. The structures were designed by the Concrete-Steel Products Co., and the Mueller Construction Co. executed the construction work.

Favors Continuing Iowa Road Improvement Policy

T. H. MacDonald Says County Boards Should Plan for Future—Traffic Count Shows Heavy Town-to-Town Travel

A PROGRAM of draining, grading and permanently bridging the public roads has been followed consistently by the State of Iowa since 1913. The effects of war conditions and high prices have not been felt to any extent as yet, and the work done in 1917 is not likely to be much less than that of 1916. It has been pointed out recently by Thomas H. MacDonald, chief engineer of the Iowa State Highway Commission, that the full force of the present situation will not be encountered until plans are made for next year and attempts are made to carry these plans into execution. He urges that the state's policy is correct, and that county boards should take steps to insure its continuance. It remains then to determine how this can be done under present conditions.

Road Work Should Not Halt

It is highly important, says Mr. MacDonald, that the present element of uncertainty should be removed. At present few of the county boards can say that their plans for the future are definitely formulated, or that they can confidently expect to carry out plans looking to the road-improvement program for the next few years. Iowa as a great agricultural state will play an important part in the present national and international food situation. Nearly 85% of its area is now raising foodstuffs that will require transportation over the public roads to the market centers. Therefore, now, if ever, is the time when the roads and bridges need to be in first-class condition. The state does not need

many military roads. But it does need a system of roads radiating from the market centers and kept continuously in condition to carry the traffic of each county.

As a result of the response to the call for increased food production, the roads are being used to a greater extent than ever before. This is shown by a traffic census. An analysis of the situation, therefore, will eliminate all doubt as to the desirability of continuing the program for road and bridge improvement throughout the state.

Progress at End of 1916

At the end of 1916 there were 7330 miles, or approximately 50%, of the county-road systems, built to a natural grade. This represents mainly the work accomplished by tractors and road graders in shaping the roads to standard cross-section, but without any considerable grade reduction. In addition, 1506 miles had been built to permanent grades and standard cross-section, and 535 miles had been surfaced with one-course gravel 10 ft. wide. This is the minimum surfacing specified by the commission, and requires 880 cu.ft. of gravel per mile.

While Iowa has a comparatively small mileage of surfaced roads, its graded and drained earth roads form a foundation for future surfacing and in the meantime provide for present traffic. Gravel surfacing makes the main traveled highways easier to maintain, prevents deterioration of the permanent grades and gives better service to the public. Mr. MacDonald considers that the proportion of funds expended on such surfacing might well be increased.

This Year's Work Similar

The work for 1917 is approximately the same as that for the previous year. During 1916 there were 625 miles of earth roads built to permanent grades and standard section, 107 miles built to temporary grades, 3680 miles built to natural grades, and 277 miles surfaced. In the expenditure of the county-road funds, 40% was for permanent work, 16.5% for temporary work, 16.6% for repairs, 11.9% for maintenance, 7.4% for equipment and unused material and 76% for miscellaneous work.

Of the expenditure for bridges and culverts, 59.3% was for permanent structures, 18.1% for temporary structures, 15.1% for repairs and 7.5% for miscellaneous work. For three years the amount spent for permanent structures has been about 60% of the total.

The continuance of this policy will result, he says, in a gradual reduction of the bridge taxes. In one county this tax has been reduced from 5 mills to 3½ mills, and still there are ample funds for building permanent structures where bridges must be renewed. Even under the adverse conditions of prices for material and labor, permanent construction is the most economical. These conditions, therefore, do not justify spending a larger proportion of the bridge funds on temporary forms of construction.

Concrete pipe for culverts has given good results. Mr. MacDonald states that on the basis of the experience of two counties which have their own pipe-making plants, the reinforced-concrete pipe manufactured by the counties is the cheapest form of culvert pipe now available. He points out that it would be practicable for two or more counties to combine in the manufacture of such pipe while the price of other materials is so high.

Road Traffic Is Weighed and Counted

In a recent traffic census, the usual count of the number of vehicles has been supplemented by taking the weight of the vehicles and thus arriving at the actual tonnage carried. At a point of 2 miles south of Ames (population 5000) road scales were placed and the traffic was weighed for a period of 10 days. The total number of vehicles was 1995, with a total weight of 4,919,468 lb., or a daily average of 200 vehicles and 250 tons. The number of people was 5560, or 556 per day. For each of eight other points the daily average was 387 vehicles and 1259 persons daily, and the weight was estimated at 500 tons.

The surprising feature of the census was the number of persons using the roads. On the road between Mason City and Clear Lake the count for one week showed more than 25,000 people, although the combined population is only 22,000.

Complaint is made occasionally as to the improvement of roads for tourist travel on the theory that the traffic is detrimental to the roads and that the tourists do not contribute to the cost of road improvement and maintenance. To obtain information on this point, particular care was taken to count the tourist traffic. Out of 22,000 vehicles counted at eight points, only 669 (or about 3%) were strictly tourist vehicles, although the stations included some of the best-known routes.

On the other hand, the census shows very clearly that it is the people of each community in the state who are making the most use of the roads. This is still another proof of the need for improved roads, and the desirability of continuing the program for obtaining such roads. The large amount of town-to-town traffic indicates, in Mr. MacDonald's opinion, the necessity for a readjustment in the method of levying taxes for county highway improvement, so that city and town property will bear a larger proportion of the cost.

Co-operation to Secure Low Prices for Material

One of the most important features of Mr. MacDonald's paper is the suggestion that the solution of the problem of supply and price of material can best be met by definite coöperation between the county boards of the several counties. If each county continues to act separately in purchasing material, as under the old plan, prices are likely to range so high as to be prohibitive. Even if orders are placed there will be serious delays in delivery. Contracts placed in this way several months ago are still unfilled.

The suggestion was for the appointment of a committee of the State Association of County Supervisors to collect at once from the county boards their estimates of materials needed for 1918. These will be grouped and bids invited for the total amounts. The committee will have no power to place orders, but will submit the bids to the county boards, leaving the latter to take individual action. This suggestion has been adopted by the association, and its committee will consist of one supervisor from each congressional district. This is the first step, and Mr. MacDonald thinks it will be of interest to see how the plan works.

Large Water-Supply Well Sunk by Open Caisson Method

Open Excavation Inside Five Successive Concrete Rings for Paper Mill Well 45 Ft. Deep and 25 Ft. Diameter

By C. B. Coe

Engineering Department, Mead Pulp and Paper Co., Chillicothe, Ohio

AN ORDER to secure an adequate water-supply for the Scioto Mill of the Mead-Pulp and Paper Co., at Chillicothe, Ohio, a new well was sunk last year by open excavation inside concrete cylinders, which were built above ground and lowered by their own weight.

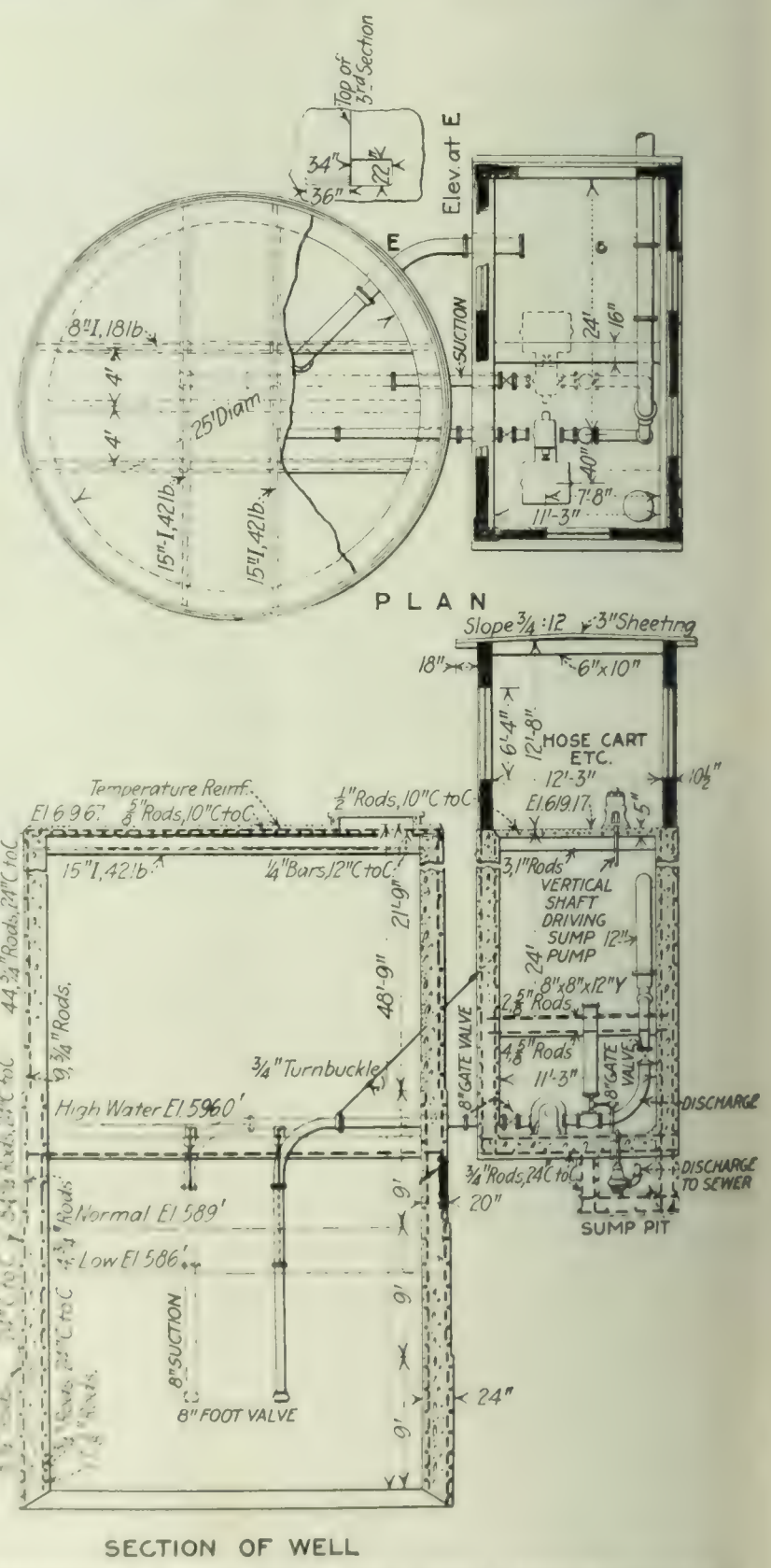
The design provided for five rings, 25 ft. in interior diameter and 9 ft. in depth. The bottom one was 24 in. thick and the next two 22 in. and 20 in. respectively, while the upper two were 18 in. This decrease in thickness was provided to ease the earth friction as the shell went down. Later, a sixth ring 18 in. thick and 3 ft. 9 in. deep was added at the top to bring the top slab flush with the ground.

Excavation was carried to a depth of 10 ft. before setting up the forms, which consisted of 13 segments inside and out, of ¾-in. tongue-and-groove lumber, each backed by six horizontal 2 x 10-in. ribs. A knife edge was formed at the bottom of the lowest concrete ring at an angle of 30° with the horizontal, but on account of the anticipated softness of the soil, a metal shoe was dispensed with. The outer and inner form shells were held together by 4 x 4-in. uprights, bolted together, the bolts passing through 1½-in. pipe spreaders, which were left embedded in the concrete to allow a free flow of the water into the well. The vertical reinforcement in the three bottom rings consisted of two rows of ¾-in. Kahn rib bars spaced 24 in. apart, staggered, and in the top rings, of one row of the same. The horizontal reinforcement in the lower three rings consisted of two rows of steel, the outer being ¾-in. rib bars and the inner ⅝-in., bent to the diameters shown in the drawing. In the upper rings there was but one row of circular reinforcement.

First Ring Sunk in Four Days

Sinking the first ring was started 15 days after the beginning of excavation and was completed in four days. Material was removed from under the ring by hand and thrown to the center, whence it was removed by a ¾-yd. clamshell bucket. The derrick was set so as to control sidetrack, but owing to the inability of the railroad to furnish cars, a hopper was built into which the bucket dumped the material and from which it was hauled by wagons. The material encountered was fine gravel and the work progressed with no difficulty whatever. When the ring had been sunk 10 ft., as shown in one of the views, the forms were placed again. The radius of the outer form was reduced 2 in. by removing sixteen ¾-in. strips from the vertical edges of the segments, enough of these having been previously placed to permit the entire reduction of outer diameter called for in the design. The outer form was moved in 2 in. and rested upon the concrete, while the inner was flush with the old surface and suspended from the outer by the bolts and pipe spreaders heretofore described. The concrete for the second ring was placed the day after the sinking of the first ring. Removal of the form was considerably facilitated by leaving the inner shell tied together and lifting it bodily out by the derrick.

Water was struck at 23 ft., during the sinking of the second ring, which progressed without further incident. The weight of the two rings, estimated to be 242 tons, forced the gravel, without further spading, to the center, whence it was removed by the bucket. The shell slipped down easily, about 6 in. at a time. During the entire job a record of the movement was kept, levels being taken at four fixed points and these plotted in a notebook. This chart showed the foreman instantly



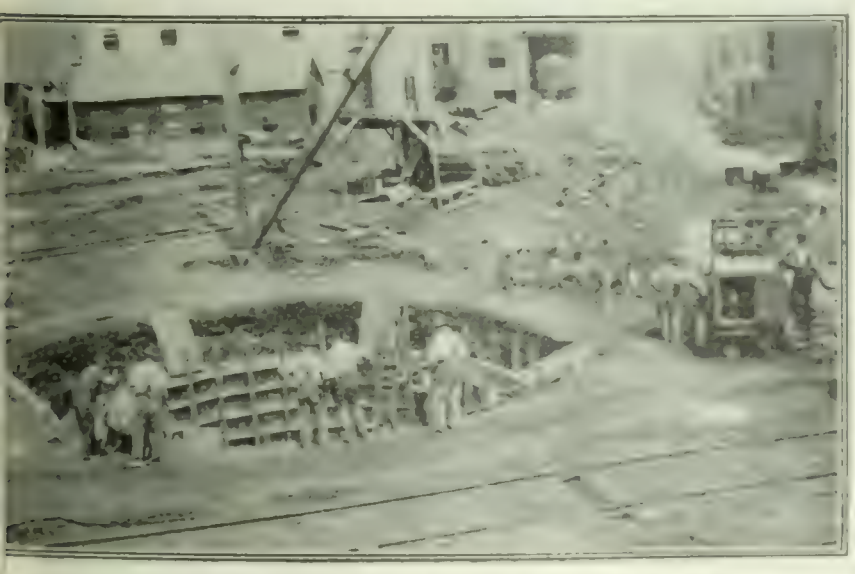
CONCRETE RINGS SUNK AND EXCAVATED INSIDE TO FORM WELL

which point was highest and directed his efforts to that side. Three ¾-in. jets with flexible connections were used to expedite the sinking of any side that might be lagging. The sinking of the first two rings required about four days each.

The sinking of the third ring was attended by considerable difficulty. At 33 ft. depth a stratum was encountered, consisting of loose boulders which refused to slide in to the center, but remained under the edge. Long bars failed to dislodge the obstruction, and several sticks of dynamite were exploded in the water without effect. Two attempts were made to pump the pit dry, and to this end a 2500-gal. centrifugal pump was set up, near the water line. This succeeded in lowering the water about 10 ft., but could do no more, so the rig was removed and digging with the clamshell resumed. Eventually, when the hole in the center had been deepened, the obstructions slid from under the edge.

No difficulty was encountered in the construction of the remainder, except that of caving ground outside the forms and rings, the hole there enlarging itself from the original 30 ft. to nearly 60 ft., but the concrete rings remained truly plumb. The concrete in the final section was placed two months from the date of commencing. The top of the well was a 6-in. slab supported by two 15-in. 42-lb. I-beams placed parallel, 8 ft. apart, and was poured after the completion of the pump pit and house. It was designed for 250 lb. per sq.ft. and was reinforced across the beams by $\frac{5}{8}$-in. rib bars spaced 10 in. apart and parallel to the beams by $\frac{1}{4}$-in. bars spaced at 12 in. to prevent expansion cracks.

The pump pit, 11 ft. 3 in. x 24 ft. x 24 ft. deep, was excavated, protected by wooden sheet piling and poured in three sections from the bottom up. The walls are 18 in. thick, reinforced by $\frac{3}{4}$-in. rib bars, as shown in the section, and waterproofed by the integral method, using Trus-con waterproofing paste. A beam 16 x 16 in., reinforced by $\frac{5}{8}$-in. bars, three at the bottom and two at the top, is provided to take the thrust of the earth on the walls. The house over it, intended to hold the hose reel and other fire-fighting equipment, is of brick. In the pit is a unit, consisting of a 1000-gal.



CONCRETE IS BEING PLACED FOR SECOND RING

De Laval centrifugal pump direct-connected to a 50-hp. G. E. motor, with provision for another unit of 2000 gal. capacity, connected by a Y-branch to the 12-in. line supplying the steel tank. The level of the water in the tank is maintained automatically, there being provided a Cutler-Hammer float control for this purpose. Connection from the well to the pit is furnished by two 8-in. and one 12-in. pipe, of which one 8-in. is in use, while the others are in reserve, one for the 2000-gal. unit and the other for a proposed motor-driven fire



FIRST RING HAS SHOVED INTO PLACE DURING EXCAVATION

pump. The intake extends about 12 ft. below normal water level and is provided with an 8-in. foot valve. Each intake is provided with a 34-in. slot in the wall of the well to allow for any future settling. The pit is provided with a 3-in. vertical Fairbanks-Morse sump pump, direct-connected by a long vertical shaft to a 5-hp. Fairbanks-Morse motor, located at the ground level.

The cost of the well was as follows:

Material	
[illegible]	$ [illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
Labor	
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	$ [illegible]

The well has been in use for nine months and has given fullest satisfaction. It is noteworthy that no appreciable movement has taken place in the shell since its completion. The work was done by the forces of the Mead Pulp and Paper Co., of which E. F. Eource is Chief Engineer.

Akron Water-Waste Survey Finds Loss in Large Meters

Isolation by Sections at Night To Test Mains—Day Tests Detect Service Leaks—Few Underground Leaks

FOLLOWING an expensive pitometer water-waste survey in Akron, Ohio, in 1916, it was concluded that the water unaccounted for was passing through large meters rather than through leaks in the mains. The results are given in the annual report of G. Gale Dixon, civil engineer, to H. H. Frost, superintendent of the Akron Water Department, from which these notes are taken.

Unrecorded use of water through factory meters totaling 586,000 gal. per day was discovered by pitometer survey and rectified. Cash adjustments for the above amounted to $3560, including one adjustment amounting to $2214, which has been agreed upon, but which has not yet been paid. The annual revenue from this quantity of water at the present maximum rate of 90c. per 1000 cu.ft. amounts to $25,820.

Hose-and-meter tests of street mains and service connections to date have resulted in the location of nine small leaks which were estimated to total 32,500 gal. per day and valued (at present minimum rate) at about $1600 per year.

The receipts for sale of water, which this year total over $350,000, represent approximately 50% of the water which is filtered and pumped.

If the present rate of setting domestic meters is continued, Akron will be completely metered next year; but the consequent reduction in household waste is not likely to increase the percentage of water accounted for to more than 60%.

Low Underground Leakage in Akron

Underground leakage from mains and services, which in some cities is a very large item, in Akron amounts to only 10% of the total pumpage.

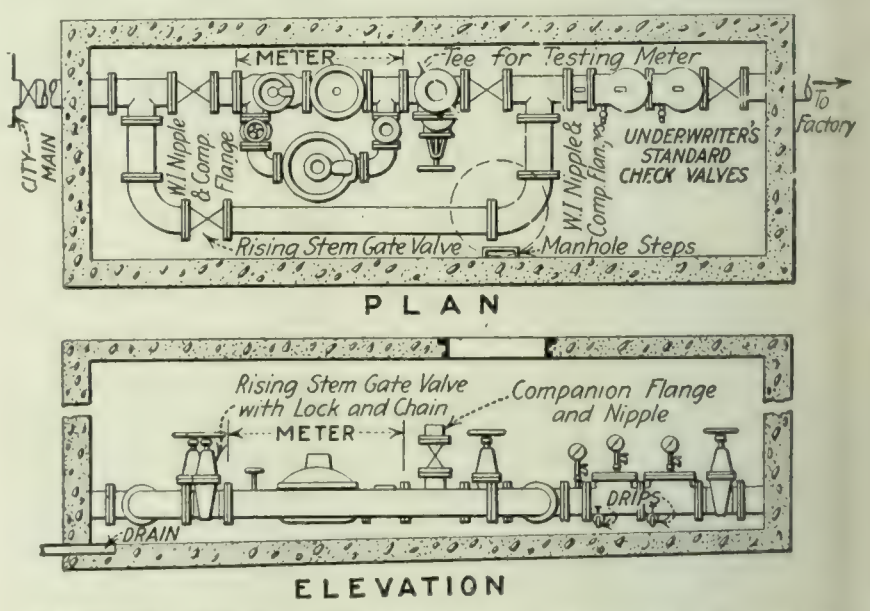
Assuming that 5% of the total pumpage is used for the flushing of streets and sewers, the extinction of fires, for watering-troughs and other public uses, an unaccounted-for balance of 25% remains. Results indicate that at least the major portion of this water can be transferred from the dead-loss to the revenue-producing side of the account by careful attention to the large connections.

The method of procedure on the night work was as follows: A section containing 10 or 15 squares was gated off and the highest hydrant opened to prove that the section was tight; great trouble was sometimes encountered in "drying up" a section, but it was always required, as any other method leaves the results open to serious question. After a section was proved tight, it was cut in to the instrument, the flow recorded and readings taken on the meters of all shops that were operating in the section. An adjacent section was then tested for tightness and added in to the one under observation, the building-up process being considered preferable to the reverse system used in some cities, due to the advantage of having smaller sections to test for

In daylight the hose-and-meter test was applied on the smallest section of main that could be isolated and included a fire hydrant. The equipment consists of 600 ft. of 2½-in. fire hose with meter board, consisting of a straight run of 2-in. pipe, a meter and a gage on a by-pass line, valves being inserted in the straight run and also on each side of the 1-in. meter. A hydrant cap tapped for 1-in. pipe and valve is used for a blow-off on the hydrant, and miscellaneous equipment includes miner's compass, aquaphones, valve keys, picks, shovels, etc.

Notification of Shut-off Given

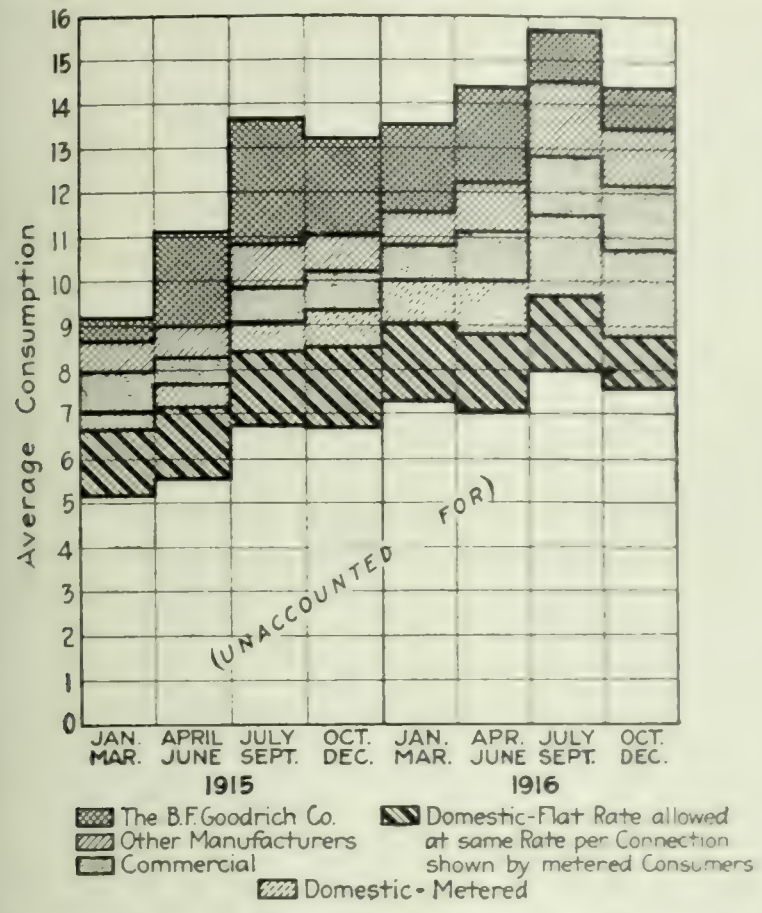
Two men first go through the section to be tested, notifying the people of the proposed shut-off. At the same time two other men test for leakage the hydrant through which the section is to be fed, and close the valves isolating the section. If the hydrant is found in good condition and the section dry, a valve is opened to supply the section. The hose and meter are then unloaded and one man connects up and opens the hydrants (first flushing the feeding hydrant) and closes the remaining street valve. While this is being done the other man, with the two men who have notified the people of the shut-off, proceed to close off the services. In this work two men take opposite sides of the street while the third man assists in locating the boxes and keeps notes of the conditions found. Each of the men



FACTORY-METER INSTALLATION REQUIRES DOUBLE CHECK VALVE AND TEE FOR TEST METER

closing the services is equipped with a curb box, key, aquaphone and flashlight. After removing the top from the box, he listens with an aquaphone at the curb cock. If he hears nothing, he closes the valve and listens again to make sure that the curb cock is closed. If he hears a flow when he first listens at the curb cock, he goes inside the house and closes the stop and waste cock; if he still hears the flow, he takes out the meter and caps the pipe. If the flow continues, there is a leak between the curb cock and the meter. If he does not hear it after taking out the meter, it is dropped, as it is going through the meter and is being paid for. If the curb box cannot be found, or if the curb cock cannot be closed, the stop and waste is shut. Three men are required, as considerable work is entailed in shutting off services due to the large size of sections between valves and the poor condition of curb boxes.

After all the services are shut off, the valve in the main line of the test board is closed, the water allowed to pass through the meter on the bypass, and the rate of flow observed. In general, flow at rates less than 0.05 cu.ft. per min. is neglected. In the case of greater flows, the foreman uses his judgment in searching for possible leaks, considering the size of the section, the



SEGREGATED USES OF WATER SHOW MUCH UNACCOUNTED FOR AT AKRON, OHIO

rate of flow, paved or unpaved streets, etc. After the test, the water is again turned through the main line of the test board, while two men turn on the services and the other two men open up the section, close hydrants and take down and load apparatus.

Coincident with the requirement that manufacturers install check valves at shops provided with dual water systems, the insertion of tees in the lines behind the meters was requested. This affords opportunity for the attachment of hose and meter at the most convenient point for test purposes.

Results From Selected Districts

Projecting the results to Jan. 1, 1917, over the whole city by applying the total leakage measured per mile to pipe and per inch-mile to the totals of these quantities as shown by the records, gives totals of 1,140,000 and 1,510,000 gal. daily respectively, as indicating the total underground loss from the distribution system. As the results have been obtained in selected districts, it is unlikely that the higher figure is actually exceeded, though the existence of relatively large leaks is possible in Districts 1 and 2, in which the distribution of the night rate is not known at present.

A comparison of the Akron results with those obtained at Cleveland, where waste-detection work has been in progress for nearly 15 years, indicates that in Cleveland an underground leak is located for every ½ or ¾ mile of main tested, while the Akron work has resulted in the location of but one leak in each 1½ mile

Water-Works Plant 3,600,000 Trees in New York State

From 1909 to 1917 Conservation Commission Supplied Trees to Nearly 30 Water-Works for Reforesting Watersheds

ENCOURAGED by the State Conservation Commission, which has supplied nursery stock at cost, more than 3,600,000 of trees have been planted on the water-works drainage areas of 21 municipally owned and 7 privately owned water-works in New York State during the last nine years. About 30% of the total has been planted by New York City and 20% by Rochester. At the other extreme is Ogdensburg, with a planting of 1000 trees.

The number and varieties of trees planted are given by years for each water-works in the accompanying table. Pine make up some 3,200,000 of the total, of which nearly half are white, more than a third are Scotch, an eighth red and the balance Austrian. Norway spruce count up to nearly 300,000. This leaves about 50,000 divided among Carolina poplar, black locust, white cedar, European larch, white ash and basswood, in the order named. Presumably white pine would be still farther ahead had not the rust discouraged its use in the last two or three years.

The table given was compiled for *Engineering News-Record* through the courtesy of George D. Pratt, commissioner of conservation, and B. H. Paul, state forester of New York.

REFORESTING BY MUNICIPAL AND PRIVATE WATER-WORKS IN NEW YORK STATE, 1909 TO 1917

Place	Year	Species	Number
Canajoharie	1915	White pine	100,000
	1916	White pine	30,000
	1916	Red pine	28,000
			158,000
Carthage	1910	Scotch pine	8,000
	1911	Scotch pine	15,000
	1912	Scotch pine	18,000
	1913	Scotch pine	14,000
	1914	Scotch pine	15,000
	1916	Scotch pine	75,000
	1917	Scotch pine	75,000
			180,000
Cortland	1914	White pine	1,000
	1914	Scotch pine	4,000
	1915	White pine	1,000
	1915	Norway spruce	3,000
	1915	Red pine	2,000
	1916	White pine	1,000
	1916	Norway spruce	1,000
	1916	Red pine	5,000
	1916	White pine	1,000
	1916	White pine	1,000
	1917	Norway spruce	1,000
	1917	Red pine	5,000
	1917	White pine	1,000
			27,000
[illegible]	1909	White pine	10,000
	1910	White pine	10,000
	1911	Scotch pine	10,000
	1911	Red pine	5,000
	1911	Scotch pine	5,000
	1912	Scotch pine	10,000
	1913	White pine	10,000
	1914	White pine	10,000
	1914	Scotch pine	10,000
	1914	Red pine	10,000
	1915	Scotch pine	10,000
	1916	Red pine	10,000
	1917	Scotch pine	10,000
			120,000
[illegible]	1910	White pine	20,000
	1911	Red pine	5,000
	1911	White pine	20,000
	1911	Scotch pine	5,000
	1911	Red pine	5,000
			55,000

[illegible]	1914	White pine	1,000
	1914	White ash	2,000
			3,000
[illegible]	1912	White pine	1,000
	1912	Norway spruce	10,000
	1916	Norway spruce	5,000
			16,000
[illegible]	1910	White pine	60,000
	1910	Scotch pine	5,000
	1910	Norway spruce	25,000
	1911	White pine	50,000
	1911	Norway spruce	25,000
	1916	White pine	30,000
	1917	Scotch pine	2,500
	1917	Red pine	10,000
	1917	Norway spruce	10,000
			217,500
Hudson Falls *	1910	White pine	500
	1910	Norway spruce	3,000
	1909	White pine	5,000
	1911	White pine	1,000
	1911	Norway spruce	1,000
	1912	White pine	2,000
	1912	Scotch pine	2,000
			14,500
Ithaca	1910	White pine	3,000
	1910	Scotch pine	1,000
	1910	Red pine	1,000
	1910	Norway spruce	3,000
	1911	White pine	3,500
	1911	Norway spruce	10,000
	1911	European larch	500
	1913	Scotch pine	5,000
			27,000
[illegible]	1910	White pine	500
	1910	Scotch pine	1,500
	1911	White pine	2,000
	1912	White pine	5,000
	1913	White pine	5,000
	1914	White pine	5,000
	1914	Scotch pine	2,000
	1915	White pine	2,500
	1915	Scotch pine	1,500
	1915	Red pine	2,500
	1916	White pine	2,500
	1916	Scotch pine	1,000
	1916	Red pine	2,500
	1917	Scotch pine	3,000
	1917	Norway spruce	2,500
	1917	Red pine	5,500
			44,500
Malone	1914	White pine	3,000
	1915	White pine	1,000
	1915	Scotch pine	4,000
	1916	White pine	1,000
	1917	Scotch pine	3,000
			12,000
New York City †	1912	White pine	60,000
	1912	Scotch pine	35,000
	1912	Austrian pine	48,000
	1912	Red pine	15,000
	1912	Norway spruce	10,000
	1912	European larch	2,000
	1914	White pine	22,000
	1914	Red pine	32,000
	1914	European larch	2,000
	1914	Carolina poplar	25,000
	1915	White pine	60,000
	1915	Scotch pine	40,000
	1915	Scotch pine	5,000
	1915	Norway spruce	5,000
	1916	White pine	35,000
	1916	Scotch pine	10,000
	1916	Norway spruce	5,000
	1917	Scotch pine	85,000
	1917	Red pine	65,000
			561,000
New York City ‡	1912	White pine	50,000
	1912	Scotch pine	125,000
	1912	Red pine	20,000
	1912	Norway spruce	10,000
	1912	European larch	2,000
	1913	White pine	30,000
	1913	Scotch pine	205,000
	1913	Austrian pine	35,000
	1914	White pine	20,000
	1917	Norway spruce	20,000
			1,078,000
Niagara *	1911	White pine	4,500
	1911	Norway spruce	5,000
	1912	White pine	10,000
	1912	Norway spruce	5,000
	1912	Black locust	1,000
	1916	White pine	5,000
	1917	White pine	5,000
			35,500
Ogdensburg *	1910	Scotch pine	500
	1911	White pine	4,000
	1911	Scotch pine	2,000
	1911	Norway spruce	6,000
	1914	White pine	8,000
			20,500
Poughkeepsie	1916	White pine	5,000
	1917	Red pine	5,000
			10,000

Salamanca	1911	White pine	1,200
	1912	White pine	60,000
	1912	Scotch pine	5,000
	1912	Norway spruce	10,000
			76,200
Ogdensburg	1912	White pine	1,000
Oneonta	1911	White pine	2,000
	1911	Norway spruce	3,000
	1912	Norway spruce	7,000
	1912	Carolina poplar	1,000
	1913	White pine	7,000
	1913	Scotch pine	5,000
	1913	Carolina poplar	1,000
	1915	White pine	7,000
	1915	Scotch pine	7,000
	1915	Norway spruce	500
	1915	Red pine	...
	1916	White pine	15,000
	1916	Scotch pine	15,000
	1916	Red pine	20,000
	1917	Red pine	1,150
	1917	Scotch pine	50,000
			141,150
Ossining	1912	Scotch pine	2,000
Port Jervis *	1912	Scotch pine	25,000
Rochester	1909	White pine	20,000
	1910	White pine	1,000
	1910	Scotch pine	10,000
	1911	White pine	13,000
	1911	White pine	17,000
	1911	Norway spruce	30,000
	1912	White pine	62,000
	1913	White pine	71,000
	1914	White pine	30,000
	1914	Scotch pine	25,000
	1914	Red pine	30,000
	1915	White pine	125,000
	1915	Scotch pine	50,000
	1915	Red pine	81,000
	1916	White pine	100,000
	1917	Red pine	100,000
			765,000
Sidney *	1910	White pine	6,500
	1911	White pine	7,000
	1912	White pine	2,000
	1916	White pine	5,000
			20,500
Southampton	1915	White pine	3,000
	1915	Norway spruce	3,000
			6,000
Troy	1913	White pine	100,000
	1913	Scotch pine	50,000
	1913	Austrian pine	15,000
	1913	Norway spruce	30,000
	1913	White ash	2,000
	1913	Black locust	8,000
	1913	Red pine	25,000
			230,000
Unadilla *	1916	White pine	1,000
	1916	Red pine	1,000
			2,000
Waterville	1910	White pine	20,000
	1910	Scotch pine	5,000
	1911	White pine	2,000
	1911	Scotch pine	2,000
			29,000
Utica *	1915	White pine	30,000
	1915	Norway spruce	15,000
	1915	White cedar	5,000
	1915	Black locust	5,000
	1915	Basswood	500
	1916	White pine	5,000
	1916	Scotch pine	5,000
	1916	Norway spruce	5,000
			70,500
Grand total			3,637,100

* Water-works owned by private company. All others owned by city.
† Department of Water-Supply, Gas and Electricity.
‡ Board of Water-Supply.

Lime Discovered in Alaska

Discovery of a limestone deposit is reported by the Alaskan Engineering Commission. It is located near the Government railway and 102 miles from Anchorage. It is found to be suitable for building purposes, and to contain 94.68% of calcium oxide (quicklime) or 67.62% of pure calcium. It was discovered by S. F. Rhodes, of Anchorage, and is being worked. The lime is sold at $3.75 per bbl., which is approximately the freight rate on lime from the States. Several contractors have placed orders. The Commission is arranging to use it, and reports that if it continues to be satisfactory and can be secured in sufficient quantity no more lime will be imported.

Missouri Cities Experiment with Vacuum Street Cleaners

Machines Pick Up Street Dirt and Haul to Dump—Center and Gutter Machines Used—Streets Must Be Dry

STREET-CLEANING by the vacuum-cleaner system has been on trial recently at Kansas City and St. Louis, Mo. The machine consists of a four-wheel motor truck which carries the machinery and hauls a closed wagon into which the dirt is discharged. This outfit hauls the dirt to the dump. One of the machines is shown in the accompanying view. They are owned and operated by the Way-Cleanse Co., of Sandusky, Ohio.

Two Machines Used at Kansas City

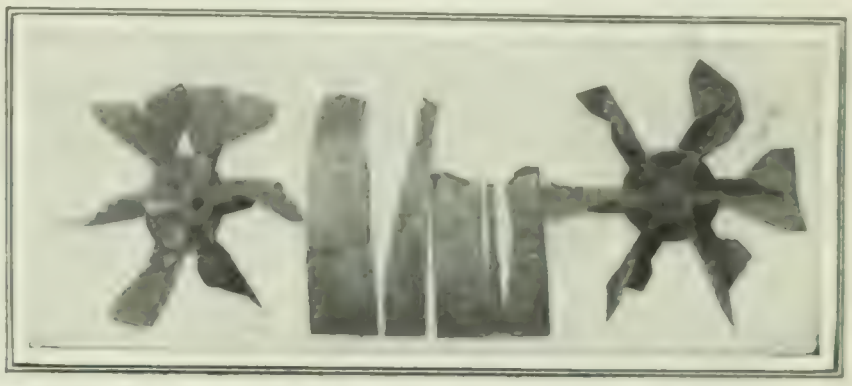
Two machines cover a district of 124 blocks, with about 2,040,000 sq.ft. of pavement. They start at 7 p.m., and finish the work usually in about eight hours. Fred. A. Richardson, street cleaning commissioner, says that in the first 30 nights they removed 497,134 lb. of dust, dirt and litter. Of this, 40% was fine dust.

A patrolman attends the machine to handle the space around dead cars, and also to pick up wet or damp material which is placed in a large garbage can hung on the back part of the machine.

This district was formerly cleaned by 140 patrolmen, but with the machines this number has been reduced 50%. The character of the pavement is mainly asphalt and wood block, with a few blocks of Medina stone in good condition.

The gutter machine travels 2 miles per hour and must make two cuts. The center machine runs 5 miles per hour and makes as many cuts as are required with the 8½-ft. width of the cleaning device. On Grand Ave., for instance, 11 cuts are necessary.

The wagon holds 20,000 lb. or about 9 cu.yd. of dirt. The fine material is heavy, due to the excessive amount of sand used on street railway tracks because of the steep hills in Kansas City. This sand wears the machine quite badly. In 27 nights the blower blades are cut out (see view) although they are ⅜ in. thick. Wood is to be tried. The back part of the fan is of ¼-in. boiler plate, but it is cut out in about the same time. The bass broom must be renewed in about 20 nights. Before the war these brooms cost $30; now the price is $106.

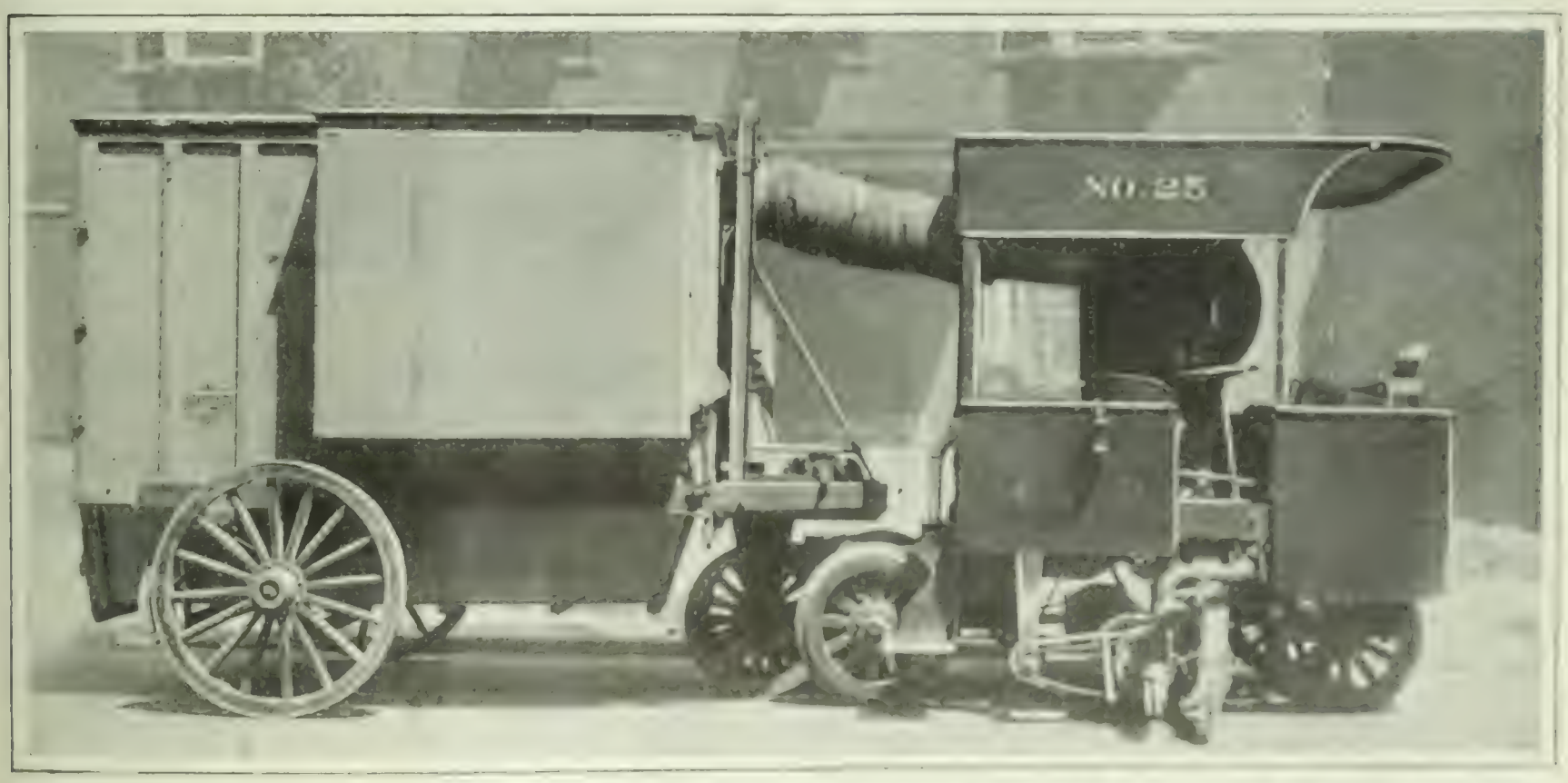


THESE FANS PICKED UP 497,134 LB. OF STREET DIRT IN KANSAS CITY IN 30 NIGHTS

A flexible pipe 12 in. in diameter and 62 in. long connects the sweeper to the dirt box. It is of No. 4 duck canvas, with a spiral wire covering. It lasts but two nights. A lining of rubber is to be tried.

Although the machine is 23 ft. long it can be turned in a radius of 17 ft., as it has a 3-point suspension. It cannot be tracked. The sweeper weighs 14,000 lb., and the wagon or trailer 7000 lb.

The machines used at St. Louis, Mo., clean 140 blocks of congested district each night, between 7 p.m. and 5 a.m. About 40% of the material will pass through a 200-mesh sieve. There are 31 blocks of poor granite-block paving. The remainder is in fair condition; it includes asphalt, wood-block and bitulithic. The rough



THIS MACHINE PICKED UP [illegible] LB. OF STREET DIRT IN KANSAS CITY AND HAULED IT TO THE DUMP IN [illegible] NIGHTS, JUNE 8 TO JULY 8, 1917

granite-block paving must be gone over twice and here the machines must be slowed down to one mile per hour. During the day this district is patroled by 60 men, as before, but this number may be reduced. The two machines cleaned the streets for nearly a year under contract ending in June, 1917. The contract has recently been renewed for a year. During the first contract the machines were out of commission only 6½ nights in 11 months.

A report on this work by C. M. Talbert, director of streets and sewers, in August, 1916, stated that the machines removed the fine and impalpable dust "which has been found by bacteriologists to be the germ-carrying part of street refuse." By cleaning every night, street sprinkling has been eliminated. This in turn lessens the skidding of automobiles on wet pavement. The use of the machines has materially reduced the labor required for cleaning sewer inlets and catch basins. The material removed from these has been reduced about 35%, and it is expected that the cost will be reduced about 50%.

Mr. Talbert considers that a disadvantage of the machine is that it cannot be used except when the roadway and gutters are perfectly dry. During the rainy season, therefore, street flushing may be necessary. He states that no complaints of dirt in the congested district were received in the 60 days the machines were in use, and that merchants and others had expressed the opinion that conditions, so far as dust is concerned, had improved.

Mill Construction Used for City Factory Building

Heavy Timber Framing for Plant Within Chicago Fire Limits—Good Lighting Insured by Large Window Area

APPLICATION of the mill-type fire-resistive system of timber structural framing for industrial buildings within the business district of Chicago is illustrated by a recent addition to the plant of the Victor Electric Company.

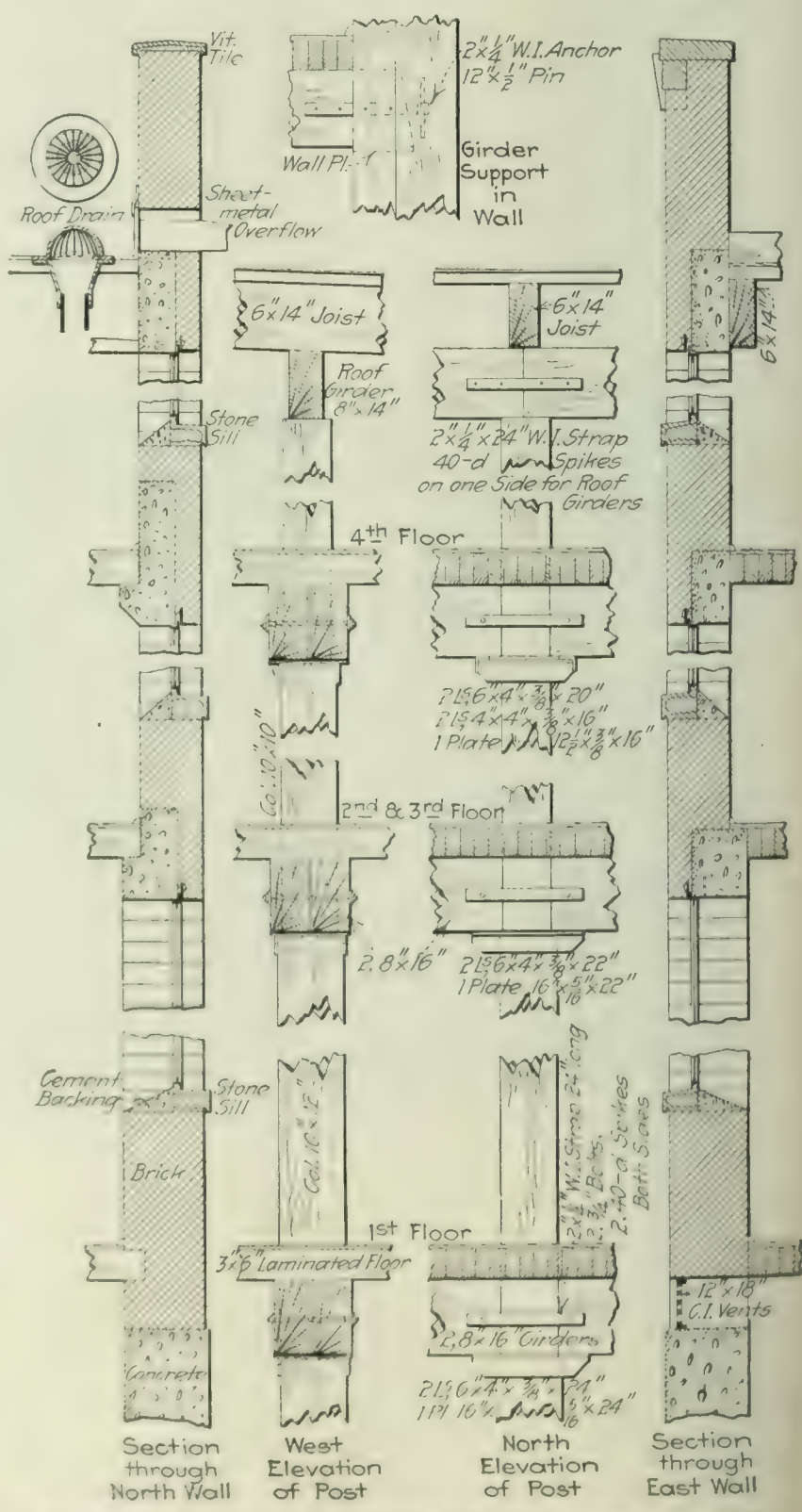
This type of construction was adopted on account of low cost and rapid erection. It is estimated that a reinforced-concrete structure would have cost 20% more and required 25% more time for erection. The cost of the building complete was 10c. per cu.ft. The building is for light manufacturing purposes, and there will be no heavy machinery to cause severe impact or vibration. For fire protection there is a sprinkler system on each floor.

The structural design which is typical for buildings of this class, is shown in the accompanying drawing. The building is 102 x 126 ft., with four stories and basement. The exterior walls are of concrete and pressed brick, with stone trimmings. The column spacing is 16 ft. on the longer side and 19½ ft. on the shorter side. Each column has a reinforced-concrete footing 7 ft. 4 in. square and 2 ft. deep, with two layers of steel bars in the bottom. The floor loads are 100 lb. per square foot.

Timbers Have Metal End Caps

All structural timbers are of long-leaf yellow pine. The columns are 10 x 12 in. for the first and second floors, and 10 x 10 in. for the upper floors. Those in the basement are seated on cast-iron shoes on the footings. The others rest on the built-up steel caps which carry the girders at each floor. The girders extend across the 16-ft. spans. Each floor girder consists of a pair of timbers 8 x 16 in., having their ends butted against the columns and seated on the column caps. For the first two floors, each column cap is composed of two side angles and a top plate, while those of the upper floors have four smaller angles and a top plate.

The ends of adjacent girders are connected across the column by a pair of outside straps with four spikes and two through bolts. Similar straps with anchors secure the ends of the girders in the wall pockets where they rest on steel plates. In accordance with standard practice the wall ends of the girders are cut at an angle, so that in case of fire burning out the columns the ends of the girders may tilt out of their pockets without



MILL-TYPE TIMBER CONSTRUCTION FOR FACTORY BUILDING WITHIN CHICAGO FIRE LIMITS

affecting the walls. No preservative is applied to the ends of the columns or girders, and no casting or finish is given to the woodwork.

The floors are of the laminated type, consisting of 3 x 6-in. timbers on edge, laid close and spiked together. They are not spiked to the girders, so that there is no interference of expansion and contraction movements in the girders and floors. At the end walls these floor timbers are carried by a 4-in. corbel. Upon this tight floor is a waterproofing layer of tar-paper and then the wearing surface of plank 1 x 3 in. A nosing strip secures the ends of these planks at the walls.

Window Area Very Large

The roof has girders composed of single timbers 8 x 14 in., with ends resting directly on top of the columns and connected by straps spiked to each girder. Upon these are joists 6 x 14 in., spaced 8 ft. c. to c., carrying a sheathing of planks 3 x 6 in., laid flat and covered with composition roofing.

The window area is very large, and all windows are of the Fenestra type with metal frames and wire-glass panes. On two sides the window openings are 16 ft. and 12 ft. 3 in. wide. On the other sides their width is 4 ft. 10 in. Reinforced-concrete lintels are used, concealed by the pressed-brick facing, which is carried by a shelf angle on each lintel. An inclosed elevator shaft and inclosed stairway occupy two corners of the building. Electricity is supplied for lighting and power, and gas for furnace work.

This mill-type structural timber construction has been used in Chicago for several industrial buildings (for manufacturing and warehouse purposes) in the business districts. It meets the requirements of the underwriters, and the insurance rate on such a building is about the same as for one of reinforced concrete, where both are equipped with a sprinkler system.

The Victor Electric Co.'s building was designed by S. Scott Joy, architect, Chicago. The E. W. Sproul Co. was the general contractor.

Connecticut Controls Sewage Disposal

After years of delay the Connecticut State Board of Health has been granted a large measure of control over sewage disposal. An act passed by the last legislature empowers the board to "investigate all points of sewage discharge" and to "examine all existing or proposed public sewage systems and refuse-disposal plants," and to "compel their operation in a manner which will protect the public health." The board may order changes, extensions or "replacement by other structures when necessary for the protection of the public health." Hereafter no public sewerage systems or refuse-disposal plant may be built without a plan having been filed with and approved by the State Board of Health. Limitations on the new legislation exclude control over sewerage systems owned and maintained by persons or private corporations, and also publicly owned sewerage systems built or under construction, or systems plans for which had been approved by the board before the passage of the act—provided that the exceptions noted "shall not permit the continuance or increase of any pollution of the waters of the state which is prejudicial to the public health."

Letters to the Editor

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Bituminous Foundations for Sheet Asphalt Surfaces

Sir—The writer has noted with much interest the various comments in regard to his recent article on bituminous concrete base construction, and desires to correct any impression, conveyed by Mr. Roberts' letter, as to the unusual conditions attending the quality of the portland cement concrete foundation under asphalt pavements, the behavior of which was cited under heavy traffic.

It is likely that pavements constructed upon poor portland cement concrete foundation would be affected most readily by heavy truck traffic, and as the observations of the writer were not extended to the quality of concrete during construction of those pavements noted, the possibility of some deficiency in the character of concrete is, of course, pertinent.

The particular pavements in mind, however, are evidently not those constructed under the conditions referred to by Mr. Roberts, as they were laid prior to 1916, and, to the writer's best knowledge, with fresh aggregate. It is also fair to state that these pavements are of the lighter construction, in which the concrete base is only five inches thick.

That this condition is not isolated nor confined to portland cement concrete base under sheet asphalt will be apparent to anyone observing paving construction in Chicago, where there are numerous instances of failure



of this type of base under both brick and wood block pavements—in fact, such failures of base seem to be more widely spread and apparent under block pavements than under sheet asphalt. Further, this condition is not confined to one city, but has been reported from various sources, including New York City, where men-

tion was made in a recent article by Mr. Stern, Chief Engineer, Borough of Manhattan, of the effect of unusual loads upon various classes of pavements. Naturally, however, this condition will be observed earlier, in the larger cities, where streets carry extremely heavy traffic.

In this connection, an interesting observation was made by the writer upon the sheet asphalt pavement laid on Cortland Street in Chicago, during the year 1909. This pavement has given excellent service since it was laid, but within the last couple of months a break has occurred in the surface, through failure of base, and presumably from some heavy load. A photograph of this break, noted shortly after it occurred, is given herewith. This pavement is of the type "A" construction: that is, 6 in. of concrete, 1½ in. of binder and 2 in. of top, and for eight years has displayed no weakness due to foundation or other trouble. The recent break, after so many years, is hardly indicative of any original weakness of the concrete in the base.

Great stress has been laid upon the ability of portland cement concrete foundation to bridge soft spots in the subgrade. It is these concealed or hidden soft spots which apparently are likely to become the source of greatest difficulty under increasingly heavy traffic. This point has been well covered by Mr. McGrath in a letter on p. 369, issue of Aug. 23. It might be added, however, that should such defects occur in a subgrade covered with bituminous concrete, and be undetected at the time of construction, later settlements can be very readily repaired with surface heaters, thereby building up the surface, rather than reconstructing the base as is necessary where portland cement concrete crushes through such weak subgrade.

The writer does not believe that all kinds of subsoil will permit of bituminous concrete base, and that its application must be restricted to conditions set forth in the original article.

L. KIRSCHBRAUN,
Director, Chicago Paving Laboratory.

Chicago, Ill.

Supreme Court Decision Protects Trade Secrets

Sir—We have just obtained a decision, which may interest you, from the Supreme Court of the United States for the duPont Powder Company. An employee of the company developed trade secrets and learned others during confidential employment by the company, and then threatened to go into the same line of business, using the secrets. He claimed those he intended to use are not secrets, but are known in the trade. We sued to enjoin him from disclosing and using the secrets, and his counsel claimed the right to disclose the secrets to experts to aid him in the conduct of the case, and the right of his client to disclose the secrets to persons from whom he was seeking information, to prove that the secrets are in the realm of public knowledge and therefore not secrets.

The trial court granted us a preliminary injunction against this disclosure, and the Court of Appeals in Philadelphia handed down an opinion holding that the trial court should not have granted this injunction. We obtained a stay of the mandate while we petitioned the Supreme Court of the United States for a writ of certiorari, thus leaving the injunction in force, and the Supreme Court granted the writ, directing the Court of Appeals to send the case to the Supreme Court. The late John G. Johnson of Philadelphia filed a brief against us, but he died before the date set for the hearing, and George Wharton Pepper, of Philadelphia, made the argument against me.

The Supreme Court has just handed down a decision reversing the Court of Appeals and sustaining the injunction. The case is of large importance because if the contentions on behalf of the defendant had been sustained, he could have destroyed the secrets in the process of trying the case, and thereafter no manufacturer would have brought suit to protect trade secrets, since he would rather have allowed one dishonest employee to use them than to have permitted them to become known to the entire trade.

EDWIN J. PRINDLE,
Prindle, Wright and Small.

New York.

Machine-Bolt Heads Smaller Than Nuts

Sir—All of the steel manufacturers' handbooks, so far as I know, as well as Kent and others, give obsolete standard tables for dimensions of machine-bolt heads in making them the same dimensions as the nuts. The manufacturers' standard dimensions of bolt heads with which orders for machine bolts are filled, are in every case smaller than the nuts. There are good reasons for this standard, in part as follows:

The head, which has no hole in it, should not be as big as the nut, which does, in order to be as strong.

The smaller head is cheaper to make, occupies less space in packages and costs less for transportation.

It saves in the number of wrenches required with square heads and nuts, because the head can be held from turning by the wrench for the nut of the next smaller size bolt and wrenches are commonly made loose enough so this can be done.

F. D. BUFFUM,
Pittsburgh, Penn. General Contractor.

[It is true that many handbooks give only the Franklin Institute or American Bridge Co. standards, showing the nuts and bolt heads equal in size, or differing only in thickness. Some of the newer editions, however, are including the manufacturers' standards, which certainly should be done, as they govern the dimensions of commercial machine bolts.—Editor.]

More Lead Produced in 1917

More than half as much lead was produced during the first six months of this year as during the entire twelve months of 1916, according to figures compiled by C. E. Siebenthal of the U. S. Geological Survey. The increase is due mainly to a marked increase in lead of foreign origin. The domestic output was 276,523 tons, as compared with 276,114 tons, half the corresponding output for 1916. The output from foreign sources, however, was 29,529 tons, as compared with 9453 tons, half that for 1916. The apparent consumption of lead in this country during the six months was 268,952 tons, as compared with 230,587 tons, half the consumption during 1916. The average outside spot price during the six months' period was 9.9c. per pound, as against 6.9c. in 1916.

THE ENGINEER IN FIELD AND OFFICE

A DEPARTMENT DEVOTED TO DETAILS OF THE DAY'S WORK

"Go-Go" Semaphore Shades Policeman

COLUMBUS, Ohio, and some of the other more southern cities, provide traffic signals that are useful in more than one way, as the accompanying illustration shows. Two octants of the umbrella are colored red and



MAKES TRAFFIC OFFICER MORE EFFICIENT

lettered "stop"; the octants at right angles are white and marked "go." The intermediate octants bear the name of "Columbus Automobile Club," which is presumably responsible for the idea.

Formulas Deduced for Friction Loss in Water Pipes and Fittings

SOME exponential formulas for the friction loss of head of water flowing through standard American pipes and fittings have been deduced by Prof. F. E. Giesecke, head of the Division of Engineering, Bureau of Economic Geology and Technology, University of Texas. These are some of the results of experiments made at that institution under his direction. (An outline of the tests was given in a paper before the July, 1917, meeting of the American Society of Heating and Ventilating Engineers; a full report will shortly be issued in a bulletin of the University of Texas.)

Briefly summarized, the method of test was to let water run from one tank to another, with and without the given pipes and fittings in the connecting line. The velocity was computed after calibrating the free area of the pipe, weighing the water flowing in a given interval, and measuring the difference of level by hook gages. In this way the head-velocity relations were established for various velocities in pipes of ¼ to 3 in. nominal size. After plotting these relations on double logarithmic cross-section paper the loss per foot of pipe could be secured. Then a logarithmic plot was made of values of K in the equation

$$h = kv^n$$

for the several sizes of pipe. From these the final formula was deduced as

$$h = 0.00685 \frac{v^{1.\ldots}}{d^{1.\ldots}}$$

for water at 68° F. and for velocities of up to 3 ft. per sec., in ½- to 3-in. black butt-welded steel pipe.

Similar studies of galvanized pipes gave the formula

$$h = 0.00845 \frac{v^{1.84}}{d^{1.\ldots}}$$

In general, the exponent of v increases with the interior roughness of the pipe.

Increasing the temperature of the water decreased friction-head loss, apparently by changing the coefficient of v of the exponent. The hot-water experiments were not completed.

For the friction loss of flow at 68° F. through one standard short-radius steam elbow the formula deduced is

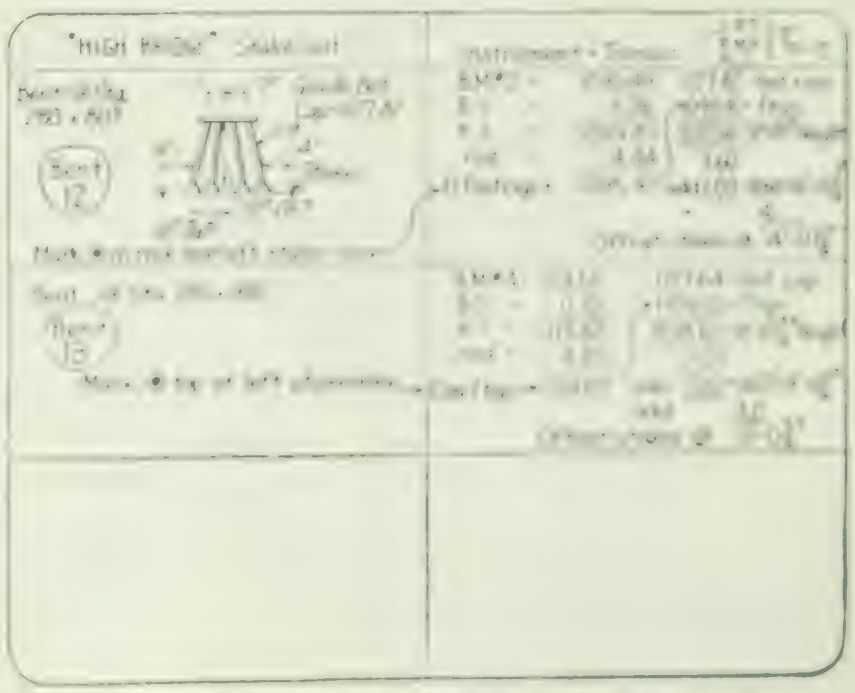
$$h = 0.0141 \frac{v^{1.96}}{d^{0.\ldots}}$$

Bridge Stake-Out Simplified by a Clear Form of Notes

BY E. P. ARNESON

San Antonio, Texas

THE following form of note keeping for stake-outs of bridge bents has been found simple, quickly made and of ready reference on the job. If the bridge is on a grade, it is necessary to have available, preferably



...HOD OF STAKING OUT A BRIDGE IN THIS MANNER

in the same notebook with the stake-out records, the information indicated in the accompanying table.

DATA ON "HIGH BRIDGE"

Station	Bent No.	Grade (Ft.) Floor Surface	Bottom of Cap
280+80.5	12	1,129.82	1,127.82
281+96.5	13	1,129.64	1,127.64
283+16.5	14	1,129.46	1,127.46

With the above data and benchmark levels readily accessible, the staking out of the bridge bents is undertaken, and the operations so performed are recorded in the manner suggested by the illustration of a typical field notebook opening.

How Design Knee-Braced Top Flange of Girder?

A correspondent submits a query regarding the proper use of column formulas and desires suggestions for rational methods of knee-brace design. The top flange of a through plate girder is stayed at regular intervals by knee braces riveted to the floor-beams. What length l should be used in the design of the top flange according to a specification stating that the unit stress shall not exceed $16{,}000 - 200l/b$, in which l is the unstayed length and b is the width of flange? Can the flange be considered as rigidly held by the knee braces? How should the knee braces be designed?

Grading and Ditching Costs but $23 a Mile in Oregon

With the equipment shown in the photograph Union County, Ore., did 127 miles of road work last year at an average cost of $23 a mile. The roads were all finished 30 ft. wide. According to the report of the county roadmaster, George Grout, the work, which occupied 160 days, included 47 miles of sidehill road where rock was encountered, 52 miles of earth road and 28 miles of existing road ditched on both sides.

The equipment used consisted of an Austin giant grader, 8-ft. blade, and a Western grader, 13-ft. blade, drawn by an Avery 40-80 gas tractor. At the conclusion of the work this equipment was overhauled and found to be in good condition, considering that much of the work done was very heavy.

The above costs include 15% of the first cost of the equipment as depreciation, oil, fuel, labor, and all repairs.

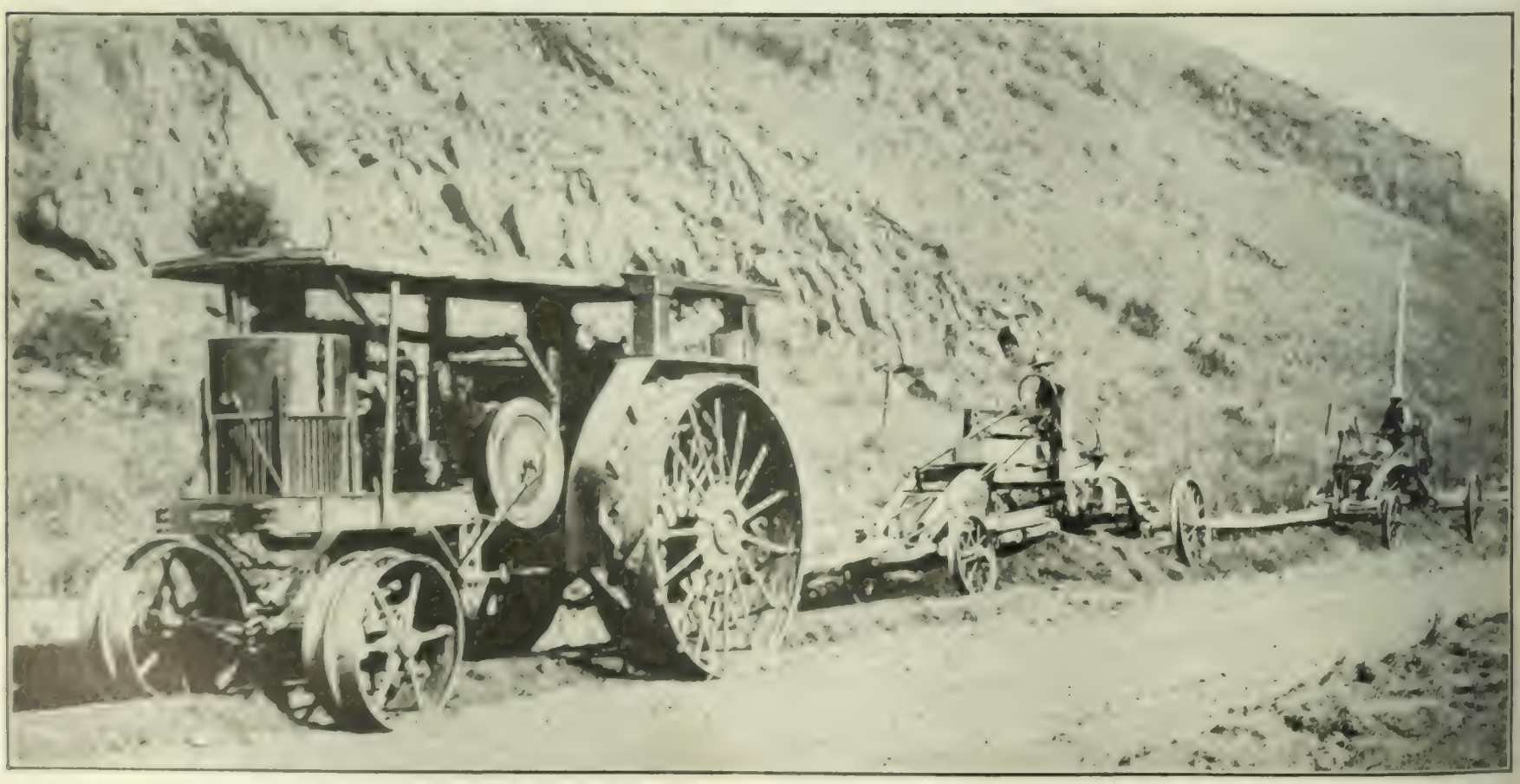
Table Gives Areas of Segments of Circles

There is frequent need for an easy formula for finding the area of a segment of a circle, since this area is needed in calculating the contents of horizontal cylinders for various depths of the liquid in the cylinder. The content of such a cylinder equals the area of the segment times the length of the cylinder.

No satisfactory formula has been developed for finding the area of circular segments in terms of the radius and altitude of the segment. All exact formulas involve the central angle subtended by the chord of the arc, and it is a difficult matter for a practicing engineer to make use of such formulas when the altitude of the segment alone is given.

A number of approximate formulas have been developed for finding the area of segments. The simplest one gives area as $\frac{2}{3}\,AL$, where A is the altitude and L is the length of the chord of the segment. This formula assumes that the arc of the circle corresponds to the arc of a parabola and gives quite close results when the altitude of the segment is less than one-fifth of the radius; it cannot be used when the altitude is over one-quarter of the radius. Other formulas for finding approximate areas of segments do not readily permit the use of logarithmic computation and, furthermore, are far from accurate.

The accompanying table has been constructed by Prof. W. B. Marquard, of Lafayette College, to give accurate areas of segments for various altitudes that range from one-sixtieth part of the radius up to the radius. It was first published in *Engineering and Mining Journal.*



OUTFIT DOES HEAVY GRADING AT LOW COST, COVERING 127 MILES IN 160 DAYS

The area of the major segment is found by subtracting the area of the tabulated small segment from the area of the circle (3.14159 R^2). Areas for various altitudes are found by multiplying numbers in the second column of the table by the square of the radius. Each division of the first column represents an altitude of one-sixtieth part of the radius. Hence areas are shown for every inch of 5-ft. circle, or for every 0.4 in. of a 2-ft. circle, etc.

AREAS OF CIRCULAR SEGMENTS

Formula used, Area = R^2 arc vers $\frac{h}{R} - (R - h)\sqrt{2Rh - h^2}$

Depth	Area / R^2	Log Area / R^2	Depth	Area / R^2	Log Area / R^2
1/60 R.	0.00408	$\bar{3}$.61066	31/60 R	0.64320	$\bar{1}$.80839
2/60 R.	0.01145	$\bar{2}$.05881	32/60 R	0.67252	1.82770
3/60 R.	0.02091	$\bar{2}$.32035	33/60 R.	0.70216	$\bar{1}$.84644
4/60 R.	0.03211	$\bar{2}$.50664	34/60 R.	0.73209	$\bar{1}$.86456
5/60 R.	0.04478	$\bar{2}$.65108	35/60 R.	0.76224	$\bar{1}$.88209
6/60 R.	0.05872	$\bar{2}$.76879	36/60 R	0.79267	$\bar{1}$.89909
7/60 R.	0.07381	$\bar{2}$.86812	37/60 R	0.62334	1.91558
8/60 R.	0.08993	$\bar{2}$.95391	38/60 R.	0.85424	1.93158
9/60 R.	0.10705	$\bar{1}$.02959	39/60 R	0.88535	$\bar{1}$.94712
10/60 R.	0.12502	$\bar{1}$.09698	40/60 R.	0.91670	1.96223
11/60 R.	0.14376	$\bar{1}$.15764	41/60 R.	0.94821	$\bar{1}$.97690
12/60 R.	0.16350	$\bar{1}$.21352	42/60 R.	0.97991	$\bar{1}$.99119
13/60 R.	0.18387	$\bar{1}$.26451	43/60 R.	1.01180	0.00509
14/60 R.	0.20492	$\bar{1}$.31158	44/60 R.	1.04385	0.01864
15/60 R.	0.22666	$\bar{1}$.35538	45/60 R	1.07610	0.03185
16/60 R.	0.24900	$\bar{1}$.39620	46/60 R.	1.10839	0.04469
17/60 R.	0.27190	$\bar{1}$.43441	47/60 R.	1.14087	0.05724
18/60 R.	0.29548	$\bar{1}$.47053	48/60 R.	1.17347	0.06947
19/60 R.	0.31957	$\bar{1}$.50457	49/60 R	1.20619	0.08106
20/60 R.	0.34416	$\bar{1}$.53676	50/60 R	1.23901	0.09311
21/60 R.	0.36945	$\bar{1}$.56756	51/60 R	1.27193	0.10476
22/60 R.	0.39483	$\bar{1}$.59641	52/60 R	1.30492	0.11559
23/60 R.	0.42083	$\bar{1}$.62411	53/60 R	1.33904	0.12659
24/60 R.	0.44730	$\bar{1}$.65060	54/60 R	1.37113	0.13708
25/60 R.	0.47418	$\bar{1}$.67594	55/60 R.	1.40433	0.14747
26/60 R.	0.50143	$\bar{1}$.70021	56/60 R	1.43756	0.15763
27/60 R.	0.52910	$\bar{1}$.72354	57/60 R	1.47083	0.16756
28/60 R.	0.55711	$\bar{1}$.74594	58/60 R.	1.50415	0.17729
29/60 R.	0.58549	$\bar{1}$.76752	59/60 R	1.53746	0.18681
30/60 R.	0.61419	$\bar{1}$.78830	60/60 R	1.57080	0.19612

Note—Areas for various depths of segments are found by multiplying numbers in the second column by the square of the radius. To facilitate the work of computation in making a table to show contents of tank for various depths the logarithms of the areas are given in the third column. The logarithms of the contents in cubic feet for the various depths are found by adding the sum of the logarithms of the length of the tank and twice the logarithm of the radius to the tabulated logarithm in the third column. The logarithm of the contents in gallons is found by adding the logarithm of length and twice the logarithm of radius and log 7.4805 to the tabulated logarithm in the third column (Log 7.4805 = 0.87393). When the depth is greater than the radius the area of the major segment must be found, which equals the area of the circle (3.14159 R^2), less the tabulated area of the small segment.

A table showing the contents of horizontal cylinders for various depths of the liquid can be easily made by using the following table of segment areas. The use of logarithms is urgently advised in making a table showing the contents of tanks. The following illustrations show a method of obtaining the contents in cubic feet and also in gallons:

Radius = 5 ft. Length = 12 ft. Log R^2L = 2.47712

Depth	Log. Volume, Cu.Ft.	Volume, Cu.Ft.
5/60 R = 5 inches	$\bar{2}$.65108 + 2.47712 = 1.12820	13.43
25/60 R = 25 inches	$\bar{1}$.67594 + 2.47712 = 2.15306	142.25
60/60 R = 60 inches	0.19612 + 2.47712 = 2.67324	471.24

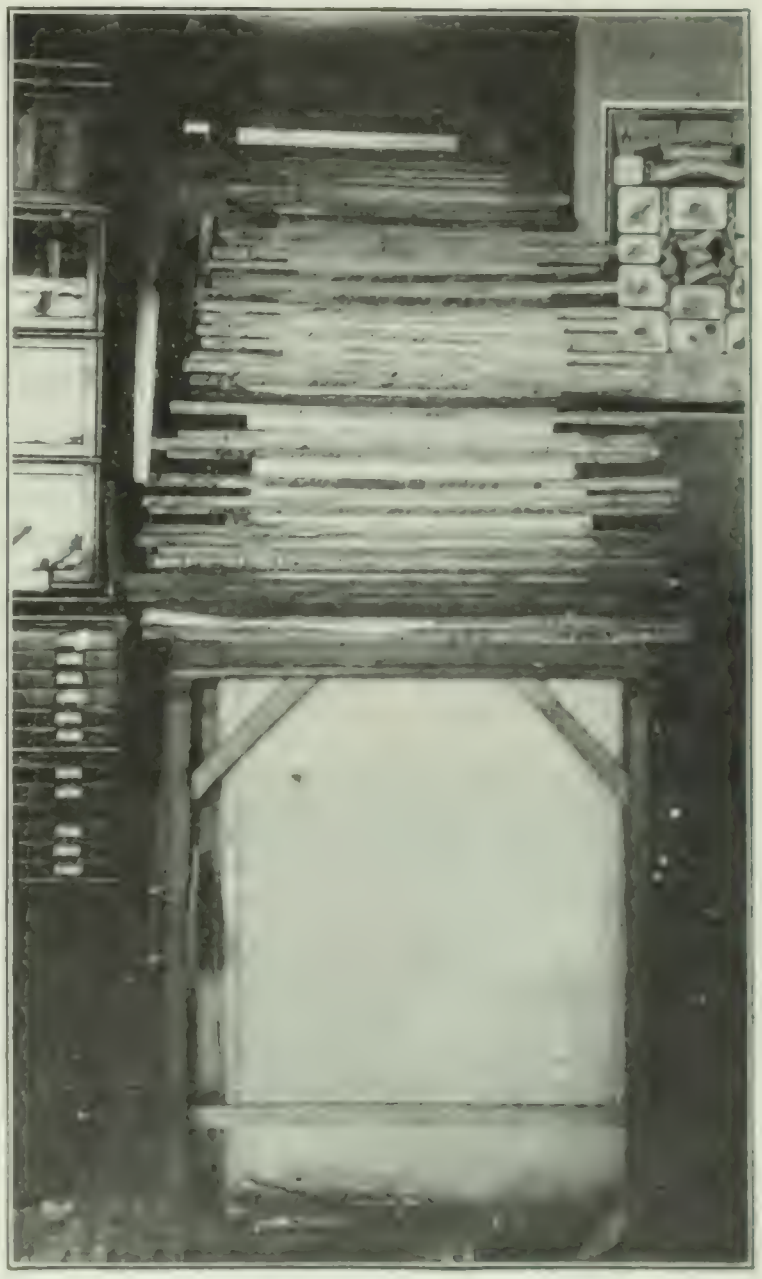
If it is desired to find the contents in gallons, add the log (7.4805 R^2L) to the tabulated logarithm in the third column of the table:

Radius = 3 ft. Length = 10 ft. Log (7.4805 R^2L) = 2.82827

Depth	Log Volume, Gal.	Volume, Gal.
5/60 R = 3.0 inches	$\bar{2}$.65108 + 2.82827 = 1.47935	29.93
25/60 R = 15.0 inches	$\bar{1}$.67594 + 2.82827 = 2.50421	318.14
60/60 R = 36.0 inches	0.19612 + 2.82827 = 3.02439	1,057.3

Large Number of Road Plans Filed in Simple Rack

THE accompanying photograph was taken in the office of George C. Diehl, County Engineer of Erie County, New York, at Buffalo, and shows the method of filing blueprint road plans of a large number of townships. The scheme consists merely of mounting the blueprints of each township between two stick or lath binders and hanging each pair of binders on an inclined rack. The titles and numbers of the roads are printed in black ink on one side of the binder sticks, and just enough inclination is given the rack so that the titles of all the binders are readable to one standing in front. Not only is convenience served, but the cost of the rock is negligible.



RACK INCLINED TO SHOW TITLES

Revision of English Standard Specifications

Periodical revision of specifications is the practice of the British Engineering Standards Committee. Each specification, according to a report of the Sectional Committee on Cast-Iron Pipes for Gas, Water and Sewerage Purposes, "will, when necessary and at least annually, come up for revision." At such times "suggested amendments or enlargements will be considered and dealt with by the sectional committee, it being of a permanent character."

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Five-Inch Holes Made with Hammer Drills on Dam Enlargement

By H. L. Hicks
New York City

THE RECONSTRUCTION and enlargement of three dams at Big Creek, Fresno County, California, to provide additional storage capacity, is marked by a method of anchoring the new concrete to the original reinforced-concrete structure of dam 2, which required drilling a large number of shallow, large-diameter holes.

The construction work is being conducted by the northern division of the Southern California Edison Co., whose chief engineer, R. C. Starr, devised a plan of using 6-ft. lengths of 30-lb. rail as ties, setting them vertically into the stepped back of the existing dam. This necessitated the drilling, at close intervals, of 5-in. holes 3 ft. deep. In fact, the practical success of the whole system was dependent upon the possibility of drilling the large number of these holes required with rapidity and at reasonable cost.

Owing to the unhandy location of the holes to be drilled, it was out of the question to use the heavy tripod-mounted piston drills usually employed for putting down large-diameter holes. E. L. Fox, superintendent in charge of the drilling, placed his faith in the ability of unmounted hammer drills to carry out the work, although nearly all the drill manufacturers were of the opinion that it would not be possible to handle bits as large as 5 in. in diameter because of the large number of very hard boulders which would be encountered embedded in the concrete. After experimenting with various kinds of bits and different machines, Mr. Fox finally selected Leyner-Ingersoll drills for this heavy duty, they having shown from 30 to 40% greater speed than others.

Eight drills are in use. Of the type ordinarily used in tunnel driving on a column or bar mounting, the drills have been fitted for this work with special handles and are operated by two men as hand hammer drills. Standard 1¼-in. solid round steel is used with 5-in. bits. The Leyner water-feeding device has been dispensed with and the holes are drilled dry, the cuttings being cleaned out by means of an auxiliary blowpipe. The average drilling time for a 3-ft. hole is 20 minutes.

The duty on the drills is severe, and to relieve the strain as much as possible a Leyner sharpener, fitted with special dies to handle the large bits, was installed. Absolute gage perfection secured in this way relieves the drill rotation mechanism of excessive wear and has largely eliminated loss of time due to stuck steels.

When all the holes have been drilled the lengths of rail will be grouted in and the forms set for pouring the new concrete.



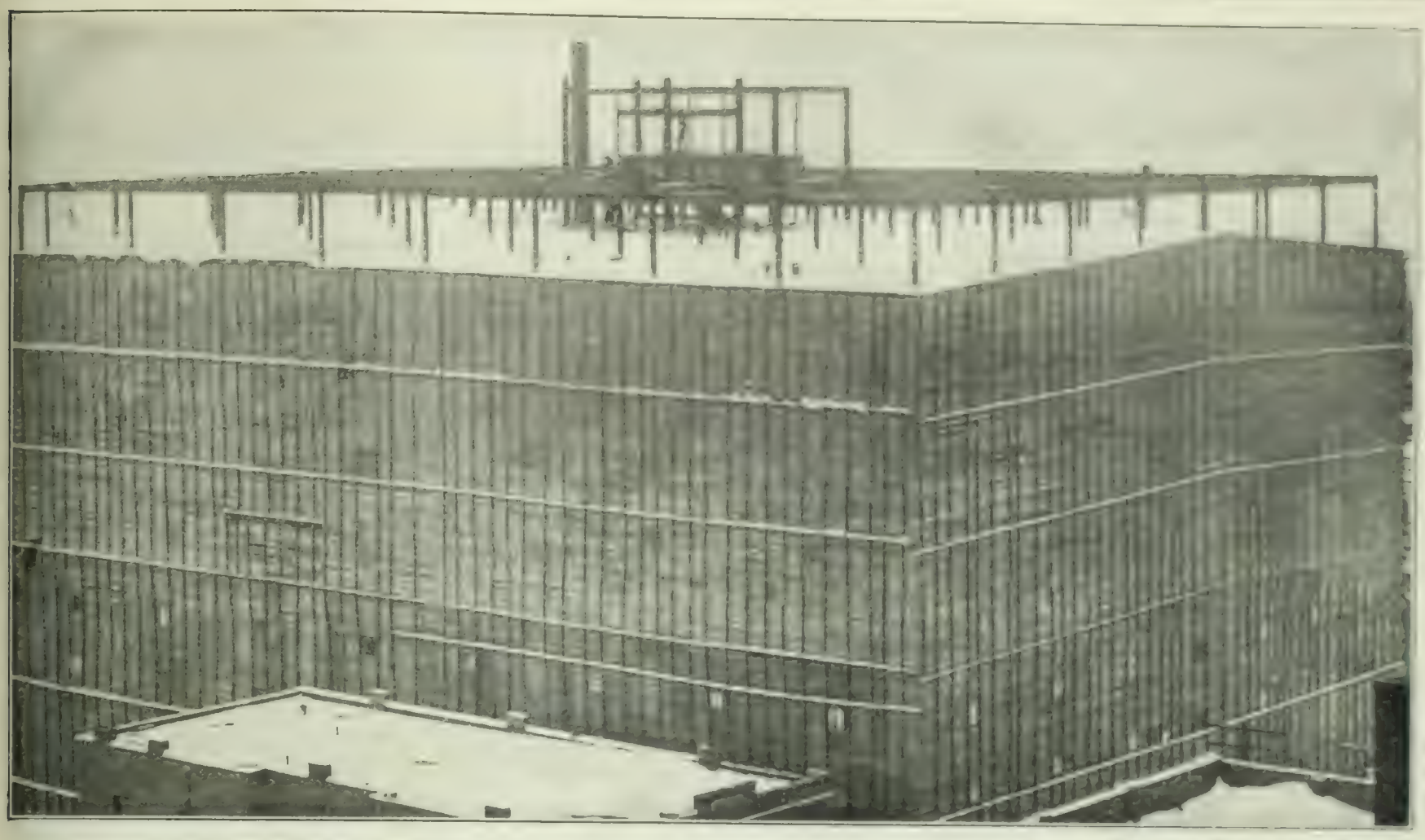
HAND DRILLS PUT DOWN LARGE HOLES FOR RAIL REINFORCING

Wooden House Incloses Steel Frame for Cold Weather Concreting

THE Furniture Manufacturers Building at Jamestown, N. Y., a 10-story steel skeleton structure with reinforced-concrete floors and brick walls backed up with hollow tile, was started last fall and for business reasons had to be continued through all of last winter. The temperature at Jamestown falls so low in the winter that it is necessary to have some protective covering inside which to place the concrete floors. The contractor, Charles P. Haas, of Jamestown, considered the use of canvas as ordinarily employed for such work, but found on analysis that lumber housing would prove more economical in the long run on account of its greater salvage value. Accordingly the whole structure was inclosed in a timber housing.

In the beginning of the construction it was decided to inclose the first four floors, as this was thought to be sufficient work to be accomplished through the winter months, but the work progressed so rapidly about the middle of January that it was decided to inclose to the ninth floor, leaving the top framing for spring.

The wooden walls were placed sufficiently far outside of the steel frame to allow for the erection of the



TIMBER FRAME HOUSE OUTSIDE STEEL BUILDING UNDER CONSTRUCTION KEEPS INSIDE TEMPERATURE 40° TO 50° F. ABOVE OUTSIDE

masonry inside. They were of simple stud and sheathing construction with cross plates as shown and braced against the exterior columns. Salamanders were used to furnish heat for the masonry and concrete floor work, there being about 26 in use practically all the time. Hard coal was used for fuel. The temperature in the building ranged from 35° to 50° F. right through the most severe winter weather, while outside the temperature registered as low as 28° below zero. The area of one floor is about 20,000 square feet.

"Flivvers" with Cleated Back Wheels Pull Stumps at Army Camp Site

BY REMOVING the rubber-tired rear wheels from a number of Ford automobiles and replacing them with cleated metal rims as shown in the picture, the Thompson-Starrett Co. was able to expedite the work of clearing stumps from the site of Camp Upton, near Yaphank, N. Y., where the recruits for the National Army will be trained. The stumps are hooked up to the "flivver" by a chain or steel cable and are easily rooted out, as the trees are mostly scrub oak and pine of small diameter. For bigger stumps a steam roller is used, as illustrated. With this machine sometimes half a dozen stumps are up-rooted at a single pull.



FOR THE BIG STUMPS A STEAM ROLLER WAS USED



HOW CAMP AREA LOOKS WHEN CLEARED AND READY FOR STUMP PULLING TO BEGIN



USE OF THE FLIVVER WITH CLEATED WHEELS WHEN REMOVING A STUMP PULLER AT CAMP UPTON

NEWS OF THE WEEK

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

Demountable Wooden Houses Needed in France

Drawings and Specifications Are on File in the Office of the "News-Record"

A letter from Maj. Ernest McCullough, chief engineer of the American Red Cross, in Paris, to *Engineering News-Record* encloses a set of drawings and specifications for temporary wood houses to be built in the destroyed region of France. These projects are in charge of the Ministère de l'Interiure and inquiries regarding them should be addressed to that department in Paris. The single copies of the documents with the drawings can be seen at the office of *Engineering News-Record.*

The Government of France is now preparing for reoccupancy of the districts evacuated by the Germans and, as is well known, practically all of the cities have to be rebuilt. For the temporary shelter of the returning residents, however, small wood frame houses are provided. These are generally of a take-down type which are shipped in cut and fitted pieces to be erected on the site. Such houses, of four different types, are illustrated in detail in the drawings sent, and it is Maj. McCullough's opinion that American manufacturers may be able to go into the business of making them.

The cost of the houses is about $250 per room delivered at a port in France, from which they will be carried by the Government to their destination. On account of short freight cars the maximum permissible length of any piece is 6 m. or 19.7 ft. Hundreds of houses have been used and thousands will be required. Those now built in France and Switzerland are of green lumber, not always of the best quality. Furthermore, it is extremely difficult now to get timber in France over 5 x 10 in. in section. Anything larger is or has been taken by the armies.

The Society of Friends of England is also engaged in this reconstruction work and has factories where these demountable houses are built.

St. Paul Engineers Entertain Soldiers

The Civil Engineers Society of St. Paul, Minn., gave a dinner on Aug. 23 in honor of those members who have received commissions in the Engineer Corps of the United States Army. The officers included Maj. George W. Rathjens, Capt. William N. Carey, Capt. T. D. Sterling, and First Lieuts. W. K. Tanner, A. Montgomery and O. M. Rufsvold.

High Prices Cause Bid Rejection for Hetch-Hetchy Tunnel

Bids on a tunnel section of the new Hetch-Hetchy water-supply of San Francisco were rejected on Aug. 23 because the only complete bid was 47% more than the engineer's estimate. The section advertised for is 19 miles long and was estimated by City Engineer O'Shaughnessy to cost not more than $6,307,000. The only complete bid, by R. C. Storrie & Co., was $9,233,671. New bids will probably be asked for in the near future, although the conditions that bring about such high bidding will probably not change in some time.

Government Will Build Boat Repair Shop at Marietta, Ohio

The Secretary of War has authorized the purchase by the United States Government of a block in the City of Marietta, Ohio, as a site for a Government repair shop which will furnish supplies for the Ohio River Government fleet in the Wheeling district.

Montclair Paving Again Held Up by Litigation

The quarter-million paving job on Park St. and Belleville Ave., Montclair, N. J., is again held up by litigation. A few weeks ago the Town Commission, after receiving bids on various kinds of pavement, awarded the contract to the Standard Bitulithic Co. for "Warrenite," although the lowest bid was for "Topeka specification" pavement. Thereupon application for a hearing on a writ of certiorari was granted, on the ground that the law required the contract to be let to the lowest bidder. The commission let the case go by default and the court ruled against the commission. New bids, for "Warrenite" only, were asked for. The lowest of three bids for one of the streets and of two bids for the other was from the Standard Bitulithic Co., to which the contract was promptly awarded. Immediately four taxpayers, represented by the attorney for the lowest bidder at the earlier letting (Chapman, Harrop & Lawrence) secured an order for a hearing (Sept. 5) on a writ of certiorari —presumably on the ground that there was no real competition under bids calling for a proprietary pavement. Christopher Harrison is town engineer of Montclair.

Canada To Buy Canadian Northern

By a majority of 53 to 37 the Canadian House of Commons voted Aug. 31 to have the Dominion Government buy the Canadian Northern Railway.

Estimated Cost of Ships Outlined by Board

Secretary of Treasury Receives Estimate for Transmission to Congress

The United States Shipping Board has sent the following statement to the Secretary of the Treasury for transmission to Congress relative to the ship program:

BUILDING PROGRAM

	Number	Tonnage	Estimated Cost
Ships contracted for.	433	1,919,200	$285,000,000
Ships ready to be contracted for when funds are available.	452	2,968,000	455,500,000
Ships under negotiations.....	237	1,281,400	194,000,000
			934,500,000
Miscellaneous vessels	150	1,800,000	300,000,000
Organization and other miscellaneous expenses			35,000,000
Amount authorized by Congress June 6, 1917 ($300,000,000 appropriated)			550,000,000
Amount to be authorized for building program immediately in sight, making no allowance for changes in cost or labor and material.....			719,500,000

COMMANDEERING PROGRAM

For commandeered ships, amount required	515,000,000
For commandeered ships, amount authorized by Congress June 6, 1917...	250,000,000
Balance requiring authorization by Congress.....	265,000,000

PURCHASE PROGRAM

For vessels to be purchased other than under construction or commandeered	150,000,000

SUMMARY

Total amount, in round figures, to be purchased in addition to amounts already authorized:	
For commandeered vessels.....	265,000,000
For construction of new vessels.....	719,500,000
For purchase of new vessels.....	150,000,000
Grand total.....	1,134,500,000
Amounts desired to be appropriated for remainder of fiscal year 1918:	
For commandeered vessels.....	365,000,000
For building program.....	400,000,000
For purchase of vessels.....	150,000,000
Total	915,000,000

King County, Wash., Turns Drainage Over to Its Engineer

Hereafter in King County, Washington, all drainage projects will be constructed under the supervision of the county engineer, by the terms of resolution adopted by the County Commissioners recently. It was pointed out to the board by S. J. Humes, county engineer, that in a number of instances the private engineers employed by the drainage district commissioners proceeded without considering the effect their work would have on public highways generally. In King County at the present time two big drainage projects are in contemplation, one at Bothell, on the north, and one at Pacific City, on the south.

Barge Transport Is Booming on Mississippi

With Aid of Government Effort Is Being Made to Develop River Traffic

Development of river transportation along the Mississippi, to meet conditions due to the war, has had some success and some difficulties. In May, 1917, the Mississippi Valley Waterways Association was organized, one of its principal objects being to develop immediate use of the waterways by such craft as might be available. The president is James E. Smith, of St. Louis, and Sydney J. Roy, of Hannibal, Mo., is secretary. The Federal Government, through Gen. W. M. Black, chief of engineers, turned over to the association 12 steel barges and two towboats.

Putting this equipment into service was found to be more difficult than had been expected, but the difficulties were finally overcome. Unlimited lumber tonnage from the Louisiana district was offered, and also 35 carloads of lumber to be transported into the territory north of the Ohio and through Missouri and Iowa. The lumber could be handled on the barges, which were without cargo houses, but the unlimited tonnage offered at St. Louis was all of a character requiring cargo houses for its protection. The Government having no funds that could be used to build these shelters, and the shippers not caring to build them for temporary use, it was impossible to handle the lumber because there was no return cargo from St. Louis that could go on a barge without a cargo house.

Attention was turned then to the upper Mississippi. Mr. Kavanaugh, of the Southern Coal Co., of St. Louis, was willing to join Mr. Goltra, of the Mississippi Valley Iron Co., of St. Louis, who needed iron ore from the Mesaba Range, a short distance from St. Paul. Through the above association they leased the towboats and barges from the Government. In the week ending Aug. 18 they succeeded in sending to St. Paul a tow of six barges, carrying 3500 tons of coal, as noted in *Engineering News-Record*, Aug. 16, 1917, p. 332. The towboat was not very efficient, and while the pilots were familiar with the upper Mississippi, they had not previously piloted such a large tow, 550 ft. in length over all. It is stated that notwithstanding these difficulties the trip was successful financially, as well as from a transportation standpoint. These barges were then loaded at St. Paul with iron ore for St. Louis.

Recently the John Deere Plow Co., at Moline, Ill., leased four barges and a towboat from the Government and moved farming implements from Moline to Minneapolis.

The Mississippi Valley Waterways Association has organized a $2,000,000 barge line from St. Louis to New Orleans. After the financing of this line has been effected, it proposes another from St. Louis to Minneapolis.

Federal Hydro-Electric Nitrate Plant Dropped for New Efficient Processes

Results of Recent Research by Chemical Companies Will Immediately Provide Government Plant

A new program has been made by the Ordnance Department of the United States Army for the production of artificial nitrates in a Federal plant, under the $20,000,000 nitrate-supply appropriation made by Congress in 1916 (Section 124 of the National Defense Act of June 3, 1916). At the time of this legislation, it was expected that any processes available would require so much power that a cheap supply, as from a big hydro-electric plant, would be required; and the Interdepartmental Board (the Secretaries of War, Interior and Agriculture) together with a committee of army engineers had started upon the selection of a site. However, new processes, in which cost of power is not a controllling element, have been developed in this country, and have been made available to the Government on liberal terms. Therefore further consideration of hydro-electric sites has been suspended. Announcement of this step has been made through the American Chemical Society in its *Journal of Industrial and Engineering Chemistry*, for Sept. 2 (Dr. C. A. Herty, editor, being a member of the Nitrate Supply Committee).

New American Processes

While water-power sites in the United States were being investigated, agents were studying the technique and cost figure of processes used here and abroad. The reports of Dr. C. L. Parsons, chief chemist of the United States Bureau of Mines, showed that two American processes for the fixation of atmospheric nitrogen as ammonia, and one for the conversion of ammonia to nitric acid, had been brought to a satisfactory stage. The fixation processes were offered to the Government on liberal terms—no compensation at all for munitions work and a royalty of $5 per 2000 lb. of material for fertilizer.

The first of these methods is the synthetic-ammonia process of the General Chemical Co., as developed largely by its engineer, Frederick de Jahn. This company has succeeded in making the preliminary mixture of hydrogen and nitrogen at a cost probably lower than before attained anywhere. It has also forced the direct combination of these elements at lower pressures than considered necessary for the Haber process, and has a production unit in service larger than supposed to be in use at Haber plants in Germany.

The second scheme reported on was the Bucher process, of the Nitrogen Products Co. This produces ammonia but employs cyanides as an intermediate product. The third process (conversion of ammonia to nitric acid) had been developed cooperatively by the Bureau of Mines and the Semet-Solvay Co.; an experimental plant has been in operation by the General Chemical Company.

Recommendations of Nitrate Committee

The Committee on Nitrate Supply, appointed by the Secretary of War, has recommended: (1) That the Government negotiate with the General Chemical Co. for the use of its process; (2) that $7,000,000 be used to build a plant to produce 40,000 lb. of ammonia per day

Surveys for an All-American Imperial Canal

Surveys for a canal wholly on American soil to irrigate 200,000 acres in the Imperial Valley, California, the water to be taken from the Colorado River at the Laguna dam, above Yuma, Ariz., were announced on Aug. 26 as about to be started. The announcement was made by Mark Rose, Holtville, Calif., president, Imperial-Laguna Water Co. The Department of the Interior will participate in the surveys and if it finally approves the scheme the land in question will be withdrawn from the Yuma project and restored for entry under the desert land act. The plan includes a widening of the present Yuma canal between the Laguna dam and the siphon beneath the Colorado River at Yuma; then a new canal to a point on the sand hills near the boundary line, and a deep cut through these hills, to avoid going into Mexico.

Idaho Highway Commission Favors Graveled Roads

The State Highway Commission of Idaho recently went on record in favor of graveled roads through the lava ash soil formation of the Snake River Valley. The action is expected to result in the graveling of the North and South Highway, the Sawtooth Park Highway, the Idaho and Pacific Highway and the Yellowstone Park Highway at points where the natural materials through which the roads are built will not sustain the heavy traffic. William A. Broadhead, chairman of the Highway Commission, said that the state has been spending too much money in grading roads that go to pieces during the hot summer months and again in the winter. The cost of keeping the highways in shape is far out of proportion to the original cost of constructing them. E. M. Booth, state highway engineer, in submitting to the commission figures on cost of constructing and maintaining the roads under the supervision of the state, said that of $1,[illegible],000 spent on the highways since the creation of the commission, $[illegible],000 had been used in grading and that $100,000 had been expended in maintaining dirt roads built.

and that it be located preferably in southwestern Virginia; (3) that at least $600,000 be used for building an ammonia-oxidation plant producing the equivalent of 24,000 lb. of 100% nitric acid per day; (4) that the War Department proceed with the construction of these plants at the earliest possible moment; (5) that the Government negotiate with the Nitrogen Products Co. for the use of its process and that $200,000 be allotted for its industrial development; (6) that $100,000 be allotted for the active investigation of processes for the industrial production of nitrogen compounds useful in the manufacture of explosives or fertilizers—under the supervision of the War Department; (7) that the Government promote the installation of byproduct coke ovens, for the recovery of ammonia and toluol, by directing priority in production and in transportation of materials and parts; (8) that more extensive installation of fixation processes or water-power development be postponed until the recommended plants are in operation or further need arises; (9) that there should be an immediate accumulation and permanent reserve of 500,000 tons of Chilian saltpeter.

ACTION BY SECRETARY OF WAR

The report of the Nitrate Supply Committee was approved and the Secretary of War has directed the chief of ordnance to carry out the first six recommendations. The Ordnance Department of the Army has taken over orders already placed by the General Chemical Co. for apparatus. Plans for plant and buildings have been practically completed by the General Chemical Co. The J. G. White Engineering Corporation has been engaged for the remaining engineering work and for construction. Gano Dunn, president of this corporation, is a member of the Nitrogen Products Committee. As the construction of the oxidation plant is less extensive work, it has been postponed to secure latest experimental results.

Canadian Northern Railway Is Building Montreal Station

Work is being pushed on the excavation for the temporary station at the terminal of the Canadian Northern Ry. in Montreal. More surface activity is seen than at any time since work on the Mount Royal Tunnel and Terminal project opened, there being during July and August three steam shovels, two 8-car trains of dump cars and numerous wagons opening up the site. Two whole city blocks, between Lagauchetiere and Dorchester Sts., are being excavated. But the present station building as at present planned is a temporary structure occupying less than half of the area of the terminal site. The rest of the cut will remain open and the five track platforms will be protected by umbrella sheds. The portal of the Mount Royal tunnel is at Dorchester St., and from here the two two-tunnel tracks will fan out to five for the station yard. Eventually the whole site will be occupied by combined station and office or hotel buildings, and two tracks will continue south down the right-of-way which the company owns leading directly to the waterfront.

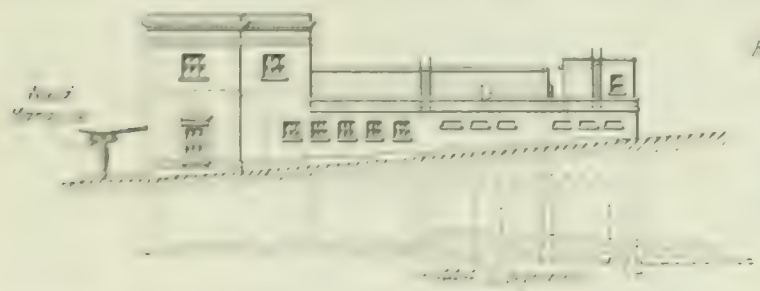
There is 260,000 cu.yd. of earth and 18,000 yd. of rock to be removed from the terminal site—20,000 yd. of earth being at the temporary-station building. The contract for the station proper was let to Norcross Bros. and the yard cut to Angus Sinclair & Co. The spoil from the building site is loaded by a steam shovel directly into the wagons in the pit, and the loads are snatched up an incline by an electric hoist. The wagons haul to Victoria Bridge, where the city is dumping for river-front improvements.

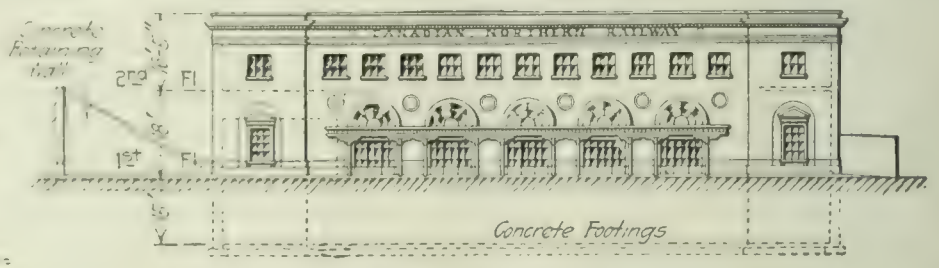
The material from the yard cut is loaded by steam shovels into 6-yd. cars, and these are hauled by dinkies to a point over the east portal of the tunnel under Mount Royal. Here the spoil is dumped into a baffled chute, discharging into spotted 12-yd. tunnel cars. The tunnel track and electric-power systems are complete from the east portal to beyond Cartierville. There are three dump trains now running to carry the spoil to a fill, where the Cartierville yards are to be. No other traffic is being handled as yet through the tunnel.

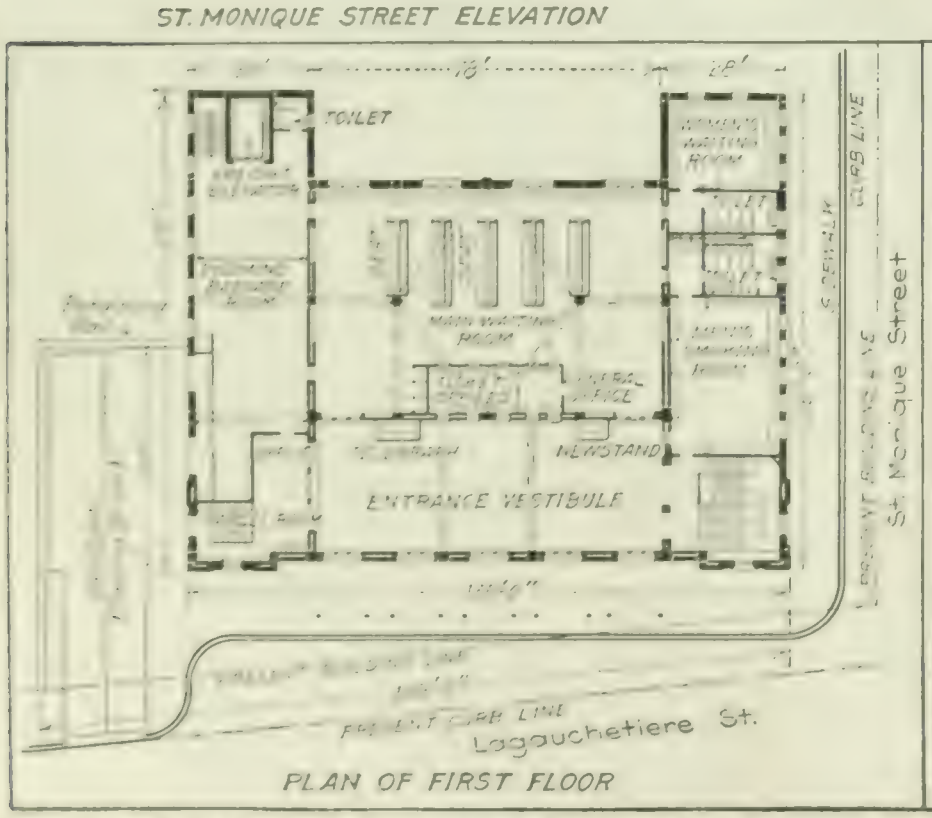
The station will have concrete walls, stuccoed on the exterior; the interior will be plaster on terra cotta tile. Warren & Wetmore, of New York City, are the architects; J. G. Brown is chief engineer of the Mount Royal Tunnel and Terminal Co.

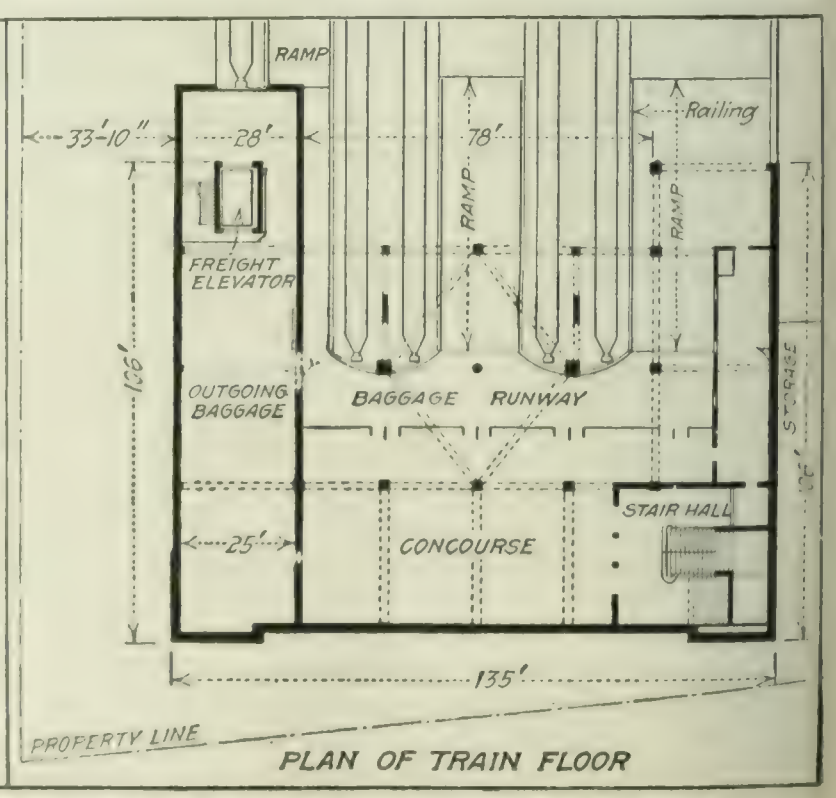
Signal Engineers to Hold Meeting

The annual convention of the Railway Signal Association will be a two-day meeting at the Traymore Hotel, Atlantic City, N. J., on Sept. 18 and 19.









THE CANADIAN NORTHERN TEMPORARY STATION IN MONTREAL WILL BE ATTRACTIVE STRUCTURE

Price of Pavement Reduced 24 Per Cent.

Resolution in Los Angeles Council Results in Lower Bid for Top Materials

The controversy in Los Angeles between the City Council and the Warren Brothers Co. reached a climax Aug. 22, when the company announced a reduction of the price of material, including the patent royalty, from $1 to 76c. a sq.yd. This is apparently the result of a resolution introduced in the Council calling for an estimate by the city engineer of the cost of building the addition to the city asphalt plant to turn out the paving mixture.

Cost of Additional Plant Estimated

A. C. Hansen, city engineer, filed a report with the Board of Public Works in answer to the resolutions, stating that it would cost $87,000 to build an addition to the municipal asphalt plant capable of producing the paving mixture on a scale proposed.

The land would cost $30,000, the plant $55,000 and the equipment $2000. A site can be obtained adjoining the present plant. A rock, gravel and sand producing plant can be obtained by the city at the cost of $25,000 additional, the city engineer reported.

Illinois Highway Paper Discontinues

For three years the Illinois State Highway Commission has published a paper entitled *Illinois Highways*. This has been discontinued owing to the change in organization by which the highway department comes under the new State Department of Public Works and Buildings. It is expected that a state publicity service will be organized to keep the people informed as to the activities of the nine departments which now constitute the civil administration of the state.

Only Segment Block Shut Out from Detroit Sewers

The action of the Detroit City Council on sewer specifications, noted on pages 386 and 428 of our issue of Aug. 30, was not so bad as we understood it to be from reports that reached us and have since proved to be incomplete. The specifications have been opened to monolithic concrete and to both concrete and vitrified clay pipe, instead of being restricted to brick. Possibly concrete segment blocks can also be used, as there is uncertainty whether the City Council intended to prohibit anything except vitrified clay or shale segment block.

New Manhattan Subway Opens This Week

Broadway Line Will Operate Through Canal Street Subway South of Fourteenth Street

Part of the new Broadway subway of the New York Municipal Lines in New York City will be in operation before this issue reaches its readers, having been opened to traffic with appropriate ceremonies on Sept. 4. This line, on which trains will operate between the Fourth Avenue, Brooklyn, subway, and Fourteenth Street and Broadway, Manhattan, by way of Broadway, Canal Street and the Manhattan Bridge, will be the first considerable underground section of the new Rapid Transit system to be placed in operation in Manhattan itself. Its operation has been preceded by the opening of the Steinway subway from the Grand Central Terminal to Long Island City, a small part of which is in Manhattan, and by the inception of a shuttle service between the Pennsylvania Station and Times Square, on a short section of the new Seventh Avenue subway.

Train service to Fourteenth Street will be followed before the end of the year, it is announced, by service uptown to Time Square over the Broadway line and by a shuttle service south on Broadway from Canal Street to Whitehall Street. This shuttle service will be replaced by through service early in the year between Times Square and Brooklyn by way of the Whitehall-Montague Street tunnels. On the completion of the new tunnels at Sixtieth Street from Manhattan to Long Island City, the New York municipal subway will be operated through from Brooklyn by way of the Whitehall Street tunnels and the Manhattan Bridge at Broadway and Seventh Avenue, across Fifty-ninth Street, under the East River and on the Long Island elevated lines to Astoria and Corona.

The Public Service Commission for the First District of New York State, under the direction of which the subway construction is being carried out, estimates that many thousands of persons living in Brooklyn who have been paying 20c. a day to reach their work will be saved 10c. a day when the first part of the new route to Fourteenth Street is put in operation.

Engineer Officers' Reserve Corps Assignments

The following-named officers of the Engineer Officers' Reserve Corps now on duty at the engineer training camp, in the vicinity of Washington, D. C., are relieved from duty at that place and will report at the proper time at the divisional training camps indicated below for duty with the engineer regiments and engineer trains of the National Army at those places:

To Atlanta, Ga.

For assignment to the Three Hundred and Seventh Engineers, Atlanta, Ga.: Majs. Harrison C. Mower and Eugene Kelly, Capts. William D. Kendrick, Harry W. Hill, Charles F. Lewis, William S. Pottinger, Jr., Hobart B. Baird, James B. Abbott, Jr., William C. Caye, Jr., Thomas B. Catchings, Merritt W. Dixon, Jr., Edward C. Lane and James W. Houseal; First Lieuts. Willson Y. Stamper, Jr., James P. Woodson, Reading Wilkinson, Isham F. Witherington, Carlston E. Shaffer, William Woodhull Moore, H. Hunter Smith, Julius D. Brown, Marvin L. Davis, Neil Houston, Edward S. Allen and Wert H. Peace; Second Lieuts. James H. Claxton, James M. Kelley, Walter R. Boyd, Delmont O. Hatch, Philip Francis Shannon and George B. Jurden.

To be attached to the Three Hundred and Seventh Engineers, Atlanta, Ga.: First Lieuts. James G. Parks, Henry W. Clark, John E. Deegan, John P. Hallowes, Benjamin H. Woodruff, Henry C. McGowan, David N. Milhan, William M. Meredith, Howard D. Pope, Grover C. Prowell, Henry S. McGee and James C. Lee; Second Lieuts. Robert W. Smith, Andrew O. Jackson, William W. Owens, Jack N. Peebles, Harry G. Farris and William F. Green.

For assignment to the Three Hundred and Seventh Engineer train, Atlanta, Ga.: Capt. Curtis Bates Goode, First Lieut. Clement Coote Brown, Jr., Second Lieut. Roberts J. Mann.

To be attached to the Three Hundred and Seventh Engineer train, Atlanta, Ga.: First Lieut. Andrew Y. Holgdon, Second Lieut. William F. Codd.

To Ayer, Mass.

For assignment to the Three Hundred and First Engineers, Ayer, Mass.: Majs. Harry F. Cameron and Richard M. Lawton, Capts. William F. Hussey, Robert Lee Whipple, Arthur L. Shaw, Hugh J. Batterley, Arthur W. Waldron, Elwin S. Warner, Maurice H. Pease, Norman D. Dean, John F. Doran and Howard S. Porter; First Lieuts. Eric C. Benedict, Edward J. Kiely, Jr., Walter R. Morse, John J. Devlin, Daniel H. B. Starr, Gordon C. Day, Ernest J. Weaver, Alfred H. Codaire, Cedric Powers, Charles J. Kittredge, Milton C. Mapes and Alexander C. Peters; Second Lieuts. Joseph F. V. Grady, Bradley W. Batholomew, Frank W. Garran, Arthur E. McDonald and William E. Bowler.

To be attached to the Three Hundred and First Engineers, Ayer, Mass.: First Lieuts. Thomas W. Bailey, Josiah B. Rutter, Stanley W. Merrill, Lewis E. Wyman and Cornelius Callaghan.

Further assignments will be noted in next week's issue.

Aviation Camp Contract Awarded

John W. Thompson, general railway contractor, 510 Boatmen's Bank Building, St. Louis, Mo., has been awarded the contract by the United States Government for the construction of an aviation camp at Fort Worth, Tex., for the use of the Canadian Government in training aviators. The work on the camp will begin immediately. The camp will be about twice as large as the camp at Belleville, Ill., and the total cost is estimated at between $3,000,000 and $4,000,000.

PERSONAL NOTES

J. D. HOFFMAN, who has been in charge of the department of mechanical engineering, at the University of Nebraska, since 1911, has become professor of practical mechanics at Purdue University. His successor at the University of Nebraska has not been named. The chair may remain unoccupied for a year or two owing to the reduced number of advanced students.

PROF. C. R. RICHARDS, who has been professor of mechanical engineering at the University of Illinois, and recently acting dean of the College of Engineering, has become dean since the resignation of W. F. M. GOSS.

GEORGE EDGECOMB, of the firm of Edgecomb Bros., Binghamton, N. Y., has completed the road contract at East Branch, Delaware County, N. Y., for his firm and is at present engaged in road construction at Camp Upton, Yaphank, Long Island.

I. M. BROWN has been appointed acting engineer, maintenance-of-way, of the Indianapolis Terminal Division of the Cleveland, Cincinnati, Chicago & St. Louis Ry., with headquarters at Indianapolis, vice C. F. HINCHMAN, who has been granted a leave of absence.

R. T. BROWN, formerly highway engineer of Davidson County, North Carolina, has been appointed assistant engineer in the South Carolina State Highway Department. Mr. Brown had been employed by the North Carolina Geological and Economic Survey as locating engineer on highway work, and then for the three years following was county engineer and superintendent for Orange County, North Carolina, having charge of the construction of roads and bridges under a bond issue.

CAMILLO WEISS, at present with the Guerber Engineering Co., Bethlehem, Penn., has been appointed instructor in structural engineering at the University of Illinois. Previous to his connection with the Guerber Engineering Co., Mr. Weiss was connected with the bridge and construction department of the Pennsylvania Steel Co., Steelton, Penn.; with Lockwood, Greene & Co., architects and engineers, Boston, Mass., and then for two years was a research fellow in the engineering experiment station at the University of Illinois.

W. B. WILLIAMS, who for several years has been engaged in the drainage contracting business, mainly dipper and dry land dredge work, has finished work at Oviedo, Fla., and now has a contract for 33 miles of drainage canals and ditches at Limestone, De Soto County, Fla., having headquarters at St. Petersburg, Florida.

MAJ. FRANK B. MALTBY, construction engineer, Day & Zimmermann, Philadelphia, has been assigned to take charge of construction work on Governors Island. Major Maltby was at one time with James Stewart & Co., contractors, New York, and was then associated with Gahren & Dodge as chief engineer. For some years he was engaged in railroad construction in the Middle West, becoming principal assistant engineer of the Illinois Central R.R. in charge of construction of lines in Iowa. He was also associated with the Mississippi River surveys, and later with municipal developments and improvements in the vicinity of St. Louis, and with irrigation work in Texas.

E. B. DARLINGTON, chief engineer and superintendent of the Salmon River irrigation project, Idaho, has been appointed chief engineer of the Twin Falls Northside Land and Water Co. irrigation project, Idaho, succeeding C. R. BURKY, resigned to attend the Officers' Reserve training camp at Presidio, San Francisco. Mr. Darlington will assume his new duties about the middle of September and will be stationed at Jerome, Idaho.

DR. J. L. POMEROY, who recently resigned as health officer of Los Angeles County, California, to accept a commission as army surgeon, has returned from his station at Fort Riley on account of poor health and has been reappointed to the position formerly held by him.

JAMES C. NAGLE has been appointed dean of engineering and professor of civil engineering in the Agricultural and Mechanical College of Texas, succeeding E. W. SPENCE, whose death occurred in June and was noted in these columns recently. Professor Nagle is a graduate of the University of Texas, and has been professor of civil engineering in the Agricultural and Mechanical College of Texas for about 20 years, and since 1911 has been dean of engineering. Resigning from this position in 1913 to become chairman of the Texas Board of Water Engineers, he gave up his last position to resume his professorial duties. Professor Nagle is the author of a field manual for railroad engineers. He is a past president of the Texas Association of Members of the American Society of Civil Engineers, past president of the Texas Academy of Science and a major in the Engineer Officers' Reserve Corps.

E. JACK SMITH, who for the past 18 months has had charge of the highway work in Meigs County, Tennessee, has been placed in charge of the engineering work on highways in Fentress and Morgan Counties, Tennessee.

ERLE B. DUDLEY, construction engineer at the Bunker Hill and Sullivan concentrators at Kellogg, Idaho, has been commissioned captain in the Engineer Officers' Reserve Corps.

P. M. GEREN, formerly engineer and salesman in charge of the San Antonio, Tex., office of the Trussed Concrete Steel Co., of Youngstown, Ohio, has received a commission as first lieutenant in the Engineer Officers' Reserve Corps, and has been ordered to duty as instructor at the second camp to be held at Leon Springs, Texas.

ORIN M. DARLING, surveyor and civil engineer, Fort Wayne, Ind., is at present in Lakewood, N. J., in charge of the engineering on the laying of 22,000 sq.yd. of concrete pavement.

GEORGE W. BOWERS has received a leave of absence from his position of assistant engineer of construction, filtration department, Cleveland, Ohio, to act as assistant engineer in charge of the water-supply under R. WINTHROP PRATT, consulting engineer for the Government, at Camp Sherman, Chillicothe, Ohio.

J. B. MCCLAIN is at present in charge of the construction of four new 100-ft. turntables to replace the 80-ft. tables which were rendered obsolete by the purchase of 12 new Mallet type locomotives by the Seaboard Air Line Ry. The new engines will be 108 ft. long overall, requiring these new tables, which are longer than anything at present in use in the South. The tables will be located at Richmond, Va.; Raleigh, N. C.; Hamlet, N. C., and Monroe, North Carolina.

A. S. ZINN is at present assistant to the general superintendent of construction for A. Bently & Sons Co., Toledo, Ohio, contractors for the cantonment at Chillicothe, Ohio. Mr. Zinn has been assistant engineer of track elevation for the Chicago & Western Indiana R.R., division engineer of the Chicago, Rock Island & Pacific Ry., and construction engineer for the Michigan Central R.R. In 1906 Mr. Zinn went to the Panama Canal as resident engineer of the central division, and in 1913 was appointed division engineer. From 1914 to 1916 he was consulting engineer for the Republic of Panama.

PROF. ROBERT GIBBES THOMAS, of the Military College of South Carolina, has been appointed a member of the State Highway Commission of South Carolina.

BENJAMIN F. LATTING, who for the past few years has been employed by the Indiana Bridge Co., Muncie, Ind., and engaged in consulting work on highway bridges, has received the appointment as aëronautical mechanical engineer, Signal Service at Large, Washington, D. C., and is at present designing structural steel work for the use of the army.

FRED W. BILTZ, formerly in the chief engineer's office of the Philadelphia & Reading Ry., at Philadelphia, has been transferred to the position of assistant supervisor of the Shamokin Division of the same road, with headquarters at Tamaqua, Pennsylvania.

CHARLES BARTHOLET, formerly with the Washington State Highway Commisison and later with the Public Service Commission of that state on grade-crossing elimination work, has been appointed assistant state hydraulic engineer, with headquarters in North Yakima.

BLACK & VEATCH, Kansas City, Mo., are consulting engineers to the Constructing Quartermaster of the National Army cantonment at Little Rock, Ark. R. E. SPEAR is acting as division engineer for this company, having resigned from the city engineering department of Flint, Mich., to accept this work.

COL. R. K. HALE, of Richardson & Hale, editor of the *Journal* of the New England Water-Works Association, has been placed as second in command of the 101st Regiment of Field Artillery.

R. E. WHITNEY, formerly with Weston & Sampson, consulting engineers, has been appointed first lieutenane in the Sanitary Engineers' Reserve Corps.

HUGH B. HOLMES has resigned as chief engineer of the Kansas City, Mexico & Orient R.R., to become associated with Cloverdale & Colpitts, consulting engineers, New York City. W. W. COLPITTS was Mr. Holmes' predecessor as chief engineer of the Orient, leaving Kansas City in 1913. Mr. Holmes has been 17 years with the Orient, beginning his connections as rodman—eight years of this time was spent on the work in Mexico.

OBITUARY

ISAAC CHAPMAN, contractor, of Walla Walla, Wash., died in that city recently.

GEORGE BROMLEY KIRKPATRICK, until recently director of surveys for the Ontario Government, died last week at Toronto. Mr. Kirkpatrick was the first president of the Association of Ontario Land Surveyors.

HENRY SOUTHER, former vice president of the Ferro Machine and Foundry Co., and at one time consulting engineer of Cleveland, Ohio, died Aug. 15 in the hospital at Fort Monroe. A short while ago Mr. Souther had been commissioned as major in the United States Signal Corps and had been serving at the time of his death as engineer in charge of the Langley Aviation Field.

ARTHUR KNEISEL, national treasurer of the American Association of Engineers, died in Chicago on Aug. 17, 1917. Mr. Kneisel was one of the original promoters of the association and had been secretary up to this year. Graduating from the University of Kentucky, he came to Chicago about 15 years ago and was engaged as telephone engineer and patent attorney. At the time of his death he was president of the Utilities Development and Sales Company.

CHARLES B. STOWELL, formerly city engineer and superintendent of the sewer department, Rockford, Ill., died Aug. 10. Mr. Stowell was well known for his geological research of the rocks in the vicinity of Rockford, and at various times had served as a member of the Illinois State Examining Board of Structural Engineers.

Notes from

MAKERS OF PLANT AND EQUIPMENT

The Vulcan Steel Products Co. held its annual banquet in the McAlpin Hotel, New York City, Aug. 17. At the last banquet there were only about 60 people in the company, while this year the attending employees numbered 175. The banquet was held somewhat in advance of the usual date because of the fact that three members of the organization were due to leave Aug. 19 for the Far East. D. D. Irwin, manager of the Far East division, has been in New York arranging for this expansion of the company's interests in Japan, where increased commercial and manufacturing activities have created a steadily growing market for American products. The party that will shortly leave for Japan is made up of E. J. Parker, sales manager of the engineering and machinery division, who will organize a Japanese department at Yokohama; Joseph Bayan, who will care for the interests of the Vulcan Trading Corporation in Japan; and D. D. Irwin, who has general charge of the Far East division. Chauncey Holmes, assistant manager, remained in Yokohama to care for the interests of the company's clientele during the absence of Mr. Irwin. A. Micoli is also leaving New York for South America. He will travel through Argentine, Brazil and Uruguay in the interests of the Vulcan Trading Corporation.

The Blaw-Knox Co., Pittsburgh, announces that T. M. Avery, one of its New York City representatives, is leaving for the Pacific Coast to take charge, temporarily, of the San Francisco office. Edward M. Ornitz, San Francisco representative, has joined the Engineer Officers' Corps as first lieutenant.

The Annual Congress of Purchasing Agents, under the auspices of the National Association, will be held at Pittsburgh, Oct. 9, 10 and 11. The program includes business sessions for the mornings and inspection of industrial works during the afternoons. All purchasing agents, as well as others interested, are welcome and expected to attend and participate in the activities of the convention.

The American Locomotive Co. announces the promotion of E. C. Fisher to the position of manager of the company's Pittsburgh works.

The Ransome Concrete Machinery Co., Dunellen, N. J., has incorporated anew with larger capital comprising $1,000,000 capital stock, $500,000 cumulative preferred stock and $500,000 common stock. The new corporation takes over the business and plants of the old Ransome Concrete Machinery Co., of New York. It will enlarge and further expand its business until it will cover the entire line of building contractors' equipment, contractors' machinery and road builders' machinery and equipment. The company has been in business for more than 25 years.

The Ingersoll-Rand Co., New York City, came out winner in a drilling contest held recently at Tonopah, Nev. There were 42 contestants, including representatives of all the manufacturers of self-rotating hand hammer drills. The company's "Jackhamer" (Type BCR-430) won first, third and fourth places. The tests were drilled in Rocklin granite, and each contestant was allowed eight minutes in which to connect his hose and drill as great a footage as possible. The winning "Jackhamer" put in 61⅞ in. The next best performance was 58⅞ inches.

The T. L. Smith Co., of Milwaukee, has recently appointed as its New York agent the Contractors' Trading Co., 232 Fulton St., New York. Messrs. Wentink, Watts and Clarke are the active partners in the company, and they will handle the complete line of Smith Co., Chicago, concrete mixers and pavers.

C. R. Dodge, formerly of C. R. Dodge & Co., of New York, representing manufacturers of construction equipment, has closed his New York office to accept a position as the manager of the Philadelphia office of the Lakewood Engineering Co., in the Widener Building.

The Vulcan Steel Products Co., New York City, has engaged Dr. Roy P. MacElwee, head of the department of physics of the College of the City of New York, to deliver a course of 15 lectures on international trade to its employees. Mr. Kafka, president of the Vulcan company, intends to have these talks popular yet technical, in order to show every individual how to do his work better and make it more interesting. At the close of the lecture series, an examination will be held and future advancement will be based to a great extent upon the standing secured.

The Torcrete Shipbuilding Co., recently organized at Chicago, is now negotiating for a suitable yard location near Detroit, where, according to the Portland Cement Association, it is proposed to begin at once the building of a [illegible] cargo steamer for Great Lakes service. Additional yards near New York, New Orleans and Los Angeles will be established later. All of these plants will build reinforced concrete vessels after what is known as the Torcrete system. Technically, Torcrete is a combination of steel and concrete, the practical application of which results in a laminated hull inlaid with steel reinforcing. Torcrete is applied under air pressure after a new process and with a machine, both of which are inventions of Carl Weber, president of the Torcrete Shipbuilding Company.

The Walter A. Zelnicker Supply Co., St. Louis, has just secured the services of J. C. Bryan, formerly with Manning, Maxwell & Moore, Inc., as Southwestern representative of the Ashcroft Manufacturing Co., the Consolidated Safety Valve Co., the Hayden & Derby Manufacturing Co. and the Hancock Inspirator Co. Mr. Bryan will be associated with the equipment department of the Zelnicker company.



KEROSENE HEATERS SOFTEN ASPHALT PAVING AND HEAT TOOLS AND MATERIALS

APPLIANCES AND MATERIALS

New Concrete Mixer Has Improved Drum

A new concrete mixer, to be known as the "Blaw-Ransome," is announced by the Blaw-Knox Co. It was designed by A. W. Ransome, who recently became manager and chief engineer of this concern.

The distinctive feature of the new mixer is the design of the drum. Both ends in shape are truncated cones. The cylindrical portion of the drum is only 2 ft. in width. Blades are a new design intended to give a spading and overturning movement and at the same time to promote fast discharge. Easy cleaning was also considered. The drum is of sheet steel. The steel frame is built of 3 x 3 x ¼-in. angles and 4-in. channels, gussetted and sway-braced. Trackways are wrought steel (welded) and turned while in place on the drum. Chain drive is used, and a segmental steel sprocket on the drum. This new mixer is equipped with 4-hp. gasoline engine and a low-charging platform or power side-loader. It is being manufactured in one size only for the present—10 cu.ft. capacity.

Kerosene Paving Heaters Burn Gas Vapor

Hand-operated kerosene heaters for use in softening old asphalt paving to be repaired, and for heating the tools used in asphalt paving construction and repair, made by the Alger Supply Co., Peoples Gas Building, Chicago, are a recent development in apparatus for street work. The oil is burned as a gas vapor and not as a spray. This requires a pressure of only 10 to 15 lb., which gives a hot blue flame with an oil consumption of about one gallon per burner per hour. The pressure is maintained by a hand pump.

The "Pluto" machine, shown in one of the accompanying illustrations, is for softening the surface of old asphalt. It has a steel frame mounted on wheels, and carrying a heater pan which covers 36 sq.ft. The heater is hinged to the uprights of the frame, and for transportation it is raised to a vertical position against them by means of cables and drums on a shaft operated by a crank handle. The machine can be hauled by an automobile. There are six Chausse kerosene burners or torches, each giving a 6-ft. flame. The torches are started by heating up with an auxiliary hand torch, or by burning oil-soaked paper in the torch. The frame carries two fuel tanks, so as to provide for continual operation. When the main (35-gal.) tank is to be filled the auxiliary (18-gal.) tank is switched into service. The machine is balanced so that one man can handle it.

A special form of the "Pluto" machine is used for heating the old paving along car tracks. This has the pan hinged to the side of the frame (outside the wheel), so that the machine can operate close to the track without interfering with traffic. The pan has three burners and covers 18 sq.ft. For use in repairing narrow ruts, there is a machine with a pan 6 ft. long, but only 9 in. wide, having two burners.

For heating the tools and material used in asphalt and other bituminous paving work (both construction and repair) there is made the "Phisto" machine, which is also illustrated. This has three kerosene burners, similar to those on the asphalt heaters. The tampers are inserted at the rear of the box. On top are supports for three buckets of binder "dope" and three shovels, which are thus kept hot.

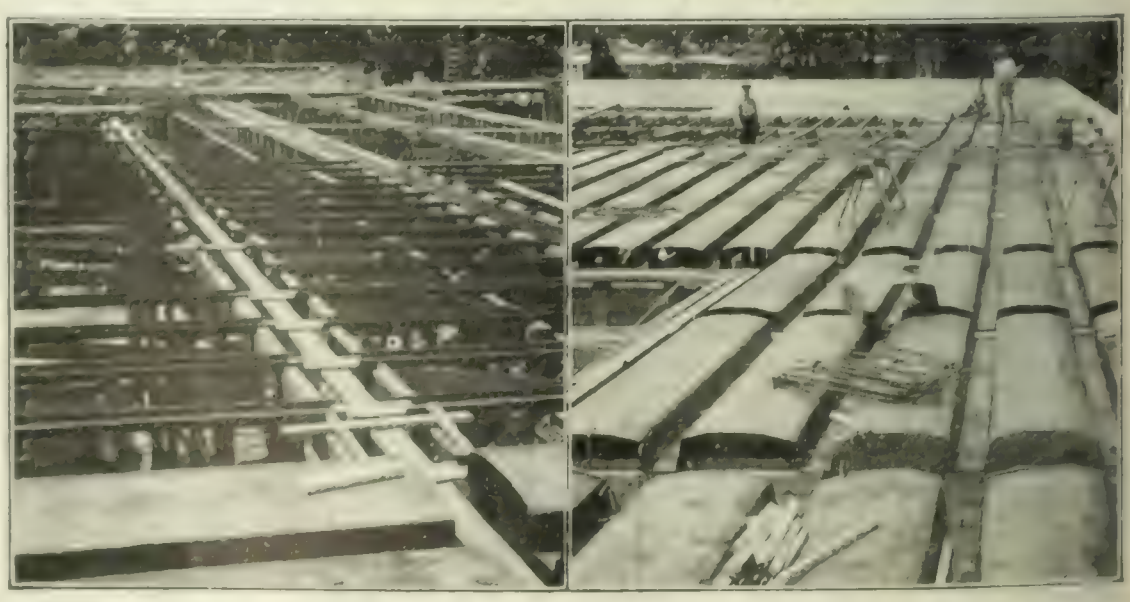
Steel Forms for Concrete Buildings Require Minimum Shoring

A new system of steel forms for the construction of reinforced-concrete buildings has been developed by M. S. Ambursen and is being sold by the Uni-Form Co., 10 High St., Boston, Mass. The distinguishing feature of the system is that the whole form structure is of steel, being made up of channels and arch plates, coupled by bolts and spreaders. All parts are removable except the spreaders and a few small nuts. Shoring supports are required only on 10-ft. centers.

These forms are standardized in uniform units of three lengths. A 6-in. channel in 6-, 8- and 10-ft. lengths serves for all conditions, but the depth of the arch plate or pan varies from 6 to 12 in. (or deeper if required) according to the load and span. These plates are of 14-gage mild steel. The pans come in 6-, 8- and 10-ft. lengths, so that any span from 12 to 30 ft. can be covered.

The accompanying illustrations show how the channels are first placed in position and then the arch plates set up with the edges of the plates in the channels and held in proper place by the spreaders and bolts. The forms can all be removed as soon as the concrete is set (that is, about 48 hours after pouring) and the shoring may be left in place undisturbed as long as required as a temporary support for the green concrete. The pans are made somewhat narrower than the actual distance employed between the flanges of the channels; this causes the pans to spring back and release themselves from the concrete when the channels are removed.

Reinforcement may be held in the desired position, with reference to the bottom of the joist, being supported by and wired to the spreaders, making a very simple arrangement.



STEEL CHANNELS SUPPORT ARCH PLATES IN NEW FLOOR-FORM SYSTEM

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Successful Bidding for a Large Tunnel

THAT competitive bidding of most successful character is possible despite the obstacles imposed by uncertainty of future labor and material costs is proved by the bids for the 18-mile Shandaken tunnel to supplement New York City's new Catskill water-supply. The figures are keenly competitive, with the lowest bid and the next only 2% apart. The specifications and contract form were of the type customary in the city's work. There were no new departures to help out the contractor, no provisions for covering his risk as to labor and material. It was straight unit-price bidding, relieved only by an unusually long time-allowance, namely, seven years. The city may well feel satisfied at securing such bids. The figures are high, but it is a time of high prices; and competent judges believe that there would be little prospect of better bidding for a long time after peace is declared.

Jersey City Moves To Clear Water-Supply Muddle

COMMENDATION is due the present authorities of Jersey City for taking action to clear up the long-muddled water-supply situation inherited from past administrations. The proposition for a trunk sewer and for activated-sludge and chlorination plants in the Rockaway valley is outlined on page 522. Prompt, positive and fearless action by Jersey City is certainly demanded after years of hesitation, vacillation and trying to shift the consequences of a loosely-drawn contract to the municipalities in the Rockaway valley and to make the State Department of Health its agent for the transfer.

An Interesting Question for the Court To Decide

TO COMMEND the Jersey City authorities for again taking up the trunk sewer project mentioned in the preceding paragraph does not mean that efforts to reopen the suit to compel the contractor to provide or pay for sewage diversion below the dam need be given up. The engineers whose perhaps excusably over-confident testimony in the very first days of a new art appears to have convinced the court that hypochlorite disinfection satisfied the contract requirement for works that should deliver pure and wholesome water have since publicly declared that they went too far. They and sanitarians generally now understand full well that chlorination is only a safeguard for doubtful water-supplies before other means of purification are provided. But can a case like this be reopened years afterward because of over-confidence by experts in the efficacy of a new process? The corporation counsel of Jersey City was instructed months ago to get an answer to this very question. Recently the question was referred to special counsel. Why not let the original court of jurisdiction—the Court of Chancery—decide? Meanwhile the trunk sewer plans may well be carried forward.

Macadam Roads Best for War Traffic

THERE are so many interesting features of the road maintenance work in the war zone of France, described by William J. Weir on page 488 of this issue, that it is difficult to single out any particular detail for comment. The thing that will probably interest United States highway engineers most is the almost universal dependence upon waterbound macadam to carry the heavy war traffic. When conditions are analyzed, however, this reversion to what can now almost be called one of the "early" types of pavement is not difficult to understand. True it is that the war-zone traffic is tremendous, both in volume and in weight, and practically continuous. Such conditions, in normal times, would immediately suggest to the highway engineer one of the so-called "permanent" surfaces—asphalt, brick, stone block, concrete or one of the numerous types of bituminous treatment. Waterbound macadam is about the last thing he would consider. But war sets up new standards, and so far as highways are concerned the chief of these is the necessity for continuous maintenance work under traffic. The motor trucks must be kept moving and road-maintenance work must shift for itself. Obviously these considerations at once eliminate any pavement whose repair would mean an interruption to traffic—even for a very brief time—and so they narrow the choice to waterbound macadam roads. The maintenance methods on these routes, Mr. Weir tells us, are of the most primitive kind—the mere throwing on of new stone between the passage of one vehicle and the next. Yet the object sought is accomplished, for the compacting of this new material under the steady stream of heavy motors is, of course, almost instantaneous

Thus the war, so far as roads are concerned, has led us around in a circle, starting with the waterbound macadam of a generation ago, proceeding through the many types of bituminous, block and concrete surfaces, and back again to waterbound macadam. War's demands have made the cycle complete.

Will Canada's Latest Move Help Her Railroad Situation?

WHAT from this distance looks to be a step directly away from a solution of Canada's railway problem has been made by her Parliament, in the decision to buy the Canadian Northern Ry. and make a large loan to the Grank Trunk Pacific Ry. In spite of a wide range in the recommendations of the majority and minority of the Royal Commission and the unofficial investigators of the matter, there was common agreement on one point—that the Canadian Northern and the Grand Trunk, each strong where the other was weak, should be made to dovetail into one system. In the face of all this expert advice the Dominion Government, panic-stricken at the urgency of the situation, votes to throw a large additional sum of money into the sinkhole of unprofitable competition. Unless all of the experts are wrong, the government cannot operate the Canadian Northern at a profit without extensive construction in Grand Trunk territory, nor will the $7,500,000 voted to the Grand Trunk Pacific make much of a start to the feeder system that road must have in Canadian Northern territory.

The United States has no railway problem quite comparable to this. Yet the railroad situation as a whole is serious enough to merit the most earnest consideration. Doctrines have for years been at large and acquiring strength that might plunge us into worse difficulties than Canada is struggling with. It behooves us not to wait until the case is acute before making a careful study of it, nor to allow ourselves to be stampeded by inexpert public opinion.

Distribution by Team, Truck and Railroad at the Camps

TEAMS for one, motor trucks for another, railroads for a third—but each of the cantonment jobs got there. To the building contractor, it is an enigma that any man can wait, when there is pressing work to be done, to lay railroad tracks or "fool around" with miles of mule teams, nose to tail, each carrying but a small load. It is equally mysterious to the railroad contractor, accustomed to open spaces where the road he builds furnishes the only modern means of transportation in the district, that the building contractor can afford to chug around in hub-deep sand or mud with one of those "condemned abominations" that can't run a hundred yards without sticking in a mud hole or breaking down.

The truth of the matter is that, when the right kind is furnished, these "abominations" will surprise the railroad man, even when run through mud and sand; that mule teams, though each hauls but a small load, can move an unconscionable quantity of lumber when massed in sufficient numbers; that a little advance preparation in the way of quickly-laid spur tracks may keep the gangs going under weather and road conditions that sorely try both the patience of the mule and the stamina of the motor truck.

There is no doubt that the five-ton trucks of the weightiest known construction with which the army truck companies sent to some of the camps are equipped can be easily out-distanced in sand or mud by the less powerful but lighter mule. The rear chain sprockets of some of these trucks, clearing the ground by scant inches, contribute to their downfall. There is also no doubt that an endless double file of teams and wagons is more subject to blockade and more expensive per ton-mile than the right kind of light, strong truck, even perhaps on bad roads. Neither is there any denying, where grading can be avoided, that a quickly-built track, thrown into the work by logging-road methods, offers a sure, rapid and almost weather-proof line of communication between the receiving yard and the center of building operations. Therefore, the description of how these diverse methods were applied in the army cantonment work, which appears on other pages of this issue, should be read without prejudice and with due regard to the conditions at each cantonment.

The Council Makes Its Statement

THE Engineering Council's first public statement apprises engineers of a new movement it has under way for the benefit of the profession. Dr. Hollis' remarks show tendencies toward a farreaching progressivism. He—and doubtless the entire Council shares the views uttered by its official spokesman—aims at some leaguing of engineering societies such that the entire profession can speak with one voice.

This far-extending body is not to discuss technical subjects, if we understand the situation rightly. Existing societies are not to be disturbed or their organizations or functions touched. Non-technical matters only are to be taken up in this general Council.

So much is sure. But nothing has been told as to what particular class of questions is to be dealt with. In other words, what is to be the precise field of operation of the Council? Only one item has been brought forward so far; a classified list of the nation's engineers is to be drawn up, containing all personal data as to professional qualifications. In the first instance, this list is to be for the use of the Government, but it will doubtless serve wider purposes in the end.

Two or three meetings of the Council have been reported. The deliberations at these meetings contain nothing that would add to the above. Nothing further has been made known that would furnish a physical expression of the idea which the Council may embody.

The Council exists, but up to the present it has not yet justified itself. Large bodies move slowly—there

are many ways of saying that patience is needed in looking for results in a big matter. It can be argued that four or five months' time is not enough for the Council to come forward and say what and why it is.

But in the opinion of *Engineering News-Record* the movement which the Council may represent is far too weighty, too vital to the interests of every engineer for anything but the most prompt and speedy action. Temporizing and slow deliberation are not appropriate to the times or to the case. In this pressing and hurrying year, an agency that rises up to bring unity to a profession seriously in need of it has the clear duty of making its appeal at once; of presenting its credentials, stating its purpose and rallying all to its standard. The Council has failed of this duty.

In this failure—up to now—we believe the Council has seriously fallen short of realizing its opportunities and has measurably jeopardized its chance of engaging the support and sympathies of the profession. It may be that resolute action in the immediate future can retrieve this loss. Such action, if it also answers the challenge as to democratic origin and constitution which was earlier raised by a correspondent in our columns, can lay the foundation for most fruitful development. We earnestly hope that this may be accomplished.

High Bids or Low Estimates?

THE DIFFICULTY of getting lump-sum or unit-price bids on public work is getting to be so common that San Francisco's recent failure to let its new aqueduct tunnel because the only bid received was nowhere near the engineer's estimate will scarcely excite so much remark as if it had occurred three years ago. Nevertheless this notable instance, in which the only complete bid submitted for the entire work was more than 46% above the estimated cost, forcibly emphasizes the question of whether contractors are bidding too high or engineers are estimating too low. While it is not desirable that contractors should become frightened into making exorbitant estimates on work which will last for some time into the future and which must by law be contracted for at an inelastic price, neither is it desirable for engineers to charge contractors with such action unless the engineers are sure that their own estimates make due allowance for the increased cost of work and the increased liability to hazards which cannot be predicted.

While it is not possible to pass a sound opinion on the merits of the San Francisco case without an independent estimate, made by competent parties, nevertheless some comparisons with the Catskill Aqueduct costs will be of interest and will emphasize to engineers the unusual importance which attaches at the present time to careful estimates of the cost of public work.

The Catskill Aqueduct was driven almost entirely in hard, igneous rock, while it is understood that the San Francisco tunnel is located in sedimentary formations, largely sandstone. There may also be some differences in the requirements of lining, while certain sections of the Catskill Aqueduct are of somewhat larger diameter than the Hetch Hetchy tunnel. In the main, however, the two projects are comparable, especially as considerably higher material and labor prices rule today on the Pacific Coast than governed the bids which were submitted some years ago for the New York City work.

The city tunnel of the Catskill Aqueduct, about equal in length to the San Francisco tunnel, was let at a price in the neighborhood of $100 a foot for driving and lining the tunnel alone. The bid also included further large items for some 3000 ft. of shaft work. As this work was done first, there is little doubt that the unit prices quoted for it carried the greater proportion of the contractor's overhead and plant charges, since it is common practice to relieve the interest burden on large work of this kind by including these charges in the prices for the first items to be paid for.

The entire bid on the Hetch Hetchy project, including plant, overhead and all other items, is reported as about $95 per foot. One important item, the supply of power, will doubtless be lower than on the aqueduct work, as it is to be furnished by the city. Moreover, the city tunnel of the Catskill Aqueduct required a great deal of trucking and the shafts were far apart, whereas the San Francisco tunnel is in open country and there is more opportunity to arrange the work for greater construction economy. To offset this, however, the contractors for the Catskill Aqueduct, except in one or two cases, ran no risk of encountering bad ground. In the more recent and softer formations to be encountered in the California project, this contingency may assume serious proportions. It might be added, in case the city tunnel is held to be an unfair section of the Catskill Aqueduct for comparison, that contract prices on the upstate pressure tunnel were about the same figure.

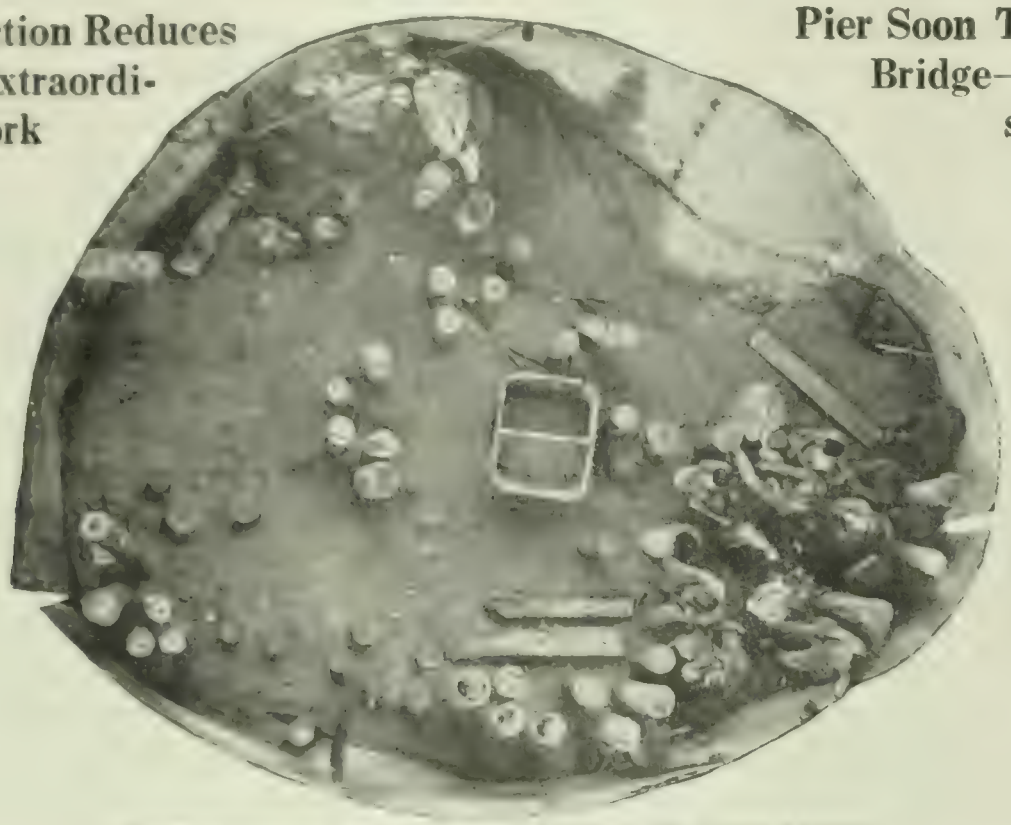
It is true that labor conditions on the Pacific Coast have made it extremely risky for contractors not already possessing an organization in that territory to undertake work of such magnitude, thus limiting competition on this work. Also, contractors are often twitted by their associates and spoken slightingly of by engineers on the ground that their experience with one job of a given type leads them to bid high on the next one that is offered. R. C. Storrie & Co., the only firm to submit a bid for the entire work at San Francisco, has just completed the Twin Peaks traffic tunnel. However this may be, it is equally true that an engineer's reputation may survive an incorrect estimate, while a contractor's bank account cannot.

[illegible]

Defective Foundation Causes Failure of Pier

Accident in Construction Reduces Area of Footing—Extraordinarily Defective Work

Pier Soon Tilts and Endangers Bridge—Successful Reconstruction Completed



UNCOVERING OLD FOUNDATION IN COLLAPSED SHELL—NOTE IRREGULAR SPACING OF PILES

LESS than two years after its construction the pivot pier of a large swing-bridge in Arkansas began to tilt to one side, and threatened to cause destruction of the bridge. In one night it tilted no less than 9 in. Nothing could be done to save the pier, and the bridge was supported on falsework to permit of wrecking the pier and building a new one in its place. When the old foundation was reached it disclosed an amazing piece of defective work, which had been covered up in the original construction.

The Martin free bridge across the Ouachita River, near Camden, Ark., built in 1913, has a 290-ft. through-truss draw span, and two 51-ft. pony-truss shore spans. The pivot pier was 60 ft. high; the lower 22 ft. was to be 27 ft. in diameter (built in a steel shell), and the upper part 24 ft. in diameter. The intermediate piers were pairs of 66-in. riveted cylinders filled with concrete and connected by horizontal channels. These piers were 60 ft. high, with five 30-ft. piles driven in each cylinder.

Early in 1915, an overturning and settling tendency of the pivot pier was discovered, and the State Highway Engineer, H. R. Carter, advised the authorities of Ouachita County to have an investigation made by an engineer. In June, 1915, the county employed I. A. Baum, consulting engineer, of Camden, Arkansas.

Defects and First Plan of Repair

Daily level readings during June and July showed that the pier was tilting at the rate of 0.02 ft. per week, the general direction being upstream and about 30° towards the left bank. The total movement from the vertical on Aug. 1, 1915, was 9 in. The river fell in September and on the night of Sept. 16 the pier tilted 9 in., making a total of 18 in.

The concrete above the water line was found to be of inferior quality, and to be in layers for each day's work, the layers being separated by ½ in. to 2 in. of laitance. Soundings showed scour of about 7 ft. on the upstream side and 4 ft. on the side opposite the left bank, but none on the downstream side or opposite the right bank. A large cavity was found in the upstream side of the pier, beginning at 10 ft. below the existing water level (or about 38 ft. below the top of the pier) and extending into the pier at about 45°. The high stage of water and a cluster of piles on this side of the pier made it impossible to measure this cavity accurately. The outline of the pier below normal water line and just above the cavity was found to be irregular and elliptical.

The existence of this cavity was explained by the fact that the concrete in the lower part of the pier was of such poor quality that it crumbled away when the river bed was scoured. It was learned that the concrete for the base of the pier was permitted to drop through the entire depth of water inside the casing. The aggregate also consisted of sand and gravel dredged from the river and used without regard to proportion or condition.

The first report made by Mr. Baum recommended surrounding the pier footing with a reinforced-concrete jacket, 35 ft. diameter, resting on two rings of piles; this to be built within a cofferdam of interlocking sheet piling which would be left in place as a protection against future scour. The pivot pier was to be underpinned with concrete as much as possible. The county authorities then (July, 1915) engaged C. D. Purdon, Chief Engineer of the St. Louis Southwestern Ry., to make an examination. His report agreed in general with Mr. Baum's recommendations. However, the sudden increase in tilting on Sept. 16, noted above, made this jacketing impracticable. It was decided, therefore, to wreck the old pier and build a new one.

For this reconstruction, the drawspan was supported on two timber towers, built on either side of the pier, and the turntable and operating machinery were re-

moved. Obstruction of the channel was done by permission of the War Department.

The report of Mr. Baum states that above low water the pier was of fairly hard concrete, but in layers 6 in. to 36 in. thick, separated by ½ in. to 2 in. of laitance. Below the water line the material resembled loose sand and gravel with layers and pockets of laitance as much as



FOUNDATION PILE IS DRIVEN THROUGH COLLAPSED SHELL FOR FOOTING ON BRIDGE PIER

18 in. thick. At 3 ft. above the top of the footing (and its steel casing) 23 piles were found, and at the level of the top of the footing 42 more piles were disclosed. Many of these last were simply poles.

The piles had been driven in clusters on the left and downstream sides, owing to the collapsed condition of the pier on the other sides (as noted below). The original plan called for 135 piles 35 ft. long, driven to a depth of 24 ft. below the base of the footing, the material around their tops to be removed to a depth of 11 ft. and the space filled with concrete. Some of the piles were so short that they were embedded in the footing for their full length. Only one pile penetrated as much as 13 ft. below the footing. For many of them the penetration was only 18 in., and the average for all the 65 piles was only 7 ft. The driving of the new piles to 25 ft. penetration showed that the requirements of the original plan could have been obtained.

Area of Pier Reduced More Than 60%

The most extraordinary discovery, however, was a reduction in area of the pier due to a collapse of the steel shell around the footing. The normal horizontal area of the footing was about 575 sq.ft., but the area at the extreme bottom was reduced to 221 sq.ft. The lower part of the shell had collapsed on all four sides. On the upstream side this began at 5½ ft. below the top of the casing and extended 11 ft. inward; downstream side, at 11 ft. from the top and 4 ft. inward; right side, at 10 ft. from the top and for 10 ft. inward; left side, at 10 ft. from the top and extending 2½ ft. into the pier.

As if this was not enough, one pile was found to be driven through the horizontal seam of the collapsed shell, at 11 ft. below the top of the footing, on the downstream side. In a report made at Mr. Baum's request by C. E. Smith, consulting engineer, of St. Louis, it is stated that the collapse evidently occurred in sinking the shell. It reduced the base area by about 50%, and made it impossible to drive the required number of piles.

Mr. Smith states that his experience in bridge building indicates conclusively that as soon as the collapse occurred the condition must have been known, and that the attempt was made to cover up the defective work by driving piles through the steel casing. This is indicated by the heavy iron point or nosing iron found on the work. This was evidently made for the purpose of punching holes through the steel casing so piles could be driven through it. However, only one pile was found thus driven.

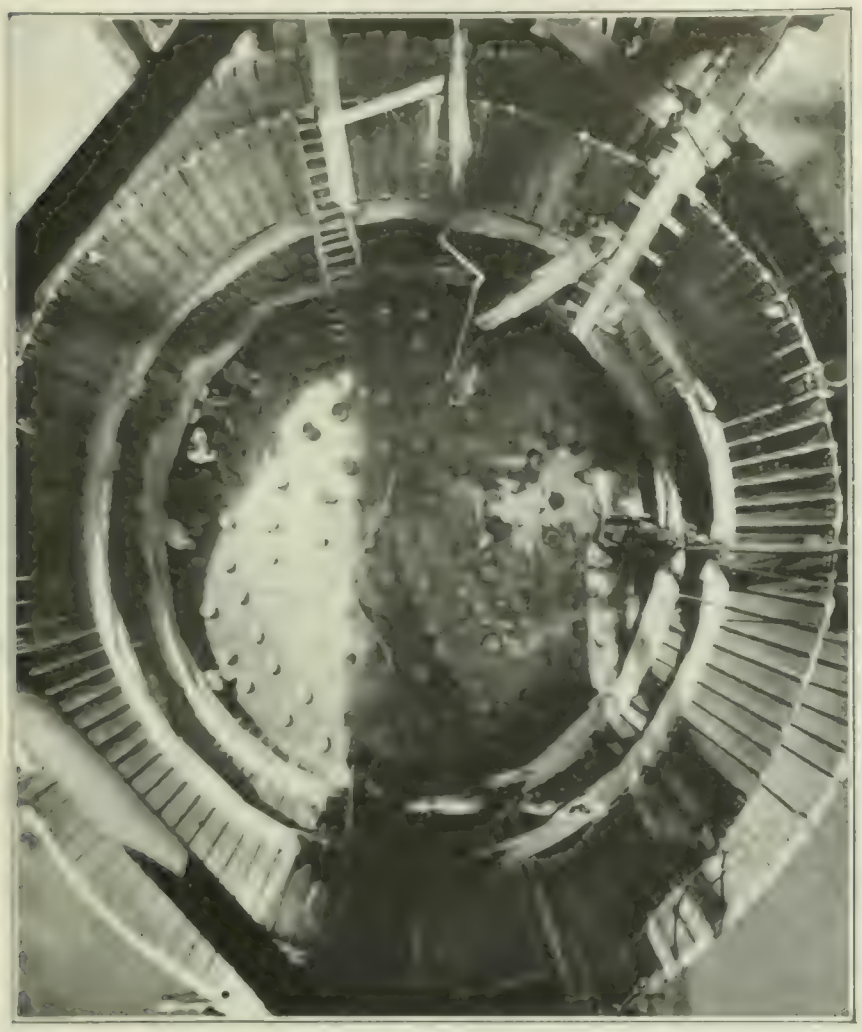
Foundation Concrete That Was Not Concrete

The original specifications provided that concrete placed under water "must not be allowed to fall into place, but must be lowered in vessels to the dumping place and deposited in a compact mass."

Mr. Smith stated that the material forming the footing of the pier had not been placed according to the specifications and could not be classed as concrete. While probably mixed in proper proportions, the materials had separated to such an extent that instead of a mass of homogeneous concrete there was a heterogeneous series of layers of gravel, sand and laitance. The gravel



[illegible]



BASE OF NEW FOOTING IN UNBRACED STEEL COFFERDAM. NOTE CAREFUL SPACING OF PILES

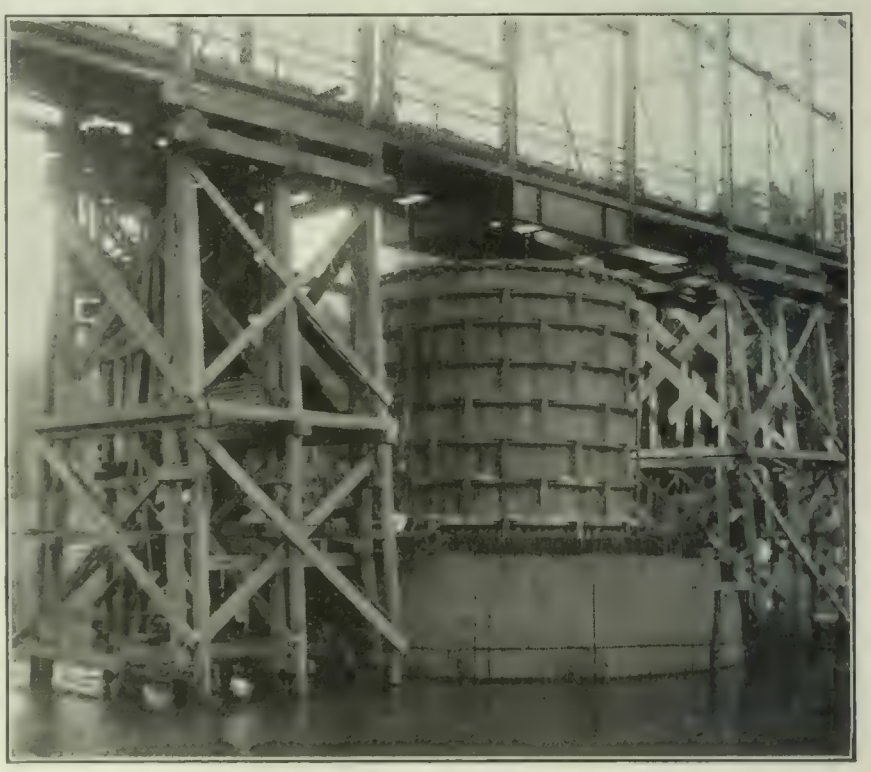
and sand could be removed with a shovel, indicating the entire absence of cement in these layers. Between these were layers of cemented material having the color and texture of chalk. "Although there is more of this material than I have ever before seen in concrete, it is quite evident that it is laitance."

Evidently the concrete was allowed to fall from some point above the water surface. The sand and gravel were washed clean and settled according to their weight. The cement was retained in the water, and kept agitated until the work stopped at night. Then it gradually settled to the bottom. But by that time it had lost much of its cementing property.

The total dead load of the old pier and superstructure was about 1618 tons. Assuming a safe load of 1.5 tons per sq.ft., the bearing power for the actual base area of 221 sq.ft. was only 331 tons. The bearing power of the 65 piles could hardly be considered of any value, due to their uneven distribution and lack of penetration. However, taking into consideration the fact that the unit penetration of the piles for the new pier was about 3 in. per blow when their total penetration was equal to the average penetration of the old piles, the bearing power of the latter could be assumed at 4⅓ tons per pile, and their total bearing power would be 282 tons, or a combined total of 613 tons. Thus there was a deficiency of about 1000 tons in bearing power of the pier foundation. Mr. Baum points out that the pier was doomed to failure in view of the above, without taking into consideration the eccentricity of loading.

The weight of the new pier and superstructure (with reduction for buoyancy) is about 2068 tons. The bearing power is about 1613 tons for the base (at 1½ tons per sq.ft.) and 1456 tons for 104 piles (at 14 tons each). This gives a total of 3369 tons, or 1000 tons in excess of the load.

A cofferdam, 37 ft. in diameter, was built of United States interlocking steel sheetpiles, 50 ft. in length.



FORM PLACED FOR NEW PIER INSIDE COFFERDAM—SWING BRIDGE SUPPORTED ON FALSEWORK



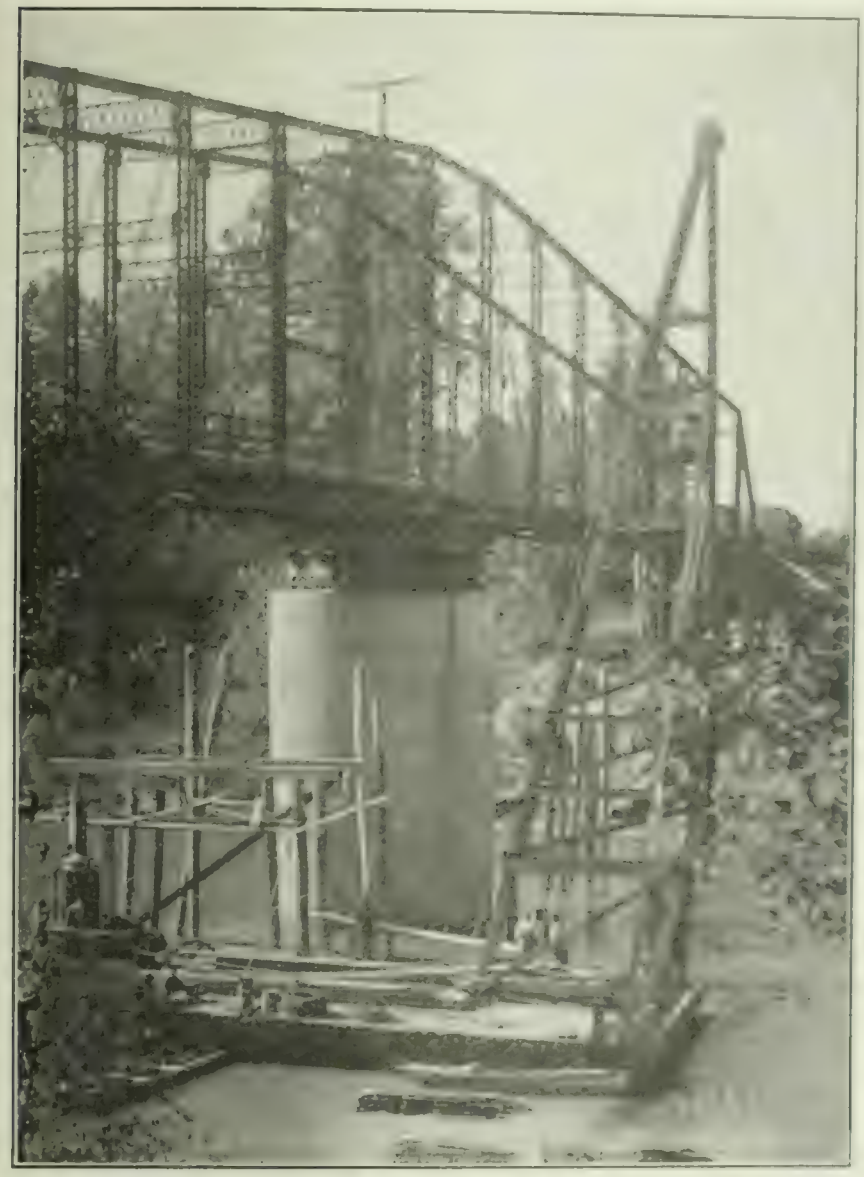
BASE OF OLD FOUNDATION IS LESS THAN 50% OF INTENDED AREA

This was set up around a guide wale and driven by a No. 2 Vulcan steam hammer suspended from the boom of the derrick barge. When the entire circle was assembled and closed, each pile in turn was driven to full depth. Outside of this was a cofferdam 45 ft. diameter composed of Wakefield sheet piling in lengths of 32 ft. for the upstream side (on account of the scour) and 28 ft. for the downstream side. A puddle of local clay was placed betwen the two rings of sheeting.

Although the cofferdam was 37 ft. interior diameter, no cross-bracing was used. Four rings of circular waling were built, each composed of two thicknesses of 6 x 12-in segments. Against the waling was driven the outer row of foundation piles 3½ ft. c.to.c. Another row was driven 2½ ft. inside, each pair of piles being on the same radial line. Struts were placed between the rows and between the piles of each row. These piles were 10 ft. longer than the other foundation piles, and

were not cut off until part of the concrete had been placed. The unobstructed open pit greatly facilitated the work of driving the inner piles, placing the concrete and building the upper forms.

The 104 foundation piles were driven in five rings, 3½ ft. to 16½ ft. radius, and spaced 3 ft. and 3½ ft. c. to c.



TILTING OF PIVOT PIER MADE IT NECESSARY TO BEGIN EXTENSIVE REPAIRS

The average penetration was 17 ft. below the bottom of the pier, and each pile was driven to refusal by the steam hammer swung from the derrick boom. The cut-off was 6 ft. above the bottom of the concrete. The top 19 ft. of the steel sheeting was cut off with an oxyacetylene torch, leaving the lower part in place as a permanent protection extending 23 ft. below the base of the concrete.

Excavation was done by hand, the material being shoveled into the concreting buckets. The new concrete was a 1:2:4 mix. Sand and gravel were excavated from the river bed by a floating derrick with orangepeel bucket, which then dumped it again into the water (to wash it) beneath a cableway operating a clamshell bucket. This dumped the material onto a platform, from which it was shoveled into buckets and hoisted by the derrick to the mixer.

The concrete mixer was placed on falsework as near the cofferdam as possible and at about the level of the bridge floor. The cement was stored in a shed near this and wheeled to the mixer. The concrete was spouted directly from the mixer to the cofferdam, which was kept entirely free from water. At 2 ft. from the [illegible] about three tons of steel rails were laid in the concrete. The steel cofferdam served as the form for the lower part of the pier. Above this the form was of 2 x 6-in. vertical lagging nailed against circular ribs made of two thicknesses of 4 x 12-in. planks, in segments, these ribs being about 3½ ft. c.toc. At the end of each day's work a key 6 ft. square and 1 ft. high was built in the center of the pier.

The upper part of the old pivot pier was wrecked by exploding dynamite charges in holes made with churn drills. The masses of concrete were loaded onto a barge by a derrick, and were used later as rip-rap around the new pier. The old concrete below low water was handled easily by pick and shovel, without blasting.

Floating Plant

The floating plant consisted of a barge 28 x 60 ft., with a stiffleg derrick (60-ft. boom) at one end and a pile driver at the other end. The latter had leads 70 ft. long, in three sections, so as to facilitate the work under the bridge. The falsework towers carrying the superstructure during this work, consisted of pile bents below surmounted by framed bents. They were made in this way so that the piles could be driven with the pile driver at the sides of the bridge, as the driving of long piles from the floor would have delayed traffic.

The building of the new pier and replacing of the turntable was completed on Sept. 1, 1916. The cost was $42,000, exclusive of the wrecking of the old pier. The reconstruction was done by the Midland Bridge Co., of Kansas City, Mo.

Information as to this extraordinary case of defective work and its reconstruction, has been furnished by I. A. Baum (now a member of the La Salle Engineering Co., Chicago), who was called in to investigate the conditions. He made the designs for the new work, and was in direct charge of the removal of the old pier and the construction of the new foundations and pier.

Worcester Buries Fish Offal

Fish offal is buried by the City of Worcester, Mass., with sanitary precautions. The service is independent of the garbage piggery described by Prof. Frederic Bonnet, Jr., on page 396 of our issue of Aug. 30.

An average of about 1.1 tons of fish offal is collected daily and is disposed of by dumping in a hollow and covering with loam. This material, during the fly season, comes thickly seeded with fly eggs and even larvæ, chiefly of the green bottle variety. Before dumping, the ground is prepared by first removing the top soil which is mixed with and finally covers the material. This allows the bacteria of the soil to destroy the material aerobically with but little odor.

In order to prevent swarms of flies developing, [illegible] fly traps, baited with fish heads, are set around the edges of the dump and the exposed pile is sprayed each morning with a mixture of 5 parts kerosene and 1 part turpentine or some arsenate spray, which very effectually kills the flies which emerge from the compost. The scraps are not dumped in the same place on two consecutive days but at some other place to the extent that the same place does not again receive scrap for six months or more, after which time all the material has been thoroughly disintegrated. This dump is surrounded by woods, which help to diffuse any odor likely to be present during the summer months.

Road Maintenance in the War Zone of France

As Observed by a U. S. Highway Engineer Driving an American Ambulance

By WILLIAM J. WEIR

American highway engineers who have been speculating as to the methods of road repair and maintenance on the Western Front, where traffic has been enormous ever since the war began, will find in this article answers to many of their queries. The author, William J. Weir, served on the engineering staff of the United States Office of Public Roads, under Director Logan Waller Page, before he went to France as a driver in the American Ambulance Corps. The facts reported, therefore, are based upon the observations of a technically trained observer. Nothing of the sort has heretofore appeared in print in this country, as far as we are aware. Mr. Weir submitted his material in the form of a report to Mr. Page, to whom *Engineering News-Record* is indebted for permission to use the following:

IT WAS in the Somme sector that I found things moving at highest tension and the transportation system most severely taxed. Here there was an immense volume of traffic moving in the entire area 20 miles back of the line; destructive artillery fire within the 5-km. zone; continuous heavy fighting that demanded great movements of troops, supplies and ammunition; and the necessity for the accommodation of an advancing army over ground that has hardly a spot untouched by shells.

The original layout of the French system of highways was fortunately most comprehensive. It has filled the requirements of the present exaggerated demands in a most admirable way and has undoubtedly been a tremendous factor in the defense against the German invasion. New roads have, of course, been constructed under special local conditions, but these instances seem to be rare and, in the main, the original highways, unchanged in location, grade, or width carry the war traffic.

Safety Roads

New roads are constructed mainly to relieve traffic from shell fire. On the eastern end of the line, among the hills, roads are often built to the "leeward" of the enemy. A specific instance of this is in the Argonne Forest, near Four de Paris. The main concentration of reserves, supply stations, dressing stations, etc., is in a long narrow valley a few hundred yards back of and parallel to the first line trenches which are on the other side of a low hill range. The original road was on the far side of the valley and is in sight and easy range of the enemy. It is marked "Very Dangerous" on army maps. An entirely new road has been built in the shelter of the hill range, hugging it closely in all the deviations of the slope. Here traffic can move in almost full security from direct hits.

Main roads are well known to the enemy and their range established by experience. In the flatter country, they often run on tangents miles in length making easy targets. In heavy actions, these roads are so vigorously shelled that supply trains cannot pass except with severe losses. As a counter measure, new roads are sometimes built near-by—crooked in alignment but in general direction paralleling the main road. Traffic is shifted between these roads to avoid shell fire or to confuse enemy airmen as to which line is actually being depended upon for service.

The French plan of troop cantonments, supply stations, base hospitals, etc., is quite evidently designed with the road facilities as a basis. It is a rare thing to find heavier traffic moving than the width of road can accommodate except, of course, on the main trunks near the first line where congestion is unavoidable; this case will be discussed later. Each class of road from the grand highways to the little community roads, seems, in a busy sector, to have just that portion of the traffic which it can satisfactorily handle. This condition is too general to be accidental, and as the result of careful planning of concentration points and the routing of movements it is admirable and a great credit to the French engineers.

Temporary concentration camps for large bodies of troops, as we know them here, are practically unknown in the war zone. Tents, except for hospital uses, are rarely seen. Troops are quartered in villages, the houses of which are entirely commandeered for the purpose. Each house, public building and stable carries a card showing the number of men it can shelter. Troops move out and new men come in, in the same day, without confusion. This system is of special advantage from the transportation engineer's standpoint for it obviates the necessity for special camp roads; does away with the transportation of cumbersome camp equipment; and keeps men and materials concentrated on existing highways and village streets.

Traffic Divided Between Many Roads

When a division moves to a new point, different units of the division may be ordered to move on different routes. Marching troops are slow moving and tend to obstruct motor traffic on the main roads; side roads are better suited for them. Light motor ambulances can take a longer route, using secondary roads. Horse-drawn supply wagons can take rough side roads which have been allowed to get in bad condition. Heavy motor trucks, with low gasoline mileage and costly to repair, must have the best roads and the direct route. In such movements, each unit is given its routing; it may or may not be designed to prevent congestion accordingly as the necessity exists. But the general scheme is there ready for use and it is made possible by the

minute network of roads of all classes in the French system.

All crossroads and road junctions are plainly and permanently marked with distances and directions to neighboring points. This has proved an invaluable aid to effective movements of units in charge of officers the great majority of whom are strangers in the particular locality. I cannot conceive of all the divergent movements of the present war being put through without the aid of these road signs, except with endless confusion and delay. On the other hand, they must be of similar aid to the enemy in the occupied territory. It would be an excellent plan in any retreat, or in time of invasion to have men especially detailed to destroy all road signs before the retirement.

Traffic

At certain points and at certain times in the war zone, the volume of traffic, of course, exceeds all limits of peace times. It combines all elements of destruction to the road surface which it uses. It is continuous and urgent. It cannot be halted for careful repairs or maintenance work to restore the road surface; yet the surface must be kept in a fair traveling condition. Travel must go on in the rainy season when the surface is softened and holes rapidly deepened by displacement of mud; and in dry summer, when the binder flies out in clouds and constant raveling occurs.

Traffic is made up of all varieties: Cavalry (very little); horse-drawn wagons and batteries with steel-tired wheels; troops with hob-nailed shoes; heavy motor trucks; and fast motor automobiles. It seemed that heavy motor trucks made up fully 50% of the traffic on the main roads. It will be seen, from our American standards, that continuous traffic of the above nature institutes as severe a test of a wearing surface as can be imagined.

The road leading from Amiens to the front lines of the Peronne-Chaulnes sector, is a good example of extreme concentration of traffic on a main feeder of a busy front. From Proyart to the front—a distance of about 9 miles—the bulk of the traffic must move at night, incidentally without lights, to avoid observation by the enemy. From Amiens to Proyart, it moves principally in the day time. In both instances it is practically continuous, four solid lines of vehicles move

New roads are constructed mainly to relieve traffic from shell fire. Traffic is shifted between these roads and the old routes to avoid shell fire and confuse enemy airmen.

in almost continuous procession. slow moving horse-drawn vehicles hug the shoulders of the roadway, leaving the center for motor travel. Fleets of motor trucks pound steadily by in hundreds, spaced only about 50 ft. apart and traveling at an average rate of about 12 miles an hour.

All convoys, or fleets of vehicles, move in a formation which provides an open space of 100 to 200 ft. or more after a group of several vehicles. Certain vehicles in the convoy carry a large red disc about a foot in diameter to indicate to the driver following that he is to leave space. This is to permit the passage of fast moving units such as officers' cars, dispatch cars, or ambulances, which would otherwise be forced to proceed at the speed of the convoy. Even with four lines moving, an open space several feet in width is usually maintained in the center. Independent units move in this, dropping into convoy spaces to permit the passage of other independents going in the opposite direction.

Cavalry and batteries are sometimes forced by traffic demands to move through the fields bordering on the roadway. It is quite common to see long stretches of main road where the effective width has been increased by what is practically an earth road on either side. Troops on the march are sometimes shunted to side, secondary or even temporary roads when the jam is great, and roadside signs indicating where this may

On the main feeders to the front four solid lines of vehicles move in almost continuous procession.

be done are frequent. These expedients are necessary to the proper movement of wheeled traffic when a main trunk leading to a busy sector is reached. As a result, this enormous traffic moves with a smoothness that is amazing.

Altogether, it is difficult to understand how any system of roads could handle traffic of such volume, continuity and destructive qualities. That it is being done in France indicates that there are lessons to be learned there by the highway engineering forces of all other nations. The various factors that make this feat possible are worthy of deep study and investigation which the nature of my army service made it impossible to give.

Type of Roads

The prevailing type of road in northern France is the waterbound macadam. Many gravel roads were also seen and a very few marls in the Marne Valley were found to be of a local chalky material. The latter were wholly minor roads. Except for the cobble and block streets of some of the villages, no bituminous macadam, concrete, brick or any of our American so-called permanent types of construction were encountered.

The waterbound macadam type lends itself extremely well to the demands of war conditions. Material can often be found at roadside or locally, thus relieving the transportation system; maintenance and repairs can be conducted in the rough manner necessary to keeping roadways open and with unskilled labor and without special equipment. The severe test of this type could of course come in the summer, when the wear due to loss of binder in the wind and to raveling must be very great. Unfortunately I was not in the war zone during that period and so cannot judge. I saw these roads in the early fall however, and they seemed to be in what I could afterwards estimate as average good condition.

[illegible] to predict just what would happen to our bituminous highway surfaces, to say [illegible] on the brick construction if these were subjected to the continuous pounding of traffic such as

Water-bound macadam, the prevailing type of road in northern France, lends itself extremely well to the demands of war. Except for cobble and block streets in some villages, no bituminous macadam, concrete, brick or any of our American so-called permanent types of construction were encountered.

occurs, for instance, on the Amiens road. They would develop severe weakness, of course; no standard surface would withstand such wear. I believe that the difficulties in repairing them in kind would be enormous owing to the absolute lack of time for necessary refinements. Modern war traffic over our standard country highways would undoubtedly bring serious problems of maintenance and repair.

General Maintenance and Repair

The system of maintenance and repairs to road surfaces in the war zone might be summed up in the phrase "do the best you can while you can." Work of this nature, in its true sense, cannot be performed with traffic demanding all of the roadway continuously. Makeshifts and rough work must be resorted to; such repairs as are possible must be made. When, and as soon as, the shifting of the point of big actions permits, complete repair and restoration of the road must be undertaken. It seems to be the French policy to keep all the important roads in best possible shape against the time when they must be used unsparingly, unmercifully and without adequate repairs. No effort to accomplish this is neglected. In no other way can the excellent service given be explained.

To illustrate: On the eastern end of the line there was comparative quiet last winter. The big actions in the Argonne and around Verdun were over. They had unquestionably brought enormous destruction to the roads in these sectors. The Bar-le-Duc—Verdun road, about 50 miles in length, had carried, during the months of the attack on Verdun, a continuous chain of about 5000 motor trucks night and day. The total wear and depreciation of the surface must have been terrific. But I found this road, and the other main roads of these sectors, in excellent condition, with smooth surfaces, full cross-section, clean waterways and with plentiful rock supply stored on the sides—in short, to all purposes, as good as new. Quite evidently, these roads had been repaired and thoroughly renewed without loss of time immediately after traffic congestion ceased. They are now as ready as they can be made to withstand the strain of another great traffic concentration should it come, and it may come any time. This is true preparedness; the result no doubt of the old French thoroughness in road construction and maintenance, combined with the lesson of experience in the importance of serviceable roads to effective army operations. Its results are remarkable especially when one considers the demands for labor and materials for purely offensive and defensive operations.

The worst roads are encountered very near the front, in an active sector. The artillery fire of the enemy within, say, 5 km. of the front line, is very destructive to the roads and, in a great measure, prevents effective repair work. This is particularly true in the Somme sector, where the country is flat and practically treeless, and so without protection to the roads or the traffic moving on them. Most of the time the enemy fire is directed on the roads and batteries in the zone from 2 km. to 4 km. back of the line. Here, too, the entire area was swept with creeping barrage fire during the Allied offensive and advance. Roads were destroyed and there has been no opportunity to rebuild them in good shape. It is a fact, therefore, that even the main road is in very rough condition after one advances beyond the position of the French first line trenches before the offensive; that is, in recaptured territory. Ambulances, for instance, are obliged to run largely in low gear from this point to and from the advanced dressing stations. The roads are passable but extremely rough. In this sector, too, upkeep of roads within about 2 km. of the front line is not attempted. Their position is too exposed and the shelling too severe. No vehicles approach the front beyond this limit, except the small "soup kitchens" and light supply wagons, and these only at night.

Details of Maintenance and Repair

My study of the details of maintenance and repair was of necessity confined to what I could see by chance in passing along the highways on service runs. It was never possible to stop for discussion with the officials in charge or to examine the work closely. Often, however, I passed a single piece of work so frequently that I became fairly familiar with it. I was able to pick up some information from officers in cantonments, which, coupled with actual observation, gave me such knowledge of the system as I here present. It is obvious, however, that this discussion cannot go deeply into this very interesting subject. But, with these reservations, the statements are, I think, true to fact.

The Bar-le-Duc—Verdun road, about 50 miles in length, had carried during the months of the attack on Verdun, a chain of about 5000 motor trucks, night and day.

The work very naturally divides itself into the more or less continuous addition of new material without interruption or real displacement of traffic, which can be called maintenance; and the renewal of the wearing surface completely, or repair.

Maintenance—The pre-war continuous patrol of road surfaces by individual cantonniers is not in evidence in the war zone. It is of course unnecessary to keep surfaces in the degree of excellence obtained in peace times. The little roadside houses of the cantonnier are now abandoned or used for storing tools. Maintenance, in the war sense, is practiced principally on the more important roads carrying heavy traffic. Two methods are in use:

1. Loose stone is placed by hand (shovels) in the surface depressions and compacted by traffic. The work is done at periods when the traffic is lightest. Usually the stone has to be placed hastily and in a rough man-

ner. Sometimes it must be cast entirely from the sides. Compaction takes place very quickly under passing fleets of heavy motor trucks with solid double 4-in. rear tires. In the continuous wet weather that was the rule last winter, the results were surprisingly good.

2. The surface is first roughly cleaned of excess mud. Working in short periods, whenever traffic permits, layers of material about one stone thick, are placed in narrow, longitudinal strips and rolled into the surface with steam rollers. The resulting surface in this, as in the first method, is irregular and rather rough but the main object, which is to restore sufficient material to maintain full thickness, is accomplished.

Repair—Repairs to main trunks in busy sectors are not attempted, except for the filling of shell holes. Material must be supplied by the methods above described and repairs postponed until such time as traffic will permit.

Building stones and brick from villages destroyed by shell fire is an interesting source of road material.

Surfaces are renewed by the half-section plan of operation. The old surface is scarified by hand and stone added to the desired thickness. Earth and clay seem to be freely used to expedite quick binding. The new surface is compacted with steam rollers.

Rock Supply

Rock supply is often brought in by rail. Usually, though, there seemed to be a local source within wagon haul. The rock is broken by hand either at the quarry or at roadside. Supply piles are kept stacked at roadside for maintenance and repair.

Building stone from villages demolished by shell fire is another interesting source of road material. Stone is so generally used in the construction of French villages that in many cases a large amount of material convenient to the location of the work can be obtained in this manner. In the Somme sector one of our advanced posts was a dugout at the crossroads which had once been the center of the village of Estrees. Originally it was 2 km. long and had a population of about 1500. I was amazed at the completeness with which it had been destroyed; there was hardly a sign of the buildings that must have stood there, not a wall or a portion of a wall standing. I soon learned that the underlying reason was that building stone had been carried away for road purposes.

Brick is also obtained from ruined buildings for road purposes. I saw an interesting and original type of surface reconstruction in the vicinity of the big base hospital at Marcelcave. A 3-in. course of brick bats, salvaged in this way, mixed with a small percentage of crushed stone, compacted with a steam roller, was used. The finished surface was quite smooth and looked like a red clay road of our South. Wet weather continued during the time this surface was under my observation. Under this favorable condition, it was an excellent road. It was probably recognized as a temporary expedient and will be in some manner strengthened to withstand dry summer weather.

Fighting men are not used for road work. All road work is done by men over the military age, by prisoners of war and by Anamites. Prisoners of war may not be, and are not, worked within the fire zone; that is in ordinary range of their own guns. Manual labor on the roads is also optional with them and they are paid therefor. Great numbers of them may be seen at maintenance and repair work however.

The Anamites are soldiers of Chinese appearance from the French province of Anam in Asia. They do not, I understand, believe in warfare and are used for guard duty well back of the lines and are apparently the main source of road labor. In winter, they are largely employed in clearing roadways of snow and scraping from the surfaces the mud which collects in enormous quantities.

General Conditions

As stated in the beginning of this paper, my work by good fortune carried me over many hundred miles of roads of all classes in the war zone. The average condition of these roads was far better than, under the circumstances, I expected. The first and second class highways are kept in relatively excellent condition. The community roads have, in very many cases, gotten into rather bad shape. They are often extremely rough with big holes, but they are hard surfaced and carry their traffic with safety from miring, if without comfort. This neglect of minor roads at certain points is evidently deliberate. It is true economy that decides it. These roads are used almost entirely by horse-drawn vehicles which are not seriously handicapped or damaged by them; in their ordinary use, speed is not essential; the distance traveled over them in reaching a second- or first-class road from the particular village is always short. The labor and materials necessary to their upkeep can be expended with greater effectiveness on the main roads. It comes back to our own policy and basis in the design of American road systems—80% of the traffic on 20% of the roads; and I think that the ratio in favor of the concentration of effort on main trunks is even more marked under the peculiar requirements of war traffic.

It is evident that the French road system has made good. Its basic theory was certainly sound.

Conclusion

It is evident that the French road system has made good. I can not conceive of any road system in the world designed without knowledge of the present demands meeting the situation as well; indeed it almost seems that the French system must have been planned for just the present conditions. Its basic theory was certainly sound. The following features of its design have proved of special advantage at this time of stress when so much depended on its carrying the war traffic efficiently, without delay or confusion, and with economy of effort:

1. The prevailing grades are not easy permitting heavy loads for horse-driven vehicles and faster

speeds for motor convoys. Location lines are found to follow contours in almost all cases. This has made for easier maintenance and easier rebuilding after destruction.

Drainage—The drainage systems, surface, side and sub-drainage seemed to be practically perfect. Outside villages I do not recall a single instance of poor drainage on a first- or second-class road. This has been a considerable factor in giving durability under the war traffic.

Foundation—Without adequate foundations, the main roads would have long ago completely failed. Maintenance, care or addition of surface rock could not have saved them. But these roads, even the worst community roads, stay solid and traffic does not mire or stick in soft stretches of broken subbase soils. This is one of the great lessons driven home; good foundation and adequate thickness of pavement.

Width—Width of traveling surface has been most important to army transport. Some of the grand highways, main feeders to the front, have a width of about 33 ft. between shoulders. Even this is crowded to capacity most of the time. How great a factor these widths have been to the success of the French army cannot be estimated nor can we guess the difference in offensive and defensive results, if they had been, say, the 18-ft. American standard.

High Ratio of Road Mileage—The landscape of France is a veritable network of roads. The number of miles of road per square mile of territory must be at least double, probably more, that in the United States. Inasmuch as these are all improved roads this has been of great service to army movements. Between two given points several routes may be selected, none of which will greatly exceed the most direct route in distance. To aid in the understanding of the continual large movements in the war zone, I should have perhaps explained earlier that divisions are constantly shifting location from one sector of the front to another; from the rear of the war zone to the actual front; in very active sectors, a particular division may be in the trenches only a few days, two weeks is said to be the average. It is this feature, sometimes overlooked, combined with demands for munitions and supplies, which accounts for the great burden of traffic these roads must bear. The dispersion of travel over different routes, made possible by the high mileage ratio, is therefore another great advantage of the French plan.

Road Signs—The military advantages of this feature have been discussed; they have depended on the fact that the work was done comprehensively, accurately and for permanence.

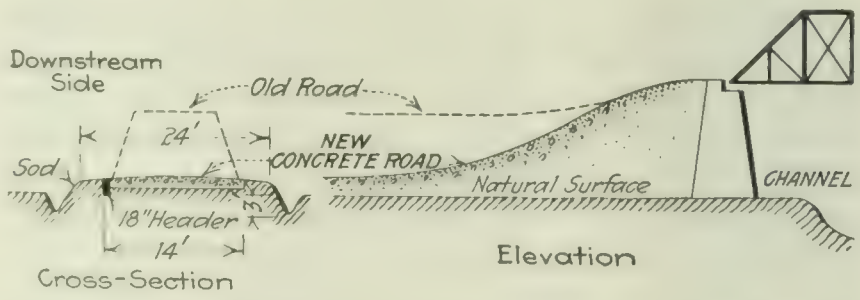
Maintenance—The general type, water-bound macadam, has proved itself well suited to special maintenance requirements of war conditions. Surfaces requiring prior mixing, careful laying, special equipment or time for setting would have been a source of great difficulty. It is also probable that the French habit of thorough maintenance, developed and held to consistently for many years by French highway engineers, has much to do with their success in meeting this extraordinary situation.

In conclusion, I must state again my realization that I have covered this field only very superficially. While in the war zone I lost no opportunity to gain information on the subject but my limitations were that my movements were restricted by my duties and military regulations, and I was not able to get in contact with officials who have direction of road engineering. Again, it is a field worthy of deepest investigation by American highway engineers, now while the war goes on; if for no reason than that here one can observe the action of road surfaces under traffic of intensity that anticipates the possible future developments along some of our main trunks; and for the study of this example of high efficiency in the engineering of transportation.

Overflow Road Approach to Bridge Instead of Old Fill

Use of Reinforced-Concrete Pavement at Low Level Prevents Water Being Backed Up During Floods

IN MANY Middle Western rivers where low banks allow high water to extend far back from the channel, it has long been the custom to build bridge approaches on low-gradient fills reaching back beyond the high-water area. Such fills formed in effect dikes too narrow on top for safe travel, making an effective dam or barrier which piled up the flood waters. Often the water would not be restrained and would wash out the fill, thus putting the crossing out of service for a time. In Putnam County, Ohio, the county engineer, P. T. Ford, some years ago began building low-level approaches to bridges over such rivers, the idea being to let the high water pass over the approach, which was built of such material and so designed as not to be damaged by an overflow.



OLD HIGH APPROACH TO LOW BANK RIVER BRIDGE IS CHANGED TO OVERFLOW SECTION

The drawing shows a typical crossing before and after lowering. The earth in the old approach is spread out sidewise so as to make a road of ample width. The pavement for the length subject to overflows is of concrete, reinforced with ½-in. longitudinal rods spaced 2 ft. c. to c. and with ⅜-in. transverse rods spaced 18 in. c. to c. There are no expansion joints, but on the downstream edge of the road there is a concrete toe-wall or header, 18 in. deep, to prevent washing back under the pavement. A tough sod is grown on the short downstream slope to protect the fill against overflow cutting.

Observations on the flood height of streams are made, and the new roadway fill is made high enough so that vehicles using it during normal high water will be about to the hubs in water.

Two structures of this type have been built now about four years, during which time they have been overflowed about ten times.

No Promise of Lucrative Practice Made to Engineering Students

Schools Report Marked Demand for Young Graduates in All Branches and Some General Increases of Pay, But Few Teachers Have Visions of a High-Paying Profession

IN CONNECTION with a study of conditions among the engineering schools of the country, just made by *Engineering News-Record*, an effort was made to size up the present demand for engineers as disclosed through the contact of alumni with deans or professors, and to find what support there existed for statements that "engineering was everywhere going to be the most lucrative of professions," recently circulated in an effort to increase the attendance at engineering schools.

Four questions were put to the deans and professors along this line:

(*a*) What demands do you experience for graduates in civil, mechanical, electrical, chemical and miscellaneous groups?

(*b*) Can you see any dearth or over-supply of engineers in any of the larger groups?

(*c*) Have you seen any field where war has temporarily or permanently taken an appreciable proportion of engineers engaged therein?

(*d*) Do you know of sufficient cases of improvement in the status and pay of engineers to support the view that engineering is soon to be the most lucrative of professions?

The replies in general show a strong demand for young graduates, but no startling dearth of engineers and little or no support for the view that engineering was expected to be particularly rich in financial reward.

Notable care was obviously given to most of the replies to these questions, and the more illuminating statements are reprinted in abbreviated form.

Response of Educators

A. W. RICHTER, dean of engineering, University of Montana—(*a*) Our graduates in mechanical, electrical, civil, and mechanical engineering are all at work. We have more inquiries than graduates. It has been necessary for us to look for an instructor in engineering, and there are very few candidates as compared to previous years. Deans of other engineering colleges inform me that they find it difficult to fill their positions.

E. E. HASKELL, dean of civil engineering, Cornell University—(*a*) The demand for graduates has been and continues to be very heavy. We are nowhere near able to meet it.

G. C. ANTHONY, dean of engineering, Tufts College—(*a*) The demand for graduate students in all departments of engineering has been unusually great. (*b*) It is not unlikely that there will be a real dearth of engineers in the immediate future. There is certainly no danger of an oversupply. (*d*) I have seen some evidence of an improvement in the status and pay of engineers, and I feel quite sure that it is soon to become a lucrative profession.

A. A. HAAMERSCHLAG, director, Carnegie Institute of Technology—(*a*) The demand for our graduates far exceeds the supply. There are remunerative opportunities awaiting our graduates in all fields. (*b*) The dearth of engineers will be in direct proportion to the number who are killed or incapacitated in the armies of the world. There is no chance of an over-supply. (*c*) In the field of mechanical engineering and metallurgy the losses are destined to be most heavy, since modern warfare is subjecting to an overstrain those engaged in that field. (*d*) It must be evident that the industrial reconstruction subsequent to the war will put the trained minds of engineers in a pre-eminent position. With a scarce supply and an extensive demand, men of this profession are destined to reap unusual rewards.

C. E. FERRIS, dean of engineering, University of Tennessee—(*a*) Very heavy demands for all classes, but particularly for mechanical engineers. (*b*) Supply not at all equal to the demand. (*c*) There is a shortage, particularly in mechanical engineers. (*d*) I foresee great work for engineers when the war is over.

LAW OF SUPPLY AND DEMAND WILL OPERATE

C. S. NICHOLS, assistant to dean of engineering, Iowa State College—(*a*) This year and last we had several times as many calls as we had men to supply. Now we find employers endeavoring to retain the services of sophomores and juniors beyond the opening of college work because of difficulty in securing men for their places. (*b*) and (*c*) There appears really to be a dearth of engineers, particularly in chemical and civil engineering. The large numbers who will go into the Signal and Quartermaster Corps will very materially reduce the supply of electrical and mechanical engineers. The small enrollment for years past in mining engineering has left a shortage of men with this training which will be keenly felt after the war, when we may reasonably expect a great increase in mining operations to replace metals exhausted for war uses. (*d*) It seems reasonable that the law of supply and demand will operate within a very few years to make the engineer much in demand. There must result a very great improvement in the status and pay of engineers.

O. V. P. STOUT, dean of engineering, University of Nebraska—(*a*) The demand for the younger men has for more than a year been acute and beyond our power to supply. We have met only a small proportion of the calls which have come to us. (*b*) A simple negative would not be far from the truth if we have in mind professional engineers only. (*d*) Although I do not believe we are warranted in advancing such a doubtful statement, I do believe that we can, without the least scruple, undertake to secure the largest possible num-

ber of qualified students of engineering. The obligation will rest on us, however, to point out the limitations of the professional field and the limitations of many students, and to urge that a considerable majority of them seek their opportunity outside.

A. A. TITSWORTH, dean of engineering, Rutgers College—(*a*) A demand we cannot fill; unusual. (*b*) In civil engineering particularly. (*c*) In civil engineering; probably in all others. (*d*) Certainly a decided increase in pay, but not to the extent suggested.

NO DEARTH AND NO OVERSUPPLY

H. S. DRINKER, president, Lehigh University—(*a*) The demand for graduates is about normal. (*b*) No dearth and no over-supply seen. (*c*) I think that the establishment of the army engineer reserve has taken a considerable proportion of civil engineers for army service. (*d*) To anticipate that engineering is soon to be the most lucrative of professions is a little oversanguine. There is no doubt that conditions prevailing in the last few years have resulted in increased demand for engineering graduates, and higher pay.

C. L. MEES, president, Rose Polytechnic Institute—(*a*) There seems to be a very great demand for graduates in civil, mechanical, electrical and chemical engineering, as we have had applications from many concerns and have been unable to secure men. All of our graduates have been placed, and a number of the January graduates have been spoken for. (*b*) It is too early to make a fair estimate, but from present indications there is a likelihood of being a larger lack of engineers in railroad service than in any other division. (*c*) It is too early to make an estimate. (*d*) No definite data at hand, but it seems likely that in the period of reconstruction immediately following the war there will be a larger demand for engineers, which, however, may not involve a very great increase in pay.

W. C. BAUER, acting director of engineering, Northwestern University—(*a*) More demands for graduates in mechanical, civil, electrical engineering than we can supply. (*b*) Yes. (*c*) All fields appear to be alike. (*d*) No.

ALFRED BOYD, dean of engineering, Oklahoma Agricultural and Mechanical College—(*a*) We would have no difficulty in placing several times as many graduates in engineering as we have this year. Apparently there is a dearth, due to abnormal conditions. I do not believe this situation is permanent. (*c*) War apparently has taken an appreciable number of engineers engaged in construction or in industries closely allied with military operations. (*d*) I have not sufficient evidence of increase in remuneration to support such a statement. An increased demand for engineers, however, should necessarily improve their status.

DEARTH IN CHEMICAL LINES

H. S. BOARDMAN, dean of engineering, University of Maine—(*a*) During the past three or four months there has been a steady increase in the demand for our graduates in mechanical, civil, electrical, and chemical engineering, and chemistry. I have never had in my fourteen years' connection with the university so few requests from graduates for assistance and so many requests from employers for men. (*b*) Our experience seems to point to a dearth of men along chemical lines. We have lost seven of our faculty in the department of chemistry and we are experiencing difficulty in replacing them. (*c*) Electrical engineering appears to have suffered the most. (*d*) I know of many cases of improvement in the status and pay of engineers which have come about from war conditions. Whether or not this is temporary or permanent is debatable.

J. G. SCRUGHAM, dean of engineering, University of Nevada—(*a*) The demand for engineers, more particularly civil engineers, exceeds that of any period in the history of the state. (*d*) The average salary being paid to engineers in this state has probably increased about 20% during the past year.

IN RAILWAY WORK SALARIES ARE LOW

C. H. BENJAMIN, dean of engineering, Purdue University—(*a*) The demand for engineering graduates the past season has been phenomenal. We have had positions for many more men than are available. This was true even before the era of enlistment further complicated the situation. We do not pretend to supply men for vacancies unless the situation is exceptionally promising. (*b*) It seems to me that at present there are not enough engineers to go around. This is due to the war and will become normal a year or two after the war closes. (*c*) I should say that there was a good demand for engineers of all kinds in the Officers' Reserve and training camps. Our difficulty is to hold back enough of our faculty to carry on our work satisfactorily. Some of our men are also in battalions of engineers already in France on railroad construction. (*d*) Except in railroad work, the outlook is good. There the salaries are low. The average income of graduates employed in the engineering departments of railways is about $1750 as against $2400 in manufacturing and $3200 in construction work. We hear complaints from railway managers that graduates do not stay. The reason is apparent.

H. V. CARPENTER, dean of mechanic arts and engineering, State College of Washington—(*a*) The opportunities for graduates in all of our engineering courses we have found to be unusually good this year, and there is a somewhat better rate of pay. One of our men was offered sixteen different positions before he finally went into an engineering training camp. (*b*) This would seem to indicate a shortage of men, although I do not know of any engineering work that has been seriously delayed through lack of engineers to handle it. (*c*) I think a little calculation will show that the demands of the war will not take any appreciable percentage of engineers into the field, but of course the productive side of the war, the manufacturing, will cause a very decided demand, which will undoubtedly cause a shortage or has already done so. (*d*) I should judge that in the Northwest at present engineers are being paid from 20 to 35% more for a given piece of work than before the war. We hope that this means a permanent improvement in the status of the engineer, but I would not care to be quoted as saying that the profession is likely to become at once the most lucrative.

JOHN E. HILL, Brown University—(*a*) The demand for graduates in the various engineering groups at present seems to be about normal, with a possible

tendency toward increase. (*b*) The supply of engineers at present seems to be normal. (*c*) Except from the standpoint of aviation, the various engineering fields seem to be normal. (*d*) Although the present pay is materially more than it was ten or fifteen years ago, I do not believe that engineering at present is as lucrative as law or medicine.

Large Returns Due to Exceptional Abilities

Ira N. Hollis, president, Worcester Polytechnic Institute—(*a*) We have so great a demand for graduates in all departments that we cannot supply them. They go into government service and into all kinds of industrial establishments. The demand for chemical men has increased our class very materially. (*b*) I cannot observe any over-supply of engineers, but I think there will be some readjustment after this war is over. Graduates will be coming back and there may be an over-supply. At present the dearth of supply is almost entirely in the junior positions. (*c*) It seems to me that this war has taken into civilian positions connected with the army or navy a large number of mechanical engineers, and that it has taken a number of civil engineers into the army, but I think it was comparatively easy to spare them. (*d*) Statistics from graduates show that pay averages as well as that in other professions, and the advancement in pay is about as good. There are exceptional cases in law, medicine and engineering where men get large returns, but it is mainly due to exceptional abilities. I do not think that engineering will soon be the most lucrative of professions, but I think that engineers will be properly paid in the future.

C. S. Howe, president, Case School of Applied Science—(*a*) Enormous demand for graduates. (*b*) No signs of any lack of demand for engineers. There will be no over-supply. (*c*) No dearth as yet, but if the war continues mechanical and electrical engineers will be in very great demand. (*d*) I hope the time will come when engineering will be the most lucrative of all professions, but fear I shall not live to see it.

Status of Engineer Will Stand Improvement

A. A. Potter, dean of engineering, Kansas State Agricultural College—(*a*) The demand has been great for electrical and mechanical engineers, but the demand for civil engineers, architects and graduates from other engineering courses does not in any way compare with that for those two. (*b*) Our observations indicate that there is an insufficient supply at the present time of mechanical and electrical engineers for the minor positions in the industries. We have not had many requests for men to fill positions which pay salaries above $2500 per year. We have had many requests for men to fill positions which pay from $75 to $150 per month. (*c*) The large manufacturing concerns seem to be short of men for the minor technical positions. (*d*) I do not believe that there is a basis for the statement that engineering will soon be the most lucrative of professions. My observations during fifteen years as an engineer and a teacher of engineering indicate that the status of the engineer in various industries would stand considerable improvement.

G. W. Bissell, dean of engineering, Michigan Agricultural College—(*a*) At the present moment the most notable demand for technical men that comes to this office is for teachers in technical schools. (*b*) A comparison of the situation this summer and last indicates no material change in the demand for men. In both seasons all of our graduates were placed without difficulty. (*d*) I would not be justified in claiming that the future of engineering as a profession is to be promoted by the expectation of its being strikingly lucrative.

C. E. Hewitt, dean of engineering, New Hampshire College—(*a*) We have been able to place all of our graduates in mechanical, electrical and chemical engineering (we do not have a civil-engineering course). We could place more first-class men at a fair salary if we had them. (*b*) My observation indicates that there are plenty of opportunities for first-class men, but perhaps there is a dearth of men who graduate from engineering schools who are barely above the passing requirements. (*c*) Aviation work has taken a large number of engineers, and apparently there is a good field in this class and also in the Signal Corps. (*d*) I do not actually know of many cases to support this view, but I am fully convinced that this ought to be the case and perhaps is one of the things to be looked for as a result of this war.

Thirty Applications for a Professorship

G. F. Blessing, professor of engineering, Swarthmore College—(*a*) All engineering graduates of Swarthmore College are, so far as I know, satisfactorily employed. I have not been able to supply men for [illegible] brought to my attention. (*c*) It may be of interest to note that I received over thirty applications for positions here as assistant professor of civil engineering and not a single applicant for an opening as shop instructor. All the civil-engineer applicants had had teaching and some had good practical experience. They were thrown out of employment by larger universities cutting down their instructing force in the higher branches and in specialized courses. (*d*) No, though I have heard the sentiment freely expressed.

A. B. McDaniel, professor of civil engineering, Union University—(*a*) We have a constantly increasing demand for both civil and electrical engineers with varying amounts of experience. Our undergraduate students have been employed in engineering and industrial work during the summer. (*b*) There is a dearth of civil engineers, largely caused by the number of enlistments in the Officers' Reserve Corps, etc. I anticipate that this condition will continue for some time to come, and that the reconstruction period in Europe will still further increase the demand. (*d*) No particular cases have come to my attention that would lead me to think that the status and pay of engineers have improved greatly in recent times. I still believe that the profession is greatly underpaid and its service unappreciated. The blame rests largely on the members of the profession. When we are willing properly to organize and give suitable publicity to our work, then may we expect due recognition from the public.

Dean Engineer Earns Less Than Mechanic

W. G. Raymond, dean of applied science, Ohio University—(*a*) Hardly a day passes that I do not [illegible] The persons available for positions of

fered." (*b*) Judging from this experience there must be some dearth of engineers. (*c*) A considerable number of engineers have been taken from railway service by the war. A good many young mechanical and electrical engineers have been so taken. More than one-half of our graduating class is in Federal service, all but two of the civil engineers being so engaged. (*d*) There has been an advance in pay, but the young engineer does not yet compare favorably in earning capacity with the mechanic whom he directs.

J. H. DORROH, dean of engineering, University of Mississippi—(*a*) The demand for civil graduates is the heaviest on record. Scarcely any demand in other lines. (*b*) Notable dearth of assistants in civil lines. (*c*) War has robbed civil engineering—notably highway and municipal branches—of most assistants (instrumentmen, draftsmen, etc.) (*d*) I know of improvement in status and pay of engineers, but also know that present conditions do not justify conclusions that engineering is the most lucrative profession now, or probably will be soon—at least not in our territory.

STANDARDIZATION REDUCES DEMAND FOR BRAINS

W. P. GRAHAM, dean of applied science, Syracuse University—(*a*) We have had an unusual demand for men trained in engineering, but no marked demand for men with special training. (*b*) The war has taken a number of our graduates employed in electrical work, but it is difficult to estimate what proportion of engineers have been taken from the electrical field as a whole. The volume of business is unusually great, and men are required to handle it. This would account for the ease with which any man who has a technical education can secure a fairly good position. There has been for some time a tendency of large corporations to consolidate their engineering work, so that one experienced man with the help of a number of comparatively low-paid assistants could handle much more work than formerly. The war seems to increase this tendency. (*d*) Pay of men just out of college has been increased perhaps 25% on the average. Experienced men command better salaries than ever before, but this seems to be true of most professions and trades. It is difficult to foresee the effect of the war on the engineering profession, but there has been a great advance in finding out the best ways of doing things and then in standardizing; standardization always means a reduced demand for skill and brains.

A. W. SMITH, dean of Sibley College, Cornell University—(*a*) There never was a time when mechanical-engineering graduates were in such demand. (*d*) I should hesitate to make an affirmative statement. The war will stimulate many lines of activity besides that of engineering.

ENGINEERING TRAINING VALUABLE FOR BUSINESS

G. F. SWAIN, professor of civil engineering, Massachusetts Institute of Technology and Harvard University—(*a*) There has been a large demand for graduates in civil engineering, and I personally have had many applications for men which I have been unable to fill. (*b*) I think there will be a dearth of civil engineers. I consider it of the greatest importance that young men should be encouraged to pursue engineering studies or, speaking more generally, studies in applied science, in order that there may be an adequate supply of trained men during and immediately after the war. (*d*) I do not know of any improvement in the status or pay of engineers, except what would naturally result from the increasing demand and lessening supply. I see no reason for the conclusion that engineering is soon to be the most lucrative of professions, but I have always believed that the status and pay of engineers should be greater than it is. Improvement must come mainly from within and from the increased value which technically trained men prove themselves to possess. It will not come from talk about the status of the engineer. Natural laws apply here as elsewhere. An engigeering training is valuable for fitting a man not only for technical engineering positions, but also for business in which a knowledge of applied science is desirable. I look to see men trained in engineering taking the lead in business in the future to a greater extent than they have in the past.

C. D. MARX, professor of civil engineering, Leland Stanford Junior University—(*a*) There is a large demand for graduates in mechanical, civil, electrical and chemical engineering to take the places of men who have enlisted or have been drafted. (*b*) The Western Union Telegraph Co. is losing more men than it can replace, and so are some of our larger irrigations works. (*c*) At present I have no lines on other fields of engineering where the war has temporarily or permanently taken an appreciable proportion of the engineers engaged. (*d*) I know of no cases of improvement in the status and pay of engineers to support the view. I think the view is absurd and not warranted by any facts.

W. H. SCHUERMAN, dean of engineering, Vanderbilt University—(*a*) We have been receiving more requests for graduates in engineering than we have been able to supply. (*b*) I believe the supply and demand are about equal. (*c*) According to my observations, the war has taken a considerable proportion of the civil engineers. (*d*) I do not believe there is any basis for the view. Should such a view become general, the attendance at engineering colleges would undoubtedly increase as it did from about 1900 to 1910, to be followed by a slump such as has occurred in civil engineering during the last four or five years. I do not believe that dissemination of such a view to be in the best interests of the profession.

IN ENGINEERING SOME MEN CAN SERVE BEST

CHAS. H. SNOW, dean of applied science, New York University—(*a*) The demand for graduates is greater than the supply. (*b*) Apparently there is a dearth of men in the divisions mentioned. (*c*) All branches. (*d*) I do not know of anything to warrant the assumption. I have no doubt that with the increasing need for men more students will enter our colleges, so that an equilibrium will eventually be re-established. Incidentally, I may say this university does not encourage men to enter the profession of engineering with the money idea paramount. We are old-fashioned enough to emphasize the fact that engineering is a means by which some men can serve their time and generations best.

The National Army's Three Southern Cantonments

An Account of Progress

By H. D. HAMMOND

Associate Editor Engineering News-Record

Logging Roads Carry Lumber to Each Brigade at Columbia Camp

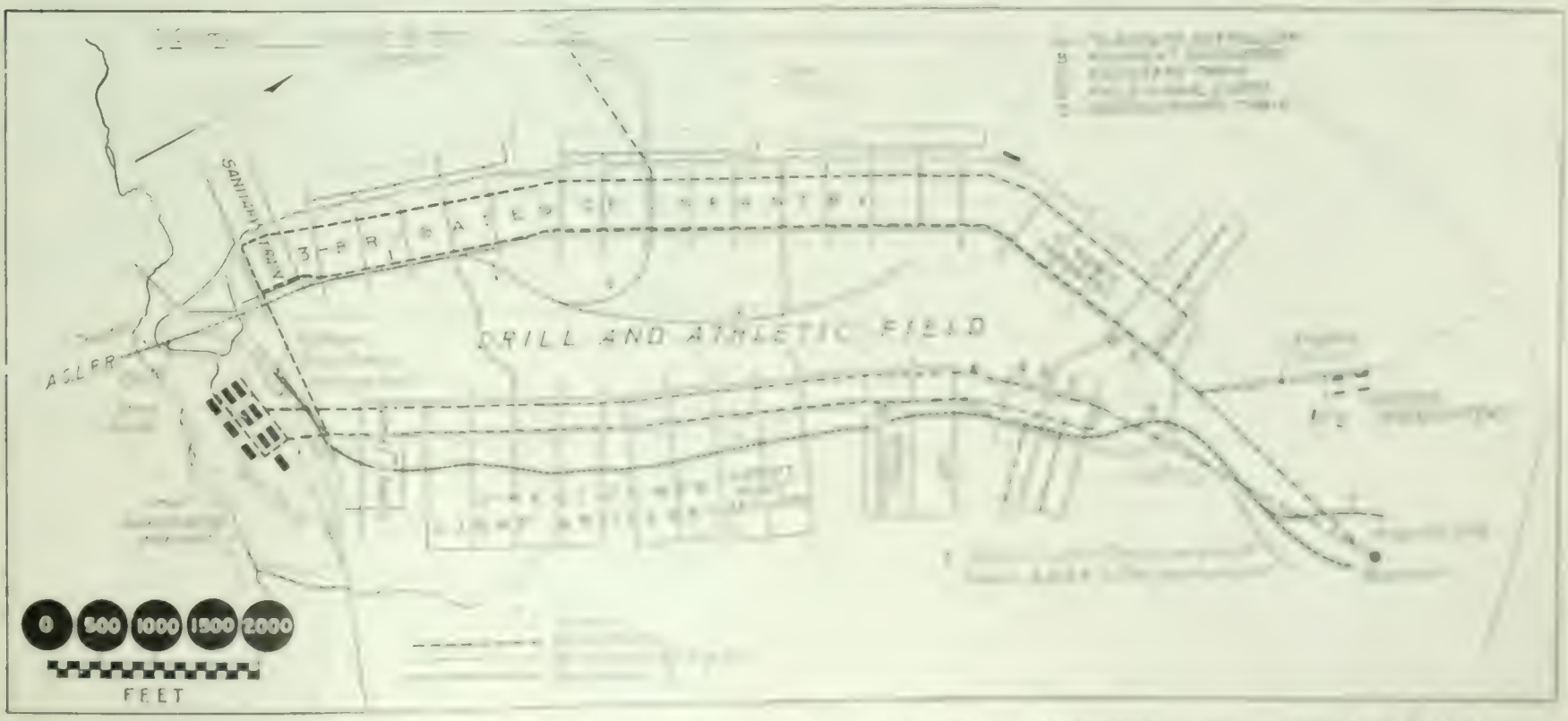
Topography Adapted to Efficient Distribution—Earth Reservoir To Build and Big Swamps To Drain—Railroad Yard Designed for Expansion—Large Auditing Force Expedites Details

LOGGING railroads of standard gage, laid close to the contour lines at a rate of 2000 ft. a day for each gang, are aiding the rapid construction of the new National Army cantonment at Columbia, S. C. The camp, stretching across a series of ridges, is so planned that each brigade on the west side of the site is draped across a "hog-back," on the ridge of which is a spur from the construction road. From these tracks the lumber is handled down hill to the point of use, by team and motor truck. The camp has a permanent receiving yard and storehouse layout which, because both of its design and location, can be expanded at will if the trackage at first provided should be overtaxed. A 1¼-million-gallon ear h reservoir, concrete lined, is being constructed on a high hill overlooking the camp proper; and large swamps, one of which may be drained by floating dredge operations, add to the difficulties.

The carpenter work is organized on the same principle as that at Ayer, Mass., different forces following each other with successive operations on the buildings. The sawmills, however, of which 23 are in use, are scattered at the buildings under way, instead of being grouped at unloading points. Local labor is being extensively trained for carpenter work, it taking about six days to make a [illegible] rough carpenter out of a raw recruit. As at other camps near good-sized cities, the housing and feeding of the working force is not a serious matter—less than a third living at the site.

The auditing and checking system in use has been worked out in great detail, and 9000 men are paid off in cash weekly, two days after the payroll closes, in less than two hours.

To connect with the Atlantic Coast Line R.R., three miles of fairly heavy construction, ending in a high trestle on the reservation, were necessary. During the short time after the award of the contract, while this work was going forward, the motor-truck company sent to the site was invaluable, delivering a large quantity of lumber and supplies from Columbia to start the work. The high trestle, which is shown in one of the illustrations, will be utilized to eliminate shoveling in handling materials for the 3000 to 4000 yd. of concrete required at the camp. Bins have been built at the north end of the trestle into which hopper cars can dump and from which trucks can be loaded. In order to operate the trucks from these bins to the higher general level of the camp, about 300 ft. of extra roadway was built. This seems [illegible] proven very satisfactory.



LOGGING ROADS THROUGH [illegible]



EVERYTHING IS UNLOADED NEAR POINT OF USE—GALLOWS FRAME AND CHAIN BLOCKS TAKE OFF PIPE

The peculiar site lends itself readily to the rapid extension of temporary railroad tracks. The various brigade sections are arranged in two parallel lines with a parade ground between, the eastern line being well back on a plateau and the western line being on the edge of the plateau toward Columbia. Into this edge, small wet-weather streams have cut a number of notch-like valleys, leaving a series of little ridges. The layout has been arranged so that the axis of each brigade located at this side of the site lies near the crest of a ridge.

Logging Roads Thrown Down Quickly

The receiving yard and main storehouses at the southern end of the east row of buildings mark the point where the railroad connection enters the site. Down the center of this line of buildings the track has been extended practically on the surface of the ground, being laid by logging-road methods by a small crew at the rate of 2000 ft. or more a day. From this point another line turns off across the future parade ground, spurs from it in turn extending out onto each of the "hog-backs," as shown in the plan. This track system, giving rail delivery to the center of each brigade group and gravity delivery from the unloading point to all of the work on the western side of the site, was readily constructed, as it follows closely natural contour lines. No grading and very little clearing were required, the site being mostly open. The soil is sandy and dries rapidly even during periods of heavy rains, such as were experienced at the camp last month. On this account, there is little trouble with soft track. One or two derailments from other causes, such as a car running off the end of one of the spurs, have occurred; but on the whole the tracks proved very satisfactory. One locomotive, rented from the Atlantic Coast Line, has been able to handle the business at the camp, which runs about 50 cars a day, mostly lumber. It is operated 18 hours a day, two crews being employed. Not a cent of demurrage has been collected from this cantonment as yet by the railroad. It is estimated that about 26,000,000 ft. of lumber will be handled by this system, fully half of which had been unloaded before the end of July.

Average Haul Only 500 Feet

With this track system, the average distance which the lumber and other building material had to be hauled by team was reduced to 500 ft. This greatly reduced the trucking, about 200 teams, in addition to the motor-truck company, being required for distributing lumber.

The hospital site and the reservoir are located on a high hill east of the plateau on which the main camp is situated. It was at first thought out of the question to run a logging railroad to the top of this hill, and therefore construction was started early in the work on a heavy fill across the valley up to this hill for one of the permanent camp roads. But the logging-road engineers have by now found their way even to this site. The reservoir, which is circular, was excavated at the top of the hill with slip scrapers. Ten feet deep, it is 130 ft. across the bottom and 150 ft. in diameter at the top. It will contain 1¼ million gallons and will be filled by city pressure through a 16-in. main from Columbia. In addition to it, one 30,000-gal. elevated tank filled by pumping is to be provided for fire service.

Work Carried from South End

Naturally, work was started on the brigades nearest the south end of the reservation. Those on the west side were selected first, and after three of them had been given a good start a beginning was made on the east side and at the warehouses. As the work ad-

vanced, efforts were made to save all of the trees that did not actually interfere with building operations, and the camp will have the benefit of considerable shade as a result.

The same difficulty with securing hardwood posts as occurred at Petersburg was also met at Columbia. To meet it, 8- and 10-in. trees cut on the site were sawn square and used for posts. Dimension lumber was also difficult to obtain, and in many places where the plans call for joists and other members of single sticks, built-up members had to be used in order to save delay. It appeared that there was a plentiful supply of dry boards on hand in the Carolina territory from which this cantonment is provided with lumber, but that dimension stocks were exceedingly low, everything furnished having to be sawed.

The carpenter work is organized in 20-man gangs, each under a foreman. Over every 10 of these gangs is a general foreman. The work is carried on progressively, being divided according to the class of operations and not according to territory covered.

Many Carpenters Broken In

One man is in charge of all of the carpenter work, in addition to which there is a general superintendent for the electrical work, for the plumbing, for the sewer work, for the water lines, and for the common labor employed. A fairly plentiful supply of good labor was obtainable locally, and this labor was encouraged to buy itself a few simple tools and learn rough carpenter work. It is estimated that in about six days, on an average, one of these men can be trained into an efficient saw and hatchet man. They are not, of course, relied on to do the finish work.

About 3000 of these men board at the camp, while a less number sleep there. There is a construction camp for negro labor, and many of the white men are housed



ACCOUNTING FORCE IS HOUSED IN BARRACKS OFFICE



APPROACH TRESTLE CONSTRUCTED BY GRAVITY UNLOADING

in the permanent buildings. The total force employed exceeds 9000, the larger part of which rides back and forth to Columbia every day. At first a special train, made up of 20 stock cars, was operated from Columbia night and morning. As many as 4000 men succeeded in finding a footing inside and outside of these cars. After the first of August, however, an interurban trolley line was completed to the west side of the site, which considerably relieved the transportation problem.

Treated Sewage Carried Away by Creek

The sewage from the camp will be collected in settling tanks, chlorinated and discharged at the southwest corner of the site into a creek. With this treatment the creek has a sufficient flow to dispose of the sewage safely.

The creek is fed by two swamps, the larger one lying west of the camp site and the smaller one extending around to the east side. This latter, in any event, is to be drained, and it will probably become advisable to drain the larger one also. On account of the boggy ground and the abundance of water, it was decided, after investigating a number of drainage projects prosecuted by floating-dredge, drag line, etc., to blast a channel with dynamite. The method has proved successful.

Railroad Yard Capable of Expansion

The freightyard and warehouses, located at the southeast corner of the camp, are arranged so that additional facilities can be provided easily while the plant is in use. As there is no railroad yard within reach where cars can be sorted out, one had to be provided at the site. As shown on the drawing, it has a ladder track on each end, and can be expanded either by adding a new yard at the north end or by adding additional tracks on the side west the warehouses. The ground being fairly level in this vicinity would make such expansion easy.

Auditing Force Handles Vast Amount of Detail

The bookkeeping, checking and accounting on this work, which represents a vast amount of detail, is being handled very efficiently, as a single indication of which it may be cited that 9000 men are paid off in cash once a week in less than two hours. In the bookkeeping system employed, there are an inside and an outside force

keeper, and a separate window and office for every group of 500 check numbers. The inside timekeeper stays at the window all day, issues and receives the checks, receives the records of the outside timekeeper and makes up his part of the payroll. The outside timekeeper has to cover the work and locate twice a day every man at work bearing a number within his section. This is simplified as much as possible by giving consecutive numbers to the carpenters under one superintendent, to the laborers on each class of work, etc. Nevertheless, some of the outside timekeepers have to cover so much territory that their rounds are made on horseback. In addition to keeping the time and paying the men for the contractor, this auditing force checks all materials received and used, pays all bills for material and does the entire accounting work on the job. All duplication of work is saved in this way, the auditing company using the contractor's forms and system, carrying on the work which would otherwise have to be done by a force in the employ of the contractor. This work, once done, constitutes at the same time the Government's check on the contractor's operations on which payment for the cost of the work is made. The force employed to take care of this work numbers about one hundred and fifty.

The work at Camp Jackson is in charge of Maj. William Couper, Quartermaster Corps, U. S. R., under the cantonment division of the quartermaster general's office. Major Couper is assisted by Capt. Adj. Walter M. Crunden. P. H. Norcross is supervising engineer in charge of the design of sewer, water, highways and drainage. The layout of the cantonment was supervised by R. Schermerhorn, Jr. J. E. Gibbons is engineer in charge of field forces. The Hardaway Contracting Co., Inc., is carrying out all the construction work except the road building, which is let under a separate contract to R. M. Hudson & Co. H. B. Crawford is general superintendent for the Hardaway Co. Charles Neville, of Charles Neville & Co., Savannah, Ga., which maintains the accounting force on the work, devised the office system mentioned, which is also in use by the same firm at several other cantonments.

Buildings Stepped To Fit Hillsides at Camp Gordon, Atlanta

Changed Plans Include Outside Stairs and Placing Concrete Lavatory Floors on Wood Sub-Floors—Good Use Made of Light Army Trucks—Road Work Well Advanced

CAMP GORDON, near Atlanta, Ga., varies from the majority of the National Army cantonments in the design of its structures, several changes having been forced by the unusual roughness of the site. To avoid high retaining walls and earth fills, the concrete lavatory floors are being laid on wood sub-floors. Many of the company barracks buildings are being constructed with the main floor at two different levels to conform to hillside locations. The permanent road grading is well advanced, while on the other hand, boulders, rock, and rough topography are making the pipeline construction unusually difficult and have practically precluded the use of trenching machines. The carpenter work is organized in sections, but the power saws working for most of these sections have been grouped at two or three points near the receiving yard. The dirt roads over which the construction materials must be carried are better than the average, and the fullest use is made of the 3½-ton army trucks belonging to the company stationed at the work. Most of the working force of 9000 men is transported back and forth from Atlanta by special trains daily.

Location Almost in Mountains

The site of the camp, about 1000 ft. above sea level and within plain sight of Stone Mountain, is one of the roughest selected for a cantonment. Many of the hillsides on which buildings had to be located dropped 20 ft. or more within the length of a standard company barracks. On this account large numbers of



THOUGH ASSIGNED TO DIFFERENT BUILDING DIVISIONS, THE SAWMILLS ARE ACTUALLY OPERATED IN GROUPS

these buildings have been constructed in two sections, with the floors at different levels, in order to avoid building them on high scaffolding.

It was found that in places retaining walls 12 and 15 ft. high and a corresponding amount of earth fill would be required to construct the lavatory floors on the ground as shown in the standard plans. To avoid this, all the lavatories are being built with wood sub-floors on posts. The framing for these floors is the same as for the other buildings, a 1-in. floor covered with building paper being laid on top of the joists. On top of this is placed a ⅞-in. wood floor and a 2-in. cement floor. Much more rapid progress is obtainable with this method, and the danger of breaking up the lavatory floors through the settlement of high fills is avoided.

The hillside construction necessitated more stairways than in the standard barracks construction, and to save room inside the buildings all stairways at Camp Gordon are placed on the outside. Although the location is well up in the mountains, it is so far south that winters in which no snow falls are the rule rather than the exception, and on this account the outside stairs are not apt to prove objectionable.

Saws Grouped at Distributing Centers

Of the 24 sawmills on the work, one or two are assigned to each of the 14 building districts, each of which is under a district superintendent employing 10 to 15 foremen. While the mills are assigned to



FULL USE WAS MADE OF ARMY TRUCKS

individual districts, they are not operated by the force engaged in constructing the buildings of those districts. A few of them are set up in isolated locations, but most of them are grouped in two mill centers, one at the receiving yard and the other near the center of the west group of buildings. Here they are under a sawmill superintendent, who receives lumber from



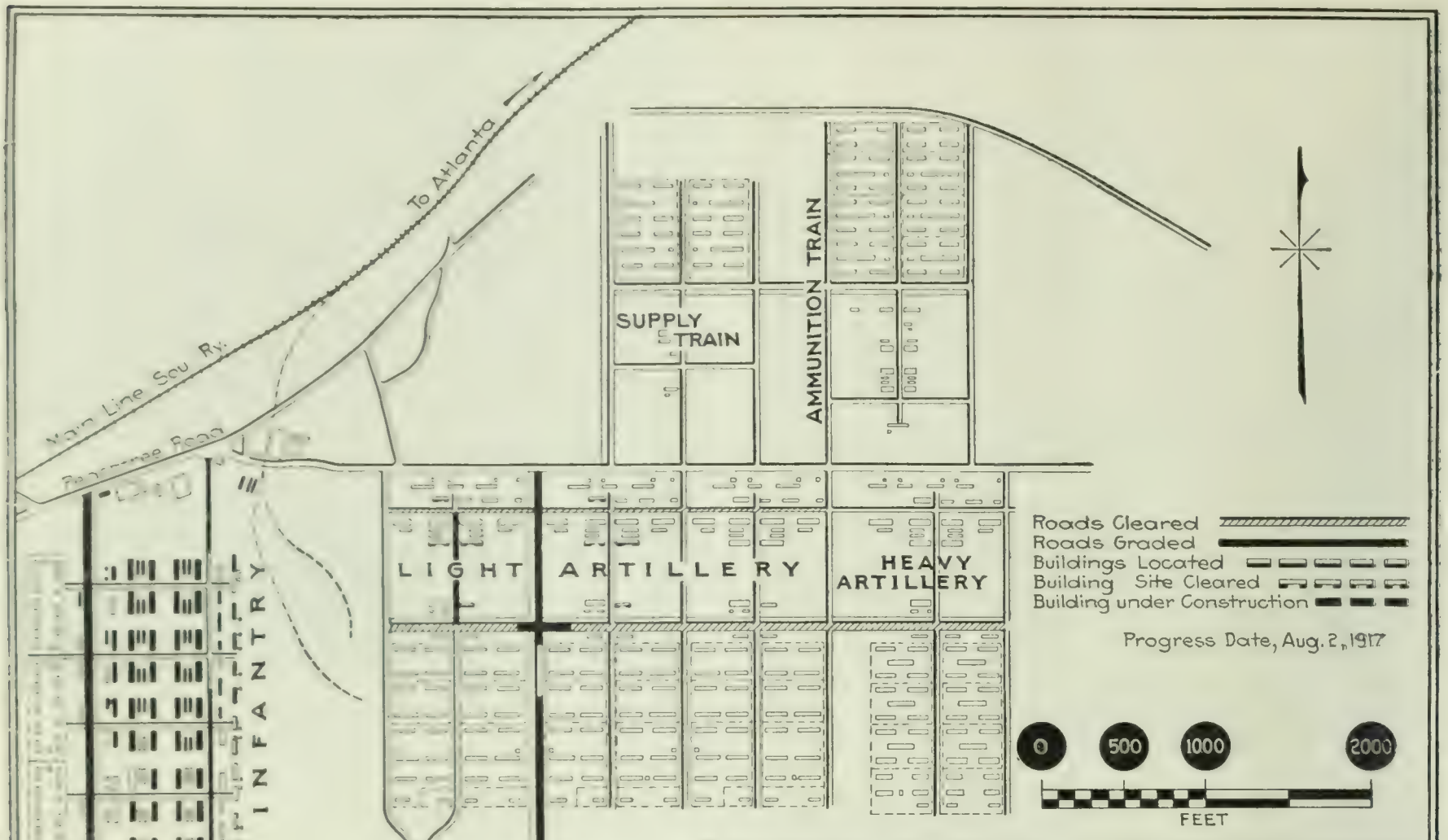
BUILDING FLOORS AT TWO LEVELS—THREE-SIXTY

the cars or from the transportation department, cuts it to order for the different sections and turns it over again to the transportation superintendent for dispatch to the point of use.

These mills frame between 400,000 and 500,000 ft. of lumber per 10-hour day. The building work at present under way, including 710 main structures, will require about 22,000,000 ft. of lumber, three-fourths of which had been unloaded by the 25th of August. In addition to the 33 3½-ton Velie army trucks and 10 motor trucks belonging to the contractor, no less than 350 teams are required to distribute all this lumber.



MORTARS FOR USE IN TRENCH WARFARE



PROGRESS SHOWN GRAPHICALLY ON LARGE BLUEPRINT BY VARIOUS CRAYON SYMBOLS OF WHICH THOSE SHOWN ARE TYPICAL

On Aug. 23 the organization erected a 2-story, 200-man barracks building complete in 9 hours and 20 minutes. About 70 men started on this building in the morning and had it entirely finished by night.

The main streets of the cantonment are being graded by two revolving steam shovels which keep 30 or 40 wagons busy. Most of the clearing work required was along the line of these roads, the timber standing on a large part of the reservation being left undisturbed except for the trees which actually interfered with the erection of buildings. The first grading was done on the wide north-and-south streets through the central and western brigade groups and the east-and-west street which connects their southern ends. The main roads will have a bituminous surface.

Trenching Difficult Because of Rough Ground

The five 200,000-gal. wood-stave tanks to be erected at the site are to be filled through a 16-in. main extended 10 miles to the cantonment by the City of Atlanta. The first half of this main, as far as Buckhead, is of cast-iron, while the remaining section is of Michigan wood-stave pipe. The wood-stave pipe within the cantonment proper was secured from California. The city pressure is sufficient to fill the tanks, while booster pumps are provided for camp fire service.

Sewage disposal at this cantonment will require the construction of a 56 x 112-ft. concrete septic tank, which will be filled from a 24-in. main sewer and from which the effluent will pass to a trickling filter. All of the trench work for the sewer and water systems has been carried on by hand. The longest continuous stretch which was free from bed rock, boulders, or surface conditions which made the use of machinery impossible, was less than 1200 ft.

Many Sign Posts on Work

The letter of each section, which represents a brigade or similar division, and the number of each building, is posted conspicuously on the roads leading to the section and on each building. With this arrangement

no time is lost by the truck drivers, as before a man has proceeded a hundred feet on any road the signs will tell him whether he is headed for his proper destination.

A good indication of the size of the undertaking which one of these cantonments represent is furnished by the contractor's daily reports on operations under way. On July 25, when 429,000 ft. of lumber was placed during the day, it required 11 pages of single-space typewriting to record in the briefest possible language the kind and quantity of work carried out during the day by each division superintendent.

The organization of Major James Norman Pease, constructing quartermaster, differs from that at some of the other cantonments by having each division of the work supervised by a captain under the direction of Captain-Adjutant Coffin in charge of the field office. One captain each is in charge of all of the civilian forces concerned in any way with the following main divisions of the work: Auditing; building location and erection; transportation; electrical installation; water and sewer systems; roads; and sanitation. The constructing quartermaster also maintains an office in Atlanta which is in charge of Captain Israel, Quartermaster Corps. Arthur Tufts is contractor for the work. Under him the organization at the cantonment is headed by E. A. Stuhrman, under whom are two general superintendents, one for all the building construction and one for the remaining work; the purchase and delivery



STEAM SHOVELS GRADED MAIN ROADS EARLY

of materials and the office work required in the administration of the contract and the commissary are handled respectively by R. M. Walker and Charles Loridans, partners in the constructing firm, from its Atlanta office. The engineering work is in charge of Lockwood, Green & Co., whose force at the cantonment includes about 80 men. All accounting is in the hands of the auditing firm of Walter Mucklow.

500 Teams Save Day in Deep Mud at Camp Lee

Petersburg Cantonment, with Horse Depot, One of Largest, Organized in Units—Contractor's Engineering Force Used

HEAVY RAINS and deep mud during July reduced the cantonment at Petersburg, Va., to entire dependence on horse transportation, 500 teams and more being required to distribute the 80 carloads of lumber received daily. This camp, one of the largest because of the inclusion of a horse depot to care for more than 20,000 head of stock in addition to the regular animal complement and the 45,000 to 50,000 troops to be stationed there, requires 30,000,000 ft. of lumber, more than half of which had been received before Aug. 1 last. The camp layout in the shape of an L made possible a railroad layout involving less road transportation than at Ayer or Atlanta, but requiring considerably more than the cantonment at Columbia. Of the 5000 men employed, fewer than one-third live at the camp.

The building construction is organized into fourteen separate jobs, or divisions, each of which finishes all work connected with one group of buildings at a time, and into transportation, sewer, highway and water divisions. Each building division has its own saw or saws, set up where it is working and moved with it. Contrary to practice at the other camps, the contractor's chief engineer and regular engineering force have been taken over by the Constructing Quartermaster, and are responsible to him for the design and field work.

The site of the cantonment, while high, is fairly level, most of it being almost flat. On this account the heavy rains experienced during July quickly turned the roads into long successions of mud holes. The camp is in the shape of a hook, through the long shank of which winds a county road which was relocated later. This road fared no better than the temporary roads, in spite of the liberal use of corduroy, brush, cinders and gravel. Because it was a public road it has to be kept open, and because it passed through the camp it soon became a mecca for jitneys bearing sightseers from the surrounding country. At one time the contractor was obliged to keep six teams at work for several days extracting mired automobiles from various portions of this county road. The regular army truck company assigned to the camp was equipped with five-ton machines designed for transport service on good roads, and could not be used extensively while wet weather lasted.

After putting in the necessary railroad facilities and starting the building work, the first step was to relocate this county road to the west of the camp, and to macadamize all the roads as fast as possible with gravel. The gravel is dug by a steam shovel at a pit opened a mile west of the camp. The pit is located on the line of a new highway being constructed from



NORTHERN CONSTRUCTION WELL SHOWN BY THIS INTERIOR OF STANDARD COMPANY MESS HALL

the cantonment to Petersburg. The sand and gravel obtained here have also been screened and used for concrete.

Railroad Half Encircles Camp

The Norfolk & Western R.R., which passes a short distance from the site, constructed with its own forces sidings extending more than halfway around the outside of the camp. From the permanent warehouses at one end of this yard to the new road to Petersburg at the other end, material is unloaded as near as possible to the work for which it is to be used. The number of teams employed is so great that there is a steady stream of material flowing from the railroad tracks down the main roads to the group of buildings under way. An idea of the density of this traffic is gained when one realizes that an average of 80 carloads of lumber a day, besides immense quantities of beaver board and other materials, are unloaded for the building construction alone.

Permanent Warehouses Designed at Job

Before the middle of July it became apparent that the Quartermaster Corps would have to begin in the near future collecting supplies at the depot required in connection with the camp. Orders were therefore received to rush work on the permanent warehouses before the standard plans for these buildings had been issued. The Constructing Quartermaster gave the engineering force the floor loads to be provided for on the afternoon of the day these orders were received. Next morning work was started on the first building, and by the end of the month half of them were ready for use. As at the Columbia cantonment, there was difficulty in securing suitable foundation posts. It had been expected that cedar posts would be employed, but the only supply available proved entirely inadequate. To prevent delay, pine posts obtained in clearing parts of the site were used, as there was no local hard wood available in sufficient quantities. These posts are likely to last beyond the training of the troops which it is now intended to raise, and can furthermore be replaced later if necessary.

Work Split Into Sections

The building work is split up into fourteen sections, one section approximating in size the buildings required for a single brigade. Each of these sections is numbered and the section numbers posted on a sign board at roads leading into it. Each is provided with its own sawmills, labor force, rough carpenter force and force of finishers which follow each other in rotation on the buildings within the limits of the section. Each section has its own superintendent and organization, and operates independently of all the others except that it draws its material from the general transportation system for the whole work. From six to eight concrete mixers are kept busy placing lavatory foundations, the mixers being passed from one section to another as required. In addition to these sections there are under the general superintendent of the entire work, a superintendent of teams and transportation, superintendent of roads, and two superintendents on the pipe line work, of which more than 30 miles are required on the job.

White Men Housed in Permanent Buildings

Five thousand or more men were at work at the camp by the end of August, although but 2000 of them slept and ate at the site. The negroes among this

number are cared for in a construction camp, while most of the white carpenters and mechanics who live at the site are housed in the permanent buildings already constructed. The site for the camp is near the electric line from Petersburg to Hopewell, where the Du Pont interests have established a city of 35,000 workmen engaged in the manufacture of explosives. It was feared that the construction of the cantonment might interfere with the operation of this plant, but such has not been found to be the case. This trolley line, two 15-car trains on the Norfolk & Western R.R., and at times the entire fleet of trucks belonging to the truck company transported at least 3000 of the working force to Petersburg and back each day. Indeed, although a 10-hour day is worked, many of the men live in Richmond and use the trolley line between that city and Petersburg twice a day to reach their work. There has not been any particular difficulty in securing and holding labor, and a high grade of skilled labor for carpenter, electrical, plumbing and other work of similar nature has been available.

Increase Petersburg Water Supply

Coagulated river water, 4,000,000 gal. of which are used daily at Petersburg, will be supplied to the camp. For this purpose it has been necessary to increase the capacity of the Petersburg water plant to 10,000,000 gal. a day. This work is now nearing completion. Included in this work, about 10 miles of new water mains were required to bring this water to the camp. Pipe lines 6 in. to 2 in. in diameter supplied the cantonment during the construction. These lines were laid directly on the surface of the ground, but two trenching machines were used throughout the work of laying the permanent water and sewer lines under ground.

Some distance east of the camp proper at the edge of the reservation is a swamp of considerable extent into which it is planned to discharge the sewage. Should it be found necessary to treat this sewage, this will probably be accomplished by means of dosing tanks.

Keep Ground Clean to Guard Against Fire

A man who was formerly chief of the fire department of Savannah, Ga., assisted by six or eight ex-city firemen, is charged with the duty of seeing that the wooden buildings do not catch fire before the camp is finished. These men do not constitute a fire-fighting force, but cover the work as inspectors, seeing that there is not a scrap of inflammable material left on the ground. Shavings, chips, scraps and sawdust are cleaned up and burned daily, and the ground in the vicinity of all buildings swept clean of anything that might propagate a blaze. With these precautions and with the close watch kept, it is not thought necessary to forbid all smoking on the reservation.

In this connection it is of interest to note that the health officer at the cantonment placed an embargo on watermelons, it being a serious offense to bring one near the camp. How this order was enforced, even with the aid of uniformed soldiers, on several thousand negroes during the height of the season in a watermelon country is a mystery; but at any rate watermelon rinds were as conspicuous by their absence [illegible]



GROUND UNDER BUILDINGS SWEPT CLEAN

swarms of flies with which they are usually associated. The health of the force of the camp has been excellent. The teams in use there are not stabled at the site, but are cared for at Petersburg and near-by farms.

The work at Camp Lee was in charge of Major Frank B. Edwards, reporting to the cantonment division of the Quartermaster General's office in Washington. Captain Houks is Captain-Adjutant. The construction work, including the road building, is being carried on by the firm of Rinehart & Dennis under the personal direction of Mr. Rinehart. The engineering force of this firm, under the direction of A. J. Seville, its chief engineer, is carrying on all the engineering work, being directly responsible to the constructing quartermaster.

Gravel Car Shortage Seriously Hinders Louisiana Road Work

The Louisiana State Railroad Commission has recently passed an order requiring all the railroads of the state to purchase gravel cars. A. D. Alderson, Vice-President and General Manager of the Tioga Gravel Co., of Alexandria, La., states that none of the railroads in the state up to this time has owned any gravel cars except the Iron Mt. R.R., consequently when foreign cars were taken out of the state they have had no cars with which to make shipments. Notwithstanding this condition, the State Highway Engineer, Duncan Blue, has done his best to keep road work going.

The Tioga Gravel Co. during July shipped about 1000 cars on orders for 2500 cars, which just about met the running expenses of the plant. Mr. Alderson states that in view of the claims made by the railroad companies, he has noted with surprise that some of the railroads in Ohio have been selling their coal cars to the Canadian Government. He believes that the building of good roads should be coupled in importance with the production of food, and the movement of road material should, under Government order, be given preferential treatment next to food products, iron ore and coal; in other words, the railroads should be given to understand that during the war more than at any other time the building of good roads should continue.

Ice Forms but Sprinkling Filters Go On

With Ice Sometimes Four Feet Thick on Sewage Filters at Rochester, N. Y., Good Winter Work Was Done

By Myron A. Bantrell
Engineer and Chemist in Charge, Brighton Sewage Works, Rochester, N. Y.

ZERO weather, ice and snow were successfully met by the sprinkling filters of the Brighton sewage-works at Rochester, N. Y., during their first winter. The story is told by the accompanying views.

The sewage at these works is distributed on two ½-acre filter beds by Columbus spray nozzles having $\frac{9}{16}$-in. round orifices. The nozzles are spaced 14⅓ ft. c. to c. and are staggered in rows across the filters. The filter material consists of 6 ft. of 1.2-in crushed limestone. The filters are located in a deep hollow, surrounded by hills and woods on all sides, and are well protected from the winds. There was no ponding of sewage and very little organic growth on the filter beds when cold winter weather set in, the beds having been in operation since March, 1916.

Operating Conditions

During the period of cold weather, Dec. 15, 1916, to Feb. 15, 1917, the following conditions obtained:

The nine lower rows, having 58 spray nozzles, were in use on each of the filters, which were dosed alternately by Miller siphons. The nozzles operated under a head varying from 7.5 ft. maximum to zero, and each nozzle discharged 68 gal. in 6½ min., with a rest period of 10 min. An average of 700,000 gal. of sewage per day reached the plant during this period. The total filter area in use was 0.54 acre, making the rate of filtration 1,300,000 gal. per acre per day.

Snow and 30° F. Brought First Ice Cover

Ice formed on the filters for the first time after a 12-in snowfall on Dec. 22, 1916, with an air temperature of 30° F. The ice was on the underdosed area in the zone 6 to 7 ft. from the nozzle and on areas in line with the overhanging arms of the nozzle. There was not enough sewage sprayed on these areas to dissolve the snow, but enough to congeal it, forming ice to a maximum thickness of 12 in. Fig. 1 shows how the ice appeared on Dec. 27.

On Jan. 11, 1917, after a snowfall of about 6 in., the temperature fell to 3° F., with the result shown in Fig. 2. The thick cakes of ice in evidence show the spots where the first ice formation was not completely melted away by the early January thaw. It continued cold on Jan. 12, and the beds were 70% covered with ice of 12 in. maximum thickness.

The temperature dropped to —4° F. on Feb. 3. This was preceded by several days of freezing weather and snowfalls. The beds were 95% covered with ice, as shown by Fig. 3. A thin layer of ice formed by the freezing sewage is seen to cover the overdosed areas around the nozzles. This ice was well perforated and did not obstruct the percolation of the sewage, as no ponding of sewage on the surface resulted. The thin layer of ice melted away by noon.

Fig. 4 shows ice formation on Feb. 10, with a temperature of —4° F. The ice was 42 in. thick in places.

With four days of below-zero weather preceding, the temerature dropped to —8° F. on Feb. 13. Fig. 5 presents the appearance of the ice around the nozzles early in the morning.

By the middle of the afternoon the ice on the overdosed areas adjacent to the nozzle appeared as shown in Fig. 6. The effect of the arms on the nozzle is clearly demonstrated in this picture. There was some ponding of sewage on the beds, immediately after the display period, but this sewage leached away within a few minutes.

It began to thaw on Feb. 17, and by Feb. 23 the ice on the lower portion of the west bed appeared as shown by Fig. 7. In the foreground of the view the shape of the area covered by the Columbus nozzle is clearly outlined.

On Feb. 20, with 25 in. of snow on the upper portion of the beds, the spray nozzles were put into operation. Within four hours the snow was melted on the overdosed areas adjacent to the nozzle. Fig. 8 shows the east filter bed after the heavy snowfall of March 6.

After the mid-March thaw the ice melted rapidly. Fig. 9 shows the skeletons of the ice formations around the lower nine rows on March 18. The upper portion of the bed, which was put into operation on Feb. 20, is seen to be practically clear of ice. Fig. 10 shows the remains of ice on the west filter bed on March 22. Four days later the ice was completely melted away.

The accompanying table gives the average results of analysis for the month of January, and from Feb. 1 to 15, 1917.

WINTER ANALYSES OF APPLIED AND FILTERED SEWAGE

	Applied Sewage		Filter Effluent	
	Jan.	Feb.	Jan.	Feb.
Temperature, degrees F., average	46.4	44.4	40.2	36.3
Temperature, degrees F., maximum	48.0	46.0	44.0	41.0
Temperature, degrees F., minimum	45.0	43.0	37.0	34.0
Relative Stability Methylene Blue 37° C.:	Unstable	Unstable	Stable	Stable
Dissolved oxygen, p.p.m	2.9	3.2	7.8	7.7
Nitrates, p.p.m	0.0	0.2	2.3	2.5
Suspended solids, p.p.m	35.0	46.0	3.5	5.6
Chlorine, p.p.m	50.0	50.0	50.0	50.0

Demonstrating Water Loss by Leaks

A device for demonstrating to water consumers how their bills are increased by the loss of water in the smallest plumbing leaks (with water running continually) has been installed by Ellis R. Goldman, superintendent of the Water Department at Rockford, Illinois.

A glass-incased meter is secured to the counter in the public office, and its discharge pipe is led upward so as to project over a galvanized-iron tank 12 x 12 in. and 14 in. deep. On the end of this pipe is a multiple cock, consisting of a revolving disk or turret having radial branch pipes ending in nozzles with openings of $\frac{1}{64}$ in. to $\frac{5}{8}$ in. The branch which projects vertically downward over the tank is the only one open to the pipe when the water is turned on.

When a cubic foot of water is allowed to run through the meter, as indicated on the dial, the consumer can see some relation between the dial reading and the quantity of water in the tank. By means of the multiple cock, he is also shown that the meter will register the flow through an opening as small as $\frac{1}{64}$ in., thus warning him against leaky plumbing.



1. FIRST SNOW AND ICE ON FILTERS AS SEEN DECEMBER 27, 1916



2. JANUARY 11 AND THE TEMPERATURE FELL TO 4° FAHRENHEIT



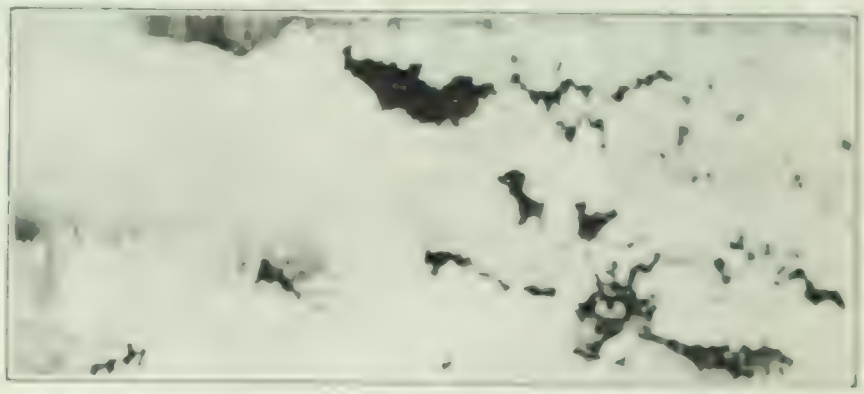
3. THE TEMPERATURE DROPPED TO —4° FAHRENHEIT ON FEBRUARY 4



4. FEBRUARY 14 MERCURY AT —4° FAHRENHEIT, ICE WAS 42 INCHES THICK



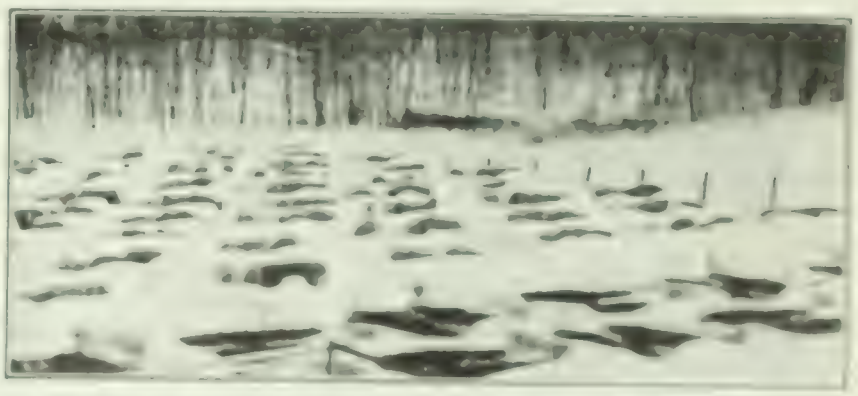
5. ICE AROUND NOZZLES EARLY FEBRUARY 15, WITH TEMPERATURE —8° FAHRENHEIT. AFTER FOUR DAYS BELOW ZERO



6. BY MID-AFTERNOON FEBRUARY 18 ICE ON THE OVERDOSED AREAS ADJACENT TO NOZZLES WAS MUCH REDUCED



7. A THAW FROM FEBRUARY 17 TO 21 LOWERED THE ICE ON THE LOWER PART OF THE WEST BED



8. AFTER THE HEAVY SNOWSTORM OF MARCH 6 THE EAST BED WAS NEARLY COVERED WITH SNOW



9. THE MID-MARCH THAW MELTED THE ICE RAPIDLY AND PRACTICALLY CLEARED THE UPPER PART OF THE BED



10. THE MARCH 21 LOWER ICE SURFACE AND THE HEAVY SNOW HAVE LEFT IT ALL WET

Sand and Gravel Digger Designed and Built for Ohio River

Machine To Raise Concrete Aggregate from Stream Bed for Use on Locks and Dams Constructed by Army Engineer — Equipment Produces 800 Cubic Yards in Eight-Hour Day

By A. W. KREAMER
Junior Engineer, United States Engineer Office, Wheeling, W. Va.



THIS MACHINE DIGS 800 CU.YD. OF SAND AND GRAVEL PER DAY FROM THE OHIO RIVER BOTTOM

IN CERTAIN parts of the Ohio River concrete aggregate is supplied from the sand and gravel river deposits by digging from a floating plant known locally as a "sand and gravel digger," or just "digger." For two locks and dams near Wheeling, W. Va., now under construction by the United States Army Engineers, such a machine was required. The writer had the task of designing this plant and succeeded in adding a number of improvements not found on existing plants in the district. The first trouble encountered was the absolute lack of literature covering any floating plant that could be applied here. It will therefore be the object of this article to put on record some of the difficulties overcome, and the arrangement decided upon, as well as the cost and the performance of the plant in general.

Machine of the "Boot-Jack" Type

From a study of the existing plants in the vicinity of Wheeling it was decided to make the new sand and gravel digger of the bucket type and on the "boot-jack" style, with a ladder made from 60-ft. timber, trussed and braced as shown in the drawings. This ladder is hinged on the driveshaft at the top and is supported at the bottom by a yoke connected through wire rope and sheaves with a hoisting engine, thus allowing the ladder to be lowered or raised at the will of the operator. The height of the driveshaft above deck is such that it provides ample slope for the sand and gravel chutes, and also allows a maximum depth of 20 ft. below water surface for digging. This depth was considered sufficient, as very few deposits are deeper than that in this vicinity.

It has been general practice to make the top, or drive drum, on the ladder square, and the bottom, or idler drum, hexagonal. The writer believed and has proved that a five-sided drum would work just as well, and with less wear. The claim was made by some of the manufacturers in the vicinity that a six- or a five-sided drum at the top of the ladder would cause trouble by allowing the chain to slip, and thus eventually either break the chain or the drum. Regardless of this claim the top drum was made pentagonal and the bottom drum was made hexagonal, both of ribbed and flanged cast-steel wheels with structural-steel connecting bars. The plant has been in continuous operation for two seasons now, and no trouble has been experienced with slipping. Furthermore, there is no reason to anticipate any trouble along that line, and a comparison with other plants shows the drum to be in better condition than its four-sided brethren.

In order to keep the drums from becoming too large and heavy, the chains, which are of the pin-connected type common to sand diggers, dredges, etc., were made up of links 21 in. c. to c. of pins. These links are made from the best grade of structural steel and the pins from the best grade of tool steel. The small idler rollers upon which the chains travel are made from manganese steel. The resulting wear on the different parts has proved satisfactory.

Buckets Spaced Far Apart

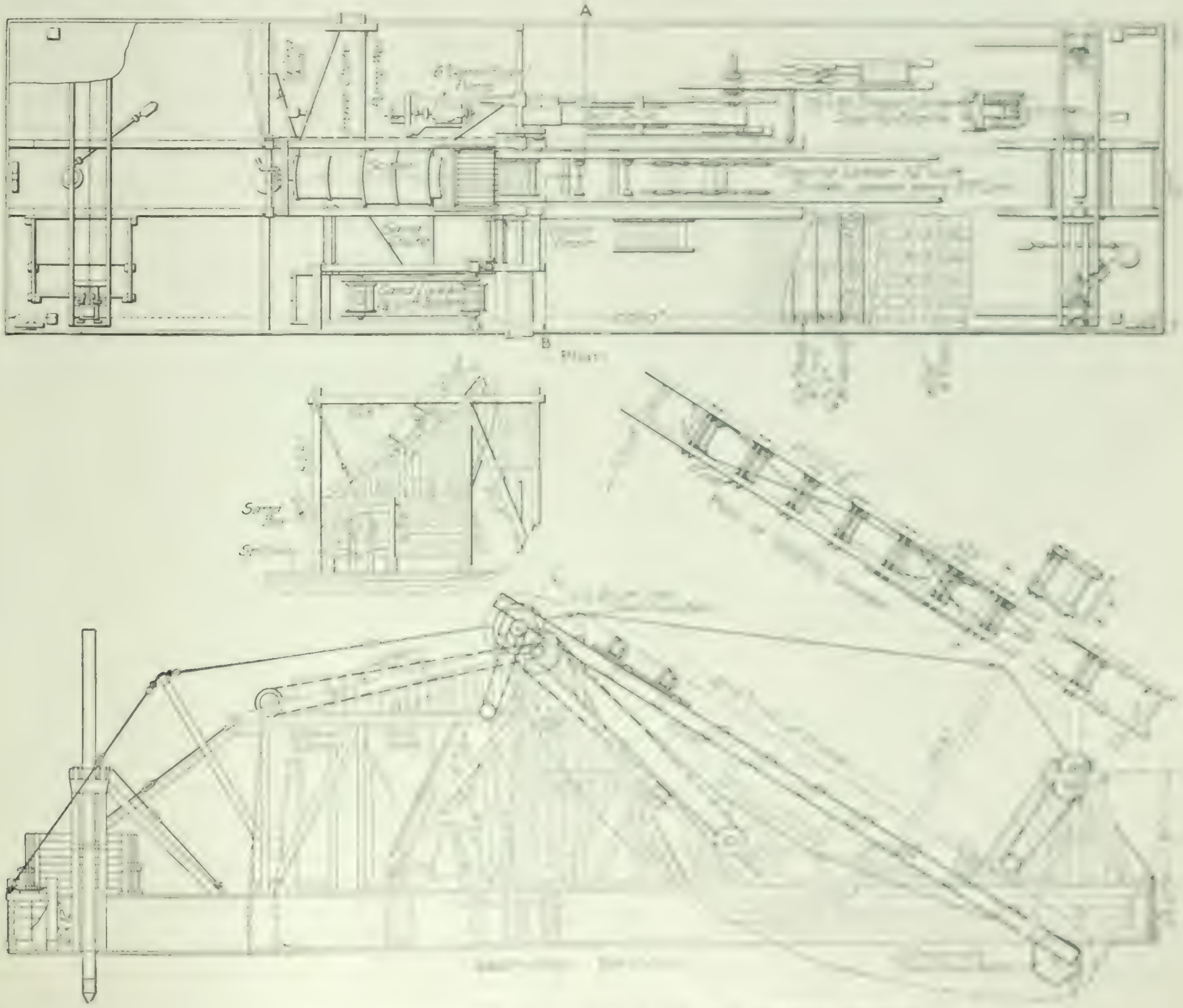
Buckets when placed too close together on the chain, will come up only partly full. To assure each bucket getting its full capacity the buckets were spaced every third link on the chain. In order to keep the speed of the chain low and still get the required capacity, the buckets were made with a capacity of 5¼ cu.ft., when the material is considered "heaped" 3 in. at the center of the bucket.

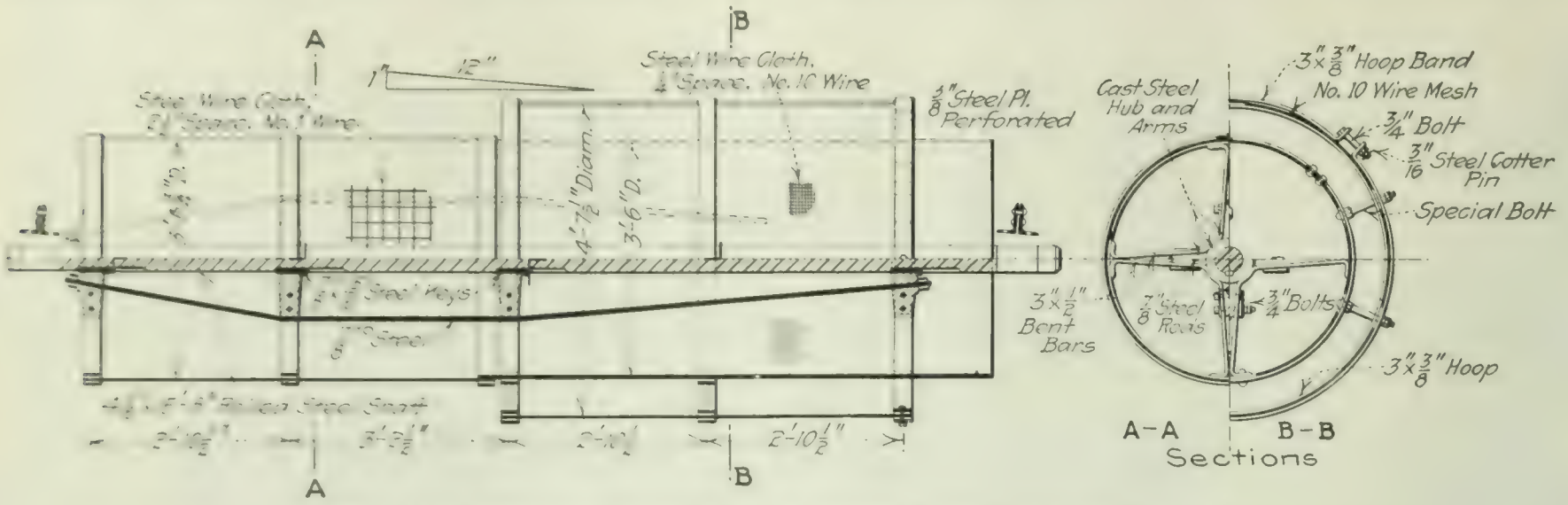
Buckets are made of the best grade of structural-steel plates and reinforced by strap plates and angles. The lip of the bucket is reinforced with a "cutting edge." The body of the bucket is punched with $\frac{5}{16}$-in. holes spaced about 6 in. apart to allow escape of water.

Experience on the river has shown that the speed of the digging-bucket chain should be such that 7½ to 9 buckets will be dumped every minute. The plant was desired to have a minimum capacity of 600 cu.ft. of material per 8-hour day. From this and the other governing conditions it was found that the top drum would have to have a speed of five revolutions per minute.

The buckets on the main ladder dump their contents upon sloping gratebars made of 4 x ¾-in. steel, set on edge and placed 5 in. apart, thus excluding all material that is larger than 5 in. in circumference. The slope is sufficient to cause nearly all large rocks to roll off the bars and fall back into the ladder well. Occasionally it is found that rocks become wedged between the gratebars and it is necessary to pry them out. To help this rolling off of the large material and also to supply water for washing the sand, a 2-in. stream of water, supplied by a centrifugal pump, plays upon the grate-bars at about their center, which has been found effective.

Under the grate-bars is a sloping steel pan that discharges the material into a revolving screen that is also set on a slope. This screen is of the center-driveshaft type, with built-up "spiders," has a speed of about 18 r.p.m., and is made in three separate parts. The first part consists of a boiler plate perforated with $\frac{13}{16}$-in. diameter holes, spaced 1¼-in. centers on 60° lines, thus allowing all material up to that size to pass into the outer space. Around this outer space is the second part consisting of a sand screen made of No. 10 B. W. G. meshed wires with ¼-in. openings between them. All sand and gravel up to ¼ in. in circumference will therefore pass out through this screen and fall into a sloping chute that discharges into the "wash-box." The material over $\frac{13}{16}$ in. in diameter travels along the boiler plate into the third part of the screen, consisting of a gravel screen made of No. 1 B. W. G. meshed wires with 2½-in. openings between them. Material up to this circumference therefore will pass out through this screen and fall into a sloping chute that discharges directly upon a gravel flat lying alongside the digger. The gravel between the ¼ and the $\frac{13}{16}$ in. sizes is also discharged into the above chute at the end of the sand screen, and thence out onto the flat. All material over





SPECIALLY DESIGNED REVOLVING SCREENS USED ON SAND DIGGER

2½ in. in diameter is considered undesirable for this class of work and is therefore allowed to travel on to the end of the screen, where it discharges into a "tailing chute," that empties near one side and underneath the boat. When the digger is working on a bed that is near the surface of the water, this deposit from the tailing chute sometimes piles up close underneath the boat. This has not proved a serious defect, however, as it is merely necessary to watch the deposit and shift the digger slightly before the pile becomes too high.

Wash-Box Cleans Sand Effectively

As stated above, all gravel up to ¼ in. in circumference, with sand and water, is discharged by a sloping chute into a wash-box. From this wash-box the material is again elevated by a ladder containing eighteen 2½-cu.ft. buckets. These buckets, ladder and drums are made of the same class of material and similar to the main ladder equipment. The driveshaft at the top of the ladder has a speed of 3 r.p.m., which allows 7½ buckets per minute to discharge their contents into a sloping chute that empties onto a sand flat lying on the opposite side of the boat to that on which lies the gravel flat. This ladder is also hinged on the top driveshaft and is supported by a 3-ton differential chain hoist and a yoke at the bottom, which allows the cleaning of the wash-box whenever desired. This wash-box puts the sand in a good, clean condition and at the same time gets rid of all small foreign substances, including mud, twigs and small flakes of coal, which in some beds are very plentiful in this section of the river. All surplus water and these foreign substances are allowed to overflow in a spillway discharging back into the river at the side of the boat.

The sand, gravel and tailing chutes are all made of wood and lined with No. 13 U. S. standard gage sheet steel. The parts that extend out beyond the edge of the digger are hinged and so arranged that they may be hoisted into a nearly vertical position when they are not in use; thus putting them where little damage could be done when other boats are near. Both sand and gravel chutes discharge onto crown-deck flats, so that all water may run off, thus leaving comparatively dry sand and gravel.

The revolving screen is a special design made by the writer and has proved very satisfactory. The claims for the design over some of the more standard product are simplicity of repair, ease of removing and replacing screens, rigidity, and speed in handling the material from the main digging ladder. It is a well-known fact that the spiders of all revolving screens of this type will wear very rapidly regardless of the material from which they are made. For this reason, the part nearest the screen, or that which would receive the most wear, was made of standard flats, requiring only bending and drilling before being placed in the screen. The separators between the perforated plate and the sand screen are also subject to severe wearing, and therefore they were made of standard product that could be repaired easily by any small shop. The heavy cold-rolled steel shaft, trussed as it is with the ⅞-in. rods at the cast-steel spider arms, is a very rigid construction and one that has very little deflection regardless of the great amount of material that is always revolving in the screen. The design has an additional advantage that has proved to be worth considerable from the up-keep standpoint—namely, either screen can be made in 3-ft. widths, and the method of holding the screen in place also allows shorter lengths than the entire circumference to be used if so desired.

Experience has shown that the upper end of each screen wears out the more rapidly. This would mean a complete screen destroyed were it made of one piece for the entire length. In this design two screens were used for both sand and gravel, thus allowing each to have their full life. At the end of two seasons' run, only one 3-ft. section of sand screen and two 3-ft. sections of gravel screen were purchased, not including the original screens put on the boat when built.

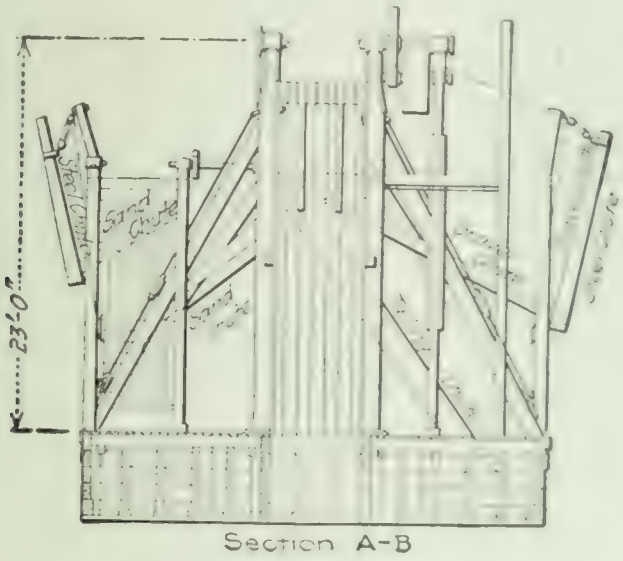
Water for washing the sand is supplied in two ways: First, on the grate-bars as described in an earlier part of this article, and second, from one manifold pipe extending along each side of the sand screen. Each manifold pipe has twelve ¾-in. outlet pipes or nozzles that throw streams direct onto the revolving screen. This method helps to separate the sand from foreign material and also to keep the openings in the screen from clogging. All water is caught by the sand chute and sent on into the wash box, where the sand being handled a second time has another chance to free itself from all foreign substances.

The following machinery was provided: One 100-hp. boiler of the return-tubular type; one 6-in. centrifugal

pump direct-connected to a vertical 2-cylinder steam engine, size 6 x 5 in.; one single-cylinder horizontal long-stroke steam engine, size 10½ x 36 in.; one 2-cylinder horizontal reversible hoisting engine, size 6¼ x 8 in.; one direct-acting duplex boiler-feed pump, size 4 x 2⅝ x 5 in.; one 100-hp. feed-water heater and two steam capstans with worm-gear drive.

As an assistance in maneuvering and holding the boat, it is provided with four white oak spuds 14 x 14 in. by 32 ft. They are operated by lines from the two steam capstans, are equipped with pointed cast-iron shoes and bear on cast-iron rollers located both in the hull and in the overhead frame.

The hull has 3-in. bottom planking, 3-in. deck planking, 6-in. gunwales, two 6-in. longitudinal bulkheads which for part of the way form the ladder well, one 6-in. transverse bulkhead at the end of the ladder well, 6 x 6-in. side posts, 6 x 10-in. braces, 3 x 8-in. bottom stringers, 3 x 4-in. stanchions and 3 x 8-in. deck joists with 1¼ x 3-in. bridging. The outside corners are protected by ⅜-in. steel plates, and the end of the ladder well is



OUT-BOARD CHUTES ARE HINGED

einforced by two U-shaped and four L-shaped ⅜-in. teel plates.

In the original design a chain and a chain drum were sed to hoist the digging ladder, but under actual work-ng conditions it was found that there was insufficient riction for the engine to hold the ladder when it (the ngine) was in the neutral position. To overcome this he drum was wrapped with rope and a 5-part wire ne with two steel sheaves were used instead of the hain.

Under average working conditions the boat will dig 00 cu.yd. of material in an 8-hour day, and has been nown to make 1200 cu.yd. when in a well-proportioned ed near the surface. With boat at full capacity only hree men and a foreman are required. A watchman tays on board at all times other than during working ours. The original cost estimate of the boat complete as $14,000, and the actual cost was not far from that gure.

The boat was designed by the writer under the gen-ral direction of Maj. T. H. Jackson, Corps of Engi eers, U. S. A., and Guy B. Bebout, Assistant Engineer, Wheeling, W. Va. The hull was built at Dam No. 28 nder the direction of W. A. Wells, Junior Engineer, nd all above deck was built at Dam No. 21 under the irection of George C. Ross, Assistant Engineer.

Coaling Plant Delivers Coal to Self-Unloading Barge

Electrically Operated Layout Has Crusher, Conveyors and Locomotive Cranes—Barge Distributes Coal Along River

TRANSFER of coal from cars to a bunker for loading a hopper barge equipped with discharging conveyors is the essential feature of new coal-handling facilities for the Milwaukee Electric Railway and Light Co., at Milwaukee. These have been made necessary by a change from water delivery to rail delivery of coal, due to changing the company's source of supply.

Coal has to be delivered at the river front, as it is distributed to the power plants by the barge. The new yard is 680 x 280 ft., on the Kinnickinnic River. It has a crusher and conveying plant, with stockpile and 1500-ton bunker. The equipment at the old yard was utilized, and all machinery is electrically operated. The plant was designed and constructed under the direction of John Anderson, chief engineer of power plants, the work being done by company forces. The cost, exclusive of land, was about $75,000.

Coal Is Handled by Conveyors and Locomotive Cranes

Coal may be unloaded at the stockpile by electric locomotive cranes with 1½-yd. grab buckets, or it may be taken directly to the crusher and delivered to the bunker for loading the barge. The company's contract calls for separation of screenings and lump at the mine, so that ordinarily the former are used at once and only the lump coal is stored. This reduces the liability of spontaneous combustion in the stockpile. The cars are handled by a steam locomotive, as trolley wires would interfere with the operation of the cranes.

Coal in dump cars is unloaded at a track hopper 40 x 20 ft. At the bottom of this are two shakers, through which the coal passes, falling upon a 36-in. belt conveyor 67 ft. long. This is driven by a 15-hp. motor at a speed of 240 ft. per min. It rises at an angle of 19½° and discharges into the feed hopper of the crusher. Cars which cannot be dumped are placed near this hopper and unloaded by the cranes. The hopper has three sides sloping at 45° to give a rapid feed of the coal delivered by the conveyor. The other side is sloped only 30° to give a slower feed of the coal delivered by the crane buckets. This arrangement prevents overloading of the crusher.

The crusher is of the single-roll type, which has been found to give satisfactory service with low maintenance charges, even when handling the harder grades of coal. The roll is 30 x 36 in., belted to a 100-hp. motor. This crusher, reducing coal to 1¼-in. size, can handle 250 tons per hour.

The coal from the crusher falls upon a 30-in. belt conveyor 150 ft. long, rising at 22½° to the loading bunker. The belt delivers the coal to a 30-in. flight conveyor extending the full length of the bunker. By inverting the return side of this latter conveyor to take the top of the coal, the capacity of the bunker has been increased by about 150 tons. The belt is driven at 325

ft. per min. by a 25-hp. motor, and the flight conveyor at 100 ft. per min. by a 20-hp. motor. With the equipment described the 1500-ton bunker can be filled in about eight hours.

Bunker Feeds Self-Unloading Barge

The coal bunker is 150 x 29 ft. and 53 ft. high. It is of timber construction and supported on piles. The floor has a wearing surface of 1-in. maple lumber, to provide a smooth lining and permit of easy repairs. The floor slopes 45° to the river side, which has two sets of chutes by which the 1500 tons of coal can be delivered to the barge in about 1½ hours. The chutes and gates are operated by the crew of the barge. There are also chutes for delivery to cars or wagons if this should be necessary.

The 1500-ton hopper barge which is used to deliver the coal to the power stations is 200 ft. long, 34 ft wide and 14 ft. deep. The hold has a false bottom forming two longitudinal hoppers. These discharge the coal upon two belt conveyors, which deliver it to two elevating conveyors. These in turn discharge it upon a single 36-in. rubber-belt conveyor mounted upon a 50-ft. boom above the deck. This boom can be revolved to deliver the coal on shore at a distance of about 50 ft. and a height of 26 ft.

The coal can be unloaded in this way at about 200 tons per hour. The 65-hp. motor driving the hold conveyors and 20-hp. motor for the boom conveyor are supplied with current by means of electrical connections at the power-house dock.

Layout of the Plant

In laying out the plant for economic utilization of the space available the location of the bunker was adapted to the length of the barge already in use. Its capacity was determined by that of the barge, and its height was made sufficient to allow for a 45° slope to the barge when lying empty at the dock. The crusher was located at such a distance as to give a 22½° incline from the boot of the elevator to the top of the bunker. This was considered about the steepest angle practicable for the belt conveyor handling coal.

In laying out the tracks, dummies of engines and cars were shifted on blueprint plans to insure close spacing of tracks with ample clearance for switching movements.

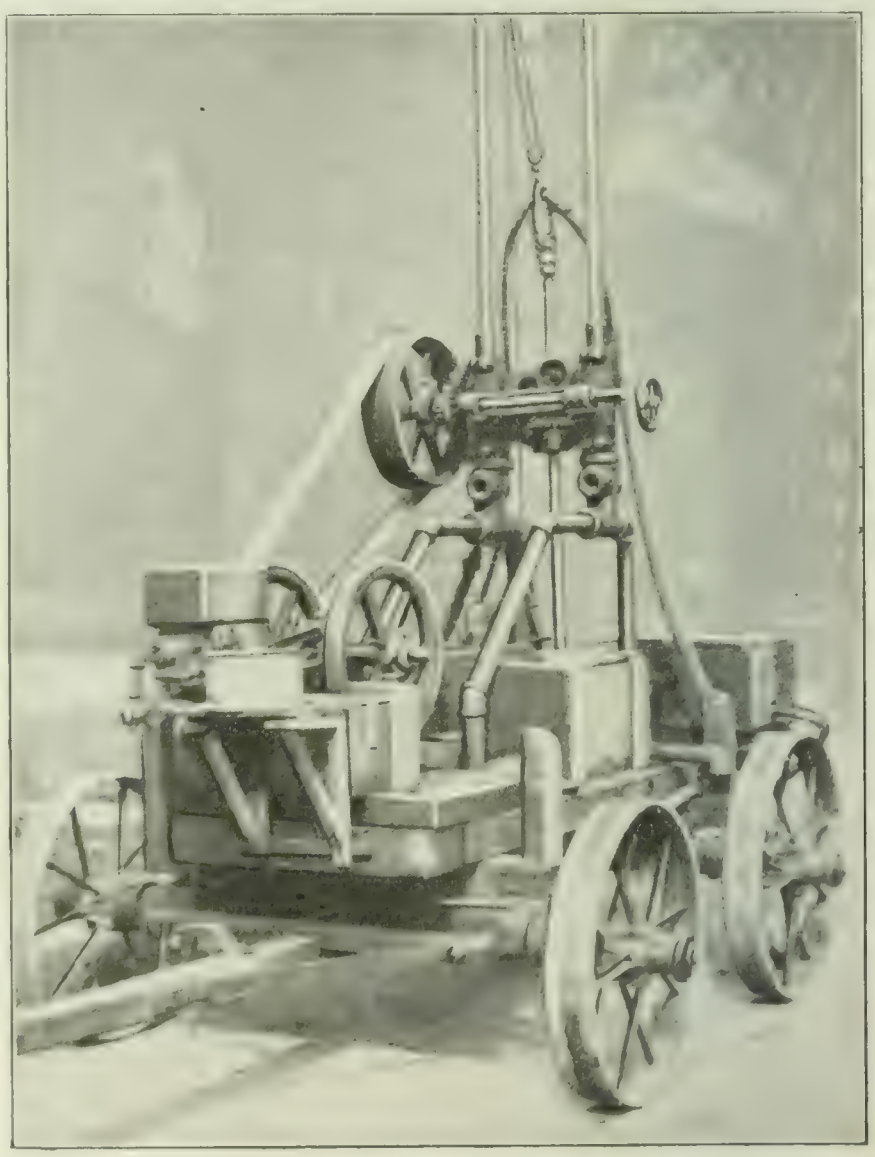
Wooden Ship Construction Taking Large Amount of Pine

Fifty carloads of Southern pine a day are being moved from Southern mills to points where wooden ship construction is under way, according to the Southern Pine Association. During the last two weeks of August fifty additional mills were put to work on timber orders for ship specifications, and many more plants are understood to have taken up business of this sort since. Two district production officers under the local purchasing agent of the Emergency Fleet Corporation at New Orleans have been appointed to determine the exact facilities of the Southern mills for producing ship material and the quantity which they can be expected to furnish.

Samples of Completed Pavements Taken with Core-Drill

Outfit Simple To Handle, Cheap in First Cost and Gives Specimens from Which Valuable Data Can Be Secured

THE practice of taking samples from completed roads or streets, and making thorough laboratory tests—such as microscopic examinations, accurate measurements of their thickness, abrasion resistance, and the like—is an approved method of inspection and research, but the reliability of the information gathered depends largely upon how the samples are taken. Quite recently a series of tests of street pavements were made in the City of Des Moines, Iowa, by the Iowa State Highway Commission, employing a Calyx core-drill outfit equipped for extracting 4½-in. diameter cores. This has proven to be superior to the usual method of employing a gang



OUTFIT OPERATED BY ONE MAN

of men equipped with chisels, sledges and picks. Through the courtesy of J. H. Ames, bridge engineer of the commission, the following description of the work is presented.

Outfit Operated by One Man

In this particular case the Calyx drill was mounted on a low-wheeled truck and belted to a 1½-hp. gasoline engine. The drill, employing chilled steel shot as the cutting medium, utilizes water for flushing the cuttings from the hole. As most of the work was done on city streets the necessary water supply was obtained by hose

from the nearest hydrant, though in one case, where this was not possible, a sprinkler wagon served the same purpose. The entire outfit was operated by one man, and beyond the expense for gasoline and oil for the engine, the pay of this man was the only expense incurred in extracting the samples mentioned hereafter.

Takes 12 to 15 Cores a Day

Several hundred 4½-in. cores were taken from concrete, brick, sheet asphalt, bitulithic and asphaltic concrete streets. The rate of progress was considerably faster than the practice employing hand power. On concrete pavement varying from 6 in. to 8 in. in thickness, it was found possible to take out 12 to 15 cores per day. On other pavements 8 in. or more in thickness, where the concrete was composed of a gravel aggregate, it was not possible to maintain this speed, and the production varied from 6 to 7 cores per day. The outfit was also tried in grout-filled brick pavement, and where the grouting material was of sufficient strength to hold the pieces of brick together during the cutting operation, entirely satisfactory cores were secured. In some cases, on the other hand, where perhaps an inferior quality of cement grout was used, the machine could not be employed.

All cores removed in these tests were carefully boxed and shipped to the laboratory at Ames for examination.



SAMPLES CHECK DEPTH OF FOUNDATION AND CAN BE SPLIT FOR EXAMINATION OF COMPOSITION OR BE TESTED IN A BRICK RATTLER FOR COMPARATIVE TOUGHNESS VALUES

A special machine at Ames cut the cores in halves and quarters, as shown in one of the illustrations. This permitted microscopic examination of the concrete and accurate measurement of its thickness. A sample taken from a sheet asphalt pavement laid over a binder course is shown, and indicates the thickness of the asphalt as well as the possibility of extracting a representative sample intact.



TAKES CLEAN SAMPLE [illegible]

Cores Can Be Tested

At the laboratory, a standard abrasion machine was provided for subjecting the cores to a test similar to the rattler test employed for testing paving brick. Although there is no recognized standard of test for concrete samples, valuable information was secured which indicated the comparative values of different types of pavements. When further supplemented, this data may prove of very definite value.

Such an equipment greatly simplifies the work of extracting unmutilated samples of a size convenient for testing. The damage to the pavement is restricted to a very small area which can be cheaply repaired. The cost of such an outfit is within $600.00 and the expense is lower than that of hand sampling. The particular equipment used in these tests is made by the Ingersoll-Rand company.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Engineers Need to Assert Themselves

Sir—The writer was very much interested in the editorial appearing in your issue of Aug. 9, p. 242, under the title of "Structural Engineers Need To Assert Themselves," in whch you suggest that "engineers should become active members of local associations of commerce and thus establish personal relations with men in commercial and industrial lines."

Approximately 25% of the population of the United States reside within areas governed by more or less efficient building regulations. Approximately one-third of the buildings erected within these areas are subjected to a fairly rigid inspection during construction. In the areas occupied by the remaining 75% of the population there are practically no restrictions as to design or character of construction used, so that, as a matter of fact, probably 90% of the structures erected in the United States at the present time are built without the advantages which are derived from the services of capable and experienced engineers and are therefore not economically, and in many instances not safely, constructed.

In the areas subject to building regulations, probably one-third of the buildings are designed by architectural firms who employ architectural draftsmen, structural engineers and equipment engineers and so produce a coordinated whole, meeting all requirements of utility and economy as well as of artistic effect. In the areas not subject to building regulations, probably 5% of the buildings are designed by architectural firms of the character above described.

Some 70% of all the buildings erected are designed by so-called architects who have received no technical training, do not know the value or necessity of engineering assistance, and in most cases have no other architectural ability than that required to plan or group a certain number of rooms on a certain number of floors, clothing the exterior of the combination with a medley of ornamentation, copied from trade publications or other similar sources. This type of architect in most instances secures his commission for the design of buildings through political, social or fraternal affiliations.

Having received the commission to design a building, he simply plans the rooms, etc., required, groups them together into a building symmetrical or otherwise and works up elevations to suit. At this point the commercial man steps in. If a steel frame building, the structural work is designed probably by some structural shop which expects to secure the contract, the design being usually such that it can be modified to the benefit of the designer after the contract is let. If a reinforced-concrete structure, the design is furnished by some concern having either reinforcing steel or some "system" for sale, and is made, of course, to favor the designer. In the matter of heating, complete plans are furnished by manufacturers of heating specialties (probably some special valve or special trap), the design as usual being made in favor of the designer. The same applies to ventilation, sanitation, artificial lighting and practically every other item required to complete the building. Consequently, buildings so designed must of necessity lack economy and true efficiency, the owner having to pay for the multiplication of designs as well as for the lack of coördination in the general design.

Accompanying such plans are ambiguous specifications, copied in many instances from specifications for entirely dissimilar buildings, full of vague terms and entirely lacking in definite detailed description of the actual work to be done. The drawings and specifications are issued without complete definite working details, leaving the contractor to guess at the meaning; and it is simply a matter of good judgment on the part of the contractor as to whether he or the owner pays all the extra cost entailed by the use of such plans and specifications as are furnished by this class of architects. It is not only on small work that this class of architects finds employment, but often on large and costly structures, especially those of a public or semi-public character.

Building committees having charge of the erection of public or semi-public buildings are not usually selected because of their knowledge or fitness; they may have been good subscribers or they may be good politicians or well placed socially, but as a rule they appear to know somewhat less about the work they undertake to supervise than does the ordinary average layman. Consequently, the choice of an architect, the selection of plans and the consideration of such matters as construction, heating, lighting, ventilation, etc., are matters of guesswork or subject to the decision of the architect and the special coterie of tradesmen or mechanics who design and perform the work for the so-called architect.

To such men as usually form these building committees, and also, unfortunately, to the general run of owners or prospective owners of buildings, the word "engineer" has no meaning. Speak of an engineer and they will have in mind either a land surveyor or a man who operates a locomotive engine, a stationary engine, a traction or threshing engine or a steam roller—or probably the janitor who, in addition to his duties generally, looks after the heating plant in a building. How shall we alter the existing state of affairs?

The National Board of Fire Underwriters has done much in an educational sense with regard to the reduction of fire risks in buildings, but little has been done to educate the public to the requirements of proper and economic construction.

In some states, laws have been passed and are supposedly enforced which require that no man shall practice architecture unless he is a certified and licensed architect. There is also some agitation to secure similar laws with regard to certain classes of engineering. Such laws, however, do not reach the root of the matter and are of practically no effect. Anyone who can secure a commission for architectural or engineering work can easily secure the services of licensed architects or licensed engineers at a comparatively small salary who will place their stamps upon anything which is turned out of the office, good, bad or indifferent, for the sake of earning their daily bread. The writer has hired a

number of such men at various times, chiefly for the purpose of having them place the formal stamp upon drawings made by other more capable and efficient men —which drawings in many cases were absolutely beyond and above the understanding, comprehension, or technical education of the men who handled the stamps. Furthermore, a carpenter who designs a house, or a builder who designs a factory, can usually, upon payment of $5 or $10, get a stamp placed upon his drawings, making them legal, irrespective of any lack of structural design. Consequently, such laws do not protect the public nor the property owner.

In order to correct existing conditions, to give engineers their due and to give the public the benefit of the services which engineers are ready to render, it is necessary to get the facts as they exist before the public.

Among the means which can be used in bringing together engineers and those who would benefit from the use of their services, the writer would suggest:

1. Enlargement of the scope of engineering extension departments in our state universities and other educational institutions so as to bring to the attention of public bodies, such as boards of county supervisors, boards of education and building committees for schools, public libraries, churches, institutional buildings, etc., as well as manufacturers and those proposing to build mercantile or amusement buildings, the fact that competent engineering services are necessary to insure the economic, safe and satisfactory construction and equipment of such buildings, and that the employment of a competent engineer would prevent errors, costly changes in construction and equipment, and big bills for extras, as well as securing the lowest possible bids for construction in the first instance.

2. Coöperation between the agencies above mentioned, the various engineering societies, practising engineers, and all who are interested in the engineering profession, all working together and working hard until safe and sane building regulations are made state laws, insuring safe, sanitary and economic construction throughout the whole country.

3. Publicity—By making known the facts and conditions existing, through the public press, through such journals as reach and are read by those most interested —even by the daily newspapers, if necessary. Subscribers to professional and trade journals are usually interested only in matters pertaining to their own business or profession. Hence, it is practically impossible to reach the persons who most need the information, through these channels. A manufacturer in looking through his particular trade journal will note the market price of materials required in his business, and will probably read articles affecting methods and processes of manufacture in his line of business, but even though he were considering the construction and equipment of new factory buildings, he probably would pass over any article devoted to the description of similar buildings and the engineering achievements in connection therewith. Unfortunately professional and trade papers, especially from an engineering point of view, reach only those who have services to sell, and do not reach those who need such services.

4. As much attention on the part of educational institutions "manufacturing" engineers to the education of the general public in the matter of benefits to be obtained from the services of engineers as they pay to the matter of securing students. Also in order to improve the standing of the engineer, it would be better for engineering schools to employ higher grade, more experienced teachers, and to increase the work necessary for graduation of students so that advertisements for $800-a-year engineering instructors and $60-a-month graduate engineers will disappear from our trade journals and daily newspapers. INGENEUR-CONSTRUCTOR.

Kansas City, Mo.

Hydrated Lime in Field Concrete

Sir—I have read with a great deal of interest your abstract of my paper on the effect of hydrated lime on the strength of concrete, as published on p. 328 of your Aug. 16 issue. I presume this was taken from the *Transactions* of the National Lime Manufacturers' Association, although you do not state the source.

I am very glad to note that all of the facts have been stated correctly, and that you have included all of the necessary precautions as to the interpretation of those facts. It is unfortunate that your abstract conveys an impression almost diametrically opposed to the idea I had in mind. This idea was brought out more clearly in the discussion than in the paper, and it is quite possible that the discussion was not bound with the paper when the latter was published.

One must conclude, from the abstract, that hydrated lime causes a diminution of the strength of concrete. This is certainly shown by our laboratory results, but our field work and observations indicate that this may not always be true—in fact the truth is frequently just the opposite. Hydrated lime as used in practice may cause an increase in the strength of concrete.

The connecting link between laboratory and field results is still undetermined, but is probably the workmanship factor. Under these circumstances, it is unfortunate to promulgate laboratory results for the information of the general public, when these results are frequently refuted by practical experience.

Riverton, Va. WARREN E. EMLEY.

Thinks Segment Block Unjustly Blamed

Sir—In the title of the article by S. U. Misner, "Segment Block Sewer Fails," on page 202 of your issue of Aug. 2, we believe that you have featured the segment block too prominently. The author says that the failure was due to a common occurrence in sewer work, that is, the use of a trenching machine and the attendant careless omission to shape the bottom of the trench to receive and thus provide a good foundation for the invert of the sewer. Incidentally, Mr. Misner lays the responsibility on the flushing of open joints with a poor mixture of cement grout.

The headline "Segment Block Sewer Fails" leaves in the mind of engineers, especially the casual reader, the impression that segment sewer tile is a good construction to avoid, whereas the fact is that any type of construction would have failed under similar trying circumstances. C. R. ROBIE,

Sales and Advertising Department,

Pittsburgh. National Fire Proofing Co.

THE ENGINEER IN FIELD AND OFFICE

A DEPARTMENT DEVOTED TO DETAILS OF THE DAY'S WORK

Drinking Fountain Attached to Hydrant

A STREET drinking fountain supplied from the hose connection of a fire hydrant at Galion, Ohio, is shown by the accompanying view, in which the small vertical pipe at the left supports the fountain and serves as a waste connection to the sewer. The supply line is tapped into a nipple screwed into one of the two hose outlets. This arrangement necessitates the main valve of the hydrant being kept partially open—enough at least, to bleed sufficient water for the fountain. A self-draining hydrant, unless accurately adjusted, might waste considerable water if adapted to this scheme, and in any case a valve, too far opened, would have to be closed before steamer connections could be made to the hydrant.



DRINKING FOUNTAIN ON FIRE HYDRANT

Heavy Storm Tests a Storm-Water Drain

A STORM which tested the capacity of the new Madison Avenue storm-water drain at Ogden, Utah, when it was barely completed, gave the engineer a chance to check up his calculations of run-off assumptions The sewer drains a steep area of 1210 acres, with grades from 2 to 10% but averaging 4%. The area is laid out in city blocks, but only one of the streets is paved, though all have gutters. The calculated run-off was based on 0.21 cu.ft. per acre for paved and improved residential areas, and 0.07 cu.ft. per acre for unpaved areas and present conditions. The calculations gave 84 sec.-ft. for present conditions, and the amount measured was 70 sec.-ft. One inlet was not complete, and it was estimated that from 15 to 20 sec.-ft. went by this one inlet.

The storm occurred at an unusual time of year, July 28, and amounted to 2.2 in. in 12 hours, although most of it fell in two hours. It is considered as intensive a rainfall as has ever occurred in the Ogden district. The calculations were based on U. S. Geological Survey assumptions of rainfall which state that the intensity in inches per hour for a 30-minute period had never between 1875 and 1915 reached a rate of 1 in. per hour. The engineer used 0.4 in. for 30 minutes.

There are three sections of this rectangular drain. The total length is 4914 ft. and the largest section is 3½ x 4 ft. It empties into the Ogden River to the north, ending in a V-shape channel in which measurements were taken. The slope is such as to give velocities when running full of from 4 to 7 ft. per second.

Entrance into the drain is through vertical openings along the gutter, 12 in. high and 16 ft. long, with grate bars spaced 12 in. c. to c. These openings, one on each side of the street, were able to take the run-off from areas of approximately 80 acres each. Blocks in Ogden are in 10-acre plats, the original idea being that each man should have an acre of land and 132 ft. frontage. The streets in this section are mostly 55 ft. between curbs. The future paved area will be cut down in many streets to 35 ft. between curbs with wide parking at the sides.

A sanitary sewer system for the section north of the Ogden River is being designed, and information as to flow is being obtained by a Stevens continuous-flow recorder placed on the outlet of the present sewer. It measures the head on a 9-ft. rectangular weir. This volume will be added to that of the district planned, and will be taken out of the Weber River and discharged at a point seven miles down stream. The new system provides for a maximum daily flow of 175 gal. per capita, plus 10 sec.-ft. for ground-water infiltration.

The contractor for the drain, which cost $25,000, was the Gibbons & Reed Co., of Salt Lake City. The design was made and work carried out under the direct supervision of Joseph M. Tracy, city engineer.

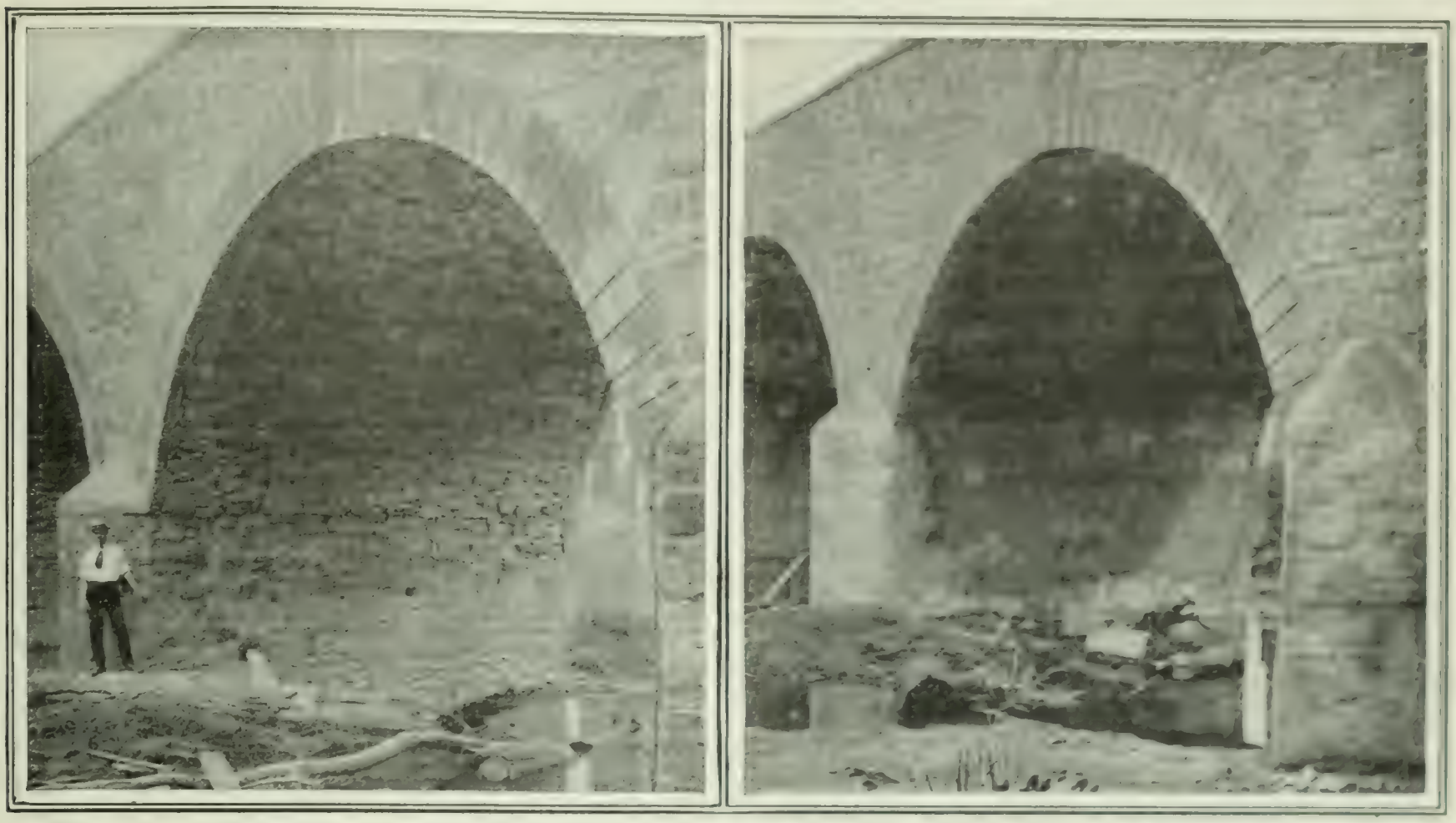
Century-Old Stone Bridge Covered with Cement-Gun Mortar

By R. L. Kell
Assistant Engineer for F. H. Shaw, Consulting Engineer, Lancaster, Penn.

TIME and the elements have made their impression on the historic Witmer's Bridge built in 1800 across Conestoga Creek, about ½ mile east of the city limits of Lancaster, Penn. The mortar on the under side of the nine rubble masonry arches, which vary in length from 23 to 35 ft., had disintegrated and fallen out to such an extent that repairs were imperatively needed to preserve the structure. As a means of obtaining permanent repairs and preserving the quaint character of the old bridge, the cement gun was felt to offer the best opportunity. The specifications for the work provided that the old, loose mortar should be picked out of the joints, that the surfaces to be coated should be covered with 3-in. triangular wire mesh, securely fastened to the face of the masonry with boat spikes, and that all holes should be shot solidly full with 1:3 mortar. The surface was to be coated with 2 in. of mortar.

The photographs herewith show the arches before and after the application of the gunite. The mortar was left rough, as being more in keeping with the type of bridge than a troweled finish. The work was done in such a manner that a solid casing of cement mortar lines the arches, no hollow spots being detected in an inspection with a hammer.

The specifications were drawn by F. H. Shaw, consulting engineer, of Lancaster, Penn., and the work was



OPEN JOINTS IN THE OLD BRIDGE SHOWN ON LEFT WERE PLUGGED WITH GUNITE AS SHOWN ON RIGHT

carried on under his supervision. The contractor was the Dewey Cement-Gun Construction Co., of Allentown, Penn. The work was completed in fourteen days of actual shooting, approximately 11,000 sq.ft. of surface being covered.

Early Tests Show Slag To Be Good Concrete Aggregate

A SERIES of tests upon the availability of air-cooled blast furnace slag for concrete aggregate have been undertaken by the Pittsburgh Testing Laboratory, Pittsburgh, Penn. Reports are now available on compression tests on 8 x 16-in. cylinders up to six months. The full test period will be five years and it will be that long before the durability studies will be complete. As to strength, however, the earlier tests should be nearly as conclusive as the long-time tests.

The purpose of the tests is to furnish a comparison of the crushing strength of concrete made from slag, from crushed stone, and from gravel, to determine the granulometric analysis of the slag and the corrosive tendency of sulphur upon reinforcement, and finally to compare the relative strength and durability of concrete made from high magnesia slag as compared with high lime slag.

The slag was obtained from a number of different slag companies. In some cases it was fresh slag and in others material which had been in the bank from six months to 15 years. Comparisons were made with concrete, made with gravel, trap rock and limestone. The slag was crushed and graded from ¼ to 1½ in. and was combined for the aggregate in equal proportions of the four gradings, ¼, ¾, 1 in. and 1½ in. It was weighed according to a standard method of filling a cubic foot measure loosely and dropping 10 times on a felt pad 1 in. thick from a height of 3 in., the measure being filled and smoothed to a straight edge after the impact. An average of 10 determinations was taken of the weight per cubic foot of material used, and the variation of the individual determinations was usually within ½% and seldom over 1%. After considerable study of maximum density it was found that an ordinary 1:2:4 volumetric mixture of cement sand and coarse aggregate would give optimum conditions.

The compression results on the 8 x 16-in. cylinders for the 14-day, 30-day, 60-day and 180-day tests are available. They show very little variation between the different slags and the other aggregates; so little in fact that no very definite distinction as to strength can be made. The engineer of tests of the Pittsburgh Testing Laboratory, P. I. Freeman, however, makes the following summary of the results after the six months' investigation:

"One-half the tests of the slag concrete were made using slag produced by the quick cooling process, in pits, in which the slag is shipped within a few days from the time it comes from the furnace, and the remainder from slag which has been seasoned in banks from a period of six months in some cases to as much as 15 years. The length of time during which the series of tests have been conducted does not warrant the drawing of any definite conclusion, but the general uniformity of the results from the crushing tests of the concrete should be observed. Slags coming from furnaces many hundred miles apart, varying quite widely in chemical analysis, and also varying considerably in the weight per cubic foot do not vary in strength in proportion to either the weight or percentage of any chemical constituents."

It is of interest, however, to note that the slag weight per cubic foot runs between 64.5 and 82.8 lb., with an average of 73 lb., as against 95 to 104 for gravel, 90 for crushed granite, and 94 for limestone.

Cost of Motor-Car Service for Field Parties on Surveys

FIELD parties surveying the areas for flood-control reservoirs near Columbus, Ohio, had headquarters in small towns, as farm-house accommodation was not satisfactory. Three Ford automobiles without beds were purchased by the Franklin County Conservancy District. These were filled with special beds having two seats, a canopy top and curtains, a box on the side to carry level rods and sighting poles, and a lock box for equipment and lunch. The cars cost $510 each, complete.

Records of operating cost were compiled only for one car. This car ran 5500 miles and made an average of 21½ miles per gallon of gasoline, or at an average cost of 0.9c. per mile for gasoline alone. Including repairs, punctures, tire renewals, a garage rental of $3 per month, etc., the total cost of operation, exclusive of interest and depreciation, amounted to 3⅜c. per mile. Assuming a life of four years, interest at 5%, and a mileage of 6000 per year, the total cost per mile would be 6.2c. As the average distance covered by the parties in going to and from work was about 20 miles, the average cost of transportation, including interest and depreciation, was about $1.25 per day. This should be compared to $1.50 per day for horses and wagons, and does not credit the time saved.

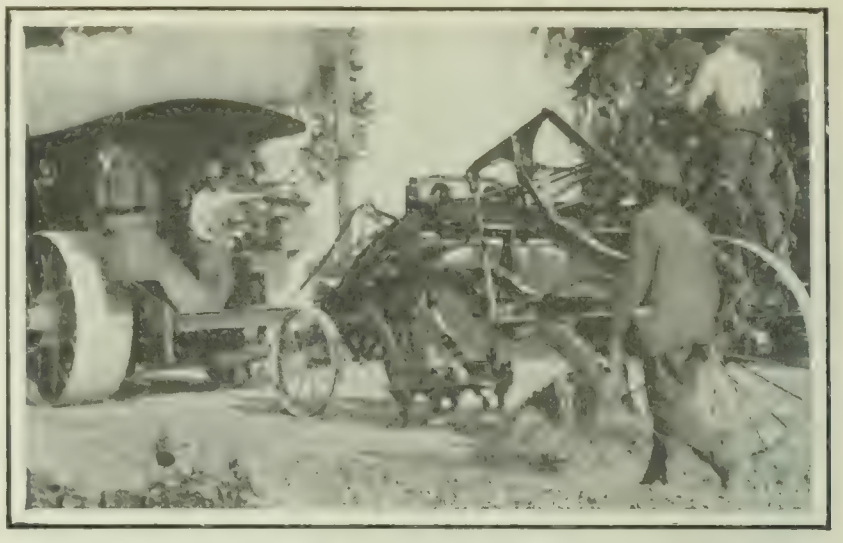
Macadam Road Is Surfaced as Base for Concrete

SURFACING and leveling the present macadam to serve as the subgrade for new paving, and the use of a special grader for this work, are features in the improvement of a main road in Cook County, Illinois. The road will have a concrete base 4 to 6 in. thick, and a 2-in. asphalt surface. This will be 18 ft. wide, with a 3-ft. macadam shoulder on each side.

The old macadam is 6 to 15 in. thick, badly rutted and very hard. Beneath it is a still older gravel paving. It was desired to level the surface, but to avoid breaking up the macadam, as it forms an excellent subgrade. The hardness of the surface, however, made this a difficult problem, as a road grader could not cut the macadam. Successful results were obtained by the use of a new machine combining a gang rooter or scarifier and the ordinary scraper blade of a road grading machine.

The rooter is mounted behind the front axle of the machine, as shown in the accompanying view, and has five teeth of hardened steel 1½ x 3 in. They are set 10 in. apart (in a staggered row) so as to make a cut 40 in. wide. They can be raised, lowered and tilted to any desired angle. Behind the rooter is a 9-ft. scraper blade. This machine was built by the Austin Manufacturing Co., of Chicago.

On this work the machine is hauled by a Reeves steam traction engine. It goes down one side of the road and back on the other, making as many cuts as may be necessary for the required depth. The rooter is set for a depth of 4 in. on the first cut. The scraper blade levels the surface and throws the excess stone out on either side, to be used later for the shoulders. The machine leaves the subgrade practically ready for the concrete, very little correction or final dressing by hand being required.



COMBINED ROOTER AND GRADER SURFACES OLD MACADAM SUBGRADE FOR CONCRETE

The working force comprises two men on the traction engine, one on the grader and one to drive the tank wagon for supplying the engine with water. This road is a 9-mile extension of 95th St., beyond the city limits. Its improvement is under George A. Quinlan, county superintendent of highways. The contractors are John A. McGarry & Co., of Chicago.

Water-Soluble Calcium Oxide Determined by Sugar Solution

THE following is the method in use in the laboratory of the St. Louis Water Department for the determinations of the water-soluble calcium oxide in quick lime. Approximately 7 grams of lime, contained in a weighing bottle, are dumped into a liter flask containing 500 c.c. of a sugar solution (160 grams per liter). Caking is prevented by causing a whirling of the solution while the sample is being added. The flask is then put on a Camp shaking machine and shaken for 30 minutes. It is then made up to the 1000 c.c. mark with carbon-dioxide-free distilled water, shaken by hand and allowed to stand overnight. Twenty cubic centimeters of this solution are then titrated with tenth-normal hydrochloric acid, using phenolphthalein as the indicator, and the per cent of lime determined. The addition of acid is continued until the first disappearance of the pink color. The color reappears in a short time, but the first disappearance is taken as the end point.

Urges Short, Level Stretches Both Sides of Grade Crossings

The use of short, level stretches both sides of railroad-and-highway grade crossings is urged by George S. Eaton in the *Concrete Highway Magazine.* At many crossings where the railroad is on fill there are short, deep grades running up to the very rail. It is pointed out that automobilists, in attempting to get up these grades on "high" and at the same time avoid bouncing over the rails at a high rate of speed, frequently stall with the front wheels on the track, and are struck before they can get away. With a level section of 30 ft. each way from the track, or outside of the outer tracks where there are more than one, any stalling would take place clear of the track.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Steam Jets Thaw Three Feet of Hard Frost in 15 Minutes

By H. P. J. Earnshaw

Contractors' and Roadbuilders' Equipment, Boston

THIRTY-FOUR inches of frozen clay, so hard that stones embedded in it could be cut off without loosening them at all, which was encountered on a recent excavating contract, was readily thawed by the method shown in the photograph, which was devised by the writer, who furnished the Erie shovel used on the job by the Boston Excavating Company.

It was impossible to lift or break this frozen crust, and ordinary means of thawing, such as steam pipes under canvas cover, and live steam under canvas cover, proved such a failure that only 4 or 5 in. were thawed out in 36 hours. The plan used was to jet holes with an open-end ½-in. pipe connected to the boiler by a ½-in. hose, the steam pressure quickly melting a hole in the frozen clay and forcing pebbles and small stones out of the way. As fast as these holes were made a ½-in. capped pipe with four ⅛-in. holes bored in it was put in each and left running to thaw out the ground. These pipes, one of which is being held ready to insert by a man at the right in the photograph, were connected in series by short lengths of hose to steam lines run from the boiler. Twelve of these were put in at a time, connected to one line. These were moved back as the shovel worked toward them, requiring only 15 minutes to thaw out a section of the bank so thoroughly that the revolving shovel could dig it as well as if it had never been frozen.

Fifty-Seven-Foot Concrete Pavement Finished with Long Belt

CONCRETE pavements 57 ft. wide were floated with a belt successfully in Ogden, Utah, early this season. The belt was 59 ft. long and handled easily by two men, who went over the road at least twice after the surface was struck off.

In striking off the pavement a row of stakes, 10 ft. apart, was driven down the center line to finished grade, and on these a channel iron was placed to support one end of a strike board templet for one-half the street. The center end was operated from a bridge which was mounted on wheels and easily pushed along.

Reinforcing of triangle mesh was placed 2 in. below the surface, and ½-in. felt expansion joints were inserted every 60 ft. Although there is as yet no pushing, the city engineer is of the opinion these should be at least ½-in. thick. No cracks had appeared in these large slabs in the two blocks laid last fall or three blocks laid this spring.

The work was done under the supervision of Joseph M. Tracy, city engineer, by J. P. O'Neil, contractor.



TWO DOZEN HALF-INCH STEAM JETS WERE USED TO THAW THREE FEET OF HARD FROST AHEAD OF A REVOLVING SHOVEL ON EXCAVATING

HARDAWAY CONTRACTING COMPANY

If presented within thirty days this becomes a sight draft on
THE NATIONAL LOAN & EXCHANGE BANK
OF COLUMBIA
but will not be paid unless the properly receipted invoice or invoices listed below are attached hereto:

Voucher No. _____ Month _____

Pay to _____ Columbia, S. C. _____

_____ $ _____

HARDAWAY CONTRACTING COMPANY
COLUMBIA CANTONMENT ACCOUNT

CHECKED: _____

By _____

DISTRIBUTION	DESCRIPTION OF ACCOUNTS
_____ 1917	

FORM BECOMES SIGHT DRAFT WHEN ATTACHED BILL IS RECEIPTED BY OFFICER OF MATERIAL COMPANY

Must Receipt Bills in Order to Get Money

THE cantonment division of the quartermaster general's office requires that all bills for material paid by the contractor must be receipted by an officer of the material company concerned before the contractor will be paid for them by the Government. Contractors who have handled percentage work on which receipted sets of bills were required by railroad companies or other owners will appreciate the difficulty of getting such signatures out of the officers of lumber companies and material concerns. The little form shown in the illustration, however, overcomes this difficulty and brings back the original bill, receipted by an officer of the company, every time.

The form, which was devised for this purpose by Charles Neville, of Charles Neville & Co., which firm is handling the accounting work for the cantonment at Columbia, S. C., dispenses in the first place with all payment by check. The form itself is a sight draft on the bank account of the contractor. The proper receipt on the face of the original bill for the material is made the indorsement necessary to enable the material firm to cash the sight draft. These drafts, with the receipted bills attached, are returned to the contractor with the next bank statement in the same way as any other sight draft. They are taken care of on the contractor's books in the usual manner.

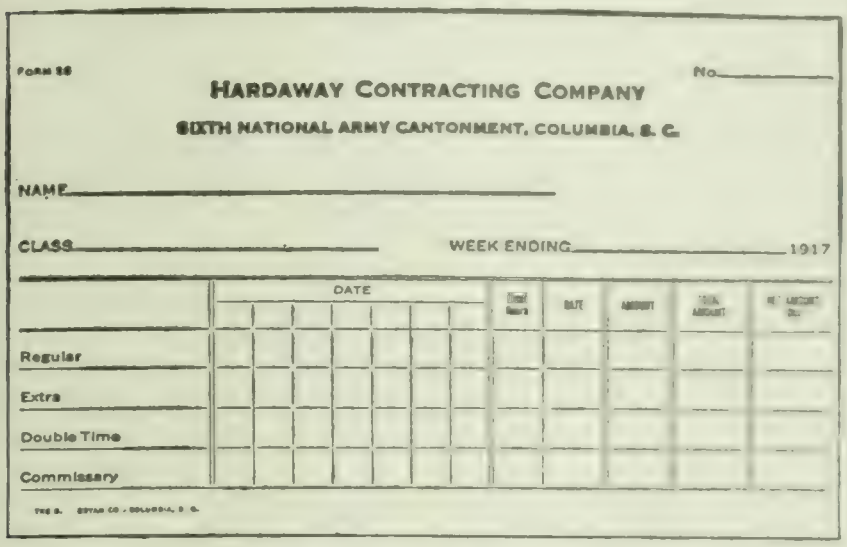
This form, which forces a proper receipt automatically before any payment can be collected, enables the Government to reimburse the contractor promptly for all material charges paid out on the work.

Nine-Thousand-Man Payroll Made Up in Sections

THE payrolls at the National Army contonment under construction near Columbia, S. C., described on p. 497 of this issue, are made up from the cards as shown in the illustration, one of which is kept for each man who has worked during the week. The men's numbers are entered on these cards, and each "inside" timekeeper has a group of 500 such cards, numbered for the batch of men for whose time he is responsible. These men receive their checks from this man, are checked up on the work by this man's outside timekeeper, and are paid off once a week by the contractor's paymaster. The cards are kept in a regular card-index drawer, and each day every one of the 500 cards is brought up to date. No other record is kept until the time comes to make out the payroll, when the cards are gone through in order and the time entered on the payroll form, which corresponds to the card except that there is only one line for each man. The cards and the payroll are totaled separately on adding machines by groups. The time is closed on Wednesday night, the roll made out and checked, the change list made, the money brought up from the bank, and the envelopes plugged in time to pay off at 4 p.m. on Saturday. The working day on Saturday is cut to eight hours for this purpose, as the men in many instances have so far to travel to reach the pay office after leaving their section of the work that if a full day were worked it would not be possible to get them back to the city until a late hour. On this account, before payday was

shortened to an eight-hour working day, the workmen in outlying sections began to desert their posts about noon, and by three o'clock in the afternoon the work would practically be suspended. This was only allowed to happen one payday before the present system was installed.

As there are more than 9000 names on the payroll each week, 25 or 30 windows are used in paying off


FORM 58 No.

HARDAWAY CONTRACTING COMPANY

SIXTH NATIONAL ARMY CANTONMENT, COLUMBIA, S. C.

NAME

CLASS WEEK ENDING 1917

	DATE										
Regular											
Extra											
Double Time											
Commissary											

EACH MAN HAS TIME CARD

groups of 500. The head timekeeper handles personally all complaints about the time, taking each matter up with the individual timekeepers concerned. The system is used by Charles Neville & Co., which firm is in charge of accounting under Maj. William Couper, constructing quartermaster.

Handy Wood Twister for Form Wires

By John E. Langley
Huntington, W. Va.

THE WOOD twister shown in the photograph has proved a handy tool on many jobs for tightening form wires. It is made of a piece of 2 x 3 in. hardwood about 14 in. long, the ends of which are smoothed for handles. Two holes are bored symmetrically through the 3-in. dimension of the stick about 4 in. apart with a ½-in. bit. The ends of the wires to be twisted are put through these holes and bent over, the twister being held about 6 in. from the face of the form or the top of the beam. The wires can then be drawn tight very quickly, making a secure and satisfactory job.


TWISTER DRAWS WIRES UP SNUGLY

Paving Mixer Charged with Measuring Boxes Dumped by Chain Hoist

IN MIXING the concrete for building roads this season B. F. Batchelder, chief engineer of the Portage County Improvement Association, Ravenna, Ohio, has adopted a method of transporting measured batches from a central loading plant in boxes which are dumped into the loading skip in a chain hoist on the mixer. These boxes hold 13½ cu.ft. or one mixer batch.

For transporting the boxes from the central loading plant to the mixer, a 3-ft. gage industrial railway is used. Each industrial railway car carries four of these batch boxes. The locomotive spots them in front of the


HOIST LIFTS BOXES BY LIGHT RAIL

loading bins and the required amount of sand is put into each box. The car is then shifted to the gravel bin and filled flush with the top. The train is then run out to the mixer and the boxes unloaded directly into the mixer skip by a small crane and geared chain hoist, which is fastened to one corner of the mixer frame.

The arrangement is stated to be proving very satisfactory, and with this equipment it has been possible to build as much as 380 ft. of 12-ft. concrete pavement 7½ in. thick in a 10-hr. working day with but eight men working at the mixer.

Laying an Intake Pipe for a Cantonment

A 3000-ft. intake of 8-in. cast-iron pipe in Lake St. Clair supplies water for the United States aviation camp at Selfridge Field, near Mount Clemens, Mich. For the first 1000 ft. from shore the pipe is laid in a dredged trench about 6 ft. deep. The remainder is laid on the bed of the lake, in about 8 ft. of water, and ends in an intake opening protected by a screen. The pipe is laid 6 ft. below the deepest known low level. The laying was done by means of a gasoline launch and two lighters or scows. The pipe lengths were connected up on the scows with special couplings. These contrivances are strong enough to carry an 80-ft. unsupported length of pipe, but the laying was so arranged that the distance from the scow to the pipe resting on the bottom of the trench did not exceed 50 ft. The Walbridge-Aldinger Co., of Detroit, has the contract.

NEWS OF THE WEEK

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

Jersey City Water-Supply Clean-Up Proposed

Diversion of Sewage Below Boonton Dam with Activated-Sludge Plant and Chlorination Advised

The long-drawn-out controversy between Jersey City and towns in the Rockaway River drainage area above the Boonton dam appears to be drawing toward a close, or at least to a new stage. Jersey City, on Sept. 4, asked the State Department of Health to approve general plans for a trunk sewer to divert the sewage of Rockaway Valley towns to a point below the Boonton impounding reservoir of the Jersey City water-supply, and also to give tentative approval to activated-sludge and chlorination works to treat the sewage thus diverted, the latter as recommended by George A. Johnson, consulting engineer, New York City. The department instructed Chester G. Wigley, chief of its Bureau of Engineering, to outline for Jersey City the general requirements of the department for guidance in drawing specific plans. Early action is expected.

TRUNK-SEWER WILL BE OPPOSED

The treated sewage would be discharged into the Rockaway River, a tributary of the Passaic, some miles above the intake of the Little Falls filtration and chlorination plant of the East Jersey Water Co. and allied corporations which supply Paterson, Passaic, Montclair and other communities. It has been reported that these corporations will oppose the trunk-sewer. It was proposed some months ago to extend the proposed trunk-sewer to a point below the Little Falls intake, but this would be costly and at once suggests a further extension to tidewater, as the Passaic Valley Sewerage District is spending millions to divert the sewage of all the communities on the Passaic below Little Falls.

ATTEMPT TO REOPEN SUIT

Another confusing element in the situation is a proposal to try to reopen the suit brought by Jersey City to compel the contractor for the Boonton reservoir and conduit to divert the sewage of the Rockaway towns, on the ground of non-fulfillment of the contract to supply pure and wholesome water. The contractor claimed, and was sustained by the court, that the Boonton water-chlorination plant, the first large hypochlorite plant for water treatment ever built, fulfilled this part of the contract. Jersey City has referred to a special attorney the question of the advisability of trying to reopen the suit, which for some months has been in the hands of its corporation counsel.

Joint Committee Named To Study Concrete Ships and Barges

Robert W. Boyd, consulting engineer, has been retained by the Joint Committee on Concrete Ships and Barges appointed by the American Concrete Institute and the Portland Cement Association. The members of the two committees are as follows:

American Concrete Institute—H. C. Turner, chairman; Leonard C. Wason, Robert W. Lesley, Charles R. Gow, M. M. Upson.

Portland Cement Association—E. D. Boyer, chairman; Joseph Brobston, F. W. Kelly, W. S. Mallory, S. P. Crabo.

An active investigation has been undertaken to determine the possibility of this type of construction.

Engineers Club Organize Home Guard

The Engineers Club of Columbus, Ohio, has organized and started to drill a company of the Columbus Reserves, in accordance with the ordinance passed by the City Council. The club was organized in May of this year and the fact that after four months' existence it was able to accomplish such a task as furnishing a company of 107 men is sufficient guarantee for the future welfare of the club. The company is formed from members over military age, or those exempted from service, but who are able to do guard and patrol duty. The members are serving without pay and are furnishing their own uniform.

Washington Land Exchange Halted by Enlistments

According to the report of State Land Commissioner Clark V. Savidge, Olympia, Wash., and Stanton G. Smith, of the United States Forestry Service, the enlistments in engineering regiments and the number of young surveyors and engineers who are working in officers' training camps to qualify themselves for war service has made it impossible for the state land commissioner and United States Forestry Bureau to complete the details of the big land exchange, whereby the State of Washington will receive in solid tracts the granted lands lost through inclusion in the forest reserves.

Canada Votes $7,500,000 Loan to Grand Trunk Pacific

A loan of $7,500,000 was voted Sept. 3 by the Canadian House of Commons to provide the Grand Trunk Pacific Ry. with funds for necessary betterments for another year.

Tunnel Bid 46 Per Cent. Higher Than Estimate

Contractor's Offer To Build 19-Mile Hetch Hetchy Bore for $9,224,000 Is Rejected

Bids were received Aug. 22, by the Board of Public Works, San Francisco, for the construction of 96,808 ft., or about 19 miles, of aqueduct tunnel 10 ft. 3 in. in diameter, on the Hetch Hetchy project, leading from Early Intake, 12 miles below the dam, to near the Priest's forebay reservoir above the power plant. As was announced in these columns last week, three bids were received, from R. C. Storrie & Co., Healy-Tibbitts Construction Co. and the Lindgren Co., all large contractors in the city. The detailed figures are given in the "Contracting News" section of this issue. The lowest was by R. C. Storrie & Co., as follows:

			City Engineer's Estimate
Section A,	23,725 ft.	$1,983,725	$1,458,050
Section B,	24,739 ft.	2,258,560	1,432,348
Section C,	48,344 ft.	4,991,386	3,200,215
	96,808 ft.	$9,233,671	$6,090,613
Extra work and engineering.....			216,387
			$6,307,000

The sum total of $9,233,671, bid by R. C. Storrie & Co., exceeds the city engineer's estimate by $2,926,000, or 46.4%. The contractor's bid averages $95 per foot, including accessory structures, which is regarded by the city's representatives to be excessive for a tunnel of such a small size. A larger tunnel, 12 ft. in diameter, it is pointed out, is now being driven under Lake Michigan for a distance of 5 miles under the lake at a cost of $59.80 per foot. A tunnel 8 ft. in diameter, 8700 ft. long, lined with concrete, driven by the Marin Water District, is costing $29.70 per lineal foot.

The city engineer and the Board of Public Works therefore deem the present bids excessive and on the recommendation of the city engineer the bids have been rejected by the Board of Public Works.

Various factors, such as the high price of steel, the high price of powder, and the uncertain condition of the labor market, are responsible for the contractor's prices on the Hetch Hetchy project.

It is expected inside of a month to have the rails laid into the dam site, when the ballasting of the track will be undertaken, so that the railroad will be in first-class condition for hauling materials. The city is prosecuting vigorously the completion of its power plant, so that it will have power to distribute along the line of the proposed work.

Contracts Awarded for Three Shipyards

Government Plants Will Be Located at Newark, Chester and Hog Island, Penn.

Contracts for construction of three Government-owned shipyards for building fabricated steel merchant vessels have been awarded by the Shipping Board's Emergency Fleet Corporation. They went to the Submarine Boat Corporation for a plant at Newark, N. J.; the American International Corporation for one at Hog Island, Penn., and the Merchants' Shipbuilding Co. for one at Chester, Pennsylvania.

The yards will cost $35,000,000 and the Government is given an option to purchase the lands on which they are located. The builders of the yards are given contracts for building in them 200 ships. The prospects are that contracts for many more vessels will be let when these are completed and more money is available.

The Submarine Corporation will lay ways for building 28 ships simultaneously and will have facilities and equipment to turn out one 5000-ton ship every two days after the first vessel is completed.

Close Bidding on Shandaken Tunnel

Two of three bidders for construction of the 18-mile Shandaken tunnel, New York water-supply, came within 2% of each other, as the opening of bids on Sept. 11 showed. The tunnel is a 10 ft. 3 in. by 11 ft. 6 in. horseshoe, concrete lined and grouted, in rock, and is to be constructed from light shafts. It extends from Gilboa, Schoharie County, to Allaben, Ulster County, N. Y., and will carry water from a new reservoir, on Schoharie Creek, southerly to the Ashokan reservoir (Esopus Creek).

The three bids, detailed in our "Contracting News" pages, totaled as follows: Degnon Contracting Co., $12,138,000; Booth & Flinn, Ltd., $12,374,000; P. McGovern & Co., $14,800,000. These figures apply to the entire length of tunnel. Separate bids were received from Degnon and McGovern for the north and south halves of the work, as called for by the bidding schedule.

The work is under the Board of Water-Supply, New York City; J. Waldo Smith is chief engineer.

Mobile To Have Municipal Docks

By an overwhelming majority the citizens of Mobile, Ala., voted on Aug. 13 to authorize the City Commission to arrange a bond issue of $[illegible] for the construction of a municipal water terminal. The project as designed comprises concrete wharves, piers and bulkheads, railroad connections to the water front and dredging to a depth of 30 ft. Warehouses are also included in the design but cannot be built within the present appropriation.

Engineering Society Starts Weekly Bulletin

Cleveland Technical Men Undertake Unusual Venture to Intensify Interest

In introducing Vol. 1, No. 1, of *Cleveland Engineering*, a four-page weekly, the Bulletin Committee of the Cleveland Engineering Society says: "It can hardly be said that the primary purpose . . . is to stimulate interest. The society is well known as an active and live organization. So that it appears better to state our purpose as that of stimulating interest," and hopes that the publication will draw the members into a feeling of closer contact with the society.

The bulletin will carry announcement of coming events, of the activities of the society, both socially and technically, and furnish a short index of leading articles in current technical literature. The first issue lists 34 articles from 17 journals. In addition, such announcements as the chairmen of various committees desire to make to the membership will receive place, and in this connection it is interesting to note that the chairman of the Program Committee has divided his work into nine sub-committees on technical matters and three on general matters, as follows:

1—Civil.
2—Mechanical
3—Electrical.
4—Mining and Metallurgical.
5—Chemical.
6—Architectural.
7—Automobile.
8—Military.
9—Municipal
A—Noon-day Meetings.
B—Weekly Bulletin.
C—Excursions.

The technical sub-committees are each composed of two men who will meet from time to time with the chairman of the main committee and one or another of the officers of the society.

Cleveland Engineering will in no way interfere with the issuance of the *Journal* of the society, but is intended as a timely supplement.

Cleveland Engineering Society Names Airplane Committee

To coöperate with Cleveland manufacturers who will take part in producing on a large scale the airplane parts for use by the United States Army now in France, the Cleveland Engineering Society has named a committee headed by H. C. Gamauter, of the American Multigraph Co. Other members of the committee are: Prof. F. H. Vose, of the department of mechanical engineering, Case School of Applied Science; James Dunlop, chief engineer for the F. B. Stearns Co.; Walter Baker, president of the American Ball Bearing Co.; Albert H. Bates, patent attorney; W. E. Dreier, district representative of the H. P. Sturtevant Company.

$14,550,000 To Help States Build Good Roads

Secretary of Agriculture Announces Apportionment for Fiscal Year Ending Jund 30, 1919

The Secretary of Agriculture has announced the apportionment of $14,550,000 of Federal funds to be used in the fiscal year ending June 30, 1919, by the several states in the construction and maintenance of rural post roads, as follows:

The division of this sum among the various states is given in detail on p. 117 of this week's "Contracting News." As will be recalled, the Federal Road Act of 1916, passed by the 64th Congress, provides that after 3% of the available annual funds have been retained for a contingent fund, the balance is to be distributed, one-third in the ratio of the relative areas of the several states, one-third in the ratio of their populations, and one-third in the ratio of their rural delivery and star routes.

This is the third apportionment under the act, $4,850,000 having been apportioned for the fiscal year ending June 30, 1917, and $9,700,000 for the fiscal year ending June 30, 1918.

Septic-Process Protective League Opposes Compromise

That the lawsuit over the Cameron septic-tank patents should be continued was the decision of a meeting of the National Septic Process Protective League held at Chicago on Aug. 14. About a score of members were present, including the president, Dr. H. M. Bracken, executive officer of the Minnesota State Board of Health. The league has now 184 members scattered.

A report of the secretary, Frank G. Pierce, Marshalltown, Iowa, explained that a suit brought by the Cameron Septic Tank Co., Chicago, is now pending against Shelbyville, Ky. This city is a member of the Protective League which has provided legal assistance. Its attorney, W. E. Lane, of Chicago, made a motion to dismiss the case, on various grounds, but the judge has recently given a ruling adverse to the motion. This is the only action that has been taken in the case. A resolution was passed in favor of continuing to render special legal assistance to the city in fighting the suit.

The report stated also that the Cameron Septic Tank Co. had made a proposition to the league for a compromise with the members, offering to make a reduction of at least [illegible] in its royalty claims. The members of the league are mainly opposed to such a compromise. To carry the litigation to the highest court, however, will require many more dues than the league can raise by the method now provided by its constitution, and for this reason the meeting was called to consider the situation. There was strong feeling in favor of carrying on the work.

Engineering Societies United by Central Council

National Groups Organized for Federal Aid; Aim to Represent Every Technical Society

The Engineering Council is a central committee of 24 men representing the four national societies of civil, mechanical, electrical and mining engineers. A lengthy official statement of its efforts and aims has been issued, the essential points of which are given in the following paragraphs:

The Engineering Council is the outgrowth of real need for united action upon questions of common concern, and the members hope that it may lead to wider coöperation in a strictly representative body for all the engineers in the country.

War has brought out impressively the actual need for united action. At present the council is supported by only four national societies, because that seemed the most practical way of getting a group together to answer the immediate needs (but the special committees already organized by the Engineering Council have in them representatives of other technical societies). These four societies have come together in pairs in the past for special purposes, but until the council was definitely organized in June there was no permanent body to advise all the societies.

The members of the Engineering Council are: For the United Engineering Society, Clemens Herschel, B. B. Thayer, I. E. Moultrop, Calvert Townley, secretary; for the American Society of Civil Engineers, John F. Stevens, George F. Swain, vice chairman; Fred H. Newell, Alex C. Humphreys, John D. Galloway; for the American Institute of Mining Engineers, P. N. Moore, S. J. Jennings, B. B. Lawrence, J. Parke Channing, Edwin Ludlow; for the American Society of Mechanical Engineers, Dr. Ira N. Hollis, chairman; John H. Barr, Charles Whiting Baker, Arthur M. Greene, Jr., Dr. D. S. Jacobus; for the American Institute of Electrical Engineers, H. W. Buck, vice chairman; E. W. Rice, N. A. Carle, P. Junkersfeld, C. E. Skinner.

Work Already Done

The first work of the Council necessarily has been its organization and the appointment of standing committees. These committees are: (1) Public Affairs, C. W. Baker, G. F. Swain, S. J. Jennings and E. W. Rice; (2) Rules, J. P. Channing, Clemens Herschel, N. A. Carle and D. S. Jacobus; (3) Finance, B. B. Thayer, I. E Moultrop, Calvert Townley and A. C. Humphreys.

As certain questions relate to the war and the assistance that engineers can render, a committee to be called the "American Engineering Service Committee" was appointed with instructions to invite the coöperation of all engineering societies. This committee in the first instance consists of A. D. Flinn, of the Civil Engineers; A. S. McAllister, of the Electrical Engineers; George J. Foran, of the Mechanical Engineers; G. C. Stone, of the Mining Engineers, and E. B. Sturgis, of the Metallurgical Engineers. Its present duty is the tabulation of the members of the five societies represented in order that the profession may take a larger part in the industries after peace is declared. At present the committee is devoting its attention to the immediate needs of the hour—the procurement of men for special service to the Government. A list of specialists in the societies has already been completed. Although a great many engineers have already entered through the engineering societies, through colleges and various special boards in Washington, the importance of a complete list of engineers and their professional specialties cannot be overrated. Such a complete list can be made only with the help of the local as well as of the national societies. The Service Committee is organized with G. J. Foran as chairman and A. S. McAllister as secretary. Communications will be sent out inviting coöperation and all societies are asked to respond.

Another committee, called the War Committee for Technical Societies, is made up of H. W. Buck, chairman; A. M. Greene, R. N. Inglis, C. R. Corning, G. C. Stone, D. W. Brunton, J. M. Boyle, J. V. Davies, Joseph Bijur, A. S. McAllister, W. D. Richardson and Charles Baskerville. It was appointed to assist any organization in Washington in any way in which it could bring to the attention of the engineers of the country the necessity for thought and help.

A Larger Council Planned

To enlarge the Council a union of all societies as the outgrowth of the present council is most natural, because many local societies and national societies also have a large membership in the four societies at present concerned. There are three classs of engineers to reach: (1) Those who are members of local societies and not members of national societies; (2) those who are members of national societies and not members of local societies; (3) those who are members of no society. There can be no question of the enormous advantage of union. That union should be completed by strengthening the existing agencies and not by the formation of new societies.

A council organized by the enlargement of the present Engineering Council can be very effective in many ways, without interfering with the autonomy of any individual society. Every society has some definite purpose of its own and also some which it holds in common with all other societies. One of the latter purposes relates to public service and to coöperation. The Council hopes that it may be successful in arousing sufficient interest to bring about a larger and better council for all engineers.

The office of the Council will be in the Engineering Building, 29 West 39th St., New York City.

General Manager of Portland Cement Association Dies

J. P. Beck, general manager of the Portland Cement Association, died in Chicago, Sept. 8, after a short illness. He was appointed to his present position a year and a half ago, at the time that the Portland Cement Association enlarged its activities. Over night, almost, its work was expanded more than five-fold, and it fell upon Mr. Beck's shoulders to create the machinery needed for the enlarged organization. That he did this unusually well is the testimony of the leading cement men of the country. His position was a difficult one. He had to satisfy the member companies, East and West, North and South, and he succeeded in this task by sheer ability, which showed in the success of his plans and administration.

Mr. Beck was graduated from the University of Illinois in 1907, and at once entered the advertising department of the Universal Portland Cement Co. Within two years he took charge of the department. His forceful personality and able handling of his work soon won him many friends and admirers in the cement industry. As a result he was asked about two years ago to draft a plan for the enlarged activities of the Association of American Portland Cement Manufacturers. This plan was presented at the annual meeting of the association, late in 1915. It was adopted and Mr. Beck appointed general manager of the renamed association to carry out the suggestions he had made. The work has developed very rapidly since that time, and instead of the one office in Philadelphia, district offices are operated in 12 cities.

In addition to his chief work Mr. Beck was for several years general manager of the Cement Products Exhibition Co., which conducts the annual Cement Show in Chicago. He also bore a leading part in the two national conferences on concrete road building.

Ouachita River Dam Fails

The drift pass and weir making up about a 150-ft. section of lock and dam No. 5 in the Ouachita River, near Monroe, La., and more than 100 ft. of the high bank on the west side of the stream were washed out Aug. 10, doing damage estimated at about $250,000. The break was probably due to the sandy bottom of the river.

The dam has been threatened on several different occasions and large sums have been spent in putting stone on the river bottom and on the bank to prevent wash. E. S. Maupin, engineer in charge of the construction of the locks and dams in the Ouachita River, gave no statement as to the future as plans will be determined by the board of engineers when they have had opportunity to estimate the damage. It is probable the site of the dam will have to be changed because of the condition of the river bank and the bed.

Cantonment Construction Nears Completion

American Contractors Equal to Great Task Put on Them by Rush of War Demands—Causes of Delay Are Local

COL. I. W. LITTELL, in charge of the cantonment construction for the United States Government, authorizes the following:

With the arrival of the first contingent of the new National Army at the cantonments Sept. 5, the status of construction at the various cantonments will undoubtedly be of public interest.

Altogether, 16 military cities have been built by the Government to house the 687,000 citizen soldiers selected for service by the draft. Of these cities, seven were ready Sept. 5 to receive their entire quota of officers and enlisted men. These seven included Camp Taylor, at Louisville, Ky.; Camp Travis, at Fort Sam Houston, Tex.; Camp Lee, at Petersburg, Va.; Camp Lewis, at American Lake, Wash.; Camp Sherman, at Chillicothe, Ohio; Camp Devens, at Ayer, Mass.; and Camp Grant, at Rockford, Illinois.

Seven Ready To Receive Officers

Seven other cantonments were ready to receive all the officers and two-thirds or more of their entire quota of enlisted men. These comprise Camp Dodge, at Des Moines, Iowa; Camp Funston, at Fort Riley, Kan.; Camp Custer, at Battle Creek, Mich.; Camp Pike, at Little Rock, Ark.; Camp Dix, at Wrightstown, N. J.; Camp Jackson, at Columbia, S. C.; Camp Gordon, at Atlanta, Georgia.

The two remaining National Army cantonments—Camp Upton, at Yaphank, L. I., and Camp Meade, at Admiral, Md.—have already received and are taking care of more than their full quota of officers and are ready to receive the number of enlisted men originally ordered there on Sept. 5.

An army of approximately 150,000 men was employed in the construction of the 16 National Army cantonments up to the first of September; since that date the force has been gradually reduced.

Certain Extra Units Not Complete

There are certain units in connection with each of the cantonments which were added after the original scheme was under way and which are, in some cases, not complete. These are general hospitals in addition to the regimental hospitals and remount stations to take care of some 12,000 horses each. The completion of these buildings will not, however, interfere with the reception of the citizen soldiers on the dates they have been ordered to report at the respective cantonments.

A typical layout such as is required for accommodating the officers and men at a cantonment comprises, in round numbers, 1500 separate buildings, requiring approximately 30,000,000 ft. of lumber.

Each cantonment requires a complete system of water-supply and sewage disposal, the piping alone for which amounts to more than 50 miles. The general warehouses, with necessary trackage, have also been provided. Where the facilities are not available in nearby cities, complete refrigerating and laundry plants have been built.

One Building Every Four Minutes

At each cantonment up to Sept. 1 it has been necessary to complete on an average of one building per hour, or for all the cantonments an average of one building every four minutes.

In the construction of the cantonments to date over 50,000 carloads of material have been transported to and delivered at the sites—an enormous tax upon the already overburdened railroad facilities of the country. The railroads, however, have given splendid service. All Government orders have received precedence and the lumber and other supplies needed have been rushed to the cantonments in record time.

The cantonments in the East have been handicapped by the fact that it has been impossible to secure sites without going away from the railroad lines and labor markets.

University Will Give Course in Public Utilities

Public utilities will be the subject of a special course of instruction by Professor Heilman at the School of Commerce, Northwestern University, Chicago, Ill. It is intended for those in the service of public-utility companies, governmental regulating bodies and financial firms; also for engineers and others interested in an understanding of the problems involved in regulation and control of utilities. The course will cover valuation, rate-making, service, operation of local utilities, financial utilities, governmental regulation and control, and the public-ownership movement.

Minneapolis Will Spend $1,000,000 for Increased Water-Supply

Minneapolis will spend $1,000,000 in new construction to increase its water-supply. Eight filter beds, four of which are under construction now, will be completed about the end of 1918. When Minneapolis began treating its water-supply from the Mississippi River by mechanical filtration, in 1914, it started with 12 filter beds. In 1915 four were added, giving a filtration capacity of 50,000,000 gal. daily. The average consumption was 30,000,000 gal. daily, but during an extended dry period in 1916 the demand crept up to 42,000,000 gal. The new filters will increase the capacity by 20,000,000 gal. F. W. Cappelen is city engineer, W. H. Jones, construction engineer, and L. P. Birdsall is superintendent of water purification.

Strengthen U. S. Public Health Service

Bill Creating Public Health Reserve and Providing for Co-operative Health Work

The joint resolution to establish a reserve of the United States Public Health Service, passed by the Senate last June, was favorably reported to the House on Aug. 30, but with amendments to change the resolution into a bill and to enlarge its scope.

If the bill as reported is enacted, officers of state, county and municipal health organizations, with the consent of the authorities under which they serve, and also "other persons skilled in sanitary science," may volunteer as members of the Public Health Service and on recommendation of the surgeon general of the United States Health Service, and with the approval of the Secretary of the Treasury, may be commissioned by the President with grade of assistant surgeons, past assistant surgeons, surgeons or senior surgeons for four years or during the present war, in accordance with rules and regulations prescribed by the President. When ordered into service these officers shall receive the same pay as officers of corresponding grade in the Public Health Service. The duties of the reserve corps shall be "directed toward the proper sanitation of ports and places" in or within the jurisdiction of the United States, including "especially places in and near which" either industrial or military forces are or are to be mobilized.

Officers To Hold Presidential Commissions

The bill as reported contains two sections which were to be independent of the provisions establishing a Public Health Reserve. One of these is designed to give Presidential commissions instead of Treasury appointments to any non-medical man appointed as chief of the division of chemistry, of zoology or of pharmacology in the Hygienic Laboratory, also to give Presidential commissions to sanitary and sanitary engineers, epidemiologists and assistant epidemiologists in the Public Health Service. The other section makes it the duty of the Public Health Service to cooperate with state, county and municipal health organizations and with officials in charge of industrial establishments, with a view to coordinating the activities and making effective the work of public health organizations in the United States.

Chamber of Commerce to Have War Meeting

A special war meeting of the Chamber of Commerce of the United States will be held at Atlantic City, Sept. 18-21, at which time will be considered the different phases of the problem of the Government control of prices, establishment of priority in requirements of the Government and of individuals for

materials and products, the supply of which is limited; and there will be discussed the industrial relations during the war, with particular reference as to how the Government can best procure the supplies most needed for the war and how to handle the interesting problems which arise in connection therewith. This war convention is expected to give business men an opportunity of expressing their thoughts and putting in definite form the results of their experience so that they may be as helpful as possible to the Government during the present crisis.

Engineer Officers' Reserve Corps Assignments

The following-named officers of the Engineer Officers' Reserve Corps now on duty at the engineer training camp, in the vicinity of Washington, D. C., are relieved from duty at that place and will report at the proper time at the divisional training camps indicated below for duty with the engineer regiments and engineer trains of the National Army at those places:

To Ayer, Mass.

Second Lieuts. Roy E. Kistler, Gerald Marcy Keith, R. Dale Braman, Ernest J. Kluge, Morris G. Shepard, John A. Root, Joseph W. Strong, Edward F. Deacon, John F. Foley, John F. Wood, Homer N. Bartlett and Grant E. Gay.

For assignment to the Three Hundred and First Engineer train, Ayer, Mass.: Capt. Elbert W. Tompkins, First Lieut. Kingsley T. Leighton and Second Lieut. Ralph W. Reynolds.

To Yaphank, N. Y.

For assignment to the Three Hundred and Second Engineers, Yaphank, Long Island, N. Y.: Maj. John H. Watson, Capts. Frederick S. Greene, Francis W. Perry, Gilbert H. Crawford, John W. Mark, Frank A. Giesting, Alfred Renshaw, Stratford St. J. Bushman, Thomas J. Scully, Henry W. Wilson, Harry L. LaFetra and Albert R. Ullrich; First Lieuts. Ralph L. Thomas, Victor G. Thomassen, Ernest V. Amy, John W. Aitken, Madison H. Lewis, Ernest L. Robinson, Charles A. Volz, Herbert A. Philip, John H. Halfpenny, Frederick W. Weston, James E. L. O'Ryan and Thomas H. Ellet; Second Lieuts. John H. Murrin, Francis J. Sinnot, Robert C. O'Donnell, Leslie O. Waite, Frederick W. L. Hill and Hamilton H. Howry.

To be attached to the Three Hundred and Second Engineers, Yaphank, Long Island, N. Y.: Capts. Edward B. Simmons, James B. Martin and Allard A. Dederer; First Lieuts. Harry G. Wood, Wilbur A. Oborne, Lewis H. Harder, Frank M. Gibson, Jesse Gover, Thomas G. Townsend and Thomas T. Newbold; Second Lieuts. Frank E. Edebohls, Everett H. Pierson, Howard A. Darrin and Frank P. Reilly.

For assignment to the Three Hundred and Second Engineers train, Yaphank, Long Island, N. Y.: Capt. Harry B. Per-Lee; First Lieuts. Samuel Gatalick, Jr., and Leslie C. Millar; Second Lieut. James A. Ryan.

To be attached to the Three Hundred and Third Engineer train, Yaphank, Long Island, N. Y.: First Lieut. Walter J. McGraw, Second Lieut. Frank Hammel.

To Wrightstown, N. J.

For assignment to the Three Hundred and Third Engineers, Wrightstown, N. J.: Majs. John P. Doyle and Ora M. Leland; Capts. Roy W. Gausmann, Bertram I. Hall, John D. Groves, Robert A. Greenfield, George A. Noska, George J. F. Carey, Ernest D. Hendricks, William J. Judge and Arthur G. Bouton.

Further assignments will be noted in next week's issue.

Personal Notes

JOHN A. STEVENS, consulting engineer, Lowell, Mass., has organized a department to design and superintend the construction of factory buildings.

H. WALTER LEAVITT has been appointed testing engineer for the Maine State Highway Commission, succeeding E. D. KINGMAN. Mr. Leavitt, who was recently student assistant testing engineer in the United States Office of Public Roads and Rural Engineering, will have charge of the Highway Laboratory which is located at the University of Maine, Orono, Maine.

STANLEY DEAN, associate professor of hydraulic engineering, Armour Institute of Technology, Chicago, since June has been chief of surveys at Camp Jackson, having charge of field work on the construction at that point. He is on leave of absence from the institute until the work at Camp Jackson is completed.

HENRY WELLES DURHAM, consulting engineer, New York City, has been ordered on active duty in the Engineer Officers' Reserve Corps and has closed up his private business.

GEORGE L. CHRISTIAN, formerly assistant engineer, the Department of Public Works, Borough of Manhattan, N. Y., has accepted an appointment as deputy city engineer of Yonkers, New York.

JAMES A. F. STRYKER, formerly with the Richardson Engineering and Construction Co., Bainbridge, Ga., is at present at Lakeland, Fla., in charge of the new post office as chief engineer with the Wise Granite and Construction Co., of Richmond, Virginia.

E. J. CHAMBERLIN has resigned his position as president of the Grand Trunk Ry. and is succeeded by HOWARD G. KELLEY, vice president, whose assumption of Mr. Chamberlin's duties during the latter's absence on a three months' leave was noted in these columns under date of Aug. 2. Mr. Chamberlin was appointed president in 1912 in succession to the late CHARLES M. HAYES, who lost his life on the "Titanic," having previously held the position of vice president and general manager for two years. He was born in Lancaster, N. H., and came to Canada in 1896 as general manager of the Canada Atlantic Ry. Mr. Kelley is a native of Philadelphia and held several important positions on American railroads, becoming chief engineer of the Grand Trunk Railway System in 1907 and vice president in 1911. GEORGE C. JONES, formerly vice president and general manager of the Central Vermont Ry., has been appointed assistant to Mr. Kelley, with headquarters at Toronto. U. E. GILLEN, late general superintendent at Chicago, becomes vice president, and W. D. ROBB, vice president in charge of motive power.

CLYDE S. CONSTANT, formerly in the contracting business at Junction City, Kan., is at present employed by the Government in the sewer and water department of the new cantonment at Ft. Riley, Kansas.

H. A. HARROLD, formerly draftsman for the California Highway Commission, is at present city engineer and superintendent of streets for the City of Napa, Calif. After graduating from the University of Oregon in 1909, Mr. Harrold became rodman on construction work with the Northern Pacific Ry., and was then assistant municipal engineer for the municipality of South Vancouver, B. C., later becoming assistant engineer for Vallejo, California.

GEORGE H. HILL, formerly chief engineer of Bluefield and chief engineer of county road construction in Mercer County, West Virginia, has been appointed assistant engineer of the West Virginia State Road Commission. Mr. Hill will have charge of road matters in the Counties of Gilmer, Braxton, Clay, Webster, Nicholas, Greenbrier and Pocahontas, with headquarters at Charleston, West Virginia.

J. S. BRIGHT has accepted a position as civilian engineer with the Federal Government, with headquarters at Portland, Ore. Mr. Bright was recently resident engineer on the Tulare County, California, highway system.

W. E. FIRTH, safety engineer for the Midvale Steel Co., Nicetown, Philadelphia, has resigned.

J. E. MCALLISTER has been appointed vice president and general manager of the National Steel Car Co., of Hamilton, Ont. Mr. McAllister was formerly general manager of the British Columbia Copper Co. and has been consulting engineer to the British American Nickel Corporation.

E. W. M. JAMES, of Winnipeg, has been appointed bridge engineer for the Road Commission of Manitoba.

W. R. HOLWAY, formerly assistant engineer, Providence (R. I.) Water-Supply Board, has accepted the position as sanitary engineer of the water-purification plant and sewage-disposal works of Alliance, Ohio.

MISS ESTHER JACK has been appointed city engineer of Williston, N. D., to succeed CAPT. E. R. EVANS, who has been called into the Federal service. Miss Jack is the first woman to graduate from the engineering department of the State University of North Dakota.

CLARENCE E. RAYNOR, formerly assistant engineer in the valuation department of the Seaboard Air Line Railway Co., at Norfolk, Va., has been appointed senior highway engineer, Office of Public Roads and Rural Engineering.

BUSINESS NEWS

Has Purchased the Business of the Sarco Company

The Standard Asphalt and Refining Co., of Chicago, Ill., has purchased the plants, trade marks and goodwill of the Sarco Petroleum Products Co. The Cities Service Co., of 60 Wall St., New York City, is the new interest in back of this company, although the management remains essentially the same as before the change.

Charles Muller, who was an executive of the former company, now becomes manager. He has been associated with the old company for 10 years and has risen through the ranks to his present position and is well known in business and financial circles in Chicago. Robert F. Trumbull has been promoted to manager of the railway and building materials department. He has been in the service of the old company for eight years in this department. By constant contact with the trade during that time he is intimately acquainted with its requirements for asphalt materials.

The indications are that the new company will be much more active than the old and that its facilities for serving the trade will be greatly increased due to the extensive control of crude materials possessed by the Cities Service Company.

Brick and Tile Products Show Large Increase

Large increases in the value of brick and tile made in the United States in 1916 are reported to the United States Geological Survey, Department of the Interior. The total output amounted to $159,042,849, an increase of $33,248,005, or more than 26% over the figures for 1915. The value of every variety of product classified by the Geological Survey except two was increased. Common brick, the product of greatest value, the output of which has been declining in recent years, showed a large increase in both quantity and value.

There were 7,394,202,000 brick reported for 1916, valued at $49,357,411, or $6.68 per thousand, an increase in quantity of 543,103,000 brick and in value of $7,212,119, or 17%. Fire brick, valued at $30,806,129, increased $11,966,198, or 64%. Sewer pipe, which showed a large decrease in 1915, rallied in 1916 and showed a large increase. Its value in 1916 was $13,577,006, an increase of $2,317,657, or 21%. Vitrified brick or block remained practically stationary, being valued at $12,236,890, an increase of only $5991 over 1915. The front brick industry showed a considerable gain, its output being valued at $11,464,614, an increase of $1,929,078, or 20%. Drain tile and architectural terra cotta also showed a large increase over 1915. Tile (not drain) valued at $6,475,464—consisting of roofing tile ($914,240), floor tile ($1,438,231), ceramic mosaic tile ($1,308,861), faience tile ($814,077), and wall tile ($2,000,055)—showed a gain of $1,289,409, or 25 per cent.

Brick and tile products are classified naturally into three divisions, (1) structural materials, (2) engineering and refractory products, and (3) miscellaneous wares. The first, structural materials, including building brick of all kinds, terra cotta, fireproofing and tile (not drain) was valued at $84,643,252 in 1916, an increase of $14,234,136, or 20% over 1915; the second, engineering and refractory products, consisting of vitrified drain tile (used principally for paving), sewer pipe, stove lining and fire brick, were valued at $67,305,448, an increase of $15,636,664, or 30%, over 1915; the third, miscellaneous wares, consisting of such products as adobes, assay supplies, burnt clay ballast, chemical brick and tile, chimney pipes, tops, conduits, glass house pots and supplies, retorts, sewer block and wall coping, were valued at $7,094,149, an increase of $3,377,205, or 91%, over 1915.

Pennsylvania was the leading state in the production of brick and tile, reporting these wares to the value of $29,630,563, or 19% of the total, an increase of $8,732,281 over 1915. Pennsylvania's principal brick and tile product in 1916 was fire brick, valued at $15,200,354, which was nearly 50% of the total value of fire brick for the entire county. This was an increase of $6,111,404 over 1915. Ohio ranked second, with products valued at $[illegible], or 12% of the total, an increase of $4,596,502. Ohio's principal brick and tile product in 1916 was sewer pipe, valued at $6,102,810, an increase of $1,315,020 over 1915. Illinois was third, with products valued at $[illegible], an increase of $[illegible] over 1915. Illinois' principal brick and tile product in 1916 was common brick, of which it was the leading producer, its output being valued at $6,738,152, a decrease of $132,838 from 1915. New Jersey was fourth and New York fifth, with products valued at $9,749,524 and $8,410,340 respectively, both states showing large increase in value compared with 1915.

Notes from

MAKERS OF PLANT AND EQUIPMENT

The Armco Iron Culvert and Flume Manufacturers' Association, of Middletown, Ohio, is supplying a large quantity of corrugated pipe for culverts under the new highway which connects the east and west coasts of Florida.



The route is known as the Tamiami Trail and extends from Tampa to Miami. The drainage of the great swamp crossed by this road will, it is believed, proceed rapidly under the authorization recently granted by the Florida legislature.

The Merchant Shipbuilding Corporation announces the following organization, effective Aug. 10: Chairman board of directors, W. A. Harriman, New York; president, R. H. M. Robinson, New York; vice president and comptroller, C. B. Seger, New York; vice president, C. W. Hamilton, New York; general manager, W. T. Smith, Philadelphia; consulting engineer, C. P. M. Jack, Philadelphia; engineering manager, Max Wollenberg, Philadelphia. This company is about to undertake the construction of 40 ships at its plant at Bristol, Penn., agents for the Emergency Fleet Corporation.

Chester H. Lehman, for the past six years secretary and director of the Blaw-Knox Co., Pittsburgh, has entered the service of the United States Government for the duration of the war as first lieutenant of artillery.

The Asbestos Protected Metal Co., of Pittsburgh, announces the appointment of C. A. Crews, formerly manager of the Grand Rapids office, in full charge of the Detroit office, located in the Ford-Stout Building. M. W. Tabor, formerly Detroit manager, has been appointed District manager.

The Warwick Steel and Iron Breaking Co., Inc., of Philadelphia, has recently been incorporated with Frank Dallett, president and treasurer; C. C. Bland, vice president and manager; and F. A. Dutton, secretary. The plant at Warwick, Penn., is designed to break large and unwieldy pieces of iron and steel. The company also intends to handle scrap of all kinds and dismantling projects of any size.

The Erickson Engineering Co. was recently organized by C. J. Erickson, of the Erickson Construction Co., Downs Block, Seattle. The company will engage in the construction of ships, having already established a plant on the Dumwamish Waterway in Seattle. Other incorporators are: C. E. Erickson and Charles M. Barnett. Capitalization is $2,100,000.

The Maritimo Coating Corporation, formerly located at 1733 Grand Central Terminal, is removing from the present quarters to more commodious ones at 2 Rector St., New York City. At a regular monthly meeting of the board of directors of this corporation, the following changes were made: Charles King, of the firm of Tams, Lemoine & Crane, marine architects, was elected president in the place of J. Willoughby Mitchell, resigned; L. B. Stoddart was elected treasurer in the place of C. A. Richards, whose duties in connection with the United States Bureau of Exports require his entire attention.

APPLIANCES AND MATERIALS

Steam-Jacketed Centrifugal Pumps Asphalt

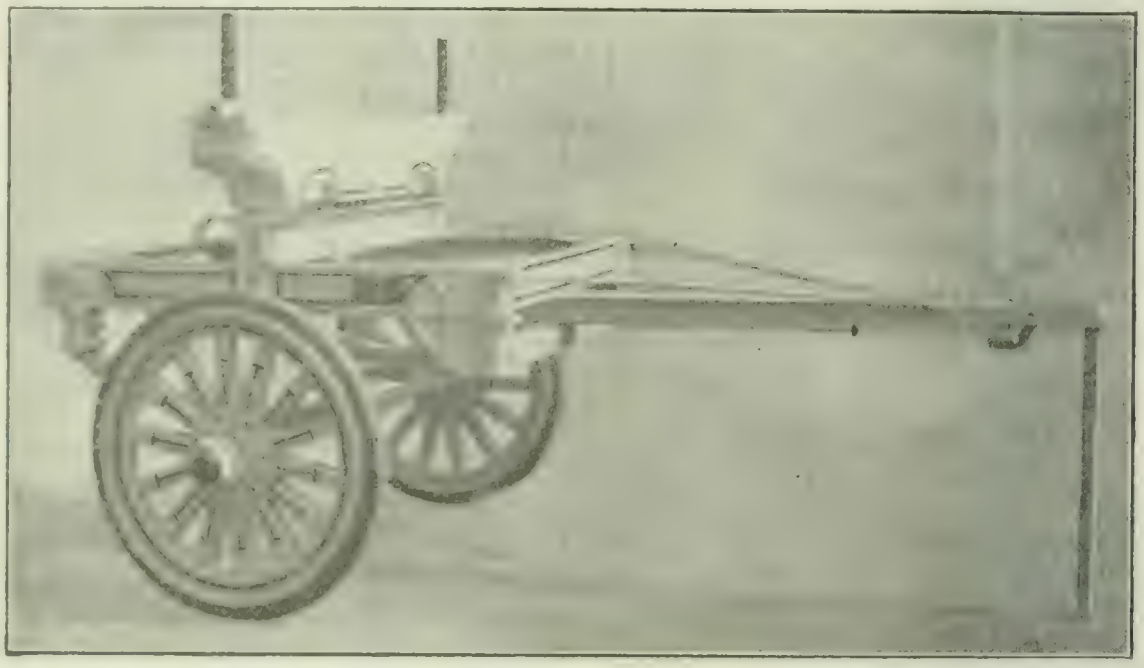
A novelty in centrifugal pumps is the steam-jacketed unit being put out by Hetherington & Berner, of Indianapolis, for handling asphalt which carries a considerable proportion of mineral matter which it is not desired to remove. With this pump it is unnecessary to watch out for foreign substances such as nails, pebbles, splinters, etc. The pump is mounted on the same base with a small steam engine taking steam from the same boiler plant which supplies the rest of the asphalt outfit.

New Goggles Give Sure Protection

A new type of safety goggles for protecting the eyes of workmen from flying particles, dust, heat, light or injurious gases has been put out by Strauss & Buegeleisen, 37 Warren St., New York City. The special feature consists in making the lenses of two layers of optical glass with a layer of celluloid interposed, the whole being "welded" together. This gives a lens which, it is claimed, has every protection which either plain glass or celluloid alone gives: That is, it is not affected by water, heat or cold and the goggles will not cloud up with moisture, since the celluloid acts as heat insulation; it can be broken as by a hammer blow and no splinters will fly; cracked lenses are gas and watertight. These goggles have been adopted by the United States Army for aviators and the lenses for gas masks.

Truck Trailer Swivels Under Load of Long Pipe

Motor-truck transportation of long pipes, well casing and other similar articles in the Oklahoma oil fields is facilitated by the use of a special two-wheel trailer shown in the accompanying view. The steel frame is mounted by long semi-elliptic plate springs on a steel axle having artillery-type wheels with 4-in. solid rubber tires 36 in. in diameter.



TRAILER HAS PIVOTED BOLSTER TO CARRY LONG PIPES AND TIMBERS

One feature is the pivoted bolster which carries the load and which allows the trailer to swivel beneath it in making turns or passing curves. A similar bolster is carried by the motor truck or tractor. Another feature is the drawbar, which is adjustable to suit the load and can be extended to a maximum length of 14 ft. This trailer truck was devised and built by the Warner Manufacturing Co., of Beloit, Wis., and over 75 of the trailers are now in use in the oil fields.

An Automatic Starter Made for Induction Motors

An automatic compensator for induction motors, enabling the remote or push-button control on this type of drive, has been developed by the Electric Controller and Manufacturing Co. of Cleveland. It can be installed by any ordinary electrician and operated by any workman or machine operator. This new device starts induction motors in the same way that the hand starters do—imposing on the motor a reduced voltage from a compensating transformer at first, and quickly substituting full line voltage as the speed comes up

The mechanism is built as a mechanical unit that slips into a cast-iron casing and is submerged in oil. A cover bolts on and the motor, line and control leads come out like those on an ordinary transformer. The mechanism includes a small transformer, a large magnet for establishing the transformer connections, and a relay which trips a spring mechanism for throwing full voltage on the motor. When the external supply is cut off the operating magnet goes dead, and the motor is immediately disconnected from the line. Under such conditions the starter contacts resume their initial position. The same action results when the operating-magnet circuit is opened for motor control, this control being secured by opening or closing the control-magnet circuit through a special circuit. Low-voltage and overload release can be obtained from relays mounted on a separate panel and connected into the remote-control line.

Henry Ford Produces a Motor Truck for $600

Great interest attaches to the announcement that the Ford Motor Co., of Detroit, is now ready for the commercial production of one-ton trucks which are Ford machines from end to end, and not adapted pleasure cars. But there is, of course, a certain similarity to the familiar Model T.

The engine, hood, planetary-gear system, clutch, front axle, front wheels, steering gear and lighting system are the same as on the pleasure car. The side members of the chassis are heavier. The wheel base is 123 in. and the rear wheels have 32 x 3-in. solid tires. The rear axle is modified for worm drive, but there is otherwise a general resemblance to the familiar Ford type. Propulsion stresses are taken by radius rods with pivot connections at the outer ends of the rear axle. The rear springs are of the familiar transverse type, but heavier than employed on the pleasure car. The sale price at Ford agencies is to be $600.

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A WEEKLY JOURNAL
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AND CONTRACTING

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Governmental Action Is Called For

MONTHS ago the exemption of engineering students from military service was urged in these columns. The plea has remained unheard, and it needs forcible reiteration now in view of the technical colleges' appeal for more engineering students. High representatives of the Government, moreover, have made similar appeals individually. As yet there is no result. On the other hand, a recent order exempts medical students from service in the National Army. Upon our national engineering societies and engineers in responsible positions at Washington now rests the duty of securing corresponding recognition of the engineering profession's needs.

No Water-Works Consolidation in Sight

IN HIS presidential address before the annual convention of the New England Water-Works Association at Hartford last week, Mr. Saville disapproved of the project for a single national water-works association involving some form of consolidation between the New England and the American organizations. In other words, the prospect for a union between these two bodies is just as remote as it was last year and the year before that. However, the question is a sort of hardy perennial and will doubtless make its appearance at future conventions, in spite of the fact that there is an air of finality about President Saville's words. "With other organizations," said the head of the New England body, "we will work together gladly, and we welcome all water-works men to our membership. Careful consideration of our own particular needs and purposes, however, forbids any thought of combination with others."

Water Filtration Shows Engineers Ready to Serve

THE MANIFOLD resources at the command of the engineer to-day make him a potentially great public servant. How ample his resources are compared with thirty years ago is strikingly illustrated by George A. Johnson's paper on rapid sand filtration read at the Hartford convention of the New England Water-Works Association last week. The rapid or mechanical filters of the eighties, crude in every respect, were held to be all sufficient. Today, notwithstanding great refinements in mechanical filters, not merely pre-treatment but after-treatment as well is the rule. The engineer now has at his command a wide range of choice in purification processes and combinations and no lack of scientific knowledge to guide him in so fitting them to local conditions as to produce the best water at the least cost. The community which tolerates turbid or colored or typhoid-infected water today has only its own ignorance, negligence and parsimony to blame. In hundreds of other fields engineering and the engineer stand equally ready to put the resources of nature and art and science to the service of mankind.

Master and Service Water Meters Cut Waste

EVERY water-works superintendent knows that water meters applied to consumer's services cut waste. Not all have learned, or having learned have not convinced those who hold the purse strings, that for the most effective control of water waste master meters are required to record the water supplied to the various districts of the city and thus enable the waste to be traced. Mr. Killam's paper on service meters and water consumption in the Massachusetts Metropolitan Water District, printed on page 541, shows that with 69 venturi master meters and an increasing use of service meters in Boston and vicinity a remarkable reduction in consumption and waste has been effected in eight years. That much more needs to be done is evident from the high night consumption which still prevails. This high figure in the Boston district and persistently high figures of both day and night consumption in other places having a large percentage of taps metered was a source of wonderment at the Hartford convention before which Mr. Killam's paper was presented. Might not the general extension of the use of master meters reduce night consumption—which is mostly waste—and with it cut down to a more reasonable figure the high percentage of water unaccounted for in some of our fully metered American cities?

Federal Investigations Point the Way

THE [illegible] for the experimental work of the Federal Government to take is one that will result in pointing a safe way for others to follow. We are expecting, of course, to work which is primarily the

function of the state, the city, the private corporation and individual rather than of the Federal Government itself. A notable example of such trail blazing, made all the more notable by the way private industries are following it, is afforded by the tests of tannery wastes treatment made by the United States Public Health Service at Luray and Cincinnati, briefly outlined on page 553. The tanners became so much interested in these laboratory tests that they clubbed together and built a working unit at one of the tanneries in order to see for themselves whether successful laboratory tests under skilled direction could be equaled in a permanent plant without technical supervision. Experience is showing that they can be excelled! By experimenting at one place just long enough to point the way and then moving apparatus and men on to a fresh trade-waste investigation the Public Health Service economizes men and funds, multiplies its usefulness, and stimulates the manufacturers to take up the work themselves. It performs its function in pointing the way.

Road Shoulders Must Be Kept Clean

THE impression seems to exist among many road engineers that the chief purpose of the gravel, macadam or earth shoulders of a pavement is simply to furnish an additional width of roadway, losing sight of the fact that the principal function of the shoulders is to facilitate drainage. It is a common experience to see a considerable amount of money spent in building shoulders and to see the same shoulders a year or two later entirely grown over with grass and weeds. On a continuous trip by an editor of *Engineering News-Record* over the roads of New York, Ohio, Kentucky and Tennessee, in only one locality were highway officials found who made it a regular practice to keep the shoulders of concrete, brick and asphaltic pavements absolutely free from grass and weeds, giving a smooth, hard surface from the crown of the pavements to the centers of the side ditches. This was accomplished by regularly scraping the shoulders with a steel-bladed road machine or drag, adding new material and rolling where necessary and removing scraped up matter.

The improved appearance of highways thus treated can be easily conceived and would alone justify the slight expense involved with any highway department which fully appreciated the aesthetics of road building. Aside from any such consideration, however, the engineers of the New York State Highway Division, with headquarters at Rochester, where the work described has been done, state that it is entirely justifiable from the standpoint of reduction in maintenance costs.

It has been found by experience many times over that grass and weeds growing at the edge of a pavement retain moisture and are often responsible for failures which could have been avoided had the shoulders been taken care of. It should never be lost sight of that the surface drainage of any pavement is not complete until the water has been led far enough away to prevent it from seeping underneath the pavement.

Has Pound-Price Bidding Injured Bridge Engineering?

FOR the better part of a generation bridge construction has followed along well defined channels. The general lines of thought persisted without change and advance was in refinements of detail practice. Now that we appear to stand at the beginning of a new era, it is pertinent to ask whether this static condition of the past twenty years has any leading factors that can be discovered. The elimination of such elements may bring about better conditions for progress in the coming era. A generation ago a new method of contracting for railway bridges was introduced. Bridge building companies until then had submitted designs and lump-sum bids. Their competition was as much in design as in economy of shop and erection work. Looking back to the earlier days, one may observe how the names of large bridges are commonly connected with the names of prominent bridge building concerns. The engineers of those concerns were the creators of the structures. Their individuality is still reflected in the economy, life and appearance of the bridges. This state of affairs no longer exists. The practice of pound-price bidding has altered it.

Under the pound-price practice the purchaser's engineers fix the general layout and type of design, and then contractors are asked for bids per pound of steel in the finished structure. This method affords the contractor no opportunity to introduce his own ideas and experience. He has no inducement to save weight and reduce the total cost. He is no longer the creator of the structure that he builds. On the contrary, he is under the commercial necessity of putting as much metal as possible into the finished structure and saving labor wherever possible in order to live up to the pressure of a pound-price reduced to the last hundredth of a cent a pound.

In the actual application of the method there is much opportunity for the contractor to work to his own advantage, and—experience shows this, despite purchaser's plans and specifications—little opportunity to suggest or secure modifications of design for improving the quality of the bridge. The purchaser is reluctant to entertain proposals involving ideas differing from his, for he is apt to hold that his own idea if not better is at least fully equal to the contractor's. On the other hand, effort to reduce total weight in the detailing is virtually non-existent, for only rarely is the purchaser able to show how metal is to be saved, while the pressure of necessity leads the contractor to checkmate any endeavors in this direction.

In setting forth these conditions, *Engineering News-Record* is well aware of the imperative reasons that led to the abandonment of lump-sum bidding. Abuses had come to flourish that were serious indeed, and "skinning" of details, as was by no means rare in the early '90's, demanded radical reform. The waste of effort involved in the preparation of numerous plans, all but

one of which were to be discarded, was a contributing factor, though of perhaps secondary importance. It seemed inevitable that competition between different bridge building contractors should be put upon a definite, business-like basis, where the relative economy of work of the several bidders would not be obscured by radical differences in design. All these reasons have force today as they did twenty-five years ago. Yet they do not essentially modify the meaning and definiteness of the picture above presented.

The case presents a distinct and important problem to all who are concerned with bridge construction. It seems clearly evident from a careful survey of the conditions as they developed during the past generation that pound-price bidding has not only led to the expenditure of much more money in bridges than the purposes required, but has also laid a paralyzing hand on the development of the bridge designer's art. What seems called for under the conditions is a return to such a form of competitive bidding as will stimulate originality and resource in bridge design. We need have little apprehension that bridge engineers of today —when the profession is on a very high plane of development indeed—will allow the same abuses to spring up that, many years ago, led to the adoption of the pound-price method.

The Magic of the Cantonments

LAST week's news brought from the War Department the statement that two of the sixteen cantonments for the National Army are 100 per cent. completed and that the others, except two where local conditions delayed a fair start, are well along toward completion. By the time these lines appear, it is probable that the list of finished camps will contain several additions. Progress is rapid on these jobs.

It has been a race against time, and the American contractor has won. A new chapter has been added to construction history, a chapter that suggests feats of legerdemain on a colossal scale. The contractor, in the role of magician, makes a few swift passes over a tract of wilderness and a city for 40,000 people springs up.

Yet it is no shallow trick of stagecraft. There is no illusion, no painted canvas, no ingenious manipulation of lights to create a semblance of strength and stability. Everything is real, substantial. The promise of three months ago is a fact of today. Then acclaimed the greatest building program of history, now it is the fulfillment of a nation's dream and wish.

Even to us, the engineers and contractors of the country, accustomed to the planning and direction of huge enterprises, the accomplishment creates wonderment. Try as he will, the layman can not comprehend what has been done. It is difficult enough for those familiar with construction methods to get a clear appreciation of the work without having visited a number of the cantonments while progress was at its highest.

The problem has been one of organization primarily—of creating in a few days machinery to handle huge quantities of materials and huge labor forces. Yet the American contractor and the American engineer have been found equal to the stupendous task set for them.

Moreover, the results reported by the War Department are an unqualified endorsement of the wisdom of the policy which cast aside the red tape of normal government methods, picked the right men for the work and gave them unlimited authority.

When the history of the war is written, we trust that the era of preparation will not be slighted—for the story of the cantonments is well worth passing down to future generations of Americans.

Facts on Sea-Water Concrete

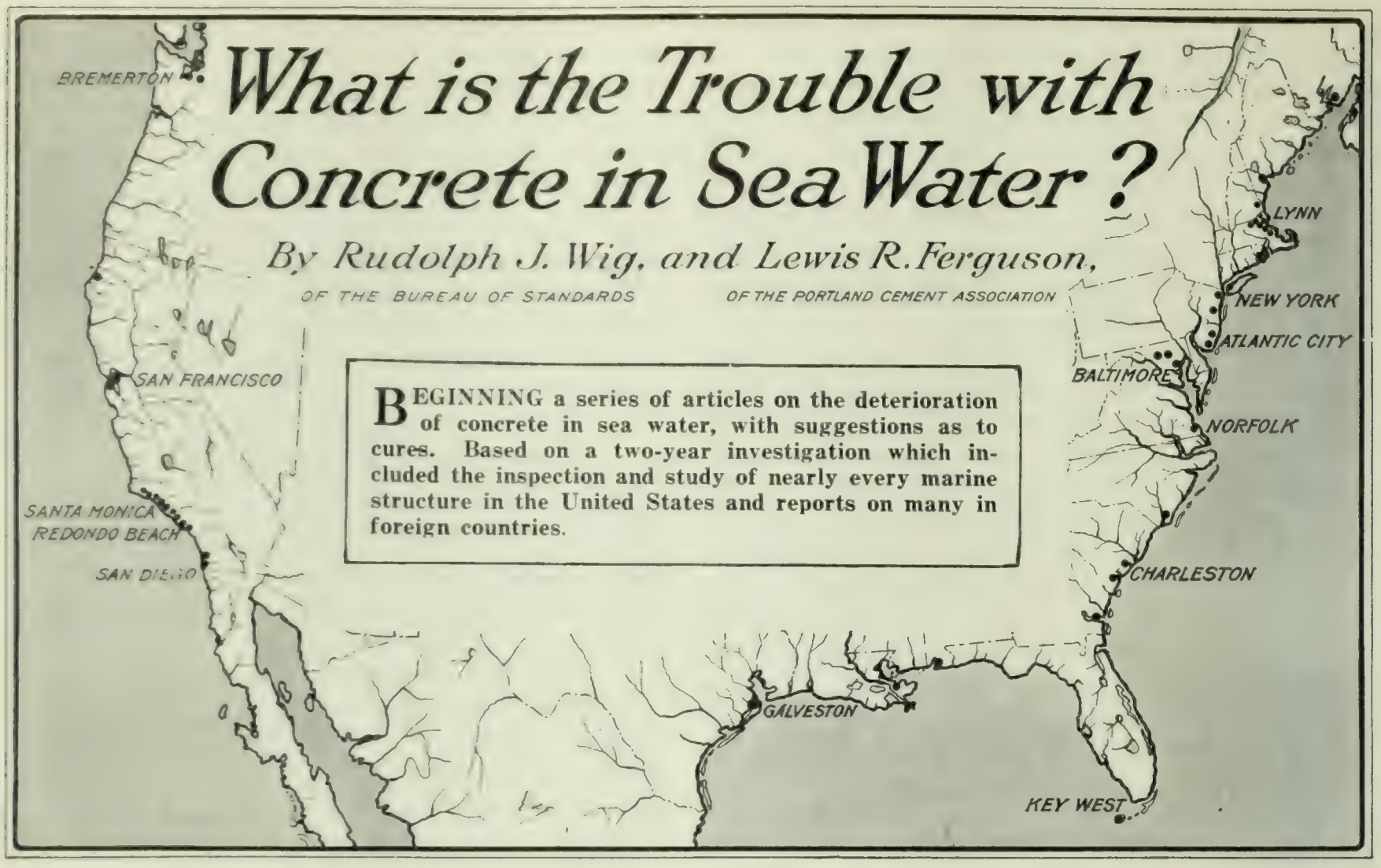
THE literature relating to the use of concrete in sea water is extensive. For instance, in one of the most elaborate recent reports on the subject, by W. W. Pagon of Baltimore, 145 references to related articles are listed. Yet it is safe to say that a careful reading of all these references would not be a certain guide as to the possible use of plain or rei nforced concrete where exposed to sea action, because the premises of each article are either pure theory or else observation of a limited number of structures subjected to a limited number of actions.

In the study of the behavior of concrete the safety of conclusions is almost proportional to the number of structures under observation. The elements that go to make up concrete or affect its wear are so many and so diverse that it is always easy to shift blame for failure upon some element not favored by the investigator, particularly when an individual instance is under discussion. For this reason, if for no other, the articles by Messrs. Wig and Ferguson on concrete in sea water, which start on page 532 of this issue, have commanding authority. Where other investigators have seen a dozen structures or studied a score of reports, these have closely inspected hundreds, and the inspection has been accompanied by complete historical records of the conditions of manufacture and material. The result is that they have a background of fact which permits deductions not to be controverted by the isolated instance.

Just what these deductions are will be brought out in future issues. In some ways they are repetitions of the past, in others they are radically new. Old or new, however, there is no doubt that they will have a marked influence on this important field of concrete construction. Concrete is too admirably adapted for all marine structures to be discarded for that use because of frequent and all-too-evident failures. But those who use it must have a proper appreciation of the danger surrounding its use and must be sure that, both in design and construction, they treat the pervasive and persistent sea water with the deference it deserves. At some future time probably this report will have official publication in full. *Engineering News-Record* deems itself fortunate in be able to present to its readers now a complete résumé of this important engineering investigation.

What is the Trouble with Concrete in Sea Water?

By Rudolph J. Wig, and Lewis R. Ferguson,
OF THE BUREAU OF STANDARDS OF THE PORTLAND CEMENT ASSOCIATION



BEGINNING a series of articles on the deterioration of concrete in sea water, with suggestions as to cures. Based on a two-year investigation which included the inspection and study of nearly every marine structure in the United States and reports on many in foreign countries.

THE durability of concrete in sea water has been a subject of absorbing interest to engineers for many years. Numerous isolated structures have been examined and many theories have been advanced, but it is safe to say that there is no unanimity of opinion among engineers as to the condition of marine concrete or as to the causes of deterioration, if such deterioration is admitted.

It has been the privilege of the writers in the past two years to make a personal examination of nearly every concrete structure in sea water in the continental limits of the United States, besides a great number in Canada, Cuba and Panama. These structures are tabulated herewith. In addition, detailed information has been secured through American consular offices on the methods of construction and present condition of concrete works in various harbors all over the world. As a result of this study, the writers are convinced that they have secured data which warrant conclusions of great importance to the engineering profession. In many cases the conclusions drawn are at variance with common engineering practice, which is shown to be incorrect by the comprehensive evidence at hand, and some radical changes in design and methods of construction are suggested. These conclusions account for the almost universal progressive decomposition of concrete in sea water and lead to suggestions for the improvement of concrete making and placing, which should insure the permanency of a material that otherwise is so well suited for many needed ocean structures.

It is the intention to outline some of the studies made and to abstract the conclusions in a series of articles of which this is the first. These articles will demonstrate that (1) permanency for plain and reinforced concrete can be obtained under most, but not all, conditions of exposure; (2) all concrete in sea water, both in northern and southern climates, is subject to chemical disintegration under certain conditions; (3) *reinforced* concrete of excellent quality, designed according to recommendations of engineering societies and present practice, is subject to relatively rapid deterioration in most localities; (4) the materials and methods used in construction have an important bearing on the durability of concrete and the design and the protection provided influence greatly the permanency of the structure.

The accompanying map, indicating the structures examined, will give some idea of the wide scope and comprehensive limits of the investigation. The fact that the number of structures examined has been so large is of much importance. Any investigation which is confined to a limited section of the country would lead one to draw very erroneous conclusions, if deductions of a general character were attempted. Such general deductions can only be made after a survey of broad scope covering sections where widely varying climatic and physical conditions exist.

In addition to this, the facts must be known about the methods used in construction, the materials of which the concrete was made, the amount of water used in mixing, the past and present conditions of exposure, the salt content of the water, and in fact all the details which can only be secured by a careful examination of the structure, by studying the specifications, drawings, records and photographs made during construction, and by interviewing those actually in charge of the work.

This information was secured by the writers in conformity with a detailed questionnaire, and the data thus obtained frequently offered the true explanation of existing conditions. Without this detailed knowledge, entirely wrong conclusions might easily have been drawn,

and in fact this was found to be the case in a number of instances. Of course, it is often difficult to unearth the actual facts about the building of a structure ten or fifteen years old; unless these facts appear in the records or can be seen from a progress photograph they must be secured from the engineers and inspectors who had charge of the work. If any defects are now in evidence or if the concrete is deteriorating these men feel a sense of responsibility and sometimes are loath to tell what actually happened during the construction. The conditions under which the present investigation was made were extremely fortunate, for to the greatest possible extent were all the facts made available.

One or two examples of the utility of historical references may be cited. In the right-hand view herewith is shown a concrete wall in a state of progressive disintegration. If one were to examine that wall in the light of present information there might be some difficulty in understanding or analyzing the reasons for the partial failure. However, an examination of the left-hand view, which is of that wall 12 years before, throws great light on the trouble. It will be noticed in the early view that construction seams were formed, as indicated by the arrows. The wall was built dry within a cofferdam, and although perfectly obvious the seams do not look particularly dangerous. A study of the later picture, however, shows that the deep erosion of the sea water has taken place right along these construction seams.

There is a concrete pier along the New England coast which has been the subject of a number of investigations and reports. This pier was built about fifteen years ago, and even before it was completed there were signs of deterioration. This continued and before a great while endangered the stability of some parts of the structure. From the construction photographs it was evident the concrete was mixed dry. The inspector who had charge of the work was the one who offered the most substantiating evidence to this effect. He said: "Yes, the concrete was dry, very dry. One day I tripped and fell into a freshly mixed batch, and when I got up I brushed the dust off my clothes." In another case an inspector testified to the fact that a tremie had not been used in its normal and expected fashion, but merely as a chute, permitting the concrete to settle from its bottom through 8 ft. of water.

It is not the intention of these articles to demonstrate that concrete cannot be used for marine structures. On the contrary, it is the opinion of the authors that it is a most economical material to be used if it is made so as to successfully resist sea-water action, and it is their opinion that it can be made so. The articles will, however, illustrate in an emphatic manner the rapid deterioration which results from the use of too little or too much water in mixing concrete, the origin and development of deterioration from normal construction seams which are common to most concrete work, the protecting influence of adequate fender systems or granite facings, the need for radical modification in the design of reinforced-concrete marine structures, and the conditions under which sea water can be used in mixing the concrete without detrimental effect.

It is a fact that plain concrete, if exposed to physical abrasion, will very soon commence to disintegrate, due to chemical action. The evidence collected by the authors shows that reinforced concrete will, in practically any



IN THE LEFT-HAND VIEW ARROWS INDICATE CONSTRUCTION SEAMS IN WALL IMMEDIATELY AFTER CONSTRUCTION. THE RIGHT-HAND VIEW SHOWS HOW THESE SEAMS WERE ATTACKED BY SEA WATER IN 12 YEARS

CONCRETE STRUCTURES IN SEA WATER ON THE AMERICAN COASTS

No.	Location	Owner	Type
1	Vancouver, B. C	G. N. Ry	Wharf, precast cylinder shells filled in place, concrete piles and deck.
2	Vancouver, B. C	Canadian Gov't	Wharf, gravity wall on wood crib with concrete facing
3	Vancouver, B. C	Burns Co., Ltd	Concrete building foundation
4	No. Vancouver, B. C.		Ferry wharf, precast piles, wood deck.
5	No. Vancouver, B. C. (Lonsdale)		Quay wall, precast slabs and piles.
6	Victoria, B. C	Canadian Gov't.	Breakwater, mass concrete on rubble mound.
7	Victoria, B. C.	Canadian Gov't.	Wharves, reinf. concrete cribs, gravity wall.
8	Victoria, B. C.	Municipal	Counterfort sea wall.
9	Victoria, B. C.	Municipal	Sea wall, gravity type, concave face.
10	Bremerton, Wash	U. S. Navy Dept.	5 gravity quay walls.
11	Bremerton, Wash	U. S. Navy Dept	3 counterfort quay walls.
12	Bremerton, Wash	U. S. Navy Dept	Combination cantilever, counterfort and revetment.
13	Bremerton, Wash		Wharf, cylinders cast in place, concrete deck.
14	Bremerton, Wash		Wharf, precast cylinder shells filled in place, concrete deck.
15	Seattle, Wash	Seattle Elec. Co.	Gunite jacket on wood piles.
16	Humboldt Bay, Cal.	U. S. War Dept.	Jetty, precast piles with conc. cap.
17	Mare Island, Cal.	U. S. Navy Dept	16 gravity quay walls
18	Mare Island, Cal.	U. S. Navy Dept	Counterfort quay wall.
19	Mare Island, Cal.	U. S. Navy Dept	Cantilever quay wall.
20	Pt. Richmond, Cal	Standard Oil Co.	Wharf, concrete jacket over wood piles.
21	San Francisco, Cal	U. S. War Dept.	Cellular quay wall.
22	San Francisco, Cal.	U. S. War Dept.	2 wharves, cylinders cast in place, concrete deck.
23	San Francisco, Cal.	S. F. & O. T. R.R.	Wharf Holmes conc. cylinder wood pile core, wood deck.
24	San Francisco, Cal.	State	8 wharves, cylinders cast in place, precast piles and concrete deck.
25	San Francisco, Cal.	State	Wharf, cylinders cast in place on wood piles.
26	San Francisco, Cal.	State	2 wharves, precast piles.
27	San Francisco, Cal.	State	Wharf, Koetitz precast shells over wood piles, wood deck.
28	San Francisco, Cal.	State	8 wharves, Holmes concrete cylinder, wood piles, wood deck.
29	San Francisco, Cal.		Wharf Holmes steel shell conc. cylinder wood pile core., wood deck
30	San Francisco, Cal.		2 gravity sea walls.
31	Santa Monica, Cal.	Municipal	Pleasure pier, precast piles, wood deck.
32	Santa Monica, Cal.	Nat. Goodwin.	Pleasure pier, precast piles, wood deck.
33	Venice, Cal	Municipal	Pleasure pier, Holmes concrete cylinder pile core.
34	Hermosa Beach, Cal	Municipal	Pleasure pier, precast piles, wood deck.
35	Redondo Beach, Cal	Municipal	Pleasure pier, precast concrete piles, concrete deck.
36	Redondo Beach, Cal	Pac. L. & P. Co.	Wharf, cylinders cast in place in steel shell.
37	Ocean Park, Cal	Fraser	Pleasure pier, precast piles, wood deck
38	Long Beach, Cal	Municipal.	2 bulkhead walls, sheet pile.
39	Long Beach, Cal	Municipal	Pleasure pier, Holmes conc. cylinder, wood pile core.
40	Long Beach, Cal.	Municipal	Pleasure pier, precast piles, wood deck.
41	San Pedro, Cal	U. S. War Dept	Breakwater anchor blocks and test blocks
42	San Pedro, Cal	O. H. D. & W. Co.	Wharf, precast piles, wood deck
43	San Pedro, Cal	Municipal	Wharf, precast piles, concrete deck
44	Huntington Beach.	Municipal	Pleasure pier, precast piles, wood deck
45	San Diego, Cal	Municipal	Wharf, cylinders cast in place on precast base, concrete deck
46	San Diego, Cal	Spreckles Bros.	Concrete jackets over wood piles
47	Ft. Dominguez, Cal	U. S. War Dept	Wharf, concrete jackets on wood piles.
48	Ft. Dominguez, Cal	U. S. War Dept	Wharf, precast piles, wood deck
49	San Diego, Cal	U. S. Navy Dept	Wharf, steel shells filled concrete, wood deck
50	Port Arthur, Texas	Gulf Refining Co.	Wharf, precast piles, concrete deck
51	Galveston, Texas	Municipal	Gravity type sea wall
52	Galveston, Texas	Municipal	Concrete precast piles and revetment
53	New Orleans, La.	U. S. War Dept	Concrete blocks, S. W. jetty, Mississippi River.
54	Ft. Morgan, Ala.	U. S. War Dept	Revetment and sea wall
55	Havana, Cuba	Luz Force House	Wharf precast Chenoweth piles, cone jackets on wood piles
56	Havana, Cuba	Cuba Pilings Coal	Wharf precast Chenoweth piles, concrete deck
57	Havana, Cuba	United Rys. Co.	Tallapiedra wharf, precast Chenoweth pile, cone deck
58	Havana, Cuba	Gas. & Elec. Co.	Tallapiedra wharf, precast piles, concrete deck
59	Havana, Cuba	P. & O. S. S. Assoc'n	Wharf precast piles, concrete deck.
60	Havana, Cuba	Regla Coal Co	Wharf, precast cylinder shells filled in place, conc. deck.
61	Havana, Cuba	Ports Company	Sea wall gravity.
62	Havana, Cuba	Yacht Club	Wharf, precast piles, concrete deck.
63	Havana, Cuba	United Rys. Co.	Paula wharf, Holmes concrete cylinders wood pile core, concrete deck.
64	Key West, Fla.	U. S. Navy Dept.	2 gravity retaining and foundation walls.
65	Key West, Fla.	U. S. Navy Dept.	Wharf and quay wall, precast piles, concrete deck and apron.
66	Key West, Fla.	U. S. Navy Dept.	Wharf, precast cylinder shells filled in place, wood deck.
67	Key West, Fla.	U. S. War Dept.	Wharf, Braxton precast pile, wood deck, breakwater gravity wall.
67a	Key West, Fla.	U. S. War Dept.	Breakwater gravity wall.
68	Key West, Fla	U. S. War Dept.	Foundation gravity wall.
69	Key West, Fla.		Quay wall gravity.
70	Key West, Fla.	Fla. E. C. Ry.	39 projects, 394 unreinforced bridge piers.
71	Key West, Fla.	Fla. E. C. Ry.	1,520 unreinforced viaduct piers.
72	Key West, Fla.	Fla. E. C. Ry.	180 reinforced bridge piers.
73	Brunswick, Ga.	A. B. & A. Ry.	2 wharves, precast piles, wood deck.
74	Brunswick, Ga.	A. B. & A. Ry.	Quay wall sheet pile.
75	Port Royal, S. C.	U. S. Navy Dept	3 sea walls, gravity.
76	Port Royal, S. C.	U. S. Navy Dept.	Wharf, steel shells filled concrete, wood deck.
77	Charleston, S. C.	U. S. Navy Dept.	Quay wall, gravity.
78	Charleston, S. C.	U. S. Navy Dept.	Wharf, cylinders and precast piles, concrete deck.
79	Charleston, S. C.	U. S. Navy Dept.	2 wharves, precast piles, concrete deck.
80	Charleston, S. C.	U. S. Navy Dept.	Foundation precast piles.
81	Charleston, S. C.	U. S. Treas. Dept.	Quay wall gravity.
82	Charleston, S. C.	Municipal	Sea wall gravity, with reinforced apron.
83	Charleston, S. C.	Bu. lighthouses	4 beacons, precast piles and concrete deck.
84	Wilmington, N. C.	Bu. lighthouses	32 beacons, precast piles and concrete deck.
85	Norfolk, Va.	U. S. Navy Dept.	7 quay walls, gravity, with precast sheet piles.
86	Norfolk, Va.	U. S. Navy Dept.	Quay wall, cellular, with precast sheet piles.
87	Norfolk, Va.	U. S. War Dept.	Quay wall, counterfort.
88	Annapolis, Md.	U. S. Navy Dept.	Quay wall, counterfort, on precast S.P.S. filled in place.
89	Annapolis, Md.	U. S. Navy Dept.	Wharf, precast piles, concrete deck.
90	Sparrows Point, Md.	Bethlehem Steel Co.	Quay wall, precast sheet piles.
91	Baltimore, Md.	Municipal	3 wharves, precast sheet piles.
92	Atlantic City, N. J.	Young's Million Dollar	Pleasure pier, steel and wood shells filled in place, conc. deck.
93	Atlantic City, N. J.	Young's Old	Pleasure pier, precast piles, wood deck.
94	Atlantic City, N. J.	Steeplechase	Pleasure pier, steel shells filled in place, wood deck.
95	Atlantic City, N. J.	Steel	Pleasure pier, steel shells filled in place, P.C.P.W.D.
96	Atlantic City, N. J.	Garden	Pleasure pier steel shells filled in place, precast piles, C. D.
97	Atlantic City, N. J.	Municipal	Foundation, precast piles.
98	Atlantic City, N. J.	Municipal	2 foundation gravity walls.
99	Atlantic City, N. J.	Gardener's Basin	Bulkhead wall, precast sheet piles.
100	Atlantic City, N. J.	A. C. & S. Ry.	Bridge pier.
100a	Deal, N. J.	Private	Pleasure pier, precast piles, concrete deck.
101	Long Branch, N. J.	Municipal	Pleasure pier, precast piles, concrete deck.
101a	Ocean City, N. J.	A. C. & S. Ry.	Bridge pier.
102	Ocean City, N. J.	Municipal	Highway bridge pier.
103	New York, N. Y.	Bu. D. & F.	Bulkhead wall, precast blocks, granite face (21 sec.).
104	New York, N. Y.	Bu. D. & F.	Wharf, multiple arch.
105	New York, N. Y.	U. S. War Dept.	Sea wall, granite gunite pointing, foundation conc.
106	New York, N. Y.	U. S. War Dept.	2 sea walls, gravity.
107	New York, N. Y.	U. S. War Dept.	Patchogue Jetty, concrete on stone substructure.
108	New York, N. Y.	U. S. War Dept	3 cable tanks.
109	New York, N. Y.	U. S. Navy Dept.	7,000 ft. quay wall, gravity.
110	New York, N. Y.	U. S. Navy Dept.	3 quay walls, gravity, faced with granite.
111	New York, N. Y.	U. S. Navy Dept.	1 quay wall, gravity, precast blocks.
112	New York, N. Y.	U. S. Navy Dept.	Quay wall, gravity, on brick arch culverts.
113	New York, N. Y.	U. S. Navy Dept.	3 wharves, reinforced conc pedestals on wood decks.
114	Ft. Adams, R. I.	U. S. War Dept.	Sea wall, gravity.
115	Newport, R. I.	U. S. War Dept	Sea wall, gravity.
116	Newport, R. I.	U. S. Navy Dept.	2 foundation piers, unreinforced.
117	Newport, R. I.	U. S. Navy Dept.	2 floats, reinforced.
118	Newport, R. I.	U. S. Navy Dept	Wharf reinforced pedestals, wood deck L. W.
119	Newport, R. I.	U. S. Navy Dept.	Foundation under granite sea wall.
120	Hingham, Mass.	U. S. Navy Dept.	Quay wall.
121	Boston, Mass.	U. S. Navy Dept.	Wharf, multiple arch unreinforced.
122	Boston, Mass.	U. S. Navy Dept.	Quay wall, granite face.
123	Boston, Mass.	U. S. Navy Dept.	Foundation wall, granite face.
124	Boston, Mass.	U. S. Navy Dept	Bulkhead wall.
125	Boston, Mass.	B. & M. R. R.	Quay wall, gravity, wood crib with concrete face.
126	Boston, Mass.	Municipal	Bridge pier, unreinforced.
127	Boston, Mass.	Edison Elec. Co	Bulkhead wall, gravity.
128	Ft. Heath, Mass.	U. S. War Dept.	Sea wall, gravity.
129	Winthrop, Mass.	Met. P. Com.(State)	Sea wall, gravity.
130	Lynn, Mass.	Met. P. Com.(State)	Sea wall, gravity.

No.	Location	Owner	Type
131	Revere Beach, Mass....	Met. P. Com.(State)	Stepped revetment, reinforced.
132	Point of Pines, Mass .	Met. P. Com.(State)	Stepped revetment, reinforced.
133	Rockport, Mass...	U. S. War Dept.	Breakwater, unreinforced blocks.
134	Portsmouth, N. H..	U. S. Navy Dept.	Quay wall, multiple arch unreinforced.
135	Portland, Me.....	U. S. War Dept	2 sea walls, gravity.
136	Portland, Me	U. S. War Dept	Wharf precast blocks, mass concrete substructure.
137	St. John, N. B...	Canadian Gov't..	Quay wall, gravity.
138	St. John, N. B...	Canadian Gov't.	Quay wall, gravity.
139	St. John, N. B.....	Canadian Gov't.	Breakwater concrete on granite substructure.
140	Nova Scotia.....	Prov. Govt.. .	60 highway bridge piers.
141	Nova Scotia.....	D. A. R. Ry . . .	10 bridge piers.
142	Nova Scotia.....	D. A. R. Ry. .	2 culverts.
143	Nova Scotia.....	Intercol. Ry.....	Wharf precast piles, concrete deck.
144	Nova Scotia.....	Intercol. Ry.....	Quay wall, precast cellular blocks, granite face.
145	Nova Scotia.....	Canadian Gov't	Quay wall, gravity.
146	Nova Scotia.....	H. & S. W. Ry	3 bridge piers.

climate, begin in a short time to fail above sea water due to the absorption of the sea water or penetration of sea air bearing chlorine to the reinforcement. This reinforcement soon rusts and the concrete cracks.

Engineers recognize that deterioration of unreinforced concrete takes place in certain localities, but the opinion is held by many that the trouble is confined to the North, where freezing conditions exist. Such is not the case. Both chemical and physical disintegration of concrete structures are in progress along all our sea coasts, although the action is greatly accelerated in the case of plain concrete where low temperatures exist and in the case of reinforced concrete where high temperatures exist.

In pointing out the conditions which have led to deterioration in some of the concrete structures, there is no intention to criticise those who were in charge of design and construction, for most of it accorded with current engineering principles. The only reason for calling attention to the causes for deterioration is to show how such trouble can be obviated in the future and more durable structures built of concrete.

Secret Garbage-Reduction Process Will Be Tested

THE COMPLICATED garbage situation at St. Louis, noted in *Engineering News-Record*, Aug. 30, p. 429, has been cleared for a while by the passage of an ordinance by the Board of Aldermen authorizing the Board of Public Service to execute a form of contract approved by it July 20. This contract provides that Joseph M. Hirsch, of Chicago, will build and operate for three months a 20-ton demonstration garbage-reduction plant which will dispose of garbage by a secret chemical process devised by him "without creating any garbage or other offensive odors which may be detected outside the building containing the plant," that the test plant will demonstrate that reduction works large enough to treat all the garbage of St. Louis will yield a revenue "at ordinary market prices" of not less than $3.60 per ton of green garbage, without considering capital charges, and that the experimental plant will further demonstrate that a 300-ton-per-day plant using the Hirsch process can be built for $150,000, not including site, building and foundations. The revenue of $3.60 per ton is based on an estimate of the Board of Public Service of the yield from a Cobwell-process plant which the board recently advised that the city build. The Hirsch contract provides that if the data from a working Cobwell plant show that $3.60 is in error then that figure "shall be modified in a proportionate degree."

Details of Agreement

Adjudication of the Hirsch assertions is to be made by a committee consisting of the comptroller of St. Louis, the president of the Board of Public Service, and two persons selected by Mr. Hirsch—or, in case of non-agreement, by an arbitrator chosen by the four.

The city agrees to supply a site for the test plant, to pay $15,000 for the installation, and also to pay $2000 for operation, besides supplying steam to operate the plant and paying 10c. a ton of green garbage for chemicals, but the city is to have all revenue from the sale of by-products. In case Mr. Hirsch does not demonstrate his claims he is to return to the city the $17,000 paid for installation and operation. The contract provides for a security bond of $17,000 to be given by Mr. Hirsch.

All the foregoing provisions lead up to the real object of the contract, which is an agreement on the part of the city that if the adjudication committee or the arbitrator rule that Mr. Hirsch has demonstrated his claims then "the Board of Public Service shall prepare and recommend for passage an ordinance providing for the construction" of a Hirsch system garbage-reduction plant, the ordinance to provide that the city shall pay Mr. Hirsch a royalty of 25c. a ton of garbage disposed of for a period of 10 years, and that the city shall be protected by Mr. Hirsch from all claims for royalty infringements.

Two further stipulations for insertion in the conditional future contract are that before the execution of the contract Mr. Hirsch "shall deliver to the President and one member of the Board of Public Service full details of his process," and that the contract shall not be made until after these two members of the board "have verified the operating costs of the process so divulged."

The contract for the test plant, as authorized by ordinance on Aug. 14, provides that the plant shall be in operation within six weeks of the date funds to meet the contract become available.

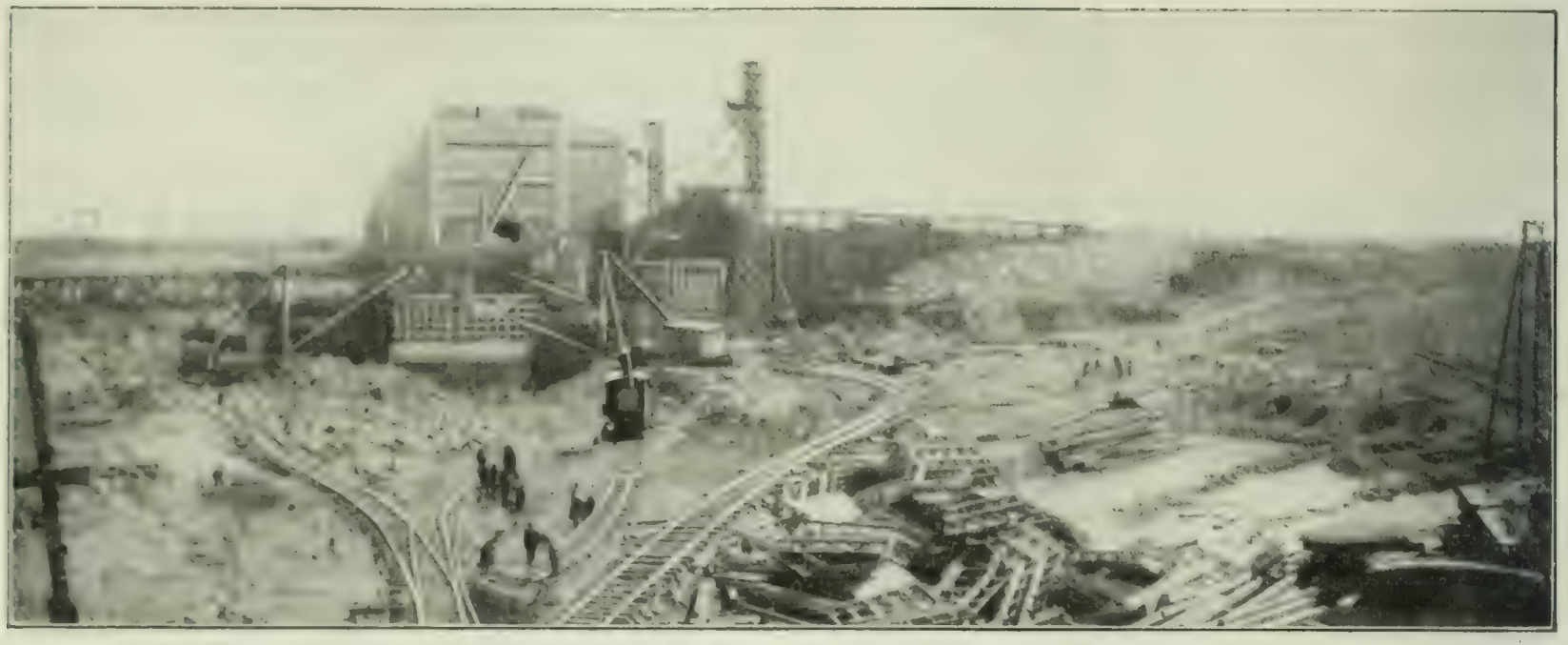
The president of the Board of Public Service of St. Louis, upon whom the contract here reviewed places much responsibility, is E. R. Kinsey. The Board of Public Service made a report to the Board of Aldermen on June 15, 1917, recommending that St. Louis build a garbage-reduction plant of the Cobwell type, at an estimated cost of $635,000, rather than buy the reduction plant of the Indiana Reduction Co., at Dupo, Ill., for $350,000 and spend $75,000 for improvements, or rather than build three incinerating plants at an estimated cost of $480,000.

Arrowrock Reservoir Cost Nearly $5,000,000

According to the Reclamation Service *Record* for August, 1917, the Arrowrock Reservoir on the Boise project of the United States Reclamation Service cost $4,752,000, not including the power plant at the Boise River and the diversion dam.

Extension of St. Lawrence River Power Development Under Way

Substructure at Cedars Extended for Eight 10,800-Horsepower Units — New Superstructure Will House Three Exciters and Four Main Units, Only Two of Which Will Be Placed Now



CEDARS CANAL DEVELOPMENT EXTENDS ALONG ST. LAWRENCE RIVER

THE SECOND STEP in the 180,000-hp. hydro-electric development on the St. Lawrence River at Cedars Rapids, Quebec, is being made on account of the phenomenal demand for power on the system of the Montreal Light, Heat & Power Co., of which it is a part. The canal headrace is being enlarged to final dimensions and the dam is being completed to final length without interference to regular service.

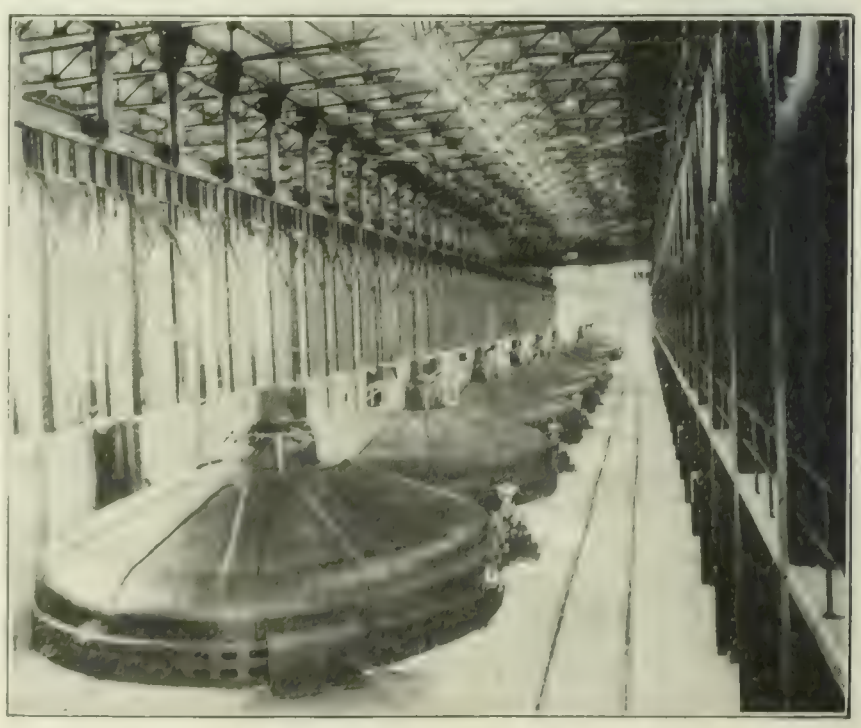
The first nine units of the plant went into service at the end of December, 1914. The tenth unit was in position shortly after. A heavy load was carried from the beginning of commercial operations, and this has steadily increased until at the present time this station apparently has the highest load factor of any on the continent, the percentage ratio of average to peak load being above 98%. With the ten 10,000-kv.-a. machines in service, 1,800,000 kw.-hr. is the daily output.

The accompanying sketch shows the general arrangement of the work both before and since the extension was started (for details of the design see *Engineering Record*, Oct. 25, 1913, and *Engineering News*, Mar. 25, and Apr. 1, 1915).

The dam across the end of the headrace canal, with which the turbine foundations are integral, is being completed for the ultimate development at this plant. There are now ten 10,800-hp. main units and three 1500-hp. exciters; there will be eventually 18 of the large units and six exciters. Only two more large units will be installed at the present time, the others to be added more leisurely as the demand for power may require.

The two main units to be installed at first will not lie next to the tenth already in place. Space is being prepared for three additional exciters in the line beyond these 12 large units, and still beyond the exciters will be the substructure for six more units, four places being temporarily unoccupied. The superstructure will be continued from the present No. 10 machine over the unoccupied bays and stop beyond No. 14, where a temporary housing will close the end. This superstructure will be of the same precast-unit concrete construction employed before (see *Engineering Record*, July 25, 1914, and *Engineering News*, Mar. 25, 1915).

This scheme of placing the new generating units permits of obtaining quicker service from them, since the existing cofferdam completing the temporary barrier at the end of the headrace canal blocks the intake of units 11 and 12. To use the turbine in places 13 and 14, however, it will be necessary only to cut through the crib enough to pass the flow for two units to the pool in front



TURBINES IN CEDARS STATION HAVE RECORD DIMENSIONS

of the new part of the permanent dam. The rest of the old coffer can then be dredged out at leisure.

The most interesting novelty of the construction plant is the cableway for handling forms and materials for concrete, etc. This is shown in plan and in detail by the illustrations. The cableway is of a radial type and was built on the spot out of plant on hand—mostly left from the earlier Cedars construction. The total span of the cable from head frame to pivot is 1300 ft., but only 700 ft. is clear, for the cable passes along the roof of the existing power station and over an intermediate traveling support on the north end of the power house.

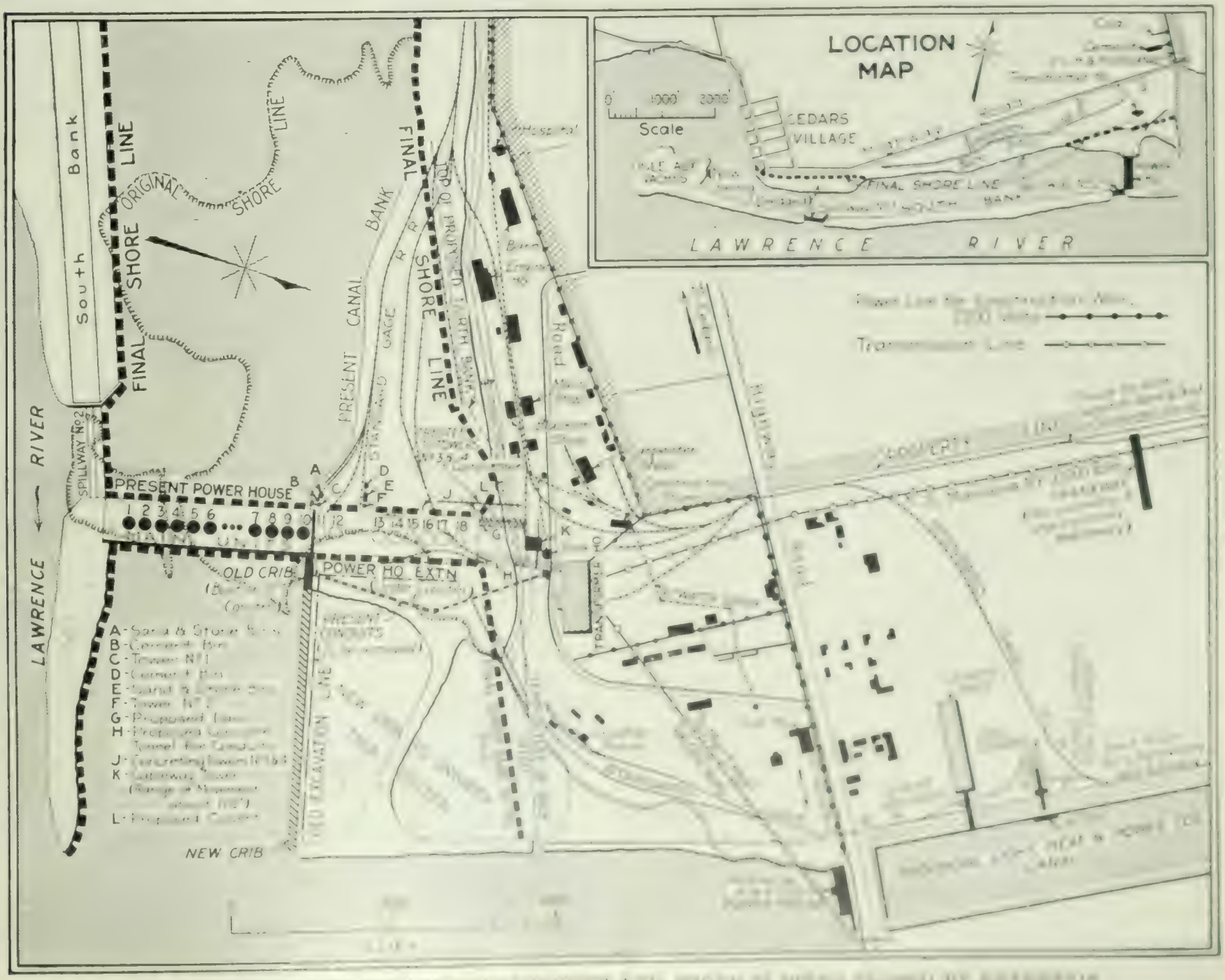
The head frame is a timber tower with its top 64 ft. above the track rails, built up of 8 x 16-in. timbers for the larger members and 8 x 10s and 8 x 8s for the others. The main cable is of plow-steel wire strands, and is 2¼ in. in diameter. For traversing the carriage a ⅝-in. cable is used, and another is used for hoisting. The engines and one pair of trucks came off the Keokuk traveler used in placing concrete for the original work at Cedars. The other trucks were taken from railway cars. Traversing is done by a small hoist engine winding in on a cable which is run forward to anchorage. With a 120-ft. length of track, practically the whole width of the new work can be reached. The cableway does not handle concrete, as at each of the concreting towers is a mixing plant with stone, cement and sand



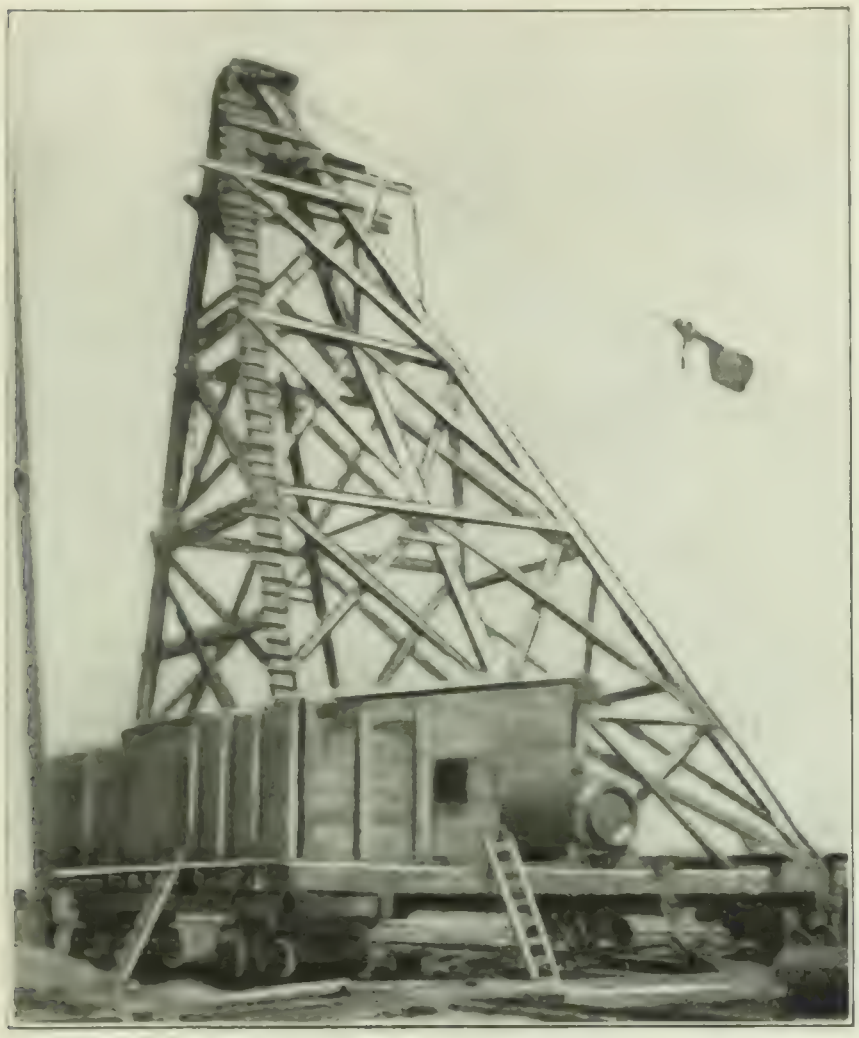
CABLEWAY HEAD TOWER WAS BUILT ON THE SPOT

bins, to which supplies are brought by cars running over construction tracks.

A cofferdam is being built as shown for the unwatering of the tailrace site for the second development. This



GAP BETWEEN [illegible]



TABLEWAY HAS A TRAVELING INTERMEDIATE SUPPORT

coffer is the extension of one built during the course of the first development, and left in place for protective purposes, and in such shape that the construction of the power-house extension could be started before the cofferdam for the complete tailrace excavation had been finished. This new coffer was built on the bottom of the tailrace of the first development, that earlier excavation having been made wide enough at the time of the first development to permit this.

It is hoped that unwatering the tailrace will cut off much of the water now entering the power-house excavation. The excavation for the north side of the tailrace cut through the stratification of the limestone rock and apparently left exposed a number of open seams through which the water is finding its way to the new excavation. When the tailrace is unwatered there will be no chance for the water to enter through these seams, and it is hoped that then the pumping will be no more for the power house and tailrace combined than was met with for the power-house work alone before the cofferdam was completed.

Some of the rock is being taken out with a steam shovel loading into side-dump cars, and some is hand-loaded into skips that are lifted to the dump cars by two stiffleg derricks which were moved as required to reach the spoil.

The canal bed above the station is being excavated in the dry by steam shovels. The work is in gravel and blasted rock, and is carried as close behind the old coffer as is considered safe. The old crib and remaining barrier will be dredged away.

Rock from the excavation is switched to the crushing plant at the northeast corner of the site, where a 36 x 42 Jenks jaw crusher serves as the primary breaker—and is the only addition to the old crushing plant. This jaw machine discharges upon a belt conveyor leading to a No. 7½ Traylor gyratory, and this in turn discharges to the screens. The rejections go to No. 5 gyratories.

The work is being done by the Civic Investment and Industrial Co., which operates the Montreal Light, Heat & Power Co., the Cedars Rapids Manufacturing & Power Co. and allied concerns. R. M. Wilson, of Montreal, is Chief Engineer. The immediate direction of the work is under G. P. Hawley, resident engineer. Fraser, Brace & Co., of Montreal and New York, are retained as supervising engineers. J. H. Brace is the firm's resident representative, and men from his organization are directly employed by the Civic company.

Road Types Often Condemned by Improper Maintenance

The Real Economy of Certain Specifications Lost Through Neglecting First Principles—Laymen Misunderstand

By B. H. Piepmeier
Maintenance Engineer, Illinois State Highway Department

MANY different types of roads have been condemned by the public chiefly on account of the lack of proper maintenance. The proper type of road may be selected by the engineer, but if he has no means of controlling maintenance his choice may be condemned by the average layman.

Public sentiment is molded largely by the results that are evident to the eye regardless of the money actually expended. It is not uncommon to hear the layman say that certain roads are very expensive and unsatisfactory. He often passes judgment upon a road and condemns it without any investigation of its cost or how economical and satisfactory it might be if properly maintained.

The average road engineer is confronted with the problem of educating the public to an appreciation of the principles of economy in road improvement as much as with technical matters, such as the selection of a type of pavement and the method of properly maintaining the roads after construction.



WELL GRADED AND DRAINED—BUT IMPASSABLE THROUGH NEGLECT OF SURFACE MAINTENANCE



A LITTLE ATTENTION TO CRACKS IN CONCRETE ROADS STOPS MUCH CRITICISM OF THIS EXCELLENT CONSTRUCTION

There are three principal items of expense connected with road improvement which the engineer must impress upon the public mind before it will be possible for him to construct an economical system of roads. These factors are: The original cost of the improvement; the interest on the money invested in the improvement, and the total upkeep cost. When all of these factors are taken into consideration, it is evident that many of the cheaper types of roads, when properly maintained, will give the desired service and yet will be much more economical on account of their low first cost.

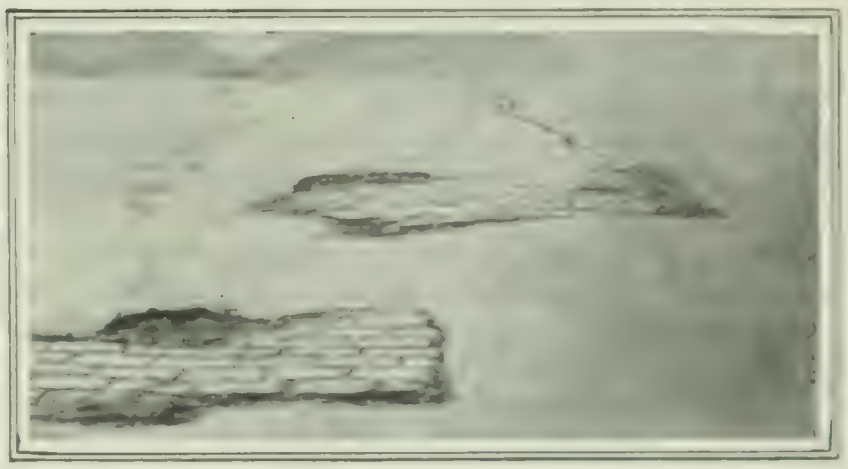
When a type of road is selected, taking into consideration the three principles set forth above, it is very essential that provision be made for proper and efficient maintenance. If local conditions are such that maintenance may be delayed or prevented, preference should be given to a type of pavement that requires only a small amount of maintenance and which will be serviceable for a period of time even with no maintenance. Neglecting proper maintenance for but one year on many types of roads is very much more serious than the amount of money involved represents. The road engineer should keep this in mind and thoroughly impress the fact upon the individuals who have a voice in the final determination of a type of road.

The tendency in road improvement is to select types of roads which require very little annual maintenance. The general feeling among laymen seems to be that when a road surface requires some annual maintenance to keep it in good shape, it is an expensive type and should be avoided. Yet, if the interest on investment and the repairs are taken into consideration, the cheaper wearing surface may in many cases prove to be the more satisfactory and economical.

It is not uncommon to see roads of a good type constructed and then, after they begin to show signs of wear, to see them neglected entirely or some method of repair or maintenance imposed which has been found by long practice to be defective. In most cases, it is true, such unsatisfactory maintenance work is directed by individuals over whom the engineer has no control. When we see mud holes in earth roads filled with riprap, crushed stone or cinders, it is not the engineer's fault that an enormous price is paid for the repair material the road engineer knows that proper drainage, and repairing with earth from the side of the road, are the economical methods of maintenance.

Old gravel and macadam roads are often repaired by filling ruts and depressions with inferior material that is readily displaced by traffic or ground to dust. Bituminous surfaces are often patched, if patched at all, with loose stone or gravel, and in some cases with concrete. In a number of streets and roads recently inspected, brick was used to patch concrete surfaces, and concrete used to patch brick surfaces.

When careless methods of this kind are applied to the maintenance of public highways, the result is that a good type of road is made to appear unsatisfactory and uneconomical. Road improvement is discouraged—particularly the cheaper types of improvement, which in many localities are the best if properly maintained. It is the utter neglect of maintenance and the many improper methods of repair that have molded public sentiment against types of road requiring annual maintenance, and have led road promoters and officials to disregard many economical types. The city engineer and the highway engineer have a great field for educational work in presenting the fundamental facts of road economics.



REPAIRS WITH BRICK GAVE ASPHALT A BAD NAME IN ONE COMMUNITY

Tannery Wastes' Anthrax Disinfection

Fine screening followed by disinfection with liquid chlorine at the rate of 50 p.p.m. proved a successful method of coping with anthrax germs in the wastes of an unnamed tannery, according to a paper by Prof. D. D. Jackson (Columbia University, New York City) and A. M. Buswell, reprinted from the *Journal* of the American Leather Chemists' Association for June, 1917. The topography made the construction of sedimentation tanks impracticable, so to remove suspended matter Riensch-Wurl screens 8 ft. in diameter with ½ x 2-in. slots were installed to treat 500,000 gal. of tannery wastes a day. Chlorine was applied to the screened sewage by means of Wallace and Tiernan's regulating apparatus. During 14 months' operation no anthrax spores were found in the screened and disinfected wastes, although they were found six times in the untreated wastes. The screens removed about 2 bbl. daily of hair, hide and fleshings, which material was shipped to a fertilizer plant and disinfected by steam. The paper mentioned gives a historical review of pertinent information on anthrax, besides a detailed account of laboratory and large-scale disinfection tests.

Trend of Thought in the Water-Works Field

Abstracts of Presidential Address and Some of the Technical Papers Presented at the Thirty-Sixth Annual Convention of the New England Water-Works Association at Hartford, Conn., Sept. 11-15.

Today's Problems in Water-Works Management

By Caleb Mills Saville

President New England Water-Works Association and Chief Engineer, Water Department, Hartford, Conn

TODAY something more is required of the water-works executive than to be able to get 480 minutes' work for the price of labor, properly to lay pipe and quickly to repair a break in a supply main. These things are necessary in carrying on department work, but they are not the essentials of present-day management. The water-works executive must be familiar with all of these, but in addition he must have intimate knowledge of and ability to handle such financial questions as valuation of works and equitable rate-making, as well as hydraulic problems relating to supply and construction or the complex questions involved in providing a water which satisfies modern standards.

Intelligent systems of accounting are necessary. Rules and regulations adjusted to present conditions are required. Scientific purchase of materials and supplies, cost-keeping that instructs, modern transportation, checks on the care of department property and similar matters are all part of the organization of even the mediocre construction company. How can water department business succeed without them?

Rate Revision Urgent

The question of revision of rates to meet existing conditions is most vital to successful operation, but one which is often the last to be taken up, particularly in municipally-operated plants. Many rate schedules now in use even in our larger cities are inheritances of the past, continued because of the inertia of the present. Some of these are ridiculously inadequate and fail utterly to recognize conditions of plant, cost of operation, and special value to different classes of users. Such conditions result in extravagant operation and in ineffectual service.

At the present time it is the trend of opinion, based on judgment of the best sanitary specialists, that all public water supplies sooner or later must be filtered. Water is demanded which is clean and attractive, as well as safe. These questions involve protection from pollution, removal of turbidity and color, reduction of chemical constituents producing hardness and other detrimental conditions, and the elimination of taste and odor.

These are some of the problems of the modern water-works executive. Properly met, they mean efficiency in organization and economy in operation, with consequent benefit to the city. To do these things it is necessary that the manager of the water department shall be able to grasp, understand and control adverse conditions which were formerly accepted as inevitable but are now known to be amenable to remedy if not to cure.

No Water-Works Alliance

The past experience of this association, with its avoidance of entangling alliances, in the best guide we can have for the future. Our present position as a power in water department matters shows clearly the wisdom of the founders of this association in rigidly excluding both politics and commercial exploitation from its voting membership. "As with the Fathers so may God be with us." With other organizations we will work together gladly and we welcome all water-works men to our membership. Careful consideration of our own particular needs and purposes, however, forbids any thought of combination with others.

In these critical and serious times it is well for us to cultivate the attitude of the open mind and the spirit of coöperation. One of the most cogent reasons why our manufactured products, up to the war period, had so little market in Central and South America was the arbitrary stand of American producers as to details of construction and methods of packing goods, regardless of the needs of the purchaser.

Until many of our manufacturers and consumers, on the one hand, emerge from this attitude of pigheadedness, and, on the other, step aside from a position of cocksureness, there will be difficulty in meeting the demands of commercial enterprise and construction possibility. Opportunity is hindered by ignorance and the effect of the small mind unable to comprehend the standpoint of the other fellow. The talisman of success in co-operation. Manufacturers must concede the necessity and be willing to consider with open mind changes in plant, even though expensive to them, if efficiency and economy result in construction work.

Engineers and users of manufactured products must recognize business exigencies and matters affecting established industry. They too, must have the open mind which is free from personal bias, broad in its outlook and dispossessed of a finicky attitude. In the "get-together" atmosphere of this convention let us all try to get into touch with the real reasons for the differences between users and producers and see if we cannot reach some mutually advantageous ground in advance of that on which we now stand.

The Trend of Prices

In these days the direction of the force of gravity as regards cost of labor and materials appears to have been reversed. An efficient way and perhaps the best way to meet this condition seems now to be the more general use of labor-saving tools, careful selection of materials,

more thoughtful planning of work and better organization of force. Present prices of labor and materials in many cases are beyond that ever before experienced, and the outlook seems to reveal little or no downward tendency. For a short period there seemed to be a faltering in construction work but contract news, construction advertisements, and bond sales indicate recovery with a tendency to accept present prices as better perhaps than will be afforded latter. From this viewpoint, more and more public work of considerable magnitude is being let. With the reduction of labor due to national requirements and the possibility of greater demands for materials, even if peace should come quickly there seems to be greater chance for increasing cost of work for sometime to come.

Meters Cut Waste in Metropolitan Water District

By Samuel E. Killam
Superintendent Pipe Lines and Reservoirs, Metropolitan Water-Works, Boston.

In 1902, the Massachusetts legislature authorized the Metropolitan Water and Sewerage Board to construct works for the measurement of water supplied to the cities and towns in the Metropolitan Water District and to report the quantity supplied to each and also whether the water was being improperly or unnecessarily used and to make recommendations in regard to preventing waste and the manner of proportioning the annual water assessment.

The Venturi meter was adopted as the best and most suitable device to measure the large quantities required without too great a loss of head. There are now 69 meter tubes installed in the district, varying in size from 6 to 60 in. In districts where the quantity to be measured is small the Hersey detector meter has been used.

The total cost to Jan. 1, 1917, of installing the meters, including meter registers and appurtenances, was $94,364. The total cost for charts and repairs to meter registers since their installation in 1903 averaged about $3.50 per meter register per year.

Leading Up to Universal Meter System

In 1907 an act was passed which provided that after Jan. 1, 1908, all cities and towns which derived their source of supply from the Metropolitan Water-Works should equip all new service pipes with water meters and should also equip annually with meters 5% of the services that were unmetered on Dec. 31, 1907, and should thereafter charge each consumer in proportion to the amount of water used.

The quantity of water consumed became a very important element and it was made an incentive, not only for the district as a whole, but for each municipality, and finally, the most important of all, each consumer, to check and to stop the unnecessary and wasteful consumption of water.

The gradual installation of more service meters in the district has reduced the average daily consumption per inhabitant from 130 gal. in 1907 to 89 gal. in 1916. Meter, consumption and related figures for each city and town in the district are given in the accompanying table.

There has been a gradual reduction in the quantity of water used with the increase in the use of meters. In Melrose, which is largely residential, the reduction due to the installation of service meters was especially noticeable. The introduction of meters was begun in 1907. On Jan. 1, 1908, about 30% of the takers were changed from scheduled to meter rates and at the end of the year 1908 practically all the services were metered. The records on the master meter showed a saving of 55 gal. per capita in two years, a reduction of 46.7%, or from 117 to 62 gal. In 1916 the consumption went down to 45 gal.

Night Consumption Still Too High

Turning now to the district as a whole, the fact that between the hours of 1 and 4 a.m., when the legitimate use of water is at its minimum, water is drawn from the mains in the district at the rate of over 60,900,000 gal. in 24 hours, equivalent to 51 gal. per capita, is very strong proof that, notwithstanding the decrease in the consumption, a large amount of preventable waste is still taking place.

Notwithstanding an increase of over 350,000 in the number of people supplied in the whole district the average daily consumption was less in 1916 than it was in 1899, 17 years ago. The per capita consumption was the same in 1916 as in 1894.

The daily average quantity of water used in the district in 1916 was 17,808,000 gal. less than during the year 1908, and the per capita consumption has been reduced from 130 gal. to 89 gal., equivalent to over 31%. This reduction in the use of water has been accom-

REDUCTION OF WATER CONSUMPTION BY USE OF METERS IN METROPOLITAN WATER DISTRICT, MASSACHUSETTS, 1907 TO 1916

City or Town	Area Square Miles	Estimated Population July 1, 1916	Services Metered Jan. 1, 1916	Meters Set Jan. 1, 1916	Services Metered Jan. 1, 1916	Average Daily Consumption		Consumption per Capita			
						1907	1916	1907	1916	1907	1916
Arlington	5.1	13,670	1,731	1,734	85.19	33	100.0	30	28	91	73
Belmont	4.6	8,560	1,436	1,436	100.0	11	100.0	14	14	98	98
Boston	42.5	748,060	104,131	54,848	849.35	5.5	53.1	107	64	134	100
Chelsea	2.1	45,020	4,971	4,877	43.30	4	100.0	99	85	90	90
Everett	3.4	38,870	5,993	5,993	99.97	2.0	50.0	60	54	61	54
Lexington	16.2	4,880	1,156	1,156	56.53	1.1	55.0	80	57	93	93
Malden	4.9	50,480	7,879	7,879	99.98	9.1	97.1	87	86	96	97
Medford	7.1	53,560	6,951	6,948	91.19	10.1	100.0	69	22	85	84
Melrose	3.1	17,260	3,003	4,344	91.98	3.5	100.0	87	36	111	87
Milton	13.1	8,850	1,156	1,156	50.06	100.0	100.0	126	78	99	42
Nahant	1.1	1,440	390	390	99.97	11.0	55.0	100	58	130	130
Quincy	16.6	47,000	8,363	8,348	129.74	14.1	99.9	100	98	100	99
Revere	5.1	30,760	5,871	5,871	97.99	4.8	70.1	93	64	82	84
Somerville	4.1	94,480	15,233	8,193	99.96	14.1	100.0	100	54	96	44
Stoneham	6.1	7,980	1,830	1,830	56.14	1.0	50.0	61	29	91	94
Swampscott	3.1	6,000	1,810	1,810	99.97	11.0	100.0	87	36	84	56
Watertown	4.1	31,186	4,940	4,871	98.98	14.1	100.0	96	78	100	81
Winthrop	1.1	15,445	2,901	2,881	99.97	2.1	100.0	93	76	100	99
District	147.1	1,295,000	210,161	142,871	2,914.95	14.1	89.1	93	57	130	89

plished largely by the introduction of service meters. If the conditions as they existed prior to 1904 had been allowed to continue additional sources of supply would, without doubt, have been required before the present time. It is also probable that if the act requiring the installation of service meters on all works receiving a supply from the Metropolitan works had not been enacted it would have been necessary to construct additional works by 1920.

Best To Sell All Water by Meter

Many are willing to pay for their own and their neighbors waste by general taxation but are unwilling to continue to pay for their own waste when presented with a quarterly bill.

The writer believes that water meters are as much a part of a well operated water-works system as gas or electric meters are to their respective works. Many gas companies account for 80% of gas delivered through the master meters. Well managed water-works in Europe account for all but 10% of their supply. Cannot American municipalities do as well?

Waste of water can be divided into two classes, leakage from mains and waste from service pipes. The first can be stopped by efficient management and the latter by enlisting the consumer's coöperation by giving him a direct pecuniary benefit. It appears to the writer that the best way to get results is to sell the water by measure and to keep the measuring devices in good working condition.

Rapid Sand Filtration Holds World Record

By George A. Johnson
Consulting Engineer, New York City

RAPID sand filtration, was first applied in the treatment of municipal water-supplies at Somerville, N. J., in 1885. Up to that time it had been used only in the purification of waters for industrial uses, while slow sand filtration had already gained an accredited standing abroad as a potent aid in the reduction of water-borne diseases. In 1885 a few small slow sand filter plants had been built in this country, the first of those being at Poughkeepsie, N. Y., in 1874.

From its very inception rapid filtration established its popularity over all other hitherto attempted methods of purifying water. It has steadfastly held that position throughout the 32 years which have since elapsed.

Of the 18,293,000 people now supplied with filtered water in the United States 74%, or 13,411,000, are supplied from 682 rapid sand filter plants, the remaining 26% or 4,882,000 people, being served from 54 slow sand filter plants. In Canada there are now some 45 municipal filter plants supplying a total of about 1,500,000 people, or about one in every six of the total population. Thirty-nine of these plants are rapid sand filters serving about 1,000,000 people. In foreign countries there are some 81 municipal rapid sand filter plants with a total daily filtering capacity of about 175,000,000 U. S. gal., serving about 3,500,000 people.

Since 1910 the progress in municipal water filtration in the United States has been noteworthy. The population supplied with filtered water has increased 69% and the total capacity of the filter plants in operation has increased 81%. The increase in rapid sand filtration has been particularly marked in the last six years, the population served by filters of this type having increased by 94%, as compared with an increase of 26% for slow sand filters. The daily filtering capacity of slow sand filter plants has increased by 11% since 1910, whereas the capacity of rapid sand filter plants has shown an increase of 139%. This is explainable by the fact that the increase in the slow sand filter population is accounted for chiefly by the natural increase in population in cities which already had filter plants in 1910, but few new slow sand filter plants having been built since that time.

The increase in rapid sand filter population since 1910, however, was principally due to the construction of new filter plants, as for example those built at Akron, Ohio; Baltimore, Md.; Dallas, Tex.; Erie, Penn.; Grand Rapids, Mich.; Minneapolis, Minn.; St. Louis, Mo. and Trenton, N. J. These eight plants alone provide a filtering capacity of 462,000,000 gal. daily and serve a total present population of 2,400,000.

Since 1910 the most notable additions to the slow sand filters then in operation were the plants at Brookline and Lowell, Mass., and the Queen Lane plant at Philadelphia. The two Massachusetts plants were built especially with iron and manganese removal in view.

Modified Use of Slow Sand Filters

A noteworthy feature in connection with slow sand filtration practice in America refers to alterations in the layouts as originally designed for several large cities, and the adoption of either prefiltration or coagulation, or both, in the pretreatment of the water before final filtration through the slow sand filters. Thus at Albany coagulating basins and preliminary roughing filters have been added to the original slow sand filter plant to lessen the load on the final filters and permit them to do satisfactory work. For the same reason preliminary filters were added to the Pittsburgh plant two years after the original plant went into operation. Philadelphia has adopted coagulation of the raw water at four out of five plants, and at Washington and Poughkeepsie coagulation of the raw water now forms a part of the preparatory treatment.

Of the 40 cities wherein the slow sand filters are operated as such without radical modifications, those of Denver, New Haven, Yonkers, Reading, Providence and Philadelphia (Upper Roxborough) are the largest, and have a combined daily capacity of 124,000,000 gal. The remaining 35 plants are small, averaging a daily capacity of 2,000,000 gal.

Of the 54 cities having slow sand filter plants now in service in the United States with a total daily filtering capacity of 922,000,000 gal., 40 provide no pretreatment other than plain sedimentation in impounding reservoirs or settling basins. The plants in these 40 cities have a total rated daily capacity of 196,000,000 gal. or an average of 4,900,000 gal. daily.

The remaining 14 cities have slow sand plants with a total filtering capacity rated at 726,000,000 gal. In five of these cities slow sand filtration is preceded by prefiltration at high rate; in four cities by coagulation and prefiltration; in one city (Philadelphia) by coagu-

lation and prefiltration at four plants; and in the remaining five cities by coagulation and sedimentation.

[The foregoing notes have been condensed from the opening pages of an exhaustive paper on "Rapid Sand Filtration" read, in part, by Mr. Johnson at the Hartford convention.—Editor]

Mechanical Filter Bottoms and Strainer Systems

By Robert Spurr Weston
Consulting Engineer, Boston, Mass.

IT IS unnecessary to recall to your minds that the strainer system of the mechanical filter, unlike that of a sand filter, serves two purposes; namely, it must collect filtered water from the sand and must serve as a distributing medium for the wash water used for washing. Unfortunately, the velocity during washing may be more than five times the velocity during filtration, and this, of course, introduces great difficulties in design; for it is essential that the rate of filtration be uniform throughout the whole sand layer, and that the wash water be distributed as uniformly as practicable over the whole filter area so that it may rise as a plane or sheet for the purpose of separating the accumulated coagulant and fine suspended matter without at the same time causing any considerable loss of sand.

Four Strainer Systems Reviewed

The most generally satisfactory strainer systems are: (1) Manifolds, strainers and a 14-in. layer of gravel. (2) The Harrisburg system of perforated pipes with a 14-in. layer of gravel. (3) Troughs having strainers at their bottoms, with a 14-in. layer of gravel. (4) The Wheeler filter bottom with 8 in. of gravel.

All of these systems should be designed to wash the sand layer without the use of air. Each system has its advantages and disadvantages, but the excessive cost of system No. 3 makes its use inadvisable. There are, therefore, three systems left. Of these, system No. 2, the Harrisburg system, is the simplest. It, however, consists largely of metal, all of which is exposed, and at the present prices is probably more expensive than the Wheeler filter bottom. System No. 1, like that installed by most of the filter companies, possesses the advantage over System No. 2, the Harrisburg system, of having the outsides of the pipes protected by concrete. The strainers, however, are exposed and must be constructed of bronze, which at present prices makes the installation costly, probably the highest of the three. The insides of the pipes are likewise exposed.

In either of the above systems there exist "dead" spaces on the floor of the filter between the openings where the wash water does not readily reach. This difficulty is overcome in Systems Nos. 3 and 4, of which No. 4, the Wheeler filter bottom, is the cheaper. The advantages of the Wheeler filter bottom consist in the absence of metal (with the exception of the short brass tube at the apex of the pyramid); the nearly perfect distribution of the wash water secured by the "ball nozzle" effect of the balls; the lower cost, and the thinner gravel layer. The writer of these notes believes that the Wheeler filter bottom is best when placed above channels rather than built as a false bottom of the filter, although to construct the latter is perfectly feasible.

Why Sand Broke Through Gravel at Akron

Considerable difficulty has been experienced with the Wheeler filter bottom at Akron because of sand passing through the gravel around the walls of the filter, particularly at the corners. The writer has investigated this filter and found that there was a ledge 1 in. wide left around the walls of the filter and furthermore the gravel layer was only 6 in. in depth. It was very difficult for the workmen to spread 1.5-in. layers of gravel evenly in the large units (2,000,000 gal. daily); consequently the sand had passed through the gravel in certain places until it rested on the ledge around the walls of the filter. This sand remained inactive. The difficulty was overcome by increasing the thickness of the gravel layer around the walls of the filter, particularly at the corners. Less than 0.5% of the area of the filter was involved. This is a very low percentage of sand surface out of action because of lumps, hard spots, etc., and the difficulty can be readily overcome. It would probably be best in a new filter with this bottom to make the gravel layer 8 in. in thickness; namely, 4 in. coarse gravel, 2 in. medium gravel and 2 in. fine gravel, rather than 3, 1½ and 1½ in., respectively, first used. Where the filter area is small, the thicknesses of the gravel layer may be reduced to those last given.

In large filters there seems to be a tendency toward wave motion in the underdrains, which may accumulate pressure at certain points in the filter bed, particularly at the ends of the channels, and may possibly cause the rupture of the gravel layer if it be too thin. This statement of course applies equally well to the three systems under consideration. The Wheeler filter bottom is better designed to resist jet action from the strainers than are either of the others. The effect of a large ball immediately above the orifice is absolute and unchangeable.

False Bottom of Strainer Manifold Type?

The discussion regarding choice of filter bottoms at present centers around the relative merits of the false bottom and the strainer or manifold type. The false bottom was used in the Miraflores (C. Z.), Erie and other plants, but only a few plants have been so built. The fear in the minds of operators of filter plants is that they may not prove so efficient bacteriologically as a plant designed on the other plan. On the other hand, the false bottom approaches nearer the condition for successful washing—namely, that of a series of orifices discharging from a tank—but with underdrain channels of sufficient size, relative to the areas of the orifices discharging from them, good enough distribution may be secured for all practical purposes, and the dangers, both structural and in operation, which the false bottom presents, avoided. There should be no objection to the use of the false bottom in small filters.

Should Wash at High Velocity with Water Only

Thirty years' experience and the results of experiments by Allen and others, indicate that the successful filter will be washed at a high velocity with water alone

This effect is best secured by a strainer system consisting of orifices, above each of which is placed a layer of graded material to prevent sand from passing out of the filter, either when filtering or washing.

The underdrain system should be designed to throttle the discharge of wash water from the orifices. The latter should be reasonably large to avoid unusual loss of head in the filter, and the underdrains should be proportioned to the orifices. The false bottom system, while cheaper, is not so reliable as the other systems, and there are more or less troublesome results from cast- or wrought-iron headers and manifold-strainer systems, even when they are cheaper, which is rarely the case. The Wheeler bottom, with sufficient gravel, best fulfills the conditions of practice. It is, however, on account of its being a patented device, more expensive than the Harrisburg system. On the other hand, it is more durable.

Leadite Joints Saved $2800 on Single Contract

By Homer R. Turner
Superintendent and Engineer Fire District, Windsor, Conn

IN DRAWING up proposals for 28,000 ft. of 10-in. cast-iron water mains alternative prices were asked on lead and Leadite joints. The contractor to whom the work was awarded, offered to do the work with Leadite joints for 10c. per foot less than with lead joints. After favorable replies were received from several users of Leadite we determined to use the material.

Leadite comes in the form of a black powder put up in 100-lb. bags. We used an ordinary portable furnace burning coke, controlling the temperature by dampening the fire with soil when necessary. One attendant is kept on this furnace continually as the material requires constant stirring and proper control of the temperature to prevent burning. The Leadite is melted until it is of the consistency of medium oil and the appearance of the surface of the liquid is smooth and free from bubbles. At this stage it has a mirrorlike surface and is ready to pour. The temperature at this time is very slightly above the melting point and a higher temperature will cause bubbles to appear. Any increase in temperature will cause the material to thicken until it becomes stringy. If this occurs the pot should be removed from the fire and cooled until the temperature is reduced so that the material is of the proper consistency.

Pouring the Joints

Dry jute should be used in the joints as the presence of oil or grease from tarred jute prevents a good bond between the Leadite and the cast-iron pipe. The material is poured similarly to lead, it being necessary, however, to build the gate at least 3 in. above the top of the bell. This is required as the material is too light to flow back into the joint at the top of the bell of the pipe without a slight head to force it. Joints made up with an ordinary gate, such as is used for lead, proved to be imperfect as the material did not properly fill the joint at the top. The Leadite in the gate can be broken from the joint when cold and remelted after being properly cleaned.

We obtained better results with the joints when the pouring was kept back at least four lengths of pipe from the laying gang. The shock of driving home a new length of pipe tends to break a freshly made joint.

One serious disadvantage in the use of the material is its tendency to crack, it being brittle on new work. One 6-in. pipe crossing laid under a railroad track in 1914 has broken down at the joints and it has been necessary to cut-out the Leadite and use lead in this location. Another disadvantage of Leadite is that in repairing a defective Leadite joint it is necessary to shut the water off the main. It has been found impossible to caulk or patch a Leadite joint with lead wool or other material. Best results are obtained by entirely removing the Leadite from the joint and either repouring the joint with Leadite or lead. On the other hand the ease with which plugs can be cut out or joints cut away in order to remove several lengths of pipe has proven of distinct advantage.

Tests of Leadite Joints

As the standpipe was not completed when the pipe lines were laid we were forced to omit exact tests of joints after pouring but each joint was inspected when a section was filled with water before back filling was done. Final tests were made this year.

The only method available in making these tests was to shut off each service connection at the curb cock and to shut off all gates on adjacent lines. No doubt some of the water measured as leakage was lost through leaky services or gates but the results have been figured on the assumption that the total loss of water was through the Leadite joints only. The standpipe was pumped full of water to give the maximum available pressure on the lines to be tested. The pressures on 35% of the line tested ranged from 45 to 70 lb. and on 65% from 70 to 98 lb. per square inch. The duration of the test was four hours. The actual quantity of water registered through the meter was 39.4 cu.ft. or 1773 gal. per 24 hours. Correction for under-registration of the meter gave a total loss of water from leakage of 1861 gal. per 24 hours or 0.36 gal. per 24 hours per lin.ft. of joint.

Better Sanitary Service for Springfield

Among improvements in the health and sanitary service of Springfield, Ohio, recommended by Dr. Carroll Fox, surgeon United States Public Health Service (Public Health Reports, Aug. 10, 1917, Washington, D. C.) after a two months' study on the ground, are the following:

That a full-time bacteriologist be employed at not less than $1000 a year.

That daily bacteriological examinations be made in the laboratory of the health department of the city water-supply.

That the city install as soon as practicable a modern disposal plant for the treatment of sewage, a chlorine plant for the treatment of the water-supply, a municipal abattoir and an incinerator for the disposal of garbage.

That thorough and comprehensive study be made looking toward the development of a satisfactory water-supply for the city.

That the plumbing inspector be transferred to a building division or the engineering department.



Building Army City in Wilderness Was the Problem at Camp Pike

Site for Arkansas Cantonment Was 5 Miles from Nearest Railroad—Much Clearing and Rock Excavation Necessary—Standard Two-Story Barracks for 200 Men Built in Less Than 3 Hours

GROUND was officially broken for Camp Pike, Arkansas, one of the sixteen National Army cantonments, on July 9, but the nearest railroad on that date was 5 miles away, and the only supplies obtainable were at Little Rock, 8 miles distant. All material and all labor, therefore, had to be hauled by wagon or truck up the hilly roads leading from the city to the reservation. During those weeks work was practically at a standstill, and it was not until July 16 that the hurriedly constructed tracks of the Missouri Pacific, requiring a large amount of rock excavation, crossed the line of the reservation. The building of the 12th Division Cantonment then really began. Contrary to the general rule of selecting level areas for cantonments, Camp Pike is situated on a hill, or series of small hills, and is full of steep grades. Almost every foot of the land had to be cleared of a comparatively heavy second growth of forest. The sewer excavation averages 75% rock. Added to this, the remoteness from a railroad and from electric light and water supply, and the many difficulties in obtaining labor, have presented numerous problems that had to be solved and solved quickly by James Stewart & Co. Inc., the contractors.

Unload Million Feet of Lumber Daily

In the preliminary stages what little material could be obtained came from the lumber yards of Little Rock, until gradually a more adequate supply began to flow in from the mills of Arkansas. This supply grew steadily until for weeks the average amount of lumber unloaded at the camp has been a million feet a day and that has lately been increased to one and one-half millions daily. Night shifts take up the work of unloading when the day gangs stop and work under powerful searchlights, helping to unload the more than 100 cars that come in every day. The cantonment, when completed, will consist of over 1600 buildings and over 32,000,000 ft. of lumber will be used in their construction.

Of the more than 1600 buildings that comprise the cantonment, over 200 are the two-story barracks, 43 by 140 ft. built to house 200 soldiers, with cots upstairs and mess halls and kitchens on the first floor. The buildings are equipped with electric lights, toilets, shower baths, water and sewer connections. On Sept. 1 enough buildings were completed to house 5000 Arkansas troops, and new companies are moving in every few days. Other barracks are used temporarily by the contractors as offices, mess houses, etc., for their men. Work on the officers' quarters has kept pace with the barracks, and steam fitters are putting the finishing touches in these. All officers' quarters will be supplied with steam heat—an innovation in cantonment building in the Southwest—and 1763 radiators and over 8 miles of piping will be required for the work. Each building will be heated by the low-pressure gravity system, with a separate cast-iron boiler for each building. The method of piping is unique from the fact that each radiator is a part of the main, which is 20-in. piping, connected straight through the radiator, the latter being suspended from the wall by brackets.

Another big part of the building construction included the ten huge storehouses for the division quartermasters, the base hospital and the remount station. The latter, which is located 2 miles from the main part of the camp, will consist of 120 buildings, mainly stables, but including barracks, mess houses, officers' quarters and administration buildings, a blacksmith school and hospital stables. Some of the buildings in this unit are 380 ft. in length. The entire station, consisting of 160 acres and planned to hold 10,000 horses, will be



HOW CONSTRUCTION AT CAMP PIKE HAD PROGRESSED UP TO AUGUST 22, ONLY A LITTLE MORE THAN A MONTH AFTER WORK HAD BEEN ACTIVELY UNDER WAY

inclosed with 20,000 ft. of woven-mesh wire, 58 in. high, with a rail 1 ft. above. The base hospital contains 1000 beds. This unit alone, which consists of 75 buildings and extends over 47 acres, will use up at least 3,000,000 ft. of lumber. It will have its own heating plant and laundry, and quarters are being built to accommodate 40 medical officers, 200 enlisted men and 65 trained nurses. Eight carloads of beds, apparatus, etc., have already arrived as a part of the hospital equipment.

Build Barracks in 3 Hours

In building construction a specially remarkable record was recently made at Camp Pike when a two-story barracks, 43 by 140 ft., was erected in 2 hours and 55 min. Work was begun at 9 a.m. and at 11: 55 a.m. the building was enclosed, floor laid, stairs in place, doors hung and windows fitted in and even screened, all scaffolding had been removed and the workmen had left the building. The amount of lumber required for this barracks is 60,000 ft. Two hundred carpenters were simultaneously employed on the work, and a remarkable feature of the construction was that, in spite of the number of workmen and the high speed at which the work was rushed, not a man received a scratch or bruise.

The schedule of completion was as follows: 9 a.m.—Work started; 9: 20—posts and studding up for first story; 9: 22—joists started for second floor; 10—second floor outside frame started; 10: 20—second floor outside frame finished, first story trim and mill work finished; 10: 45—joists on second floor finished; 11—flooring on second floor finished; 11: 05—rafters started on roof; 11: 30—rafters finished; 11: 50—roofing finished, second story trim and mill work finished; 11: 55 scaffolding down and workmen out. As the work progressed moving pictures were taken by Government photographers for purposes of record.

All this, of course, was a little out of the ordinary, but the fact that while this particular barracks was going up thousands of other workmen were busy on at least 200 other buildings throughout the cantonment, gives some idea of the rapidity with which the work proceeds. The record above is quite often closely approached in the daily routine of ordinary work. Only a few days ago the company's commissary chief received word late in the afternoon that a new mess house, to feed 200 men, must be opened at once at the remount station, where work was just beginning. He rode out and found that the ground was just being cleared for the building, a one-story structure 133 ft. long. The lumber was piled up near by, but not a stick had been touched. He explained his needs to the foreman, and the next morning sent out truck-load after truck-load of cooking utensils, crockery, food, etc. That evening supper was served in the building.

Solving the Water-Supply Problem

One of the first big problems that confronted the contractors was that of a safe and adequate water-supply. When ground was broken, Camp Pike was 8 miles from water mains, 500 ft. above sea level, and without any natural sources of supply. Work upon a temporary system was rushed. Within a week wells had been driven, and within ten days tanks were up and in use. Since that time an ample supply has been furnished the camp for its daily increasing needs, its thousands of workmen and its herds of horses and mules.

In the meantime, work has steadily progressed on the permanent system; in fact, the trenching and pipe-laying for the temporary system have been done, wherever possible, as a part of the permanent system. When the latter is completed, artesian water for the cantonment will be supplied by the Arkansas Water Company, of Little Rock. From Argenta, near Little Rock on the cantonment side, a 16-in. main has been laid to a point near Levee, about 2 miles from the reservation, where a booster station has been erected with a 200,000-gal. tank, into which water will be forced by city pressure. Thence it will be pumped by three Platt Iron Works three-stage centrifugal pumps, operated by belt-driven 100-hp. motors. Each pump has a capacity of 750 gal. per minute and operates under 300-ft. head. A 16-in. Remco redwood pipe will carry the water from the station to the cantonment. Here it will be received in five 200,000-gal. tanks, whence it will be pumped

throughout the cantonment by four direct-connected Allis-Chalmers motor-driven pumps, operating under 100-ft. head. Two of the motors are 50 hp. and two 75 hp. The water system is laid out along the lines of the streets and roads of the camp, with laterals to the various buildings, and is equipped with hydrants at about every 300 ft. for fire protection.

Altogether, the system will include 7 miles of 16-in. main pipe and 20 miles of 6-, 8-, 10- and 12-in. redwood and cast-iron mains, and about 25 miles of smaller lateral metal pipe. It is estimated that on Sept. 1 work on the original contract was at least 75% completed. When finished, a daily supply of 2,225,000 gal. of water will be furnished the camp, entirely adequate for the 40,000 soldiers and 10,000 horses and mules to be quartered there.

The Sewer System

The sewer system of the camp consists of a septic tank three main trunks, with a total length of about 6 miles, and about 14 miles of laterals. Work on this branch of construction has been peculiarly difficult, and has taxed the resources of the contractor to the utmost. The material excavated in digging trenches averages at least three-quarters rock—shale, slate and trap—and in several places the cuts run as deep as 23 ft. Four sewer-excavating machines, one Parsons, one Keystone of the drag-line type, one Austin caterpillar and one Buckeye, are used constantly, but are frequently delayed on account of the vast amount of rock, which requires constant blasting. The work progresses steadily, however, the machines working at night under searchlights, and the men with picks and shovels beneath strings of traveling incandescents, which move along as the trenches extend. The septic tank, half a mile from the nearest barracks, is nearly completed. This is 50 x 100 ft. in size and divided into eight compartments with walls 10-ft. high.

Plumbing, Electric Light and Power

Of the 1600 buildings of the cantonment plumbing is required in nearly half. Between 300 and 400 plumbers are constantly employed, and have practically finished the work of roughing in. The installation of fixtures and finishing showers is well under way. All of the 400 lavatories have concrete floors and foundations, and nearly a million feet of lumber was used in the forms for these, mainly on account of the unevenness of the ground. While among the least spectacular of the various branches of construction, probably no other line better illustrates the advanced stage of the work at Camp Pike than this department. On account of the great variety of operations, the amount of detail involved and the number of different kinds of mechanics employed at various stages of the work, the department is peculiarly difficult to organize and keep up with the general progress of construction, but the contractors have succeeded in doing this to a remarkable degree and have fulfilled all expectations.

The Labor Supply

From the very beginning, the supply of labor at Camp Pike has been scarce and, largely of an inferior quality. Government work at Fort Riley and Louisville, which had been started in the latter part of June, with railroad tracks running alongside of or through their sites, had already drawn heavily from this territory and from such cities as Memphis and Kansas City, both for men and material, leaving Camp Pike badly handicapped. A large proportion of the common laborers, whites and negroes, has been drawn from the cotton fields of the South and is not used to ditch work. The same lack of efficiency is found in a large percentage of those who come to work as carpenters, etc. This condition has required a constant weeding out, and a consequent strenuous exertion to keep the labor forces up to the maximum. Agents for Stewart & Co. have not only combed Arkansas, Missouri, Tennessee and Texas for competent workmen, but large numbers have been attracted from the cities of the North and East. One train brings in fifty plumbers and as many steam-fitters from St. Louis; the next imports a band of sixty Mexicans from Chihuahua, San Luis Potosi and Sonora by way of Texarkana. These latter, with their long line of mound-building and rock-hewing ancestry behind them, take naturally to the ditches and are among the most valuable of the laborers. Thousand by thousand the labor force has been increased, until it now reaches nearly 10,000 men and the weekly payroll runs over $225,000. And, in addition to the men, some 1500 horses and mules and a hundred huge motor-trucks are kept constantly at work on the excavation.



ONE OF THE THIRTY PAY STATIONS OF THE JAMES STEWART CO., INC., CONTRACTORS

Transporting to and from work, and feeding and caring for this big army of workmen has been one of the incidental but very important problems the contractors have had to solve along with their actual construction. Every morning half a dozen trains bring thousands of men to the camp from Little Rock, and carry them back at night. Other thousands never leave the reservation. Meals must be provided for all and sleeping places for at least half of the laborers. To do this, barracks, to be occupied later by the soldiers, have been fitted up by the contractor as mess houses, and in these the employees eat and sleep. Twenty of these great dining halls, feeding from 200 to 300 men at a meal, have been opened, and serve as high as twelve thousand meals a day.

The Men on the Job

To accomplish all that has been done at Camp Pike within a few weeks has called for an unusual and highly efficient organization. Under the Government's ruling, there could be no subletting, and it was necessary for the contractors to organize all such branches as plumbing, steam-heating, wiring, commissary, etc., which in strictly commercial operations are usually underlet to specialists in these lines. To take care of and direct the various departments of the work, Stewart & Co. immediately summoned their experts from their offices at New York, St. Louis, Chicago, Salt Lake City and Canada, and in a short time had mobilized a highly efficient organization from nearly every section of the United States and Canada. Many of them came direct from Fort Douglas, where they had already had experience in cantonment building, and the mountain engineers were thoroughly at home in the kind of work called for at Camp Pike. If a hundred buildings had to be staked out and elevations established in a day, it was done. Coöperating closely with the engineers on the staff of the construction quartermaster, they became practically one organization, and all the work, with the exception of water and sewers, was laid out by the company's engineers.

Personnel

Among those directly in charge of the work have been: Major John R. Fordyce, constructing quartermaster; Black & Veatch, consulting engineers; Lawrence V. Sheridan, city planner; James Stewart & Co., Inc., general contractors; H. W. Baum, manager and in charge of construction; Don G. Scott, in charge of engineering and contracts; John F. Rourke, field auditor; Ben. F. Baum and J. W. Bell, general superintendents; Ralph Morris, office superintendent and in charge of time-keeping; P. J. Lewelling, superintendent of sewers and pipe lines; R. R. Reed, superintendent of electrical work; J. B. Evans, superintendent of water supply; J. B. Baum, superintendent of commissary.

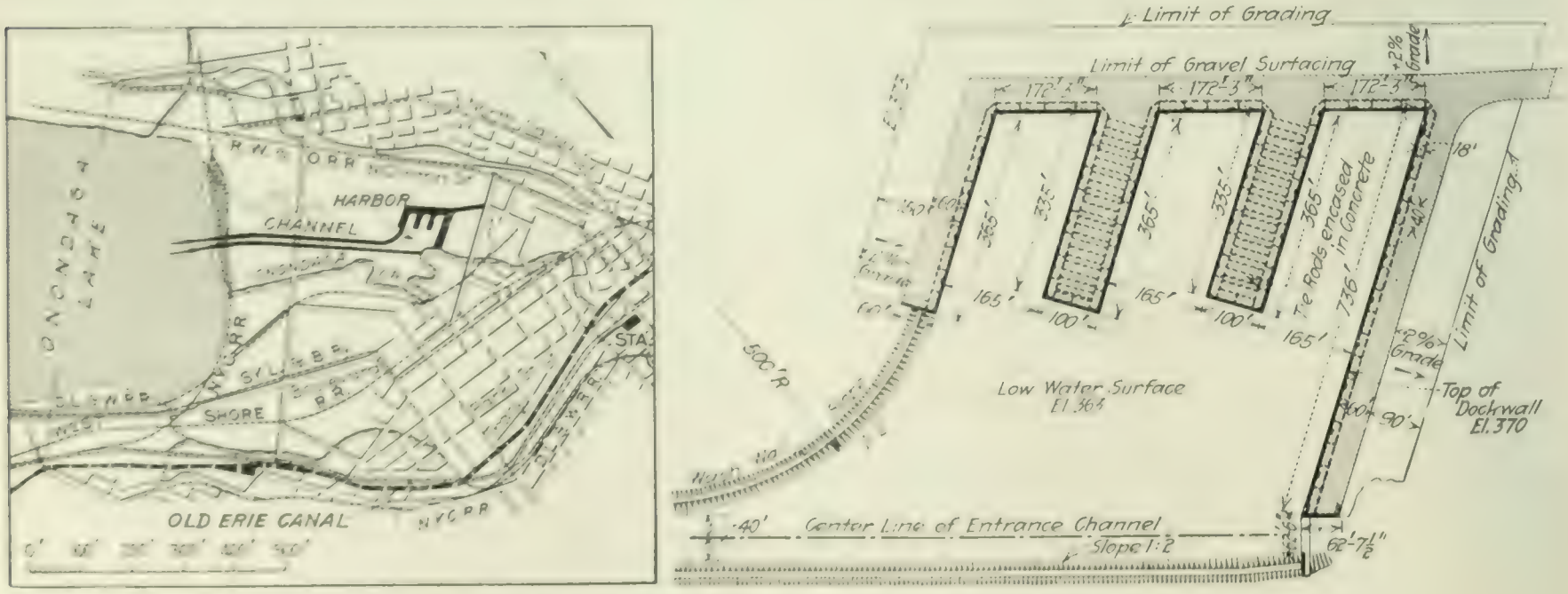
Syracuse Canal Terminal Built Over Old Salt Works

Two Piers with Slips and Turning Basins on Low Ground Used for Many Years for Salt-Drying Tables

THE TERMINAL piers for the New York State Barge Canal at Syracuse, N. Y., are now being built at the head of Onondaga Lake in the midst of flats which for many years were the site of the long timber sheds where brine pumped from wells was evaporated out into the salt which was one of the city's principal products. These flats were in some previous geological period a part of a lake bed, but low water had let them dry—a large area quite near the city's busiest district given over entirely to the land-wasting brine sheds. Here the new terminal is being dug out of the ground. The lake is being brought, by dredging, up to the dock wall, which will be connected by railway and highway to the rest of the city. It is hoped that in time the whole district will be reclaimed for manufacturing and shipping purposes.

Pier Type of Terminal Here

In the New York State Barge Canal there are two types of terminals. One is a marginal dock wall in a slightly widened waterway section, the other a pier construction where lake or large river area is available. In Syracuse the latter type is being built. The old Erie



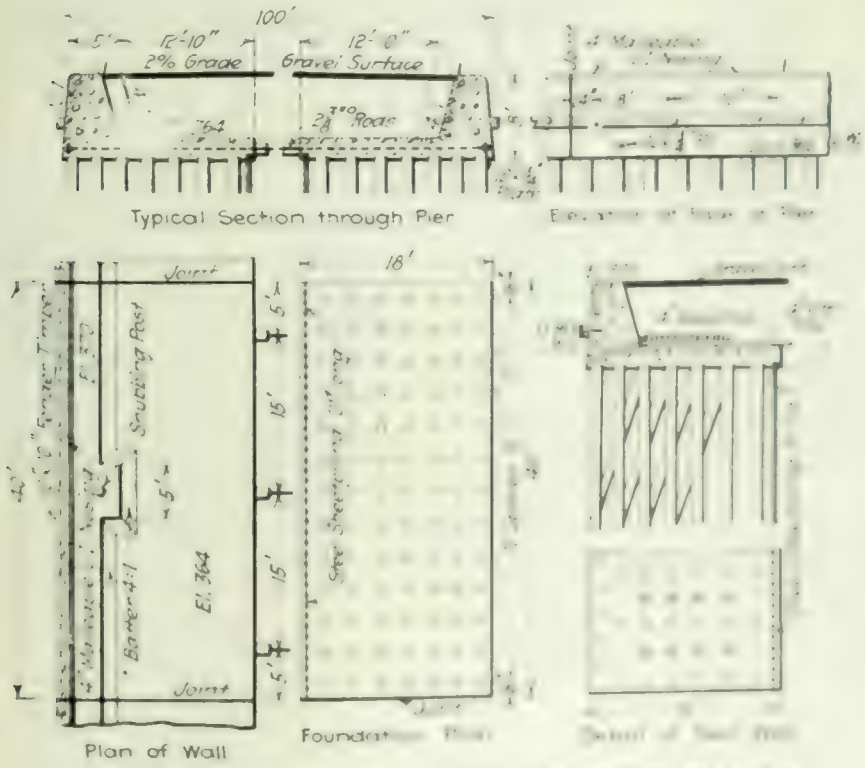
BARGE-CANAL TERMINAL AT SYRACUSE LOCATED NEARLY MILE FROM LAKE



FIRST EXCAVATION WAS MADE ON OLD SALT FLATS

Canal passed through the City of Syracuse. The new Barge Canal main line is several miles north of Syracuse but connection to that city is had through Onondaga Lake to the new terminal being built at its southern end. Here on the flat lands between the various railroads entering the city the terminal channel 80 ft. wide is being excavated for a distance of about 3600 ft. up to the turning basin, which is about a square—800 ft. on the side with a dockwall around three sides from one of which protrudes two piers 350 ft. long, forming in the whole area three 165 x 350-ft. slips and a large basin.

The standard wall construction for dock wall and pier is a gravity section of concrete 3 ft. thick at the top with an outside slope of 12 on 1, and an inside slope of 4 on 1, extending down 8 ft. to a foundation of timber piles, with a backfill up to the level of the wall and a gravel surfacing clear across the pier and for a distance of 60 ft. back of the wall. These walls rest on a concrete floor base 2 ft. thick and 18 ft. wide, which is integral with the wall, and under which the concrete piles are placed. The pier walls, which are 100 ft.



GRAVITY WALLS FOR PIER AND DOCK WALLS

apart throughout, are tied together every 15 ft. by two 3-in. rods with heavy washers at the wall end and turnbuckles for tightening in the middle. The middle section between the floor concrete has been incased in concrete a foot square.

Both the dock and pier walls are in 40-ft. lengths with a straight joint for expansion. Centered in each block, is a snubbing post with a counterfort extension in the concrete wall. The dock wall has a similar design to the pier walls, except that there is no tie rod and



GRAVITY WALL COMPLETE BEFORE SLIP WAS EXCAVATED

there are, in addition, three batter piles to help take the inclined thrust.

There is on the inner face of the wall forming a continuous line of steel sheet piles 21 ft. long, which were used in making the wall floor excavation but which are left in place cut off so that they extend a short way into the concrete floor. The piers and the ground for 60 ft. back from the dock wall are floored with gravel surfacing 6 in. thick. From there back a distance of 90 ft. the natural surface is to be graded off to a 2% grade to El. 373, which is 10 ft. above low-water surface, the top of the dock and pier wall being at El. 370. The channel, as in all the Barge Canal, is 12 ft. deep.

When the contractor entered the site it was covered with dilapidated salt-drying sheds founded on a solid

and dry formation which was, nevertheless, filled with roots and trees and presented every indication of having been a marsh before drying out. As shown on the general map this was nearly a mile from the lake shore. The pier and dock walls were first excavated between rows of steel sheet-piling limiting the outer and inner faces of the wall floors. Ordinary Lackawanna steel sheet-piling was first used for this, but it was found to be insufficient to stand the earth pressure when excavated so the arch web type of the same sheet-piling was substituted with very satisfactory results. These piles were driven on the 18-ft. spacing clear around the limits of the wall, and excavation made with clamshell to grade, the clamshell operating on a simple derrick mounted on tracks, which were moved across the site as needed. One view shows the site at the early part of the work, and the other is taken looking along one of the completed walls after the stone had been placed just behind the wall.

This wall construction was completed this spring, and the gravel fill for the flooring is now being placed. At the same time a hydraulic dredge was brought up Onondaga Lake and is proceeding to dig a channel across the flats to the basin. It will be noticed that these flats are the original bed of Onondaga Creek, which will now empty into the turning basin and thence through the channel to the lake. There will be about 1,000,000 cu.yd. of excavation in the whole job.

The terminal was designed and is being built under the direction of the New York State Engineer, Frank M. Williams, with T. B. LaDu, Special Deputy State Engineer, in charge of terminal work. The contract is being carried out under the direction of Guy Moulton, Division Engineer, by the Walsh Construction Co.

Stone-Shipping Dock Is Patterned After Ore-Bin Type

Cylindrical Steel Bins, Loaded from Cars Above, Discharge by Gravity to Steamers—Capacity 7880 Tons

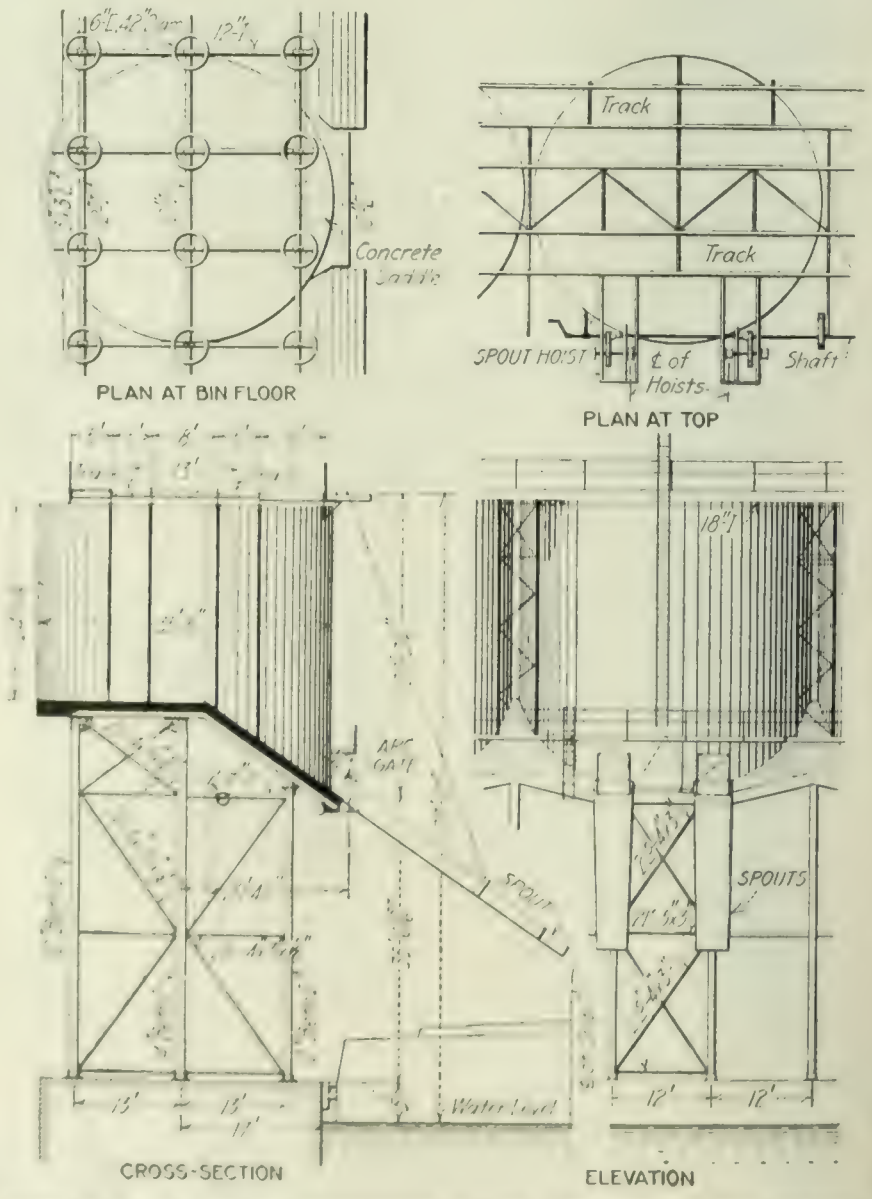
THE Michigan Alkali Co.'s dock for storing and shipping broken-stone at Alpena, Mich., is of the bin type generally used at ore-shipping ports on the Great Lakes, but has several distinctive features. It consists of a steel structure carrying a series of bins, over which run tracks for the cars and from which the stone is spouted by gravity to ships or barges. It has spouts on one side only, as the dock forms one side of a slip, on the other side of which is an old timber dock which will be replaced later with a new structure.

The dock, shown by the accompanying view, is 288 ft. long, with eight circular bins of 985 tons capacity, making a total of 7880 tons. It is on a pier 34 ft. wide, built of cribs which are founded on solid rock and filled with stone and concrete. Anchor bolts for the steelwork were embedded in this concrete. At the shore end is a steel trestle connection to a long earth fill carrying the tracks over which cars are run from the crusher house to the upper level of the dock. This dock was designed and built by the Wisconsin Bridge & Iron Co., of Milwaukee, Wis.

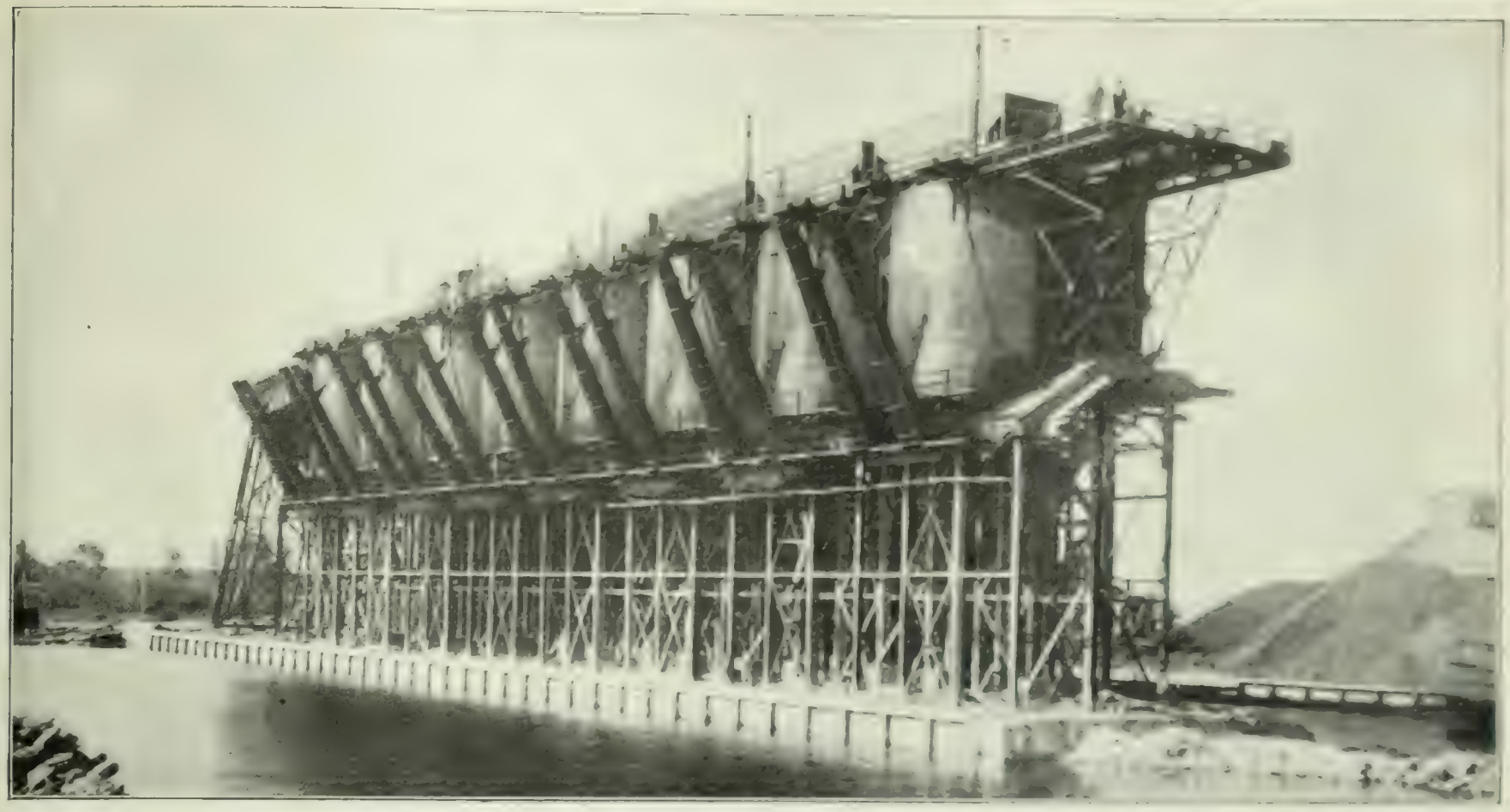
Design of Stone-Shipping Dock

The lower portion of the structure consists of 25 three-post bents 26 ft. wide, spaced 12 ft. c. to c., with diagonal bracing in each third bay. The posts are Bethlehem H-beams, 12-in. for the outer posts and 14-in. for the central posts. The height is about 36 ft. on the shorter side of the bent. The bins are 24½ ft. deep at the rear, where the floor is flat, and 37½ ft. at the front, where the floor is inclined. They are of $\frac{5}{16}$-in. plate for 17 ft. from the top, and thence of $\frac{3}{8}$-in. plate. The framing on top of the bents carries a 24-in. reinforced-concrete slab. The rear part of this is flat, while the forward part is inclined 7 on 10 toward the gates, with a ridge or saddle between the two gate openings. This sloping portion is protected from wear by a 3-in. wood covering.

The steel framing at the tops of the bents supports four rows of columns between the bins, and upon these are plate-girder stringers with track rails laid upon the top flanges. The space between the rails of each track is open, for dumping the stone from hopper-bottom cars. Between and outside of the tracks is a 3-in. plank deck. Along the front of the bins is a walk giving access to the gate-operating machinery. The steelwork was given two coats of Johnson magnetic paint. The interior of the bins is given no special protection against the stone—this not being thought necessary.



DETAILS OF STONE-SHIPPING DOCK, SHOWING CONCRETE FLOOR FOR BINS

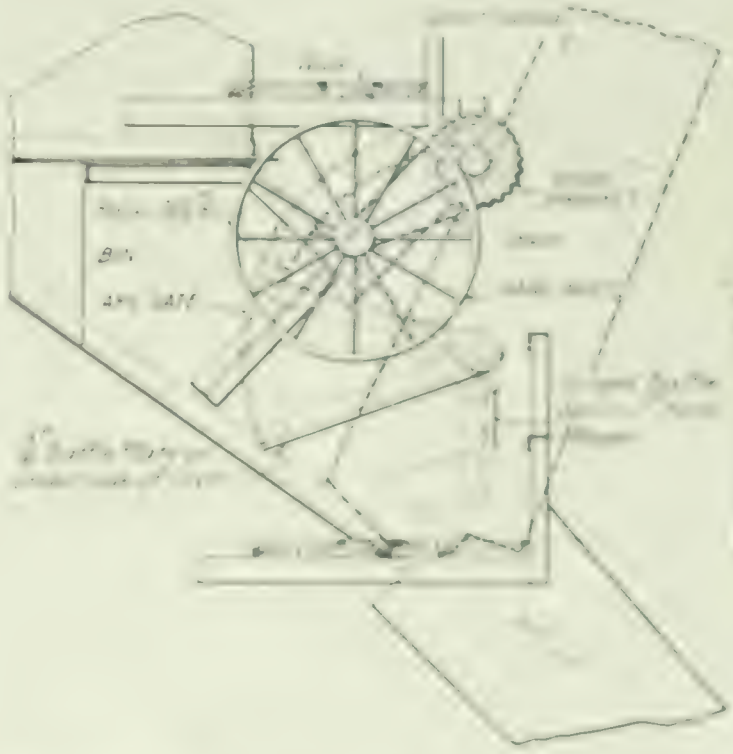


STEEL CYLINDRICAL BINS ARE USED FOR STORING AND SHIPPING BROKEN STONE

A special feature is that the bins are of relatively large capacity, and each is fitted with two doors or gates, thus allowing for more complete discharge of the contents. The large bins reduce the cost of construction and also reduce the maintenance and repair expense for a given capacity. The concrete floor practically eliminates deterioration of the bin bottoms and serves to stiffen the structure, while it also forms a protecting roof over the lower or supporting portion. The two spouts of each bin are 12 ft. c. to c., which corresponds to the standard hatch spacing of lake vessels. As the space between the spouts of adjacent bins is 24 ft., each third hatch is left unserved, and the vessel must be shifted 12 ft. to get its full cargo. This shifting, however, is not objected to by the boat captains.

The use of two doors to each bin makes it possible to reduce the size of the openings so that the flow of stone can be controlled by hand-operated doors. These small doors may be of simple construction. Each opening has a curved or arc gate as shown in one of the drawings, with the convex side facing the bin. On the outer or concave side is a curved rack gearing with a pinion on a short shaft which also carries a 16-in. sprocket wheel. A riveted pintle chain runs over this sprocket and a 4.3-in. sprocket on a shaft carrying a 42-in. hand wheel. Owing to the curvature of the gate its movement in closing is in the direction of the flow of the stone so that it is easily closed. The gates are operated by men on a platform near the bottom of the bins.

The swinging spouts or chutes are steel troughs about 33 ft. long, 52 to 32 in. wide, pivoted at the heel and having near the lower end a bail attached to a cable. They are of light construction and are counterweighted, so that the operating power required and the repair cost are very low. The hoists for these spouts are arranged in groups of four. Each group has a line shaft which is fitted with a friction clutch for each hoist and is driven from a 10-hp. electric motor. By means of a special device, the motor and clutches can be controlled from the operating platform or walk on top of the dock



This enables one man to operate any of the four chutes from any part of the platform directly above the group, and at the same time to keep control of the motor.

Brockton Activated-Sludge Plans

Plans for the proposed activated-sludge plant for Brockton, Mass., are being made by H. E. Crocker, city engineer, but they will probably not be sufficiently advanced for bids until 1918. The plant will have a capacity of 8,000,000 gal. in 24 hr., with a 4-hr. running-through period.

Building Up an Engineering Organization

—*With Special Reference to the Selection of Men*

By ARTHUR E. MORGAN
Chief Engineer, Miami Conservancy District, Dayton, Ohio

Engineering is not simply doing a thing. It is first finding the man to do it. The primary requisite of finding the man is to know what qualities are wanted for the particular job. The next is to spot those qualifications in any particular man. Mr. Morgan is the head of one of the big and successful engineering organizations of the day. He tells here what qualities a man had to have before he was asked to join that organization. How those qualities were discovered in a man, is a secret Mr. Morgan finds difficult to analyze, for he writes the editor: "It is about as easy to tell how one knows a good man when he sees him, as it is to pick out the kind of woman to have for a wife."

A BUSINESS or professional organization is efficient or inefficient depending on whether it serves the particular purpose intended. In the prosecution of the present war, the discipline and organization which would be most effective on the battlefield would fail hopelessly if applied to the organization of a research laboratory where anti-submarine devices were being sought. In the one case all wisdom and judgment, except as to details, comes from the higher authority, and the organization is most nearly perfect when it functions without any independent purposes in the individual parts, but simply carries out orders effectively. In a research laboratory it is insight and imagination which count, and the man on the job must personally exercise these qualities.

Organizations Differ

So in various fields of engineering, different kinds of organization are necessary to serve different purposes. In such a field as that occupied by the large bridge companies a mechanically exact organization may produce excellent results. In the case of the Miami Conservancy District, such an organization at the inception of the project would have meant failure or serious loss of efficiency. The collection, classification and platting of data was standardized as far as possible, but a large part of the work was exploration or research, and could not be treated in this manner.

When the work was undertaken an outline of the problem was made, and a general scheme of organization prepared, of which the following is roughly a summary:

About fifty men were employed for field surveys, divided into five to seven parties. Each party was in charge of a chief, who also acted as transitman. He had one or two rodmen and one to three helpers or axemen. Under his direction was a transitman or topographer with a similar number of helpers. A single field engineer was employed to supervise these field parties and to standardize field methods. Considerable time passed before all the parties were brought to standard methods, and complete coördination secured between field and drafting room. In the drafting room from 20 to 30 draftsmen were employed, who were under the direction of a chief draftsman. Here, also, considerable time elapsed before standard methods for the somewhat unusual type of work had been developed and thoroughly established.

Research a Big Part of Work

However, the principal part of the work was of a different character. It consisted of research and investigations in meteorology, hydraulics, earth dam and conduit design, the preparation of a legal code, and numerous other problems where the particular man in charge must be depended upon not only to work accurately but to have the imagination, experience, insight and judgment to get the results. Nearly every important problem was attacked by several different men who worked independently and later compared results, but there could be little supervision of any particular investigation in the usual sense. It was necessary, therefore, to gather together a group of men, each capable of doing sound, dependable work in his field. Moreover, it was desirable that as the project should arrive at the construction stage, the job should have developed a force of men of such experience and training on other work, and of such acquaintance with this project, that they could take charge of construction.

> *"To associate for a number of years with this type of men is one of the experiences which make life worth living."*

During the period of research and exploration it was impossible to foretell what particular line of investigation would be dropped as of no interest, and what line would become of controlling importance. Therefore it was imperative that the men holding responsible positions should not stand upon their dignity but should be willing to lose the identity and importance of their work in that of the project as a whole. Any man to whom the advancement of his personal reputation was first consideration, would be out of place. The perfect organization must be in a continual state of change, each man in it continually tending to gravitate toward the place where he is most useful, whether that place be more or

less important than the one he has filled in the past. Where research is involved, the most destructive criticism by one's fellow workmen must be sought and cheerfully accepted.

Three Qualities Sought in Men

These three principal qualities, therefore, are necessary in an organization built on these lines.

First, the men in responsible positions must be able to carry on research and exploration work, being of such calibre that they are responsible for the results secured.

Second, they must, by personality, training and experience be fitted to take charge of the construction, for their acquaintance with the development of plans is an asset which must not be lost. Of course, not every man doing important work in the organization can be expected to fit into both fields. The most notable research work was done by a man who would not qualify for construction.

Third, they must be of such personality and character that they can merge their personal interests in those of the job, expecting a vaguely defined organization to take shape gradually as construction is approached and as the particular efficiency of the various men is determined.

> *"Men must be of such personality and character that they can merge their personal interests in those of the job."*

In Plato's "Republic" Socrates is described as outlining the character of the ideal soldier. He must be courageous and ruthless in battle, but gentle and peaceable at home. When one of Socrates' young friends insists in effect that there is no such animal, Socrates remarks that such men are necessary to his scheme, and therefore they must be found. That was the assumption made in organizing the engineering force of the Miami Conservancy District. Thousands of prospects were looked up, through acquaintances, advertisements, technical schools, engineering agencies, and especially by conference and correspondence with heads of projects nearing completion. Extensive trips were made, during which hundreds of men were interviewed, always with the above specifications clearly in mind. And the kind of men wanted were found.

> *"Nearly every important problem was attacked by several different men, who worked independently and later compared results."*

Responsibility Clearly Defined

The research and exploration problems of the project have been handled in an admirable manner. There has been a degree of coöperation, mutual respect, and good will which is not commonly found; the men are fitted by training and experience to see the construction through to completion and their years of work on the project have given them intimate acquaintance which insures that they will appreciate the significance of the plans.

> *"Where research is involved, the most destructive criticism by one's fellow workmen must be sought and cheerfully accepted."*

As construction approaches a formal organization has gradually been perfected, and status and responsibility have become clearly defined.

Not only has this type of organization been good for our particular job, but the opportunity to associate for a number of years with this type of men is one of the experiences which make life worth living.

Tannery Wastes Studied

Tests of Precipitation and Double Filtration by Government Lead Tanners To Build and Run Working Unit

EXPERIMENTS on the purification of tannery wastes by chemical precipitation with copperas, primary filtration through cinders and secondary filtration through sand, conducted at Luray, Va., and Cincinnati, Ohio, by the U. S. Public Health Service, gave such good results and were so successful in arousing interest among tanneries that three Virginia tanneries combined to build and operate a working-scale plant at Luray with a daily capacity of 10,000 gal. The coöperating tanneries are the Deford Leather Co., Luray; the Leas & McVitty Co., Salem; and Cover & Sons, Elkton.

The original tests, which were made at the first-named plant and at the tannery of Haffner Brothers, Cincinnati, were briefly described by Harry B. Hommon, sanitary chemist, U. S. Public Health Service, Cincinnati, in a paper printed in the July *Journal* of the American Leather Chemists' Society. They show the following results, starting with composite samples from the various elements of the tannery: Suspended solids, reduced from 1200 p.p.m. in the raw wastes to 450 in the settling-tank effluent, to 160 in the cinder, and to 30 in the sand-filter effluent; organic and free ammonia, 70, 55, 30 and 25 respectively; oxygen consumed (30 min. at 96° C.), 900, 530, 205 and 55. The cinder filters were operated at a rate of 250,000 and the sand filters 300,000 gal. per acre. The cinder filter gave 0.29 p.p.m. of nitrites and 6.0 of nitrates; the sand filter, 0.17 and 23.0 respectively.

Conclusions and Application of the Tests

Mr. Hommon expresses the conclusions drawn from the small-scale experiments and their practical application in the larger or 10,000-gal. unit at Luray, as follows:

1. "A storage tank for spent tan liquor to be used also for treatment of this liquor with lime sludge if it is strongly acid. As it is customary to discharge tan liquor intermittently or but once a day, this tank is required to distribute the flow throughout the day. For the 10,000-gal. plant at Luray, duplicate tanks, each 10

x 6 ft. in plan and 3½ ft. deep, with dosing appliances, are provided.

2. "A solution tank for the ferrous sulphate (copperas) solution. These tanks are in duplicate, each 1½ x 2½ ft. in plan and 2 ft. deep, and have the necessary regulating devices.

3. "A settling tank of sufficient capacity to allow a minimum detention period of two hours computed on the displacement basis. The tank for this purpose at Luray is 20 x 8 ft. by 11 ft. deep, and contains baffles and scum boards.

4. "Cinder filters having a total depth of 5 ft. of cinders, or 4 ft. exclusive of the underdrains. At Luray this is 42 x 30 ft.

5. "Sand filters. Since as good results were obtained in the tests with a depth of sand of 2 ft. as with 5, the sand filter at Luray is divided into three sections having 2, 3 and 4 ft. of sand laid over underdrains which occupy a maximum of 1 ft., sloping to zero at the sides. Separate outlets are provided for each section for taking samples, and provisions were made to increase the depth of the shallow sections if it becomes necessary. These filters, as well as the cinder filters, will operate at a rate of 200,000 gal. per acre per day.

6. "Sludge beds, with sloping bottoms, containing 1 ft. of cinders overlaid with 4 in. of sand. For a 10,000-gal. unit treating the type of wastes produced at Luray, an area of about 600 sq.ft. is required.

Best Results From Low Rates of Operation

"In the operation of the testing units," states Mr. Hommon, "it was found that better results were obtained by operating the filters at low rates throughout the 24 hours, rather than applying the entire dose for a given rate during the working day. In the permanent unit the settling tank is designed to store enough wastes during the day to operate the filters during the 14 hours the tannery is not in operation. During the latter part of the tests, sand filters 2 ft. deep gave as satisfactory results as the deeper filters, but these filters were only 1 ft. in diameter and the results were not directly comparable. It seemed advisable, however, to construct the larger filter in the permanent unit of three different depths to definitely decide this point.

"It is recognized that a testing station operated under the constant supervision of a technical man may produce better results than can be obtained from the operation of a large plant under the control of an unskilled operator. It is also appreciated that small units like those operated in the tests may be more readily adjusted to temperature changes and other unfavorable conditions affecting the results. It was to learn how far the results obtained from the operation of the testing units could be duplicated in a large plant that recommendations were made to the tanners interested that they build and operate a large unit.

"The plant now under construction at Luray is to be under the general supervision of the government, but this will extend only to making analyses of samples sent to the government laboratory, and to occasional visits for the purpose of suggesting changes in construction and operation."

The 10,000-gal. plant has been in operation since the latter part of June, 1917. Although without technical supervision it is giving results even more satisfactory than those obtained by the small-scale tests.

The Public Health Service will publish a detailed report in the near future containing complete descriptions of the plants and the results obtained. Progress reports will also be published giving the results from the operation of the permanent unit. The general supervision of the work described was conducted by Prof. Earl B. Phelps, Washington, D. C., under the immediate charge at Cincinnati field headquarters of Mr. Hommon.

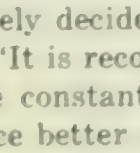
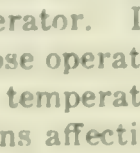
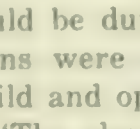
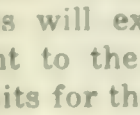
System Makes Easy Determination of Empirical Formulas

Procedure Laid Down for Use of Logarithmic Paper in Finding Equations for Simpler Experimental Graphs

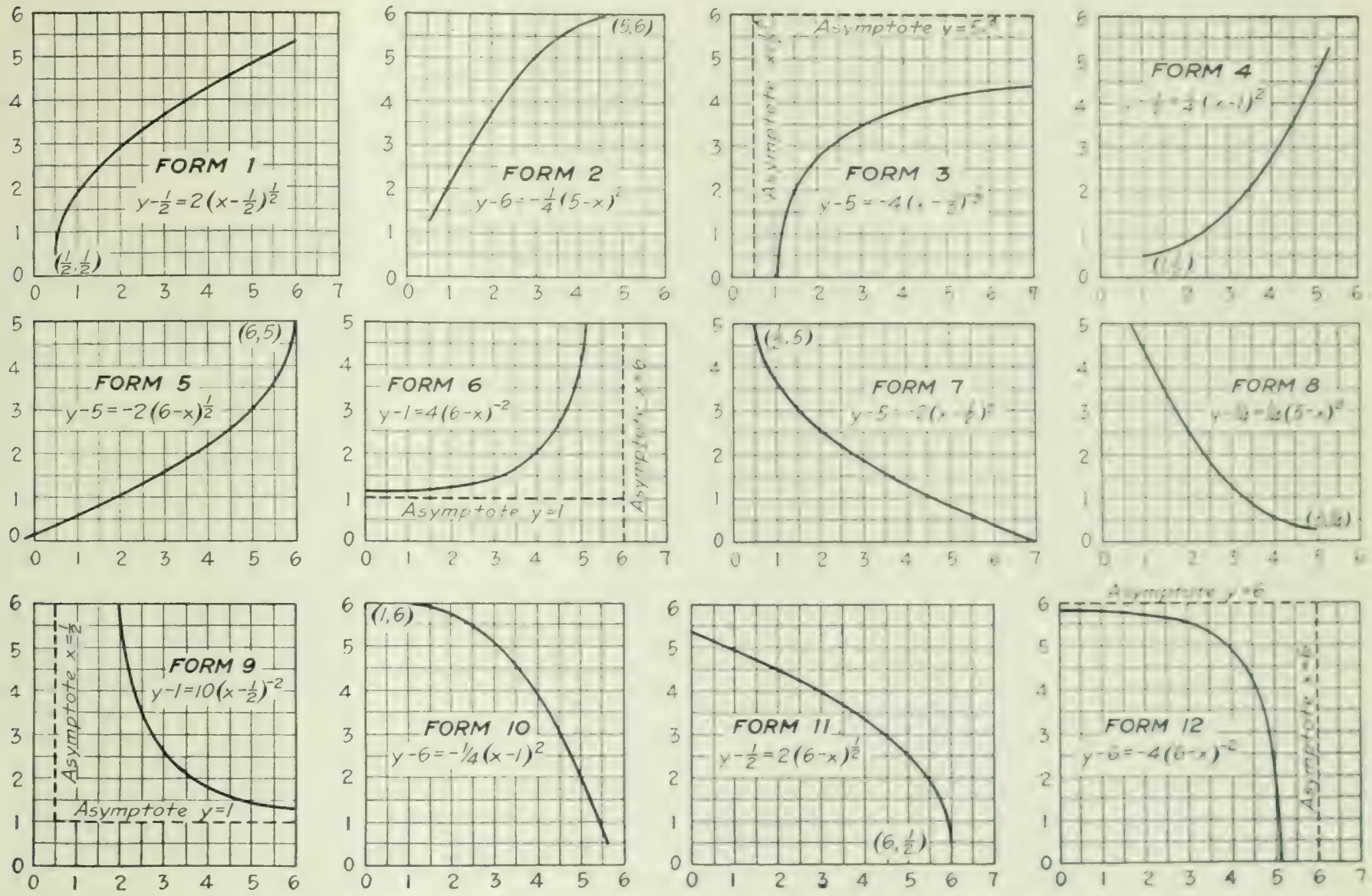
By E. W. Lane
Engineering Department, Miami Conservancy District, Dayton, Ohio

FOLLOWING the universal adoption of the slide rule for making ordinary computations, the use of logarithmic coördinate paper is becoming increasingly common in engineering studies. Some of the properties of such paper are obscure and complex and this article aims to set forth in plain directions a systematic procedure to be followed in one of the most valuable applications of this useful modern device—the determination of empirical exponential formulas to fit given curves.

The use of logarithmic paper in finding equations to express the laws governing phenomena in certain simple classes of cases is already familiar to most engineers. It has been found especially valuable in the analysis of experimental results on account of the great variety of cases in which it can be applied and the ease with which equations may be derived by its aid. An important property of this paper is that any straight line drawn upon it has a simple and easily determined exponential

CHARACTERISTICS OF THE CURVE						FORM OF EQUATION			
Class	Form No.	Ends at	Ends Parallel to Axis of	Point of Greatest Curvature	Asymptote to	Equation Type No.	Sign of "C"	Sign of "n"	n ≷ 1
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
CLASS A 	1	b, a	y	b, a		I	+	+	<1
	2	b, a	x	b, a		II	−	+	>1
	3				y=a x=b	I	−	−	
CLASS B 	4	b, a	x	b, a		I	+	+	>1
	5	b, a	y	b, a		II	−	+	<1
	6				y=a x=b	II	+	−	
CLASS C 	7	b, a	y	b, a		I	−	+	<1
	8	b, a	x	b, a		II	+	+	>1
	9				y=a x=b	I	+	−	
CLASS D 	10	b, a	x	b, a		I	−	+	>1
	11	b, a	y	b, a		II	+	+	<1
	12				y=a x=b	II	−	−	

TABULATED CURVE CHARACTERISTICS AND EQUATION FORMS FOR DETERMINING EMPIRICAL EXPONENTIAL FORMULAS



TWELVE TYPICAL EXPONENTIAL CURVES OF THE SIMPLER FORMS

formula, and its use has been largely confined to cases in which the data fall on such a line. Simple formulas may in many cases be found, however, where the experimental data plot on a curve, sometimes even on reverse curves. Some writers have suggested the method of finding the equations of such forms, but no thorough investigation of the subject seems to have been published.

The following discussion was prepared by the writer under the direction of S. M. Woodward, in connection with the design of the flood-prevention works of the Miami Conservancy District. Its purpose is to point out some of the possibilities of the determination of equations by the aid of logarithmic paper and the characteristics of the curves to which the process may be applied. In this article the mathematical principles are not discussed, but an effort is made to present the subject in the form in which it will be of greatest practical use. It is assumed that the reader is already familiar with the theory and principal properties of logarithmic paper, and the case of the straight line will therefore not be considered.

Classification of Curves

Simple exponential equations can be found by the aid of logarithmic paper for a great variety of curves. The formulas are of two general types:

Type I, $y - a = b(x - c)^n$

Type II, $y - a = b(c - x)^n$

where a, b, c and n are any real numbers. Most graphs, in which one variable is a single-valued increasing or decreasing function of the other, can be closely approximated by one of these two equations.

In this discussion only the cases where $y - a$ and $x - b$ or $b - x$ are positive will be considered, since when they are negative, complications are introduced, a consideration of which will add little to the value of the discussion. Depending on the sign and magnitude of the constants c and n, these two type formulas cover 12 distinct forms of curve, each having different characteristics.

To aid in selecting the equation which will fit any desired curve, the forms here have been classified according to their shape when plotted on rectangular coordinates. In the accompanying table these classes are tabulated, together with the characteristics of the three forms in each class, and the magnitude and sign of the constants which distinguish them. Typical curves of each case are shown in the 12 sketches.

The basis of classification used is the well-known one of differential calculus, depending on the signs of the first and second derivative. In other words, all curves whose slopes are of the same sign, and which are concave in the same direction, are in the same class. For example, class A contains all those forms which slope upward to the right and are concave downward, or for which the first derivative is positive, while the second is negative. There are three of these forms, which, for the purpose of identification, have been numbered 1 to 3 inclusive. Examples of each form are shown and in the table are listed their characteristic features.

Consider a curve of form 1. The second column of the table shows that it ends at the point (b, a). The third

column shows that at this point the curve is parallel to the axis of y, while the fourth column shows that it is also the point of greatest curvature. Column 5 indicates that the curve is not asymptotic to any line. In the last four columns are given the determining features of the formula for the curve. In the first of these, column 6, is given the type of equation for this form—in this case type I, or $y - a = c\ (x - b)^n$. The next two columns show that the signs of both c and n are plus, while column 9 shows that n must be less than unity. In the sketches is a typical curve of this form, the equation being $y - 1 = 2\ (x - 1)^{\frac{1}{2}}$.

Consider a curve of form 3. Columns 2 and 3 of the table indicate that this curve has no finite end. Since the expression for the point of greatest curvature is complicated, it is not included in column 4. Column 5 shows that the curve has two asymptotes, $y = a$ and $x = b$. Columns 6 to 9 inclusive give the characteristics of the formula. It belongs to type I; both c and n are negative, and n may be greater or less than unity. A typical example of form 3 is drawn for which the equation is $y - 5 = -4\ (x - 2)^{-1}$.

Selection of Type of Equation

The first step in the determination of the formula of a curve is to find to which class and form it belongs. For example, consider a curve which slopes upward toward the right, is concave upward, is asymptotic to a line parallel to the axis of x and possibly also to one parallel to the y axis. The first two characteristics, a plus slope and concavity upward, place this curve in class B of the table, while having asymptotes, places it in form 6. The equation whose graph will most nearly fit the given curve is therefore $y - a = c\ (b - x)^n$, where c is positive and n is negative.

It sometimes happens that the curve is not so easily classified as this example and it is necessary to try out several forms in order to arrive at the best one.

Where a high degree of precision is not required, the determination of the values of the constants can best be made by a cut-and-try process. In order better to understand the method, consider the two type forms:

$$y - a = c\ (x - b)^n$$

$$y - a = c\ (b - x)^n$$

If we replace $y - a$ by another variable, z, and $x - b$ or $b - x$ by w, we have the equation

$$z = cw^n$$

This will be recognized as the equation of a straight line on logarithmic paper. The method of determination of the proper values of a and b is therefore to find those values which will cause $z = y - a$ when plotted against $w = x - b$ or $b - x$, to form as nearly a straight line as possible. The shape of the graph when plotted on rectangular coördinates often indicates approximately the values of a and b. If the curve belongs to one of the forms where n is negative, the asymptotes will be at the values of b and a. If n is positive, the curve will start from the point (b, a) parallel to the x or y axis, depend on whether n is greater or less, respectively, than unity.

Having determined the form of the equation and the approximate values of a and b, plot on logarithmic paper the values of $y - a$ against $x - b$, using these approximations of a and b, x and y being any of the simultaneous values of the two variables the relation between which it is desired to express by a formula. If c is negative, the form of the type equations must be changed to

$$a - y = -c\ (x - b)^n$$

or

$$a - y = -c\ (b - x)^n$$

and the values of $a - y$ plotted against $x - b$ or $b - x$. The plotted points, using the approximate values, will probably lie on a line which is nearly straight. To transform this into a straight line it will be necessary to use somewhat different values of a and b.

Adjusting the Constants

The following rules will aid in determining the nature of the required changes. To alter the values of these constants in such a way that the curve is moved in the direction in which it is concave, increases the concavity, while to move it in the opposite direction decreases the concavity. Thus, if the graph obtained by plotting $y - a$ and $x - b$ or $b - x$ slopes upward to the right, and is concave upward, to make it more nearly straight change a and b in such a way as to move the graph downward or to the right or both. In any such movement those parts of the graph nearer the lower and the left-hand parts of the sheet tend to move faster than the other parts. With the above rules in mind, a little practice will enable one quickly to select a and b of such magnitude that the points will fall as nearly on a right line as it is possible to make them.

From this straight line the values of c and n of the formula $y - a = c\ (x - b)^n$ or $y - a = c\ (b - x)^n$ are easily determined, since, on account of the properties of logarithmic paper, the value of c with its sign is the ordinate as read on the logarithmic paper of the point at which this line crosses the axis along which the values of $y - a$ were plotted; while the value of n, with its sign, is the tangent of the angle which the line makes with axis along which the values of $x - b$ or $b - x$ were plotted.

For Greater Precision

In case greater precision is required than can be obtained by the use of ordinary logarithmic paper, the logarithms of the values of $y - a$ and $x - b$ or $b - x$ may be plotted to any desired scale on rectangular coördinates and the values of a and b adjusted until a straight line is obtained. In this case the value of c, with its sign, is the number whose logarithm is the magnitude of the ordinate where the straight line crosses the axis along which the logarithms of $y - a$ were plotted, while the value of n is the slope of the line with respect to the axis of the logarithm of $x - b$ as was the case with the logarithmic paper.

Panama Canal Traffic Increasing

The total number of ships in seagoing traffic passing through the Panama Canal during the year ended June 30 was 1876, states the *Panama Canal Record*. This compares with 787 the year before, and 1088 the year before that. The cargo carried during the fiscal year 1916-17 was 7,229,255 long tons.

Side-Hill Drainage Allowed To Wash Over Roads

Between Steep Rock Bank and Lake Culverts Are Done Away with and Fill Replaces Usual Retaining Wall

By W. C. Slayton

Assistant Engineer, New York State Commission of Highways, Rochester, N. Y.

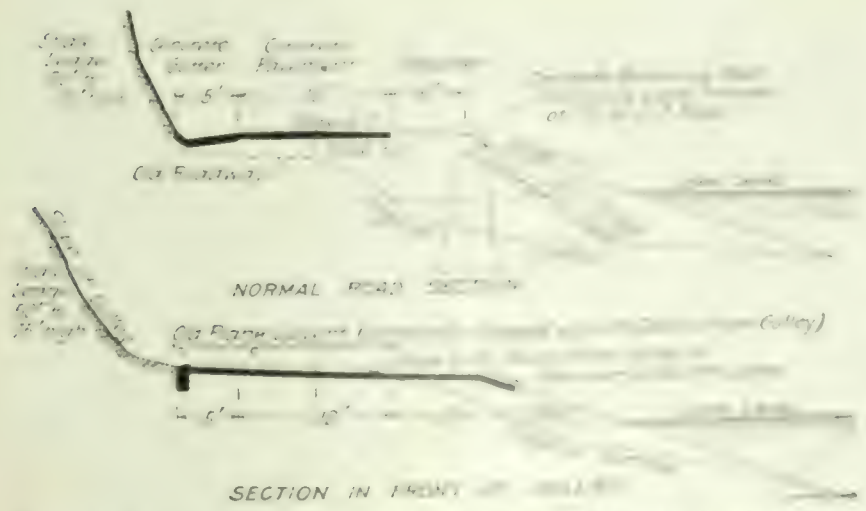
IN THE DESIGN of the Naples-Bristol state highway in Ontario County, New York, one ⅗-mile narrow section runs between the shore of Canadaigua Lake and a nearly perpendicular shale-rock ledge. This ledge is pierced on an average of every 300 ft. by steep and narrow gullies which have worn their way into the ledge and empty into the lake, presumably through plank box culverts under the old road. As a matter of fact, due to the extreme steepness of the gullies and the amount of débris brought down with the water, these culverts are generally clogged up, and the water washes over the road instead of flowing under it. This is especially true after heavy rainfall, as the gullies at such times carry off a large volume of water from the hills above.

New Design Does Away with Culverts

In making a design to surmount the difficulty which the gullies present, it was first thought best to try to build the culverts wide and high enough to carry any amount of water that might be brought to them. It was found, however, that in order to get sufficient headroom for culverts of the desired size, the road grade would have to be raised 6 or 8 ft., thereby requiring a large amount of material for the fill. Even then there would be no assurance that the culverts would not sometimes become clogged, as after unusually heavy storms large boulders are washed down the gullies with the smaller débris.

It was therefore finally decided to go to the other extreme, do away with the culverts altogether, and provide for the water running over the road. While heavy rainfalls will undoubtedly wash some débris onto the road, this will be comparatively easy to handle.

The lower of the two accompanying drawings shows how this is accomplished. A concrete road has been designed for this entire section, though for the road on either side of the rock ledge gravel surfacing has been provided. Along the inner edge of the road there is a concrete gutter except opposite the gullies, where a toe wall is placed. From that toe wall to the edge of the road the concrete surface is sloped at ½ in. per 1 ft. and continues for some little distance over the edge of the fill, which tails off into the lake. The toe wall and the aprons extend 12½ ft. either side of the center line of the gullies.



FLAT-SLOPE FILL AND CONCRETE WASHOVER INSTEAD OF USUAL RETAINING WALL

These washovers are supposed to allow the water to flow freely and still are not steep enough to endanger traffic. The concrete roadway on either side of the washover will have a slope of ¼ in. per ft. from the center line to each edge. On account of the regular roadway sloping each way from the center line toward each side and the washovers sloping in one direction only toward the lake, it will be necessary to gradually warp the road surfacing from the regular to the washover section in order to secure this effect.

Flat-Slope Fill Instead of Wall

Normally, for a side-hill road such as this a retaining wall or a steep-slope fill would be used. On this particular section, however, a flat 1:3 fill, sloping into the lake, has been designed. It was first thought that it would be necessary to use retaining walls to prevent the fill from being washed away by the lake. It was finally decided, however, that inasmuch as this fill is to be made from the shale excavated from the ledge, if it is placed on a flat enough slope it will be equally as serviceable as the wall, to say nothing of being considerably cheaper.

As an added precaution against wash, it is the intention to plant willows along the water edge. Small willows can be set at small expense and will eventually grow to such size as to form a protection as well as an ornament to the shore line. The upper drawing of the two shown herewith gives the main section of the road with the slope as designed and the design made but not used for retaining wall and steep slope. Concrete was used for this particular part because it was thought to be warranted on account of the saving in doing away with the large concrete culverts in front of the gullies and because also the washover sections had in any event to be of concrete.

First Cape Cod Canal Engineer Drafted by George Washington

Thomas Machin, the engineer charged by a committee appointed in 1776 by the colony of Massachusetts with the task of making the first survey for the Cape Cod Canal, was "drafted" as an army engineer by George Washington before he could make a fair start on the survey. George Washington's letter to the chairman of the committee which appointed Mr. Machin read:

"The great demand we have for engineers in this department has obliged me to order Mr. Machin hither to assist in that branch of the business."

This bit of American engineering history is recounted by William Barclay Parsons, in a paper (published in the August, 1917, issue of the *Proceedings* of the American Society of Civil Engineers) on the Cape Cod Canal, which was first proposed more than 300 years ago and finally opened to commercial traffic in 1914.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Faster-Flowing Water Does Not Mean More Water

Sir—The writer has been very much interested in General Chittenden's article entitled, "Faster-Flowing Water Does Not Mean More Water," in your issue of Aug. 9. The writer has often had to combat the same fallacy which General Chittenden points out and has found the mental attitude of the average layman very much as described by him.

It appears to the writer that a hasty reading of the article might leave the inexperienced engineer with the idea that there could be no increase in floods in the lower part of the stream due to improvements of the upper reaches. The article itself, however, indicates two ways in which such increases might occur, neither of which affects the main point. The author says:

"It is scarcely necessary to point out that the matter we are discussing should not be confused with the effect of cutting off valley storage. It is well recognized that the cutting off of such overflow throws a heavier burden upon the main channel in time of flood. . . . . For instance, if the Mississippi River were shortened, as it might be, so that a flood entering Cairo would reach Vicksburg two days earlier than by the present channel, that fact would involve no menace if more water did not also come, which would certainly not be the case."

The reader must remember that the elimination of valley storage may greatly increase the floods. This has been demonstrated in the studies of all of our large rivers, but is particularly important in the case of small streams where the improvements are of a very radical nature. This was brought out in the study of the extraordinary flood in the River des Peres of Aug. 19, 1915 (see *Engineering News* of Oct. 14, 1915).

In this instance, which referred to a small stream of only 100 sq.mi. of drainage area, and with a very insufficient channel, the valley storage reached unusual proportions. In attempting to analyze the conditions in order to arrive at the proper size of improved channel, the writer prepared a hypothetical discharge curve based on the elimination of storage. This showed that an improved upper stream of ample capacity would have discharged approximately 20% more water per second into lower reaches.

As General Chittenden points out, this is not in any way due to faster flowing water in the improved channel, but is due entirely to the provision of an ample channel.

Referring now to the second sentence quoted, the fact of the flow reaching Vicksburg two days earlier may be of no material importance in the Mississippi River, but in a small stream of the character outlined above, the fact of a flow reaching a junction point two hours earlier than in the improved channel might have considerable effect on the flow in the lower valley. This would be clearly illustrated by the following:

Assume the time of flow from the headwaters to a junction point in the improved channel to be six hours. Assume the time of flow in the branch at the junction point to be four hours. If the improvement of the upper channel decreases the time of flow of the main stream to four hours also, then the critical condition below the junction is for a four-hour maximum rain instead of the six-hour rain, and on the occurrence of such a rain the flow in the lower valley would certainly be more severe than it could possibly have been if the upper channel had not been improved.

It is evident that any extended channel improvement will involve both a reduction of valley storage and a probability of a shorter concentration of flow, and that the combination of these two factors may introduce important differences along the lower reaches.

These illustrations have no direct bearing on the point of General Chittenden's article, but are offered as a warning that his article should be read carefully and that the reader should not jump at a conclusion from the title.

W. W. HORNER,
Engineer-in-Charge Design of Sewers and Paving.
St. Louis, Mo.

Sir—General Chittenden's theory will not accord with the facts if the channel improvement above a point is so extensive with relation to the water-shed as to produce a more rapid rate of run-off from the drainage area. The theory will be approximately correct only in the case where the improvement of a section of the water course does not affect the rate of run-off from the drainage area above.

Assuming at a point a well defined water channel, improved or unimproved, having a maximum flood discharging capacity within the limits of overflow, a larger waterway opening will be required and the sectional area of the flood will increase in some relation to improvements of the water courses in the drainage area above producing a delivery of the rainfall from the entire area at a more rapid rate in a shorter time. It might well be that channel improvements in the drainage area above could be of such character and extent as to produce an increased sectional area of flood at the assumed point below even if a channel improvement had been made at the latter place.

J. L. CAMPBELL.
El Paso, Tex.

Sir—It is with no little diffidence that the writer undertakes to question the logic of so able a writer as General Chittenden. The startling heading given above means nothing unless consideration is given to the section of the channel through which the water is flowing.

If a volume of water flows through a fixed section at a velocity of 3 ft. per sec. and this velocity is increased to 6 ft. per sec., then the volume carried in a given interval of time will also be increased. To carry the same volume through the section at different velocities, requires that for the higher velocities the hydraulic mean depth must be decreased, and for the flatter slope and lower velocities the hydraulic mean depth must be increased. So it will be seen that the stage or elevation of

the surface of the water is to that extent independent of volume.

The writer is somewhat familiar with the flood problems of the Mississippi River and the menace of cut-offs. Deep bends are common on both the Mississippi and Missouri Rivers. Take for instance a bend ten miles in length with an average slope of 4 in. to the mile. The narrow neck of land separating the upper and lower branches of the bend is, say, one mile wide. The hydraulic head against the upper side of the threatened cut-off is then 40 in. A cut-off now occurs and this head is absorbed by lowering the surface above and raising it below. Close the cut-off again and the head above is restored, the surface of the water on the upper side of the narrow neck is raised and on the lower side it is lowered. To those living behind levees below the cut-offs that have occurred, these facts have been so emphatically demonstrated by actual observations that further proof is not necessary. To them, higher water with its larger flooded area, means more water, and any other construction is a mere quibble; their only means of measurement is gage height. They are interested in volume of flow only so far as it affects stage, or height of water surface, but are quite alive to any change in that particular. The picture of ruin and devastation drawn by the attorney in the Miami Conservancy case quoted was not so far wrong after all.

The influence of storage is by no means so insignificant that it can be ignored. A flood passing Cairo at the rate of over two million second feet passes the mouth of Red River at a rate of about one and a half million second feet. Even within its banks, the storage area of the river in the reach named is 953 square miles.

General Chittenden says that there is "no menace in increased velocity" due to cut-offs and that it is "wholly inconsequential." If he limits the application to rock-bound streams then the writer agrees with him, but it will not do to apply it to alluvial streams. Neither is it true that the increase in velocity due to a cut-off will "be absorbed in the first few hundred feet." We have examples in both the Missouri and Mississippi Rivers where the phenomena relating to cut-offs have been very carefully observed and it has been definitely established that cut-offs affect the slope for many miles both above and below. The increase in velocity does accelerate bank erosion to a very serious extent, and causes a general disturbance of the regimen of the river.

Fixing the banks of a great alluvial river is the largest item in the cost of regulation and control, and it is also indispensable in any such scheme of improvement. It is not surprising then that a threatened cut-off is viewed with no little alarm. The writer cannot agree that all these ideas are "airy nothings" that have merely found "local habitation," for they are based on facts developed in world-wide experience.

Deficient navigable depth usually applies to comparatively straight reaches of river, and not to bends. The bends in the vicinity of Greenville are good examples. In fact so far as cost of improvement is concerned an ideal condition would be realized when curvature with its slope and consequent velocity was such that the stability of the banks would not be disturbed by erosion.

St. Louis, Mo. J. A. OCKERSON.

Show Students How to Observe

Sir—The writer was interested in a letter under the above caption in your issue of May 17, p. 372. Nature study and freehand drawing and sketching from nature are very efficient means of cultivating observation.

There is no good reason for referring particularly to engineering teachers and students. Observing and reasoning should become a habit before the age for entering any college is reached. Likewise there should be a habit of doing some real and original thinking and not that of swallowing whole whatever is printed or told.

The following is one of the numerous instances in the writer's experience of the lack of observation: A railway location was made in a river cañon. Several years thereafter construction was begun. In the meantime, or possibly before the location was made, there occurred a freshet that left unmistakable high-water marks in the numerous piles of drift. Yet the work was staked out, grade pegs were set below the high-water marks, and the grade was actually made by excavating below the driftwood.

The significance of the signs did not occur to the engineers. If others on the work were more observing they made no effort to inform their employers.

Honolulu, T. H. C. H. KLUEGEL.

British Engineers and Founders Agree on Pipe Specifications

Sir—With reference to the controversy in your columns as to cast-iron pipe specifications, perhaps you are not aware that a British standard has been prepared in this country under the auspices of the Engineering Standards Committee, in which both engineers and pipe-founders are represented. The detailed specification will be available for general use in a few weeks.

In view of your own discussion you will be interested to note that interchangeability is to be attained by constancy of external diameter, and that strength is to be determined by a relation between load and flexure. The range of standards is up to 48 in. diameter for socket and spigot pipes, and up to 24 in. diameter for flanged pipes and special castings.

D. HALTON THOMSON.
Chief Eng. Asst., Borough of Portsmouth W.-W. Co.
Portsmouth, England.

[The two clauses relating to interchangeability or uniform outside diameter and to relation between load and flexure are as follows:

"(4) *Constancy of External Diameter*—In order to render the pipes and castings interchangeable it was necessary to standardize the external diameter and allow the internal diameter to vary slightly with the thickness and describe it as the nominal diameter or more. This has had the effect of enormously reducing the number of patterns, as those for the barrel and socket of any group remain the same throughout.

"(5) *Strength and Testing of Cast Iron*. The tensile strength has been fixed at the minimum of 9½ tons per square inch, and the transverse strength, on the standard 3 ft. 1 in. bar with supports 36 in. apart, at the minimum of 28 cwt. and deflection of 0.22 in."

Tons of 2240 lb. are of course to be understood.—Editor.]

ENGINEERING LITERATURE

A REVIEW OF BOOKS AND A LISTING OF NEW PUBLICATIONS

Revised American Classic and New British Graphic Statics

REVIEWED BY J. P. J. WILLIAMS

First Assistant Engineer, Concrete-Steel Engineering Co., New York City

A TEXTBOOK ON ROOFS AND BRIDGES. Part II Graphic Statistics—By Mansfield Merriman, M. Am. Soc. C. E., and Henry S. Jacoby, Professor of Bridge Engineering in Cornell University. Fourth Edition, Revised and Enlarged; Total Issue, Twenty-Second Thousand. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited. Cloth; 6 x 9 in.; pp. 294; illustrated. $2.50.

THE ELEMENTS OF GRAPHIC STATICS: A Textbook for Students, Engineers and Architects—By Ernest H. Sprague, A. M. Inst. C. E. London: Scott, Greenwood & Son. Cloth; 5 x 8 in.; pp. 200; 163 illustrations.

Although these two texts on graphic statics are not directly comparable, since one is a thorough treatment of the application of graphic methods to the analysis of stresses and deflections in roofs and bridges, while the other considers mainly the elementary principles and methods of graphics, nevertheless certain striking differences between the American and British texts are more or less typical. The first of these is seen in the drawing and reproduction of the illustrative diagrams—a matter which is, of course, of the most vital importance in any treatment of graphic methods. The British book is astonishingly weak in this respect; in addition to poorly executed drawings and lettering, there are cases where letters to which reference is made in the text are entirely omitted in the diagrams. The American textbook is wholly satisfactory in this important element of clear and well-lettered drawings.

A second principal requirement for satisfactory treatment of graphic methods is concise and easily followed statements of the principles of the construction and explanations of diagrams used for illustration. In this respect the British text is weak; in fact, an impression of hurried writing and lack of polish is often obtained, as though the text had been rushed to completion to meet a certain time limit. Although in the American treatment the explanation of the practical examples used too often are given undue prominence, tending to obscure the main principles by excessive detail, yet the treatment is, on the whole, quite satisfactory, as is well known by those acquainted with the earlier editions of this classic work. The new chapters on influence lines for stresses and deflections, in which some of the matter is apparently original, add materially to the value of the book and clearly mark its advance over the more elementary work by Mr. Sprauge, who treats influence lines in a separate volume of the Broadway Series of Engineering Handbooks.

In one respect the book by Mr. Sprague is superior to that by Merriman & Jacoby. This is in the important matter of problems—or "examples," as they are called by Mr. Sprague. Instead of giving a few problems at the end of each article, which are obviously to be solved by the methods of that article, as in "Roofs and Bridges," Mr. Sprague gives many differing problems at the end of each chapter, thus forcing the student to select the proper method of solution. The order of presentation in the two treatments is quite different. In fact, there seems little logic in the sequence adopted by Mr. Sprague. This will be seen in the list of chapter headings found in the following discussion of each book.

PART II OF ROOFS AND BRIDGES REVISED

The general character of the previous editions of "Roofs and Bridges," Part II, on graphic methods is too well known to American engineers to require description. The material now added consists mainly of articles on bridge loading and new formulas, a new article treating a special case for the central panel in truss deflections, and three new chapters treating influence lines for stresses and deflections and giving references to American articles on graphic methods, with reproductions of recent photographs of buildings and bridges. The number of pages has been increased from 242 to 304.

The new chapters on influence lines are thorough and up-to-date, that on deflection influence lines following the treatment suggested by D. B. Steinman in the *Engineering Record*, Nov. 25, 1916. Engineers will be particularly interested in the graphic analysis for the K-truss, although it is unfortunate that only a simple-span truss is considered, without extending the analysis to include the cantilever type for which the K-truss is best suited.

To aid in the judgment of the text by those not familiar with Part II of "Roofs and Bridges," the following list of chapter headings in the new edition is given: Principles and Methods (includes moment of inertia, etc.); Roof Trusses; Bridge Trusses; Locomotive Axle Loads; Trusses with Broken Chords; Miscellaneous Trusses; Elastic Deformation of Trusses; Influence Lines for Stresses; Deflection Influence Lines; Reference Literature.

ELEMENTS OF GRAPHIC STATICS

The principal criticisms of this new textbook have already been mentioned. For its purpose, which is evidently to explain general principles in an elementary manner for young engineering students, it is well conceived, and should meet with approval in spite of its obvious shortcomings. The use of such illustrative examples as "flap-doors" and similar nonengineering objects does not add to its value for engineers.

The best indication of the general scope of this little book is in the following list of chapter headings: Composition and Resolution of Forces; the same, mathematically considered; Framed Structures; Superposed and Space Frames; Moments; Roofs; Shear and Bending Moment Diagrams; Relation between Curves of Load, Shear and Bending Moment; Shear and Bending Moment for a Moving Load; Moments of Areas; Stress Distribution on Cross Section; The Line of Pressure.

Hydrology and Its Principles

REVIEWED BY H. K. BARROWS

Consulting Engineer and Associate Professor of Hydraulic Engineering, Massachusetts Institute of Technology, Boston

THE ELEMENTS OF HYDROLOGY—By Adolph F. Meyer, M. Am. Soc. C. E., Consulting Engineer, Associate Professor of Hydraulic Engineering, University of Minnesota. New York: John Wiley & Sons. Cloth; 6 x 9 in.; pp. 487; 287 illustrations, including some on folding plates. $4 net.

The purpose of the author is to clearly set forth fundamental data and considerations relating to the science of hydrology, for the assistance of professional men, teachers and students of engineering, rather than to provide either a text or a reference book on this subject. Problems of hydrology are fundamental in planning and carrying out the works of hydraulic engineering, such as water power, water-supply, irrigation, sewerage and drainage projects, etc., but the treatment of this subject heretofore has been entirely supplemental and in connection with books relating to the various branches of hydraulic engineering.

Beginning with first causes, the atmosphere and water in its various states are discussed in an interesting manner. Precipitation is quite fully treated, including its different forms of occurrence, its measurement and variation. Particular attention is given to maximum precipitation and hourly rates of excessive precipitation, for which very complete data are tabulated. Evaporation from water surface is discussed in some detail and some of the best records of actual observed evaporation given. For the estimate of evaporation based upon data of temperature, relative humidity, etc., the author inclines toward the use of the Dalton formula, with a slightly modified wind coefficient.

The author bases his treatment of the subject of run-off upon the now generally accepted theory that run-off is a residual; that is, precipitation minus losses, rather than a proportion or percentage of precipitation. With this in mind, the water consumed in evaporation from land areas, in transpiration and interception due to vegetation, and the effect of deep seepage are discussed, giving such general information as is now available as well the personal views of the author.

The factors affecting run-off and its division into surface flow and seepage flow are discussed and a number of monthly and daily hydrographs of discharge of streams given. The latter, however, are confined almost entirely to streams in Minnesota and Wisconsin.

The flood flow of streams is discussed chiefly by data of particular occurrences, although a brief statement is made in regard to maximum flood formulæ which have been suggested by different writers. The author leaves this important subject somewhat indefinitely in the mind of the reader and more definite suggestions as to methods of estimating flood flow which he believes desirable would be of value to the engineer. The low-water flow of streams is but sparsely treated, the only data given being for Minnesota streams.

The instruments, methods, etc., used in obtaining stream-flow data are well described, although the author could with advantage more clearly define conditions under which different methods of measurement should be used, with especial reference to the quantity of discharge to be measured. The use of sharp crested weirs for stream-flow measurement should also receive attention.

To supplement the many short-time records of stream flow which are now available through the work of the U. S. Geological Survey, the author suggests the use of the so-called "hydro-physical" method, which, in brief, consists of computing the losses due to water and land evaporation, transpiration, etc., and subtracting these losses from the rainfall. This is a logical method of procedure, but the student should keep in mind that the use of basic diagrams of soil evaporation, transpiration, etc., presented by the author, with variable coefficients, to take into account conditions upon a particular drainage area, requires to a very large degree an intimate knowledge of the characteristics of the drainage area and good judgment in interpreting these conditions.

The author should perhaps state more emphatically that the ideal consideration is always data of run-off over a long period of years and that the use of the hydro-physical method in extending short-time records should be carefully checked and analyzed by comparison with the actual run-off data before acceptance of results.

The general problems of modifying stream flow by storage are well presented and described. The manner of studying the effect of storage and pondage is only briefly touched upon, however, and the treatment of the mass curve and other methods now in use could well be amplified.

This book, although, as the author frankly states, not complete in many respects, will be of interest and value to all who are studying and meeting the problems of hydraulic engineering. It will be found of material aid in indicating logical methods of analysis and drawing sound conclusions in an important field of engineering.

Machine-Shop Engineering

MODERN MACHINE SHOP CONSTRUCTION, EQUIPMENT AND MANAGEMENT. A Work for the Architect, Engineer, Manufacturer, Director, Officer, Accountant, Superintendent and Foreman. By Joseph H. Dodge, M. Am. Soc. M. E. Second Edition, Revised and Enlarged. New York: Spon & Chamberlain, The Norman W. Henley Publishing Co. Cloth; 6 x 9 in.; pp. 484; 319 figures in the text. $5.

Much information on machine shop requirements and on equipment of interest to the shop architect and structural engineer has here been gathered. There is, of course, still more of greatest interest for the shop managers and superintendents on building construction, improved layout and equipment, shop management, and cost reduction.

The author illustrates what he considers good practice by giving the design, layout and construction adopted for a good-sized plant for the production of medium-sized machinery—a concern having its own foundry, and pattern, carpenter and forge shops, as well as the machine shop and power plant. Steel frames and roof trusses with brick walls are described as the first choice though mill ("slow-burning") buildings and saw-tooth roofs are used for some specific cases and are described at length. Chimney foundations and floors required by various shops are discussed. The topic of floors is handled in a way of particular practical benefit to the architect and structural engineer, since it is written from the shop man's point of view as to what is required. Heating, lighting, power supply, ventilation and the interior transportation lines are discussed.

The author is conservative with regard to "scientific management." He recommends adapting the tools to the work and the materials, the use of standardized performance records as bases of wages, etc., but he does not surrender himself to these ideas in extreme form. He advocates works hospitals, company doctors, mutual-benefit associations, company reading rooms and schools.

Masonry Dams Notably Treated

REVIEWED BY F. TEICHMAN

Engineer, U. S. Reclamation Service, Washington, D. C.

ENGINEERING FOR MASONRY DAMS: By William Pitcher Creager, C. E., M. Am. Soc. C. E. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited. Cloth; 6 x 9 in. pp. 247 (illustrated). $5.00.

This book is remarkable for the completeness and methodical arrangement of its subject matter, the logical and concise language used and the careful interpunctuation. It is never necessary to re-read a sentence or paragraph to arrive at its meaning and even the inexperienced reader must be conscious of a literary pleasure in reading the book.

The author begins with the investigations required for the location of a dam and the selection of its type and then limits his discussion to masonry dams. In a very careful way the forces that act upon a dam are separately treated, and finally the rules and equations are established that govern the design of solid non-overflow and solid spillway gravity dams. This subject terminates with the computation of two examples for each of the two kinds of dams. The hollow dam is next considered and again the principles of the design are illustrated by the computation of two examples. Then follows the arch dam. Here the question of relative arch and beam stress is discussed without any further complications than are of interest to the practical designer. A table gives the general characteristics of 34 representative arch dams. The Jorgensen principle of constant central angle is clearly brought out in a few equations, the advantages of such design are critically examined and by way of illustration the well known Salmon Creek dam is given. The multiple-arch dam is noted in a short section containing suggestions sufficient to the experienced designer.

Near the end of the book one chapter treats the preparation and protection of foundations of dams, another the flood flows of rivers while the last chapter takes up the masonry of dams, including architectural treatment, contraction joints, drainage, waterproofing and the regulation of the high-water surface by gates or syphon spillways.

Only relatively small space is allowed to mathematical deductions—short and satisfactory where they occur. Where higher mathematics would be required to arrive at workable formulas, these formulas are given and the reader is referred to specific articles or books. Such questions as the beam action in an arched dam, or the ice pressure on a dam, or the distribution of shear over the dam section, or uplift, are treated by quoting from the best known authorities on these subjects, or by referring the reader to them, or by both. The author derives his own formulas for the maximum inclined stress in the masonry of the dam and for the lower nappe of jet and the corresponding masonry line of spillway gravity dams and gives an interesting graphic comparison of the outline of five representative spillway dams with that derived from his own formula, all reduced to an overtopping head of 10 ft. Many practical sides of the engineering of masonry dams are not treated at large, but references are given to standard articles or books.

The 229 pages of the volume are full of valuable information, made easy of access by the methodical arrangement of the material. The assumptions and recommendations are consistent with good conservative practice, and the title of the book well represents its contents. If the reader feels any regret it is because he does not find treated one of the difficult problems of engineering of masonry dams—outlet control. It may safely be predicted that the work will be of great value to the student and be a counselor and companion to the designer and to the engineer in the field.

Slopes and Rises

REVIEWED BY R. FLEMING

American Bridge Co., New York City

SMOLEY'S PARALLEL TABLES OF SLOPES AND RISES: In Combination with Diagrams of Slopes and Rises and Other Tables—For Bridge and Structural Engineers, Draftsmen, Checkers, Templet Makers, Builders and Vocational Schools—By Constantine K. Smoley, Author of Parallel Tables of Logarithms and Squares, of the I. C. S. Civil Engineer's Handbook, etc. New York: McGraw-Hill Book Co., Inc. Leather; 5 x 7 in.; pp. 300; illustrated. $3.50.

The great amount of work done in the preparation of these tables may be appreciated from the fact that separate solutions of more than 100,000 right triangles were required. The first 35 pages of Part I are given to the explanation and application of the tables. The tables themselves take up the next 200 pages. Eight two-page plates of graphical solutions of right triangles follow. Part II, of 75 pages, is a reprint of certain pages from the author's well known "Tables of Logarithms and Squares."

The tables of slopes and rises are given for bevels varying by $\frac{1}{16}$ in. from $\frac{1}{16}$ in. to 12 in. per ft. At the top of each page is placed the bevel. The given numbers are the bases, varying by $\frac{1}{16}$ in. from 0 to 12 in. and by 1 ft. from 1 ft. to 40 ft. For each base the corresponding rise and slope or hypothenuse calculated to the nearest $\frac{1}{32}$ in. are placed side by side. It will be seen that if the bevel and any side of a right triangle are known, the other two sides can be readily found.

The reviewer doubts if the tables will be put to all the uses pointed out by the author. Evidently their main purpose is the determination of clearances and distances in structural details. Referring to square-end connections, Fig. 12, it will be seen that the distance from the working point to the first rivet of the diagonal is obtained by adding the slopes found in two tables, the clearance distance, and the distance from the end of the diagonal to the first rivet. But with the usual clearances of $\frac{1}{4}$ to $\frac{1}{2}$ in. and a permissible variation of $\frac{1}{8}$ in. or more the desired distance can be scaled with sufficient accuracy from the general layout. Again, the lengths of main members are usually calculated from the same figures used to obtain the bevel.

The tables can be used to advantage when unusual accuracy in detailing is required. They may also be time-saving when the bevel is given or when several lengths are to be determined from the same bevel. On the whole, the practical value of a book of this kind can be established only by trial. The draftsman must decide for himself whether it is better to use these tables or to stick to his usual methods.

Contents of Levee Embankments

TABLES OF CUBIC CONTENTS OF LEVEE EMBANKMENTS: Designed by Arthur Alvord Stiles, State Reclamation Engineer. Austin (Tex.) State Reclamation Department. Paper; 6 x 9 in.; pp. 212. Price on request as long as limited supply is available.

For use in computing the cubic contents of levee embankments and in approach fills to carry roads over them, these tables give, in section I of the work, the cubic contents per 100 lin.ft. of embankments varying in height from 0.1 ft. to 30 ft. by tenths of a foot, with crown widths from 1 to 10 ft. by feet, and with side slopes the same on both sides or differing on opposite sides from 1:1 to 3:1. The second section covers a greater range of heights—from 0.1 ft. to 60 ft.—but only the yardage of the triangular sections is given complete, the yardage of the rectangular central section being for a section 1 ft. wide, which must be multiplied by the width of the crown and added to the yardage of the triangular sections. The third part of the work gives the total number of cubic yards in embankments for complete road approaches and component parts leading to the top of the levee embankment on one side. It is assumed in computing all of these tables that the ground on which the levee and approach fills are to be constructed is level from side to side.

Fortier's Irrigation Revised

USE OF WATER IN IRRIGATION—By Samuel Fortier, M. Am. Soc. C. E., Chief of Irrigation Investigations, Office of Public Roads and Rural Engineering, United States Department of Agriculture. Second Edition. [Agricultural Engineering Series.] New York: McGraw-Hill Book Co. Cloth; 6 x 8 in.; pp. 325; illustrated. $2.

Besides the correction of minor errors this edition of Professor Fortier's book has an addition of eight pages to the article on water measurement, an entirely new article of six pages on sewage irrigation and a comprehensive new chapter of 54 pages on the "Use of Water in Foreign Countries." The section on sewage irrigation was perhaps added to meet the omission in the first edition, noted in *Engineering News*, Feb. 11, 1915, p. 264. It appears to be based chiefly on the late G. W. Rafter's two Water-Supply and Irrigation papers on sewage irrigation, published many years ago, but there is little other information available on the subject. The various additions improve a book that was already meritorious.

Compressed Air in British Mining

COMPRESSED AIR PRACTICE IN MINING—By [illegible] Peerman, M. Inst. M. E., Certificated Colliery Manager, Lecturer in Mining and Engineering at [illegible] Mining School, London. Charles Griffin & Co., Ltd. Philadelphia: J. B. Lippincott Co. Cloth; 6 x 8 in.; pp. 221; 113 illustrations. $1.75 net.

American engineers who may desire to know something about the use of compressed air for mining work in British possessions will be glad to see this book, for we are told that the use of air in English mining has not developed as much as is warranted, and that there has not been a text from which representative practice could be learned.

The first two chapters, on the thermodynamics of air compression and expansion, and the sections on compressor requirements and power transmission by air, will be lightly passed over by American readers—in view of other adequate treatises of those phases which are not affected by territorial considerations and local ideas.

Much interest should center in the descriptions of English compressors, particularly the "Inbye" type, those intended for use underground. Coal cutters, rock drills, etc., are not neglected. The various forms of mechanism described will be familiar to American users but the makers will appear less so.

Brick Manufacturers Issue Textbook

A TEXTBOOK ON BRICK PAVEMENTS—By Clark B. Mandigo, A.B., M. C.E. [illegible] M. Am. Soc. C. E. Kansas City, Mo. Western Paving Brick Manufacturers Association. Cloth; 5 x 8 in.; pp. 126; 42 illustrations. $1.25

Formerly assistant city engineer of Kansas City, Mo., Mr. Mandigo must have had extensive opportunity to study this type of pavement, so much used in the central and middle western states. The book is written for the Western Paving Brick Manufacturers Association, but is unusually free from bias, even though especial emphasis is laid on the virtues of the so-called "vertical-fiber" brick—the unpatented type advocated by this association. Fair treatment is accorded the Dunn wire-cut-lug block, but points of difference are given and an acceptable case made for the less well known method of manufacturing block suitable for street paving.

Besides this matter, there is a historical sketch of road building development; a statement of the factors of highway economics; a satisfactory treatment of brick manufacture, sub-grade and foundation construction, the composition and method of handling the bedding course and the laying and grouting of the brick; a consideration of certain paving problems; and the specifications for paving with brick which are recommended by the Western Paving Brick Manufacturers Association.

Lighthouse Construction

LIGHTHOUSES AND LIGHTSHIPS OF THE UNITED STATES—By George R. Putnam. New York: Houghton Mifflin Co. Cloth; 6 x 9 in.; pp. 294; illustrated. $2 net.

From early days the building of lights has been the most picturesque of engineering constructions. The constant struggle that the building of a lighthouse involves and the pitting of man's strength against the forces of nature are perhaps more obvious than in any other line of engineering work so that the story of lighthouse building appeals to every engineer, even though he has never smelled salt water. Mr. Putnam for many years has been connected with the Lighthouse Service of the United States. His book is based on authoritative knowledge within his own experience and considerable searching through the records of the office at Washington. The result is more than a technical book; it is a story interesting to the engineer as a man and as a practitioner.

Cost Data for Builders

THE BUILDING ESTIMATOR'S REFERENCE BOOK. A Practical and Thoroughly Reliable Reference Book for Contractors and Estimators Engaged in Estimating the Cost of Any Building. [illegible] Methods, Systems and Short Cuts Employed in the Execution of Every Description of Modern Building Work, with Approximate Costs, Together with Much Valuable Data and Information Relating to the Cost of All Classes of Buildings. By Frank T. Williams, author of "Practical Cost Keeping for Contractors." Second edition. Chicago: The Frank Williams Co. The Author. Leather; 6 x 7 in.; pp. [illegible]; illustrated. $5.

In these days when prices have to be revised weekly, records of cost data are more than ever only comparative. To those who can judiciously balance past costs

with probable present ones, Mr. Walker's handbook should be very useful. It is almost three times as large as the first edition (*Engineering News*, Feb. 17, 1916, page 318) and contains therefore a proportionate increase of material. Its field is very large, extending over all of the details connected with building work of any sort. Even assuming its unit figures to be far off present values, it cannot fail to be of use to anyone concerned with building work.

For Hydraulic Engineers

Two papers for hydraulic engineers have been reprinted separately from the *Journal of Agricultural Research* for April 23, 1917. One is "The Venturi Flume" (see also *Engineering News*, Aug. 10, 1916, page 271), and the other is entitled "Flow Through Submerged Rectangular Orifices with Modified Contractions." Both are by V. M. Cone, Irrigation Engineer, Office of Public Roads and Rural Engineering, United States Department of Agriculture, and are based on studies in the hydraulic laboratory of the Colorado Experiment Station, at Fort Collins.

Bituminous Road-Surfacing Materials

Two pamphlets on bituminous road-surfacing materials have been issued by the Ontario Department of Public Highways (Toronto). One is entitled "Bituminous Surface for Macadam Roads: The Selection of Materials and Methods of Testing," by G. Cameron Parker. The other, "Specifications for Bituminous Materials," contains condensed specifications supplementary to the first-named pamphlet, which seemingly might far better have been included with the first.

Tells How To Study

Based on his long experience, wide observation, extensive reading and deep reflection, Dr. George F. Swain, Gordon McKay Professor of Civil Engineering in Harvard University and Massachusetts Institue of Technology, has written an interesting pamphlet on "How To Study." (New York: McGraw-Hill Book Co., 25c.) The book is addressed primarily to college students and their instructors, but in interest and possible helpfulness it is far broader.

PUBLICATIONS RECEIVED

So far as possible the name of each publisher of books or pamphlets listed in these columns is given in each entry. If the book or pamphlet is for sale and the price is known by the editor, the price is stated in each entry. Where no price is given it does not necessarily follow that the book or pamphlet can be obtained without cost. Many, but not all, of the pamphlets, however, can be secured without cost, at least by inclosing postage. Persons who are in doubt as to the means to be pursued to obtain copies of the publications listed in these columns should apply for information to the stated publisher, or in case of books or papers privately printed, then to the author or other person indicated in the notice.]

MORTALITY STATISTICS, 1915—Washington, D. C.: Bureau of the Census. Cloth, 9 x 12 in.; pp. 797.

ADVANCED FIRST-AID INSTRUCTIONS FOR MINERS: A Report on Standardization. By a Committee of Surgeons: G. H. Halberstadt, A. F. Knoefel, W. A. Lynott, W. S. Rountree and M. J. Shields. Washington: Bureau of Mines. Paper; 6 x 9 in.; pp. 144; illustrated.

Much of the information here given would be as useful in other fields of first-aid work as in mining.

AMERICAN ASSOCIATION OF PUBLIC EMPLOYMENT OFFICIALS. Proceedings for 1916. Washington: Bureau of Labor Statistics. Paper; 6 x 9 in.; pp. 97.

ANTHRACITE AND BITUMINOUS COAL: Report of the Federal Trade Commission, June 20, 1917. Washington: The Commission. Paper; 6 x 9 in.; pp. 139.

Contains much statistical and other information on various phases of the coal industry, together with the recommendations of the commission.

AMERICAN CONRETE INSTITUTE: Proceedings of 1917 Convention. C. D. Hands, Secretary, 30 Broad St., New York City. Cloth; 6 x 9 in.; pp. 486; illustrated.

CALIFORNIA DEPARTMENT OF ENGINEERING: Report December 1914, November 1915. Sacramento: The Department. Paper; 6 x 9 in.; pp. 208. Includes Appendix B, reprint of Bulletin 30, Irrigation Districts of California 1887-1915, pp. 148; Appendix C, reprint of "Investigations of the Economical Duty of Water for Alfalfa in Sacramento Valley, Calif. 1913-1915," pp. 18; and Appendix D, Preliminary Report on Conservation and Control of Flood Water in Coachella Valley, Calif., pp. 31, illustrated.

STATISTICAL ABSTRACT OF THE UNITED STATES 1916—Washington, D. C.: Superintendent Public Documents. Paper; 6 x 9 in., pp. 765. 50 cents.

WISCONSIN RAILROAD COMMISSION: Digest of Decisions Published in Vol. I to XV, 1905 to 1915—Compiled by Harold L. Geisse, Secretary. Madison, Wis.: The Commission. Cloth; 6 x 9 in.; pp. 965.

THE COAL FIELDS AND COAL INDUSTRY OF EASTERN CANADA. By Francis W. Gray. Ottawa, Ont.: Canada Department of Mines. Paper; 7 x 10 in.; pp. 65; illustrated.

AUSTRALIAN PRICES, LABOR AND INDUSTRY: Prices, Purchasing Power of Money, Wages, Trade Unions, Unemployment, and General Industrial Conditions, 1916. By C. H. Wickens, Commonwealth Statistician, Melbourne, Australia. Melbourne: McCarron, Bird & Co. Paper; 8 x 9 in.; pp. 586. 4s shillings.

CHEMICAL AND BACTERIOLOGICAL EXAMINATION OF LONDON WATERS, 1916-17. By Dr. A. C. Houston, Director of Water Examination, Metropolitan Water Board. London, England: P. S. King & Son. Paper; 8 x 13 in.; pp. 16. 2½ shillings.

Notwithstanding reduction to 16 pages, compared with 40 and 61 for the two previous years, this report contains many interesting data, including observations on chlorination and 48 microphotographs of the suspended matter in 0.05 c.c. of water. The latter were designed to show the blocking effect of algae growth on filters.

DISINFECTION OF TANNERY WASTES: By D. D. Jackson [Columbia University, New York City] and A. M. Buswell. [Reprinted from "Journal" of American Leather Chemists Association, June, 1917.] Paper; 6 x 9 in.; pp. 253

HANDBOOK OF SHIP CALCULATIONS, CONSTRUCTION AND OPERATION: A Book of Reference for Shipowners, Ship Officers, Ship and Engine Draftsmen, Marine Engineers and Others Engaged in the Building and Operating of Ships. By Charles H. Hughes, Naval Architect and Engineer. New York: D. Appleton & Co. Flexible Leather; 5 x 7 in.; pp. 739; illustrated. $5.

NEW JERSEY PUBLIC UTILITY COMMISSIONERS: Findings and Decisions, July, 1915, to December, 1916. Trenton, N. J.: The Commission. Cloth; 6 x 9 in.; pp. 613.

NEW YORK STREAM GAGINGS, 1915-16. Albany, N. Y.: State Engineer and Surveyor. Cloth; 6 x 9 in.; pp. 453; many tables; illustrated.

THE RATIO CHART FOR PLOTTING STATISTICS: By Prof. Irving Fisher, Yale University. [Reprinted from "Quarterly Publications," American Statistical Association, June, 1917.] New Haven, Conn.: The Author. Paper; 6 x 9 in.; pp. 24; illustrated.

THE SUBMARINE AND KINDRED PROBLEMS—Bulletin No. 1, Naval Consulting Board of the United States, 13 Park Row, New York City. Paper; 6 x 9 in.; pp. 16.

Information and instructions for those offering suggestions and inventions for coping with submarines.

TRANSACTIONS OKLAHOMA SOCIETY OF ENGINEERS—Vol. III, 1917. By H. V. Hinckley, Secretary. Oklahoma: The Secretary. 6 x 9 in.; pp. 56; illustrated. $1.

THE USE OF THE PANORAMIC CAMERA IN TOPOGRAPHIC SURVEYING: With Notes on the Application of Photogrammetry to Aërial Surveys. By James W. Bagley. Washington, D. C.: United States Geological Survey. Paper; 6 x 9 in.; pp. 88; diagrams and folding plates of halftones and maps.

A remarkably interesting and suggestive review of this relatively new and very promising field.

WATER-SUPPLY PAPERS U. S. GEOLOGICAL SURVEY: Surface-Water Supply of the United States—Nathan C. Grover, Chief Hydraulic Engineer. Paper; 6 x 9 in. At prices named below, from Superintendent of Documents, Washington, D. C.

No. 391: 1914. Part I. Pacific Slope Basins in California. H. D. Mcglashan and F. F. Henshaw, District Engineers. Prepared in coöperation with the State of California. Pp. 328; 30 cents.

No. 394: 1914. Part XII. North Pacific Drainage Basins, Lower Columbia River and Pacific Drainage Basins in Oregon. F. F. Henshaw and G. L. Parker, District Engineers. Prepared in coöperation with the States of Oregon and Washington. Pp. 180; 15 cents.

No. 405: 1915. Part V. Hudson Bay and Upper Mississippi River Basins. W. G. Hoyt and A. H. Horton, District Engineers. Prepared in coöperation with the States of Minnesota, Wisconsin, Iowa and Illinois. Pp. 211; 20 cents.

THE ENGINEER IN FIELD AND OFFICE

A DEPARTMENT DEVOTED TO DETAILS OF THE DAY'S WORK

Pave Steep Grade with Stone Cubes

STONE PAVING has been laid for 300 lin.ft. on a 7% grade on Grafton Ave., at Dayton, Ohio, as it is considered that the wood-block paving used elsewhere on this street would be dangerously slippery. Wood blocks are not used on grades steeper than 1% at Dayton, though in other cities they are sometimes used on heavier grades, the blocks being separated by lugs or strips of lath so as to give a good hold.

The stone paving is of the Durax type, and is costing $3.75 per sq.yd. The blocks are 3½-in. cubes laid on a



STONE-CUBE PAVING ON 7% GRADE AT DAYTON, OHIO

1¼-in. sand cushion on a 6-in. concrete base, and flushed with a 1:1 cement grout. Before grouting the pavement is rolled with a hand roller. A gang of five men can lay about 150 sq.yd. per 8-hr. day.

The city's specifications for this type of paving call for granite with a crushing strength of about 30,000 lb. per sq.in., and a toughness of 12 as determined by the method employed by the U. S. Office of Public Roads. The cubes are specified to be not more than 4-in. or less than 2¾-in., and those used on any one city block must not vary more than ¾ in. That is, the cubes used on any block must be 2¾ to 3½ in., or 3¼ to 4 in. The joints must be ¼ to ½ in. wide. Coarse, dry gravel or crushed stone is spread over the surface and swept into the joints, so as to fill them to a depth of about 1 in. and the paving is then rolled with a 5-ton roller and sprinkled with enough water to moisten the 1:4 mortar cushion. Both cement-grout and asphalt filler are included in the specifications. The work is being done by Edward Ryan, contractor, under the direction of J. E. Barlow, director of public service, and F. O. Eichelberger, city engineer.

How One Steel Structure Failed and Another Stood

BY R. FLEMING

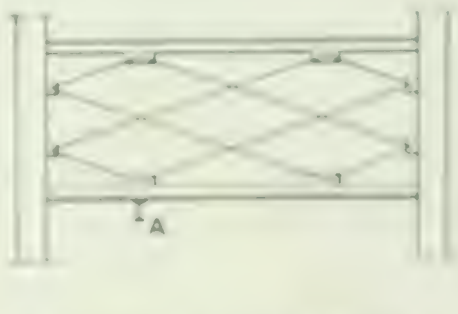
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THE PORTALS of a 200-ft. railroad span were made as shown in the left-hand of the two drawings herewith. The manufacturing company to which it belonged wished to carry a monorail system across the bridge, and attached a row of 12-in. I-beams to the intermediate struts and the portals. There was no trouble at the intermediates, but when the load came to the end the portal gave way, although the flanges and web members were considerably larger than those of the intermediates.

A glance at the portal shows that having no triangular web system it could not carry heavy loads at *A*. It was strengthened by the addition of a 3 x ½-in. flat connecting vertically the gussets above the I-beam, and one in the corresponding place on the other side of the portal. The flats were connected to the gusset plates by two bolts at each end. Since then loads of two tons and more have been on the monorail without causing any trouble.

The right-hand sketch shows a trestle on which cars were run from the headframe of a coal mine. The erecting firm rendered a bill to the fabricating company for reaming holes to make field connections match. The fabricating company's engineer could find no errors in the working drawings nor in the shopwork and insisted that the trouble came from the piers not being on the same level. The matter was left to the purchaser, who finally decided that the fabricating company should pay the bill rendered.

Some months later the engineer visited the site and found at the high corner a clear distance of an inch between the bottom of the base plate and the top of the pier. This upheld him in his former contention that there had been an uneven settlement of the piers. But light cars had been running over the structure daily. It was evident that the vertical reaction was carried by the diagonals at the top and bottom of the end post. It was fortunate that only empty cars had been run over the trestle. When the space between the base plate and top of the pier was filled, loaded cars could be carried.



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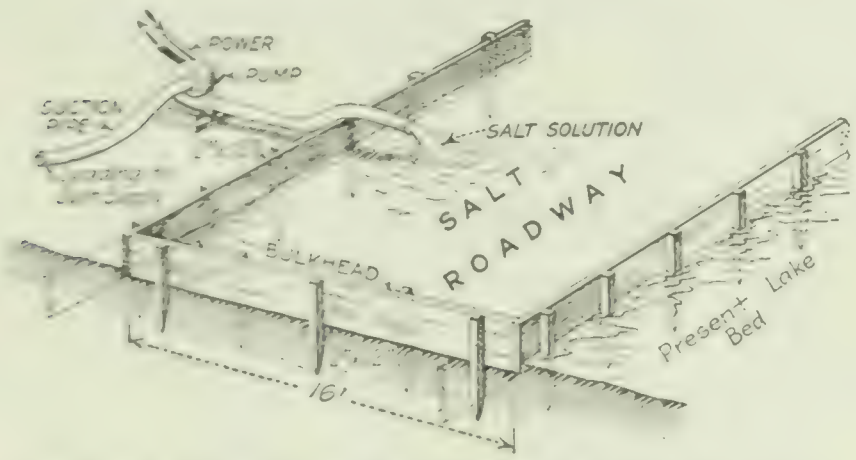
Construct Utah Highway of Solid Salt

By LeRoy W. Allison

Newark, N. J.

A UNIQUE roadway of solid salt, forming a part of the Wendover highway in Tooele County, Utah, is projected by the Utah State Road Commission. Between Timpie and Wendover the line of the highway traverses a flat area, crossing at one point a salt bed about 7 miles wide. For a considerable portion of the year this bed is covered with water which, while it thoroughly saturates the roadway, is never of sufficient depth to impede the progress of vehicles. When dry, the bed is found to make an admirable pavement, with salt 2 to 3 ft. deep, hard and smooth, and with a tendency to cool the rubber tires of motor-driven vehicles.

The plans of the commission provide for the establishment of wooden bulkheads of 2 x 12-in. plank 16-ft.

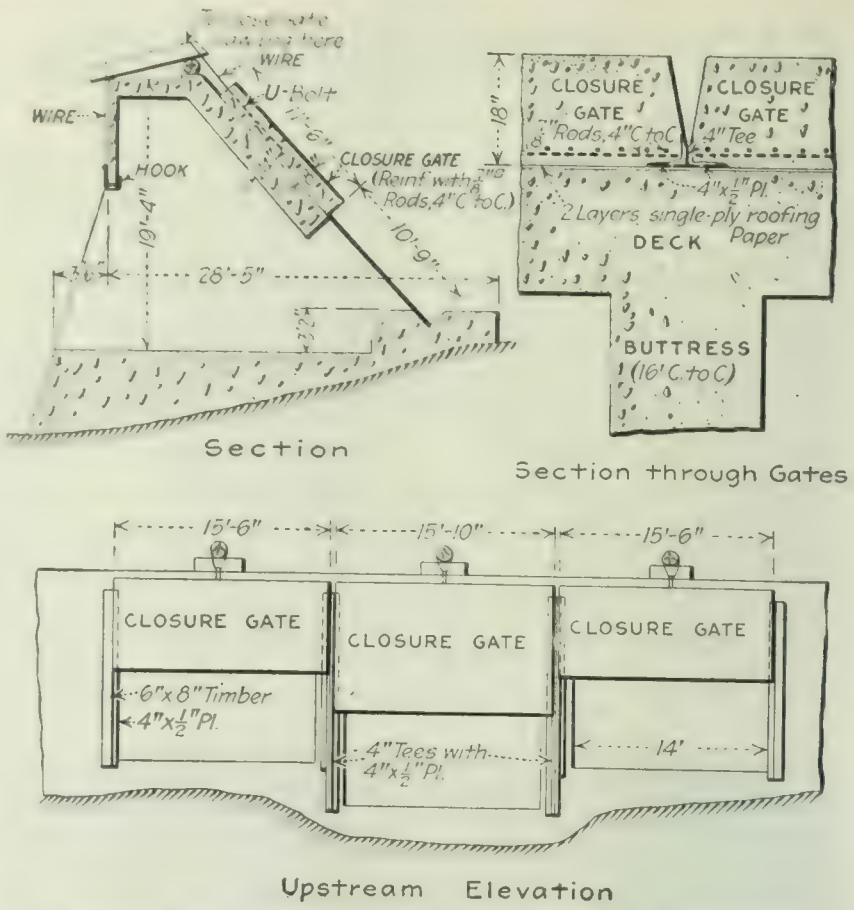


SIMPLY CONSTRUCTED BULKHEAD RETAINS SALT SOLUTION UNTIL EVAPORATION IS COMPLETE

wide and made practically watertight. The construction which will be followed is shown in the accompanying illustration. The pump installation, drawing its supply from lakes of heavy salt water, will pump continually into these trenches, replacing evaporation and leaks until the roadway is formed of crystallized salt to the desired depth. About 40 miles of pavement is to be built by this process and the cost, as estimated, should not run over $1500 per mile. If at any time before construction it becomes desirable to widen the roadway, this could be done without any material addition to the cost.

Concrete Slabs Slide to Place on Deck of Dam to Make Closure

ON the construction of the dam at the new hydroelectric plant of the Cumberland County Power & Light Company at Hiram, Me., on the Saco River, water was allowed to flow through the dam during the main building period, three openings being left in the lower part of the deck. Closure was then accomplished by three reinforced concrete gates which were cast upon the deck of the dam as shown and each held in position by a wire rope attached to log anchored under the opposite wall of the dam by a second rope and hook. Each closure gate was reinforced both ways with ¾-in. square rods spaced 4 in. on centers and was provided with a U-bolt by which the wire attachment was made. To prevent adhesion between the closure slabs and the deck of the dam, two layers of single-ply roofing paper,



SLABS SLID DOWN DECK OF DAM ON GREASED TARPAPER TO MAKE CLOSURE

greased between layers, formed the base upon which the concrete was poured. The closure gates were about 16 ft. high, 18 in. thick and 15 ft. wide, sliding downward between guides composed of 4-in. tees flanked by 4-in. by ½-in. plate on each side. By sawing off the log above each gate on the top of the dam the slab was released and slid into place seating against a concrete recess at the bottom of the deck, as shown in the cross-section.

Photographic Survey of Proposed Railway Route

A PANORAMIC photographic survey of the route of the proposed Oregon, California & Eastern Ry. has been made in order to show the character and possibilities of the country to persons interested. The outfit used was a "Circuit" camera capable of making a picture 8 in. wide and up to 4 ft. in length. The camera revolves on the head of the tripod and is driven by clockwork so as to cover any desired degree of a circle. From a high point it was possible to cover a distance of 10 to 30 miles. In most cases it was found practicable to set up on a mountain or butte in such a position as to take a view from one valley to another, the points being selected by the engineer. Each picture was begun at about the point where the previous one ended.

It required 31 pictures, each 3 to 4 ft. long, to cover the entire route. This work consumed 19 days, as much time was taken in getting to and from the view-points. Pictures were taken only under favorable conditions of light, atmosphere and absence of wind, in order to get good results. After the photographs had been made, the chief engineer had a draftsman plot the line of the survey upon each picture, so as to show the cuts, fills, structures and other main features. The photographic work was done by Charles R. Miller, of the Miller Photo Co., Klamath Falls, Ore. It was ordered by Robert Strahorn, of Portland, Ore., president of the railway company.

HINTS FOR THE CONTRACTOR

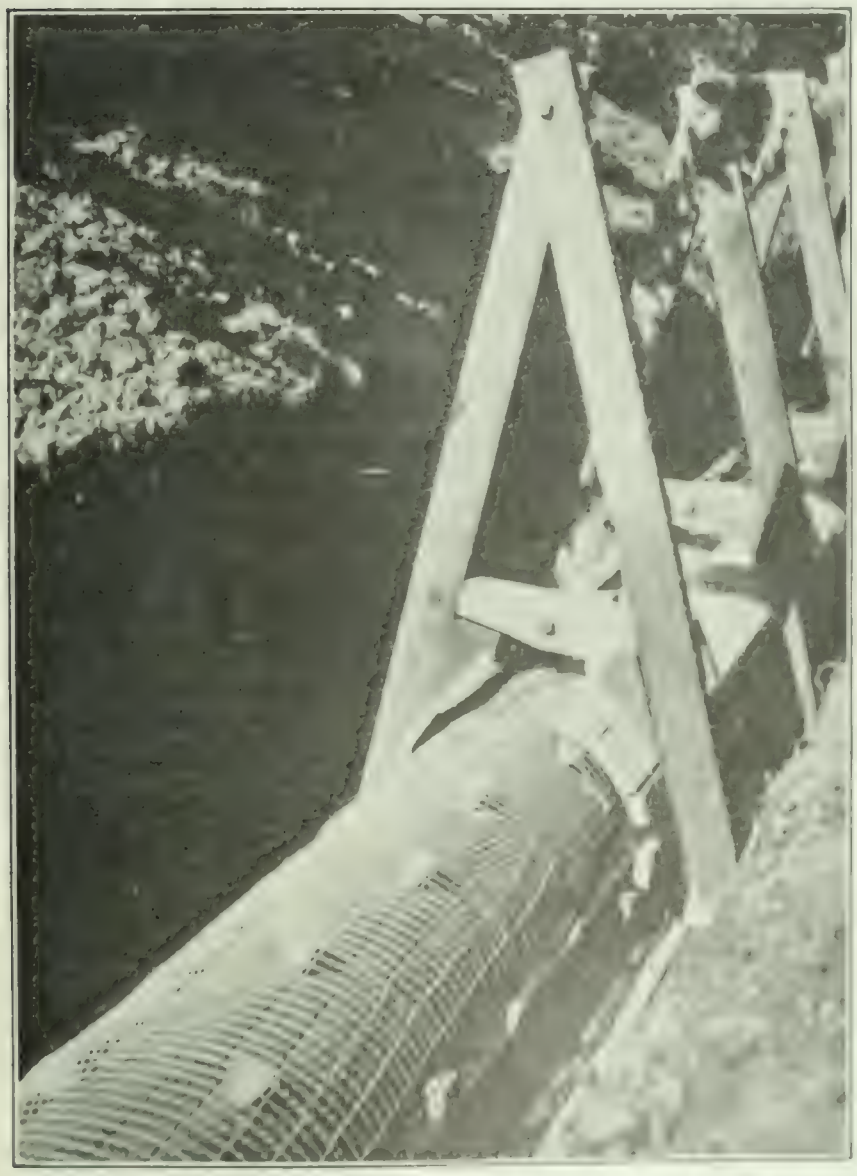
DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Steel Pipe Line Covered with Concrete Without Disturbing Flow

By H. R. Case
Manager, Temescal Water Co., Corona, Calif.

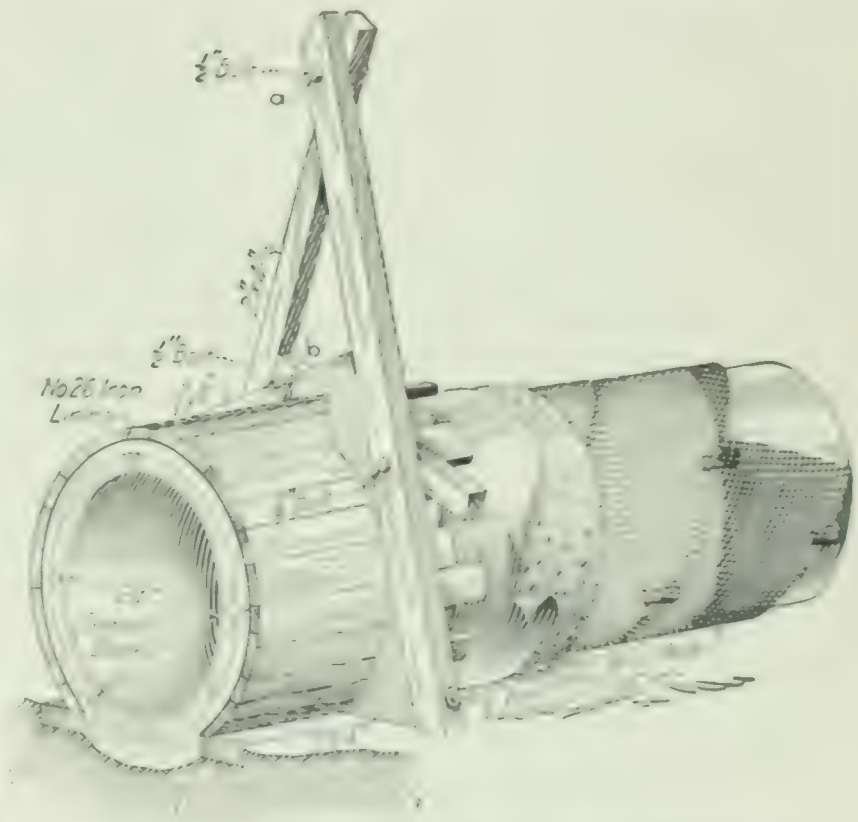
LONG stretches of old riveted-steel water pipe have been successfully incased in reinforced concrete with an economical method in use by the Temescal Water Co., Corona, Calif., for the past four years. In the light of the present high price of steel plates the work may be of interest to others having pipe lines to replace.

These details were worked out more particularly for use in covering 10,000 ft. of 24-in. riveted-steel pipe line used as inverted siphons working up to 80 ft. head. This line was laid 30 years ago and is beginning to give way near the ends of the siphons, and where light weight steel was used on account of low heads. Possibly 95% of the iron is still in the pipe, but it has rusted badly and pitted particularly at the seams, so that it



FORMS BLOCKED FROM GROUND SIDE-BOARDS FROM SHOWN

has been necessary to make repairs during the irrigation season. The system not only protects the outside of the pipe and prolongs its life by the jacket of reinforced concrete, but eventually utilizes all the iron in



OLD STEEL INSIDE FORM FOR NEW CONCRETE PIPE

the old pipe, and when it has disappeared leaves a reinforced-concrete pipe without joints, sufficiently strong to carry the pressure.

The drawing shows the details of the wood form used in covering the 24-in. pipe. The forms are constructed of Oregon pine and lined with No. 26 black iron, which saves not only the forms but much material, making a smooth outside surface to the finished pipe. Forms for 24-in. and larger pipe are made in 8-ft. lengths, while the smaller sizes are made up in 12-ft. lengths.

After the steel pipe is uncovered it is thoroughly scraped and cleaned with steel brushes. The ground under the pipe is then shaped to the required depth, the pipe being supported on wood blocks until the forms are set. Bedplates of 2 x 4s are then spaced with a template, similar to the end section of the form, on each side of the pipe to support the forms when in place. The wire-mesh reinforcement cut to 50- or 75-ft. lengths is then wound spirally around the pipe and supported where the edges unite by small cement-mortar blocks made in the form of truncated pyramids, 1½ in. high, 2 in. square at the base and ½ in. at the apex, which is placed next to the pipe. A man with a hand mold will make 2500 or 3000 of the small blocks in nine hours. The edges of the mesh rest on the base of the little pyramids, thus keeping the wire mesh spaced a uniform distance from the steel pipe or forms. As the blocks are placed, the edges of the wire mesh are tied together with No. 24 soft stovepipe wire.

The forms are then placed on the 2 x 4s and held rigid by the two 2-in. bolts as shown. The wood blocks supporting the pipe are removed, and the pipe is held in place by a strand of wire and a turnbuckle clamp until the form is filled to a point where the concrete will

support the pipe. The concrete is a 1:2½:1 mixture of cement, sand and crushed rock or screened gravel of ¾-in. maximum size. It is mixed by hand and poured rather wet, being worked to place with a light rod and by tapping the forms with a hammer. In laying the pipe up hill the top openings, as the forms are filled, are closed with covers clamped to place until the concrete sets slightly, when the covers are removed and the surface is well troweled and smoothed. The next morning the forms are removed, and the pipe is painted with neat cement. The pipe is then covered with soil and kept wet for two weeks.

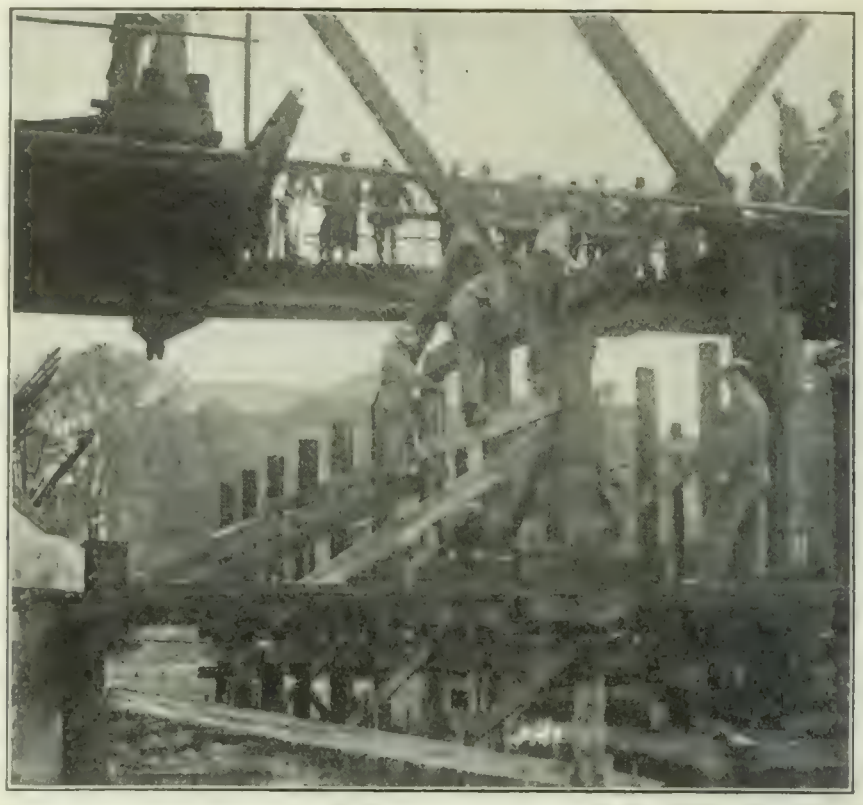
Twelve men will easily build and backfill 140 ft. of 18-in. pipe, 100 ft. of 24-in. or 80 ft. of 30-in. pipe in a day of nine hours. The company is replacing 30-in. steel pipe under 40-ft. head, placed on bridges, with concrete siphons of the same size, at a cost of $2.50 per foot, including the ditching, using collapsible inside forms. Covering 24-in. pipe, including the digging, costs $1.70 per foot, and 18-in. pipe $1.40 per foot. Cement is $2.30 per barrel and labor from $2.25 to $2.50 per day. The mesh used is selected from the stock of the United States Steel Products Co. and varies with the size of pipe and head.

Support Old Steel Spans While Building Arch Bridge Beneath

By R. W. Gearhart
County Engineer, Buchanan County, Independence, Iowa

TWO STEEL spans of an old bridge at Independence, Iowa, were suspended and used to maintain traffic and also as a working platform during the construction of a three-span arch concrete bridge directly beneath it, which has recently been completed under the supervision of the writer.

A clause in the contract required the maintenance of a foot bridge during construction, and the contractor decided to support the old bridge in place rather than build a temporary foot bridge, as the course chosen made it possible to use the old bridge in placing the concrete and earth fill required for the new one. After the new bridge was done it was easy to dismantle the old steel spans on it without the necessity for falsework. The east abutment of the new bridge, which consists of three 80-ft. span arches, was located inside of the old abutment, but the west abutment was so located that the old abutment had to be removed. The west end of the west span of the steel bridge was therefore supported by a bent under each shoe consisting of a 12-in. I-beam of 14-ft. span resting on timber posts. After the new abutment was completed, the weight of the span was transferred to two 10 x 24-in. timbers, one under each shoe, bearing directly on the new concrete. This support remained in place until the old steel was removed.



CENTER SHOES BORE ON COMMON POST

The east span and the west span of the new bridge were concreted under the floor of the old bridge, there being 4 in. clearance between the top of the arch rings and the lower chord of the old steel. During the construction of the new center arch, however, it was necessary to support the inside ends of the two steel spans. The pins of the shoes of these spans were 2 ft. 11 in. apart. Three railroad rails were placed under the pins as a supporting span to reduce the area occupied by the temporary support, so that the opening which had to be left in the arch ring could be made as small as possible. The shoes were first supported on timber bents while the old span was removed, and then on 12 x 24-in. columns directly supporting the rails, as shown in one of the photographs. After the new arch had been concreted and the old steel removed, these holes were filled. The Widell Co., of Mankato, Minn., was the contractor. The new bridge was designed by the Iowa State Highway Department.



CONCRETE AND EARTH FILL PLACED FROM OLD SPANS SUPPORTED DURING CONSTRUCTION OF NEW ARCH BRIDGE BENEATH

Table Shows Complete Average Operating Costs of Trucks

By Ralph W. Horne
Boston, Mass.

IT IS OFTEN the case that a prospective purchaser of a motor truck is misled in regard to the operating cost of the vehicle which he considers buying by a truck salesman who either wilfully or otherwise quotes costs that do not take into account certain items with which the purchaser soon finds himself confronted. During the past few years the writer has made it a point to collect data on the cost of motor-truck operation. These cover the operation of trucks during the periods of from one to several years, and it is believed that all factors which might be affected by seasonal variations are properly averaged.

In considering the distribution of cost, the total should be subdivided into separate, independent items so that each of these may be studied by itself and its relation to the whole cost determined. The following classification of costs will prove to be satisfactory:

1. Gasoline—More or less independent of the total mileage and not to be reduced by increasing the total ton-mileage.

2. Lubricants—A small item relatively and, like No. 1, constant regardless of the total ton-mileage.

3. Tires—Dependent upon the mileage and the load. This figure may be accurately determined only when data are available for some considerable mileage, and should include not only the first cost but any repair charges on the tires.

4. Repairs and Sundries—A large item and not decreased by large total ton-mileage.

5. Depreciation—Frequently neglected, and complicated in that sinking funds to care for the depreciation are calculated for a unit time, whereas the depreciation of a vehicle is dependent directly upon the mileage it accomplishes.

6. Chauffeur—A fixed quantity for any given period, the cost per ton-mile varying indirectly with the total of mileage.

7. License, Insurance and Taxes—A fixed amount regardless of ton-mileage covered by the vehicle, so that its cost per ton-mile is indirectly proportional to the total ton-mileage.

8. Storage—Independent of the mileage and thus also reduced as the total mileage increases.

9. Interest on Total Initial Investment—This might be figured at the rate of 5.5% per annum.

All of the foregoing items may be grouped into two classes. The first classification contains items 1, 2, 3, 4 and 5, which are found to be more or less constant regardless of the total ton-mileage; while items 6, 7, 8 and 9 are seen to fall under the second class, wherein all items decrease directly as the total ton-mileage increases, so that it is very desirable that as large a total as possible should be accomplished in a given period of time. With these figures it is possible to study the relation which each of the individual items bears to the whole if the total cost per ton-mile is obtained.

The accompanying table expresses the percentages which any given item is of the total item. They are based on a cost of 25c. per gallon for gasoline, taxes at $18 per $1000, license fees on the basis adopted by the Massachusetts Highway Commission, storage charges at the rate of $20 per month, and depreciation costs on the sinking-fund basis with interest at 5.5% applied annually. The life of the truck has been rationally estimated after careful study of the conditions under which the given truck was operating. Allowance must be made for any factors which may tend to increase or decrease the items, such as poor vs. good roads, hilly vs. level country, short vs. long haul, light vs. heavy loads, and short loading vs. long loading periods. An allowance likewise should be made where the costs of fuel, supplies and labor differ greatly.

OPERATING COSTS OF MOTOR TRUCKS

Capacity of truck, tons	2	3	3½	4	5	7
Average load carried, tons	2	3	3	4	5	7
Total operating cost per ton-mile	21 5	18 1	17 8	16 5	15 8	
Per cent of total cost per ton-mile as cost of:						
1 Gasoline	15 6	15 2	17 3	16 7	16 6	17
2 Lubricants	4 7	4 2	2 0	1 4	1 3	1
3 Tires	18 0	14 5	13 7	10 5	9 7	10 2
4 Repairs and sundries	9 1	9 4	10 6	10 5	11 0	11 1
5 Depreciation	23 5	22 0	20 5	21 0	20 0	20 0
6 Chauffeur	18 1	20 6	24 0	21 7	22	13 4
7 License, insurance and taxes	4 3	4 4	4 6	5 4	5 0	4 8
8 Storage	5 2	4 8	5 0	7 7	7	8
9 Interest at 5½ per annum	5 5	4 6	5 1	5 4	5 3	5 5

Window-Frame Clamp Saves Time and Room

By John E. Langley
Huntington, W. Va.

WHEN setting window frames in stone or terra cotta faced buildings, considerable time can be saved, as well as avoiding the obstruction of floor space with long braces, by using the clamp shown in the photograph. The long piece is a 2 x 4 to each end of which is nailed at right angles a piece of board about 6 in. long. Five nails are used in each end. The distance between the inside edges of these boards is 1 in.



CLAMP CAN BE QUICKLY ADJUSTED

greater than the distance between the outer face of the jamb and the face of the brick backing.

The window frame is set up when the first jamb stones have been placed, after which one of the braces is placed at each side. The braces may be tightened with wedges, or by driving down one side until the brace sets tight. They will hold the window frame securely in place until the brick work is finished.

NEWS OF THE WEEK

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

Hoisting of Suspended Span in Progress at Quebec

Began Monday and Proceeding Favorably at Rate of Nearly 50 Ft. per Day—Completion Expected Friday

Hoisting the new 640-ft. suspended span of the Quebec Bridge to its permanent position between the ends of the cantilever arms was begun on Monday, Sept. 17, 1917. The span replaces the one which fell into the St. Lawrence River during the attempt to hoist it, on Sept. 11, 1916, on account of breakage of one of the supporting rocker shoes of cast steel. During the year a new span has been built, identical with the first one, and at the same site, Sillery Cove. The same method of floating it to the bridge site was followed, and in a general way but with some changed details the same method of hoisting is being used. The work is in progress as we go to press, and is expected to reach completion on Thursday, Sept. 20, or early Friday.

The start of hoisting had been tentatively scheduled for Saturday, Sept. 15. But rising wind the evening before and reports of an approaching gale caused postponement to Monday. At sunrise, with perfect weather, the span was floated out from its erection sup-

Continued on page 571

New England Water-Works Men Get Together

Convention Held in Home City of President Saville, Who Is Awarded Brackett Medal for Best Paper in 1916

War times may have kept some from going to Hartford last week for the 36th annual convention of the New England Water-Works Association, but it did not interfere with the get-together spirit of the 150 active and 100 associate members and the 150 to 200 guests who received their blue, red or white badges at the registration desk.

By way of innovation, the convention opened a day earlier than usual, or on Tuesday instead of Wednesday. This gave opportunity for greetings from city officials and other prominent citizens of Hartford on Tuesday afternoon and for an informal reception the following evening. At the afternoon session Caleb Mills Saville, chief engineer and manager of the Hartford water-works, responded to the official and citizen welcome already mentioned and gave a brief address devoted to the interests of the association and its members. An abstract of the address appears on page 540 of this issue.

A particularly happy incident of the convention was the award to President Saville of the Dexter Brackett medal for the most meritorious paper appearing in the association *Journal* during 1916. The paper on which the award was based was entitled "Some Water-Works Experiences in Hartford, Conn.," read Nov. 10, 1915, and published in the *Journal* for June, 1916.

Some twenty papers were scheduled and nearly every author responded when his name was called. The program went through like clockwork, with ample time for discussion, and without wearisomely protracted sessions. Strictly speaking, there was little discussion. What did happen was the asking of scores of questions from the floor in order to elicit further information from the authors of papers.

A notable feature of the program was a group of seven papers on the Hartford water-works by members of President Saville's engineering staff. These came Thursday forenoon and prepared the way for a more thorough appreciation of the enjoyable automobile trip over the water-works, to which Friday morning was devoted. The seven papers mentioned included a historical and descriptive review of the works, by W. E. Johnson; outline of distribution system, by Frank Brainard; engineer-



SUSPENDED SPAN OF QUEBEC BRIDGE JUST BEFORE IT WAS FLOATED TO PLACE AND RAISED THIS WEEK

ing work on additional gravity supply, by H. W. Horne; design of spillway at Richard's Corner dam, by R. E. Wise; construction of Phelp's Brook dam, by J. H. Shaunessy; construction of Nepaug River masonry dam, by H. W. Griswold; and grouting dam foundations, by J. E. Garrett.

Water Filtration Given Entire Session

A feature of the well-devised program was an entire session devoted to filtration, with three papers on rapid or mechanical and one on slow sand filters. The session was led off by George A. Johnson, consulting engineer, New York City, who presented an extended review of "Rapid Sand Filtration," sufficient to fill a whole number of the *Journal* of the association. How far rapid filters exceed slow sand filters in numbers and population supplied is shown by extracts from Mr. Johnson's paper, on page 542. The paper also showed the striking decline of typhoid since water filtration was well established in this country, went into details of rapid filters, and discussed pretreatment and after-treatment of water subjected to either of the two types of filtration.

Robert Spurr Weston read a paper on "Mechanical Filter Bottoms and Strainer Systems," abstracted on page 543.

Mechanical filtration at Evanston, Ill., was described in a paper sent by John W. Gaitenby, superintendent of filtration. After experience with both kinds, Mr. Gaitenby does not think high-velocity filter washing with water alone is any better than air-and-water wash. The wash-water velocity at Evanston is 15 ft. per second. The operation of the slow sand filters at Providence, R. I., was described by F. L. Cady, bacteriologist, Providence Water Department.

Some Questions Answered

In answer to a question following Mr. Johnson's paper the author said that after filtered water becomes available, flushing through hydrants is generally all that is necessary to get rid of possible contamination in the mains. E. E. Lochridge, Springfield, Mass., said that when filtered water was introduced in that city a reversal of the direction of flow was caused. A bushel or two of sediment per hydrant was flushed out.

Answering another question, Mr. Johnson said that wash water at the Baltimore rapid filters is conserved by discharging it into a settling pond. W. C. Hawley stated that at Wilkinsburg, Penn., sedimentation and reuse reduces the wash water to 0.1%—a matter of moment, since some of the supply is pumped against a total head of 630 feet.

Water Rates and Allied Matters

Problems connected with the regulation of the private companies supplying water to portions of New York City were reviewed at some length by Delos F. Wilcox, deputy water commissioner. In the case of one company, the city effected an increase in hydrant rental at public expense to gain a needed reduction in rates to private consumers. The city now has a large surplus gravity supply on hand, from the Catskill system, which would naturally be used in place of water now pumped from wells by private companies, and might be furnished at lower rates than the companies are charging.

How Waltham, Mass., voluntarily revised its water rates in accordance with the general plan adopted by state public service commissions was told by Bertram Brewer, city engineer and superintendent of sewers and water-works. Reproduction cost was estimated, the expenses of the past five years reviewed, the needs of the future forecast and new rates fixed accordingly. An annual surplus of $8000 having been produced by unexpected economies, due to improved city administration, further revision is proposed, with reference to doing away with conditions particularly annoying to consumers. Mr. Brewer believes that a municipal water-works plant should pay taxes into the public treasury and should, in turn, be paid for all service it renders other municipal departments.

Various Practical Experience Papers

A combined repair and service shop, costing $29,000 with land and equipment, was described by H. W. Hosford, water commissioner, Northampton, Mass. The building is about 40 x 120 ft. in ground plan. Part of it is two stories high. Provision is made for ordinary repair work, meter testing and storage of supplies. There is a garage.

Experiences in laying 48,000 ft. of 4-, 6- and 8-in. universal joint pipe, beginning in 1908, were described by John H. Walsh, superintendent, water-works, East Hartford, Conn. No repairs due to the pipe itself have been necessary. Another member, who had laid 25,000 ft. of this pipe since 1911 with good results, stated that elastic paint seemed to be better than white lead at the joints.

A variety of interesting problems met and solved at Windsor, Conn., were detailed by H. R. Turner, superintendent of water-works. His experiences with Leadite for joints are presented on page 544.

How 69 master meters of the venturi type and a steadily increasing number of service meters are reducing water consumption in the Massachusetts Metropolitan Water District was told by S. E. Killam, superintendent of pipe lines and reservoirs. An abstract of this paper is given on page 541.

The use of copper sulphate to control microscopic organisms causing bad tastes and odors in water was dealt with by William Hazen, of the Newlands Sanitary Laboratory. J. J. Jerome, one of the engineering members of the Advisory Council of the Connecticut Department of Health, reviewed some stream pollution problems in the state.

The customary exhibit of water-works appliances was well placed by William F. Woodburn, of the Warren Foundry and Machine Co. The Water-Works Manufacturers' Association provided funds for whist and theater parties for the ladies. The Hartford Water Board took the members and guests on an automobile trip to its water-supply sources and provided lunch at the Hartford Golf Club. Other courtesies were extended by the Pratt & Cady Co. and the Terry Steam Turbine Works, of Hartford, and C. W. Blakeslee & Sons, contractors for the Richards' Corner dam.

Quebec Bridge Raising

Continued from page 570

ports, using the same scows that did the work a year ago. It reached the bridge site and was moored to the hanging mooring-trusses by 7:30. The four chairs under the ends of the span were attached to the eyebar lifting-chains, and at 9:30 jacking was begun, raising the span clear of the scows in an hour. By 4:40 p.m. twelve 2-ft. lifts had been made, and then work was stopped for the night, the span being first anchored against wind. Last year's program contemplated continuous work until the span was up in its permanent position, which it was believed could be accomplished within 24 hours. This year no nightwork is being done.

Jacking was resumed at 7 a.m. Tuesday and except for the noon-hour interruption continued till 5:30 p.m., 22 more lifts being made, a total from the start of 34, or 68 ft. of lift. The work was not hurried, and it was interrupted from time to time to remove the freed links of the lifting chains.

Judging from the rate of progress attained Tuesday, at least two more days were then required to finish the hoisting. The final steps, including attachment of the permanent hangers, may carry the work over to Friday.

Association of Engineers Organizes Three New Chapters

The board of directors of the American Association of Engineers, at their meeting on Sept. 5, granted charters to the members in St. Paul, Indianapolis and Milwaukee. This makes a total of seven chapters which have been organized since the association was incorporated about two years ago. The total enrollment is now over [illegible].

A joint meeting of the association and the Detroit Engineering Society was held in the Chamber Building, Aug. 30. It was the unanimous opinion of the engineers present that the Detroit society should form a working co-operation with the American Association, as they have been carrying out a similar program locally for Detroit as the other organization has operated in a national way. The Detroit society has a total enrollment of about [illegible] members and if this working cooperation is established it will mean the fostering of the work laid out by the Committee on Engineering Cooperation.

Should Exemption for Medical Students Apply to Engineers?

In view of the suggestion that students in engineering colleges be exempted from draft in the National Army, the following memorandum from the provost marshal general to the governors of all states, exempting medical students and hospital internes, is timely:

"The President prescribes the following supplemental regulations governing the execution of the selective-service law:

"First—Hospital internes who are graduates of well-recognized medical schools, or medical students in their fourth, third or second year in any well-recognized medical school who have not been called by a local board may enlist in the Enlisted Reserve Corps provided for by Section 55 of the National Defense Act under regulations to be issued by the surgeon general, and if they are thereafter called by a local board they may be discharged on proper claim presented on the ground that they are in the military service of the United States.

MAY APPLY FOR DISCHARGE

"Second—A hospital interne who is a graduate of a well-recognized medical school, or a medical student in his fourth, third or second year in any well-recognized medical school, who has been called by a local board and physically examined and accepted and by or in behalf of whom no claim for exemption or discharge is pending, and who has not been ordered to military duty, may apply to the surgeon general of the Army to be ordered to report at once to a local board for military duty, and thus be inducted into the military service of the United States, immediately thereupon to be discharged from the National Army for the purpose of enlisting in the Enlisted Reserve Corps of the Medical Department. With every such request must be enclosed a copy of the order of the local board calling him to report for physical examination (Form 103), affidavit evidence of the status of the applicant as a medical student or interne, and an engagement to enlist in the Enlisted Reserve Corps of the Medical Department.

WILL NOT BE SENT TO CAMP

"Upon receipt of such application with the named enclosures the surgeon general will forward the case to the adjutant general with his recommendations. Thereupon the adjutant general may issue an order to such interne or medical student to report to his local board for military duty on a specified date, in person or by mail or telegraph, as seems most desirable. This order may issue regardless of the person's order of liability for military service. From and after the date so specified, such person shall be in the military service of the United States. He shall not be sent by the local board to a mobilization camp, but shall remain awaiting the orders of the adjutant general of the Army. The adjutant general may forthwith issue an order discharging such person from the military service for the convenience of the Government.

"Three official copies of the discharge order should be sent at once by the adjutant general to the local board. Upon receipt of these orders the local board should enter the name of the man discharged on Form 164A and forward Form 164A, together with two of the certified copies of the order of discharge, to the mobilization camp to which it furnishes men. The authorities at the mobilization camp will make the necessary entries to complete Form 164A, and will thereupon give the local board credit on its net quota for one drafted man."

H. E. Hilts General Manager of Portland Cement Association

H. E. Hilts, formerly district engineer at San Francisco for the Portland Cement Association, has been elected by



H. E. HILTS

the board of directors of that body to succeed the late J. P. Beck as general manager.

Mr. Hilts was born in New York in 1882 and obtained his technical and engineering education at the University of Pennsylvania, where he graduated in 1905. His first work was as rodman with the Mexican International R.R. Later he was in the employ of the Philadelphia & Western R.R. For two years he was instructor in the engineering department of the University of Pennsylvania, after which he entered the service of the New York Central R.R., leaving that company to become associated with the Portland Cement Association as road engineer in 1913, for territory comprising the New England and Northeastern States, having been stationed at Albany and Easton, Penn. In 1915 he was appointed district engineer at San Francisco.

While with the New York Central R.R. Mr. Hilts designed reinforced-concrete arches carrying the railroad over city streets, worked up schemes for accommodating increased traffic at the Weehawken yards of the West Shore R.R., made investigations of grain elevators in and near Buffalo, designed masonry abutments and piers for various crossings over the New York State Barge Canal. Among other works upon which Mr. Hilts was engaged was the design of five reinforced-concrete bridges at Rome, N. Y., and a four-track tunnel at Rhinecliff, New York.

Mr. Hilts is an associate member of the American Society of Civil Engineers, member of the American Society for Testing Materials, associate member of the American Railway Engineering Association and member of the American Concrete Institute.

Help Re-Make the World!

The following advertisement appeared in the *New York Times* of Sept. 13:

"Help Re-Make the World

"The call of the time is for the engineer or applied scientists, including the physician and sanitarian. Young men who are ineligible for military service for one reason or another, or who can render better service by completing their technical courses, should train themselves to become builders of the future.

"Vast parts of Europe are in ruins. Our own railroads and industrial equipments will need rebuilding after the terrible strain of wartime. Yet the supply of technically trained men does not meet the demand *now*. When the war is over the demand will be still greater.

"America must take a leading part in the reconstruction of the world. Products of our factories, farms and mines, raw materials and finished products will be needed in enormous quantities. Physicians and sanitarians must be supplied to aid the wounded and to restore sanitation.

"War is not only fought at the front. And if you cannot serve there you should train yourself technically to direct production of clothing, chemicals, food, munitions and machinery of war. And then in the days of reconstruction to come you can help to repair the ravages of war.

"Men who hold the helm of the Ship of State voice this appeal. Let them convince you that if adapted for applied science you are urgently needed in that field. Read and heed their words. Do not allow the supply of trained engineers, chemists, biologists, agriculturists and physicians to be depleted. Enter or continue in a technical school if qualified for such a career. You will thereby be performing a patriotic duty and will help the industrial progress of America and of the world.

"Brooklyn Polytechnic Institute, Brown University, Carnegie Institute of Technology, Case School of Applied Science, Clarkson College of Tech-

nology, University of Colorado, Thayer School Civil Engineering, Dartmouth; Drexel Institute, George Washington University, Harvard University, University of Illinois, Johns Hopkins University, Lafayette College, Lehigh University, Leland Stanford Jr. University, Massachusetts Institute of Technology, University of Michigan, Michigan Agricultural College, Michigan College of Mines, Missouri School of Mines, University of Missouri, New York University, Towne Scientific School, University of Pennsylvania; Princeton University, Rensselaer Polytechnic Institute, Rose Polytechnic Institute, Rutgers College, Sheffield Scientific School, Yale; University of South Dakota, Stevens Institute of Technology, Syracuse University, University of Texas, Tufts College, University of Vermont, University of Virginia, Washington University, St. Louis, Mo.; University of Wisconsin, Worcester Polytechnic Institute."

Washington Association of County Engineers Convene

The Washington State Association of County Engineers, in which 39 counties are represented, held their thirteenth annual convention at Spokane, Wash., Sept. 6, 7 and 8. As usual the meeting was held at the same time and place as the convention of county commissioners of the State of Washington. The papers read before the engineering sessions included "The Preparation of Preliminary Estimates," by H. J. Doolittle, division engineer, Washington State Highway Department, Spokane; "Small Bridges and Culverts," by M. K. Snyder, professor of structural engineering, State College of Washington, Pullman; "The Location of the Wenatchee-Ellensburg Road," by J. W. Miller, assistant professor of civil engineering, University of Washington, Seattle; "Concrete Roads of Washington," by C. N. Reitze, consulting engineer, Seattle; "The Use of Bitumens in Road Construction and Maintenance," by Allen R. Scott, county engineer, Spokane County, Spokane.

R. H. Thomson, former city engineer, of Seattle, reviewed the recent progress of civilization in its relation to road building and discussed the developments which may be looked for along this line. State and county funds must not be looked upon as the source from which all road moneys must come, he said. We must get accustomed to the idea of local assessments. Mr. Thomson made two suggestions to the association with the comment that the organization would do well to take some action upon them. These were (1) that in the Northwest, where roads are built through lowlands, several years should elapse after grading and draining is done before the hard surfacing is put on, and that it is the duty of engineers to see that this need is observed even if it is necessary to change the state constitution to accomplish it; and (2) that officials in the universities at Pullman and Seattle be authorized and instructed to try out various types of road-working machinery to the end that specific recommendations be published for the benefit of county engineers as to the best equipment adapted for certain work with materials commonly used on roads in the state. These suggestions were enthusiastically endorsed by the convention.

Seattle was selected for the meeting place in 1918 and the following officers were elected for the ensuing year: President, G. G. Harvey, county engineer, Lincoln County; first vice president, R. F. Foster, county engineer, Douglas County; second vice president, D. H. White, county engineer, Pierce County; secretary-treasurer, C. A. Lindberry, county engineer, Whatcom County.

Norwegian-American Engineers To Meet in Chicago

American and Canadian engineers and architects of Norwegian birth and descent are to hold an informal meeting and session in Chicago, Sept. 27 to 29. The meetings will be at the Chicago Norske Klub. Joachim G. Glaver, consulting engineer, is chairman of the committee of arrangements. Visits will be made to the underground freight railway system, the drainage canal and other points of interest.

Navy Department Wants Assistant Civil Engineers

An examination will be held at the Navy Department, Washington, D. C., to fill not less than 10 existing vacancies in the grade of assistant civil engineer, Corps of Civil Engineers, United States Navy.

The examination to determine the candidate's professional fitness will comprise:

1. A preliminary examination to determine the candidate's general fitness, based on his collegiate record, testimonials, statements of references and professional experience. Candidates will not be assembled for this examination, but will submit their papers by mail direct to the examining board in Washington.

2. A final examination, including an oral and written examination, to be held in Washington, D. C., and open only to those who have passed the preliminary examination.

Candidates before the final examination will be examined as to physical fitness by a board of medical officers of the United States Navy. If found to be physically unfit the candidate will not be further examined.

The following are prerequisites for consideration:

No candidate over 26 years of age on July 1, 1917, will be eligible for examination. The candidate must be an American citizen, must have received a degree from a college or university of recognized standing, showing that he has satisfactorily completed a course in civil, electrical or mechanical engineering; must have had not less than 14 months' practical professional experience since graduation, and must be of good moral character and repute.

Candidates who did not qualify in the preliminary examination held in May, 1917, or who failed in the final examination held in June, 1917, are not eligible for this examination. Candidates who passed the preliminary examination but failed to complete the final examination are eligible for this examination.

The fact that a man is married will not militate against his eligibility for the examination.

Appointees are commissioned in the grade of assistant civil engineer, Corps of Civil Engineers of the Navy, with the rank of lieutenant (junior grade). This rank carries with it pay and allowances approximating $2500 a year. The highest rank in the Corps of Civil Engineers is rear admiral, carrying with it, including pay and allowances, a remuneration of approximately $9500 a year.

A descriptive circular regarding the Corps of Civil Engineers, United States Navy, and the coming examination for assistant civil engineer will be mailed to those interested upon request to the chief of Bureau of Yards and Docks, Navy Department, Washington, District of Columbia.

Holds That Jersey City Cannot Reopen Water Suit

Jersey City has no legal grounds for an application to reopen the lawsuit in which the Court of Chancery and the Court of Errors and Appeals held that the hypochlorite plant at Boonton fulfilled the contract of the Jersey City Water-Supply Co. to furnish pure and wholesome water, says Marshall A. Von Winkle, special counsel, in an opinion submitted to the Jersey City Commission. Mr. Von Winkle holds that newly discovered evidence, in existence when the case was tried, would be necessary to reopen the case, and that none such exists.

Even though the Court of Chancery did make a mistake in the decision, and the mistake was confirmed by the Court of Errors and Appeals, says Mr. Von Winkle, there is now no relief. The object of reopening the suit would be to compel the contractor to build a trunk sewer through the Rockaway Valley to divert sewage before sewer systems are built in a town below the Boonton dam. The court decision of 1915 held that the chlorination plant made such a sewer unnecessary, and relieved the contractor of any obligation to build one. Jersey City has applied to the State Department of Health for approval of plans for a trunk sewer, as noted on page 127 of our issue of July 12, 1917.

PERSONAL NOTES

R. V. ROSENBAUM, formerly resident engineer with the Kanawha Traction and Electric Co., of Parkersburg, W. Va., is now resident engineer and superintendent of construction for the Potomac Light and Power Co, engaged in building a hydro-electric station at Dam No. 5 on the Potomac River near Martinsburg, West Virginia.

J. A. WADE, until recently assistant to the chief engineer on the construction of the munitions plant of the British Chemical Co., at Trenton, Ont., is now resident engineer for Esselstyn Murphy & Hanford, Detroit, on the construction of a steam power plant for the Central Michigan Light and Power Co., at Alma, Mich. Mr. Wade has been connected with the Morgan Smith Co., of York, Penn., designing water-power machinery and water-power plants, and later was in the office of George F. Hardy, New York City, on paper-mill design.

JOHN R. MONAGHAN, who for the past 10 years has been in various positions with the engineering department of the Public Service Commission, New York City, has resigned to take the position as engineer for subway construction with the Rapid Transit Subway Construction Co., New York City.

FRANK MCLAUGHLIN has resigned as contracting manager with the Federal Bridge and Structural Co., of Waukeshaw, Wis. He has accepted a position as chief engineer of the Kelly-Atkinson Construction Co., of Chicago, and has charge of the construction of 18 single-screw composite cargo-carrying steamers which this company is building for the United State Shipping Board, Emergency Fleet Corporation, at Mobile, Alabama.

J. K. MACNEILLIE, general superintendent of the Canadian Government Ry., has resigned to accept a position on the Delaware & Hudson Ry. under F. P. GUTELIUS, former manager of the Canadian Government Ry. L. S. BROWN, assistant general superintendent, becomes general superintendent of these roads.

JESSE A. JACKSON has been granted an indefinite leave of absence from his position as chief road computer in the engineering department of the City of Seattle, to fulfill his duties as major, Signal Corps, United States Army.

GEORGE B. POST & SONS and ERNEST P. GOODRICH announce that they have become associated professionally in the practice of architecture, engineering and city planning. The new firm comprises the following men: WILLIAM S. POST, J. OTIS POST, GEORGE B. FORD, ERNEST D. GOODRICH and A. PEARSON HOOVER, and will have an architectural office at 101 Park Ave., New York City, and an office at which engineering matters will be handled at 261 Broadway, New York.

F. J. VON ZUBEN, city engineer of Fort Worth, Tex., is acting as supervising engineer on the construction of Camp Bowie. Mr. Von Zuben was incorrectly mentioned as being "Constructing Quartermaster" on p. 284, issue of Aug. 9.

JOHN L. BACON has been elected to the City Council of San Diego, Calif., as a result of an effort made by the business men of that city to promote a more efficient city government. The Council is now working on several schemes looking toward the divorcement of city government from personal favoritism.

L. T. KNISTERN, who was until recently superintendent of construction on the Thirty-ninth Street Power House, Chicago, Ill., is now superintendent of construction for the Chester Shipbuilding Co., Chester, Penn. Mr. Knistern was at one time assistant general superintendent for Thompson-Starrett Co., and during 1914 represented that company in Chili, S. A., returning at the outbreak of the present war to become superintendent of construction of the Equitable Building in New York City.

CHESTER W. SMITH, who for the past year has been connected with the J. H. Mendell Engineering and Construction Co., Manchester, N. H., on estimates and investigation for various hydro-electric projects, has been spending his time recently equipping a yard at Newington, N. H., for the building of wooden steamers under Government contract.

LE ROY K. SHERMAN has opened an office as consulting engineer at 5 North La Salle St., Chicago. He was formerly the engineer member of the Illinois Rivers and Lakes Commission, the duties of which are now included in one of the departments of the new state civil organization.

OBITUARY

CHARLES LEE CRANDALL, emeritus professor of railway engineering at Cornell University, died on Aug. 25, at Ithaca, N. Y., after a week's illness with penumonia. Practically all of Professor Candall's adult life was given over to Cornell University. In 1868, a boy of 18, he entered the first class of the university and graduated with the first full class in 1872. For two years thereafter he was engaged in railway engineering, but he returned to Cornell in 1874 as instructor in civil engineering, becoming professor of railway engineering and geodesy in 1895, and retiring as an emeritus professor in 1915. For four years, 1902-06, he was in charge of the College of Civil Engineering. In addition to his regular professorial duties, Professor Crandall found time to be city engineer of Ithaca for 20 years and to write a number of books on railway layout and construction and, in his earlier years, on descriptive geometry and drafting. He was a distinguished member of the American Railway Engineering Association, contributing much to the committee work of that society, particularly to the committee on iron and steel structures. As collator of the biographical data of the graduates of his college he kept in touch, as few professors can, with the graduates of the college.

GEORGE S. RIDER, head of the George S. Rider Co., of Cleveland, died suddenly at his home, Sept. 11, as he was about to leave for his office. A heart attack was held the cause. Mr. Rider went to Cleveland from Providence, R. I., 25 years ago, and started in business as a consulting engineer. He designed several of the largest industrial plants in Ohio. He was a member of the Cleveland Chamber of Commerce, Cleveland Engineering Society, American Society of Mechanical Engineers and Franklin Institute.

J. H. P. HUGHART, president of the Grand Rapids & Indiana Ry., died Aug. 16 in his home in Grand Rapids, Mich., from concussion of the spine caused by a recent fall. Mr. Hughart was born in Pittsburgh, Penn., and received his education at the Massachusetts Institute of Technology. Entering the employment of the Grand Rapids & Indiana Railway Co. in 1874, he became second vice president in 1892, vice president and general manager in 1906, and president in 1914—which last position he held at the time of his death.

HARRY A. DALLYN, of St. Thomas, Ont., consulting engineer with the Ontario Hydro-Electric Power Commission, was electrocuted while at work on a new system at Sarnia.

WILLIAM HARRY ARNOLD, terminal engineer of the Lehigh Valley Railroad Co. at New York, died Aug. 13, 1917. At the time of his death Mr. Arnold had charge of the new ore dock at Constable, N. J., together with the construction of piers, pier sheds and dredging in New York harbor and Perth Amboy, N. J. Graduating from the Rensselaer Polytechnic Institute in 1890, Mr. Arnold was with Nier & Hartford, and then with Hartford & Hebert, engineers, Chattanooga, Tenn., on general engineering work. For four years with G. W. G. Ferris & Co., Pittsburgh, Penn., on general inspection work, he then became connected with the Barber Asphalt Paving Co., of Buffalo, and then with R. W. Hildreth & Co., New York, on inspection work in the vicinity of New York. From 1896 to 1899 he was with various offices of the Corps of Engineers, U. S. A., as draftsman, inspector of harbor im-

Engineer Officers' Reserve Corps Assignments

The following-named officers of the Engineer Officers' Reserve Corps now on duty at the engineer training camp, in the vicinity of Washington, D. C., are relieved from duty at that place and will report at the proper time at the divisional training camps indicated below for duty with the engineer regiments and engineer trains of the National Army at those places:

To Wrightstown, N. J.

Majs. H. B. Brewster, S. S. Garrett; First Lieuts. Jamieson Marshall, Robert L. Tate, Theodore S. Babcock, George P. Kuzmier, Gilbert Doolittle, David M. Dunning, Harry H. Walsh, Allen W. Jacus, Bevan Jones, Leonard H. M. Whitney, Ray McL. Robinson and Merl B. Breese; Second Lieuts. Frederick H. Gross, Butler E. Ward, Manly L. Mackey, Peter E. Bermel, Allen Mulford and George L. Beaver.

To be attached to the Three Hundred and Third Engineers, Wrightstown, N. J.: First Lieuts. Harold L. Hock, Raymond C. Semple, Louis E. Thompson, Alexander Kennedy, Jr., Laurence Knibloc, Ashton H. Hart, Frank S. Storey, Harold Govinlock, William B. Neilson, Jr., George W. Knight and Francis H. Wisewell, Jr.; Second Lieuts. Aldace H. Davison, Henry TenHagen, Howard E. Bailey, Virgil D. Stone, George E. May, Gerald F. Healy and David H. Cameron.

For assignment to the Three Hundred and Third Engineer train, Wrightstown, N. J.: Capt. Earle H. Welles, First Lieuts. George N. Brown and Clarence C. Bailey, Second Lieut. Kerr Atkinson.

To be attached to the Three Hundred and Third Engineer train, Wrightstown, N. J.: Second Lieuts. William B. Clarkson and Earl B. Miller.

To Annapolis Junction, Md.

For assignment to the Three Hundred and Fourth Engineers, Annapolis Junction, Md.: Majs. James F. Barber and Percival M. Churchill; Capts. Percy J. Wilson, Lewis P. Bailey, Alexander Colt, Erastus St. John, Henry Taylor, Theodore S. Dunn, Frank W. Hamilton, Samuel H. Brooks and Leon R. Woodhull; First Lieuts. Harry L. Haverstick, Gordon H. Fernald, John R. Armington, Meyer Hefstater, John D. Brewster, James H. Smith, Jr., James M. Roberts, David A. Gilbert, Edgar C. Rack, Spencer Roberts, Daniel Summers and John P. Fogarty, Jr.; Second Lieuts. Otis D. Covell, Albert S. Crandon, Francis E. Schenker, Earl W. McKee and Richard C. Greenland.

To be attached to the Three Hundred and Fourth Engineers, Annapolis Junction, Md.: First Lieuts. Frank T. Leilich and Howard C. Molsberry; Second Lieuts. Howard A. Thompson, Bernard E. O'Hagan, Francis S. Friel.

Further assignments will be noted in next week's issue.

provements and on work in connection with battery emplacements at Fort Wadsworth, N. Y., and Fort Taylor, Key West, Fla. From 1899 to 1903 he was superintendent and engineer for the W. H. Beard Dredging Co., New York, with complete charge of the dredging fleet and reconstruction of dredges and tugs. For a year he was connected with various harbor improvements in New York and in the Philippine Islands, becoming in 1905 superintendent of floating equipment for the Bush Terminal Co., of New York City, and in 1906 being made chief engineer for the same company. In 1907 he established the firm of Arnold & Andrew, consulting engineers, New York City, and then in 1909 became general manager of the Bay State Dredging Co., Boston, Mass. From 1912 to 1914 he was engaged in general engineering work, and at the latter date became terminal engineer of the Lehigh Valley.

LIEUT. H. W. MORRIS, who before his enlistment in the 73rd (Canadian) Highland Battalion, was chief electrical engineer of the Grand Trunk Ry., has been reported killed in action. Lieutenant Morris had been awarded the military cross for distinguished bravery at La Culotte on June 12 of this year.

J. W. WATTS, honorary treasurer of the Royal Architectural Institute of Canada since its inception, died very suddenly at his home in Ottawa.

ALEXANDER MITCHELL, for over 50 years one of the leading contractors of Toronto, Ont., died at his home there recently.

BUSINESS NEWS

Hudson River Brick Shows Increase in Value

The supply of common building brick for the enormous consumption of Greater New York, the largest brick market in the United States, comes principally from the narrow strip of land on either side of the Hudson from New York City to Cohoes, including Bergen County, New Jersey. In 1916 the number of brick marketed in this region, according to a report in preparation by the United States Geological Survey, Department of the Interior, was 893,552,000, a decrease of [illegible] brick. The value of this output, however, was $[illegible], an increase of $[illegible] over 1915. The average price per 1000 brick was $6.62, an increase of $1.41 over 1915.

The New York part of the region is by far the larger producer, reporting, for 1916, [illegible] brick, or 72% of the total, valued at $[illegible], or 77% of the total for the region. This was a decrease of [illegible],000 brick, but an increase of $[illegible] compared with 1915.

The average price per thousand in this part of the region increased $1.43, or to $6.48. Ulster was the leading county in this part of the region, reporting 222,651,000 brick, valued at $1,444,275, a decrease of 6,692,000 brick but an increase of $[illegible] in value, compared with 1915.

The New Jersey part of the region reported 190,956,000 brick, valued at $1,362,786, being a decrease of 28,003,000 brick, but an increase of $98,269.

After-War Lumber Demand

While world peace still seems far off, the Southern pine industry, according to J. E. Rhodes, secretary of the Southern Pine Association, is already making preparations for the part it will play in the work of rebuilding the devastated areas of Europe. The Federal Lumber Trade Commission, financed jointly by the Government, the Southern Pine Association and other lumber organizations, is now abroad making a first-hand study of the probable requirements of the various allied nations when hostilities cease. It is the general opinion that, although Europe will not be prepared to buy or use much lumber the first year after the war, and material delivered will cost high prices, due to the scarcity of tonnage and consequent excessive ocean freight rates, the second year after peace will witness a considerable movement of Southern pine across the seas, and there will be a steadily increasing demand for some years afterward.

In order to take care of this business properly, the Southern Pine Association now has in process of formation a Foreign Export Selling Agency, which will have representatives in the various European centers, and deal directly with the European buying agencies, which all who have studied the problem feel certain will be organized by foreign powers.

Building Tile Manufacturers Form Association

The Hollow Building Tile Association has recently been organized, with a membership of 65 manufacturers, representing 2,200,000 tons of material. In percentage it is about [illegible] of the output of building tile, and the membership extends from the Atlantic Coast to Texas. The manufacturers of the mills in the organization of this association because they realized the very great need for a central body which would do for the industry the things that needed to be done and which could not be done by the individual manufacturer.

The use of all materials in the larger cities is controlled by law, and of the most important problems confronting this association is building codes. The association has established a building-code department and has employed John A. Ferguson, an engineer, to have charge of it. He will work with and cooperate with building committees and building inspectors in all cities and states

which are revising their codes. He will also try to have the code changed whenever it is unfair to tile material. The engineer in charge will also make investigations covering the fire-resistant qualities of tile material, to see that it is properly recognized by the underwriters and insurance companies.

Notes from

MAKERS OF PLANT AND EQUIPMENT

Gaston, Williams & Wigmore, Inc., international merchants, New York City, announce the resignation of Thomas S. Garrett as manager of their machinery department. Mr. Garrett is planning to go into business for himself.

José Más Nadal, formerly construction inspector with the Department of the Interior, Puerto Rico, wishes to secure agencies for construction material. His address is P. O. Box 30, Humacao, Puerto Rico.

The Topping Motor Truck and Machinery Co., Pittsburgh, dealer in general contractors' equipment, such as Koehring concrete mixers, McKiernan-Terry pile hammers, Gramm-Bernstein motor trucks, etc., announces the appointment of Otto Lehmann, Jr., as a member of the sales force.

The Asbestos Protected Metal Co., of Pittsburgh, announces the opening of a sales office in the Union Central Building, Cincinnati, under the direction of J. C. Lathrop.

The Buffalo Contractors' Plant Co., Buffalo, N. Y., has reorganized with the following officers: G. M. Misner, president; E. S. McCready, general manager; F. H. Williams, chief engineer; William Viess, assistant engineer; William Ahlers, production manager; F. B. Misner, purchasing agent; W. L. Misner, sales manager. The company will continue to specialize in its well-established lines of hoists (steam-electric), derrick fittings, hand powers.

Gen. T. C. du Pont has recently joined the directorate of the Vulcan Steel Products Co. Other new members on the Vulcan board of directors are Hon. Frank H. Hitchcock, who assumes the duties of vice president, and L. W. Baldwin, of the Empire Trust Company.

H. J. Richardson has been appointed works engineer for the Berger Manufacturing Co., Canton, Ohio. His new work includes the power plant, new constructions, maintenance and repair of manufacturing equipment and buildings. Mr. Richardson recently was connected with the New England Westinghouse Co., where he was manager of the gage department. Previous to this connection he was acting chief engineer of the ordnance department of the Crucible Steel Co., Harrison, N. J., and prior to that, for a long time he was with the Commonwealth Edison Co., of Chicago, the last seven years of this service having been in the engineering department.

TRADE PUBLICATIONS

The Sullivan Machinery Co., Chicago, Ill., has issued a new catalog on diamond core drills which contains data on prospecting with these drills.

The Jeffrey Manufacturing Co., Columbus, Ohio, is sending out Bulletin No. 229 describing the Jeffrey stepped multi-bladed fans for the ventilation of mines.

"Michigan" water pipe is described in a new catalog issued by the Michigan Pipe Co., Bay City, Mich. Arguments for the use of this pipe are stated in new form and illustrated with fresh views and sketches, besides which useful data for water-works are given.

Bulletin No. 221, listing offerings in rails, locomotives, cars, etc., and "Blue Streak Special," Bulletin No. 222, listing machinery offerings, have been received from the Walter A. Zelnicker Supply Co., St. Louis, Missouri.

The Fort Scott Cement Association, Kansas City, Mo., has issued a booklet illustrating the use of natural cement in a wide variety of structures.

The West Coast Lumbermen's Association, Seattle, Wash., is distributing copies of the revised standard specification grading and dressing rules covering Douglas fir car material. This is the result of the work of a special committee, appointed to revise the rules for the grading of car material so as to conform with changes made in the standard rules of Jan. 1, 1917.

The Western Electric Co., 195 Broadway, New York, has issued a new edition of its Year Book. This follows the plan of uniform list prices and basic discount inaugurated by this company three years ago, and in addition manufacturers' list prices are shown on certain standard lines. The book consists of 1160 pages and contains more than 50,000 items.

Folder describing the "Blaw" Bulldog bucket has been received from the Blaw-Knox Co., Pittsburgh, Pennsylvania.

The Buchanan all-steel rock and ore crusher, Type C, is described in Bulletin No. 10 issued by C. G. Buchanan Co., Inc., 90 West St., New York.

The Edison Storage Battery Co., Orange, N. J., has issued a new bulletin describing and illustrating Edison storage batteries in lumber transportations.

Worthington volute centrifugal pumps are described in Bulletin W-600-A received from the Worthington Pump and Machinery Corp., 115 Broadway, New York.

The C. F. Pease Co., 213 Institute Place, Chicago, has issued a drafting-room equipment pamphlet. The equipment includes horizontal and vertical filing cases, drawing tables, roller mounts for maps and charts, and such supplies as lettering triangles, punctators (for dotted lines), bottle holders and pen fillers.

The American Steel Export Co. has recently published a 16-page illustrated booklet describing the practice of American makers of tin plate.

The Jennison-Wright Co., Toledo, Ohio, has issued a pamphlet containing a report of comparative bleeding tests made on Kreolite lug and plain rectangular wood paving blocks made by Clyde T. Morris, professor of civil engineering, Ohio State University.

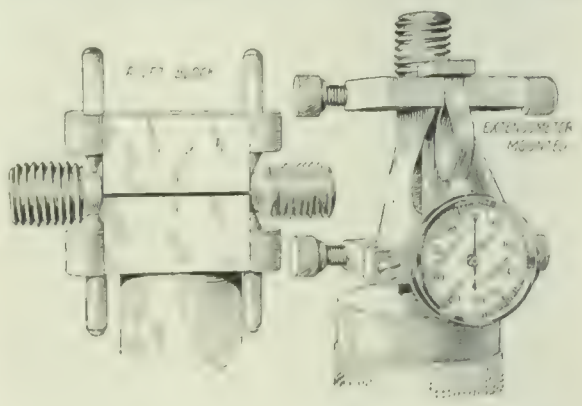
APPLIANCES AND MATERIALS

Yield Point Can Be Closely Determined by Simple Extensometer

A new extensometer has been brought out by the Riehlé Bros. Testing Machine Co., of Philadelphia, to meet the demand for a simple, direct-reading, compact and rigid instrument that can be quickly attached to a specimen, and by which the yield point may be more closely determined than by the drop-of-beam.

Provision is made for attaching the instrument to opposite sides of the test bar so that it will average any uneven stretch between the two sides. This is accomplished by mounting the lower points of attachment in a frame that can swivel about its center. With the apparatus a block is supplied with which a specimen is quickly and accurately center punched 2 in. apart at opposite ends of a diameter.

To attach the extensometer it is taken in hand with the forefinger through the hole shown under the top frame and the thumb resting on the clip above the top



EASILY ADJUSTED TO PUNCH MARKS

frame. The hardened contact points are thus brought about 2 in. apart; the instrument is put up to the bar and with the other hand the screws are quickly set in the marks. The dial of the indicator can be rotated with the fingers at will so when the specimen with the extensometer attached is in the machine ready to begin testing, the dial is moved until the pointer stands over zero and test is begun.

It is apparent that no electrical contacts have to be bothered with and no adjustment of a micrometer screw made. The instrument has sufficient motion to carry the test well beyond the elastic limit before it must be removed.

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ENGINEERING NEWS-RECORD

A WEEKLY JOURNAL
DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

Volume 79 — NEW YORK, THURSDAY, SEPTEMBER 27, 1917 — Number 13

The Pledge of Business

LAST WEEK the business men of the nation, under the auspices of the National Chamber of Commerce, met in war convention in Atlantic City. Without reservation they pledged their support to the Government in the present crisis. The pledge really was not necessary. Already there is ample evidence of the whole-heartedness of the support of industry. Yet if there were doubting Thomases they should be convinced by the size and quality and earnestness of the gathering at Atlantic City. The nation is at war. So is business. Its first thought is for the Government. The nation's leaders need only say what they want. The business men of the nation will promptly respond.

Professor Crandall— A Successful Teacher

THE LOT of the professor of engineering is not always a happy one. Compensation is low, recognition is often belated. The main reward must come from a sense of duty well performed and the affection of a long line of students. Success of the more material sort came to Professor Crandall of Cornell University, whose death was noted in last week's issue, but the crowning professional success, the affectionate regard of forty engineering classes, was his in exceptional measure. Kindliness and sympathy were the lodestones by which he attracted the young men, and forever kept them as friends; but to these traits he added a sureness of technical knowledge that made him in after years a professional mentor as well. His work and the place he holds in the memory of his boys should be an inspiration to every teacher. He showed how great a success can be made in the teaching profession.

Coercion by the Government

RELIABLE information has come to *Engineering News-Record* that attempts have been made by a district office of the Division of Valuation, Interstate Commerce Commission, to induce the railroads not to hire away at larger salaries the division's men. The plaint of the district office is that while the railroads can take on men at once, whenever found, it requires from two weeks to a month for the division to secure men through the Civil Service Commission. The argument is addressed to the railroads, but it is the individual men who suffer. Our informant suggests the contrast between one arm of the government kneeling a year ago to the strongly organized trainmen, and another arm trying through private correspondence to "restrain a group of underpaid technical men who have no union, but who claim the right to an open market for their services." Should they be denied that market because of defects in the government's way of securing employees? *Engineering News-Record* is glad to have learned from the director of the Division of Valuation that he knows of no such attempt at coercion, and that he has, in fact, "stated to at least one railroad that it was perfectly free to offer employment to any of our men." But there are many railroads, and it is to be hoped that he will pass the word down the line that such coercion is not to be countenanced.

Guarding City Money Supplied to Promoters

HOW far a city should go in providing funds to experiment with new proprietary processes is a question that sometimes confronts municipal engineers but is more often settled by city councils or other administrative officials who lack technical knowledge. One thing is certain: Where funds are provided by a city to test some untried process the city should be protected by adequate contract guarantees and surety bonds. An unusually well considered contract of this kind was recently drawn by the Board of Public Service of St. Louis, Mo., at the request of the City Council, as outlined on page 535 of the *Engineering News-Record* of Sept. 20, 1917. This contract was designed to safeguard the city against the possible loss of $17,000 which it agreed to furnish for the installation and test of a system of garbage reduction which the promoter claimed would cost far less to install than one recommended by the Board of Public Service. The board, which drafts contract ordinances for enactment by the City Council and is composed largely of engineers, wrote a contract which states just what the claims of the promoter are and how a decision as to their fulfillment shall be reached, and exacts a bond to insure the return of its money to the city in case the claims are not met. The contract may well serve as a model for other cities whose authorities set aside the recommendations of engineers while testing the claims of promoters.

Right Kind of Economy

NO CONSTRUCTION work, especially in these days, should be carried out without careful study. We need more of the sort of planning illustrated so strikingly in the description on page 582 of the methods used in building the huge power house at Cincinnati. Taking an existing coal plant, some ordinary guessing equiv-

ment and a guy derrick arranged to revolve with a section of the chute line, the builders put them together into a labor and time-saving concrete plant on the efficiency of which it would be hard to improve. The plant was doubly valuable as the economy of the entire work depended on ability to place concrete quickly in large volume and, successively, at a number of scattered locations. In foundation work of this type everything waits on the concrete. If the mixing plant breaks down, the other operations are interrupted. If it fails to deliver the expected quantity of concrete at the right time, the entire work is delayed. The efficient layout on this work probably paid bigger returns in keeping the rest of the job going at top speed than the actual saving of labor and time in concreting. There is now such a heavy premium on time and labor that badly-needed construction work will be postponed unless both are economized to the utmost. Contractors who will think through every job as this one was thought through—it was as well-planned in other respects as in relation to the concrete plant—will be doing a big service. Not only is it a duty in the present time of stress for every contractor to give the most efficient service possible, but such service is bound to produce greater returns than in normal times.

Let All Back Government in Steel Price Experiment

THE RIGHT start toward solving the problem of fixing steel prices has been made, if first press reports of the voluntary agreement reached Monday last by the War Industries Board and the steel manufacturers are accurate.

This journal has maintained that prices of everything entering into steel products should be regulated if a low figure for the finished steel is to be set, and that unless this were done, and unless a price were named which would hold for the public as well as the Government, the results would be disastrous. The sort of halfway price fixing, to a taste of which we were treated by the Navy Department and the old shipping board, has been abandoned by the Administration, and the only method that could possibly succeed has been adopted in its place. The price of coke, iron ore and labor, as well as that of pig iron, billets and more finished products, is regulated by the agreement. These prices are the same for the Government, our allies and the public.

Buying competition is eliminated by the operation of a priority board. The relative urgency of requirements is determined by this board, and not by the amount of money a buyer is willing to pay for quick delivery. If there is enough to go around, everyone will be supplied in turn. If not, those who want steel for purposes least essential to the war will have to wait, however much they could afford to pay for it.

In short, the plans for suspending the operation of economic laws are complete. Whether they will succeed is still open to doubt. It is said that England has failed to fix maximum prices in any instance. If this country fails, however, it will not now be for lack of intelligent leadership, nor for lack of patriotism. It will be because the problem is too complicated to solve in the short time available. Suppose, for instance, it should be found impossible to hold labor in the steel mills at present wages. This is a remote contingency, perhaps, in view of the fact that the steel industry has so far led the rise in wages. But suppose that the rise, now checked in the steel industry, continues in other war industries until steel-plant wages are forced to follow. Present maximum prices would undoubtedly have to be adjusted again. Numerous other upsets of this sort may be in store for the present price agreement. However, the Administration has recognized these difficulties, and a readjustment, if such proves necessary, will be made Jan. 1 next.

Whether the task will prove so complicated by then that it will be abandoned, no one can say. We may succeed where others have given up. In any event, it is the duty of those in the construction field, as consumers of steel products, to back the Government with a will. All essential projects will be taken care of, and those who have planned work which is not needed for the war must cheerfully forego for a while future benefits which might be derived from its immediate execution. Although existing contracts are protected by the price agreement, it would be a fine thing if engineers, owners and steel mills could get together and submit to the priority board all existing contracts for steel to be used in construction work where it is possible to substitute other material or to postpone the project without crippling those involved. The most important use for every one of us to which steel can be put is Government use. Let all help the Government to secure the steel it needs on time!

Highway Relief for Railroad Congestion

FOR YEARS the inability of the railroads to handle the business consigned to Atlantic ports has been patent. Embargoes have been chronic. To relieve this situation, and in general to prevent waste in transportation, the Railroads' War Board was established shortly after we entered the war. The results have been excellent, and the hope is entertained that through its efforts we shall be able to handle successfully the tremendous volume of freight that is coming.

But we have not yet experienced peak conditions. The millions of dollars' worth of supplies ordered by our Government for use abroad have not yet started to move to the seaboard, and our allies are continuing their purchasing. When the factories begin to ship, the carriers will be deluged with freight. Unless the railroad board's efforts prove successful, we shall see congestion the like of which has never been experienced.

In this situation it is the part of wisdom to take stock of all of our transportation resources in order that we may know what alternative facilities are available, how they may be used in case of emergency, and what steps are necessary now to put them in condition for maximum use if the demand should come.

Obviously, the waterways and the highways are two remaining agencies of transportation available. Already a subcommittee of the Council of National Defense is working on the waterway problem. To some extent, also, this committee is looking into the use of highways—particularly as they serve as feeders to the waterway system. The highway problem, however, is so large that it requires special study, and that from the standpoint of an emergency war measure.

Readers of this paper already know that the highways have ben called upon to a large extent to save industries crippled by the rail congestion. Many a factory and business house in Cleveland would have shut down this summer, or have been run on part time, had it not been for the fleet of motor trucks that have poured over the roads from Akron, Elyria and other points. A number of Michigan automobile plants have been making deliveries of pleasure cars and motor trucks this year via the highways from Michigan points to Toledo, Chicago and Indianapolis. One such plant has kept nine men busy piloting new cars from its factory to the seaboard. Furniture haulage between Boston and New York and between Philadelphia and New York is common practice, while the Goodyear Tire & Rubber Company will shortly increase a fleet of four trucks which has been running for a year between Akron, Ohio, and Boston. These trucks carry two drivers, and run night and day on a schedule that has been carefully worked out.

These are but a few instances in which the roads have saved the day for business which found it impossible to secure adequate service from the railways. They are sufficient, nevertheless, to show what can be expected from a comprehensive highway system. To what further extent, however, this highway system will be called upon for relief service, what coördination there must be between state and government to secure satisfactory pavements over long routes, what provisions there are now for maintaining these prospective relief roads, and what further maintenance methods will be needed should they be used by great fleets of heavy, fast moving trucks, are problems that need a most thorough study. It is safe to say that only here and there are there good interstate roads available, and that on these maintenance provisions are not equal to the strains that heavy truck traffic might put upon them.

In this situation there is imperative demand for a thorough study of the highway situation. It may lead to the conclusion that a Federal highway board is needed —comparable to the Railroads' War Board—to place our highways in a position to be operated at maximum efficiency as a relief for railroad congestion. The Chamber of Commerce of the United States, meeting in Atlantic City last week, recognized the seriousness of the highway problem, pointing out that all transportation agencies need to be brought to the highest state of efficiency in order that foodstuffs may be moved economically from farm to market, and manufactured products from factory to consumer.

If one further word is needed to point the urgency of the situation, one needs only recall that upon our entrance into the war various agencies were discouraging a continuance of highway building. Now we are awake to the situation. We know that foodstuffs that should go to Europe may rot on the farm for lack of adequate transportation, and that our fighting strength overseas may be seriously affected because of the difficulty of getting munitions from the inland factories to the seaboard.

Under these conditions action is necessary, and the first step, so far as highways are concerned, is the provision, through the Office of Public Roads or otherwise, for an immediate and careful survey of the situation.

Quebec—The Final Chapter

IN THE engineering world the name Quebec has for half a generation been associated with a great prospective engineering triumph. Twice the hopes of success have been dashed, but never in the heart of the true engineer was there doubt that the enterprise would be brought to a successful completion.

Now the great hopes are realized. The greatest of cantilevers stands closed across the St. Lawrence.

Just ten years ago the south half of the first bridge crumpled under its own weight, dragging a hundred men to their death. The investigations and discussions that followed destroyed that first project to its very roots. But new leaders were found, new ideas developed. On the wreckage of the old there arose the finest creation of bridge-building that any generation has seen.

What courage was required to attack the work anew can be realized only when one recalls the extent of the defects revealed in the old design. True, these discoveries were warnings for the succeeding designers, but impressed with the terribleness of the first experience their work could not but be haunted by visions of what had happened in that dark August of 1907. The new structure from the start gave evidence of the masterly hands responsible for it. A new truss design was developed, the shopwork was of marvelous precision and finish, the erection novel and courageous.

Yet, despite the most careful study and precautions, a second accident marred the record of the structure, when last year the suspended span, while being hoisted, fell into the river. One might think that in the face of this second discouragement the engineers and contractors responsible might have wavered in their determination to proceed. But he who thought so failed to reckon with the mettle of the men in charge. The wires had not finished sending the story of the lost span to the world when announcement was made that it would be rebuilt and erected by the very method employed last year. The promise of that announcement has now been fulfilled. What changes there have been from the previous erection plan are only in details. They are described elsewhere in this issue.

Before closing the final chapter in the design and erection of this remarkable structure, it is proper to record the debt that bridge-builders owe to the work at Quebec. It has advanced greatly our knowledge of the problems of large compression members and of tension bars. The effects of distortion in trusses were explored farther than before and means devised for dealing with such effects. Much knowledge has been added to our store of experience on the assembly of heavy members, while new standards were set as to degree of precision and finish in shopwork. Then there is, beyond all this, a great gain in our general grasp of the problem of very large bridges as to practicability and cost.

But these are the gains of the profession as a whole. To the individual engineer the great value of the achievement lies in the inspiration emanating from the courage of the men who have erected on the failure of 1907 and the loss of 1916 this greatest of bridges—and in so doing not only have erected a monument to themselves and their courage and ability, but have vindicated the profession before a doubting world.



QUEBEC SUSPENDED SPAN HAD TO BE LIFTED 150 FEET AFTER IT HUNG CLEAR

Quebec Suspended Span Successfully Hung from Cantilevers

Fifty-Four-Hundred-Ton Structure Floated 3½ Miles on Scows and Hoisted 150 Feet by Hydraulic Jacks and Lifting Links—Work Done Entirely During Daylight Hours

By HARRY BARKER
Associate Editor, "Engineering News-Record"

A NEW MILESTONE in bridge erection was passed last week when at Quebec the greatest single fabricated part of a structure was placed in position, the heaviest span ever floated was moved 3½ miles and the greatest job of jacking, both in total load and total lift, was completed. The complete success of every detail of the floating, hoisting and pinning, the remarkable adherence to schedules and the accurate checking of the engineers' computations of deflections and clearances throughout were the final answer of the St. Lawrence Bridge Co. and the Government board of engineers to critics of the design of the Quebec bridge and of the boldness of the scheme of placing the center span. Success has vindicated the judgment of the designers whose confidence was unshaken by last year's failure.

The entire operation was peculiarly dramatic to all the engineers who were fortunate enough to see it. The first day of the floating and connecting to the hoisting chains, and the last day when the final lifts were taken and the big pins slipped through the eyes of the permanent hangers, were filled with inherently spectacular moves. Even the two days of steady jacking were hours of constant interest in the ease with which the apparatus worked and the changing perspective in which the huge span was seen as it slowly rose above the river.

With each step of progress the confidence of workers on the bridge and watchers on shore grew firmer and firmer and at the end of the third day's work, when the plank platforms on the spans could easily be reached from the cantilever working floor, there was an eager rush of all the men to be in the first group to go across.

The faith of the men in the ultimate success of the enterprise was notably increased by the unique interest and confidence of the Sillery parish priest—Father Mc-

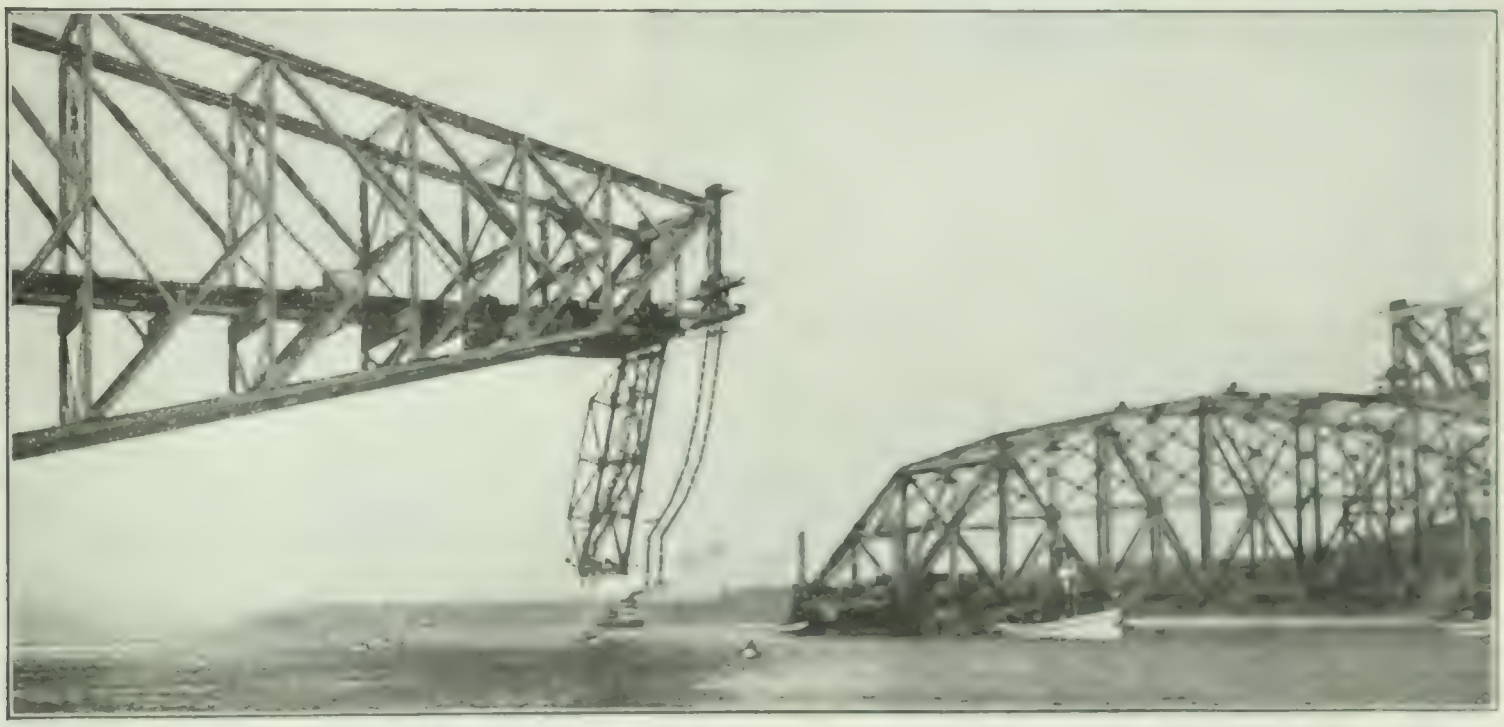


THE SPAN REACHED ITS FINAL POSITION AFTER FOUR DAYS' WORK

Three Preliminary Stages in the Raising of the 640-Foot Suspended Span of the Quebec Bridge Last Week



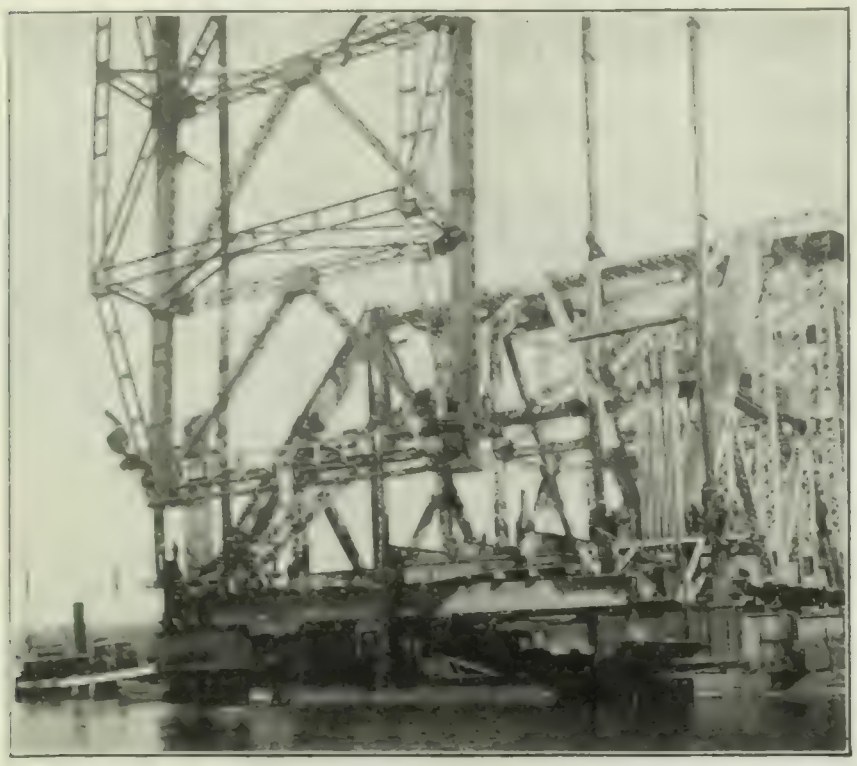
AT SUNRISE THE SPAN WAS TOWED OUT FROM SILLERY COVE



AS THE SPAN CAME CLOSE UNDER THE CANTILEVERS GUIDE LINES WERE CARRIED OVER TO MOORING TRUSSES



WHEN THE SUSPENDED SPAN WAS LIFTED FROM THE SCOWS THE [illegible] THEM

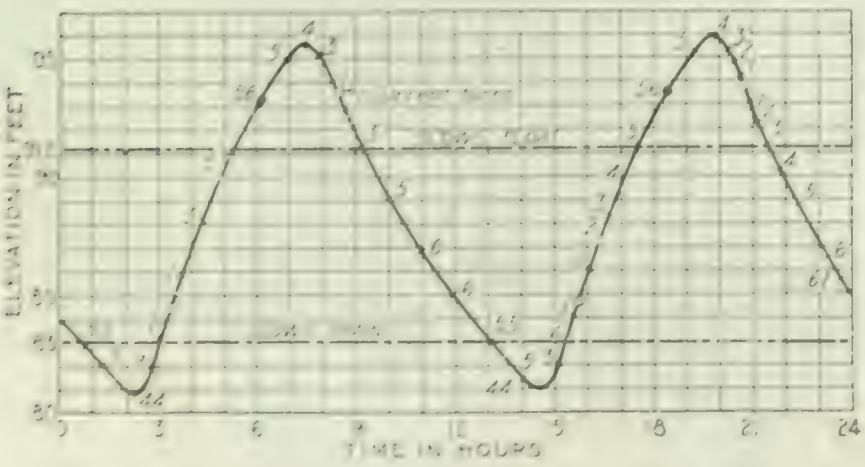


CONNECTING THE FLOATING SPAN TO THE LIFTING LINKS

Guire. A new force making for success was injected into the work and a new element was added to already dramatic scenes. On Father McGuire's initiative, the span and both cantilevers were blessed with due ceremony some days before the floating, and on the Sunday morning before the start a special Mass was offered. When the span floated past the Sillery church, all its bells rang out. Then the priest came out in a launch, boarded the span and rode up the river with it. He was around the work thereafter and spent the whole of the last day on the end platform of the north cantilever.

It was first intended to float the span Saturday, Sept. 15, but high winds Friday night and reports of an approaching gale led to postponement of the work for a day; then as the workmen were rather desirous of not working on Sunday, the start was put over one day more. With Sunday and Monday came perfect weather and good prospects for Tuesday and Wednesday, and the undertaking was started. The delay was not without benefit, for the smoothness of the operations on the succeeding days was due in no small measure to the practice drills with the jacks and pins.

As the tide reached low ebb Sunday night, men closed the bottom valves in the scows that were to float the span. The water rose steadily on the six scows until they lifted gently off their foundations and let the flat bearings, employed for the swinging on fixed end sup



QUEBEC TIDE DIAGRAM FOR SEPT. 17

Showing the rise and fall of the river and changes in current at all stages of the floating operations

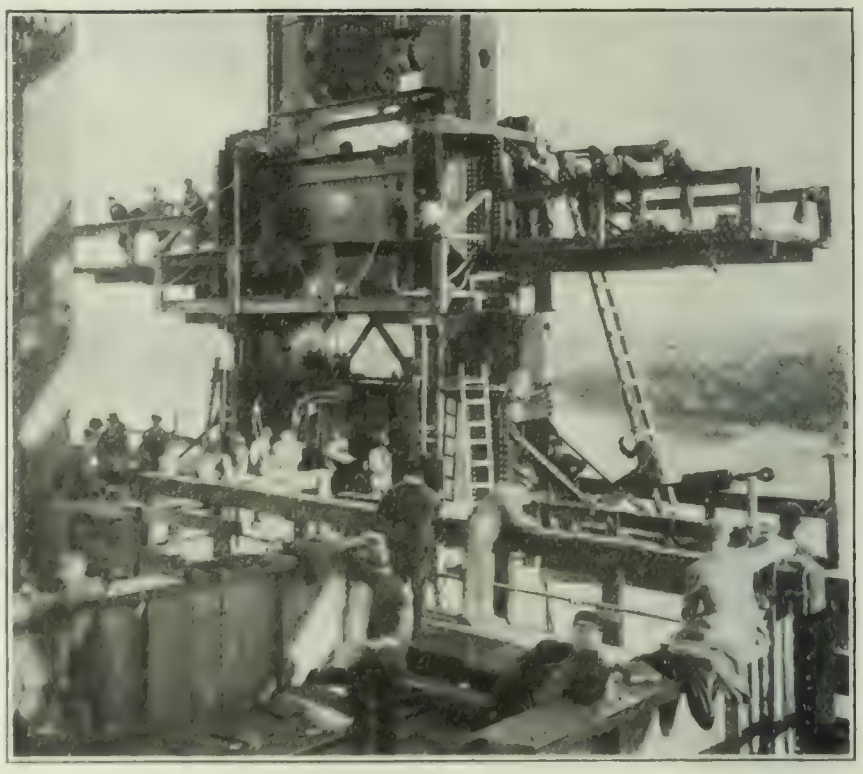
ports, come free. This was approximately at 5: 15, and by 5: 22 the lifting girders were perceptibly clear of the end bents. A few minutes' wait was necessary to get the needed depth of water channel for this strange tow and its tugs. At 5: 47 the first move out was made.

Two tugs had taken position outside the scow groups and easily handled the floating span on the smooth water. The span came out as the sun was rising and was turned cross stream as it went out, so that by the time it was in mid-channel, at 6: 15, it was ready to move up the river.

The strong tidal current (6 miles per hour) swept the span upstream with little effort required from the two towing tugs. Five tugs downstream stood by, stern on, with lines in place and waiting to serve as brakes.

By 7: 25 the span was roughly in its place, and five minutes later the first lines were run out to the mooring trusses. In 18 min. the six lines at the end of the span were all out and the tugs were standing by with lines eased off. At 8: 05 the lifting chains, which had been drawn back, were let down and the ends appeared to be pinned in place in 20 minutes.

At 7: 30 the tide had turned, and by 8: 30 the current had shifted from upstream to down. By about nine o'clock conditions were right for beginning the 150-ft. hoist. At 9:10 the jacks started; the bottom chain pins came to the bottom of the lowest-link slots with the jacks a few inches from the top of the first hitch-adjustment stroke—which, being taken for more than half the lift without the load of the span, was not counted as one of the 75 lifts needed to do the work according to



EASE WITH WHICH APPARATUS WAS OPERATED GAVE EVERYONE CONFIDENCE

schedule. (Five such adjustment lifts were provided for beyond the normal scheduled operations in case any delays in connecting the hanging and stub links were longer than anticipated. In such an event the chains could have been lowered to connect with the span at any time down to low tide.)

At the end of the third counted lift, at 10: 28, the scows came free and were swept from underneath by the current, the south-shore group preceding the north by a minute. The blocking beams between the span

and scows were not relieved of the load at quite the same time on the upstream and downstream sides, so that the barges began to swing around as they came out and for a moment gave some apprehension to those onlookers who did not realize the massiveness and strength of the hoisting details.

The imposing spectacle of the span hanging clear was received by the thousands on shore and on excursion craft in absolute silence—there was not a shout or a whistle. The feeling was tense, the scene most impressive. Everyone realized that the crucial test was at hand, for the work had reached this same stage last year when the span slipped from its supports.

Once the span was clear the men went in to a delayed breakfast. After an hour's intermission they returned, and at 11: 25 jacking was resumed. Two lifts were made and another recess was taken. The fourth lift was started after lunch, at 2: 05, and nine were made



THE SPAN GREW IN APPARENT PROPORTIONS AS IT ROSE

in rapid succession, ending at 4: 40. The actual time required for a lifting cycle varied from 13 to 19 minutes, and the actual lift period was from 6 to 8 minutes.

Up to this time there had been no wind, and the mooring tackle used to warp the span into its final floating position had not been shifted. For tying the span up for the night, however, the anchor lines were set, being better arranged for holding the span fixed.

The first task of the second day was the lowering of the top links, which had come through the top jacking girders. Taking off the pin caps, pulling out the short pins and lowering the links to the platform used up a trifle more than three-quarters of an hour. Jacking started at 8:16 and continued steadily to 12: 02, when the twenty-sixth lift had been taken. Another set of links had to come off after the noon hour, and it was 3: 40 before jacking began again.

During this part of the work there occurred the only accident of the entire job—and that was a minor one without anything more serious than an extra half hour's delay and a broken nose for one workman. For supporting the link-removal tackle, there were brackets bolted to the upstream jacking-girder box hangers, and several bolts on one at the southwest corner were



A CLOSE VIEW OF THE WHOLE HOISTING EQUIPMENT

sheared off. This was probably due to overloading, which was possible on account of the substitution, after the brackets were erected, of a heavy platform hoist for the light powered hoist mounted on the end diagonals of the cantilevers. The bracket was reinforced with slings and steamboat ratchets.

Seven more lifts were added to the score between 3: 40 and 5: 31, making the total number 34 and the lift 68 ft.

The third day was one of steady progress—of jacking interrupted only for letting down the top links as they came free. There was no wind, and the anchor tackles had to be shifted up the mooring towers only once. That being done at noon. In all twenty-six lifts were made this day, completing the sixtieth. This third day gave the appearance of the greatest progress to onlookers on shore, on the river and even on the bridge. From all points of view the proportions of the span appeared to increase as it rose.

The fine weather broke just at the time of the second day with a heavy shower that ushered in fitful east winds. By Thursday morning the wind had risen to

25 or 30 miles per hour, and was coming in gusts. But a moderate pull on the anchor leads held the span in place, and it could be manipulated with ease to ½ in. or less. When allowed to hang free the wind held the span from 5 to 7 in. off center, the total length of the suspension system being 100 ft. at that time. A ½-in. longitudinal oscillation with a period of about 10 or 12 seconds was observed.

The jacking started at 9: 05 and by noontime (11: 53) ten lifts had been taken. Only 8 ft. remained to be covered when the recess was taken. The span portal was in full view; the upstanding permanent-hanger eyebars had come up through the jacking girders and were approaching contact with the eyebars suspended from the cantilevers.

The last afternoon's work started at one o'clock in an atmosphere alive with mingled excitement, expectancy, confidence and anxiety. The first afternoon lift, the seventy-second, was made in 15 minutes, and 5 minutes was taken for a look at clearances all around. The seventy-third lift was made from 1: 20 to 1: 40, and then 30 minutes were used up in taking down the inside free top links and a pair of angles across the lower box hangers, so as to secure the maximum room for driving the pins.

The seventy-fourth lift was taken very slowly (2: 10 to 3:10), as some of the wooden working platforms had to be taken down, the clearances inspected, and the eyebars guided into proper position interlaced. The seventy-fifth lift followed immediately, and locomotive cranes were run out to all four corners with pin-driving cages and pins. At the end of the stroke, at 3: 25, the first of the eight pins was driven. The clearances were perfect, and each long pin slipped through its eyebars with a few taps from a short rail swung by about ten men. Every ringing blow of the rails stirred the onlookers. And when at 4 o'clock the last foreman shouted, "Right, here!" all restraint among workers and watchers was lost. The crane whistles on the bridge picked up the men's cheers and the river boats passed the signal down to the City of Quebec, where (by the Mayor's proclamation) every whistle and bell and automobile horn was turned loose, and flags and buntings were thrown to the breeze everywhere, for Quebec realized that its dream of thirty years had come true.

But with the driving of the pins the day's work was not quite done. The jacks had to be lowered to let the load come on the permanent hangers and to let the lifting girder bearings come free—which they did with from ⅛- to ¼-in. clearance at the end of the seventy-fifth return stroke of the jacks. With this the day ended.

On Saturday the work of dismantling the hoisting equipment started and the wind-stress (pin-and-socket) connections between span and cantilever were brought forward. The span floor system has yet to be erected, the footwalks laid, and some lateral-bracing connections have to be riveted. Trains may perhaps pass over the bridge in six weeks, but the last work can barely be finished this year.

The story of the Quebec bridge has now been written. For one man, Phelps Johnson, who now retires from active work, it is the story of his last great effort. For many others, Duggan, Porter, McMath, Mitchell, Monsarrat, Modjeski, Borden, it is only the record of another achievement. For a score of younger men it is the inspiration of promising careers opened up by their notable work here under the guidance of the older men.

New Details Found in Quebec Span Hoisting Arrangement

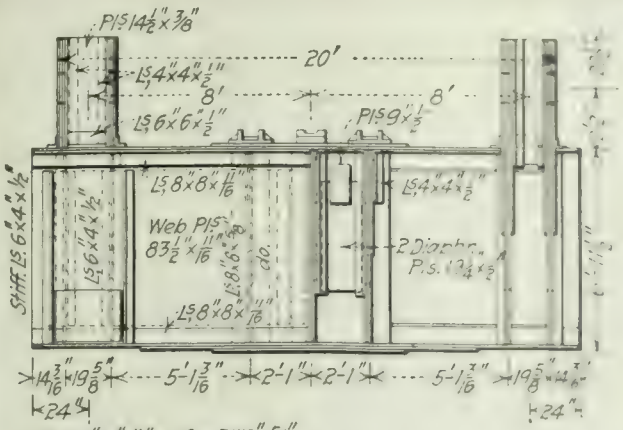
General Scheme Employed Last Year Retained, but Radically New Bearings Used Between Span and Chairs New and Heavier Hoisting Links and More Follower Jacks

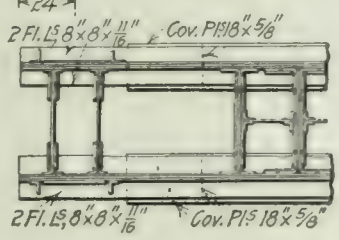
THE SCHEME and equipment for hoisting the new suspended span of the Quebec Bridge, successfully completed on Sept. 20, as noted elsewhere in this issue, follow the general practice employed in 1916, but with a few important modifications which the events of last year made advisable—though not all sprung out of the loss of the first span.

The new span is a duplicate of the old one—640 ft. long, 88 ft. wide and weighing 5400 tons. The task of rolling the steel (about 75% of which was nickel alloy), fabricating it in the shop and erecting it on falsework was completed in ten and one-half months—itself a notable performance in view of wartime demands for material and labor. The shopwork, if possible, was even better than that on the first structure, and the erection time was cut by ten days. The same site at Sillery Cove was used, and the same falsework and end supports. The identical six scows before employed for floating were used again.

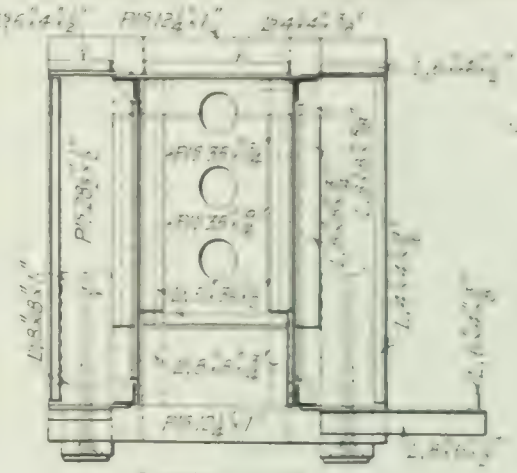
It will be recalled (see *Engineering News*, Aug. 31, 1916, and *Engineering Record*, Sept. 23, 1916) that the program called for erecting the span on falsework over shallow water, lowering it upon its end supports; letting six scows, moored underneath near the ends, pick it up as the tide rose; towing it to the main bridge site; connecting lifting chairs carried under each corner to pairs of lifting chains hanging from the cantilevers, and then jacking the span as a unit until pins could connect the permanent hanger bars carried by the cantilevers and the span.

The corner chairs, or "lifting girders," as they have been commonly called although they were employed while the span was being erected, when it was resting on its four end supports at Sillery, and while it was being hoisted to final position between the cantilever arms, were the old girders used with the first span, but largely rebuilt to meet the needs of the different intermediate bearings between chairs and span corners. These girders

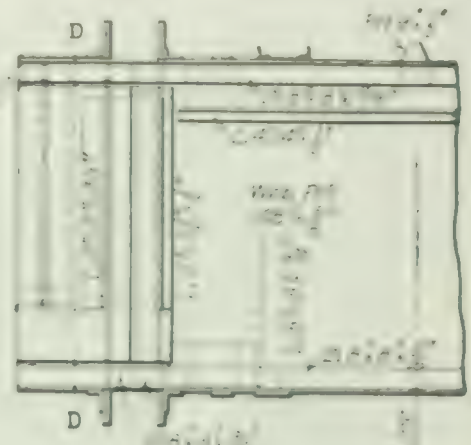




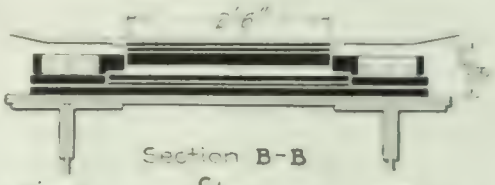
DETAIL OF LOWER LIFTING GIRDER



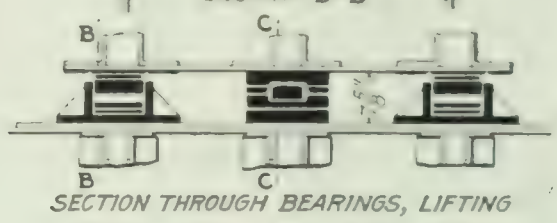
Section D-D



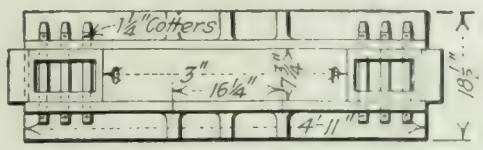
Half Side Elevation



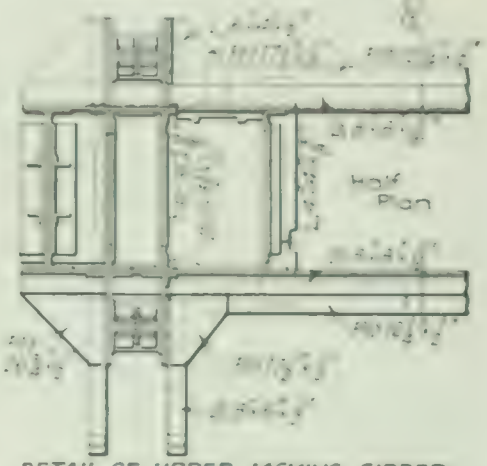
Section B-B



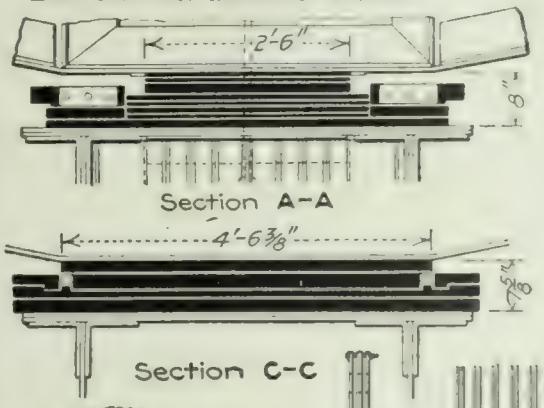
SECTION THROUGH BEARINGS, LIFTING



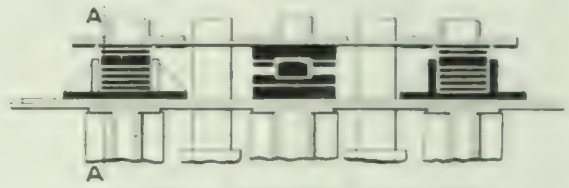
END-SUPPORT BEARING DETAIL



DETAIL OF UPPER JACKING GIRDER

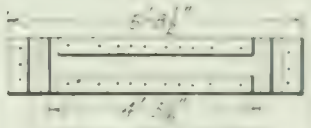


Section A-A

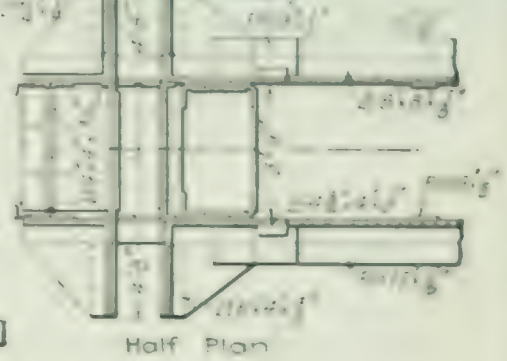


SECTION THROUGH BEARINGS, ON END SUPPORTS

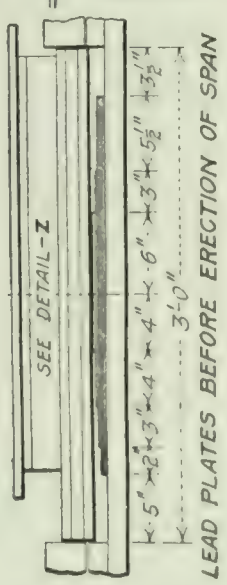
Section C-C



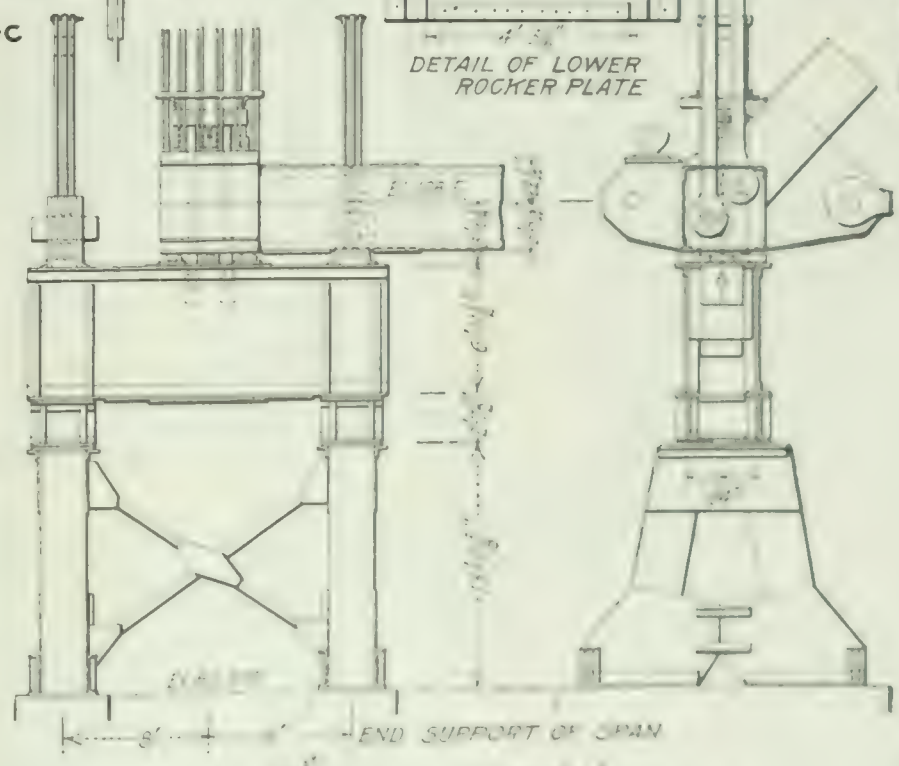
DETAIL OF LOWER ROCKER PLATE

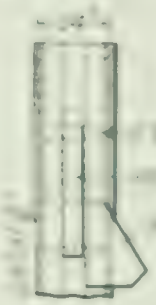


Half Plan

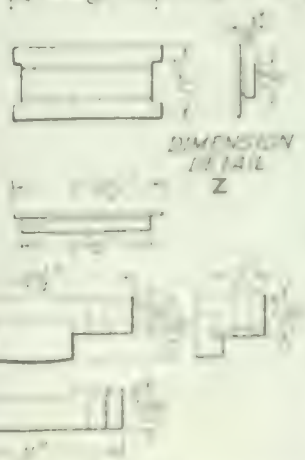


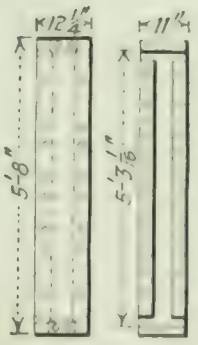
LEAD PLATES BEFORE ERECTION OF SPAN



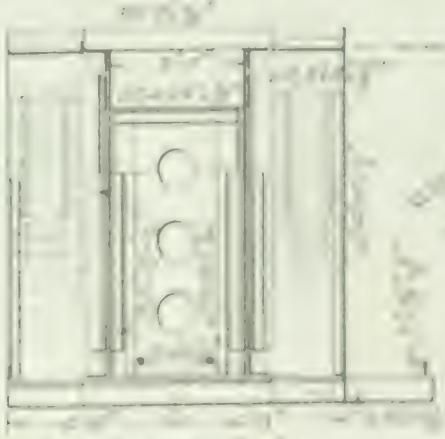




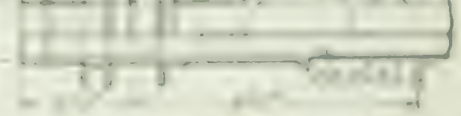




DETAIL OF TOP GIRDER BEARING



Section E-E



LOWER JACKING GIRDER

DETAILS OF LIFTING GIRDERS AND SPAN BEARINGS FOR ERECTING AND HOISTING SUNBURY SPAN

DETAIL OF JACKING PIN

(A)

(B)

(C)

DETAIL OF HOISTING LINKS A, B, C & D

(D)

FINAL POSITION OF MOORING LINES

GENERAL ARRANGEMENTS FOR FLOATING AND HOISTING

ANCHOR LINES DURING HOISTING

ARRANGEMENTS FOR REMOVING LINKS

HALF ELEVATION OF JACKING GIRDERS AND HANGERS

SPAN IN HIGHEST POSITION

ARRANGEMENTS FOR FLOATING, MOORING AND LIFTING THE NEW QUEBEC BRIDGE CENTER SPAN

are briefly described as being built up of two plate girders connected by bearing and stiffening diaphragms and cover plates. They are 5 ft. 6 in. x 20 ft. in plan and 7 ft. in depth. Some details are shown in the accompanying sketches.

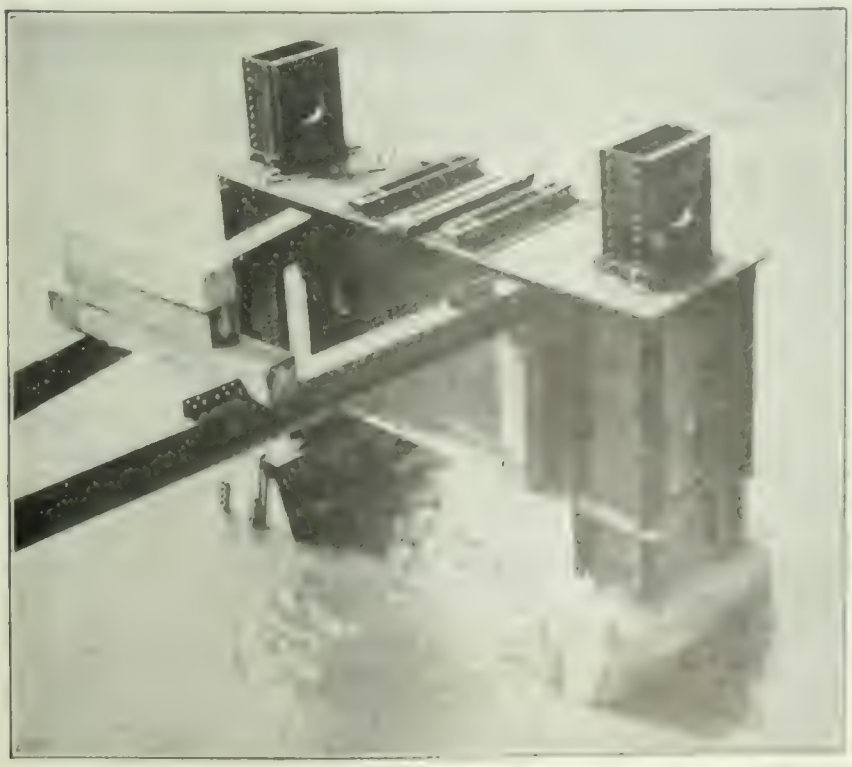
When the suspended span was swung on its fixed end supports, the load was concentrated at each corner upon two flat-plate bearings having their centers 4 ft. 2 in. apart, directly under the two outside ribs of the truss end post. Considerable sliding movement had to be accommodated, as the span elongated 4 in. as it was let down from its supporting falsework to the end supports alone. Then there was provided for a possible range of travel of $3\frac{9}{16}$ in. for each corner, due to expansion and contraction from temperature changes.

These plate bearings comprised a base—a machined steel casting, shown in detail in the accompanying sketches, in the pocket of which are six lead strips of varying length—and above these two steel filler plates, the lower one fitting the casting very closely to prevent extrusion of lead, and a bronze bearing plate on top of all. The lead strips were placed in initial position like the leaves of a carriage spring, so that as the load on the bearing increased during erection and swinging and as the inclination of the corner XLO changed, the lead would flow and give a firm seat for the bearing filler plates, and so provide uniform load distribution.

On each polished bronze top plate rested the polished face of a built-up steel bearing shoe, 2 ft. 6 in. long by $7\frac{7}{16}$ in. wide, bolted underneath the suspended-span corner. The upper steel filler plate and the bronze seat plate were held pocketed by finished and fitted guide blocks, each held in the bottom casting by three large cottered pins. The polished surface of the bronze plate was lubricated with paraffin before being placed. When the span was floated these bearing plates came out of contact and the lifting girder was then carried by a pair of small hanger links coming down from short channels on brackets attached to the gusset plates of the end diagonal. When the sliding bearings were free—that is, when the span was afloat—the bronze seat and one steel filler were taken out and the end blocks then turned around so as to serve as guides between the lifting girder and suspended span, in order that the girders might remain properly centered ready for the hoisting operation. These sliding bearings did not again take load when the lifting girder and span were picked up by the hoisting chain; they served thereafter only as guides and as emergency bearings intended to come into play in case of any accident to the single corner bearing employed during the lifting operations.



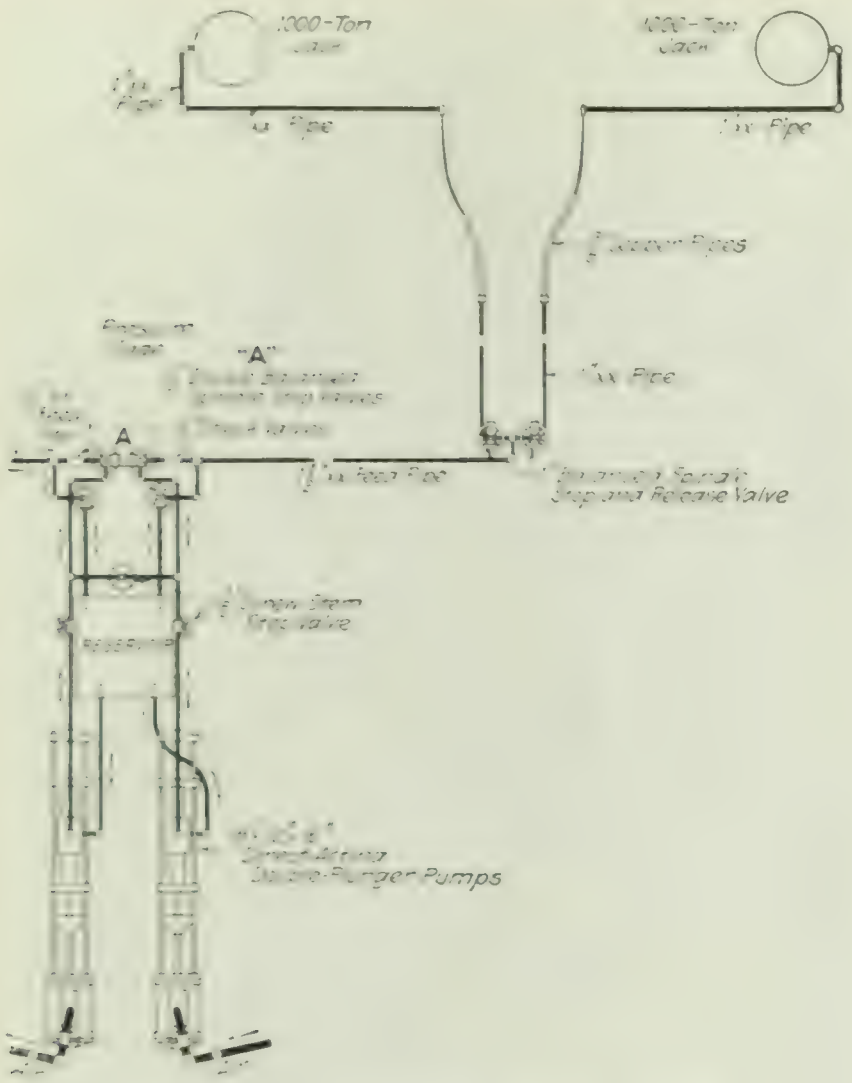
SLIDING SHOES AND ROCKER PLATE UNDER SPAN CORNER



CORNER-BEARING POCKETS ON LIFTING GIRDER

Between the slide bearings, and between the center of the lifting girder and the center rib of the span corner XLO, was the single bearing used during lifting (and idle during swinging and floating). This bearing contains no castings; it was fabricated entirely out of rolled material. On top of the lifting girder was first a $2\frac{1}{8}$-in. filler plate, and on this a machined holding plate grooved for end stop blocks and for a nickel-steel rocker 5 in. wide, $2\frac{3}{4}$ in. deep and 4 ft. 3 in. long, having its top surface a cylinder of 24-in. radius. A nickel-steel plate with machined groove to center the rocker was riveted to each span corner under the center rib. The centering stop blocks of this rocker were bolted into place after the span floated free, and together with the end blocks on the convertal sliding bearing guided the nickel-steel rocker into the shoe under the span corner.

Each lifting girder during the hoisting was carried by two chains going up to the jacking girder. Each chain was formed by four strings of lifting links. In each string one link was 26 ft. 11 in. long, five were 27 ft. 1 in. and one was 32 ft. 1 in. They were bored for the 12-in. jacking pins at 6-ft. centers, with ¼ in. clearance transversely and ½ in. longitudinally. The lifting links were bored in sets of sixteen, and each link had a



SYSTEM OF FOLLOWER SCREW JACKS

designated place in the chain, so that the spacing of pin holes at each end of the span was identical for each lift made. The lifting links were fastened together into a chain by 12-in. pins, 1 ft. $\frac{3}{4}$ in. long, held in place by caps and through bolts. The links themselves were each 2 ft. 4 in. wide and $1\frac{1}{2}$ in. thick, and were not attached to each other except through the common bearing pins of each chain (four links). The allowable stresses through the pinhole were 18,000 lb. per sq.in., including stress from 20% of the load as impact and an assumed additional load of 500,000 lb. per corner to allow for possible differences of level between corners of the span.

The stub links and lowest section of the lifting links were made of silicon steel with an elastic limit of 50,000 lb. per sq.in. All other links were of carbon steel rolled to the same specifications as the material for the permanent structure—62,000 to 70,000 lb. ultimate strength. Full-sized tests of similar links developed an ultimate strength on net section through pinholes of 60,000 lb. per square inch.

The mooring arrangements were the same as last year. Six lines were used to guide and haul the floating span into final position between the mooring trusses hanging down from the cantilever end. Two lines came down from electric hoists on the cantilever to each mooring truss corner and spread out to the two corners of the span; and two came across from steam hoists on the floating span along the center to the end, and spread across to the corners of the mooring truss.

The only change was the provision made for replacing the mooring lines by an 8-part $\frac{3}{4}$-in. steel line thrown from each corner of the mooring truss to the diagonally opposite span corner. As the jacking progressed, these lines could be held taut by derrick hoists on the platforms above. Each time the bottom of the span rose past a panel of the mooring truss, a 24- to 36-ft. lift, these anchor lines could be shifted to the next higher anchorages on the trusses. This provision for anchoring at any time on very short notice was provided so that work could be stopped at any time and the span held against wind movement. The tackle was kept tight, however, only during the idle night hours and on the last day, when the wind was strong.

To facilitate connection at the slotted bottom hole of the bottom links in the lifting chain, the stub links borne by the lifting girders under the span corners had fastened at their top a pair of guide straps between which were cross bolts—one continuously in place and the other removable through a top slot. On swinging down the chains to engage the stub links the slotted links were brought up against the back guide bolt, and then the front bolt was dropped into its slot and fastened, leaving $\frac{3}{4}$ in. total play between bolts and links. With the hanging and upstanding links thus guided, it was easy to slip home the 12-in. connecting pin.

The upper supporting girders, at the ends of the cantilever arms, were similar in design to the lower supporting girders, except for arms which carried various counterweights. Between the center of each girder and the center of the supporting arm is a rocker joint very much like the center bearing under the suspended span, the rockers in both cases being parallel to the bridge axis. At the top support the rocker was locked to the bearing plate on the supporting girder, and the cylindrical surface was down against the bearing plate on the cantilever.

Pinned to the upper supporting girder (at right angles to the span and thus, with the rockers, accommodating movement of the suspended span in any direction from external forces) were the box hangers, about 2 ft. 3 in. square, which came down some 44 ft. to carry the lower, or fixed, jacking girder. Each pair of box hangers was cross-connected by two panels of X-bracing. Coming up from each fixed jacking girder to meet these box hangers coming down from the upper supporting girders was a pair of cross-braced box hangers about 15 ft. long. The two sets of box hangers met at a pin joint. The lower pair of hangers was riveted into the lower or fixed jacking girder and served as a guide for the upper jacking girder as it was raised and lowered.

The fixed jacking girder carried on its center line at the extreme end, outside the supporting hanger, two 1000-ton hydraulic jacks, and four auxiliary, or follower, screw jacks on brackets in line with the lifting chains. The hydraulic jacks had rocking seats at both upper and lower bearings to accommodate, without binding, the deflection of the girders under load. The reaction from the hydraulic jacks was carried by transverse diaphragms in both jacking girders, while that from the follower screw jacks was borne through brackets to the main members.

Each follower jack consisted of a 12-in. screw, a nut and a barrel casting. Each barrel was supported by brackets on the lower girder, and the nut fitted a recess in the top of the barrel. The screw carried below it a vertical splined shaft by which it could be rotated. The

screw and shaft were supported on a clearance yoke below, from which two cables ran up to a similar yoke above. From the latter yoke a cable ran to a counterweight. Loose on the screw shaft, but restrained by guides on the lower jacking girder, was a feathered bevel gear meshing with a gear on a shaft going through other gears to a drum and handwheel carried by the lower jacking girder. As shown in the accompanying sketch, the two follower screws at each hydraulic jack were geared to one handwheel. Two men easily followed the movement of the upper jacking girder.

The lifting links passed between pin-bearing cross diaphragms in each jacking girder. The chains, as already noted, were bored every 6 ft. to receive a 12-in. pin, while the girder pin diaphragms were similarly bored on 2-ft. centers. There was ½ in. transverse and ⅞ in. longitudinal clearance in the chain holes, and larger clearances of 1 in. and 1¾ in. in the pin diaphragms.

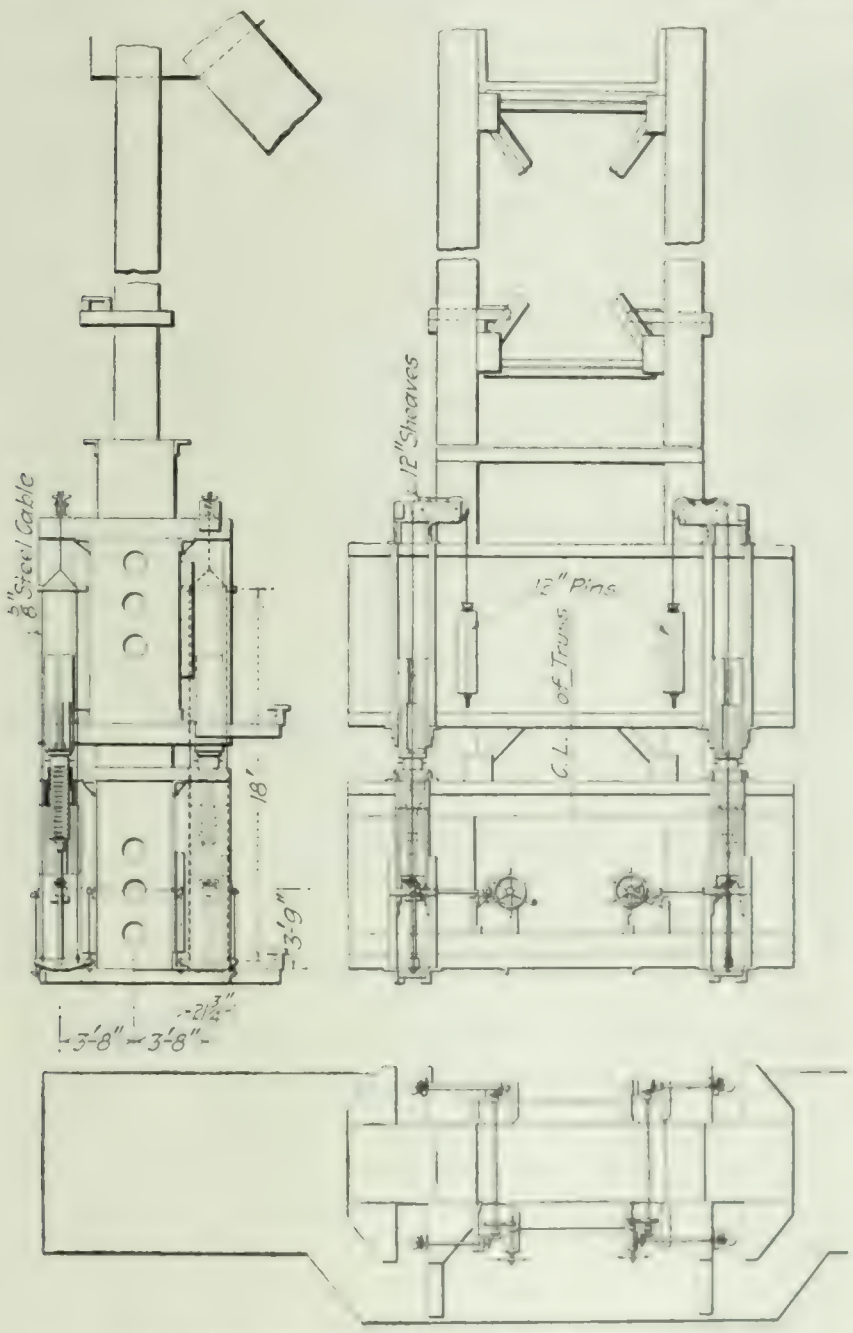


DIAGRAM OF HYDRAULIC JACK CONTROL

Each upward jacking movement carried the span up 2 ft., the platform pins holding the chains to the upper girder. At the end of the upstroke the lower platform pins were entered through the lower girder diaphragms and a registering chain hole. Then the jacks were eased off to let the load come on the lower pins, while the upper pins came out. After a return stroke of the jacks and the upper girder, the upper pins were reinserted and a new lift began, the lower pins coming out as soon as released from their load.

The two 1000-ton hydraulic jacks lifting each corner of the span were supplied at 4500 lb. pressure by a parallel pair of air-driven direct-acting double-plunger (18 x 2 x 16-in.) pumps drawing water from a wooden tank into which the jacks discharged on their return strokes. The stopping and starting of the jacks was controlled by the valves on the air-supply lines to the pumps, and no air or hydraulic receiver was inserted in any of the lines, the long lines coming over the cantilevers amply cushioning all shocks. Air was supplied by three motor-driven compressors, each with a free-air capacity of 534 cu.ft. per min. at 110 lb. pressure.

The flow to the various jacks was controlled by stop valves, used as throttles, in the first feeder line, in the distribution block (connecting one or both pumps to the east or west pair of jacks) and in the branches leading to each jack connection. The actual lifting and release of the jacks was in the hands of the central pump operator solely, the east and west valve men merely holding alike the travel of their two jacks.

All the connections on the cantilever platform were of 1½-in. *XX* pipe and fittings. The jacks were connected first to a 1-in. *XX* pipe on the jacking platform, and the platform systems were connected by double 16-ft. lengths of ¾-in. copper pipe in S-bends. All the hydraulic equipment was made by the Watson-Stillman Co., of New York City, and was set up under the direction of that company.

Telltales were placed before the three valve men on each end of the span. Each indicator comprised a pair of cords and counterweights, sliding on firm guides and carrying registering targets. The corner telltale cords came from the ends of the upper lifting girder; the cords for the center telltale came from the center of the same girder. Only the center indicator had a scale. On each central telltale board were mounted four incandescent electric lamps representing the four pairs of screw jacks. These were on a circuit which was broken at an automatic contactor when the follower screws were about ¾ in. below their uppermost position. Their chief use was in warning the operators when the follower screws had retired far enough so that the return stroke of the hydraulic jacks could be started.

Both end platforms of the suspended span during floating were connected to the central control platform of the span by telephone lines. When the span was moored these instruments were disconnected and the circuit was used as a line between the north and the south cantilever platforms. Each cantilever platform also had a connection with the main-office switchboard of the company.

The actual lifting operations were directed by W. B. Fortune, erection superintendent of the St. Lawrence Bridge Co., but under the general direction of G. H. Duggan, chief engineer, C. F. Porter, engineer of construction, and S. P. Mitchell, consulting engineer of erection. The Board of Engineers of the Quebec Bridge, representing the Dominion Government—C. N. Monsarrat, chief engineer and chairman, Ralph Modjeski and H. F. Borden—personally inspected the floating and hoisting.

Highway Commissions, Not Legislatures, Should Draft Traffic Regulations

By A. N. Johnson
Consulting Highway Engineer, Portland Cement Association

THAT adequate traffic regulations are necessary, and that such do not exist, is well evidenced by the amount of discussion that this topic is receiving in both the daily and technical press. Nearly every legislature has this subject before it for consideration. The present statutes on traffic regulation are voluminous, varied and wholly inadequate.

Traffic regulations may be divided broadly into two classes; those which conserve the safety of the traveling public, and those which conserve the highways. Speed, danger signal, light and similar regulations illustrate those of the former class, while regulations concerning the weight and size of vehicle are of the latter.

State Regulations Differ

Inasmuch as interstate travel, already large, is constantly increasing, it becomes a matter of considerable concern that the regulations, particularly those relating to the safety of the traveling public, should be, under given conditions, the same in every state. This is far from being the case at present. Inasmuch as these regulations are today a subject of statutory enactment, it is evident that there will be considerable practical difficulty to secure any degree of uniformity among the different states. Moreover, it will be agreed by all that traffic regulations of all kinds is a matter that requires a high degree of expert study, if they are to be such as will insure the results that should be obtained.

Such expert consideration, it is submitted, can scarcely be expected to result from such deliberations as a legislature or a committee of a legislature can give; but it is on such basis that practically all of these statutes rest. Discussions of this subject have brought out and developed many details as to the regulations to be enforced, but it will be necessary to make some fundamental change in the method of originating such regulations and making them of practical application, if the two essentials are to be secured, namely, proper regulations and uniformity under similar conditions in all states.

A Possible Solution

As a possible solution to this problem, the following is suggested:

First, traffic regulations, both as to the operation of vehicles and their weight and size, should be primarily promulgated by the state highway commissions of the different states, with the idea that the highway commissions would be best able to bring to bear the most expert knowledge that could be secured.

Second, it would be far more practical and possible for the state highway commissions of various states to coordinate their efforts and secure a degree of uniformity much greater than is possible by legislatures.

The statutory enactments that would be necessary to make such a proceeding possible would be along these lines:

The legislature of each state should pass a law that would empower the state highway commission to formulate traffic regulations and provide a penalty for the operation of a vehicle in such a manner as to endanger the life and property of others. Also, a penalty should be provided for such use of the highways as is likely to cause extraordinary wear or damage. It would be made *prima facie* evidence that a vehicle had not been operated properly or that a highway had been misused, if such operation or use was contrary to the rules and regulations of the state highway commission pertaining thereto. Such a statute would necessarily provide details as to the publication and promulgation of the rules and regulations of the state highway commission.

Speed Limits Not Defined

Under this plan the legislature would not attempt to provide definite speed limits, would not say which vehicle on meeting another at a crossroads had the right of way, what lights should be carried, what warning signals should be given, what the limits of weights of loads or the weight to be allowed upon a wheel, or what the limiting size of vehicles that could be moved over the highways. All these details would be given careful study by state highway commissions and be made a matter of regulation by them. Legally they would have significance as defining evidence. Thus a person would not be fined or imprisoned because he disobeyed a regulation of a state highway commission, but because he had operated a vehicle in such a way as either to endanger the life or property of another or to cause undue damage to a highway. And the test or evidence upon which his conduct would be judged would be the rules and regulations formulated by the state highway commission.

Under such a plan as this, there would seem to be the best chance of having proper and uniform regulations for traffic in all states.

New Data Available for Checking Old Magnetic Compass Lines

Information of special value to surveyors and engineers engaged in reproducing on the ground the lines of old surveys run with the magnetic compass has been made public by the U. S. Coast and Goedetic Survey. It is in the form of a 51-page pamphlet containing results of magnetic observations made by the Survey at 352 stations in 33 states and territories. Numerous old stations were reoccupied in order to determine the secular change of the magnetic elements, and many auxiliary stations were occupied where previous observations had indicated the presence of local disturbance.

The results of the observations on land are given in tabular form arranged by states and territories alphabetically, for declination, dip and horizontal intensity, with the geographic position, and a separate description is given of each station occupied. A comparative table is given of the declination results at stations formerly occupied with the results obtained in 1916.

The publication may be obtained at a price of 10 cents from the Superintendent of Documents, Government Printing Office, Washington, D. C.

Concrete Trestles Have I-Beams and Rails in Slabs

Removable Fixed Span in Erie's Two-Track Structure Over Kankakee River Will Permit Passage of Dredges

DOUBLE-TRACK concrete pile trestles, having slab decks which are practically I-beam spans incased in concrete, have replaced the old single-track timber trestles carrying the Erie R.R. across the Kankakee River near Lomax, Ind. The new trestles have just been completed in connection with the double-tracking of this section of the Erie, described in *Engineering News* of Feb. 8, p. 224. A feature of the construction is the inclusion of a removable fixed span to permit the anticipated passage of dredges. There are two trestles, 322 and 162 ft. long, crossing respectively the main and overflow channels of the river. The longer one is shown in the accompanying drawings.

The trestle spans are 16 ft. c. to c. of bents, the bents consisting of premolded concrete piles supporting concrete caps. At intervals of four or five spans there are double bents supporting caps of extra width, over which expansion joints are located in the deck slabs.

The piles are from 20 to 30 ft. long. They are of uniform octagonal section, 16 in. wide across the sides. The end is tapered for a length of 2 ft., ending in a 5-in. point. Each pile is reinforced with eight longitudinal round rods—¾-in. rods for piles 24 ft. or more long, and ⅝-in. for piles less than 24 ft. in length. These rods are surrounded with electrically welded hoops of No. 7 wire, spaced 6 in. c. to c., except that for 2 ft. at the head of the pile they are spaced 4 in. c. to c. Four of the longitudinal rods extend into the point, where they are brought together and wrapped with No. 12 wire.

The material in the river bed is mainly sand and gravel, with some clay. This made the driving of the piles with a Vulcan 5-ton steam hammer somewhat difficult, and a water jet proved of little assistance.

There are twelve piles in each single bent, spaced 30 in. c. to c. The double bents have two rows of piles spaced 30 in. c. to c. in both directions. The caps, cast in place upon the pile heads, are 42 in. deep, with a width of 30 in. on the single bents and 5 ft. on the double bents. They were made for each track separately, the two parts having a lapped joint at the middle, as shown.

The abutments are of plain concrete. Each is supported on three rows of timber piles, those of the front row being driven on a batter in order to brace the abutment against being crowded forward.

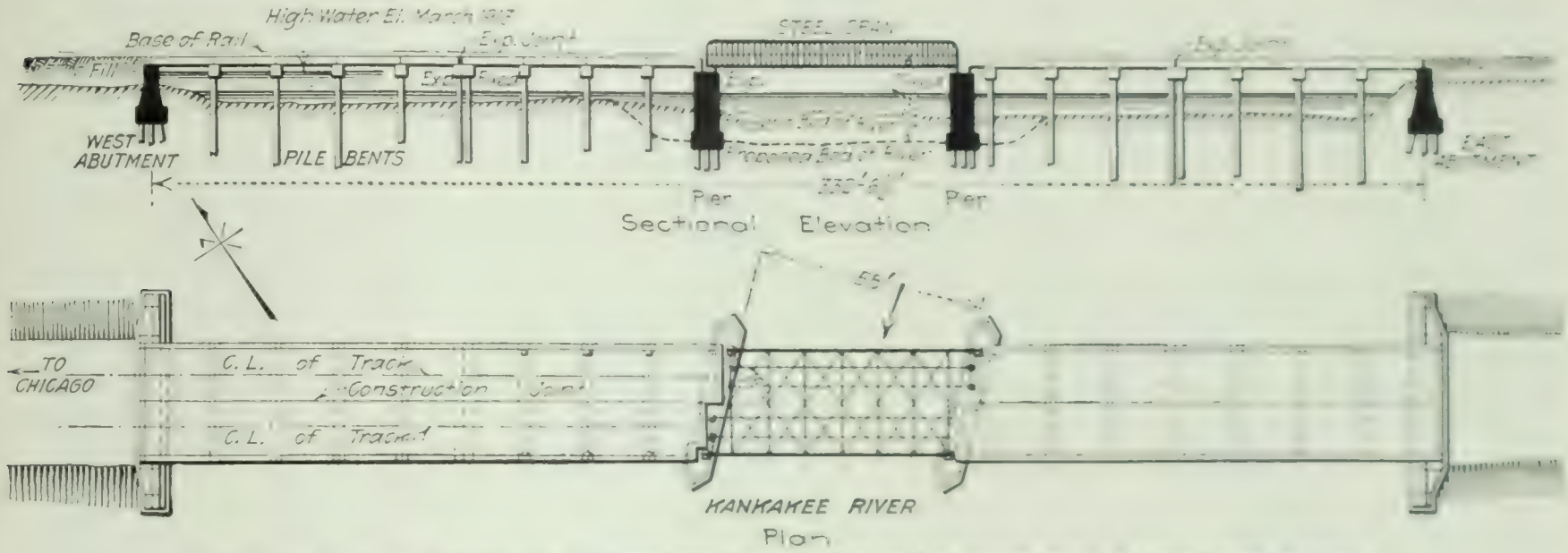
The concrete deck slab is 20 in. thick and 30 ft. wide. It is made in 16-ft. lengths for each track separately. In each slab are nine 15-in. 42-lb. I-beams placed directly beneath the ties. Old 80-lb. rails are placed on each side of these beams, as shown in the cross-section. A sheet of Clinton welded fabric, suspended from the I-beams and rails by wire hangers, is incased in the bottom of the slab and extends up into the curb wall on the outer side.

The slab and its reinforcement have a construction joint over each single bent, both ends of the slab being anchored to the caps by 1-in. dowel rods. Over each double cap there is a 1-in. expansion joint, the end of one slab being free to move, while that of the other slab is anchored as above described. This joint is filled with a non-hardening flexible material. Curb walls 6 in. high retain the ballast.

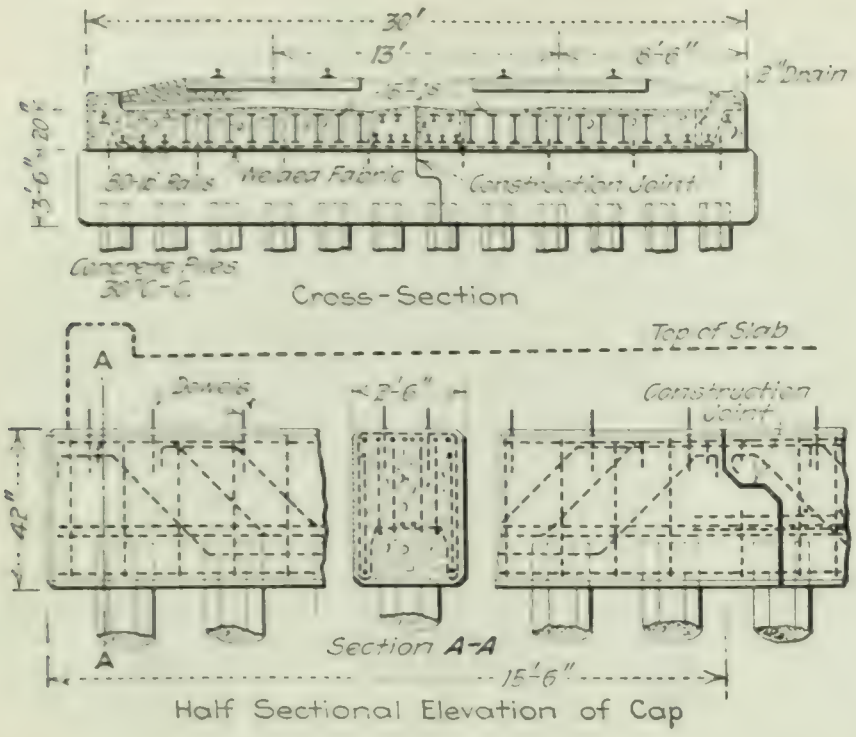
As the deck slab was built in two longitudinal sections (for each track separately), the inner side of each section was made 1 in. higher than the body, so as to throw drainage away from the central joint. The top of the slab under each track slopes ½ in. per ft. in each direction from the center of the track to a drain outlet. Each slab under each track has four 2-in. drain holes, formed by 2-in. pipe sleeves embedded in the concrete. They extend 2 in. below the slab in order to prevent the water drip from spreading on the bottom of the slab.

The concrete deck is covered with a waterproofing course of coal-tar pitch ½ in. thick. Over this is a 1-in. layer of sand, upon which is placed the stone ballast, 8 or 9 in. deep under the ties.

The main channel of the river was straightened and dredged several years ago, and it is expected that it will be dredged deeper in the near future. An opening 68 ft. wide at right angles to the general direction of the river was therefore introduced in the trestle for the passage of the dredges and of large drift. This opening is spanned by a double-track through plate-girder bridge having two main girders.



CONCRETE PILE TRESTLES CARRY THE ERIE RAILROAD OVER THE KANKAKEE RIVER



DETAILS OF CONCRETE PILE TRESTLE

Provision is made in the construction of the concrete trestle adjacent to this girder span for support of a boom derrick to assist in lifting the bridge out. There is provision also for roller bearings on which to roll the bridge endways to permit the dredges to pass through, and to replace the bridge over the channel with the least possible delay to railway traffic.

This span is carried on plain concrete piers, so located that their faces are parallel with the general course of the river and at an angle of 75° with the tracks. Each pier is supported on three rows of timber piles. The piers are carried considerably below the present bed of the river, so as to be below the new bed after the river has been deepened.

One-half of each trestle (for the new second track) was built first, close alongside the old single-track timber trestle. When this part of the work was completed, traffic was transferred to the new track. The old trestles were then removed, and the second half of each concrete trestle was built.

The steam pile-hammer, noted above, was carried in leads swung from the boom of a locomotive crane. This drove the concrete and wood piles, and also the steel sheet piling for the cofferdams at the abutments and the two piers. In the construction of the south half of one of the trestles, however, the leads were supported on skids, as ordinarily used for a land pile driver.

All concrete was poured in place, with the exception of the piles. The concrete for the piles, caps and deck slab is a 1:2:4 mix. For the abutments and piers a 1:2½:5 mix was used. The concrete was made in a drum mixer of 15 cu.ft. capacity, which was kept close to the work. Wheelbarrows were used to carry materials from bins at the end of the trestle to the mixer, and to carry the concrete for placing in the forms.

The dead-load on each double-track bent is 182,500 lb.; the live-load (Cooper's E-60 loading) is 341,200 lb. With an impact allowance of 154,400 lb., this makes a total load of 678,100 lb. per bent.

These trestles were designed by F. A. Howard, engineer of bridges and buildings, Erie R.R.; A. M. Knowles is assistant engineer of bridges and buildings. The design and construction were under the direction of R. S. Parsons, chief engineer and assistant to the president, and R. C. Falconer, assistant chief engineer. The trestles were built by the Robert Grace Contracting & Engineering Co., of Pittsburgh. Most of the piles were made by the C. F. Massey Co., of Chicago, the others being made at the bridge site by the contractor.

"Best Buy" in Pavements Determined by Popular Vote

AN EXAMPLE of the policy of letting property owners decide on the type of pavement, instead of allowing the matter to be settled on its merits by the city engineer, comes from Frederick, Okla. One would conclude from the details that popular amusements are rare in Frederick. The following description is based upon a report by an "eye witness."

All members of the city council and a crowd of citizens that filled every seat in the court room and left many standing were present when the mayor called the meeting to order and stated that its purpose was to ascertain what kind of paving should be used. It was decided by the council that two votes should be taken: First a vote on the type of paving preferred individually, and after this vote was canvassed all types but the two having the largest number of votes were to be dropped and a decisive vote taken on which of these would be adopted.

Each paving company, or promoter, was allowed 15 min. in which its representative could present the merits of a particular kind or brand of pavement. Mr. H., representing bitulithic pavement, spoke first. He made a price of $2.34 per square yard. Mr. P., representing rock-asphalt paving, spoke next and quoted a price of $1.75 per square yard. He offered a $10,000 bond that the price would not be in excess of the one quoted. Mr. G. spoke for vertical fiber brick paving, offering it at a price not to exceed $2 per square yard. Mr. W., of the B. Asphalt Co., spoke in behalf of sheet asphalt and asphaltic concrete, but made a price of $1.85 per square yard on the latter only, as sheet asphalt was not under consideration. Messrs S. spoke for vibrolithic (cement concrete compacted by patented method) quoting a price of $1.74 per square yard.

Ballots were distributed, each property-owner voting for the kind of paving he preferred, noting the amount of frontage he had on the streets to be paved. One vote was allowed for each 25 ft. of frontage or fraction thereof. The result of the ballot was as follows: Vibrolithic, 409; asphaltic concrete, 273; vertical fiber brick, 17; rock asphalt, 4; concrete, 3. Vibrolithic was adopted without resort to a second ballot. The account concludes: "Coming in as an eleventh hour contestant the Vibrolithic Co., of Dallas, Tex., represented by four busy men, succeeded in convincing the property owners that they had the best 'buy' in paving goods."

Concrete in Sea Water Articles

Owing to the space devoted in this issue to the Quebec Bridge it has been necessary to defer one week publication of the second article of the series of R. J. Wig and L. R. Ferguson on concrete in sea water.

Sink 7700-Ton Drop Shafts To Exact Line and Grade by Dredging

Foundation Work for Large Cincinnati Power Station, Requiring 50,000 Yards of Concrete, Is Finished Within a Year—Concrete Plant Places 900 Yards a Day

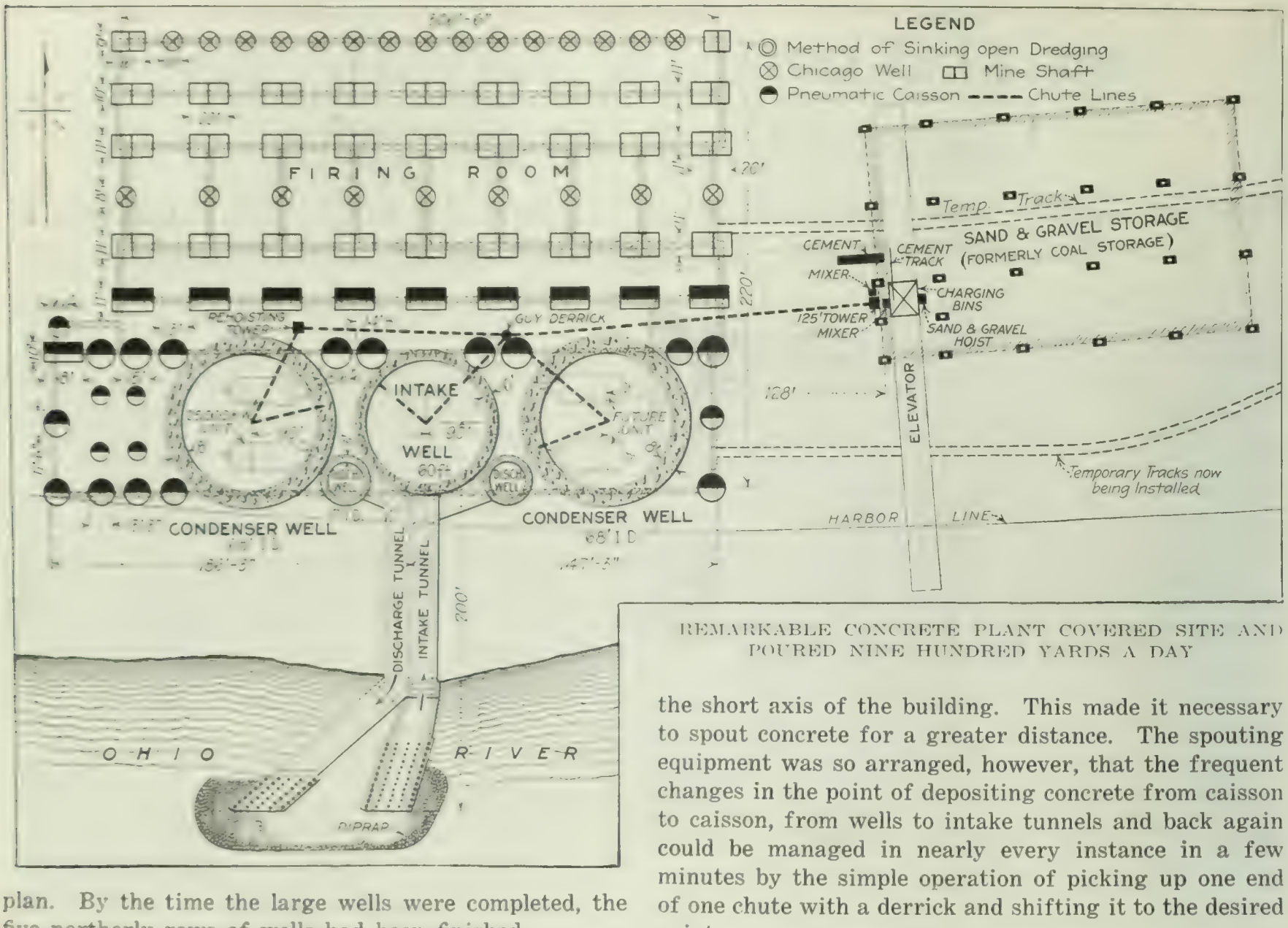


EXISTING COAL PLANT AT RIGHT CLEVERLY ADAPTED TO HANDLING CONCRETE MATERIALS

EXTENSIVE foundation work in which cofferdam, caisson, well and open-dredging methods have been brought into play, and which required 80,000 yd. of excavation and 50,000 yd. of concrete, has just been completed in less than a year in the course of the construction of a new steam-electric power station for the Union Gas and Electric Co., in Cincinnati. In spite of the size of the contract, it was entirely covered by a single spouting plant, cleverly adapted to make use of existing structures, which time after time poured 900 yd. every 24 hours without stop or breakdown. Either the caisson and well work or the cofferdam work alone would have formed a sizable contract, but in addition the unprecedented feat of sinking a concrete drop shaft 72 ft. in diameter and two 84 ft. in diameter concrete drop shafts by open dredging in sand to practically exact line and grade was accomplished. These huge cylinders, weighing from 6000 to 7700 tons each when landed, were handled with a nicety not believed possible at the time the contract was undertaken.

The new power station is located on a bank some 45 ft. above ordinary stages of the Ohio River. It occupies a rectangular space about 831 x 550 ft. The material encountered is from 30 to 40 ft. of cinder dump containing stone, scraps of old blast furnaces and all imaginable sorts of rubbish. Beneath this is sand or sand and clay, to a depth of about 40 ft. below the river bed, where a stratum of gravel which could be relied on for a foundation is encountered. The station is therefore carried on the intake and condenser wells, and on pneumatic caissons and open wells, all of which reach this stratum. The large wells, located in the middle of the river side of the station, are connected to intake and discharge tunnels extending into the river, which required for their construction the unwatering of the river bed within a typical Ohio River cofferdam. Large reinforced-concrete coal pockets through the boiler room along the north side of the building below the first-floor level also had to be constructed as soon as the piers were sunk and before steel erection could begin. The frame of the power station itself required about 6000 tons of structural steel.

As quickly as materials and plant could be assembled in July of last year, a start was made on the large cylinders, cofferdam work, caissons and well construction, and all were carried forward together as rapidly as possible. By the time the river cofferdam was closed and pumped, a good start had been made on the three big wells. As the open-dredging method by which these were sunk disturbed the ground in the immediate vicinity, it was advisable not to sink the pneumatic caissons nearest them until the large cylinders had been sealed. Accordingly, work was started on the two lines of circular open wells, as indicated on the foundation



REMARKABLE CONCRETE PLANT COVERED SITE AND POURED NINE HUNDRED YARDS A DAY

plan. By the time the large wells were completed, the five northerly rows of wells had been finished.

In the meantime, the intake and discharge tunnels had been constructed inside steel sheet-pile dams driven in the floor of the area unwatered within the box cofferdam, and the junctions with the openings left in the intake and discharge wells had been made. The caisson work, which progressed continuously from the time air was put on, as many as 18 caissons, wells and shafts being under way at one time, was then continued until the two discharge wells and all the piers around the large wells on the river side of the power house had been completed. Meanwhile, the reinforced-concrete coal pockets, erected on the first wells sunk, had been formed and concreted. This permitted the start of steel erection about Apr. 1 last.

The rapid work done in carrying on all these operations simultaneously at full speed has been, of course, made possible by the concentration of enough derricks, floating plant and other equipment to handle the work as fast as the physical limitations of the site would permit its being opened up. The largest single factor in this plant, however, has been the equipment for mixing and distributing concrete. While, perhaps, every single feature of this plant had been used before, it has proved extremely effective and is thought to be unique as a concreting layout.

The delivery of sand and gravel is by water from a dredge in the Ohio River. Both because the river cofferdam was in the way, and because an old coal-handling plant was available for taking the gravel up the bank and storing it at the east end of the work, the mixing plant had to be located on the long axis instead of on the short axis of the building. This made it necessary to spout concrete for a greater distance. The spouting equipment was so arranged, however, that the frequent changes in the point of depositing concrete from caisson to caisson, from wells to intake tunnels and back again could be managed in nearly every instance in a few minutes by the simple operation of picking up one end of one chute with a derrick and shifting it to the desired point.

The main hoisting tower, 125 ft. high, was located on the west side of the converted coal-storage plant, and concrete was spouted from it direct to a hopper built around the tall revolving mast of a guy derrick. This chute line remained in place throughout the entire work. The boom of this derrick supported a counterweighted section of chute, from the outer end of which a second chute was hung, which covered the easterly two-thirds of the building. When concrete was to be deposited at the western end of the building or down the bank inside the cofferdam, the chute line from the revolving mast was simply swung around and straightened out so that it discharged into the hopper of an 80-ft. rehoisting tower from which chute lines were strung as required. The lines from the rehoisting tower to the western condenser well and to the cofferdam required practically no shifting, and the chutes to the various wells and caissons at the west end of the site could be changed at leisure while concrete was being poured at some other point from the revolving mast.

The guy derrick was located on a line perpendicular to the common axis of the east condenser and intake wells, and the counterweighted chute reached the exact center of either well. The second chute, revolving around the end of the counterweighted chute, could travel all around the well as concreting progressed. This chute had a 10-ft. section which could be removed when the intake well was being concreted. The first section of chute suspended from the boom on the rehoisting tower reached the center of the west condenser well, so that it could be concreted in the same way.



LARGE NUMBER OF DERRICKS KEPT WORK GOING SIMULTANEOUSLY AT MANY DIFFERENT POINTS

It can readily be seen that with such a distributing system the work of changing chutes was not only reduced to a very low point, but could always be carried on without interrupting the operation of the concrete plant for any length of time. The effectiveness of this distributing system was proved time and again. On Apr. 17, for instance, 750 yd. of concrete was poured in 15 hours, during which the mixer scarcely stopped, the concrete being deposited in the intake well and in several different caissons.

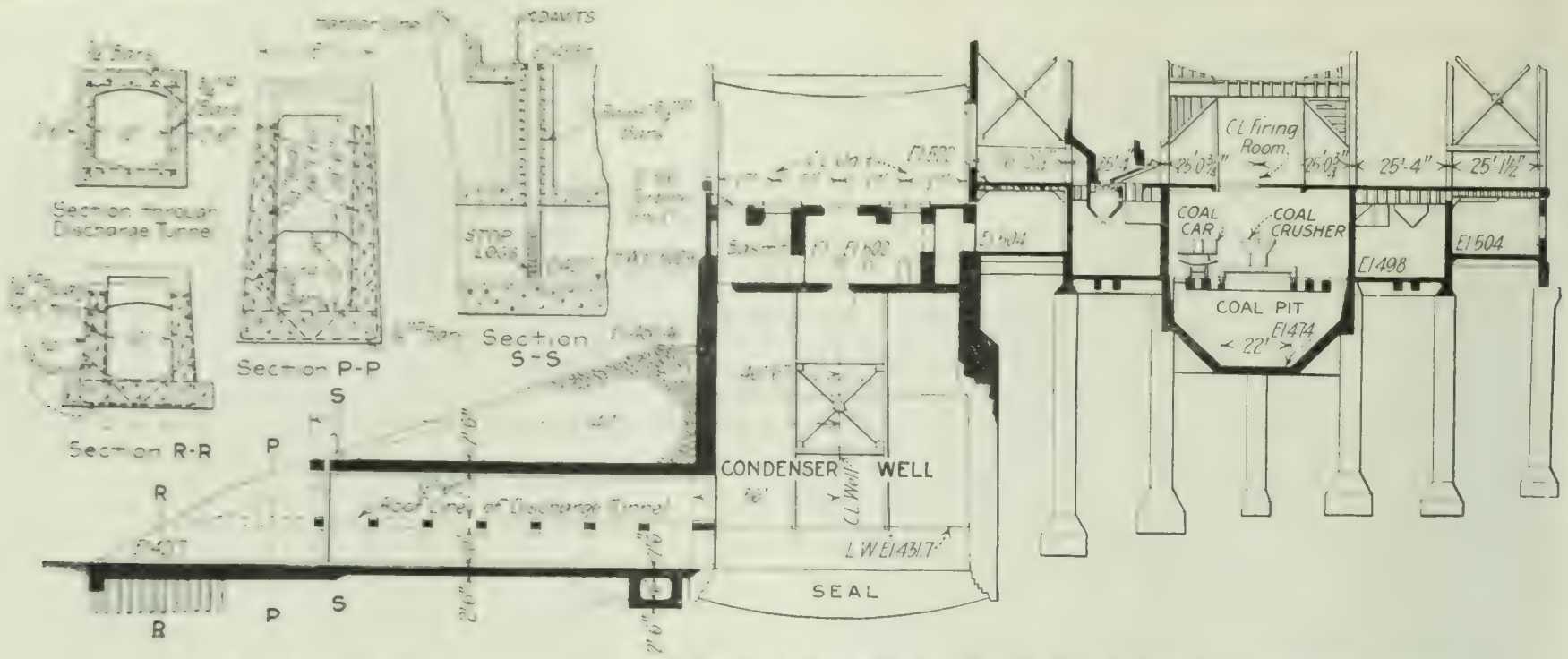
The coal pockets and incline used to receive gravel from the river and store it were formerly used by the owner of the power station in operating one of its gas plants. Gravel and sand are unloaded by derrick boats to a hopper on a float at the foot of the incline, which discharges into one of two cars traveling on the incline and handled by a hoist. These cars are turned at the top of the incline and run east under the roof of the steel frame shed which covers the coal-storage space. The gravel is dumped here to a stockpile on the ground. The total space available will accommodate 12,000 yd.

A slip scraper operated by wire rope and a hoist takes material from these stockpiles and dumps it into a pit which supplies the skip of a small tower erected behind the mixer. The sand and gravel are elevated by this skip to charging bins erected under the level of the roof, from which material can be drawn by gravity into the measuring hopper feeding the mixers. These bins hold 250 yd. of gravel and 150 yd. of sand. Cement, which is received by rail and stored in a 6000-bbl. shed, is hauled to the mixing platform up a slight incline on a platform car holding 40 bags.

Two concrete mixers were set up to insure continuous operation, one discharging into the skip of the main hoisting tower from the east side and the other from the north side. Both are of 1-yd. capacity. While the larger cylinders were being sunk, this plant frequently poured 450 yd. in one condenser well on the day shift and 450 yd. in the other on the night shift. The Lakewood mixer on the east side of the tower directly beneath the 400-yd. sand and gravel bins was the one used for these runs, the other being held in reserve and called upon only occasionally.

Although the caissons were not sunk to great depth, 24 lb. being the maximum air pressure required, they were not easy to handle, because of the sand soil through which they were sunk and the fact that earth had to be belled out below the cutting edge in gravel. Frequently, as soon as the air pressure would be slacked for a drop, the caisson would take a plunge and fill the working chamber with sand. As the caissons were skillfully handled, however, no serious delays occurred in sinking any of them. Little weight was required because of both the material and the depth. The weight used was limestone blocks from an old building which had been demolished on the site. A maximum compressor capacity of 3800 cu.ft. was installed, which took care of three of the caissons at once. The compressor plant was located at the bank of the river at the west end of the building.

Both of the small discharge wells were sunk as caissons, as were all the circular wells, except those in the north and fourth from the north rows, which were sunk by the Chicago well method. All the rectangular piers



FOOTINGS BELLED OUT ON GRAVEL—DEEP COFFERDAM WORK WHERE DISCHARGE TUNNEL PASSES UNDER INTAKE

were sunk by mine-shaft timbering methods. The caissons and shafts struck old concrete piles, which had to be cut off, and blocks of stone and slag. One caisson descended on parts of an old blast furnace, made of ⅜-in. plate which had to be burned through.

Eight stiffleg derricks were used in sinking. Most of the derricks were equipped with skeleton hoists. A total of 725 boiler-hp. was concentrated on the job, including a dinkey and a locomotive crane. About half this horsepower was represented by a pump boat which had been constructed for use on government dam work on the river. After the box cofferdam was flooded, this pump boat was tied up at the west end of the job, and the boilers continued to supply steam for the compressor plant and derricks.

The large condenser wells and intake well were each dredged down with two derricks, using grab buckets. Contrary to expectations, the very size of these shafts was an advantage in keeping them level, and each of them was landed in a practically vertical position. On account of the slag fill and sand through which they were sunk, these huge caissons were expected to prove very difficult to handle. It was thought that they might jump and go some distance below where it was desired to stop them, or that they might rotate in sinking and throw the openings left to connect the intake and discharge tunnels out of line. None of these things, however, happened. The 1-ft. provision made for twisting and the 2-ft. provision for variation in grade were not required.

The maximum difference in either respect between the designed position and the position in which the cylinder was actually left occurred with the west condenser well. This cylinder, which struck the worst accumulation of slag, showed a tendency to plunge on the way down, dropping on several occasions distances of from 5 to 8 ft. in a few seconds. When, therefore, this well took a drop of 6 ft. and landed 4 in. above its final position, no effort was made to induce it to move farther.

On account of this tendency to drop suddenly, the concrete on these large wells was left 10 or 12 ft. low and completed after they were sealed. A comparatively small amount of additional weight could be added at any time if the wells failed to move as desired by putting on limestone blocks. Even though these wells were not built up before being landed, the two larger ones weighed approximately 7700 tons when landed, and the intake well reached the weight of 6000 tons before being sealed. This latter well was landed within 2 in. of grade all around and exactly in the position contemplated for connecting it to the intake tunnel.

In dredging down it and the east condenser well, the bottom was frequently excavated to an inverted cone 12 or 15 ft. below the cutting edge at the center. No jetting was required, as the sand came in nicely from all sides to the dredges. Considerable material ran in from outside these wells, the ground caving back in some places for 25 ft. In view of experience with similar work, however, the difficulty caused on this account was negligible.

The concrete seals placed in the large wells were each in the shape of an inverted dome. Each required 2600 yd., about two-thirds of which was placed under water before pumping out. The concrete walls and turbine foundations within the west well were then completed, the east well being left blank, as only half of the machinery installation is to be made at the present time.

One of the condenser wells was landed Jan. 9 and the other Jan. 19, the intake well having been com-



STEEL ERECTION NEARING COMPLETION ON JULY 7

pleted last November. While sinking was in progress, steel sheet-pile cofferdams had been driven and excavated in the floor of the box cofferdam for constructing the intake and discharge tunnels. Where one of the discharge tunnels crosses beneath the intake tunnel, 60-ft. sheeting was required, and right next to the intake well, which was in place at the time, the excavation went down into running sand 50 ft. below river level. This was the deepest excavation on the job, and required extreme care. The steel sheeting here was difficult to pull, and much of it was abandoned.

The larger part of these tunnels was concreted before the large wells were sunk, the sections joining the tunnels with the holes left in the sides of the shafts being placed last. Two derrick boats were employed on the work, constructing the box cofferdam and unloading sand and gravel. The excavation within this cofferdam, however, was handled by derricks.



GUY DERRICK INCORPORATED IN CHUTE LINE

A spur of the Baltimore & Ohio R. R. runs through the property, and all plant and materials were received over this road. The railroad also accepted from the contractor the spoil from the cylinder and caisson excavation which could not be used at the site. Gondola cars were furnished, into which the dredges and caisson derricks dumped, the cars being set out by the contractor's dinkey for the railroad.

When the caissons had all been sunk the derricks were in position, with the assistance of the locomotive crane, to dig the coal pockets out again and dump the sand where needed to level up the site. If the amount which it was possible to store in this way should fall short, the contractor can complete the backfill with spoil from an extensive conduit system which is being constructed in connection with the power house, under a later contract.

The designers of the new station are Sargent & Lundy, consulting engineers, for whom H. M. Walmsley is resident engineer. The Union Gas & Electric Co., which owns the plant, is represented by its consulting engineer, C. R. McKay. The Foundation Co. contracted for the power station complete except for the installation of machinery, and is carrying out the work with its own forces. W. B. Taylor and George V. Salle have been successively superintendent of the work, while William U. Smick is general foreman. The contract has been handled by the Foundation Co.'s Chicago office, of which Frederick W. Adgate is manager.

Concrete Floor Tested to Destruction

Removal of a reinforced-concrete eight-story warehouse building to clear the site for the new Union Station at Chicago, has been made an opportunity for testing one of the floors to destruction. The building is about 107 x 120 ft., with flat-slab floors. Four adjacent panels on the sixth floor were selected for test by loading with pig iron.

The panels are 19 ft. 4½ in. by 17 ft. 5½ in. c. to c. of columns. Each panel has four-way reinforcement (rectangular and diagonal), with 15 high-carbon steel bars ⅝-in. in diameter in each reinforcing band. These bands are 7 ft. wide. The slab is 8½ in. thick, made of gravel concrete, 1:2:4. The columns are octagonal. Those of the fifth floor are 24 in. in short diameter, with 21-in. core; those of the sixth floor are 21 in. in diameter, with 18-in. core. Their caps are 4 ft. 6 in. in diameter at the top. Each column has eight 1¼-in. round rods, wrapped with ¾-in. wire in a spiral of 2½-in. pitch. The floor was designed for a live-load of 250 lb. per square foot.

The test loading consisted of pig iron, stacked in four piles on each of the four panels. It was applied in increments of about 200 lb. per sq.ft. until a total of 910 lb. per sq.ft. was reached. The first load was applied Aug. 16 and the last Aug. 28. Readings of deflections of concrete and steel were taken for each increment of loading.

The maximum deflection was 1.1 in. The approximate stresses at the maximum load were as follows: At column (Col. 22), 31,000 lb. in direct rods and 52,000 lb. in diagonal rods. At center of panel, 23,800 lb. in direct rods and 18,400 lb. in diagonal rods. Deformation in the concrete around Col. 22 indicated by flaking of concrete that at certain gage lines the ultimate strength of the concrete had been reached. These figures are the result of preliminary computations and may be changed when the computations are completed.

The structure is the Western Newspaper Union Building at Adams and Clinton Sts. It was built in 1909-10. S. N. Crowen was the architect, and Ritter & Mott were the engineers. The George Hinchliff Co. had the contract. The test was made under the direction of Prof. A. N. Talbot, of the University of Illinois, with H. F. Gonnerman in direct charge. Permission for the test was given by the Chicago Union Station Co. and the W. J. Newman Wrecking Company.

Ohio River Gravel Makes Good Roads in Kentucky

Mixed with 15% of Clay, It Gives a Surface That Quickly Becomes Compacted—Material Is Pumped from River

AFTER considerable experimenting, it has been found in Kentucky that very fine gravel roads can be built of river gravel, or washed gravel, as it is sometimes known. Three counties in western Kentucky are now devoting practically all their funds to roads of this type, although for a period it looked as if such roads never would be satisfactory.

The river gravel used in Daviess, Henderson and Union Counties is obtained from gravel bars in the Ohio River. It is composed of rounded water-worn pebbles ranging in size from fine sand to stone fragments 2, 3 or 4 in. in diameter, although the largest size does not predominate. The pebbles are hard, flinty



RIVER GRAVEL OF ROUNDED PEBBLES MAKES GOOD ROAD

stones mixed with some granite and a little sandstone. The sand is sharp quartz and, of course, is entirely free from clay.

This material is pumped by suction dredges and is delivered to the screens in a steady stream of water.

The first road built with this river gravel contained very little sand, and from 20 to 25% of clay was added. This road required a very long time to "set-up" or bond, and it was not until the action of traffic combined with several heavy rains, after eight months, that it finally did become hard; but since then it is asserted to have been in almost perfect condition. An effort was made to roll the gravel after the clay had been added, but the roller sank down into the gravel and had to be pulled out with teams. There was very little attempt made on the early roads toward harrowing the material in place.

Profiting by this early experience, W. S. Canning, division engineer, Kentucky State Highway Department, hit upon an idea of mixing the material exactly as the aggregates for concrete are mixed—with a 1:2:4 mixture, substituting clay for cement.

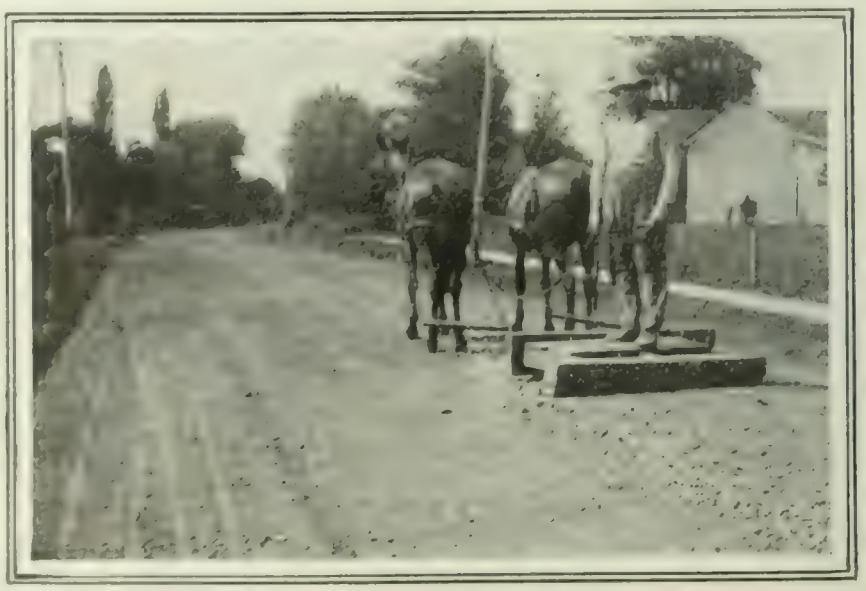


RIVER GRAVEL ROAD WHICH REQUIRED EIGHT MONTHS TO "SET UP"

Carrying out this idea gave about 15% clay, which Mr. Canning found by correspondence with county and state highway officials all over the United States was about the best proportion, although he, personally, is of the opinion that about 10% of the clay is amply sufficient. Likewise the percentage of sand under ¼ in. was made 25 or 30% and the remaining 50 or 60% is gravel in size not exceeding 2 inches.

The gravel and sand, which come from the screening plant in barges already mixed, are placed in one course from 6 to 10 in. thick, according to the importance of the road. The required amount of clay is then spread over the surface, and the road goes through a process of harrowing and dragging which, combined with the action of traffic, sets up and binds the gravel in only about two weeks, although it undoubtedly takes considerably more time thoroughly to compact the surface.

It has been found impracticable to use a steam roller to any extent, for it is next to impossible to roll the rounded gravel with it. Mr. Canning believes that in the process of harrowing and dragging with a split-log drag the gravel could be placed in three courses of 3 or 4 in. each and the clay thoroughly incorporated, so that by sprinkling, as in water-bound macadam construction, followed by rolling, the gravel surface could be permanently bound and the road completely compacted during the period of construction.



DRAGGING FIRST COURSE OF GRAVEL ROAD

Mental Values Derived from Study of English Are the Essentials

Emphasis Placed on Subject Matter by Professors Aydelotte and Park Likely To Hide the Fact That the Fundamental Need Is the Ability To Write with Accuracy and Compression

By EMERSON GRANT SUTCLIFFE
Instructor in English, University of Illinois, Ill.

PROFESSOR PARK of the University of Cincinnati and Professor Aydelotte of the Massachusetts Institute of Technology have discussed in the *Engineering Record* their quite different methods of solving the problem of how the engineering student should learn to write. Professor Park believes in correlation in this as in engineering education generally, and therefore in narrowing the student's range of topics to those directly technical in nature. Professor Aydelotte, on the other hand, leads the student as rapidly as may be away from engineering, and stimulates him to write on matters of opinion political, social, ethical, esthetic. Their methods agree, apparently, only in the assumption that the problem of the engineering course in writing is one of subject-matter: Shall the student write on topics closely connected with his profession or on those of broader cultural value? But is this the fundamental question? There is, I believe, an entirely different avenue of approach, broad and straight, which leads much closer to a satisfactory solution. It is the street of mental values.

Let me preface my explanation with a statement of underlying principles, axioms perhaps.

Engineering English Is Primarily Practical

(1) The course in writing for engineering students is primarily practical, as practical as mechanical drawing; it is cultural only secondarily. Though freshmen and even upperclassmen, ignorant of engineering, believe this reluctantly, and though so-called inspirational or esthetic methods of teaching the subject do not help to change their unbelief, they must some day discover what every engineer knows: The engineer must write, and therefore he must know how to write. Writing is not a thing remote from practice, a monstrosity and instrument of torture inseparable from themes; it is a part of his business.

(2) The two chief qualities of expression needed by the engineer are accuracy and compression. So far as these are concerned, it makes no great difference what the subject-matter is so long as the student is held rigidly to saying exactly what he means in as few words as are consistent with clearness.

(3) Professor Park's method of correlation has the exceeding merit that the student governed by it must regard writing not as a separate entity, divorced from life, but as a part of all his work. It has the additional value that it must awaken all but the unfit to the fact that writing is a practical engineering subject. The weakness of the system is that it hems in the student and in that way narrows his opportunities for mental training.

(4) Professor Aydelotte's system of developing the student's general culture is strong where Professor Park's is weak and vice versa.

(5) By way of balance: In general, the good teacher can succeed with any congenial method.

Both Technical and Cultural Subjects Should Be Included

It may perhaps seem that compromise ought not to stop here, that a mixture of technical and cultural subjects is desirable. Such mixture certainly results in cooperation on the student's part and hence has a persuasive value; it wins for writing the interest of all types of students: The narrow-minded who never want to get away from engineering either because they have no other interest in life except carburetors or because they fear that attention devoted elsewhere may mean a dollar less some day; the broader-minded, who regard engineering as a profession and not a trade and the course in composition as a chance to get cultural advantages; and the largest group, those who, if only for human reasons, like variety.

There is much to be said, too, for combining Professor Park's and Professor Aydelotte's methods in another way. At many engineering colleges it is the practise to devote one hour a week to a general engineering lecture, the principal intention being to familiarize the freshman in a broad way with his future profession. There may well be a correlation of this course of lectures with the course in writing, and to this extent Professor Park may be followed without any possibility of cabining, cribbing, or confining the student. On the other hand, such correlation is not entirely inconsistent with Professor Aydelotte's plan. If the instructor wants to dabble in the philosophical or the sociological, he does not have to stray far from the professional field proper, for there are such questions as engineering ethics and the relation of engineering to society. I use the word *dabble* to express what must be a fact; it is impossible for the ordinary teacher of writing to know much about either politics or ethics, or, for that matter, about engineering ethics—and to mention finding room for the expression of such knowledge. At the same time I recognize the suggestive and stimulative value of amateur or even dilettante discussion of such matters. And the topics may profitably be more specific. I have not disdained to ask for themes based on such topics as "At what age should the engineer marry?" "What salary has the engineer a right to expect immediately after graduation?"

But after all, this is not at bottom a question of subject-matter; it is a question of mental values.

The course in writing, like other engineering courses which are distinctly practical in nature, should have two main purposes: It should teach what it sets out to teach—how to write; and it should, so far as is consistent with the nature of the subject, develop those mental qualities which the engineer will find most useful. The significant fact is that accomplishment of the second aim means accomplishment of the first. I shall try to demonstrate that the course cannot develop proper mental values without at the same time teaching the student how to write, and furthermore how to write in the way which is most serviceable to the engineer.

What mental qualities does the engineer particularly need which training in writing can best cause to grow in him?

Perhaps the two most valuable are the twinscrew powers of analysis and organization.

Report Writing Is Most Important

The most important kind of engineering writing is the writing of reports. Reports require: First examination and investigation—analysis; secondly, proper ordering and relationship of the results of the investigation—synthesis or organization.

Double ability of this kind is indispensable also in connection with clerical systematization; of which the engineer, like every other business man, must avail himself.

Nor is the need of analysis and organization confined to matters that involve writing. The engineer is an organizer. He cannot organize unless he has everything in its place—in its proper relation to other constituent elements, and in relation to the whole. Laymen are satisfied with Mr. Hoover as food administrator and General Goethals as head of the ship-building program, though perhaps Mr. Hoover could not himself raise a corn crop or General Goethals give detailed directions for building a catboat. We laymen think of them as organizers, men who get things done and done well because they can size up a whole situation and its parts and know how to assemble men and material in the best way to meet the demands of the situation.

Can the college course in writing do its part, however humble, in helping to develop the mental powers of such men? Readily. Outlining and abstracting, whether of themes the student is to write himself or of essays and articles he reads, cannot but bring out and foster the power to divide and unite logically, to practise the sense of proportion. Similarly useful are the making and the assembling of notes taken on reading in the preparation of longer themes, and in addition these are directly worthwhile drill for the engineer whose studies do not stop after graduation and who in various other instances, more immediately practical, needs to take notes and put them together. Argument, especially formal argument with its disciplinary brief, furnishes excellent training of a like kind.

Several Types of Themes Are Available

Themes of the following types give exercise to the analytical and synthetic faculties:

(a) Classification: Whether of gasoline engines, farm workmen, co-eds, high school teachers, or religions.

(b) The root-principle or purpose of a mechanism, process, or organization in relation to its parts: Wireless telegraphy, getting out a high school annual, the Red Cross Society, the comm'ssion form of government, the Gary school plan, the Epworth League, democracy.

(c) Criticism, preferably not literary or artistic; that is, evaluation, judgment by standards: Anything from "The —— as a Doctor's Car" to the success or failure of a certain advertisement.

(d) The statement of a problem—the social evil, say, or the submarine.

(e) Arguments in which one process or material for a certain purpose is compared to another or others: Heating systems, roofing, unlimited debate or closure.

The Thought-Process Is the Important Point

It should be noted here that in any case it is not the nature of the topic which is important, but rather the processes of thought.

For the sake of deepening in the student's mind the grooves of analysis and organization, it might seem at first sight that report-writing could be advantageously taught. And so it can, but hardly in the usual freshman course. For there, in addition to such assignments as I have mentioned, there is a vast heap of detail to be attended to—essential detail: Spelling, punctuation, grammar, sentence-structure, paragraphing. I believe firmly that a course in report-writing, probably including and led up to by further themes, analytical in nature, of the type mentioned above, should be required of every engineering student—but it should be required in addition to the freshman course. Anyway, "that's another story."

Partly because analysis and organization are of such importance and partly because they are typical of engineering mental qualities which the course in writing should stimulate, I have chosen to discuss in detail their relation to engineering and to writing. The course has, or may readily be made to have, other mental values. In being thus far so definite, I have not meant to neglect the general quality of logical accuracy. No one needs more than the engineer the power to think straight—unless it is the writer. All writing goes back to the brain; and it is, therefore, first of all essential that the student should be strictly held to account whenever his sentences evince failures to think clearly, definitely, precisely, and completely. Assertions without proof should be rigorously challenged. Some of the other common fallacies should be discussed, and if possible there should be still further discussion of the more serviceable and everyday principles of logic. The brief should bring home to the student, if nothing else can, how painful and also how necessary it is to think accurately. General statements should be supported by specific examples, whether in an exposition of how to make hay, or an artistic description of a hayfield. The general word, too, should never be accepted when the specific is more precise, as it is, almost always. Definiteness should be the cry, for what profession requires more definiteness than engineering? And nowhere can mental precision, clearness and sharpness be checked up so stringently and so convincingly as in writing.

Some of this may be new to engineering readers, but I already hear my fellow-instructors clamoring: "Of course, of course. This is the height of triteness. We all do these things." I must now disclose a subtle pur-

pose which I had in mind in the very beginning. I intended to make clear in the course of these remarks not only that the college course in writing should be approached from the point of view of mental values, but also that these mental values result from it to some extent in nearly every case, no matter what system is used. I have been trying to demonstrate that the course is practical indirectly, as well as directly.

I recognize also that most of the mental qualities here named are valuable to the man in every profession and business, but I fail to see why, for that reason, they are less necessary to the engineer and to the engineering student's course in composition.

Other desirable mental characteristics which the course in writing may profitably encourage in the engineer are tact, the habit of observation, and imagination. The engineer must win the coöperation of his subordinates; he must obtain the goodwill and support of his superiors; and he must soften the obduracy of city councils and of legislative committees, national and state. Tact is essential. The course in composition misses a shining opportunity if it does not impress these facts upon the student. He may be asked, for instance, to write a conciliatory but firm speech which the leader of a labor organization delivers to an employer, demanding an increase in wages and threatening a strike as alternative; or the employer's speech to the workmen, in which a soft answer turns away wrath. Ability to put oneself in the other man's place may also be indirectly induced by imaginative description and narrative of a less definitely practical type. Description is, however, chiefly valuable because it makes evident the practical importance of seeing straight, of the power of observation; and because, like narrative, it furnishes incentive to the imagination. Need I dwell upon the necessity of the engineer's keeping his eyes open, or upon the fact that none of the great engineering enterprises would have been either thought of or carried out without the starting and executive power of imagination? This is usually constructive imagination, of course, of which analysis and organization are indispensable parts.

Under any circumstances, it is, as I have tried to suggest, the demands that the writing makes upon the student's brain and not the topic that is important. One can instil valuable habits of thought in the engineer's college course in writing no matter whether he believes, with Professor Park, that the collegiate day's work furnishes the best kind of material, or whether he agrees with Professor Aydelotte that incursions into wider fields of thought bring most profit, or whether he takes an intermediate position. Is not, then, the subject-matter of subordinate moment? Should not the character of the course in writing be governed by the mental qualities of especial value to the engineer which the course most naturally and capably trains?

Eleven States Have Civil Service

Civil-service commissions are maintained in 11 states at a total expenditure of $358,486 a year, according to information gathered by the U. S. Census Bureau. The 11 states are: Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Ohio, Illinois, Wisconsin, Kansas, Colorado and California.

Put Twenty Thousand Men Under Roof in Two Months

Motor-Truck Transportation Prominent in Work of Housing Regular-Army Increment at Chickamauga

WORK was started May 20, eight days after the signing of the contract, on wooden barracks for 30,000 of the volunteer troops just added to the regular army. In completed sections of these barracks 20,000 troops had already taken up their training quarters before the end of July. The encampment, located on the Georgia-Tennessee line in the historic Chickamauga Park, consists of several groups of buildings housing from one to three regiments each, scattered within a radius of four miles from Lytle, where the quartermaster storehouses for the encampment are located, and from which most of the construction materials were distributed by motor trucks. This method of transportation was made possible by the good macadam roads existing in the park.

Frederick Snare, of the contracting firm of Snare & Triest, reached Chattanooga on May 18, and began placing orders for material. On May 20 local yards delivered to the site a million feet of lumber by motor truck, and actual construction was begun. The work was taken up a section at a time, each brigade or regimental camp being pushed to completion as soon after it was started as possible. The first regimental quarters to be finished were occupied June 18, and thereafter troops moved in at frequent intervals until by July 24 thirteen units, with a personnel of 20,000, were in camp.

About 18,000,000 ft. of lumber will be used in the entire work, which includes substantial additions to the hospital of the regular army post at the park, and the quartermaster warehouses which are under construction at Lytle. Most of this lumber was ordered direct from mills in Alabama, Tennessee and Georgia, and is re-





ENCAMPMENTS CONSIST OF ONE-STORY BARRACKS BUILDINGS—SHOWN HERE IN PART—ACCOMMODATING TWO REGIMENTS

ceived by rail at Lytle, where temporary sidings aggregating about a mile in length were put in. These tracks parallel one of the main highways in the park, from which all of the encampment sites can be reached by good roads. The average haul is about 2½ miles. Platform trucks of 3½ and 5 tons' capacity have handled practically all of the hauling, about 30 being used.

All the 13 sawmills used in framing the lumber for the barracks buildings are located at the work, one being used in each camp site, and the remaining mills being shifted about as needed.

Chattanooga city water is used, a 500,000-gal. concrete-lined reservoir and ten miles of new water mains being necessary for the distributing system. These and the ten miles of sewers required are being laid in trenches dug by hand. All the sewage is carried to a disposal plant, where it is treated in septic tanks and pumped over sand filtration beds.

A force of 2000 men, recruited for the most part in Chattanooga, has been steadily employed. Most of the men get out to the work, which is ten or twelve miles from the city, by trolley or railroad, though several hundred live in the contractor camp near Lytle. The work is organized with a superintendent for the buildings at each encampment, for the reservoir, sewage disposal plant, pipe lines, and for transportation. The general superintendent for the contracting firm, Snare & Triest, is F. S. Maxwell. The surveying and other engineering work is being carried out by the contractor's forces with F. J. Letter, chief engineer, in charge as engineer. In addition, the work receives the personal attention of Frederick Snare, president of the firm. The camp is being constructed under the direction of the Cantonment Division of the Quartermaster General's Office, and is in direct charge of Maj. E. S. Walton as Constructing Quartermaster.

Texas Roads Damaged by Army Operations

County roads in El Paso County, Texas, following last season's military operations to the East and "Big Bend" country, required repairs exceeding $130,000 on a 60-mile stretch of earth and gravel surface. Truck trains of 26 motors each operated over this road, carrying supplies to the army, but there was also an enormous amount of drilling of the green company drivers for the 3000 machines located at Fort Bliss. Practically all of the small wooden bridges were stripped of timbers which the drivers used in extricating trucks from sand or mud. In repairing these culverts 80,000 ft. b.m. of timber was used, but this included many replacements of stringers that were found in a decaying condition. A large proportion of the money was spent for regrading, scarifying, rolling and hauling in new gravel.

There is no possible way for the Government to reimburse the county. However, a fund exists which allows the army officers to have work done to repair damages, and the payrolls for the road crews to a certain extent were handled in this way. Destruction of the roads is considered a good thing in a way in El Paso, because it forced reconstruction of a large mileage, which would otherwise have been in an indifferent state by now, on this the only outlet from El Paso to Fort Worth and San Antonio. The work was done under the direction of L. White, road engineer for El Paso County.

Why Require Fineness in Hydrated Lime

The current tentative standard specifications for hydrated lime of the American Society for Testing Materials require a fineness of 85% through a 200-mesh screen and 99.5% through a 30-mesh screen. Inasmuch as hydrated lime is an extremely fine material, there has been some wonder why such comparatively low prescriptions have been made. Norman G. Hough of the Hydrated Lime Bureau writes in explanation that the 30-mesh sieve provision was added merely to rule out limes with impurities, such as quarry sand, kiln brick dust, etc., all of which are deleterious in amounts greater than an arbitrarily placed minimum of ½%. The 200-mesh provision was merely to insure a finer lime than a standard cement, which must pass 78% through a 200-mesh. This insures a finer material in mortars, stuccoes, etc., where hydrated lime is mixed with cement.

Louisiana Reclamation Project Grows To Seven Thousand Acres

Little Woods Lands Take Rectangular Development—Town Plots Given with Grove Tracts—Soil Brings Construction Difficulties

By A. M. SHAW
Consulting Engineer, New Orleans

THE RECLAIMED LANDS of the New Orleans Lake Shore Land Co. (a stock company formed by local business men) now comprise about 7000 acres lying close to New Orleans. Late in 1912 the company decided to adopt a broader plan of development than had been followed for the few hundred acres first drained. Cultivation required the canals and ditches to be laid out on a rectangular scheme. The existing steam pumping plant was inadequate for the larger area, and a new electric station was built near the middle of the district. The combination of alluvial deposits and muck had to be considered in digging the canals and building the pumping station.

The tract has a frontage of seven miles on the south shore of Lake Pontchartrain and has an average width of two miles. Various agencies have contributed to produce a varied set of soil conditions in this tract. The entire surface of these Little Woods lands, with the exception of a slightly higher strip of ground along the lake front and two small lagoons in the interior, was originally at about mean water level of Lake Pontchartrain. The typical wet prairie lands of the lower Mississippi delta have a top soil of 2 to 6 ft. of muck mixed with silt, over a subsoil of "sharkey" clay, which is an alluvial deposit similar in texture to true clay.

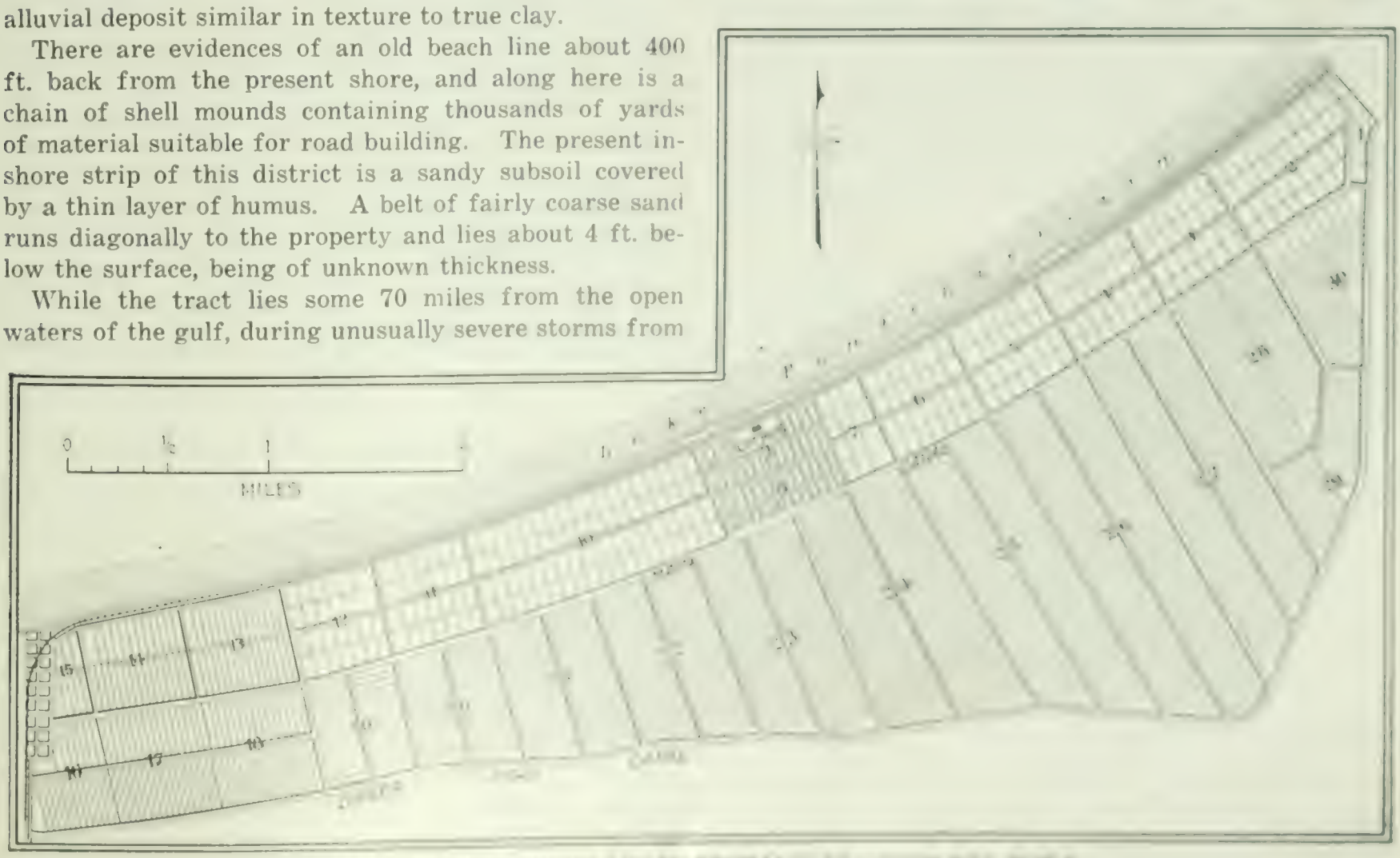
There are evidences of an old beach line about 400 ft. back from the present shore, and along here is a chain of shell mounds containing thousands of yards of material suitable for road building. The present inshore strip of this district is a sandy subsoil covered by a thin layer of humus. A belt of fairly coarse sand runs diagonally to the property and lies about 4 ft. below the surface, being of unknown thickness.

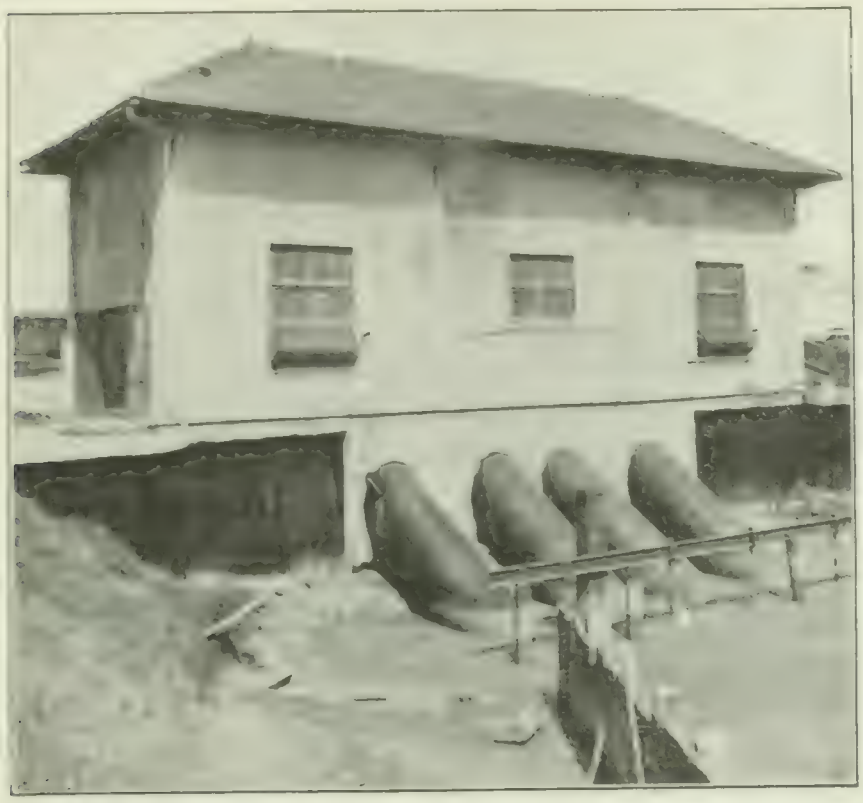
While the tract lies some 70 miles from the open waters of the gulf, during unusually severe storms from the east and southeast quarter, the lake water has been known to rise 5 ft. above ordinary level, necessitating levee protection. The most exposed front is protected by the double-track embankment of the New Orleans and North Eastern Railway—a barrier 8 ft. above normal lake level.

The eastern levee was constructed by the project owners to a top grade of 28.00 (Cairo Datum, mean lake level being 21.2). This levee has since been incorporated in the protection system of the City of New Orleans, and its reconstruction to El. 30 has been undertaken. A levee was built by the tract owners along the rear of the property, but this will not be required after completion of the work undertaken by the city.

Excessive shrinkage and subsidence were encountered in building across the deep muck deposits, but this was held down by constructing in multiple layers. Test pipes, attached to broad plank platforms, were placed in the levee line for determining the subsidence of the foundation, and valuable information is expected to be derived.

These protection levees were constructed of material from canals outside the protected and drained areas. A few projects in this locality have followed the oppo-





STEEL SHEET PILING SUPPORTS WALLS AND CUTS OFF SEEPAGE

site plan, utilizing the borrow pit canals as a part of the interior, low-level canal system, but the excessive danger and trouble from seepage and the difficulty of repairs to levees so constructed have made the outside canal plan seem preferable.

A main drainage canal has been constructed through the property at a distance of half a mile from the lake shore. This canal is 45 ft. wide through its central portion and gradually reduces to a width of 30 ft. at each end. Its average depth is about 8 ft. below general land level. Lateral canals are spaced ½ mile apart, leading from the rear of the property to the main canal. These are each 30 ft. wide and 7 ft. deep. A 60-ft. trunk canal connects the main canal with the central pumping station.

Field laterals have been constructed along each of the division lines between the five-acre groves into which the property has been subdivided, the average spacing being about 165 ft. These laterals were usually dug 3 ft. deep with a top width of 4 ft. and bottom of 2 ft.

A radial system of drainage canals would have been objectionable here from an agricultural standpoint on account of the difficulty of cultivation of the large number of small groves into which the tract was to be split. In these soils, systems of open-field ditching are necessary to secure proper drainage and ditches are spaced at such close intervals, usually about 10 rods, that all cultivation must be along lines parallel to them. Even as laid out here, in rectangles, these lands present serious difficulties in cultivation.

The hydraulic gradient assumed by the water in the canals is so slight, when the canals are well filled after storms, that any shortening by a radial system would not be of appreciable benefit.

It was also desired that the individual groves (each of five acres) should be as nearly unifrom in dimensions as possible. In this way the desirability of the groves depends only on the location as regards nearness to town, existing roads, and the lake front; the selections, therefore, have been normally made along certain fairly systematic lines so that the work of breaking up and planting has been as nearly contiguous and continuous as possible. This has resulted in an economy of development which, it is believed by the sales department of the owners, would not have been secured with the haphazard system of selection and improvement which would have resulted from the radial layout.

The sketch map shows that blocks have been reserved for villa sites and a commercial reserve in the town of Citrus at the lake-front center of the tract. The sales of all lots of five acres have been made with the idea that they would be planted in citrus fruits, and usually only one five-acre lot to a purchaser. No provision has been made in these five-acre tracts for a residence site, for the purchase of each lot carries with it the transfer of a 40 x 100-ft. villa site in the town reserve.

This scheme has been planned to bring about a concentration of the homes so that the planters would have the advantages of real community life. The promoters of the district have been to considerable expense in bringing city water out to this reserve, and good drainage, sewers and electric current are all available. The one defect that can be urged is one of omission. Much is still to be desired in the artistic arrangement of the building lots, parkways, etc., compared with the layouts which have been proposed for some other communities of similar nature.

In designing the discharge canal, the railroad company, which passes along the lake front of the tract, constructed a pile trestle for the outlet of the water under their tracks to the lake. It was agreed with the railroad company that the owners of the project would guarantee freedom from scour of this canal or of the ends of the railway embankment. A section was adopted which would result in a velocity of 1 ft. per second when both pumps were operating and when the lake was at normal level. Observations have now been taken frequently for two years and show no appreciable change in section either by scour or by accretion, though a considerable mud flat has formed in the lake in front of the plant.

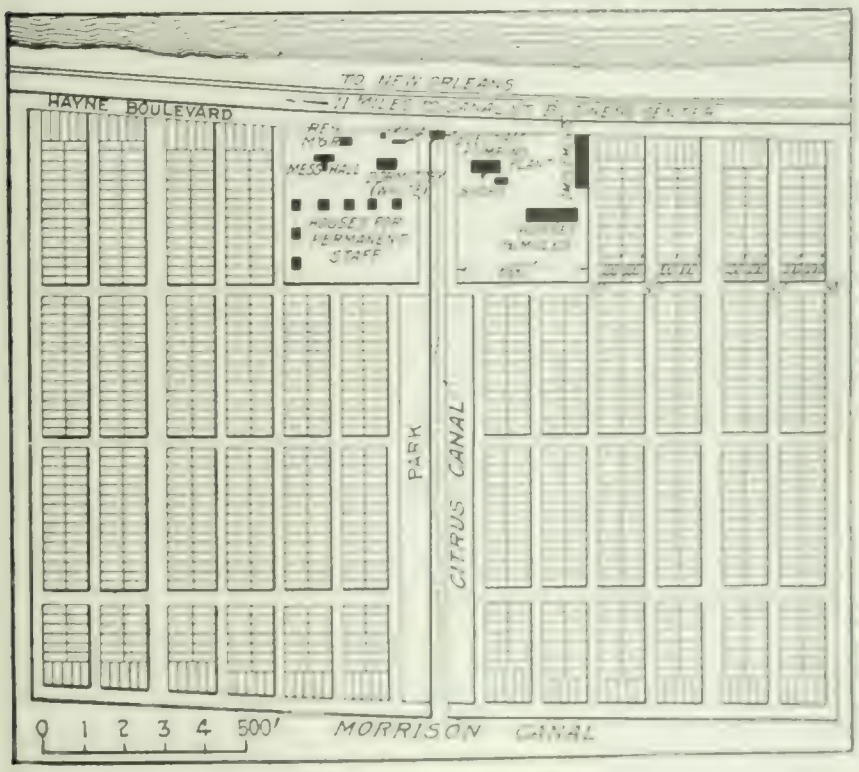
Trouble was experienced during the early part of the Little Woods development (as has been the case with all similar projects in this section) in maintaining the dredged canals to satisfactory depth. The loss in section was due to various causes, but principally to fine ooze brought in by the field ditches, to caving of canal banks and to upheaval of canal bottoms from excessive loads on waste banks. Caving banks have not been an important factor in loss of section, except where the sand stratum was encountered. At such points the movement of the ground water brought in a considerable amount of sand and the banks caved as a result of the displacement of the supporting stratum.

As the canal velocities never exceed and seldom approach 1 ft. per second in the larger arteries, no relief from these difficulties can be expected through scour. It is estimated that the interior canals of such a tract will require redredging after the end of the third or fourth year.

The pumping plant building is 22 x 60 ft. in plan and contains, in addition to two pumping units, a 5-ton, hand-operated, traveling crane and two motor-driven vacuum pumps for priming the main units.

In deciding upon the type of prime mover, consideration was given to steam, internal combustion engines, and electric motors. Judged solely by questions of first cost and economy of operation, the advantage appeared to favor internal combustion engines of a fairly high grade, but it was found that by adopting electric power other advantages could be gained, and this was finally selected. By making a long-term contract with a local company, it was found that a favorable rate could be secured and current would be more easily made available for lighting and miscellaneous power service of the town. Without a large power contract, it would not have been feasible to secure current, as five miles of new transmission line were required.

The two main pumping units are of identical design, each consisting of a Worthington centrifugal pump driven through herringbone reduction gears by a 215-hp. motor, operating on a three-phase 2200-volt alternating current. The discharge end of the pumps is novel, being 48 in. vertical diameter and 54 in. horizontal. It was adopted in an effort to harmonize the conditions imposed by the speed of the motor and the desire to keep the nozzle velocities within reasonable limits. The suction and discharge pipes are belled at their extremities, so that the approach and discharge velocity will not exceed 4 ft. per second. The plant has a guaranteed efficiency of 52½% overall between the switchboard and



LAYOUT AT LAKEFRONT CENTER OF TRACT

the canal when operating against a state head of six feet. The guarantees for efficiency were exceeded on test.

As the building foundation formed a dam between the suction and discharge basins, steps were necessary to prevent seepage through the porous substrata. Interlocking sheet steel piling was used. Piles were 30 ft. long, and were depended on to carry the weight of the building walls, the top of the piling being incased in the concrete footing. The rear line of piling was carried well beyond the limits of the building to prevent seepage around the end. The machinery foundations rest on round pine piles, cut off below permanent water level.

About 40 miles of shell roads have been constructed on the property so far, all of the shells being secured from the mounds along the old lake shore line. Roads along the lake front and on the tops of the canal waste banks are constructed by placing the shells directly on the earth after it has been properly graded, but in building across the flat prairie lands it is necessary to cover the sub-grade with a layer of cheap cypress planks before spreading the shells.

As already noted, the land company is a stock concern formed by local men. In 1912 Prof. W. B. Gregory, of Tulane University, was employed to examine the property and make recommendations for a general plan to reclaim the entire tract completely and at an early date. In the year following, the writer was employed as engineer and general superintendent, Professor Gregory being retained as consulting engineer. The bulk of the construction work was completed in 1913, and agricultural work was then started on a large scale. A contract was made with the firm of Symms & Means, of San Francisco, for the management of the property, the writer being retained as engineer, and A. R. Weber being the resident manager representing Symms & Means.

Bituminous-Joint Brick Pavement Still Preferred

Excellent Results with Asphalt Joints at Warren, Ohio, Explained by C. H. Lawrence, City Engineer

THE City of Warren, Ohio, has what are believed to be some of the most perfect brick pavements to be found in the state, and these have been constructed almost wholly with bituminous joints. In spite of the fact that for a number of years the tendency has been almost universal toward cement-grouted joints and latterly toward the monolithic type of construction, many paving engineers in the very heart of the brick-paving country still prefer bituminous joints. The reason for this preference was recently summarized as follows by C. H. Lawrence, city engineer of Warren, for a member of the editorial staff of *Engineering News-Record*:

"Like many other engineers and contractors I have talked with, I am adverse to using cement-grout filler for two reasons. One is that the checking and cracking of the pavement cannot be avoided or overcome by the use of expansion joints, particularly in very wide streets; and the other is that on residential streets grouted pavements are apt to be noisy and this, to my mind, is very objectionable in a first-class residential district. This, of course, leads us to the use of the filler, which will overcome the first objection and eliminate the second objection to a very large extent at least.

"We have confined ourselves in the past to the use of tar as a joint filler for repressed brick, and have insisted that the joints be poured full. But I have noticed that although we start pouring at the curb and work toward the center of the pavement in order to give the tar a chance to chill and hold back the hot material from the curb, when the pouring is done on

a very hot day the tar will get down into the gutters. Going over the joint a second time we find after the tar has chilled it has gone down to a level of ⅛ to ⅜ in. below the brick.

"We have observed as well that after the pavement has gone through a hot summer and a cold winter, the tar will be found from ¼ to ½ in. below the surface of the brick, and that the edges of the brick begin to peel off and go to pieces at the joints. This, to my mind, is a very serious objection to the use of tar filler, and to eliminate this we have decided to use asphalt this year to see if this defect cannot be overcome.

"We try to pour the asphalt in such a manner that the joints will be filled flush the first time, and then go over the joints a second time to fill up the places missed on the first pouring. This I believe, with the help of close inspection, and a reasonable amount of care in pouring, will result in our getting well filled joints and thus prevent chipping of the edges of the brick.

"Our reason for considering asphalt preferable to tar is based on an experience we had last year on a street having cement-grouted joints. On this street three joints parallel to the curb and three joints every 30 ft. lengthwise of the pavement were provided as expansion joints. I have paid particular attention to these joints, and the asphalt is where it was when first put in, and as yet no cracks or checks can be noticed, nor have the bricks gone to pieces at the expansion joints.

"In pouring joints we start about 18 in. from the gutter and pour toward the center of the pavement, thus providing for the excess bitumen to fill up the 18 in. and the gutter joints and give it a chance to cool and hold back to a certain extent the hot material on the street crown. After the first pouring we go over the joints a second time to fill all the low places. The pavement is then covered with about ¼ in. of granulated slag, which works down into the joints and gives stability to the filler."

The specifications for asphalt filler provide that: (a) It shall contain not less than 98% of pure bitumen soluble in carbon disulphide; (b) of the total amount soluble in carbon disulphide 98½% shall be soluble in carbon tetrachloride; (c) when tested by the Dow method for one minute with a No. 2 needle weighted with 200 grams at 32° F., it shall have a penetration greater than 25; (d) when tested for five seconds with a No. 2 needle weighted with 50 grams at 115° F., it shall have a penetration not greater than 110; (e) when tested for five seconds with a No. 2 needle weighted with 100 grams at 77° F., it shall have a penetration between the limits of 25 and 60; (f) one-half gram of the material when made into a ball shall not melt or drip from an aperture one millimeter in diameter at less than 200° Fahrenheit.

Rapid Stadia Surveys Cover 50,000 Acres

Five-Man Parties Take Topography of Flood-Control Basin—Costs Compared with Other Surveys

By L. R. Howson
Principal Assistant Engineer, Alvord & Burdick, Chicago

PLANNING the flood-control system for the protection of Columbus, Ohio, necessitated the survey of an area of 50,000 acres for three reservoir sites of respectively 23,000, 18,000 and 9000 acres. This work is for the Franklin County Conservancy District, of which Alvord & Burdick, of Chicago, are the engineers. It was necessary that the survey information should be available for office computations as soon as possible, and that the surveys should be completed before winter. The stadia method was selected as combining speed with accuracy for the class of survey to be made. The methods of procedure, with instructions to parties and a system of reports for comparing the progress of the three parties, were devised by the writer. The survey was in charge of John C. Prior, resident engineer for the district.

The areas surveyed differ greatly in shape, steepness of slopes, percentage of wooded area and regularity of width or freedom from side ravines. The Delaware basin is the largest and has the most favorable topography for rapid stadia work. The survey covered 23,000 acres on a site about 14 miles long and from ½ to 2½ miles wide. The maximum difference in elevation is about 90 ft. There are only three large side ravines or creek channels.

The Dublin-basin survey covered 18,000 acres, of which about 20% is wooded. The area is 25 miles long, with an average width of about one mile and a maximum of about 2½ miles. The country is somewhat rougher than that in the Delaware basin, and has a range of 150 ft. in elevation. More numerous side ravines, some of which are virtually gorges, cut into the stratified limestone to depths of from 50 to 75 ft., with a scarcely greater width.

The Flint basin, though containing only about 9000 acres, has very rough topography and is largely wooded. Steep side ravines enter the river channel at frequent intervals, one every 600 ft. on each side of the river not being unusual. The basin is about 11 x 1½ miles.

Each party consisted of four field men and one office man, with salaries as follows: Chief of party, $115 to $125 per month; instrumentman, $75 to $85; draftsman (office), $85; two rodmen, $2 per day. All expenses were paid for the first three men. The rodmen received all expenses when away from home, which averaged about half the time. The work of the instrumentman and the draftsman was considered of equal importance. Rodmen were picked up locally, being selected for willingness, agility and physique. A bright country boy under a good chief or instrumentman soon becomes a

first-class stadia rodman. For each party there was a Ford automobile with special body.

About nine hours per day were spent in the field. Primary traverse lines for several days' topography were run and closed before topography was started in that area. Primary traverse points were marked with oak stakes, and levels were taken on them. Secondary traverses were run as topography was taken. All these were closed in each night, so as to catch any errors. Two field books were used. The primary traverse line was carried in both books. The draftsman each day plotted the notes taken in the field on the preceding day. Bench marks were established at about ½-mile intervals. All available data were gathered as to adequacy of bridge and culvert openings.

Special rods were made to permit of rapid long-distance reading without eye-strain. The rods were of



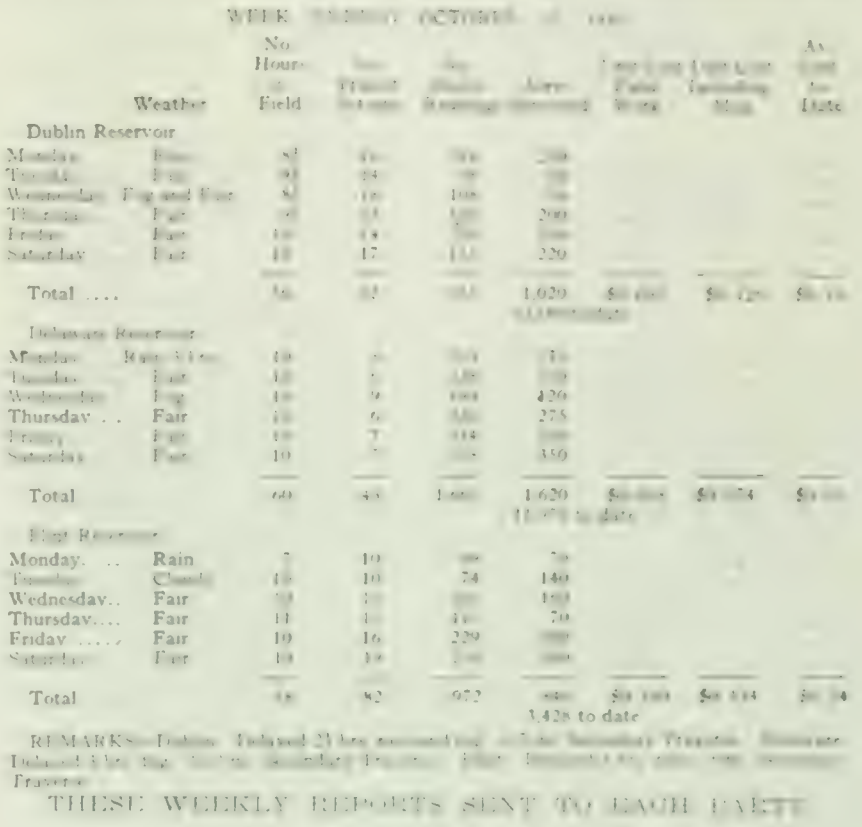
STADIA ROD FOR 3000-FT. SHOTS

1 x 4-in. clear poplar, 15 ft. long, painted in black and white, as shown. This rod can be read, using a half interval, for 3000 ft. as easily as the ordinary rod at only a fraction of that distance.

The instrumentman recorded his own notes. For the country surveyed a recorder's services were not warranted. For each set-up only about 15 shots could be taken.

The draftsman reduced all stadia notes with the aid of a K. & E. stadia computer. The notes were plotted with the use of an 8-in. full-circle paper protractor, which carried a scale. Both the elevation of the ground and the instrumentman's shot number were marked on the drawing for identification by the instrumentman in his daily checking of the map. The scale was 1 in. to 400 ft. for the Delaware and Flint maps, and 1 in. to 600 ft. for the Dublin map.

Each chief-of-party made a daily report on a post-card blank form. This gave the weather conditions, hours spent in the field, number of transit set-ups, number of readings taken and number of acres covered, with notes or remarks. These were compiled into weekly reports, as shown. Copies of these weekly reports were given to each party. While the figures therein were interpreted in the light of the conditions influencing them, they created an added impetus to make a good showing.



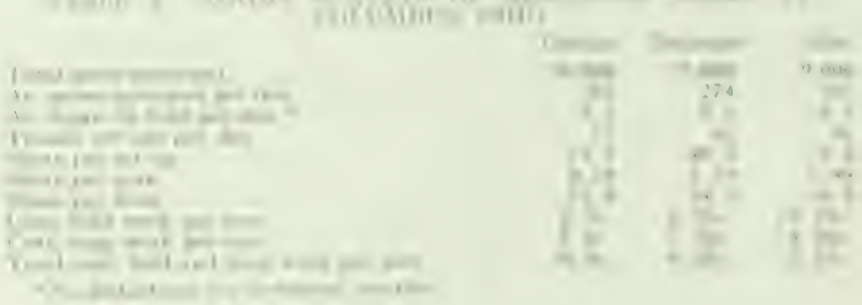
THESE WEEKLY REPORTS SENT TO EACH PARTY

The form of the report was so arranged as to indicate the differences in the character of the topography of the three areas, which has been noted above. It is evident that where few shots per acre are taken, the topography is comparatively uniform. Where few shots per set-up are possible, the country is either wooded or rough.

The greatest area covered in any one week was 2190 acres. The greatest number of shots in any week was 1902, or an average of 317 per day. The average number of shots per day for all parties was slightly over 200, counting all time occupied in running level and traverse lines.

Comparative Costs of Surveys

The small table shows the summarized performance and costs of the three survey parties on this work. The larger table has been prepared to show the costs of these and other stadia surveys where some details of execution, cost and character of land surveyed were available.





Would Close Milwaukee River to Navigation

Engineers' Society Recommends Port Occupation by Longitudinal Viaducts, and Retention of Barge Traffic

CLOSING the upper part of the Milwaukee River to navigation, and utilizing it as a thoroughfare by building a viaduct along each side (over the water) are the radical recommendations in a report made recently by the Engineers' Society of Milwaukee. The river would be closed above the present bridge at Michigan and Sycamore Sts. The report has been submitted to the city council, and if the conclusions are approved the city will then have to submit the proposition to the U. S. War Department. In June, 1916, the mayor of Milwaukee requested the society to investigate the cost of building bascule bridges, and of maintaining the present drawbridges over the Milwaukee River, in order to see whether these costs in comparison with those for fixed bridges would justify the movement for closing the river. The committee to which this matter was referred did not confine its investigations to the bridges, but included also the use of the river for navigation and the best method of improvement for the city.

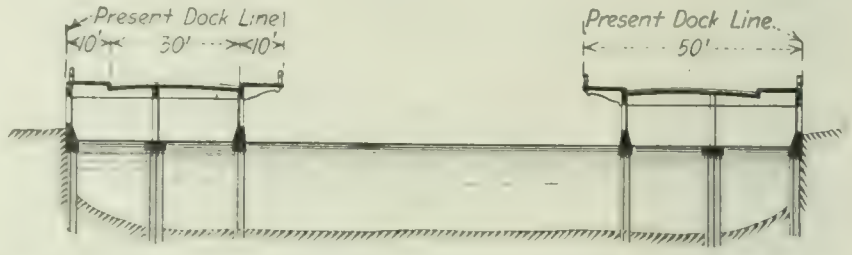
The present conditions may be summarized briefly. The river is narrow and winding so that it cannot be used by the largest lake vessels of the modern type, and there are few places where large boats can pass. Boats of more than 5000 tons capacity cannot navigate the river, while only about 7.6% of the coal tonnage of the city is received in boats up to this capacity. Only about 37% of the waterfront is utilized for dockage, and most of the docks are dilapidated.

Most of the nine drawbridges are old, narrow and too light for present loads. The street traffic is growing steadily and is hampered by the old narrow bridges, so that new structures will soon be required. The annual cost for maintenance, operation, interest and depreciation of bridges is about $85,000. Dredging for navigation purposes in the channel above the point where closure is proposed costs from $3550 to $7500 per year. The bridge and dredging expenses together represent an annual cost to the city of about 16.2c. per ton of original shipments, or 12.2c. per ton including reshipments and ashes.

This part of the river, states the report, is now a poor business utility. Commercial and civic conditions would not warrant the great expense necessary in order to adapt it to modern vessels by straightening, widening and deepening the channel and building new bridges of greater span. To do this would also result in splitting the busiest part of the city into two parts, connected only by drawbridges which would be opened frequently.

Furthermore, the city has excellent opportunities for harbor development near the mouth of the river (both within the river and on the lake front). These would be readily accessible by the largest lake boats, and would have good railway communication. These harbor projects are already under consideration, and with such facilities in use the traffic on the upper part of the Milwaukee River would doubtless be reduced.

With the channel closed to lake vessels, and crossed by fixed bridges, the principal benefit would be the elimination of traffic interruptions. The committee's plans, however, provide for greatly improved traffic facilities by the construction of roadways or viaducts on each side of the river and inside of the present dock lines. Between them would be an open channel about



VIADUCTS ALONG THE MILWAUKEE RIVER PROPOSED AS NEW TRAFFIC FACILITIES

75 ft. wide. Tentative plans calls for structures with a 30-ft. roadway and two 10-ft. sidewalks, supported on columns, so that there would be practically no restriction or interruption of the channel.

Such thoroughfares would relieve traffic congestion and provide new outlets for the business district. The abutting property would be benefited also by the additional street frontage. The cost of these viaducts, built of concrete, is estimated at $125 per foot. The river channel would be available for barges. Fire protection of the riverfront district could be provided by low-deck fireboats having gasoline or oil engines, or by a pumping station on the river to serve all the city's downtown high-pressure fire-protection lines.

With the river kept open for lake traffic, the cost of necessary new bridges would be about $1,484,220. The annual cost would be about $165,169 for operation, maintenance, interest and depreciation. The improvements proposed along the river when closed to traffic would cost $3,375,625. From this there would be deductions of $130,000 for salvage on the bascule bridges removed, and $2,555,000 for assessments, leaving a net cost of $690,625. The annual cost (including damages) would be about $145,448.

The conclusion arrived at by the committee is that the closing of the Milwaukee River above the Michigan-Sycamore St. bridge is feasible and desirable. It recommends that the city authorities should seek the coöperation of civic societies, the harbor commission and other bodies interested, in studying the proposition more deeply, and in determining the character of the improvements to be made. After such a conference the city would be in a position to submit the project to the consideration of the federal government.

Method of Closing Break in Dam Planned by Ralph D. Thomas

The article, "Break in Dam Closed Rapidly at Brainerd, Minn.," published in *Engineering News-Record*, Aug. 16, page 313, credited the C. L. Pillsbury Co., of Minneapolis, with participation in this work. As a matter of fact, this company was not connected with the work in any way. Ralph D. Thomas, civil and hydraulic engineer, of Minneapolis, was solely responsible for the method of closure, which was executed under the direction of N. F. Helmers.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Have Tests Been Made on Concrete Using Calcined Sand?

Sir—I would like to hear of any comparative tests on cement mortars using sand dried at about 100° C. and with sand calcined at a red heat.

While such treatment of sand would of course not be commercially profitable, yet this question has arisen: Does mixing cement with dried or calcined sand effect a better mix if mixed dry and then with water? How does the strength of such concrete compare with that made with air-dried or moist sand?

ARMIN C. AREND,
Chemist, Glass Brick Co.

Huntington, W. Va.

In Support of Wooden Ships

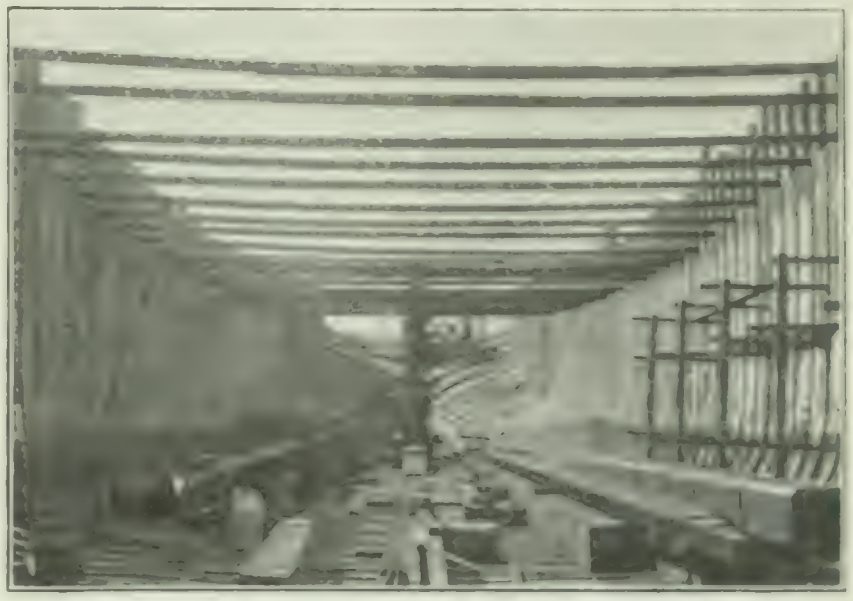
Sir—I have read with considerable interest your discussion on p. 51 of the July 12 issue of the *Engineering News-Record*, entitled "What Is Delaying the Fabricated-Steel Ships?" I think the reader is very apt to get the impression from this article that you are condemning, in general terms, the wooden ship. This I do not believe to be your intention, but more to condemn the type which was advocated by Mr. Denman, and which design was against the good judgment of General Goethals.

If your condemnation is wholesale in regard to the wooden ship, past records do not support your contention. Many wooden ships are now being built by commercial interests to carry over-seas cargo, and unless they felt confidence in wooden ships they would not be willing to spend large sums of money in the construction of this kind of carrier. This is true of many companies on the Pacific Coast at the present time. In fact, all the wooden ships are being constructed that it is possible to build, aside from those now under contract by the United States Government.

One of the points which I consider to be favorable to wooden ships is that unquestionably many of these ships under construction will be sunk, and if a wooden ship goes down, the loss is much less than in the case of a steel ship. It is also true that the cargo destroyed by the sinking of a wooden ship will be smaller in amount than through the sinking of the type of steel ship now building. This will mean a greater expenditure of torpedoes in order to account for any great amount of tonnage.

The experience on the Pacific Coast would hardly indicate that wooden ships well built, would be of little value after five years, as you state. We have many ships in service which have been active twelve to twenty years and they are still giving good service. There seems no logical reason why a wooden ship cannot be stiffened by vertical and horizontal steel trusses so as to be sufficiently rigid to withstand the hardest usage on the high seas. This combination type of ship, I predict, will form a standard type of cargo carrier which will compete commercially with the best design all-steel ship built.

As far as the durability of wooden ships is concerned, if they are properly constructed, there is no need for trouble due to dry rot, nor should they rack in continued service on the high seas. Therefore, a wooden ship, properly constructed, would prove a good investment, and should not be condemned as worthless after five years' service.



THIS TYPE OF WOODEN SHIP SAID TO HAVE PROVED SUCCESSFUL

I am inclosing a photograph of a wooden ship similar to those building on this coast. There have been many constructed of this general type, and as previously stated they have given an excellent account of themselves in service.

O. P. M. GOSS,
Consulting Engineer, West Coast Lumbermen's Association.

Seattle.

Engineers' Lack of Business Sense Blamed on the Schools

Sir—Referring to the editorial in your issue of Aug. 30 last, "Professional Questions Call for Study," I note the statement "Some engineers do starve, or nearly so, by adhering to the old principles. That is a loss to the nation, since their less conservative brethern are often, also, less able; only in business acumen do they excel."

It is the writer's observation that the most universal criticism of the engineering profession is that engineers lack business sense and judgment. There are, of course, many notable exceptions. I believe it is true that for the most part the leading men in the profession are men with sound business ideas. It is reasonable that the engineer who can best serve his clients, if they are planning or starting a business venture of any kind especially, is the one who understands all sides of the problem to be solved. In the majority of instances this requires business knowledge and judgment. Personally I believe that the failure of the profession as a whole in this respect has been one of the main reasons why engineers as a class do not rank higher in the affairs of the world and in social position. I also believe that "poor compensation," so often complained of by engineers, is due largely to this same lack of business ability.

The cause of this general lack of business ideas and knowledge, can, I believe, be traced to the system of education in our universities and colleges for men who are to follow the engineering profession, at least to a large extent. As has been frequently said before an engineering course as usually given has the tendency to narrow a man's vision, whereas breadth of vision and keen foresight are very necessary to the success of a man in business, and to the understanding of business.

Some improvement has been made in engineering courses in the matter of more general education, but the writer believes there is still much room for improvement, and he hopes to see the day come when the engineering profession will merit and achieve the position its importance in the affairs of the world ought to bring.

WALTER H. WHEELER.

Minneapolis, Minn.

Bituminous Foundations for Sheet-Asphalt Surfaces

Sir—Relative to Lester Kirschbraun's paper "Bituminous Foundations for Sheet-Asphalt Surfaces," (*Engineering News-Record*, June 21, 1917, p. 591):

You printed, on Aug. 23 a letter from Geo. B. McGrath, general manager, Southern Purchasing Co., Chattanooga, Tenn., and on Aug. 30, a letter from L. B. West of the West Construction Co., of the same city, both of which letters referred to Mr. Kirschbraun's paper, and my letter commenting on the same, which you published July 26.

The intent of my previous letter was to attempt to draw both engineers and contractors into discussing Mr. Kirschbraun's ideas, which, as I stated, I support in the main. It is apparent that I was mildly successful.

I am, indeed, glad to learn of the activity of certain paving contractors in the South in advancing arguments. It is my opinion that every engineer, worthy of the name, would welcome any logical, well meant data along the line of progress in this or any other field, even though it happened to be promulgated by a "modest" contractor (to quote Mr. McGrath)—providing, of course, such propaganda answered the question in a real, practical sense, and did not merely advance ideas, which if adopted would be advantageous to the contractor only. In short, engineers generally are ready and willing to be "educated" by contractors or anyone else who has any revealing light to cast.

It is quite evident that some contractors have given this subject serious consideration, as is evidenced by the replies. However, I wonder whether these ideas would have been so ably revealed, had it not been for what Mr. McGrath termed the writer's "chiding" tone.

When men like Mr. West come forward with such a letter, it is possible for us all to obtain the contractor's practical ideas, as he sees them, presented in such a manner that there can be no misunderstanding them. There can be no doubt about such arguments not having their effect on the ultimate solution of this problem, which we all must realize is one requiring sober consideration from every angle—the contractor's included.

If bituminous foundations are to be generally used for asphaltic surfaces, a great deal of "educating" must be done in another direction, namely, that of the contractor. To prove successful, this type of foundation must be laid under ideal conditions upon a sub-grade which has been prepared with extreme care, and properly protected during the lapse of time after its preparation and before the foundation is laid.

We have some first-class contractors in the Chicago district (the writer, for one, has learned a great deal from some of them, too), but I regret to say that I have met very few, if any, who are inclined to give proper attention to the preparation of a sub-grade without being literally forced into doing so. I have seen concrete base laid (not in Oak Park, I assure you) on a sub-grade which, owing to recent rains and traffic, was in such abominable condition that it was a crime to continue with the work. Yet the contractor was blithely "sloshing" about in the mud, laying concrete.

Both Mr. McGrath and Mr. West indirectly allude to that old time atmosphere indicative of friction between engineer and contractor. I believe that spirit is rapidly dying out for the simple reason that broad-minded men will not support it.

There are still some of those engineers to whom Mr. West refers, just as there are some contractors of the type I mention. Perhaps that is sufficient reason why some engineers have refused to consider ideas suggested by contractors. Engineers, generally speaking, are primarily interested in safeguarding the public, or the tax-payer. Consequently they have been extremely slow in putting to practice ideas advanced by those whom they have had to fight in fulfilling their duty to the public. Both of these types are steadily becoming scarce, and decidedly better relations exist between contractor and engineer—it pays better on both sides.

Mr. McGrath refers to a letter by S. H. Lea, city engineer of Charlotte, N. C. (*Engineering News-Record*, July 12, p. 83) which states as an argument for cement-concrete foundations, their ability to bridge soft spots in sub-base. If Mr. McGrath will help engineers "educate" his "brethren" to follow his suggestion in regard to proper attention to these weak spots, then Mr. Lea's argument for cement concrete will become unworthy of consideration.

H. W. SKIDMORE,
Construction Engineer, Department of Public Works.

Oak Park, Ill.

Sir—The paper "Bituminous Foundations for Sheet-Asphalt Surfaces" by L. Kirschbraun, on p. 591, issue of June 21, seems to have received a hearty and deserving welcome by various engineers and contractors as reflected in various letters in the columns of *Engineering News-Record*

There are several good points to be enumerated in favor of this type of construction; these having been ably set forth by Kirschbraun. He goes on further to say, however, that, "besides the fact that there are certain practical considerations of construction which favor the use of a bituminous-concrete foundation whenever conditions permit, so far as cost is concerned a bituminous-concrete foundation is more economical under present price levels."

Let us consider each item of cost as given in his article. "The 5-in. bituminous base requires from 22 to 25 lb. of asphalt cement per square yard, which would cost about 20 to 25c. A square yard of 1:3:6 port-

land-cement concrete of the same thickness requires about 53 lb. of cement." There therefore appears to be a saving of about 10c. per square yard on cementing material, if cement costs $2.50 per barrel.

"Stone and sand for either construction will cost the same, and the expense of hauling bituminous mixture from the plant to the street will be ordinarily counterbalanced by the expense of hauling from the cars to the street, the individual elements going into the portland-cement concrete. That the labor of mixing and placing bituminous concrete will be less than for portland-cement concrete will be apparent when one considers the facilties at the asphalt plant for mechanically handling the constituents in large quantities. The fuel cost of heating the aggregate for bituminous concrete must, however, be considered." The saving in the "labor of mixing and placing" the bituminous concrete would seem rather doubtful especially for the railroad type of plant in common use. Further it would seem that the cost of heating the aggregate would more than balance any saving in the "labor of mixing and placing" even for the very best stationary plants.

"A detail which substantially reduces the cost of construction on a bituminous foundation is the fact that it will be unnecessary to employ a binder course, the foundation itself acting in that capacity. For a binder course of 1½ in. this saving amounts to about 25c. per sq.yd. and in addition permits a saving in the cost of excavation and grading. In many cases, however, this saving will be counterbalanced by the cost of providing drainage or the necessity of placing broken stone or cinders upon the subgrade." Assuming that the figures given above are correct it would appear that the 5-in. foundation of bituminous concrete should cost 83.4c. per square yard which would not be an unreasonable price for one square yard of 5-in. concrete with 1½-in. binder even at present prices. If the 1½ in. of binder costs 25c. per sq.yd., the 5-in. foundation would cost 83.4c. per sq.yd. because it would be necessary to lay it in at least two courses in order to get reasonably uniform compaction on the earth foundation.

"To the paving contractor it will certainly be an advantage to dispense with the extra equipment for mixing portland-cement concrete and to use instead the same equipment that must be brought to the job for the surface. In addition, in times of labor scarcity it is a decided advantage to do away with the extra organization required for the portland-cement concrete, inasmuch as bituminous concrete, both in preparation and laying, will be handled by the same men who handle the surface. It will be possible also to finish the pavement construction immediately following the grading, as bituminous concrete will require no long period of time to set, but can be topped almost at once. As this affects the efficiency of the organization and the speed of handling work it will amount to no small item to the paving contractor." While it is true that the size of a paving organization can be reduced by doing away with the cement concrete gang the amount of work completed per day will be more than correspondingly reduced. An asphalt plant that mixes 1000 sq.yd. of 1½-in. binder during the morning hours, prepared to be topped in the afternoon, will be able to mix only 300 sq.yd. of the 5-in. bituminous concrete base in the same time. The plant that would mix 1000 sq.yd. of finished pavement (1½-in. binder, 1½-in. top) per day would mix only about 460 sq.yd. of finished bituminous foundation pavement. Two asphalt plants could not complete as much as the concrete mixer and single asphalt plant. The reduction in equipment and men is not apparent.

While there are good points to be made in favor of a bituminous-concrete foundation for sheet asphalt it seems that economy in first cost is not one of them. Even though the original cost will be greater for this type of construction it seems well worth trying. Engineers and contractors will watch with interest any experiments with this type of foundation.

ROY M. GREEN,
Assistant Professor of Highway Engineering,
Agricultural and Mechanical College of Texas.
College Station, Tex.

Fire Destroys Old Landmark

Sir—Accompanying is a photo of the remains of the Fincks Basin suspension bridge spanning the Mohawk River at Little Falls, N. Y. This historic span



was destroyed recently by a fire in the north tower. The bridge was erected in 1869-70 at a cost of about $22,000.

ARTHUR T. CLARK,
Resident Engineer, Water Supply Department,
Herkimer, N. Y. Municipal Commission.

Filtration and Hypochlorite at Niagara Falls

Sir—In my article entitled "Filtration Controls Typhoid at Niagara Falls," published on p. 449 of your issue of Sept. 6, I stated that one of the two plants supplying the city, that owned by the New York Water Co., used hypochlorite as a sterilizing agent in connection with filtration. I am advised that this statement is in error, in that the plant is using liquid chlorine instead of hypochlorite. My informant states that the pioneer experiments on the use of liquid chlorine were made at this plant, and that liquid chlorine has been continuously used at the plant since 1912. I am further advised that the New York Water Co. is furnishing about 10% of the water supplied to Niagara Falls at the present time.

CHARLES B. BURDICK.
Chicago.

THE ENGINEER IN FIELD AND OFFICE

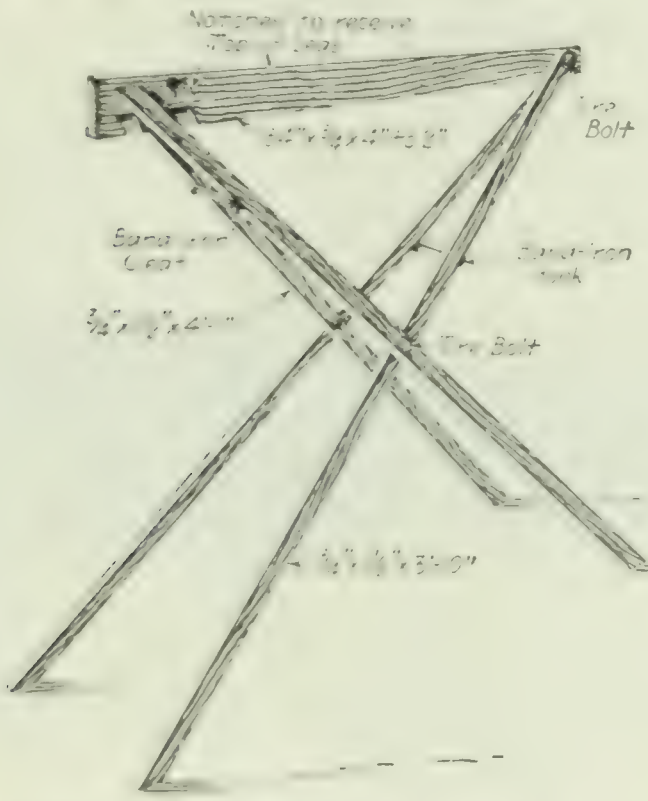
A DEPARTMENT DEVOTED TO DETAILS OF THE DAY'S WORK

Folding Drawing Trestle Is Rigid and Simple to Construct

BY H. A. SITTERLEY

Chief Engineer, Low Moor Iron Co. of Virginia, Low Moor, Va.

A DRAWING table trestle which will take up a space only 4 in. square and 4 ft. long when stored, would prove a great convenience to many engineers who do not need a drawing table continually, or whose work sometimes requires one where ordinarily there would not be proper facilities. The construction illustrated in the accompanying drawing has been used for the past two years by the writer and has proven to be convenient,



ADJUSTMENT FOR HEIGHT AND SLOPE OF BOARD EASILY MADE

rigid, light and capable of being easily transported and stored in a small space.

The following is a bill of necessary materials:

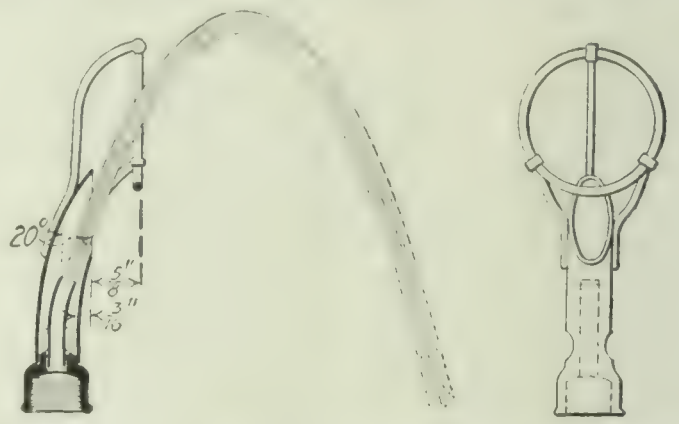
2—¾ x 1½-in. hardwood strips, 4 ft. 1 in. long, front legs.
2—¾ x 1½-in. hardwood strips, 3 ft. 10 in. long, back legs.
1—¾ x 4-in. hardwood board, 34 in. long, top piece.
6—1-in. shothead screws.
2—2-in. tire-bolts and washers.
1—2½-in. tire-bolt and washer.
1—¾-in. band-iron strip, 7 in. long, drilled for screws on 6-in. centers and one hole cut out to serve as a hook.
1—¾-in. band-iron strip, 4 in. long, drilled for screws on 3½-in. centers.

The method of assembling is perhaps sufficiently illustrated in the drawing. By placing the top ends of the longer legs in the different notches, which must be gained in the top piece, the top of the trestle can be made either level or sloping, and the height adjusted from 34 in. to 42 in.

612

Which Type of Drinking Fountain Do You Use?

TESTS of 77 drinking fountains of 15 different types (see sketches) at the University of Minnesota showed that due to improper design all were possible sources of infection of the users. No less than 80%



THREE TESTS OF THIS PROTECTED DRINKING FOUNTAIN SHOWED NO STREPTOCOCCI INFECTION

of the fountains and the water from 11% of them contained streptococci, although none were found in the water supplied to the 18 buildings in which the fountains were located.

The infection was due to contact between the lips of users and the structure of the fountains, or to water falling back from lips to fountains, owing to vertical discharge of the jet.

To keep lips away from the fountain structure and water from falling back on it, and to prevent water from being retained in fountains with cup- or ring-shaped depressions, the fountain shown herewith was designed. Three bacterial tests showed no streptococci on either the fountain or the water discharged from it.

The study here outlined is reported in detail in a paper by H. A. Whittaker, director of the Division of Sanitation, Minnesota State Board of Health (Reprint No. 397, Public Health Reports, Washington, D.C.). George W. Putnam assisted in the investigation.



TESTS OF 77 FOUNTAINS OF ONE OF THESE 15 TYPES SHOWED 80% OF THE FOUNTAINS AND 11% OF THE WATER SAMPLES INFECTED WITH STREPTOCOCCI

Tables Give Moment Coefficients for Concentrated Loads

By S. M. Cotten

Waco, Texas

THE TABLES herewith give the coefficients of the moments in a beam at each of nineteen sections, varying by one-twentieth of the span, due to a concentrated load at any of these sections. It will be observed that the tables are analogous to influence lines, and are used in the same manner.

The position of the load and of the sections is expressed as a percentage of the span distant from the left support. Let P be the load and L the span. Then the moment for any condition is PL multiplied by the corresponding coefficient. The reactions for any position of the load are P times the corresponding reaction coefficient. Interpolation may be used for intermediate values of the coefficients. Inflection points are expressed as a percentage of the span distant from the support considered.

While, in general, the use of the tables is sufficiently

SIMPLY SUPPORTED BEAM

Load at Section	MOMENT COEFFICIENT-SECTION AT																			
	.05	.10	.15	.20	.25	.30	.35	.40	.45	.50	.55	.60	.65	.70	.75	.80	.85	.90	.95	
.05	.047	.045	.042	.040	.037	.035	.032	.030	.027	.025	.022	.020	.017	.015	.012	.010	.007	.005	.002	
.10	.045	.090	.085	.080	.075	.070	.065	.060	.055	.050	.045	.040	.035	.030	.025	.020	.015	.010	.005	
.15	.042	.085	.127	.120	.112	.105	.097	.090	.082	.075	.067	.060	.052	.045	.037	.030	.022	.015	.007	
.20	.040	.080	.120	.160	.150	.140	.130	.120	.110	.100	.090	.080	.070	.060	.050	.040	.030	.020	.010	
.25	.037	.075	.112	.150	.187	.175	.162	.150	.137	.125	.112	.100	.087	.075	.062	.050	.037	.025	.012	
.30	.035	.070	.105	.140	.175	.210	.195	.180	.165	.150	.135	.120	.105	.090	.075	.060	.045	.030	.015	
.35	.032	.065	.097	.130	.162	.195	.227	.210	.192	.175	.157	.140	.122	.105	.087	.070	.052	.035	.017	
.40	.030	.060	.090	.120	.150	.180	.210	.240	.220	.200	.180	.160	.140	.120	.100	.080	.060	.040	.020	
.45	.027	.055	.082	.110	.137	.165	.192	.220	.247	.225	.202	.180	.157	.135	.112	.090	.067	.045	.022	
.50	.025	.050	.075	.100	.125	.150	.175	.200	.225	.250	.225	.200	.175	.150	.125	.100	.075	.050	.025	
.55	.022	.045	.067	.090	.112	.135	.157	.180	.202	.225	.247	.220	.192	.165	.137	.110	.082	.055	.027	
.60	.020	.040	.060	.080	.100	.120	.140	.160	.180	.200	.220	.240	.210	.180	.150	.120	.090	.060	.030	
.65	.017	.035	.052	.070	.087	.105	.122	.140	.157	.175	.192	.210	.227	.195	.162	.130	.097	.065	.032	
.70	.015	.030	.045	.060	.075	.090	.105	.120	.135	.150	.165	.180	.195	.210	.175	.140	.105	.070	.035	
.75	.012	.025	.037	.050	.062	.075	.087	.100	.112	.125	.137	.150	.162	.175	.187	.150	.112	.075	.037	
.80	.010	.020	.030	.040	.050	.060	.070	.080	.090	.100	.110	.120	.130	.140	.150	.160	.170	.180	.090	
.85	.007	.015	.022	.030	.037	.045	.052	.060	.067	.075	.082	.090	.097	.105	.112	.120	.127	.135	.067	
.90	.005	.010	.015	.020	.025	.030	.035	.040	.045	.050	.055	.060	.065	.070	.075	.080	.085	.090	.045	
.95	.002	.005	.007	.010	.013	.015	.017	.020	.022	.025	.027	.030	.032	.035	.037	.040	.042	.045	.022	

BEAM FIXED AT RIGHT END

Load at Section	MOMENT COEFFICIENT - SECTION AT (To left of heavy broken line - positive moments; to right - negative)																			
	.05	.10	.15	.20	.25	.30	.35	.40	.45	.50	.55	.60	.65	.70	.75	.80	.85	.90	.95	
.05	.046	.042	.039	.035	.031	.027	.024	.020	.016	.012	.009	.005	.001	.002	.006	.010	.013	.017	.021	
.10	.042	.085	.078	.070	.063	.055	.048	.040	.033	.025	.018	.010	.003	.005	.013	.020	.028	.035	.043	
.15	.039	.078	.116	.105	.094	.083	.072	.061	.050	.039	.027	.016	.005	.007	.019	.030	.042	.053	.065	
.20	.035	.070	.106	.141	.126	.111	.096	.082	.067	.052	.037	.022	.007	.009	.026	.041	.056	.071	.087	
.25	.032	.063	.095	.127	.158	.140	.122	.103	.083	.066	.045	.027	.009	.011	.032	.052	.071	.090	.110	
.30	.028	.056	.085	.113	.141	.169	.147	.125	.103	.082	.060	.038	.016	.005	.038	.062	.085	.108	.132	
.35	.025	.050	.075	.099	.124	.149	.174	.148	.123	.098	.073	.048	.022	.003	.044	.073	.099	.126	.154	
.40	.022	.043	.065	.086	.108	.129	.151	.173	.144	.116	.087	.058	.029	.001	.051	.084	.116	.147	.179	
.45	.018	.037	.055	.074	.092	.111	.129	.148	.167	.135	.102	.068	.035	.002	.059	.096	.133	.170	.207	
.50	.016	.031	.047	.063	.078	.094	.109	.125	.141	.156	.118	.079	.040	.002	.068	.109	.151	.193	.235	
.55	.013	.026	.039	.052	.065	.077	.090	.103	.116	.129	.142	.103	.064	.025	.077	.123	.170	.216	.263	
.60	.010	.021	.031	.042	.052	.062	.073	.083	.094	.104	.115	.125	.083	.042	.086	.138	.189	.241	.293	
.65	.008	.016	.024	.033	.041	.049	.057	.065	.073	.081	.090	.098	.106	.065	.095	.152	.208	.265	.322	
.70	.006	.012	.018	.024	.030	.036	.042	.049	.055	.061	.067	.073	.079	.085	.104	.166	.228	.290	.352	
.75	.004	.009	.013	.017	.021	.026	.030	.034	.039	.043	.047	.051	.056	.060	.064	.113	.155	.197	.239	
.80	.003	.006	.008	.011	.014	.017	.020	.023	.025	.028	.031	.034	.036	.039	.042	.045	.062	.079	.096	
.85	.002	.003	.005	.006	.008	.010	.011	.013	.014	.016	.017	.019	.020	.022	.023	.025	.034	.043	.052	
.90	.001	.001	.002	.003	.004	.004	.005	.006	.007	.008	.008	.009	.010	.011	.011	.012	.017	.022	.026	
.95	.000	.000	.001	.001	.001	.001	.001	.001	.002	.002	.002	.002	.002	.003	.003	.003	.004	.005	.006	

BEAM FIXED AT BOTH ENDS

Load at Section	MOMENT COEFFICIENT - SECTION AT (Origin at left end; positive moments)																			
	0	.05	.10	.15	.20	.25	.30	.35	.40	.45	.50	.55	.60	.65	.70	.75	.80	.85	.90	.95
.05	.045	.004	.004	.004	.003															
.10	.081	.032	.016	.015	.013															
.15	.108	.061	.014	.032	.029															
.20	.128	.083	.038	.006	.051															
.25	.141	.098	.056	.013	.028															
.30	.147	.108	.069	.030	.011															
.35	.148	.112	.076	.040	.014															
.40	.144	.111	.079	.047	.021															
.45	.136	.107	.079	.050	.027															
.50	.125	.100	.075	.050	.031															
.55	.111	.090	.069	.048	.032															
.60	.096	.078	.061	.043	.031															
.65	.080	.066	.051	.037	.028															
.70	.063	.052	.041	.031	.024															
.75	.047	.039	.031	.024	.018															
.80	.032	.027	.022	.016	.013															
.85	.019	.016	.013	.010	.008															
.90	.009	.007	.006	.005	.004															
.95	.002	.002	.002	.002	.001															

obvious to require no explanation, the writer would suggest that their principal function is for the investigation of the effect of a series of related moving concentrations as these pass over a beam. Their application to such a condition will be apparent upon inspection.

Details of Mounting Blueprints on Muslin

By Milton Harris
Draftsman Training Camp, San Francisco, Calif

MAPS and plans on paper frequently fail by tearing or wearing through due to hard usage. Sensitized cloth has been employed more or less successfully, but it has its disadvantages due to the fact that the cloth is generally of poor quality and tears easily. Furthermore, if allowed to stand for some time before being used, the sensitizing solution causes the cloth to rot. A much better and not too difficult method is to mount the paper print upon cloth. Large wall maps hang better and are much less liable to be harmed when mounted in this way than when left unmounted.

The print should be made upon "medium" weight paper unless an extra strong sheet is desired. While the printing is going on, a helper can prepare the cloth backing. Unbleached muslin that sells at about 10c. per yard is ordinarily used. Select a smooth board, larger than the size of the print to be mounted, and clean it thoroughly. A drafting board or the top of a drafting table is excellent for this purpose—provided it is not cedar, for cedar will stain the prints. Fasten the cloth on this board with 4-oz. carpet tacks spaced about 2 in. apart, and driven only partially home so that they may be easily pulled.

Tack one edge of the cloth down, stretching it smooth but not too tightly, for the paper contracts on drying-out and will crack if there is not enough "give" to the cloth. Follow around the edge of the cloth until it is completely tacked down. It should now present a smooth surface and is ready for the mount. If many prints are to be mounted it may be an advantage to set several boards, end to end, and tack the cloth over their entire length. In this manner considerable cloth can be saved.

After washing the prints they should be taken from the final bath and the excess water blotted from both sides with a dry towel or cloth. If the print has been made some time previously and is dry, immerse it in water for two or three minutes—or until it is thoroughly wet—then remove it and proceed as above. Lay the print carefully down on a clean table top or board and apply a thin but even coating of paste, making sure that the edges and corners have received their share. The paste should be a fresh, stiff corn-starch paste or fresh wall-paper paste. "Kodak adhesive," a trade compound, has been found to be an excellent paste when made according to directions. Glue or library paste is unsatisfactory and should not be used.

Pick the paper up carefully and while one man holds an edge above the cloth, the other, on the opposite side of the table, should take the lowered edge and paste it down—using a stiff kalsomine or large, flat paint brush. Brush the paper down, working *away* from the body with short strokes, the helper slowly lowering his end. In this manner the brush will drive out all air bubbles and make a uniformly smooth job. After the paper is brushed fast, take a stiff clothes brush and gently pat the edges down, thus insuring a perfect contact at the vulnerable point.

The print should dry slowly in an even, moderate temperature for at least 36 hours. The print can then be trimmed. If a Van Dyke print, corrections, if any, should be applied at this time, using ordinary black drawing ink. A job completed for the County Assessor's Office at Benton County, Ore., cost 0.073c. per square foot. The prints were Van Dykes made from Van Dyke negatives which were several years old. Each print was about 36 x 36 inches.

Erect Company Barracks Building in Three Hours

ONE of the standard army company units—a two-story frame building 43 x 140 ft. in plan—was framed and erected complete at Camp Pike, Little Rock,



TWO HUNDRED WORKMEN COMPLETE ARMY BARRACKS IN LESS THAN THREE HOURS

Ark., on Aug. 26, in two hours and fifty-five minutes, by James Stewart & Co., Inc., the company holding the cantonment contract.

Work was begun at 9 a.m. and at 11.55 the building was inclosed, floors laid, stairs in place, doors hung and windows fitted and screened, roof on, and all scaffolding had been removed and the workmen had left the building.

The amount of lumber required for this size of barracks is 75,000 ft. Two hundred carpenters were employed on the work. A notable feature of the construction was the fact that, in spite of the number of workmen and the high speed at which the work was rushed, not a man received a bruise or scratch.

The schedule of completion was as follows: 9 a.m. —work started; 9:20—posts and studding up for first story; 9:22—joists started for second floor; 10—second floor outside frame started; 10:20—second floor outside frame finished, first story trim and mill work finished; 10:45—joists on second floor finished; 11—flooring on second floor finished; 11:05—rafters started on roof; 11:30—rafters finished; second story trim and mill work finished; 11:55 scaffolding removed and workmen out of building.

The view was taken early in the framing and shows the swarm of workmen. Moving pictures of the work were taken by government photographers for purposes of exhibition and record.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Conveyor Tunnel Roofed While in Use, Stopping Serious Leakage

BY PAUL R. PRUFERT
John Wunder Co., Minneapolis

A GRAIN conveyor tunnel 600 ft. long, in which working clearance was very limited, was recently roofed with waterproofed concrete in three weeks by an efficient organization under the writer's direction without interrupting service on the conveyor.

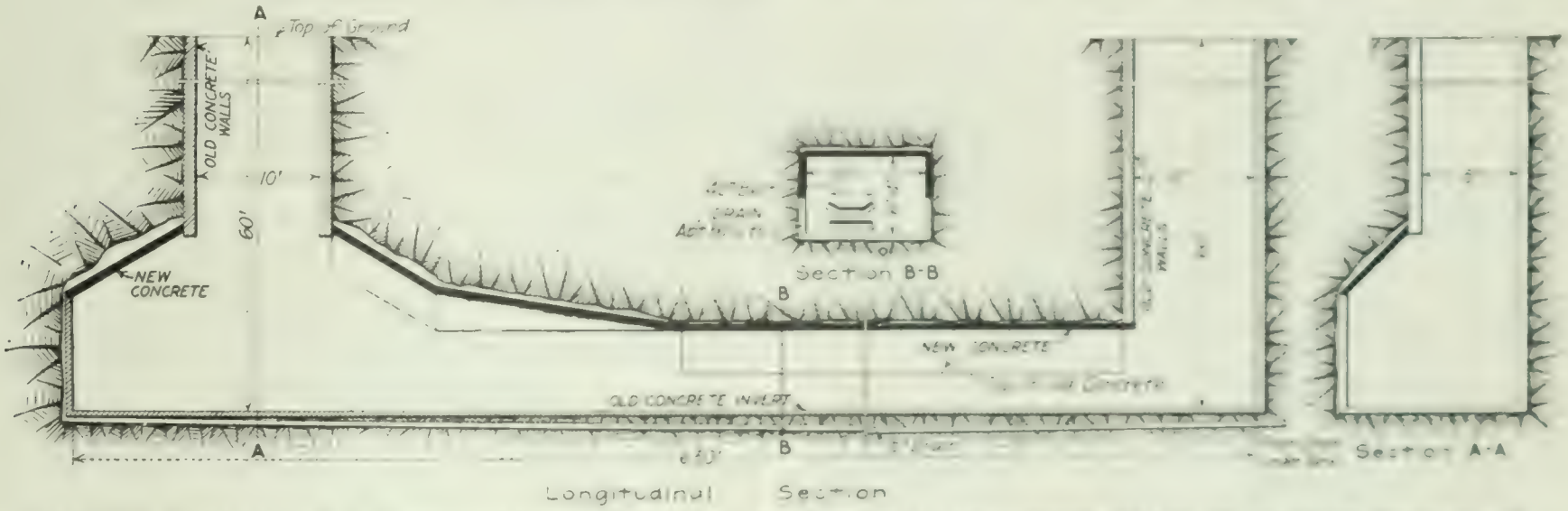
This interesting problem in waterproofing was encountered in connection with construction work at the plant of the Washburn-Crosby Co., in Minneapolis. Early in 1917, this company completed a large grain elevator on a site about 650 ft. from its plant. The elevator was connected with the mills by a tunnel 10 ft. wide by 7 ft. high, located 60 ft. below ground and running through sandstone and shale strata. A 42-in. belt conveyed the grain to the mills. At the time of driving the tunnel an 8-in. sewer was laid under it and the invert and sides to a height of about 3 ft. were lined with 5 in. of concrete. Three-inch pipes were placed in the concrete from the sewer to the top of the sidewalks, about 50 ft. c. to c. As the tunnel was then perfectly dry, it was decided to leave the upper part unlined.

After grain had been run through it for about a month, however, several leaks developed in the roof, especially at the entrance shaft. They grew worse day by day, making it necessary to place sheet-iron watersheds over the belt at numerous points. When the leakage finally became so bad that at the entrance for a distance of 40 ft. it resembled a light steady rainfall, it was decided to line and waterproof the entire tunnel.

After several methods of doing the work were considered and discarded as impracticable, it was decided to line the tunnel with about 6 in. of concrete, using a flat roof slab with ¾-in. bars, 6 in. c. to c., and to continue the 3-in. drain pipes up to the top of the roof slab, leaving a space between the top of the slab and the rock clear across the tunnel wherever necessary for drainage.

Working conditions were about as bad as could be imagined. The available space in the entrance shaft for taking down material had an area of 4 ft. 6 in. by 2 ft. 6 in. The rest of the shaft was taken up by the elevator legs. The conveying of grain through the tunnel could not be interrupted or delayed during the work and the passageway along the belt had to be kept as free from obstructions as possible. The clear headroom could not be decreased to less than 6 ft. 4 in.

The roof slab at the entrance shaft was centered up first. On account of the steep slope it was necessary to build two sets of centering, one above and one below the slab, the top one being left in place. The concrete was mixed outside and chuted into the tunnel through a 10-in. pipe with a swivel joint 5 ft. above the bottom of the shaft walls. On each side of the old concrete shaft a hole was cut through the old wall and the concrete for the roof slab was spouted into place for a distance of about 10 ft. from the shaft. The concrete for the remainder of the tunnel was spouted into a box, put into wheelbarrows and wheeled to the point of deposit.



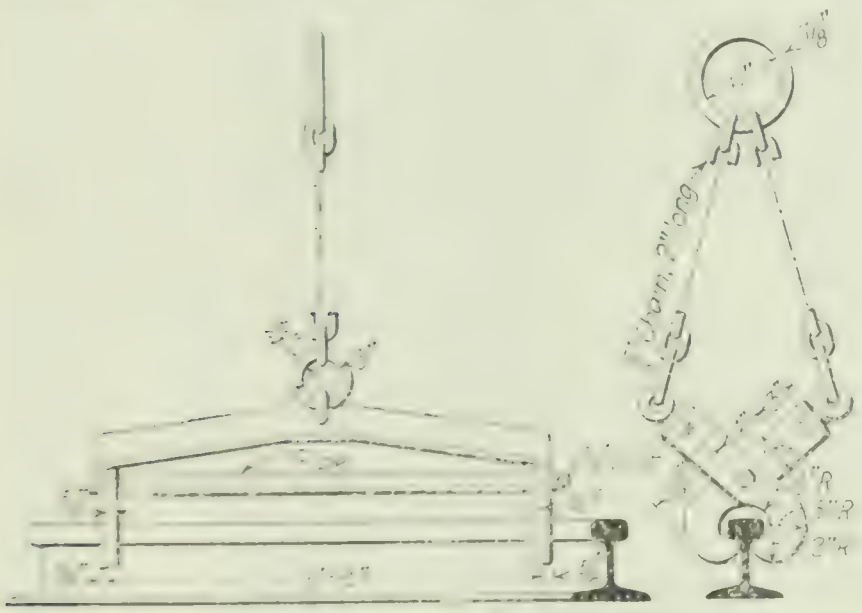
NARROW CLEARANCE DID NOT PREVENT SMALL CREW FROM LINING UPPER HALF OF 600-FOOT TUNNEL IN THREE WEEKS

The work was carried on with a day and a night crew, working 10 hours each. Each crew was divided into three gangs, the first putting up centering, the second concreting the side walls and the third concreting the roof slab. The boards for the roof slab centering, which ran at right angles to the tunnel, were placed four or five at a time, the reinforcing was laid and the concrete thrown in with short-handled shovels. It was then smoothed down and floated and another section of four or five boards started. It was surprising to see the skill with which the men handled this work after a short period. The belt was protected during the work with a section of sheet iron, which was moved with the concreting.

A 1:2:4 concrete was used, with Trus-Con concentrated waterproofing, mixed in the proportion of 1 gal. of waterproofing to 24 gal. of water. The whole job, including the difficult work at the shaft, was completed in a little more than three weeks. The grain moving had not been interfered with and not a single leak showed after the forms were removed. The work was done by the John Wunder Co., with the writer in charge of design and construction.

Special Tongs Prevent Rails from Seesawing While Being Handled

THE SKETCH shows some simple rail tongs which have been developed on the Atchison, Topeka & Santa Fé Ry., and which have given good service, according to William Barnes, supervisor of work equipment at Topeka, Kan. As described in *American Ditcher Scoopings*, published by the American Hoist & Derrick Co., the length of these tongs, 2 ft. 8 in. between grips, is found sufficient to prevent rails from seesawing while being handled by a crane. The main part of the tongs is made from $\frac{5}{8}$ x 3-in. soft steel, the jaws being hinged on a $\frac{3}{4}$-in. bolt with a 1-in. pipe spreader. Each half of the tongs is connected by a 2-ft. length of $\frac{3}{4}$-in. chain to a large ring, which is hooked to the hoisting line.



TONGS HOLD RAILS STEADY IN HANDLING

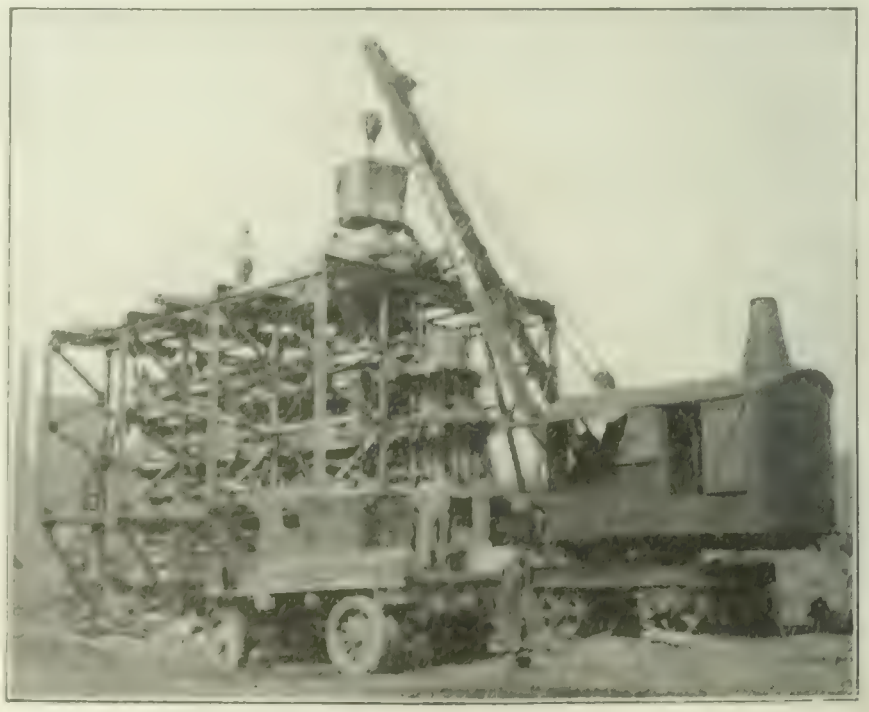
Have This Printed and Keep It Posted in Your Garage

IT MAY sound foolish to tell your drivers to cover their radiators in cold weather to save the extra gasoline it takes to start and warm up a cold engine—but the National Automobile Chamber of Commerce estimates that this and a dozen other small economies that ought to be practiced anyway in the operation of motor trucks and passenger cars can save 125 million gallons of gasoline a year, or more than one-third of the entire quantity of gasoline required in the next twelve months for the use of the army. Following the announcement of the Bureau of Mines that the gasoline supply, if used with care, will be sufficient for all reasonable needs, national automobile organizations have begun a "Save Gasoline" campaign. As many contractors are large operators of both trucks and passenger cars, it may not be amiss to quote a few of the suggestions circulated by the National Automobile Chamber of Commerce. Those which might with profit be posted and enforced in contractors' garages follow:

1. Do not use gasoline for washing or cleaning—use kerosene to cut the grease.
2. Do not spill gasoline or let it drip when filling—it is dangerous and wasteful.
3. Do not expose gasoline to the air—it evaporates rapidly and is dangerous.
4. Do not allow engine to run when car is standing. Most cars are fitted with self-starters and it is good for the battery to be used frequently.
5. Have carburetors adjusted to use leanest mixture possible—a lean mixture avoids carbon deposits.
6. See that piston rings fit tight and cylinders hold compression well. Leakage of compression causes loss.
7. Stop all gasoline leakage. Form the habit of shutting off gasoline at the tank or feedpipe.
8. See that all bearings run freely and are well lubricated—friction consumes power and wastes gas.
9. Protect the radiator in cold weather—a cold engine is hard to start and is short in power.
10. Keep tires fully inflated—soft tires consume power.
11. Do not drive at excessive speed. Power consumption increases at a faster rate than speed. Every car has a definite speed at which it operates with maximum fuel economy.
12. Change gears rather than climb hills with wide open throttle—it saves car and gas.
13. Do not use cars needlessly or aimlessly.

Motor Trucks Spout Concrete and Carry Dump Buckets

CONCRETE handled in dump-body motor trucks on track-elevation work in Chicago is deposited in place by means of a long wooden chute attached to the rear of the body, as shown in one of the accompanying views. The truck is of Garford end-tipping make, with the body temporarily blocked up high above the frame. Thus with the truck at a safe distance from the excavation the concrete can be placed at the far side of the



MOTOR TRUCK CARRIES DUMP BUCKETS HANDLED BY LOCOMOTIVE CRANE FOR FILLING WALL FORMS



MOTOR TRUCK WITH REAR CHUTE PLACES CONCRETE FOR FOUNDATIONS

wide forms for footings of retaining walls and bridge abutments. This avoids shoveling the concrete to distribute it in the forms.

For the upper part of the walls and abutments, large drop-bottom buckets are carried by Garford motor trucks from the central concrete-mixing plant to the work. There locomotive cranes on traction wheels raise the buckets to dump into a hopper at the top of the traveling steel form. From this it is spouted into place. The bucket stands on I-beams across the hopper, thus reducing the spattering of concrete.

Similar motor trucks also remove the material excavated for the foundations and dump it as filling behind the completed footings, the top of which is at street level.

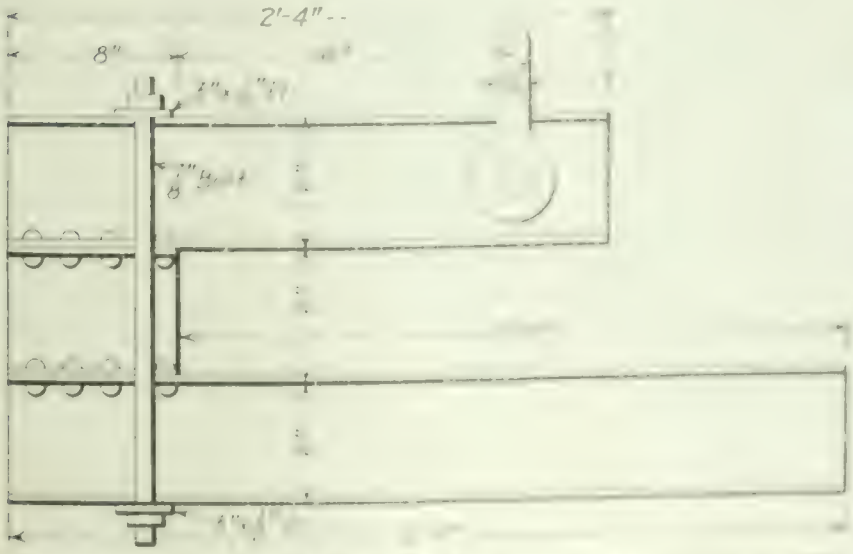
This work is for the elevation of the Chicago & Western Indiana R.R. along Canal St., from 23rd to 29th St. It is under the direction of E. H. Lee, vice president and chief engineer. The W. T. Newman Co. has the contract.

Hook Built of I-Beams Successfully Handles Large Concrete Pipe

By Sidney K. Eastwood

Owego, N. Y.

THE ACCOMPANYING sketch shows a hook for lowering large reinforced-concrete sewer pipe into the trench from a traveling derrick. It was made in the blacksmith shop of a large sewer job. The hook is made up from three 6-in. I-beams clamped together with two



HOOK SOLVES PROBLEM OF [illegible] PIPE

⅞-in. bolts and 3 x ½-in. plates. The beams are also riveted together through their flanges. An inch and a quarter shackle is placed on the upper arm of this hook midway of the lower arm. Into this the hoisting line is hooked. Five-foot pipe was handled satisfactorily with this hook after considerable trouble had been experienced with the failure of hooks forged from one piece of metal.

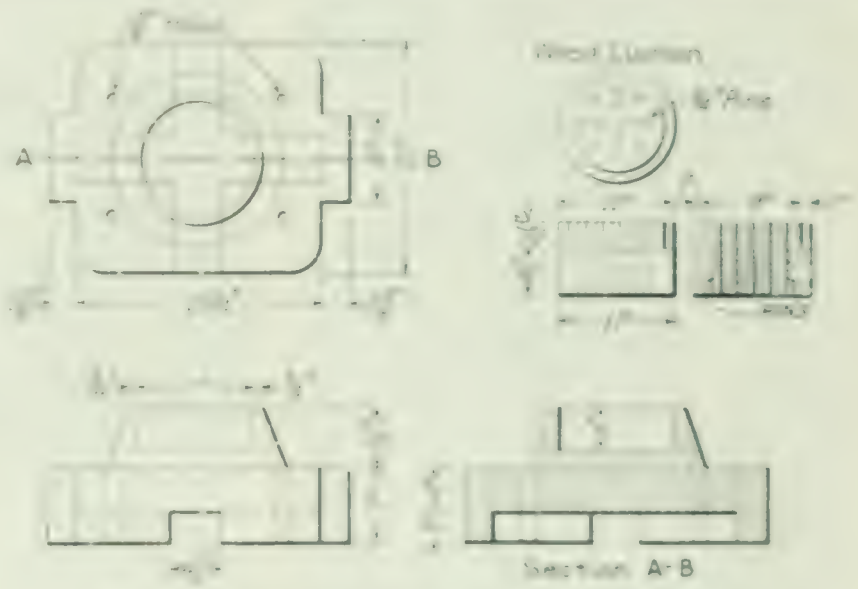
Rapid Driving with Cushion Block Reinforced by Vertical Rods

By George W. McAlpin

[illegible]

WITH a specially designed hood fitted with a reinforced wood plug rapid driving of steel sheet piles has been accomplished at Dam No. 39, Ohio River. As many as fifty-four 25-ft. Lackawanna piles have been driven with one driver in one 8-hour shift.

The hood which is made to fit Vulcan hammers, is of cast steel and so constructed that either straight web, gusset, corner or T piles can be fitted into the grooves



[illegible]

in its under side. It is held to the hammer by wire lines or by rods passing through 1¾ in. holes.

A circular hole in the head permits an oak block to be inserted as a cushion to receive the direct blow of the hammer. This block, 11 in. in diameter, is bound with a 1 x 2½-in. iron collar. This prevents it from mashing up at the top. Holes are drilled in the block to receive ¾-in. round iron pins which transmit the blow from hammer to pile follower. These pins and the collar have proved very successful.

The entire pile hood and block have proved most practical in actual use, no trouble at all being experienced in keeping piling in the groove. Neither does the block have to be changed frequently. The hood was designed by L. H. Prell, assistant engineer at the dam.

Cities Spend Far More Than States

[illegible]

NEWS OF THE WEEK

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

"Go-Ahead" Road-Building Policy Indorsed by Ohio Officials

A "go-ahead" road-building policy for Ohio was indorsed last week at the convention called by the State Highway Advisory Board and Commissioner Cowen to acquaint the state road officials with the principle of state aid and the laws under which the state and counties operate in promoting building of the state system. The resolution urging a continuation of highway construction, introduced by W. A. Alsdorf, secretary of the Ohio Good Roads Federation, was as follows:

"Whereas, No greater national necessity exists than the need of improved transportation facilities, in order to get foodstuffs to market, to relieve congested railroad terminals and to get manufactured products from the factories to the jobber and consumer, and to help Uncle Sam's war program; and

"Whereas, No more effective blow can be struck at the high cost of living than by putting the farmers and market gardeners of the state in close touch with the great centers of population through the construction of a complete system of modern roads available for use in all seasons; and

"Whereas, Ohio has a fixed road program with revenues established and work under way, which in the recent words of Governor James M. Cox, 'must go forward to completion,' and counties and townships are coöperating with the state and nation in highway improvement; now, therefore, be it

"Resolved, By the officials of the State Highway Department and the county commissioners, county surveyors and county auditors of the State of Ohio, that, for these reasons and to meet the exigencies of war, we demand a harmonious coöperation of road officials in the performance of their duties, the abandonment of makeshift policies and the adoption of a vigorous, go-ahead road-building program in the State of Ohio; and be it further

"Resolved, That we pledge our united support to the State Highway Commissioner and the State Highway Advisory Board in the collection and compilation of all data necessary to secure through the action of the National Council of Defense and other agencies of the Federal and state governments an adequate supply of cars for the shipment of road-building materials; and also in the collection of such information as may be necessary in the securing of labor and the marketing of securities."

The meeting was the first of its kind ever called by the officials of the State Highway Department. More than 300 road officials attended

American Business Indorses Price-Fixing

Convention Held by Chamber of Commerce of United States Passes Resolutions Affecting Industry of the Nation

American business was mobilized at Atlantic City, N. J., on Sept. 17 to 21, when the leaders in every industry in the United States gathered there to see how the industrial, commercial and financial resources of the country could best be utilized to aid the Government in bringing the war to a successful conclusion, as well as aid business itself to come to a definite understanding as to its future in connection with the conduct of the war.

Some of the best work done at the convention, aside from the speeches which inspired those who were present, was done by the Committee on Resolutions, which included men in every line of commerce, industry and finance, as well as men from every section of the country. It was freely pointed out in the convention, which was called the War Convention of American Business, that no committee on resolutions in any assembly of the Chamber of Commerce of the United States had ever included a more representative body of American business than the committee which served so laboriously at this Atlantic City convention.

Catchings Analyzes Conditions

The background of the convention had been that American business, since the declaration of war with Germany, and since the competitive buying of supplies in the United States for the Allies, for the United States and for private business, which has forced prices to an abnormal height, had thrown American industry into chaos. This situation was very clearly defined by Waddill Catchings, chairman of the Program Committee of the convention, and also chairman of the Committee on Coöperation with the Council of National Defense, on behalf of the National Chamber. Mr. Catchings, formerly a president of a number of iron and steel companies, left those industries upon the declaration of war, declaring he did not care to make money out of the war, and placed his services at the hands of the Government in Washington, so that because of his previous experience in the industries with which he has been connected, and because also of his close relations with the Council of National Defense, he was in the opinion of the delegates to the convention well qualified to analyze the present condition of business as it affects Government and private industry jointly.

Newspaper reports did not carry a complete report of Mr. Catchings' address to the convention, nor of the resolution which was adopted by the Chamber of Commerce of the United States at the War Convention which was inspired by Mr. Catchings' address and the background which made necessary the calling of the War Convention. Never in the history of American business have such resolutions been passed at any convention such as that of the National Chamber just ended. Leaders of industry, commerce and finance, supported by less known men from every section of the country, declared in their resolutions that at the earliest possible moment all the purchasing of the Government for the war should be concentrated in one body. They declared for the first time in the history of American industry that it is right, proper and necessary that the Government should have the power to fix prices on all materials needed for the conduct of the war as well as all materials affecting the public interest for the Government itself and for the public at large. It was declared that the Government should by right of necessity have the power of fixing the priority of shipments. It was declared that American business is ready for heavy taxes, for the dissipation of its savings, and that it is ready to turn over its plants to the Government, under Government control, if necessary, and to do any and every other thing which may be necessary for the successful conduct of the war.

Discuss Water Power

One of the features of the convention was a resolution in regard to water power which was discussed by S. A. Osborne, vice president of the Westinghouse company. There was an extended discussion upon the subject, most of which tended toward committing the Chamber of Commerce of the United States to an attempt to urge upon Congress the desirability of the enactment of some of the water-power bills which have been pending in Congress for several years. It was declared that Congress should without delay enact this legislation, especially the legislation pending which would develop the water powers at sites now under Federal control. There were two resolutions upon this subject, the other one tending especially toward irrigation projects. The first resolution requested that the directors of the Chamber of Commerce

of the United States be asked to appoint a special committee to investigate the present need of water-power development and the character and extent of legislation required and to report to the National Chamber as soon as possible. The Committee on Resolutions suggested and the convention indorsed the request that this resolution should be referred to the board of directors of the National Chamber; and the Committee on Resolutions also suggested, which suggestion was also indorsed by the convention, that the other resolution on water power should be referred to the board of directors.

It is understood in Washington, since the convention adjourned, that a special committee on water power will be appointed in accordance with the suggestion in the resolution, which asked for such a committee, and into the hands of this committee-to-be no doubt will be committed the other water-power resolution dealing with irrigation, etc.

The convention, according to those who were present, was an inspiring occasion. James A. Farrell, president of the United States Steel Corporation; John D. Ryan, president of the Anaconda Copper Co.; Henry Bruere, vice president of the American Metal Co.; E. H. Huxley, of the United States Rubber Co., and many other leaders in industry addressed the convention. Herbert C. Hoover, the United States Food Administrator, delivered an address. Very strong resolutions of support for Russia were passed, and especially in regard to further financial support for that new democracy.

To Unify Purchasing Power

In speaking on the subject of unification of Governmental purchasing power and price control, Waddill Catchings said, in part:

"The committee on coöperation with the Council of National Defense, of which I am chairman, has been in intimate contact in Washington with the great industrial problems which have arisen as a result of the large purchases which our Government is making. It is said that our Government will expend for war purposes for our armies and for the allies during the next year nineteen billions of dollars, or more than twenty times the annual gross output of all the subsidiaries of the United States Steel Corporation.

"You are having an opportunity at home of seeing the effect on business of these great purchases, the effect of the withdrawal of material and labor. These interests essential to the industrial fabric are unable at the present time to secure the materials which they need. The interests which are not essential to the industrial life are faced with the great problem of what they are going to do during these times to carry their structure from the present over into the future. The result of the competitive bidding by the Government for the vast quantities of materials and supplies which it needs, and of the competitive bidding by business for what is left, has produced high prices. These high prices have produced great discontent throughout the country. Our people have not viewed with unconcern the acquiring of great riches in this time of national sacrifice and distress. There are great labor difficulties arising in all sections of the country. We are having here the same experience which England had in securing the exceptional effort of labor when an indirect effect of that exceptional effort was the creation of great riches.

To Reduce High Prices

"You know that when business men are told that they should not charge a high price for materials and supplies, that that is entirely ineffective unless some action is taken to create a different condition. As long as there is a great demand, so long will prices continue; and it is idle for us as business men to respond to the patriotic addresses that are made unless we carefully discuss how we can carry into effect the ideas that are expressed, and make them effective.

"It is for you to determine if this country has vested in our Government at Washington sufficient power in times of peace to settle these extraordinary problems which have arisen in connection with the war as a result of these vast purchases. In this great democracy of ours powers must be vested in the Government before the Government can act, and it is not possible for the authorities in Washington to act in regard to the problems existing as might seem best to them. It is only possible for them to act in accordance with the statutory power which has been given to them. The War Industries Board was created by the Council of National Defense, but the Council of National Defense has no authority under the law to act; it is a body that was created in time of peace to investigate, report and give advice. The War Industries Board has been created by that body. It can have no power which was not possessed by the body which created it. The War Industries Board is rendering great service today in advising Government officials in bringing centralization to the Government purchases, but the purchasing for the Government today is being done just as it was done in times of peace by the many bureaus and departments of the War Department and of the Navy Department. Independent purchases are being made today by the Signal Corps, the Engineer Corps, the Naval Corps and all of the various quartermasters. The War Industries Board is doing all it can to bring about coöperation among them, but any successful study of the situation in Washington will lead you, I think, to the conclusion that what they are able to accomplish, however great it may seem, is not great in comparison with the [illegible] to be done.

Need War Board with Power

"I say to you without hesitation that without the use of some new Government

should be given power to create a war board similar to the Ministry of Munitions in England. This should be a board which would assemble under one control the trained buyers of the various departments of the Government. It should be drawn from the various competing bodies and gathered together; but these competing bodies of Government officials should be reinforced by men from civilian life. Most of those men are probably in Washington at the present time advising the Government as best they may, but these men should be no longer advisers; they should be in the actual service and doing actual purchasing for the Government.

"The Government is in contact with business today on a scale never heard of in our Government before. Army and navy officers who are trained with special work and who have had some experience with special buying in the past are called upon to deal with these enormous problems. Our committee says unhesitatingly that these men should be relieved for service at the front, except such of them as are necessary to retain experience from what has been done. All who have experience should be called into the Government service.

Board Must Have Power

"A board such as I have mentioned would have to have power to determine prices when negotiation between buyer and seller can no longer take place because of the unprecedented demands for material. As to those materials which are necessary for the national defense, those materials which are necessary for the preservation of our essential industrial life, where negotiations between buyer and seller can no longer be had, our committee says unhesitatingly that the Government should have authority to determine the price upon some fair basis. Such a body would have to have power to determine priority, the order of distribution.

"We say to you that you cannot expect the material of our country, which is not equal to the entire demand, to go where it is most needed into national defense or for the preservation of our essential industrial life by merely competitive bidding. We say to you that the experience that has been acquired should be made use of here.

"If you say that the Government should not interfere with business, our committee says that the purchasing of nineteen billion dollars' worth of materials and labor is an interference with business, and that the suggestion is not that there be no interference but that there be orderly interference, and not disorder. If you say that the loss of taxes should be taken into consideration, our committee says that when the entire material life of our nation is concentrated upon the single purpose of winning the war there is no loss of trade. If you say that the machinery of the Government should be developed and used for the purposes of the War and Navy Departments, we

think the answer is that these are temporary problems, that business is asked to give the Government great power temporarily; that the situation which we are asked to meet exists only during the war, and that therefore a tempor ary structure should be created so that at the end of the war we can so far as possible return to normal conditions.

"If you say that the situation is too big, too complicated, that our Government cannot undertake the regulation of prices or the regulation of priorities, we say to you that chaos exists in business today, and that order must be brought out of that chaos. If our industrial energy is to be centered behind winning the war, these problems must be solved. We believe that you can bring order out of this chaotic condition at a much earlier date than it will be brought by the natural course of events. That can be done if you approach our Government and point out that business is willing to submit to control in these times; that you do not insist upon full freedom of action when winning the war is at stake. If that is done, cooperation can come about between business and the Government which cannot exist at the present time. Business will no longer be on the opposite side of the table in any negotiation. Business can sit side by side with the officials of the Government in an effort to solve these problems."

Digest of Resolutions

The convention came to an end Sept. 21 with the passage of some of the most remarkable resolutions ever passed by American business.

One resolution pledged the support of business to the war in the most comprehensive and sweeping terms. The resolution declares that American business is ready for heavy taxes, for the dissipation of its savings, is ready to turn over its plants, and to do any and every other thing which may be necessary to prove that American business is behind the war until the last gun is fired.

Another resolution passed declares that at the earliest moment all the purchasing of the Government for the war should be concentrated in one body. It declares in an unequivocable manner for the first time in the history of American business that it is right, proper and necessary that the Government should have the power to fix prices on all materials needed for the conduct of the war as well as all materials affecting the public interest, for the Government itself and for the public at large.

Another resolution indorsed the principles laid down by the Committee on Labor of the Council of National Defense, and as set forth by the Secretary of Labor, to the effect that employers and employees should not attempt to change existing standards of work during the period of the war.

The convention indorsed another labor resolution of great importance. This was in support of the idea of a Federal board appointed by the President to adjust disputes. During the process of adjustment, American business declared, there should be no shutdowns, lockouts, strikes or other cessation of industry. Business pledged itself to accept decisions made by such a board and invited the coöperation of labor. During some of the discussions in the group meetings of the convention some delegates advocated compulsory arbitration of labor disputes. The Committee on Resolutions refused to report a resolution that would try to tell labor what it must do, and the convention took the attitude that American business should merely invite the coöperation of labor.

The usefulness of the United States employment service under the Department of Labor, which brings employers into closer connection with workers seeking employment, was indorsed. The convention indorsed the action of the directors in creating a foreign commission to proceed abroad and study and report upon the means whereby business may adapt itself to the problems that will arise during and after the war.

The convention having placed itself on record in favor of governmental fixing of prices on essential products, the Chamber went on record as advising a revision of prices based on the cost of production. A plan of allowing business to pay war taxes in four quarterly installments instead of annually was suggested and approved.

The convention requested every organization member to call a war meeting of its own organization before Nov. 1 to take to these organizations the lessons of the convention.

Railroad transportation was declared inadequate and the Chamber urged upon Congress the enactment at the present session of legislation giving the President or the Shipping Board power to suspend during the war the provisions of law govering coastwise shipping.

The daylight-saving plan, it was declared, would conserve the nation's supply of coal. The Chamber urged action by Congress and the President to make the daylight plan effective as a war measure. Improvement of public highways for military roads and in order to move foodstuffs economically was indorsed.

The Committee on Resolutions suggested that a number of recommendations be referred by the Chamber to the board of directors with power to act. Among these was a recommendation that the National Chamber make a prompt and careful study of labor conditions after the war.

The Committee on Resolutions requested that a number of recommendations be referred to the board of directors without advice. Among these was a recommendation regarding waterpower legislation which asked that Congress should enact legislation for the development of water power at sites now under Federal control without delay; another recommendation so treated suggested that the business interests of the country would be best served if the Federal Trade Commission or some similar Government commission be empowered to tell business what it is or is not permitted to do jointly with competitors in a lawful manner; another recommendation was intended to approve the action of the adjutant general of the State of New York in organizing chambers of commerce of that state.

The Chamber went on record as urging a vast and immediate increase in the number of American ships.

To Start on Big Construction Program for Flood Control

About $10,000,000 worth of work will be placed under contract Nov. 15 as part of the $25,000,000 flood-prevention project of the Miami Conservancy District, Dayton, Ohio, the largest project of its kind ever undertaken. The work is divided into a number of contracts, including five dams, road construction, levee building, river channel excavation, revetment, retaining walls, etc. The larger contracts, according to a statement by Arthur E. Morgan, chief engineer of the Conservancy District, contain numerous smaller pieces of work for which the main contractor may not be equipped and which he may desire to sublet. The chief engineer of the district will be pleased to hear from any persons or firms who are in position to take any of these subcontracts, and will put them in touch with those who will bid on the larger contracts as a whole.

Some of the kinds of work which may be included in these subcontracts are: Clearing and grubbing trees from base of dam; soil stripping from base of dams, levees and borrow pits; surface dressing and grassing of dams; seeding or sodding of levees; trimming slopes of river channels; removal of buildings; excavation for minor drainage systems; construction of levees; excavation and fills for highway construction; rolled gravel paving for highways; waterbound macadam paving for highways; street paving; bituminous macadam, brick, concrete, etc.; guard rails for highways; construction of wire fences; laying vitrified pipe; gutter paving; stone masonry; stone paving; riprap; small concrete structures; road culverts; concrete slope revetment for river banks; concrete blocks for slope protection; setting flood gates in canals and sewers.

Degnon Contracting Company Gets 18-Mile Shandaken Tunnel

The Board of Water-Supply of the City of New York has awarded to the Degnon Contracting Co. the contract for the 18-mile Shandaken tunnel, a portion of the Catskill aqueduct which will connect the Schoharie and Esopus watersheds. The Degnon company was low bidder, with an estimated cost of $12,138,738. The main tunnel section is horseshoe-shaped, 11 ft. 6 in. high and 10 ft. 3 in. wide, concrete lined.

War Department Has Authorized 46,000 Engineer Troops

According to information received by *Engineering News-Record* from the office of the Chief of Engineers, United States Army, the War Department has authorized about 46,000 engineer troops to be used for gas and flame work, mining, water-supply, construction, depot work, surveying, roads, forestry, rail roads, etc. The term "authorized," it is explained, means that the policy has been adopted whereby, at some future time, when the necessity arises, such engineer units will be organized.

At present the following have been ordered raised immediately:

	Men.
1 Regiment, 20th Engineers, Forestry, at American University, Washington, D. C.	1,200
1 Regiment, 21st Engineers, Light Railways, at Rockford, Ill	1,200
1 Regiment, 23rd Engineers, Highways, at Annapolis Junction, Md	1,200
1 Regiment, 25th Engineers, Construction, at Ayer, Mass. (less 1 company camouflage)	1,000
25th Engineers, Construction, 1 company camouflage, at American University, Washington, D. C	200
1 Regiment, 26th Engineers, Supply and Water-Supply, at Wrightstown, N. J.	1,200
Total	6,000

The recruiting officers are now making enlistments for these organizations. Very little difficulty in raising these men is anticipated because the Chief of Engineers now has on lists enough men to fill up these organizations.

Orders will soon be issued calling into active service members of the Engineer Reserve Corps to join the organizations which have been ordered.

"Handy Men" Wanted

"Handy men" having some knowledge in any of the technical work of the new regiments of engineers of the National Army can now volunteer and see active service in France. Young men 18 to 21 are most desirable; in fact, many experienced officers believe that 18-to-21 boys make the best soldiers. The consent of parents is not now required for the enlistment of such. Many parents, noting that their boys are anxious to do their patriotic share in this trying hour, see the wisdom of their volunteering in the engineers, so that when this war is over they will have a mechanical trade such as railroading, house construction, electricity, water-works, bridge work, iron work, sawmill work, mining, etc.

Depot Detachments at Each Camp

Engineer depot detachments at each of the cantonments, such as Camp Dix, Wrightstown, N. J., each consisting of 54 men and helpers (including any married men whose wives sign waivers) have been authorized by the War Department. Applicants are advised to write to the engineer officer at any of the cantonments setting forth qualifications, etc., and applying for card authorizing enlistment. Upon receipt of the card they will then be examined for enlistment at the nearest recruiting station.

Charles Lee Crandall

Prof. Charles L. Crandall, Cornell University, whose death on Aug. 25 was noted in these pages last week, was one of the pioneer professors of engineering in this country. Though only 67 years of age at his death, his term of professorial service was coincident with the life of the university from which he graduated and which he served. For only two years, between 1872, when he graduated, and 1874, was he absent from the faculty of the College of Civil Engineering at Cornell. In 1874 he became an instructor in civil engineering and by the regular course of promotion reached the chair of railway engineering and geology in 1895. In 1902, on the death of Dean Fuertes, he took charge of the college until 1906, at the same time holding his regular chair in



PROF. CHARLES LEE CRANDALL

the faculty. In 1915 he retired from active duty and became emeritus professor.

He early entered the field of technical authorship. In 1886, "Tables for Computation of Railway and Other Earthwork" was published, and in 1888 a second edition appeared. Then followed, in 1893, "Notes on Descriptive Geometry," "Notes on Shades, Shadows and Perspectives of the Transition Curve," and, in 1907, a textbook on "Geodesy and Least Squares." In 1909 Professor Crandall produced a "Field Book for Railroad Surveyors." In 1913 as joint author with Professor Barnes, of Cornell University, he published "Railroad Construction." Besides these [illegible] he was from 1870 to 1891 city engineer of Ithaca, N. Y., where he currently is signaled. An interesting [illegible] on the high regard with which engineering students were held in the early days in the fact that he was appointed to this post while he was a junior in the college.

As his books and the character of his instruction would indicate, Professor Crandall was interested primarily in railroad construction, and in pursuance of that interest he was an active member of the American Railway Engineering Association, serving on a number of committees, particularly on the committee on iron and steel structures, which presented an elaborate report some years ago on the subject to which it was assigned. His services to the college are emphasized by his connection with the alumni. He served as corresponding secretary of the Cornell Society of Civil Engineers, in which capacity he not only maintained a list of all the alumni, with their locations, but also a correspondence bureau which was devoted largely to the employment of the alumni.

No better epitome of his life work could be expressed than the words of the university faculty in a motion at the time of his retirement from active teaching in June, 1915: "What is probably Professor Crandall's greatest usefulness is the result of his high, unselfish character. His whole life has been given to the devoted service of his associates and of his students. Graduates from the College of Civil Engineering have no memories that do not include a feeling of affection and thankfulness to Professor Crandall. Of kindly disposition and practical sound sense, sympathetic in his intercourse with the students, quiet and reserved in manner, but with strong convictions as to fair and justice in any matter brought before him, and always ready to sacrifice personal interest in following the dictates of duties, Professor Crandall has won the warm esteem of all who have come within his influence during his two-score years of service at Cornell."

New Haven Railroad Will Widen South Boston Cut

A contract has been awarded and work will be started at once on the widening of the South Boston cut of the New York, New Haven & Hartford R.R. at Boston. At present all traffic to and from the piers, yards and industries of the South Boston freight district has to pass through a half-mile bottleneck which, though double-track, has insufficient clearance for two trains of present-day equipment to pass. Train movements through the cut average one every three minutes during the day.

The cut will be widened to allow four tracks with ample clearance. Eleven street bridges will be rebuilt, steel being used for the superstructure. The street approaches will in some cases be somewhat raised, while the tracks will be depressed to [illegible] below mean high water. A pumping plant with a discharge capacity of 4000 gal. per min. will be installed to drain the cut.

Estimated quantities include 125,000 cu.yd. of excavation, 20,000 cu.yd. of masonry, 10,000 sq.yd. of street surfacing, 1½ miles of fencing and 2 miles of track. The cost is estimated at $1,000,000 and the work is expected to require eight months.

PERSONAL NOTES

H. A. WOODS, assistant chief engineer of the Grand Trunk Pacific Ry. at Winnipeg for 15 years, has resigned.

O. L. GEARHART is serving as resident engineer on 3½ miles of concrete pavement in Burean County for the Department of Public Works and Buildings, Division of Highways, representing the reorganized Illinois State Highway Department. Mr. Gearhart has just finished 10 miles of earth-road improvement in Stark County.

S. B. TAYLOR, who has been engaged in logging engineering work since 1912, with offices at Dallas, Ore., is constructing a 30-mile logging road for the Pelican Bay Lumber Co., of Klamath Falls, Oregon.

SLOAN, HUDDLE, FEUSTEL & FREEMAN, consulting engineers, of Chicago and Boston, announce that on Sept. 15 their general offices in Madison, Wis., and their local office in the Peoples Gas Building were removed to the Conway Building, Chicago. WILIAM F. SLOAN has assumed personal charge of the Eastern office at 14 Kilby St., Boston, as resident partner.

EDWARD J. LANGFORD, chief engineer of the New York, Westchester & Boston Ry., has been commissioned a major in the Engineer Officers' Reserve Corps.

MORGAN T. GUM, of Frankford, Del., formerly road engineer of Sussex County, Delaware, has accepted a position with the State Highway Department. Mr. Gum is succeeded by WILLIAM E. HAWKINS.

HARRY E. BYRAM has been appointed president of the Chicago, Milwaukee & St. Paul Railway.

W. J. JAMIESON has resigned as assistant engineer of the United Verde Copper Co., Clarkdale, Ariz., to accept appointment by the Governor of Arizona as engineer member of the Commission of State Institutions, with headquarters at Phœnix. Appropriations by the last legislature called for a considerable amount of construction work to be done under the supervision of this commission.

GUY H. CHASE, commissioner of streets, sewers and engineering, of Fitchburg, Mass., has resigned to devote his entire time to private practice. Mr. Chase is a member of the firm of Parker, Bateman & Chase, civil engineers, of Fitchburg, Ayer and Clinton, Massachusetts.

IRA DYE has been appointed night superintendent of the Weir Frog Co.'s shop at East Norwood, Ohio.

D. A. WATT, formerly principal assistant engineer in the United States Engineer Office, Albany, N. Y., has left that work for active duty in the office of Chief of Engineers, Washington, D. C., having been commissioned a major in the Engineers Officers' Reserve Corps.

C. H. FOOTE has returned to El Paso, Tex., after an absence of several years, during which period he was associated with the engineering department of the El Paso & Southwestern Ry. as inspector of bridges and buildings. Mr. Foote also built several highway bridges for the State of Arizona. He has now established a general contracting business, with headquarters at El Paso.

S. BUFFINGTON has been appointed resident engineer of the Kansas City, Mexico & Orient Railroad Co., to take the place left vacant by the resignation of H. B. HOLMES, chief engineer, who has become associated with Coverdale & Colpitts, of New York City. Starting as a rodman, Mr. Buffington has been connected with the Orient Lines since 1907.

E. H. MORRIS has resigned his position as assistant engineer, maintenance-of-way, with the Evansville & Indianapolis R.R., to accept an appointment on the engineering staff of the Public Service Commission of Indiana, with headquarters at Indianapolis.

HERBERT COHEN, for eight years superintendent of construction, United States Public Buildings, has been transferred to the War Department as superintendent of construction, Signal Service at Large, taking charge of the design and construction of the aviation station near Honolulu, work upon which is now being commenced.

H. J. WILD has given up his work as professor of engineering, Pennsylvania Military College, and is now on active duty as captain in the Engineer Officers' Reserve Corps. He is serving as instructor at the Plattsburg training camp.

HOLTON COOK has been appointed resident engineer for the Fargo Engineering Co. on the construction of the Foote Development of the Consumers Power Company.

M. A. STAINER has been promoted from assistant engineer of the Gulf, Colorado & Santa Fe Ry. at Galveston, Tex., to roadmaster of the Beaumont division, with headquarters at Center, Texas.

R. A. CONARD, for several years past superintendent of the Sewer Department, Jacksonville, Fla., has been appointed civil engineer, with the rank of lieutenant, in the United States Naval Reserves, and has been detailed for special duty in Haiti. He was formerly connected with the Sewer Department at Washington, D. C., and served two and a half years on the construction of the Panama Canal.

JAMES NISBET HAZLEHURST has resigned as chairman of the Board of Consulting Engineers for the City of Atlanta, Ga., and from the chairmanship of the executive committee of the Affiliated Technical Societies of Atlanta and the State of Georgia, on the expectation of leaving shortly for duty with the American Expeditionary Force in France.

ROBERT J. PHILLIPS has resigned from the department of designs of the American Steel Co., Havana, Cuba, to enter the Officers' Reserve Corps training camp, Plattsburg, New York.

CAPT. HENRY L. BOWLBY, formerly state highway engineer of Oregon and of Washington, has been appointed senior highway engineer of the Office of Public Roads and Rural Engineering, Washington, D. C. His headquarters will be in Denver. Captain Bowlby is a West Point graduate, although he did not enter the army. He has since been commissioned captain in the Engineer Officers' Reserve Corps. For several years he served as professor of civil engineering at the University of Washington. He was state highway engineer of Washington from 1909 to 1911, and state highway engineer of Oregon from 1913 to 1915.

J. E. ROBERTSON, at present professor of highway engineering in the Missisippi State Agricultural College, and who for the past three summers has been in charge of road construction in Shelby County, Illinois, has been appointed road engineer for this county, vice MURRELL MIDDLETON.

ALEXANDER L. LUCAS is at present civil engineer and superintendent of construction, United States Quartermaster Corps, Ft. Douglas, Utah. Mr. Lucas served during the Civil War in the regular army, and then was attached to the headquarters of the Fifth Military District, Austin, Tex., as topographical engineer from 1869 to 1871. He then became bridge engineer of the Guatemala Central Ry., Central America, in 1893, leaving his work to become United States assistant engineer in 1896, with headquarters in San Francisco. Mr. Lucas was engineer in charge of the exploration, Isthmus of Darien, South America, for the Isthmian Canal Commission, in 1900, having headquarters at Cartagena, Republic of Colombia. In 1911 he became bridge and designing engineer of the Bureau of Public Works, Porto Rico, and in 1910 bridge and designing engineer, Compania Ferrocarril, Nov.-Oestre de Mexico, with headquarters at Nueva Casas Grandes, Mexico. From 1911 to 1916 he was in private practice as bridge engineer, which work he gave up to take the position mentioned above.

J. HAMPTON BAUMGARTNER, publicity representative of the Baltimore & Ohio R.R., has resigned to become assistant to S. Davies Warfield, president of the National Association of Owners of Railroad Securities.

C. E. HARRIS, of the contracting firm of Harris & Griffin, Norwich, N. Y., is at present at Linden, N. Y., in charge of the construction of sewage-disposal work at the Genesee County Home.

Engineer Officers' Reserve Corps Assignments

The following-named officers of the Engineer Officers' Reserve Corps now on duty at the engineer training camp, in the vicinity of Washington, D. C., are relieved from duty at that place and will report at the proper time at the divisional training camps indicated below for duty with the engineer regiments and engineer trains of the National Army at those places:

To Annapolis Junction, Md.

First Lieuts. Daniel M. N. Turner, John E. Hoffman, Robert S. Glose, Andrew M. Stevenson, Charles Weiss, Andrew E. Bryans and William F. Schwerin.

For assignment to the Three Hundred and Fourth Engineer train, Annapolis Junction, Md.: First Lieuts. Edward T. Collins and Clinton W. Morgan; Second Lieuts. Samuel R. Hursh, James R. Wilson and Edward A. Hill.

To Petersburg, Va.

For assignment to the Three Hundred and Fifth Engineers, Petersburg, Va.: Majs. Arthur A. Reimer and Elihu H. Ropes; Capts. George F. Hobson, Irving P. Kane, Joseph T. Kelly, Jr., J. Vinton Birch, Vinton D. Cockey, Myron H. Peck, Howard H. George, Alexander C. Knight, George W. Knight, William R. Grunow and Graham B. Bright; First Lieuts. Samuel H. Sherrerd, Case B. Rafter, Robert C. Levis, Matthew J. Hoff, Frank Lloyd Weaver, Caleb S. Kenny, Donald S. MacBride, J. Camden Brady, Irl D. Brent, Charles W. Chesley and Ward H. Ream; Second Lieuts. Alexander W. Yereance, Charles Lee Packard, Wilson T. Ballard, Edward M. Stuart, Rush F. Miller and Anson S. Hathaway.

To be attached to the Three Hundred and Fifth Engineers, Petersburg, Va.: First Lieuts. Henry B. Ross, Herbert R. Haar, Merritt T. Cooke, Jr., Perry S. Abell, Willard W. Troxell and Marshall W. McDonald; Second Lieuts. Fred G. Rockwell, Kenneth B. Jones, Harold F. Bucher, Charles R. Martin, Karl J. Eisenhardt, James N. Gregory and Henry H. Mapother, Jr.

For assignment to the Three Hundred and Fifth Engineer train, Petersburg, Va.: Capt. Thomas J. Powell; First Lieuts. Russell A. Warner, Jacob Shlessinger and Clift Hornwall; Second Lieuts. John T. Morgan and Robert F. Kohr.

To Columbia, S. C.

For assignment to the Three Hundred and Sixth Engineers, Columbia, S. C.: Majs. William M. Lamson and Thatcher T. P. Luquer; Capts. Thomas C. Clarke, Charles D. P. Robinson, Richard W. Berliner, George H. Bunker, Stewart Mitchell, Wylls H. Taylor, James G. Ross, Thomas H. Allen, Herbert C. Whitehurst, Cambridge M. Trott and Arthur C. Forbes; First Lieuts. Harry B. Vaughan, Jr., Carl L. Raymond, Lois L. Adams, James D. Andrews, Jr., Thomas E. Snook, Jr., Carl W. Mengel, John A. Martin, John R. Stewart, Orton B. Stauffer, Samuel P. Graves, John T. Lynch and Ellison S. McKissick; Second Lieuts. Ralph Millis, George M. Dillingham, Lloyd D. Knapp, David L. White, Walter Carter and Blight S. Robinson.

To be attached to the Three Hundred and Sixth Engineers, Columbia, S. C.: First Lieuts. Francis W. Chapman, Ambrose Harwell, James C. Fitz Simmons, Clarence B. Cooper and Albert T. DeRaum, Jr.; Second Lieuts. Landon E. Rosser, Ruel E. Nottingham, William E. Mathews, Leonidas P. Denmark and Charles P. Townsend, Jr.

For assignment to the Three Hundred and Sixth Engineer train, Columbia, S. C.: Capt. James R. Crocker; First Lieuts. Page B. Blakemore and Charles C. Lynde; Second Lieut. George F. Lynde.

To be attached to the Three Hundred and Sixth Engineer train, Columbia, S. C.: Second Lieuts. Julian Loebenstein and Charles S. Boyce.

A. MARSTON, dean of the School of Engineering, Iowa State College, has been commissioned major and placed in command of the Iowa Engineer Troops (First Battalion, Iowa Engineers) and has been mustered into the Federal service. Major Marston is now located at Camp Dodge and is concerned with the engineering required in the construction of the camp. MORRILL W. MARSTON, his son, has been commissioned second lieutenant in the regular army, and is now with the 40th Infantry Regiment.

HENRY F. BLOOD, for some years chief examiner of plans of the City of Portland building department, will have charge of the structural features of the new 1,000,000-bu. elevator to be built by the Commission of Public Docks. The mechanical equipment will be designed by J. M. WITHERSPOON, consulting engineer, Chicago.

J. F. GIBSON, formerly principal assistant engineer of the American Pipe and Construction Co., Philadelphia, has been elected manager of the city water department of Charleston, S. C. Mr. Gibson will assume his duties when the property of the Charleston Light and Water Co. is transferred to the city. Mr. Gibson is familiar with the waterworks at Charleston, having assisted in the design, construction and testing of all the equipment of the Goose Creek plant. He also assisted in the original investigation to determine the methods and procedure to be followed in the treatment and filtration of this water, and has kept in constant touch with the property since that time. Graduating from the University of Arkansas in 1904, he was assistant engineer with Jay M. Wilson, consulting chemist and bacteriologist, Philadelphia, until 1908. Upon his return to the Moro Phillips Chemical Co., Camden, N. J., as mechanical engineer of power-plant construction, he became superintendent and engineer of the Waukesha Water-Works Co., which was owned and operated by the American Pipe and Construction Company.

FRANCIS W. BLACKFORD and FRANCIS J. TAYMAN have opened an office for general practice as mine and civil engineers at Miami, Okla. Mr. Blackford was for four years chief engineer of the Cerro-Pasco Mining Co., in Peru, South America, and later on railroad and mining work in Mexico and Central America. Mr. Tayman has spent the last two years in the lead and zinc district of southeastern Missouri, and previously was engaged for 12 years in mining work in Mexico.

DR. A. W. FREEMAN has secured release from his connection as epidemioligist with the United States Public Health Survey at Cincinnati, where he is directing a sanitary survey of the Ohio Valley, to accept the appointment as health commissioner of Ohio.

GEORGE W. GRAFF, assistant engineer with the Pitometer Co., is now in Buffalo working to reduce the excessive water consumption. Previously to his connection with the Pitometer Co., Mr. Graff was chemist in charge of the filter plant at Troy, N. Y., and acted as inspector for the Water Department during the construction of additions and alterations to that plant during the last year.

WILLIS E. HAYES, superintendent of construction, Treasury Department, has been commissioned major in the Engineer Officers' Reserve Corps.

RALPH W. OSBALDESTON, who was superintendent of public works at Atlantic Highlands, N. J., has been elected city manager of Westerville, Ohio, to succeed R. F. BLINN, resigned.

O. E. LACKEY, resident engineer of the Southern Ry. at Old Fort, N. C., has been promoted to superintendent engineer, with office at Washington, succeeding M. F. NORTHAM, resigned.

J. M. SALMON, recently general manager and engineer of the Louisville Bridge and Iron Co., Louisville, Ky., and before that assistant bridge engineer of the Louisville & Nashville R.R., has been appointed bridge engineer of that railroad. He succeeds E. A. BYRAM, resigned to enter military service.

M. C. WELLBORN, city engineer of Austin, Tex., has resigned to accept the position of division engineer with the Texas State Highway Department, succeeding DUKE A. DEBEE, resigned.

W. W. MAYBORN, formerly assistant engineer with J. F. Stevens, of Chicago, is on his way to Europe for service with the aviation section of the United States Army. He has the rank

of first lieutenant. Until about 18 months ago he was an assistant engineer with the Sanitary District of Chicago. More recently he was engaged on the construction of Camp Custer, the cantonment at Battle Creek, Michigan.

H. T. FROST, of Chicago, is assistant to E. H. BENNETT, consulting architect for the United States Army cantonment at Rockford, Ill. He is in direct and responsible charge of the work on the ground. The construction of this cantonment, known as Camp Grant, was described in *Engineering News-Record* Aug. 30.

HOWE & WISE, Houston, Tex., have been retained as consulting engineers to Harris County, in which Houston is located, to advise with W. N. Thatcher, county engineer, as to the expenditure of $1,100,000 bonds voted this spring and recently sold. Concrete roads will be constructed with $100,000; the remainder will go to treat 215 miles of shell and gravel roads with a bituminous top of some kind not yet determined upon.

OBITUARY

LIEUT. MONTGOMERY ARNOTT, formerly in the employ of the Edmonton, Dunvegan & British Columbia Ry., Edmonton, as a civil engineer, was recently killed in action in France.

HENRY B. MCINTIRE, of Wilmington, Del., formerly chief engineer of the Water Department of that city, died Sept. 11. His early work was on construction of the Philadelphia, Baltimore & Washington Railroad.

Notes from

MAKERS OF PLANT AND EQUIPMENT

E. B. Hotchkiss, of the American Steel Export Co., sailed Aug. 28 for France. Mr. Hotchkiss will visit France, Italy and Spain in connection with a number of large engineering problems. Incidentally he will make certain investigations in these countries for the American Steel Export Co. and also act as a special representative of its engineering department in that part of the world. Mr. Hotchkiss resided in France and Belgium for over 19 years. During this time he had charge of a large number of very important engineering works.

J. B. Beall, for the last two years manager of factory sales for the Wayne Oil Tank and Pump Co., of Fort Wayne, Ind., has been assigned to the management of a new branch office located at Cleveland, Ohio. J. D. Rauch, formerly treasurer of the American Steel Dredge Co., of Fort Wayne, Ind., and for the past two months employed as engineer by the Wayne company, has been appointed manager of factory sales. Three additions have just been completed by the Wayne company, doubling the former floor space, and four acres have recently been purchased immediately west of the main office building for an addition to the heavy metal tank shop.

B. F. Devine has recently been made assistant advertising manager of the Chain Belt Co., Milwaukee. Mr. Devine is at present assistant manager of the mixer department. He will hold these two positions. Mr. Devine has been



B. F. DEVINE

with the Chain Belt Co. for nine years and has worked his way up from the shop to his present position. He has been traveling from Cleveland to Denver for the past three years for the company, pushing Rex products and Rex mixers.

E. Jordan, of Toronto, has been appointed chief engineer of L'Air Liquide Society, with headquarters at Montreal. He succeeds E. Royer, who recently resigned.

The Wyckoff Pipe and Creosoting Co., Inc., New York, is furnishing several hundred thousand feet of creosoted wood conduit for carrying underground wires of the New York, New Haven & Hartford R.R. The Wyckoff company has also furnished over a million feet of conduit to the Bell telephone companies this year for wires underground.

Norman R. McLure, for the past three years chief engineer of the Phoenix Iron Co., of Phoenixville, Penn., has resigned that position and formed a connection with the Taylor-Wharton Iron and Steel Co., of High Bridge, N. J. Mr. McLure will assist for the time being in the construction and operation of the extension to the plant of the Tioga Steel and Iron Co., a subsidiary in Philadelphia in which the ordnance contracts recently taken by the company from the United States Navy Department will be executed.

The Universal Concrete Products Co., 208 South La Salle St., Chicago, has the following new officers, elected by the board of directors on Sept. 17: President, C. F. Massey (who is president of the C. F. Massey Co., makers of concrete pipe, etc.); vice president, T. W. Siemon (connected with the Union Switch and Signal Co.); treasurer, F. V. Shannon. The company's principal specialty is hollow-concrete poles. These are made by the centrifugal process described in the *Engineering News-Record* of May 24.

TRADE PUBLICATIONS

Troy motor truck trailers are described and illustrated in a new bulletin issued by the Troy Wagon Works Co., Troy, Ohio.

The Chain Belt Co., Milwaukee, Wis., has issued Bulletin No. 77, descriptive of the smaller sizes of Rex concrete mixers, also Rex pavers.

The Worthington Pump and Machinery Corporation, 115 Broadway, New York, is sending out Bulletin W-602 on turbine pumps for high-head service.

Knudsen packless swivel joints are described in a booklet issued by the Universal Valve Co., Burlington, Iowa.

The Venturi Department of the Builders Iron Foundry, Providence, R. I., has issued Bulletin No. 143, showing the construction of the Venturi meter tube and the material used.

"Metal Lath Hand-Book," published by the Associated Metal Lath Manufacturers, Youngstown, Ohio, contains a large amount of data on metal lath and its uses. It is designed to place concisely before architects and contractors the best methods of using metal lath. The price of the book is $1.

The Detroit Graphite Co., Detroit, Mich., has issued a bulletin on complete maintenance painting specifications for manufacturing plants, storage buildings and power houses which are in operation, and ought to be of value to superintendents, engineers and others in charge of building maintenance.

The Edwards Manufacturing Co., Cincinnati, Ohio, has isued a four-page folder describing how Edwards rolling doors of galvanized iron saved a quantity of material and cars during a fire at a pier in Philadelphia of the Baltimore & Ohio Railroad.

The Waldo Hardness Tester, for testing the hardness of metals under conditions of service, is described in a pamphlet recently issued by the Palo Co., 90 Maiden Lane, New York City.

The Municipal Supply Co., of Chicago, has issued a folder describing the Directograph recording meter, claimed to be the only meter that records the flow of water with a continuous and permanent ink line, thus giving a complete and immediately available record of velocity, quantity, pressure and output. The company is also featuring, in its literature, a new type of tapping connection which, it is said, the City of Chicago has used for more than seven years to cut the cost of tapping water mains.

The National Lime Manufacturers' Association has published in the form of bulletins addresses by Miss Frances Kellor on "The Americanization of Workmen Around the Lime Plants" and by H. J. Russell on "The Necessity for Lime Manufacturers to Stop Cutting Prices and Get More for Lime."

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Road Builders!

The National Army Needs You—*Now!*

Engineering News-Record has been called upon by the Commanding Officer of the Twenty-Third Engineers, National Army, to mobilize the road-building engineers and contractors of the country in a Nation-wide drive to secure experienced men for the new highway construction regiment of 10,500 volunteers, now being formed for immediate service in the war zone of France.

In the new regiment no pick and shovel men are wanted; the heavy manual labor will be done by German prisoners and service battalions. Recruits must be experienced in some line of road construction, or mechanics skilled in operating road-building plant. A limited clerical staff also is needed. Further details will be found in the official statement on the following page.

Everybody Can Help

(1) If you are qualified by experience for active service fill in and mail the blank form on the next page.

(2) If not qualified for enlistment get at least one man to volunteer. You can be of immense help in this way even if you yourself are too old to serve.

(3) Get this announcement printed in your local newspapers. *This is exceedingly important.*

(4) Have your local engineering society form a recruiting committee. Call a special meeting to get action at once.

(5) *State and city officials*—Carry the recruiting campaign to contractors who are doing your work.

(6) *Contractors*—See that a few men of your organization respond to this call.

(7) Use this page as a poster in your office, or ask us for reprints.

Load Must Be Distributed

Every contractor can contribute a *few* men without disrupting his organization. Do your share. Show that the nation's engineers and contractors, who opened the eyes of the world by the record-breaking construction of the Army cantonments, can also man this new highway unit with the pick of the construction men of America.

If every one puts his shoulder to the wheel the volunteers needed will be secured over night, *and no single job or organization will suffer.*

Mature Men Needed as Bosses

For men under 40 with the proper road-building experience, the prospect for promotion to non-commissioned and special ranks is excellent. Practically all construction men, who have the ability will be assigned, *not as Laborers, but as Bosses of gangs, which will include German prisoners.*

Men of Draft Age Acceptable

Even if within the draft age limits you can volunteer for the highway regiment if you have not already been called by your local board.

You can *not* volunteer if you have been called in the draft, or exempted.

You must be in good physical condition.

Your Opportunity

Here is your opportunity to help the Country along the lines of your specialty. We know that the Nation will not call upon its Road Builders in vain.

Read on the following page the official message from Colonel E. N. Johnston, commanding the 23rd Engineers, to readers of Engineering News-Record.

Experienced Highway Construction Men
for Service in France

[THIS STATEMENT IS AUTHORIZED BY COLONEL JOHNSTON, COMMANDING THE 23RD ENGINEERS]

Men who have had experience in any branch of road construction are offered an opportunity to see early service in France in special road-building battalions of the United States Army by recruiting plans here announced. These battalions will be required to repair and maintain the highways near the fighting front, over which tremendous traffic is operated continuously. They will also build new strategic highways in the war zone. Consequently, these troops, all volunteers, will be in the thick of the greatest activities.

The new battalions are constituted as regular military units and as a part of the regular army organization. They are fully armed and will be required in emergencies to fight along with other troops. Generally, however, they will be occupied with road work.

The battalions will form a part of the 23rd Regiment of Engineers of the new National Army. This regiment will eventually have a strength of about 10,500 men—more than an ordinary brigade—and will, so far as is at present known, be the largest in the army. It will be commanded by Col. E. N. Johnston of the Corps of Engineers, U. S. A.

Many Worth-While Jobs

There will be more highly-paid and high-ranking non-commissioned officers in the regiment, it is believed, than in any other. There will, therefore, be more openings for men of education and practical experience than is usually the case.

The organization of the battalions is as nearly the same as that of large contracting forces as is feasible. Modern road-building machinery has been fully provided, including rock-crushing plants, steam shovels, road rollers, tractors, graders, motor trucks and pumps. A full line of dump wagons, wheel and drag scrapers and similar dirt-moving equipment also will be available. Shops for the repair and maintenance of all the plant and equipment will be operated close to the front.

Much of the plant used on road work in America is new to European engineers, while the methods also are quite different from those used abroad. A great opportunity is thus offered to demonstrate what skilled Americans can do with modern equipment, and the regiment which is now being recruited must include men to operate the necessary construction plant, to man the shops and, as non-commissioned officers, to handle the forces.

Who Can Qualify

For the non-commissioned officer positions men are required who can qualify in private life in the following lines: Superintendents and assistant superintendents of highway, bridge and quarry work, of mechanical plant and of transportation; chief clerks, material men, stock men, timekeepers; foremen for concrete, road, bridge and quarry work; powder men, riggers, carpenters, iron workers, surveyors and draftsmen.

For the enlisted personnel it is desired to secure men skilled and experienced in one or more of the following occupations: Surveyors, draftsmen, clerks, stenographers, axmen, blacksmiths, blacksmiths' helpers, machinists, gas-engine operators and repairers, crusher operators, hand driller, drill runner (air drills), quarrymen, powdermen, masons, teamsters, pile-driver operators, concrete, form, road and bridge men; tractor operators (gasoline), grader operators (blading and elevating graders), bridge carpenters, motor-truck drivers, chauffeurs, cooks, motor-truck and automobile repair men, pipe fitters, electricians, horseshoers, tailors, shoemakers, musicians (bugle, fife or drum), mechanics, telephone operators, steamfitters, tool sharpeners, ditchers, boatmen (builders and caulkers), shovel runners (gasoline), barbers, veterinarians, French interpreters, bituminous road men, iron workers, riggers, general utility men capable of driving automobiles, motor trucks and all types of gasoline-driven machinery.

Any male American citizen between 18 and 40 years of age, and who has not actually been called by a local board in the draft, is eligible for enlistment in these special battalions, if acceptable physically. All men must first enlist as privates, the rate of pay being $33 per month and expenses. Men with the necessary experience may be assigned to special duties and given non-commissioned rank at rates of pay ranging from $40.20 to $96.00 per month and expenses. The latter include, for both privates and non-commissioned officers, food, clothing, medical attendance and transportation. Those who enlist will be eligible immediately for promotion, according to their ability and as openings occur. Men who are specially well qualified and recommended will be given definite promise of advancement to higher grades when their enlistment is authorized.

Officers are Specialists

Colonel Johnston, who will command the regiment, was graduated from the United States Military Academy at West Point at the head of the class of 1901. After service on road and bridge work in the Philippine Islands and river and harbor work in the United States, he served as an instructor at West Point and as an assistant to the Chief of Engineers at Washington.

The first two battalions are commanded by Majors I. C. Moller and Henry H. Stickney. Major Moller received his engineering education in France. He has been engaged exclusively in highway work for the last ten years, and for three years has been chief engineer for an American company doing road work in all parts of the world. In this capacity he has been called upon to act as consulting engineer for the governments of almost every Central and South Amreican republic.

Major Stickney was educated at Clarkson College of Technology, Potsdam, N. Y. Since 1906 he has been engaged on state highway work in New York and on the New York State Barge Canal. He has also had considerable experience as consulting engineer in road and water-supply construction. He is a graduate of the Engineer Officers' Training School at Fort Leavenworth and a member of the New York State National Guard.

Captain F. S. Skinner, regimental adjutant, is a graduate of the United States Military Academy. Thus the regiment will be under the direction of those who have fully demonstrated their ability in highway and construction work.

Full information regarding steps that must be taken to enlist in this regiment may be secured from the Commanding Officer, 23d Engineers, National Army, 1419 F. St., Washington, D. C., by mailing the following information to him.

Fill in This Form, by Typewriter if possible, and Mail Today, to

COMMANDING OFFICER, 23rd ENGINEERS, NATIONAL ARMY,
1419 F Street, Washington, D. C.

(1) Name ..... (2) Address .....

(3) Age ..... (4) Nationality .....

(5) Married or single..... (6) Have you been called in the draft?.....

(7) Will you enlist for period of the War?..... (8) State briefly your road-building or other construction experience .....

.....

(9) What machinery can you operate?.....

(10 Your present or a former employer must certify to your qualifications by signing here.....

....

SIGNATURE OF EMPLOYER EMPLOYER'S ADDRESS FOR TELEGRAMS

Congressional Controversy Over Definition of Costs

A CONTROVERSY arose in Washington a short time ago of grave importance to every one furnishing material or executing contracts for the Federal Government. It has been apparent for some months that a marked difference of opinion has been growing concerning what should be considered the true cost of materials or services. Different departments of the Government have not agreed concerning this, as was shown some weeks ago when a standard price for coal approved by one department was peremptorily rejected by another. Inasmuch as a large amount of work is being done for the Government on the basis of cost plus a percentage for profit, or is being done under compulsion by commandeering, the price to be fixed later by the Government, this subject of true cost has suddenly become one affecting the entire country. A large part of our population is now engaged in work for the Government, and the success or failure of those responsible for this work will depend upon whether or not the Government decides to adopt these views of cost which are held by men engaged in successful business.

The surprising feature of this situation is the fact that Congress stated very clearly in Section 302 of the Income Tax Law of Sept. 8, 1916, what the true cost of a manufactured product was. The purpose of Congress at that time was to establish the net income of a manufacturing corporation which should be taxed. Manifestly it would insert in that statement of cost nothing which was questionable, for the larger the cost is fixed under the terms of the law the smaller is the taxable income. The statement has since been written into various cost-plus-percentage Government contracts.

The trouble arises over the subject of interest. In the law it is stated that costs shall include "interest paid within the taxable year on debts or loans contracted to meet the needs of the business and the proceeds of which have been actually used to meet such needs." In the contracts this wording was changed to read: "A reasonable rate of interest on a proper proportion of the investment in plant, facilities, inventory and working capital not owned or provided by the Government." Most large manufacturing companies have an outstanding bonded indebtedness incurred to provide buildings and equipment for carrying on this work. The interest charges on this indebtedness are admitted in the income tax law to be a part of the cost of manufacturing, but certain members of Congress disagree with this view.

The trouble is unquestionably due to the fact that there is not a universally accepted clear, concise statement of what must be considered the true cost of carrying on work. Certain economists insist that costs must include a certain interest on the capital engaged in the work. They hold that if capital is invested in high grade bonds it will earn a certain amount of interest without any supervision by its owners, and consequently it is not until that interest is earned that true profits begin to accrue.

It is clear to those who have followed this recent controversy that both sides are acting in good faith. The difference of opinion was bound to arise and now that it has arisen it should be settled immediately. The United States will make many more contracts on a cost-plus-percentage basis, for that system of contracting is far superior to any other for emergency work. The time has come, therefore, when the protection of the Government and fair play to our manufacturers both demand an immediate settlement of this controversial subject. There are certainly enough able men in the departments at Washington and enough of the leading manufacturers of the country in that city, giving their time without charge to the Government for various purposes, to enable the House committee on appropriations to obtain in a few days, from a commission appointed from these authorities, a succinct statement of the elements that must be included in any determination of true cost. If something of this sort is not done at once very serious complications will arise which may cause, through financial difficulties, grave interruptions in services greatly needed at this time.

A Discussion of Water-Works Valuation Well Worth Reading

SELDOM have *Engineering News-Record* or its predecessors had the opportunity to present a more carefully developed discussion of water-works valuation than that by J. W. Ledoux on p. 633 of this issue. The author takes the entirely rational view that the use of the valuation should determine the method employed. He advocates three totally different methods, based respectively on original cost, reproduction cost and market value, for three principal purposes of valuation. All three methods are carefully analyzed by him, and he visualizes his argument by developing the three valuation figures for the same assumed plant. With three methods that have so little in common the closeness of the three totals—$241,170, $276,744 and $244,830—is surprising. It would not always work out thus.

If this journal were to take issue with the author it would be on his use of original cost as the basis for ratemaking. This prevents the utility from sharing in the general prosperity of the community it serves. There is, of course, a vast difference between a railroad in open competition with others, and a water-works plant with a protected monopoly. *Engineering News-Record* has no doubt that the railroad should have the benefit of the so-called unearned increment. But even in the case of the water-works plant there seems good reason for basing rates on reproduction rather than original cost. It is hard to determine whether the plant has been judiciously constructed and operated, and it seems more equitable as well as simpler to consider what the identical plant, including the development of business, would now cost, irrespective of whether the actual investment and development cost were higher or lower.

So many free lances have taken their fling at the valuation problem that it is frequently suggested that the only way to keep a clear mind on the subject is to disregard every new discussion that comes out. This does not apply at all to the author's paper. Quarrel though we may with parts of his reasoning, he has given us a most thoughtful and clear discussion of water-works valuation, and all in any way interested in the subject are urged to read the article carefully.

St. Paul-Minneapolis Dam and Locks Are Now Completed

Head of Navigation on the Mississippi Moved Up Thirteen Miles—End of Three-Year Battle Against Floods—First Work Altered To Make 15,000 Horsepower Available

THE NEW Mississippi River lock at St. Paul and Minneapolis was opened for traffic on July 3, 1917, and the head of navigation extended from St. Paul to Washington Ave., Minneapolis, a distance of 13 miles. After one lock and dam of the original scheme (requiring two locks and dams) had been completed (May, 1907), the project was modified to permit developing water-power. Both power and navigation works have original features of unusual interest. Since the new construction was started heavy floods and very cold weather have conspired to interfere.

The original government project for improving the Mississippi between St. Paul and Minneapolis, adopted



FIG. 1. TWO LOCKS AND DAMS RAISE THE HEAD OF NAVIGATION THIRTEEN MILES

in 1894, provided two locks and timber crib dams of approximately 13½ ft. lift each and 2.88 miles apart. (See Fig. 1.) Lock and dam 2 (the upper works) were completed and in operation by May, 1907, giving navigation between St. Paul and Minneapolis at least two months in the year. Lock 1 was completed in 1909, but no work was done on the dam. At that time it was decided to modify the plans to permit developing power.

The plans as now carried out, approved by the River and Harbor Act, June 25, 1910, provided for abandoning lock and dam 2; for remodeling lock 1 for a 30-ft. lift by increasing its height and cross-section, demolishing its floor and building another one 5 ft. lower; for constructing a hollow dam 568 ft. long, of a modified Ambursen type, with eight sluice gates, each 6 ft. square, at the power-house side, and a power-house foundation 112 x 160 ft., and for installing either horizontal or vertical turbines to develop 15,000 hp. (see *Engineering News*, Nov. 12, 1914).

Fig. 2 shows the cross-section of the modified lock and the new position of the floor. The lock floor was a solid underdrained slab 3½ ft. thick, reinforced with 1-in. square rods every 6 in. transversely and every 3 ft. longitudinally. When the demolition of the lock floor, which was 80 x 325 ft. and 3½ ft. thick, was decided upon, a test of its strength was made so that the engineers might check their calculations. This was done by raising the head of water under the floor. A failure at 15.7 ft. head occurred under the lower miter sill; the original computations gave the ultimate load as corresponding to 14.5 ft. (For a description of the test by Adolph F. Meyer, Consulting Engineer at that time in Government service, see the *Journal* of the Association of Engineering Societies, 1913.)

To remove the floor, holes were drilled 1½ ft. apart in lines across the locks at 3-ft. spacing. The holes were sunk to a depth of 3 ft. with a steam drill. Light explosive charges broke the floor into sizes which could be handled by the cableway. One ½-lb. stick of 40% dynamite was used near the walls and two ½-lb. sticks near the center. The center was exploded first and those near the wall last. The reinforcement was cut by oxy-acetylene gas. The cost of removing this floor, about 5000 cu.yd., was $2.62 per cubic yard.

The dam consists of 36 buttresses faced with pre-molded reinforced-concrete beams weighing 5 tons each. There are 19 of these beams on the upstream side and eight on the downstream face. The roll or crown was cast in place with expansion joints at every other buttress. The beams were handled by carrying loops, embedded in the concrete, so placed that when suspended from the cableway they swung into position without twisting. Thin wood fillers were placed at their ends and the anchor loops were wound with oakum to provide for beam expansion. The beams are 15 ft. 3 in. long, and the 9 in. between them was filled with grout.

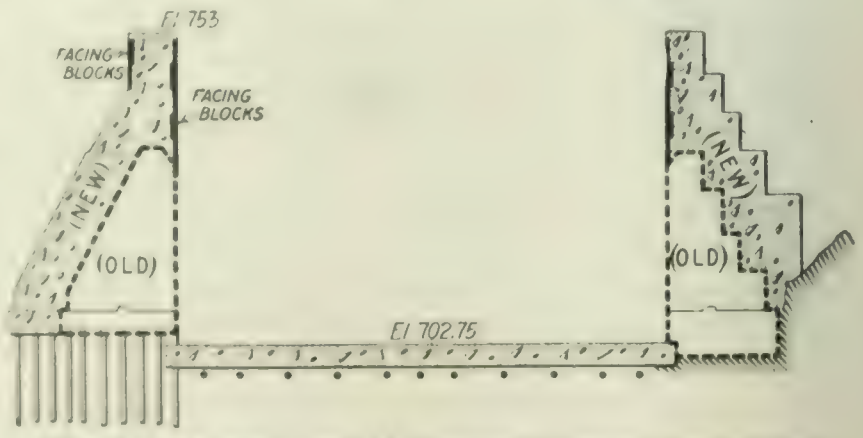
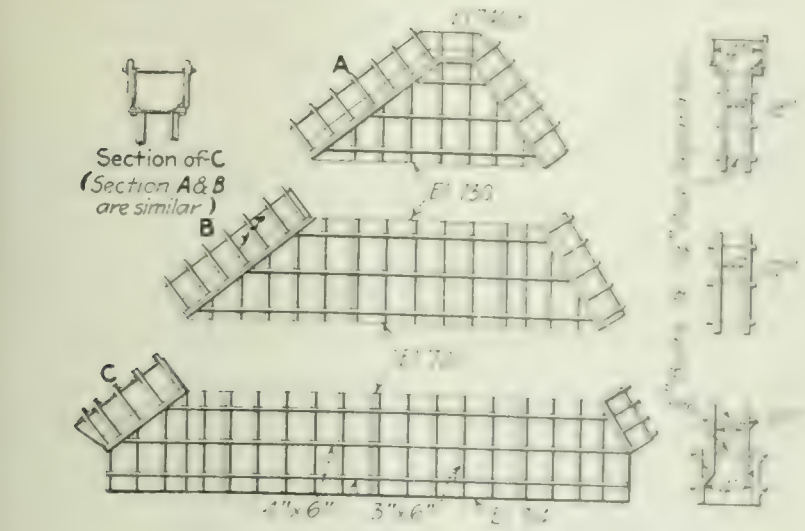
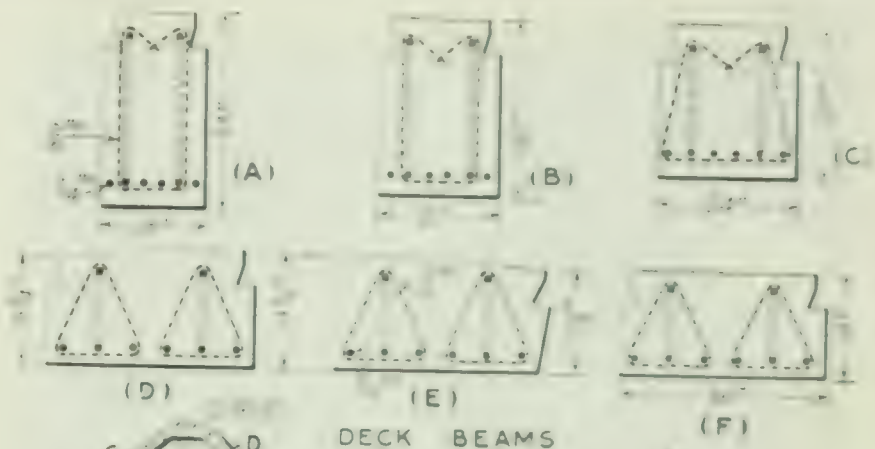


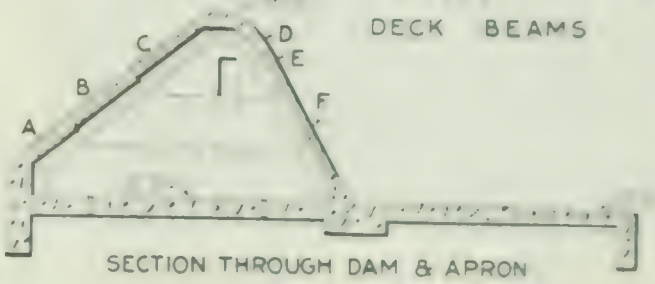
FIG. 2. ORIGINAL WALLS WERE RAISED AND MADE THICKER



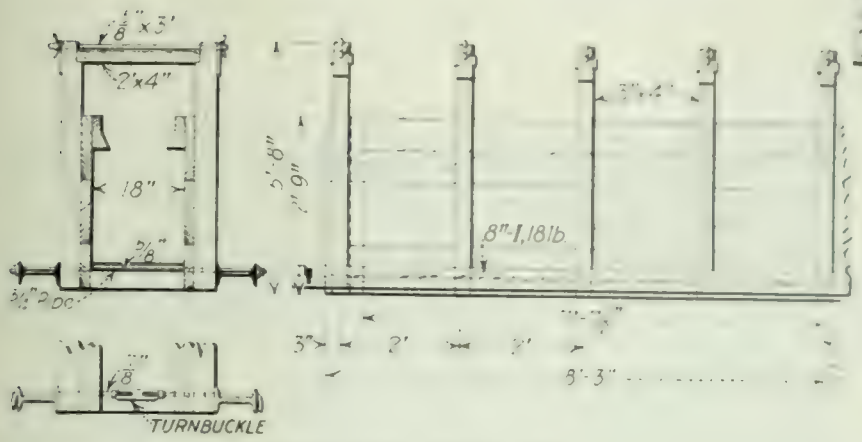
BUTTRESS FORMS



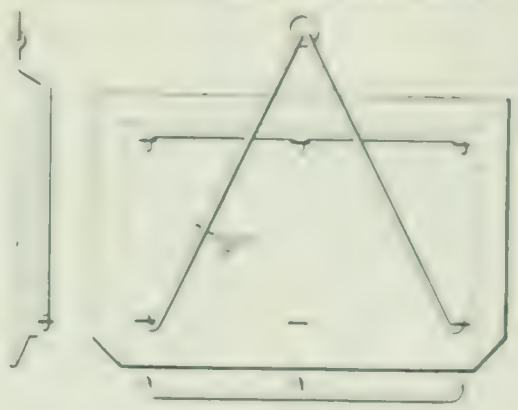
DECK BEAMS



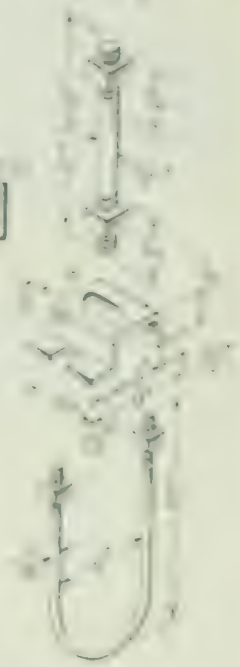
SECTION THROUGH DAM & APRON



FORM FOR BEAM "A"



IRONS FOR PLACING FACING BLOCKS



HOLDING-DOWN BOLTS

FIG. 3. SOME CONSTRUCTION DETAILS OF THE MINNEAPOLIS-ST. PAUL LOCK AND DAM No. 1

The beams were cast in wooden forms on the lock floor. Common building paper was used on the bottom to prevent sticking. The side forms and ends were held in position at the top by bolts dropped into slots in the upright form posts and by 8-in. I-beams at the bottom, one on each side—their ends being engaged by hooks on the ends of two rods in a turnbuckle. This is shown in Fig. 3.

The original lock wall had to be increased in height and thickness. Instead of using timber forms and building up in monolith, reinforced-concrete facing blocks with interlocking edges were cast separately in concrete molds and, when cured, were set in place, tied into steel rods in concrete deposited previously, and used as forms for casting the interior of the wall. These blocks were 4 ft. high, alternating 6 ft. and 3 ft. in length and 6 in. and 9 in. in thickness. The short thick blocks were recessed to take the beveled tongues of the larger ones. Hook eyes were cast in the blocks; and a carrier iron with two hooks passed behind an iron bar dropped into the upper eyes and engaged the lower ones, so that the blocks were swung vertically into position.

After lining up bracing and tying, the spaces between the block ends were filled with grout and the joints in the face were pointed later. A bond was made between the facing block and the mass concrete by running 1-in. steel rods through the hook-eyes and bending them to form a single loop with arms extended. Figured as forms alone, these facing blocks cost $1.22 per cubic yard of concrete in place.



FIG. 1. [illegible]

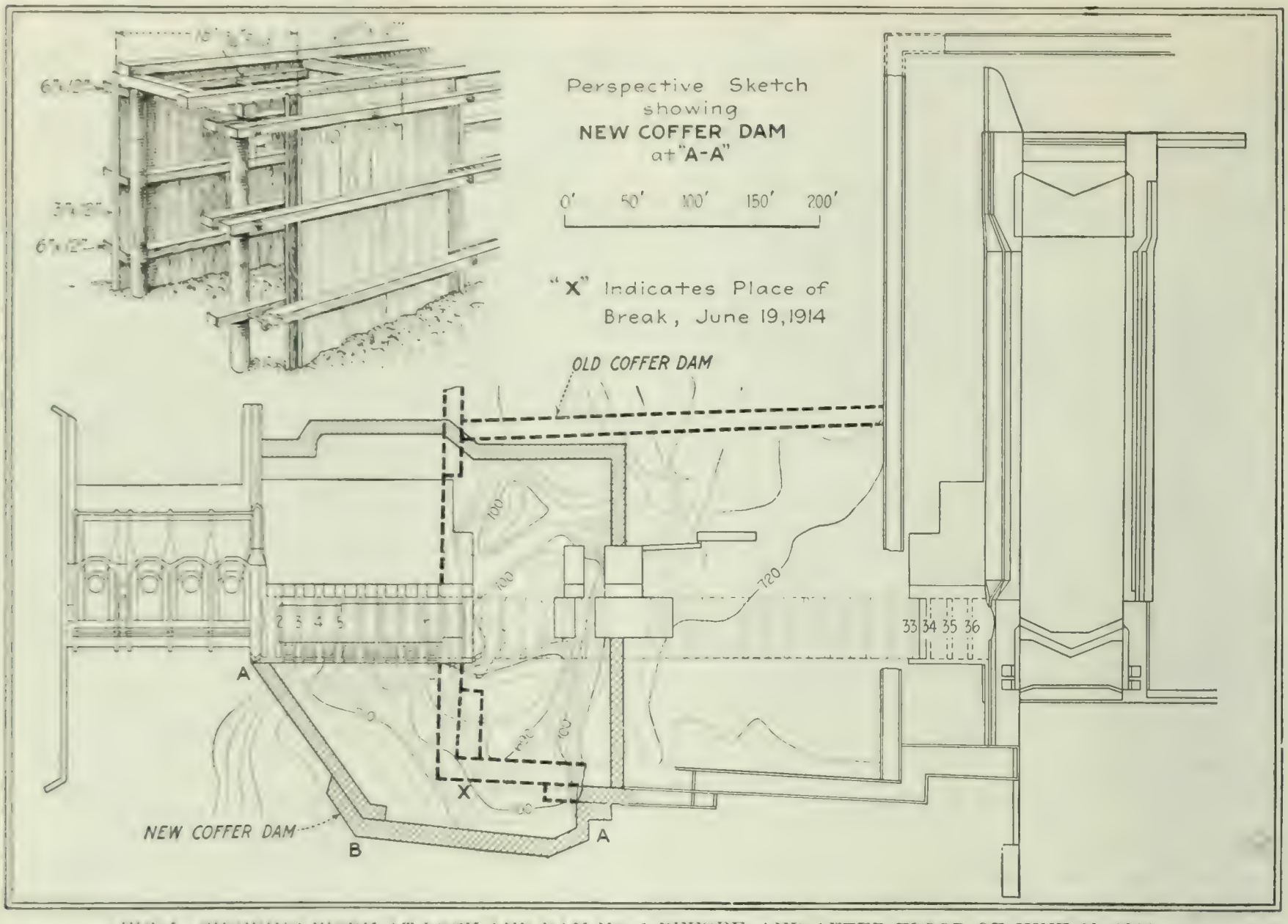


FIG. 5. SHOWING WORK AT LOCK AND DAM NO. 1 BEFORE AND AFTER FLOOD OF JUNE 29, 1914

The crushed stone for all of this work was taken from a limestone quarry developed on the west bank of the river above the lock. All material was handled to the work by a traveling overhead cableway. The wheel pits and power-house foundations were poured from a tower and chute.

On June 29, 1914, lock 1 as modified was completed and the lower gates were hung; the power-house foundation was practically completed; 48 ft. of the dam adjoining the lock and 144 ft. (nine sections) adjoining the power house, including eight sluices and their valves, was built, and the beams on the lower side over the sluiceways were laid to El. 730 (the elevation of the top of the dam being 743.5, Cairo datum). The cofferdam around the power house and sluiceways had been removed and the river allowed to flow through the sluices and power house; a cofferdam had been built around the remaining portion of the dam and some work done on the floor of the site. The river was flowing 30,000 sec.-ft. as against a low-water flow of 4000 sec.-ft., and for several weeks had been flowing over the cofferdam, which had an elevation of 734. On this day the water reached El. 736.8 and a break occurred in the upper cofferdam on the powerhouse side (at "A" in Fig. 4) and the entire lower cofferdam went out (see Fig. 5). Three sections of the dam, including two sluiceways, were undermined and tipped upstream, one section disappearing entirely.

The flood subsided about July 20. It was then decided to allow the river to continue to flow through the break and build a temporary cofferdam to inclose 270 ft. of the dam on the west side. The material deposited by the high water had to be removed, and an attempt made to do this with a suction dredge proved unsuccessful. The removal was accomplished by using drag scrapers, and the temporary cofferdam was completed.

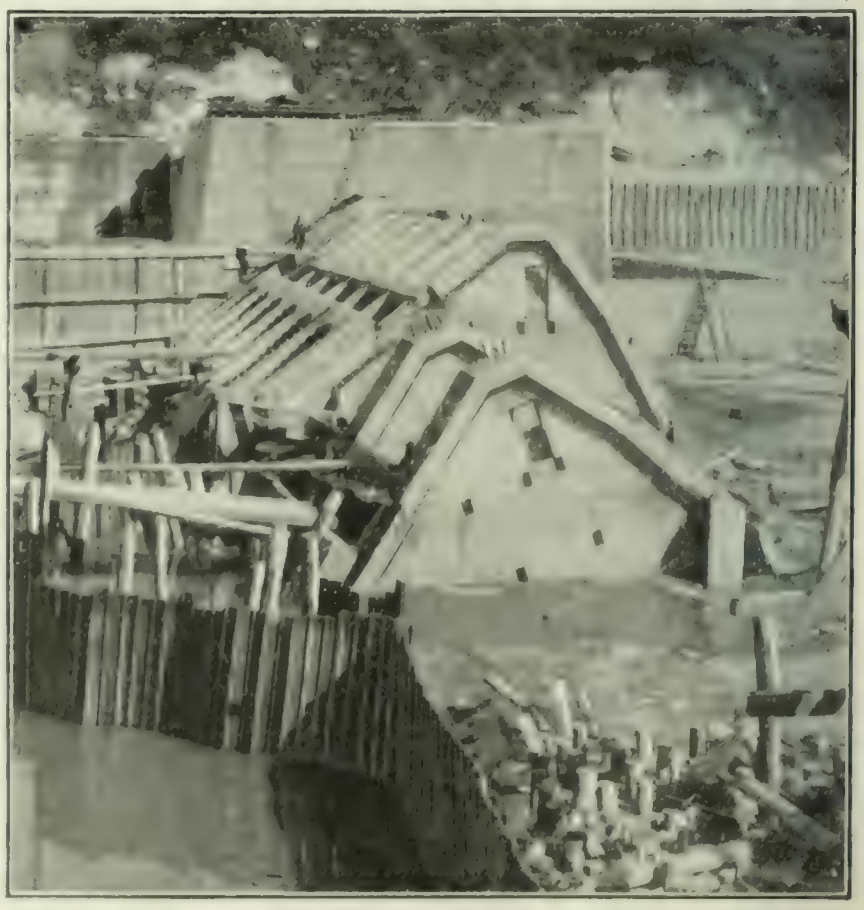


FIG. 6. THREE SECTIONS OF THE DAM WERE UNDERMINED IN 1914

During the fall and winter of 1914-15 the foundation sections 19 to 36, inclusive, together with the breast wall and apron, were completed and a steel sheet-piling cut-off wall was driven along the upper side of the dam its entire length. The plan was to remove the cofferdam around these completed foundations and allow the water to flow over them in the high stages while the remaining gap was being closed.

In March, 1915, work was started on the cofferdam to inclose this gap. The sluiceway sections were included in the inclosure in order that their foundations could be examined and the undermined sections disposed of (see Figs. 5 and 6).

This work was completed, "A" to "A" (Fig. 5) except filling 120 ft. when operations were halted by high water which did not recede until August, 1915. The unfilled portion of the coffer had gone out, and the opening, about 120 ft., had a depth of from 15 to 18 ft.,

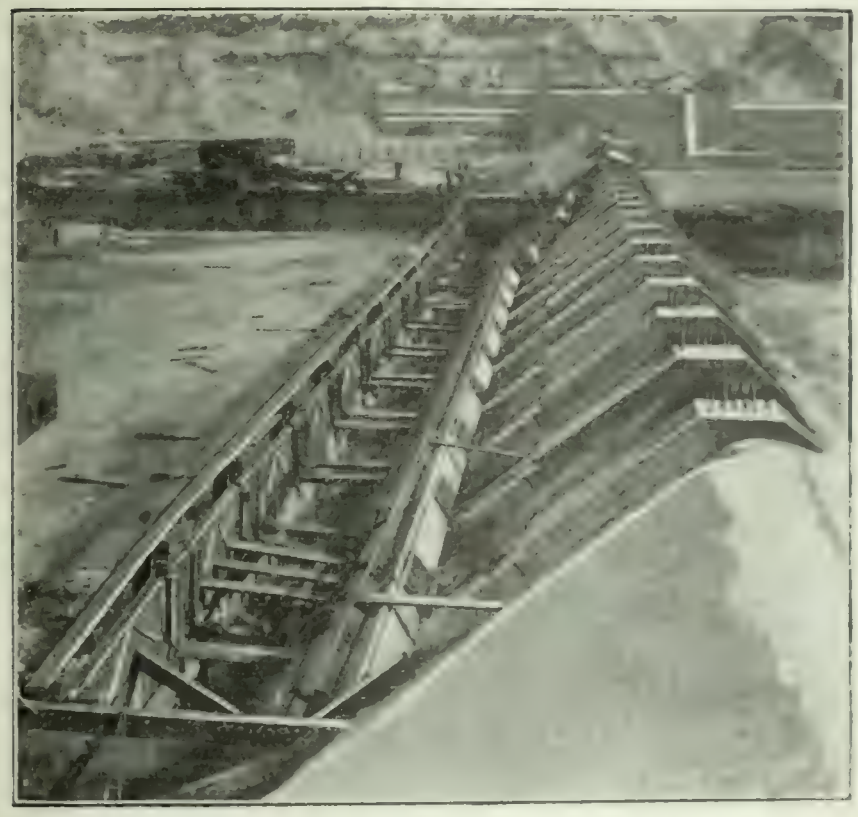


FIG. 7. THE DECK IS BUILT UP OF PRECAST BEAMS AND A CAST-IN CROWN

carrying practically the entire flow of the river with a very swift current.

Thousands of tons of rock were then dumped into the washout at each side of the gap, "A" to "A," Fig. 5, to narrow it and retard the current sufficiently to permit the use of a floating piledriver behind this barrier. By working both ways from "A," and dumping rock on each side of the coffer as it was filled, the gap was finally closed at "B."

By special orders the board of engineers at this time (1915) made an examination of the work, and it decided to complete the dam and apron by resting it on round piles, at 3-ft. centers under the dam proper and at 4-ft. centers under the apron, and to continue the steel sheet-piling cut-off wall along the upstream face of the dam, driving it as deep as possible. Back water from the Minnesota river drowned the work in March, 1916, and work was discontinued until subsidence of the floods in the Mississippi in August, 1916.

Between August, 1916, and April, 1917, the dam was completed. Again unusual and long continued high water forced the work into the winter months, requiring



FIG. 8. THE 1917 FLOODS OVERTOPPED THE NEW IN COMPLETED DAM

the heating of the materials used, and forcing unusual hardships on the workmen. During the winter of 1916-17 there were 155 days in which the thermometer registered below freezing, and 53 days in which it registered below zero. On Apr. 5 water flowed over the dam to a height of 5 ft. The roll or crown, parts of which were poured a week before the flood and in freezing weather, withstood the flow of water, ice and logs and came through with only a few scars.

The lower lockgates of the abandoned lock 2 were used for the upper gates at lock 1. These gates weigh 75 tons each and have very recently been transported from the upper to the lower lock and hung. Each gate was swung underneath I-beams attached to a barge and floated down to its new location.

All this work was done by the U. S. Engineer Department under force account. Work on the original dam was begun in 1906 under Col. G. M. C. Derby, and continued under Maj. F. R. Shunk. Work on the new project was begun in 1911 under Maj. F. R. Shunk, continued under Col. C. L. Potter and Maj. E. D. Peak, and completed under Col. E. H. Schulz. George C. Freeman (now major, Engineers' Reserve Corps) has been in charge of the new project on the ground as works superintendent.

Convicts Now Used on Rhode Island Roads

A law recently passed by the Rhode Island Legislature leaves with the Penal and Charitable Commission so much discretion as to the use of convict labor on roads that the result so far has been very encouraging. Convicts can be used only on state roads, but the State Board of Public Roads, having made satisfactory arrangements with the Penal and Charitable Commission, sends a request for a certain number of convicts for work on designated roads direct to the prison authorities who are authorized to detail as many of these men for the purpose as they may consider advisable. The Road Board must pay the cost of transportation, guarding and supervision, and pay a reasonable charge for the labor. Money so accumulated to the extent that it is in excess of the cost of keeping the prisoners, may be paid to the convicts themselves at the end of their terms, or to their families.

Highway Financing in Texas in Need of Reform

County Road Improvement Procedure Is Flagrant Example of Extravagant Methods of Paying for Work

By R. L. Morrison

Professor of Highway Engineering, Agricultural and Mechanical College of Texas

MILLIONS of dollars in "anticipation warrants" have been issued in Texas to pay for road construction—in fact, several million dollars are probably raised in this way every year. These warrants are issued by the County Commissioners at their own pleasure and without legal limit. They usually bear a high rate of interest, sometimes over 6%, and they are often sold at a discount of 15% or more. Competitive bids are not required, so that the work is often let to favored contractors at absurdly high prices. Very often the work is done without engineering supervision and under a contract prepared by the contractor.

Any county which obtains more than 50 cents worth of road for each dollar expended under this system is fortunate. But perhaps the worst phase of this situation is that no additional tax can be levied to pay the interest on the warrants or to redeem them at maturity, so the regular road tax must be used for this purpose, leaving little or nothing with which to maintain the roads. I understand that at least one county has issued so many warrants that it takes practically all of the road funds to pay the interest on warrants, leaving nothing with which to redeem the warrants or to maintain the roads. It is hard to imagine county finances in a much more "frenzied" condition than that.

The various counties and road districts in Texas issue altogether about ten million dollars' worth of road bonds each year. Probably not less than 80% of this bond money is used for the construction of gravel, shell, and sand-clay roads. Of course, a large part is spent for grading and concrete bridges and culverts, which may be considered permanent, but considerably more than half is spent for the more or less temporary surfacing.

Unfortunately there are very few counties which have anything approaching an adequate maintenance system, and hundreds of miles of surfaced roads are apparently never touched after they are first built. As a result some of the roads go to pieces in a year or two, and there are probably few roads which do not need complete resurfacing within five or six years.

Long-Term Bonds—Short-Lived Pavements

But are the bonds retired by the time this extensive resurfacing is required? Hardly! Data are at hand regarding the term of years of approximately half the road bonds issued in Texas previous to Jan. 1, 1914 (Office of Public Roads Bulletin No. 136). Nearly 60% are straight 40-year bonds and 85% mature in from 20 to 40 years. In other words, it is the old story of paying interest on bonds long after the roads have worn out and been rebuilt.

As a specific instance, one county has outstanding road bonds to the amount of $1,479,000 and anticipation warrants to the amount of $531,559, making a total of $2,010,559. Most of this money was used in building shell and gravel roads, a large part of later issues being used to repair roads built by means of the earlier issues. This county has just voted an additional bond issue of $1,100,000, and according to press reports all but $100,000 of this money is to be used in putting a bituminous surface treatment on the gravel and shell roads under a five-year guarantee.

Statistics regarding other counties are not at hand, but the example given is by no means the worst in the state. This county has spent enormous sums on maintenance while many counties have allowed their roads, built with long-term bonds, to be absolutely ruined in a few years.

Fault Lies in State Laws

The main fault lies not with the individual counties so much as with the state laws, which provide that road bonds "shall run not less than 20 years nor more than 40 years with such option of redemption as may be fixed by the Commissioners' Court," . . . and the court is required "to levy and collect . . . taxes to pay the interest upon such bonds and provide a sinking fund for the redemption thereof, . . ." Of course, the temptation under this law is to issue straight 40-year sinking fund bonds, and so keep the tax rate a minimum. It is a well known fact that to the average man the size of the tax rate is the most important consideration, and this is very likely responsible to a large extent for our unwise and even profligate financing methods.

There is one redeeming feature about these very lax methods of financing which is often overlooked. When a well settled community in the older states improves its roads it gets comparatively little for its money except the roads, so that unwise financing means a dead loss. In the average Texas county, however, the construction of a system of improved roads results in developing the county, increasing the population, raising the property values, etc. This development outlives the bonds even though the bonds outlive the roads, and, while that is no excuse for bad financing methods, it at least offers a little consolation in a bad situation.

Fort Wayne Garbage Disposal Will Cost City Nothing

Under a ten-year contract with the Fort Wayne Rendering Co., approved Aug. 29, the City of Fort Wayne, Ind., will have its "garbage, junk, waste paper, tin cans, waste material and animal stock" disposed of without cost, and will receive $1500 at the outset to buy additional collection equipment. The contractor must collect dead animals, or kill and collect live animals, wherever they may be in either case, on notification by the city, and must also maintain a pound. Material other than dead animals must be delivered by the city to the works of the company. The contractor is required to give a bond for $10,000 for the faithful performance of this contract, and for any failure to accept or receive the various wastes he is liable to a forfeit of $1 a ton. The city has the option of buying the plant at the end of the contract, or at a time for forfeiture for non-fulfilment, the price to be determined by appraisal. The plant is already in use.

Purposes Should Govern Water-Works Valuations

Original Cost, Reproduction Cost Less Depreciation and Market Value Are All Thought To Have Their Applications

By J. W. Ledoux
Chief Engineer, American Pipe & Construction Co., Philadelphia.

AFTER years of discussion of valuation of public utilities, such as a water-works property, there is still no unanimity of view, so that each case has to be treated on its merits by the valuator, with a fair chance that the court or commission will discredit the whole argument. The writer believes one reason for this chaos is the frequent attempt to find one valuation only, whatever the purpose. In the writer's estimation there should be several materially different valuations, depending on the purpose. In particular there are three different bases—original investment, reproduction cost less depreciation, and market value—all of which have their applications in three common cases.

Original Cost for Ratemaking

If rates are to be established, the valuation should be based on the fair and legitimate investment. If the financial transactions have been honest and the works have been built and operated according to average practice, and the book records are in good shape, the historical cost should be taken, and the rates should be such as will enable the utility to receive a fair return on its investment from the beginning. Hence, if the utility has not yet received a fair return past losses must be added to the historical cost.

The logical method of procedure is to tabulate for each year a, plant cost; b, operating expenses; c, estimated depreciation; d, gross revenue; e, fair return, and v valuation. Then

$$e = (a + b + c - d)\ p\ 100$$

and

$$v = a + b + c + e - d$$

where p is the fair return decided upon as a percentage on the investment.

By this process it is seen that if the utility has earned a fair return and no more, $b + c + e = d$ and $v = a$. If it has earned more than a fair return, v will be less than a, and if it has earned less than a fair return v will be more than a.

Under this plan no allowance would be made for accrued depreciation, obsolescence or fluctuation of value of real estate, water rights or other property. Neither would allowance be made for service pipes or street pavements unless their cost were borne by the water company.

Following are some of the reasons why the writer believes this method of determining value should be used for establishing rates, or where the property is being condemned by the municipality: Most water-works systems were established before the advent of state control and regulation of rates. The owners knew there would have to be a development period, but believed the works would eventually pay a sufficient return to make up for early losses. Hence if the city should condemn, the owners should receive the past cost plus a reasonable rate of return on such cost. With proper regulation of rates the public is protected against undue profits to the water company, and the company is protected against loss. Hence, the valuation must be based on investment and not on estimated cost of reproduction at

TABLE I. VALUATION BASED ON ACTUAL COST, INCLUDING A FAIR RETURN OF p% ON INVESTMENT, LESS DEPRECIATION

Year	1 Plant Cost and Improvements from Year to Year	2 Operating Expenses Including Taxes and Insurance but Not Interest or Depreciation	3 Gross Earnings from Operation	4 Total Expense	5 Total Expense Minus Depreciation	6 Fair Return, p% on Investment	7 Amount of Investment on Which Fair Return Is Figured
1889	$42,000 00			$42,000 00	$42,000 00		
1890	6,335 40	$2,025 39	$2,439 67	50,560 79	48,311 12	$4,347 99	
1891	2,879 92	1,885 36	[illegible]	57,424 [illegible]	[illegible]	[illegible]	
1892	6,936 30	[illegible]	5,101 43	67,417 [illegible]	[illegible]	5,608 43	
1893	1,903 61	1,955 96	[illegible]	71,784 20	[illegible]	5,903 78	
1894	1,425 85	[illegible]	7,128 58	74,487 16	[illegible]	[illegible]	
1895	7,780 83	2,020 84	[illegible]	83,222 51	[illegible]	[illegible]	
1896	1,607 65	[illegible]	[illegible]	86,871 49	77,815 [illegible]	[illegible]	
1897	10,747 41	[illegible]	[illegible]	98,591 16	88,824 [illegible]	[illegible]	
1898	[illegible]	4,470 75	[illegible]	102,634 61	93,072 [illegible]	[illegible]	
1899	1,862 82	[illegible]	10,413 49	[illegible]	[illegible]	[illegible]	
1900	532 78	3,479 73	[illegible]	[illegible]	[illegible]	[illegible]	
1901	2,870 80	[illegible]	12,774 14	[illegible]	[illegible]	[illegible]	
1902	3,279 23	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
1903	[illegible]	[illegible]	13,207 14	[illegible]	[illegible]	[illegible]	
1904	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
1905	[illegible]	[illegible]	14,272 20	[illegible]	[illegible]	[illegible]	
1906	7,262 56	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
1907	[illegible]	8,209 [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
1908	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
1909	522 41	[illegible]	19,253 54	[illegible]	[illegible]	[illegible]	
1910	[illegible]	[illegible]	19,277 86	[illegible]	[illegible]	[illegible]	
1911	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
1912	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
1913	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
1914	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
1915	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
1916	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
1917	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

* Figures 1 to 7 in Col. 4 [illegible]
(Valuation as of Jan. 1, 1917.)

TABLE II CALCULATION OF GOING VALUE OF PLANT TO BE ACQUIRED

Date	Given Data, Present Plant: Capital Invested to Buy Old Plant	Gross Revenue	Operating Expenses	Interest on Capital	Net Return	Calculated Data, Equivalent Plant: Capital Invested in Plant	Capital Added to Make Up Deficits	Gross Revenue	Operating Expenses	Interest on Capital	Net Return
1917											
Jan. 1	$276,740					$235,265					
[illegible] 1	276,740										
[illegible] 31	276,740	$29,400	$8,500	$13,837	$7,063		12,945			$5,882	$7,063
1918											
Dec. 31	276,740	30,500	8,700	13,837	7,963	.....	13,733	10,800	4,160	12,410	7,963
1919											
Dec. 31	276,740	31,700	9,000	13,837	8,863	.....	8,400	19,800	6,240	13,097	8,863
1920											
Dec. 31	276,740	32,700	9,300	13,837	9,563	.....	3,990	27,000	7,910	13,517	9,563
1921											
Dec. 31	276,740	33,900	9,500	13,837	10,565	.....	1,820	31,400	8,940	13,717	10,563
1922											
Dec. 31	276,740	35,100	9,800	13,837	11,463	.....	591	34,300	9,620	13,808	11,463
1923											
Dec. 31	276,740	36,100	10,100	13,837	12,163	.....		36,100	10,100	13,837	12,163
						Going value =	$41,479				

Valuation of plant $235,265 + $41,479 = $276,744

present prices—nor on market value, which cannot be established until the rates have been fixed for a long period in the future.

Where there are difficulties in the way of determining original cost, because of loss of accounts, or mismanagement or extravagance in the construction or operation of the works, the valuator must use his best judgment to supply proper data for a fair valuation.

What shall be taken for p, the percentage of fair return? A water-works is one of the most important and vital elements upon which the health and welfare of a community depends. To be operated well and continuously, its financial success must be certain. Because of a tendency on the part of public service commissions to squeeze down valuations to figures that are a grave menace to this class of property, capital is reluctant to invest in it unless earnings are assured far in excess of the legal rate of interest. Men experienced in water-works management and finances refuse to purchase these properties except on a 9 or 10% basis, and it would therefore seem that for the present at least 8% should be taken as a fair return.

Table I applies the foregoing reasoning and develops the value for rate-making purposes of a typical plant, established in 1889. By this method the valuation as of Jan. 1, 1917, was $241,170.11.

Reproduction Cost for Forced Sales

Next comes the case wherein a municipality desires to acquire the utility. It may have the option of negotiating with the owners, of exercising its right of eminent domain or of building its own plant. Assuming that the municipality prefers not to condemn, it asks the valuator what it can afford to pay for the utility rather than build its own works. The valuator estimates at present prices the cost of construction of an exactly equivalent plant, from which he deducts a proper allowance for accrued depreciation. To the remainder he adds the value of the acquired revenue and obtains a valuation based on the cost of reproduction—usually designated as "the cost of reproduction less depreciation plus going value."

The municipality may or may not be able to prevent the water company from continuing its business when the new municipal plant is completed. If it cannot the going value will be a maximum, as the city can afford to pay the water company a high price rather than be subjected to disastrous competition. If the city can prevent the water company from continuing its business, it is sure to secure all the revenue within a few years after the new works are completed.

To determine what the going value should be for either of these cases, it is necessary to make a comparison of the financial operation of each plant from the present time up to the time when the new plant is receiving the same gross and net revenues as the old plant is then receiving. The annual differences in favor of the old plant reduced to a present-worth basis will be the going value.

Some broad assumptions have to be made—length of time required to build the new plant, annual operating expenses, depreciation, interest and gross revenue for each plant up to the time at which they are equivalent, and the value of money to be used in calculating the present worth. While the calculation is subject to uncertainty, it is likely to reach much nearer the truth than a mere guess.

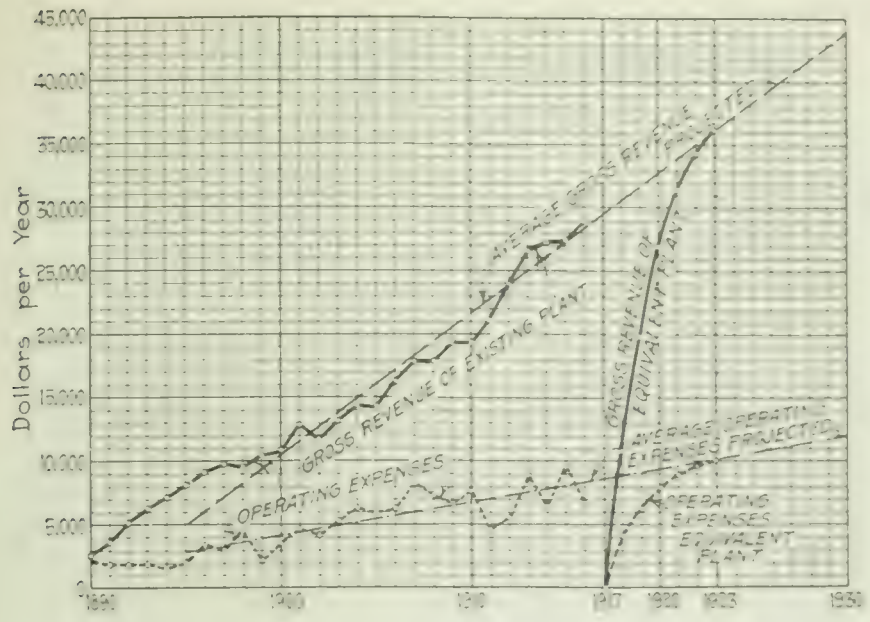
Graphs To Forecast Future

Prognostication of the future is much aided by the graphical method. As shown in the illustration, curves can be drawn to indicate the variation of gross revenue and operating expenses for the old plant, and these can be extended into the future years, preferably by straight lines. From these straight lines an equation of operating expenses is derived in the form $O = a + bR$, in which O is annual operating expenses, R is gross revenue and a and b are constants. Substituting known values of O and R for two points on each of the straight lines, the constant values of a and b are obtained.

The estimated annual gross revenue for the new plant is tabulated and from this an equation may be used to calculate the operating expenses. This gives sufficient data to complete the table. To reduce the net-revenue differences to present worth, it would seem that the rate of interest which the municipality has to pay for money should be used rather than that which the water company should receive as a fair return.

This valuation will represent what the city can afford to pay rather than build its own plant; and it will also show what the water company can afford to ask.

Table II shows the foregoing method of determining going value, based on an assumed price for the existing plant, to be verified afterward, of $276,740 and an as-



FORECAST OF REVENUES AND EXPENSES OF EXISTING AND EQUIVALENT PLANTS FOR DETERMINING GOING VALUE

sumed reproduction cost of $235,265 for the equivalent plant, and gross revenues and operating expenses of both plants as indicated by the diagram, which assumes that six years after the equivalent plant is completed it will have the same earnings and operating expenses as the present plant. It is also assumed that it will take one year to build the equivalent plant.

The left-hand side of the table shows the principal items, including net return, over and above interest on capital, for each of the next six years. With the equivalent plant we assume that $235,265 for construction is borrowed uniformly during the first year, and therefore the interest during the year will be 5% on the total amount for six months. That year there will be no revenues and no operating expenses, and to make up the interest on capital and the net return of the present plant, $12,945 capital must be added. In the next year there will be operating revenues, but the interest will cover the entire year, so that a slightly larger addition to capital will have to be made to make up deficits. Thereafter each year the necessary capital addition will be less, and in the sixth year it will be zero. The going value will be the sum of these additions, or $41,479, and the valuation of the plant will be $235,265 + $41,479 = $276,744.

Several trial calculations for the going value will, of course, have to be made, and the table worked out from the existing data in each case until we find the sum that will be just sufficient so that at the end of the six years the two plants will be earning the same without any extraction for capital added to make up deficits.

Market Value for Voluntary Sales

The third important case is where the city has neither the right to condemn, grant a new franchise nor build its own works, so long as the water company furnishes good water and service, and where the rates are established for a long and indefinite term of years. If the city or some outsider desires to acquire the plant, what should be the process of valuation?

This is a case where the market value applies. The appraiser is not interested in what it will cost to reproduce the plant, but he is interested in what it will cost to operate and maintain it and make the necessary renewals and improvements. He wants to know how the revenue is varying from year to year and what it is likely to be in the future. His inquiry does not extend beyond thirty or forty years, because he recognizes such remoteness to be in the realms of posterity.

He proceeds to draw graphs of the operating expenses during the past years, and extends them forty years into the future. To find out how the plant is likely to grow he makes a similar graph of the plant cost, which aids him in determining depreciation. With a graph for past and future gross revenue he completes the data from which to tabulate the annual net revenues for the next thirty or forty years. This is preferably divided into two parts, one of which applies to the plant as existing at present. The latter figures are determined by taking the earnings in proportion as the present plant cost is to the future total plant costs. If money in the water-works business is worth 8%, he takes that to reduce the future annual net revenues to present worth, and the sum will be a valuation from which should be deducted the accumulated depreciation up to the present time.

Accumulated depreciation up to the present time must be deducted, for we are starting with a plant that has suffered a certain amount of depreciation. If this be figured from the beginning on a sinking-fund basis, at a fixed per cent. on the cost, we cannot be justified in figuring it in the future at the same rate unless we place the accumulated depreciation up to the present time in a depreciation fund to the credit of the water company—or, what is exactly equivalent, deduct that amount from the price of the plant. Future depreciation, however,

TABLE III VALUATION BASED ON MARKET VALUE

Year	Estimated Cost of Plant at End of Year	Net Returns = Gross Income Less Operating Expenses and Depreciation	Net Revenue on $204,000 — Cost of Plant	Present Worth of Those Net Returns at 8% Plus Present Cost of Plant
917	$204,000	$20,730	$20,730	$19,[illegible]
1918	204,000	21,[illegible]	21,[illegible]	18,[illegible]
1919	207,300	21,[illegible]	22,[illegible]	17,[illegible]
1920	213,400	23,220	22,[illegible]	16,[illegible]
1921	219,[illegible]	24,050	22,[illegible]	15,[illegible]
1922	225,600	24,880	22,500	14,180
1923	231,700	25,710	22,640	13,220
1924	237,800	26,540	22,[illegible]	12,[illegible]
1925	243,900	27,370	22,890	11,450
1926	250,000	28,[illegible]	23,010	10,660
1927	256,100	29,030	23,[illegible]	[illegible]
1928	262,200	29,860	23,[illegible]	9,220
1929	268,300	30,690	23,[illegible]	8,[illegible]
1930	274,400	31,520	23,430	7,[illegible]
1931	280,500	32,350	23,530	6,[illegible]
1932	286,500	33,180	23,[illegible]	[illegible]
1933	292,700	34,010	23,[illegible]	6,410
1934	298,800	34,840	23,[illegible]	[illegible]
1935	[illegible]	35,670	24,[illegible]	5,330
1936	311,[illegible]	36,500	23,[illegible]	[illegible]
1937	317,100	37,330	24,[illegible]	[illegible]
1938	323,200	[illegible]	24,[illegible]	[illegible]
1939	[illegible]	[illegible]	24,[illegible]	[illegible]
1940	[illegible]	[illegible]	24,[illegible]	[illegible]
1941	341,500	40,650	24,[illegible]	[illegible]
1942	347,600	41,[illegible]	24,[illegible]	[illegible]
1943	[illegible]	[illegible]	24,[illegible]	[illegible]
1944	359,800	43,[illegible]	24,[illegible]	[illegible]
1945	365,900	43,970	24,[illegible]	[illegible]
1946	372,000	44,[illegible]	24,[illegible]	[illegible]
1947	378,100	[illegible]	24,[illegible]	[illegible]
1948	[illegible]	[illegible]	24,[illegible]	[illegible]
1949	[illegible]	[illegible]	24,[illegible]	[illegible]
1950	[illegible]	48,120	24,[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[

must be figured on the plant cost the same as if no deduction had been made.

Table III shows a calculation for the market value of the property according to this method. At the present time the historical cost of the existing physical plant is assumed to be $204,000 in round numbers—as derived from the first column of Table I. The table shows the gross earnings in the future, both for the present plant and the necessary additions to it for capital account. The last column shows the present worth of these net returns, year by year, and the sum of these, less accrued depreciation, gives the required valuation—in this case $244,830.

In this particular case the valuations by the first and last method are substantially the same, and that by the second is higher. This is not always true. There is, in fact, as will readily be seen, no necessary relation or agreement of the results.

There are still other purposes of valuation, for which the methods to be pursued are not so obvious. Among these may be mentioned valuation for purposes of taxation and valuation for security issues. The three cases cited, however, are the most important ones for which valuations are required.

Summary

Summarizing, there are three fundamentally different methods of valuation, only one of which is applicable to any particular case:

1. *Legitimate Actual Cost*, including deficiencies of net income below a fair return on the legitimate investment. This is applicable to the fixing of rates, and to condemnation of the plant by the municipality.

2. *Estimated Cost of Reproduction Less Depreciation Plus Going Value.* This is applicable to negotiations between the city and the water company, whereby the city desires to know what it can afford to pay for the water company rather than build its own works.

3. *Market Value*—determined from a sufficient number of public sales of the company's stocks and bonds, or, if such records are inadequate, from the present worth of the annual net revenues for the next 30 or 40 years. This is applicable where the rates are fixed for a long and indefinite period in the future and the city has neither right to condemn, build its own works nor grant a franchise to another water company, and where the city or another company desires to purchase. It is also applicable when it is desired to create a mortgage or capital-stock issue, or to determine the valuation for taxation purposes.

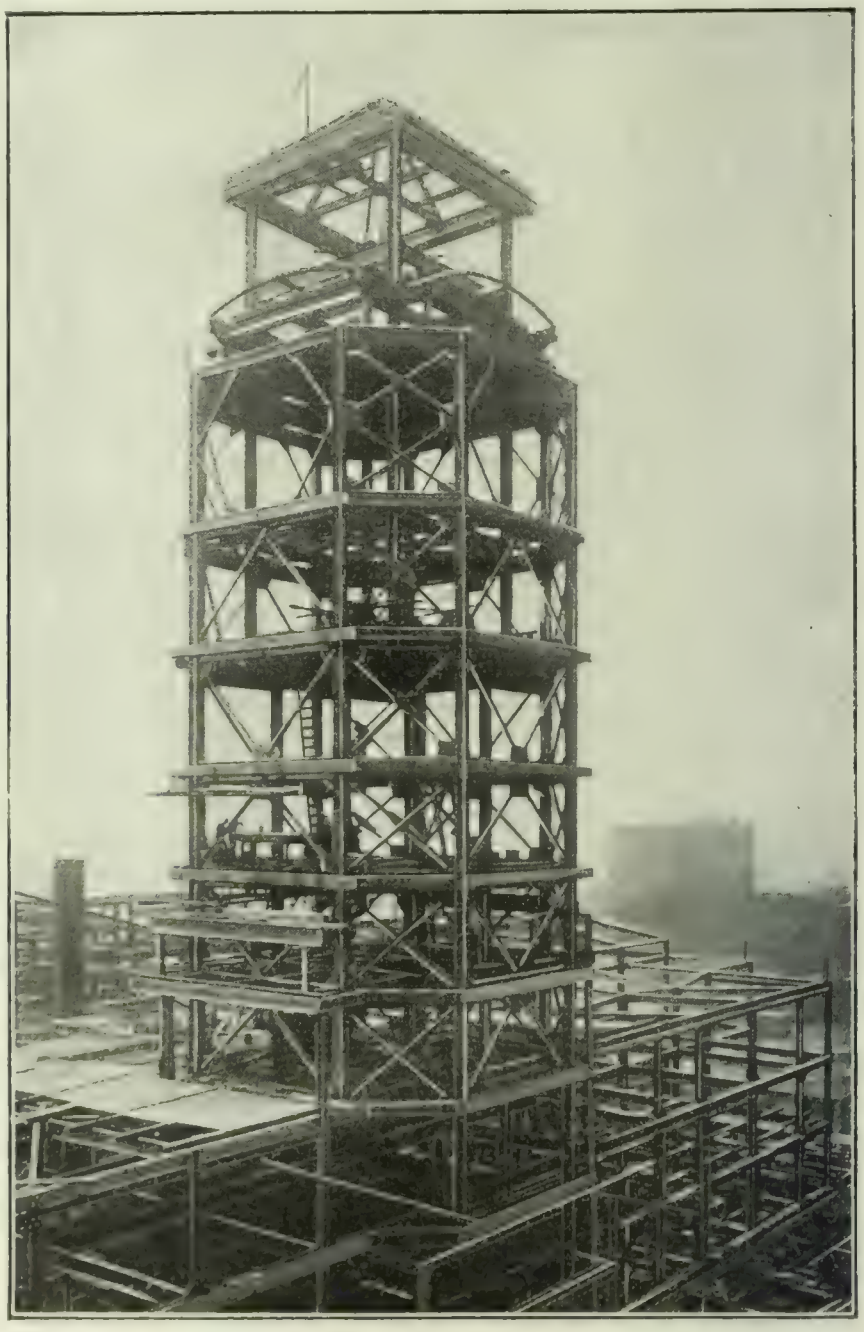
Two Hundred Million Feet of Pine in Army Camps

Since the cantonment construction was started at the beginning of the summer, 250 solid train loads of Southern pine have been delivered to various camp sites from Southern mills, according to the estimate of the Southern Pine Association, which states that approximately 200,000,000 ft. of this wood has gone into camp construction. It is stated that in many instances train loads of lumber have been loaded and dispatched within a few hours after the mill concerned had received the order.

Steel Tower Carries Clock and Water Tank

Freight House Has Unusual Architectural Feature Columns of Upper Portion Offset from Those Below

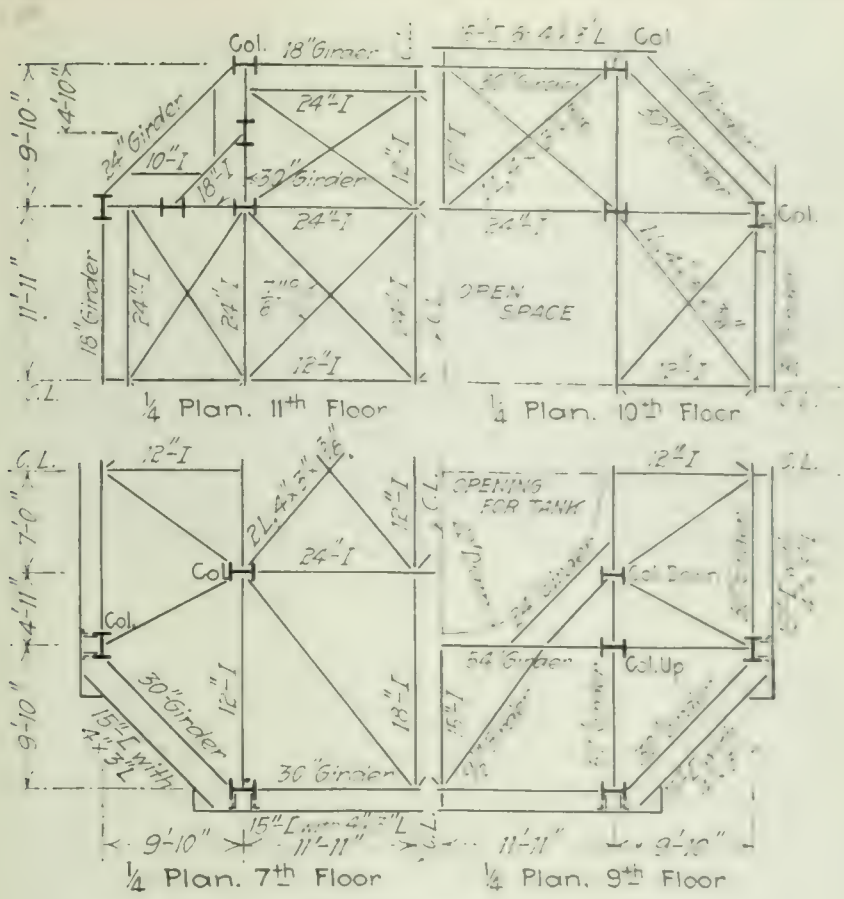
A STEEL-FRAME clock tower, which also houses a fire-service tank, forms a prominent structural and architectural feature of the very large freight station now being built at Chicago for the Pennsylvania



THIS STEEL-FRAME TOWER WILL CARRY A CLOCK AND CONTAIN A FIRE-SERVICE TANK

Lines. This station is a four-story structure 750 x 420 ft., with tracks at the basement level, team driveways on the first floor and three upper floors for warehouse purposes. It is of steel-frame construction with concrete floors, as described in *Engineering News* of Jan. 25, 1917. The exterior finish of the building and tower consists of light-red pressed brick, with green terra-cotta trimmings, and the tower will have a roof of green tile.

The tower has a height of 126 ft. above the main building, or 190 ft. above the sidewalk. Its height is divided into eight floors. Between the fourth and fifth floors will be a 50,000-gal. tank for the sprinkler service, and above the sixth floor will be the clock, having four 16-ft. dials.



FLOOR PLANS OF STEEL-FRAME TOWER

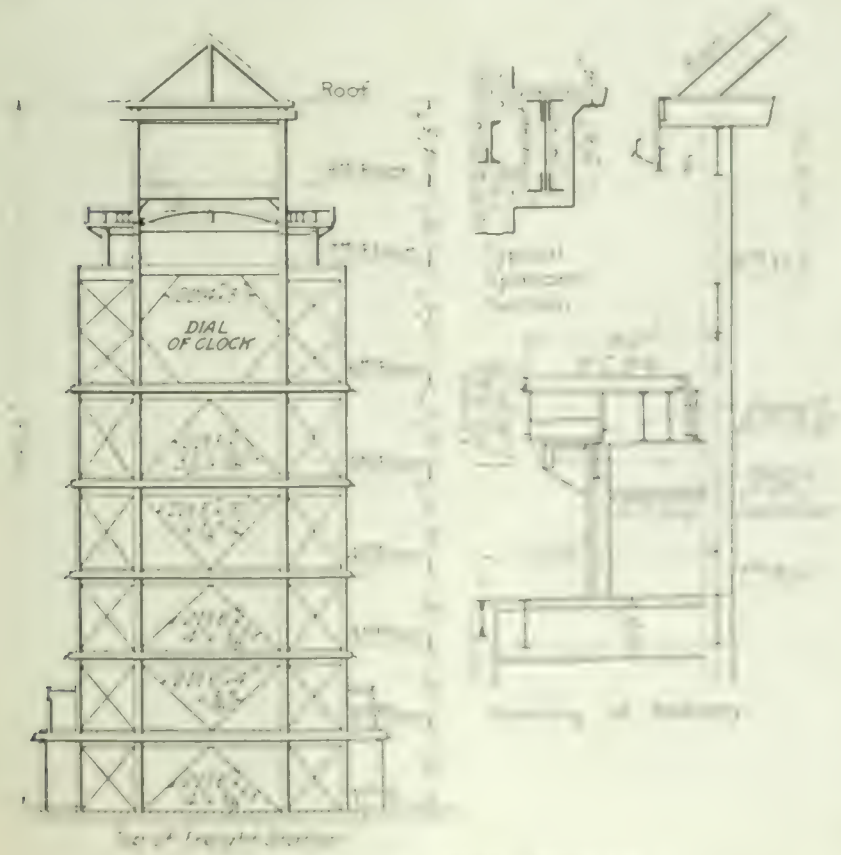
Up to the seventh floor the tower is octagonal in plan with sides alternately 24 ft. and 12 ft. long. Above this it is 24 ft. square, with a pyramidal roof. The main framing includes eight exterior columns and four interior columns. The former extend only to the seventh floor, where the size of the tower changes. The main interior columns stop at the fifth floor, where heavy girders are framed between these and the outer columns. These girders carry interior columns offset from those below and giving a wider spacing in the upper floors. The seventh floor also has heavy girders carrying short columns which support an outside gallery framing at the eighth floor.

The main columns extend down through the building to the concrete foundations. All the columns are of H-section, each built up of a 14½-in. web plate and four angles, 6 x 4 in., with cover plates over the backs of the angles. Large wing or gusset plates are provided for connections to the floor framing and diagonals. The diagonal bracing is two stories high in the longer sides and one story high in the shorter sides. The clock space (sixth and seventh floors) is higher than the other stories, but the dials prevent the use of diagonals in the longer sides. These large panels, therefore, have only knee braces. This lack of other bracing is compensated for by the use of two tiers of diagonal bracing in the shorter sides.

The horizontal framing at each level consists of a ring of 29½-in. plate girders between the outer columns, with interior lines of I-beams and girders for the floor. The arrangement of the interior framing varies, owing to the different purposes for which the floors are to be used. The fourth and fifth floors require circular spaces 13 and 22 ft. diameter for the tank, while the sixth floor (on which the clock is mounted) has a rectangular opening about 24 ft. square, spanned by I-beams to support the machinery. Brackets on the outer columns at each floor level, carry a ring of 15-in. I-beams with a bottom shelf angle to support the curtain walls.

The floors have 4½-in. concrete slabs, and all the girders, framing and columns are cased in concrete. The tower is heavily braced to resist an assumed wind load of 20 lb. per sq.ft. in accordance with the requirements of the Chicago building ordinance.

This freight station was designed under the direction of Thomas Rodd, Chief Engineer, and Robert Trimble, Chief Engineer of Maintenance of Way, Pennsylvania Lines. T. M. Bole is Resident Engineer in Charge.



FRAMING OF STEEL TOWER

Urges Better State Supervision of Dams

More efficient state supervision of the design and construction of dams is urged in the latest annual report of the Department of Engineering of the State of California. In 1915 the Legislature made it the duty of the department to "pass upon" all plans and specifications for dams, but gave the department no authority to require changes in the plans. To emphasize the fact that safe plans alone will not protect the public, the report states that a wealthy corporation built a dam after designs which the department would have approved. Subsequent interior exploration of the structure showed skimped and faulty work that, according to the report, "endangered the lives of hundreds of people living below the dam."

The report cites two penal provisions of the law governing work done under the direction of the Department of Engineering and urges that these might well be extended to "apply to any owner, contractor or employee engaged in erecting any structure the weakness of which would be a menace to the lives or property of other people." One of these requires any inspector working under the state engineer to render "a full, true and correct report of the kind, manner and progress" of all work upon which he serves as inspector and makes a false report a felony. The other provision makes it a felony for any contractor or his agent or employe knowingly to permit the violation of a contract of such a contractor or to fail to report such a violation

Ore Dumped to Barges Through Railroad Bridge

Hoppers Are Placed in Bridge at St. Paul and Ore Dumped Directly Into Barges for Mississippi Travel

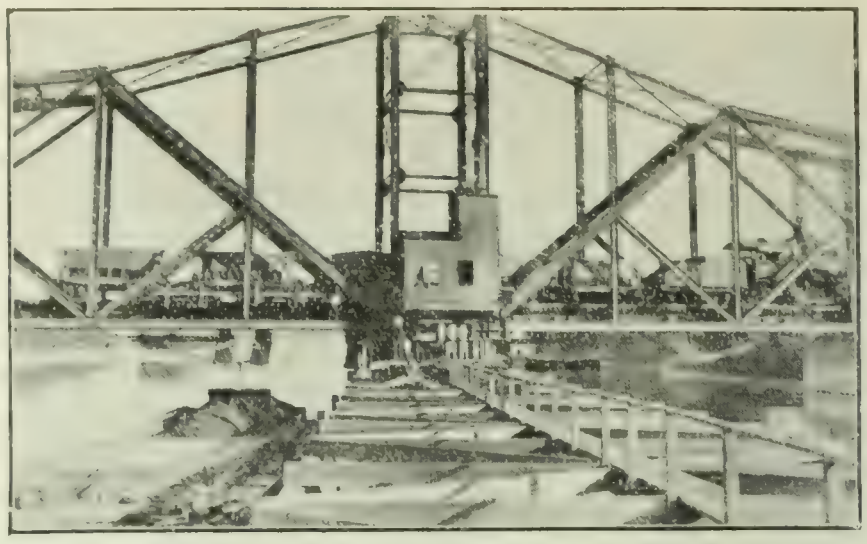
THE city of St. Paul, Minn., recently appropriated $50,000 for municipal ore and coal terminals in the Mississippi, with the idea of facilitating the river transportation of coal from the Illinois district and loading the return barges with ore. On account of the lateness of the season and the difficulties in securing necessary materials the construction of a permanent terminal has been postponed and a temporary coal dock built. This dock cannot handle the return ore, so a unique utilization of an existing railroad bridge as a terminal has been designed and is now under construction.

Coal barges from the south are unloaded in the upper part of the city and will then be dropped downstream about two miles to the St. Paul Terminal Ry. bridge, in the floor of which hoppers will be placed, taking the ore direct from cars run out on the bridge. The openings are to be put just beyond the pier of the swing span of the bridge, the main channel being under the other half of the draw. Piles driven to form a berth will be used to hold the barge in place under the openings while the loading is going on.

The work to be done consists merely in cutting two openings in the open-tie floor and hanging two hoppers from the steelwork of the bridge, according to the details shown in the accompanying drawing.

The hoppers will have a clear opening trackwise at 6 ft. each, with a width of 2 ft. 2 in. narrowing to 2 ft. 6 in. x 2 ft. 2 in. at the bottom. They are hung one on each side of the first floor-beam from the tower. The hopper frames are 6 x 6 x ⅜-in. angles riveted to two 8-in. channels at both top and bottom. The ends of the sawed-off ties will rest on four 12-in. I-beams 7 ft. 4 in. long. Each beam is riveted at one end to the floor-beam of the bridge and the other end is supported by two 12-in. I-beams, 7 ft. 10 in. long bolted to the web of the bridge stringers, which are 3 ft. 6½ in. deep.

The hopper frames are hung from the I-beams by angle plates and bolts. A stiffening frame of 6 x 10-in. and 8 x 10-in. timbers supports the sides of the hoppers about 4 ft. below the base, the rail. The lower 8 x 10-in. timbers rest on the bridge-stringer flanges.



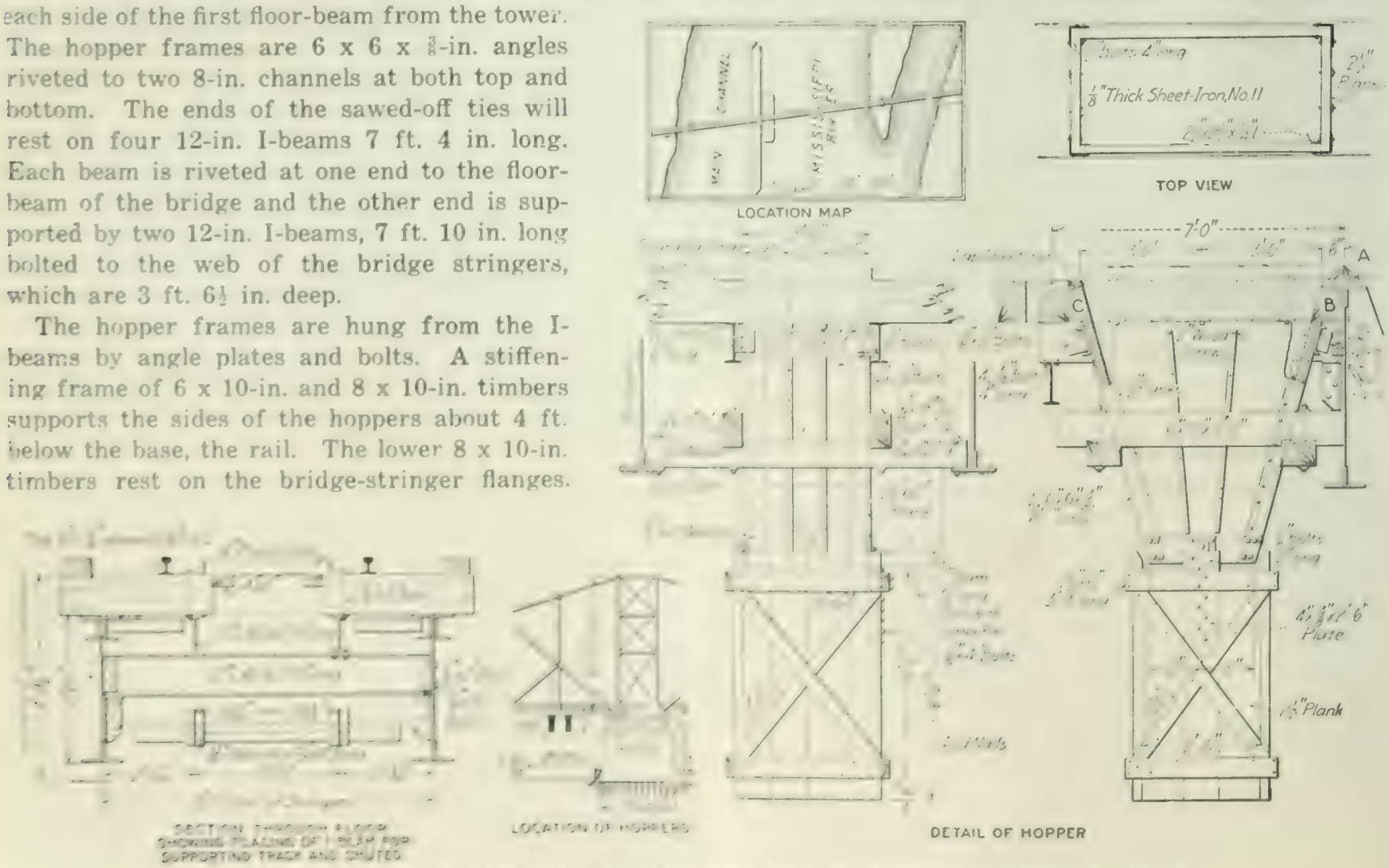
DUMPING ORE THROUGH BRIDGE

The walls of the hoppers are 2½ in. plank lined with sheet steel. The hoppers hang 6 ft. 10 in. from the base of rail and are extended to a length of 13 ft. by swinging timber chutes hung from the bottom of the hoppers by 4 x 2/8-in. plates fastened to the bottom channel of the hopper by a 1-in. bolt and cotter-pin. Two diagonal stringer laterals which cross the openings of the chutes are replaced by stringer laterals from the end of the floor-beam to the stringers.

Plans were made by M. S. Grytbak, Bridge Engineer, under the supervision of O. Claussen, Chief Engineer, City of St. Paul. The construction work is being done by force account. M. N. Goss is Commissioner of Public Works.

Unnecessary Passenger Trains Eliminated

Approximately 20,000,000 miles of train service per year, states the Railroads' War Board, has been saved by the elimination of unnecessary passenger trains.



HOLES ARE CUT IN RAILROAD BRIDGE AND ORE IS DUMPED DIRECT TO BARGE

Pipe Staves Creosoted Without Loss of Strength

Douglas Fir Treated at Low Temperature and Given Crushing Test—Preservative Does Not Taste in Water

By O. P. M. Goss

Consulting Engineer, West Coast Lumbermen's Association, Seattle

THE DECAY of wood staves has come to be recognized as of importance in limiting the life of wood-stave pipe, and methods of creosoting Douglas fir, the pipe material most used, that do not cause loss of strength have been developed by Western lumbermen. The taste of creosote disappears after a few days' service, and there is no ill effect on plant life.

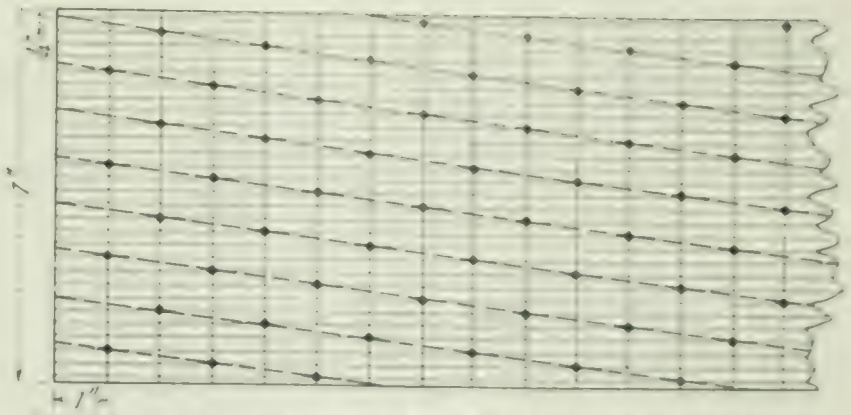
A hydrostatic head of at least 20 ft. has been generally required to keep the staves saturated and prevent decay—and the line is kept above ground where possible. Decay almost invariably starts at the stave ends as the result of leaky joints. Where water runs over the outside of the pipe, algae usually get a start, mosses grow in the soil which collects, and decay spreads. Contrary to old theories, the durability of wood pipe is usually dependent on the life of the wood rather than that of the bands (Bulletin 155, U. S. Department of Agriculture).

Loss of Strength Prevented

During the last three years considerable effort has been made by the engineering department of the West Coast Lumbermen's Association and the Association of Creosoting Companies of the Pacific Coast to improve the methods of creosoting Douglas fir in its various forms. One of the forms already studied is staves. The old methods of treating (boiling or steaming) caused 30%, or more, loss of strength in compression perpendicular to the grain. This loss, of course, was undesirable in the case of staves, which depend on the strength of the wood in side bearing to resist the water pressure. However, by the process of "boiling under vacuum," which greatly reduces the temperature of the oil during treatment, or by simply treating under low temperatures, the loss in strength of the stave has been eliminated.

The West Coast Lumbermen's Association recently completed some strength tests on staves which had been creosoted by this mild-temperature method of treatment. Twelve Douglas-fir staves were selected which were entirely free from sapwood, and twelve other staves were chosen as nearly like the first group as possible except that they contained various amounts of sapwood. All of these staves were 6 ft. long and were kiln-dried. A section one foot long was cut off the end of each stave and retained for control test. The remaining portion of each of the 24 staves was treated in the following manner:

They were warmed in creosote oil for 4 hours at 170 F. and the pressure was raised from zero to approximately 100 lb. per sq.in. until the staves had received about 16 lb. of oil per cubic foot. The oil was then heated from 170° to 230° F. in 3 hours and held at this latter temperature for 1 hour. The staves were then removed.



SMALL PERFORATIONS PERMIT FULL PENETRATION OF OIL

The final heating bath was for the purpose of removing surplus oil and cleaning the staves.

After treatment, as above outlined, the staves were free from excess oil and were easy to handle. They were then placed in a water tank with the untreated pieces above referred to, and all were soaked for about 30 days, after which time both natural and creosoted staves were subjected to a "band-pressure" test.

In this band-pressure test four sizes of bands were used, as shown in the appended tables. Each band was 3.35 in. long and was pressed into the stave the entire length of the band in a direction perpendicular to the grain of the wood, until it was embedded over an area equal to 60° and 90° of the band arc. Figs. 1 and 2 illustrate the method of test used. The loads in pounds required to cause this depth of compression are shown in the tables. Each stave, natural and treated, was subjected to tests of each size band.

The results of these tests show clearly that creosoted staves of all heartwood, as well as those of mixed heartwood and sapwood, uniformly show strength values even greater than those obtained from the test of natural wood. The results are particularly significant since the tests approach about as closely as possible to the actual condition of staves in a pipe line in service. The tests also clearly indicate the practicability of permitting sapwood in staves which are to be creosoted. In the staves tested as above described, the oil penetration in the sapwood was very complete in every case.

Recent experimental work conducted by the writer has also shown the practicability of perforating the outer surface of Douglas-fir staves with small holes systematically spaced as shown in the sketch. The resistance of the oil passing into the wood along the grain is practically nil compared with that found in forcing the oil in across the grain. The fine holes made, through which the depth of penetration and the distribution of oil is controlled, are so small and so regularly spaced that they do not reduce the strength of the wood when tested in compression perpendicular to the grain. The



result of these perforations is that the depth of penetration and the distribution of the oil can be thoroughly controlled—two factors that are very important in securing the greatest efficiency from creosoted timber.

Effect of Creosote on Water

In connection with the use of creosoted wood-stave pipe, the question naturally arose as to what might be the effect of the creosote oil on the water passing through the pipe when used for domestic consumption or irrigation. There being no data on this subject, the engineering department of the West Coast Lumbermen's Association and the Association of Creosoting Companies of the Pacific Coast coöperated with the Bureau of Industrial Research of the University of Washington in carrying out experiments to determine this effect. The conditions chosen were as similar as possible to that found in the Cedar River pipe line delivering water from Cedar River for the City of Seattle. The test was made on the basis of a 56-in. creosoted wood-stave pipe line 22½ miles long, carrying water at the rate of 5 ft. per sec. The experiment was made to represent in every detail just as far as possible the condition above mentioned. (For full description of the experiment see Bulletin 1, Bureau of Industrial Research, University of Washington, entitled "Creosoted Wood Stave Pipe and Its Effect Upon Water for Domestic and Irrigation Uses.")

Water was collected at various periods after going through the pipe line and was tested both as to its effect upon plant life and also as to whether or not it was affected by the creosote in the staves when used for drinking purposes. A thorough examination of the samples was made by the members of the committee of the bureau's staff, together with representatives of the engineering department of the City of Seattle and the West Coast Lumbermen's Association. At the conclusion of the experiment, the following conclusions were drawn:

After the experimental pipe line had been in service for 13 days, no taste of creosote could be detected in a sample of the water diluted with two parts of ordinary city water.

After the experimental pipe had been in service for 29 days, no taste of creosote could be detected in undiluted water flowing through it.

The amount of creosote that diffuses into water in ordinary creosoted pipes does not have an appreciably injurious effect upon the percentage of germination, the rapidity of growth or the general vigor of the plant.

Further Test of Creosote Action

One of the largest projects built of creosoted staves to date is that of the Wenatchee Reclamation District in the Wenatchee Valley. This line is 8947 ft. long and includes 5675 lin.ft. of 63-in. creosoted pipe, 2470 of 60-in. creosoted pipe and 802 of 44-in. untreated pipe. Water is carried at the rate of 2.31 ft. per sec. in the 63-in. section and 2.55 ft. per sec. in the 60-in. section. It was constructed during the past winter and water was first admitted Apr. 16, 1917.

This line was also tested by the University of Washington, Bureau of Industrial Research, in order to determine the effect of the creosoted staves upon the water flowing through the pipe. Samples of water were collected after passing through the line. The line, being approximately 1.55 miles long, gave a reasonable test, and shows what may be expected from any large pipe line in service.

The finding reported was as follows:

The water had been running through the pipe for eleven days when these samples were taken. The most critical examination failed to show the presence of any foreign taste in the water resulting from the use of creosoted wood staves in the construction of the pipe line.

From the foregoing it will be seen that it appears to be entirely feasible to use creosoted staves in a pipe line to deliver water for domestic or for irrigation uses.

Kiln Dry for Best Results

To obtain the best results in creosoting, staves should be thoroughly kiln dried before treatment and should be impregnated with from 6 to 10 lb. of oil per cubic foot of wood. The treatment should be done by the "boiling under vacuum" method in such a way as not to injure the strength of the wood. The creosote oil goes in freely at the end of each stave, thereby protecting amply the part of the stave most subject to decay. Such treatment will add probably $20 per 1000 ft. b.m. to the cost of the staves.

The extra cost of creosoting the staves does not materially increase the cost of the pipe line in place. This is due to the fact that the cost of the steel bands, the excavation, backfilling, engineering, transportation and other items remain constant regardless of whether or not the staves are creosoted. As a matter of fact, the final cost of a continuous stave line in place, if creosoted, will be approximately 20% more than that of an untreated line.

Creosoted pipe is certain to displace untreated pipe for all uses as engineers become more and more familiar with its real possibilities. A thoroughly creosoted wood-stave pipe line should last from 25 to 50 years under normal conditions. If conditions are very adverse, it should last from four to six times as long as an untreated line.

Milwaukee Has Unique Meter Record

Milwaukee is unique among water-works in having no minimum meter charges and no service charges. Consumers pay for their meters. In 1916, according to the annual report of the water-works, 30,258 consumers, or 48.35% of the total, paid less than $3 a year for their water, and 45,874, or 73.3%, paid less than $5 a year. There were 1009 consumers who paid less than 50c. a year for water. About 99% of the services are metered, and 72% of the consumption. Metered water yields 94% of the revenue. The average daily water consumption within the city is 111 gal. per inhabitant, and within and without the city, 118 gal. The cost of supplying water was 1.572c. per 1000 gal. based on total pumpage and ordinary expenses, and 4.556c. if sinking-fund charges, depreciation, taxes and 4% interest on net invested capital are taken into account. The meter rate is 6c. per 1000 gal. within and 8c. outside the city. Yearly rentals of $5 per hydrant and $50 per drinking trough and per bubble fountain are charged.

Plain Concrete in Sea Water Must Be Protected Against Abrasion

Hard Concrete Surface Is a Carbonate Which Is Safe from Sea-Water Attack, but Softer Interior With Lime Hydroxide Present Is Readily Dissolved if Exposed

BY RUDOLPH J. WIG AND LEWIS R. FERGUSON

Second of Five Articles on the Problem of Sea-Water Concrete, Written as a Result of Long Investigation and Inspection of Practically All the Marine Concrete Structures in the United States.

UNREINFORCED concrete structures are subject to disintegration by the action of sea water irrespective of location. Unmistakable evidences of deterioration have been observed upon structures along all the coasts of the United States as well as those of Canada, Cuba and European countries. As a rule, the failure of a concrete structure in sea water has been explained on the ground that the concrete has been of poor quality. It is a fact that wrong design, poor materials and improper methods of construction will often lead to rapid disintegration, but even the best of concrete will be chemically attacked after the surface has been appreciably abraded. In addition to the chemical disintegration which occurs to both plain and reinforced concrete if abraded, there occurs a quite distinct physical deterioration of reinforced concrete due to the corrosion of the embedded metal. This will be discussed in a subsequent article.

Deterioration of plain concrete may be due to several causes, but the underlying one, which is chemical disintegration, cannot take place unless the original surface of the concrete as molded is first abraded or eroded from mechanical means.

WHY CONCRETE IS ATTACKED BY SEA WATER

One of the main constituents of cement is lime. When the green concrete is placed in the forms, the lime of the cement at or near the surface is in a form to combine readily with carbon dioxide in the atmosphere. Thus there is formed at the surface and for a slight depth in the mass, lime carbonate (limestone) which is practically insoluble in sea water. This layer or skin of insoluble material acts as an armor or protection to uncarbonated cement in the interior of the mass. If concrete is deposited in water it is not exposed to the air, but there is sufficient carbon dioxide in the water to carbonate the lime at the surface, and the same result is obtained.

If this is true, why does not the lime of the cement in the interior of the concrete carbonate in a similar manner when exposed, due to accidental abrasion of the surface? The reason is that as cement hydrates over a period of months in the interior of a mass of concrete where not exposed to carbon dioxide, the lime which is freed as the cement ages is changing from the amorphous to the large crystalline form. On account of its relatively slower rate of solution in water than amorphous lime this crystalline form, which is a hydroxide, does not react appreciably with the limited amount of carbon dioxide present. When the sea water comes in contact with the lime in its crystalline form, the lime is dissolved and passes into solution largely as calcium sulphate, the magnesium salts of the sea water being precipitated as magnesium hydroxide, which is practically insoluble. The dissolving of the uncarbonated lime will continue until the cement is completely disintegrated.

Analysis of disintegrated concrete shows the lime content to be very much reduced and the magnesia content increased. When concrete is placed in sea water some magnesium hydroxide is precipitated on the surface. This coating may become very hard in time, and if not abraded act as a further protection to the concrete.

OUTER SKIN MUST BE PROTECTED AGAINST ABRASION

Assuming this explanation to be true—and it is supported by the physical, chemical and microscopic studies which have been made—it is quite evident that if the outer skin can be protected against mechanical abrasion the permanency of the structure is assured against chemical disintegration.

This chemical action, therefore, is not confined to any particular locality, but occurs in the tropics as well as in the cold climates. The action is far more rapid in the latter case, owing largely to the mechanical erosion from frost. Generally in warm waters the action is so retarded, especially if the quality of the concrete is good, that no apprehension should be felt. The disintegration proceeds at a very slow rate where there is no frost or severe mechanical erosion to remove the softened material.

There is a concrete sea wall on the Pacific Coast in a locality where the winter climate is very mild which serves as an excellent example. This wall, shown in Fig. 1, was built about seven years ago. The top of the wall is 18 ft. above mean low water, but one short section was depressed so that car barges can dock.

Some time after the completion of the wall it was found that the depressed section was about 12 in. too high, and a layer of concrete of this thickness was removed, leaving an abraded surface which is covered at half tide. This surface has softened to a depth of 1 in., but the vertical front face of the wall just below the abraded surface is hard and in perfect condition; in



Fig. 1. Abraded Surface Is Softening From Chemical Action of Sea Water

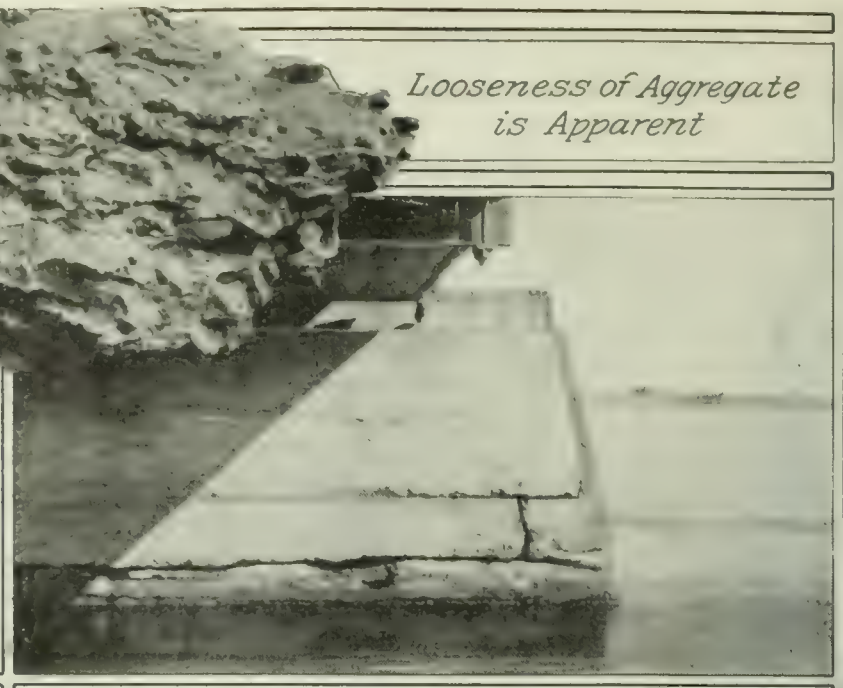


Fig. 2, Specimen of Disintegrated Concrete Looseness of Aggregate is Apparent

Fig. 3, Erosion Started at Construction Seams Between Successive Days' Work

fact, this surface which was cut away is the only part of the wall which shows any signs of chemical action. As there is very little wave action and no ice in this locality, the disintegration is slow, for the softened material is not rapidly removed, and a fresh surface is not continually exposed.

The characteristic softened and laminated condition due to chemical action was observed in other localities along southern coasts.

Freezing Water Accelerates Decay

In northern latitudes where the concrete surface is abraded by ice in addition to the action of waves, vessels and floating débris, and where the water freezing in the pores removes the decomposed surface so that fresh cement is constantly exposed to sea water, the chemical disintegration is accelerated and proceeds at a rapid rate if the outer skin has been destroyed. When concrete is acted upon chemically by sea water there is a typical lamination and softening of the mortar, so that the coarse aggregate can be removed easily.

Fig. 2 is a photograph of a specimen of disintegrated concrete removed from a sea wall which had been exposed to sea-water action. The loosened aggregate and laminated condition is typical. The mortar becomes like so much soft putty or clay containing grit. As soon as the outer skin is abraded even to a slight depth, the disintegration starts, and it will spread from a softened section under the hard surface skin of the adjoining sound concrete. Where this has occurred the outer layer can be picked off with the fingers, and while the surface which was most exposed is hard and secure, the under side is softened, owing to the disintegration progressing from an adjoining affected section.

It is obvious that if chemical disintegration does not occur unless preceded by mechanical erosion, deterioration will generally be confined to those parts of the structure above the elevation of low water. The concrete below water is practically immune from attack unless it has been placed carelessly, or unless the forms leaked to such an extent that loose stone pockets were formed. In such cases the scouring action of the current may soon undercut the concrete. There are a number of structures which have settled and cracked from this cause.

Concrete bulkhead walls have been built in New York harbor at various periods from 1879 to the present. The construction consists of massive blocks which are entirely submerged. The exposed section of the wall is of granite. In 1912, due to some alteration, several blocks which had been placed in 1902 were removed. The concrete showed no signs of deterioration. Here is excellent evidence that the disintegrating action of sea water does not normally occur below low-water.

Concrete structures which are subjected to sea-water action must usually be built where there is a rising and falling tide. The common practice has been to place the concrete below low water in a cofferdam or by means of a bottom-dump bucket or tremie. The concrete above the elevation of low water is placed in forms which are usually not water tight. When the water drops to the lowest elevation the work of depositing the concrete is started and carried up as fast as possible. Usually the tide rises faster than the concrete can be brought up, and when the water reaches the elevation of the uncompleted section, the placing of concrete is discontinued until the tide falls again below this point. When the water recedes there is always found a layer of soft chalky material covering the top surface of the concrete.

Laitance Comes from Two Sources

This soft material comes from two sources. Part of it is cement, some of which rises to the surface of the concrete when an excessive amount of water has been used in mixing, and part of it is magnesia which has been precipitated from the sea water during submersion. The relative amounts of these constituents and the thickness of the layer are dependent upon a number of factors, such as consistency used, exposure conditions, methods of placing concrete and fineness of cement. If the surface is not thoroughly cleaned of this soft material before the placing of the concrete is resumed, a

seam is formed. Such a condition is seen in Fig. 3. In a very large number of the concrete structures along our coasts these seams exist, and often they are 2 in. or more thick.

This soft layer is particularly susceptible to attack by abrasive action, and as soon as it is removed to even a light depth, the adjoining surfaces of the concrete are exposed to the chemical action of the sea water. As a consequence disintegration very frequently begins at one of these construction seams.

The methods to be used to insure the stability of unreinforced concrete in sea water are dependent upon local conditions, but there are a number of principles of general application which should be followed. The design of the structure should be such that it will as far as possible offer the least opportunity for abrasion or erosion. Sharp corners and edges should be avoided, for these chip easily. An example of poor design from this standpoint is shown in Fig. 4. A pier structure with successive arches is defective in that a large surface is unnecessarily exposed to abrasion and chemical attack where most vulnerable. This could be obviated by either raising the arch so that the springing line would be above high water, or lowering it so that the soffit at crown would be below low water. If neither is possible some other design should be employed. An adequate fender system which would prevent floating material getting under the arch would aid greatly in preserving the structure if the design is used.

The toe of the wall shown in Fig. 5 has sloughed off at the edges, and the concrete has softened. The abrasion at this point was followed by chemical disintegration, which in turn made the softened concrete more easily abraded. Much of this would have been avoided if the exposed edges had been rounded.

The sea wall shown in Fig. 6 was given special surface treatment which resulted in starting chemical disintegration. In order to give an artistic appearance to this wall the surface was tool dressed. This of course removed the outer skin, and as a result softening of



Fig. 4, Exposed Buttresses Increase Possibility of Chipping and Abrasion

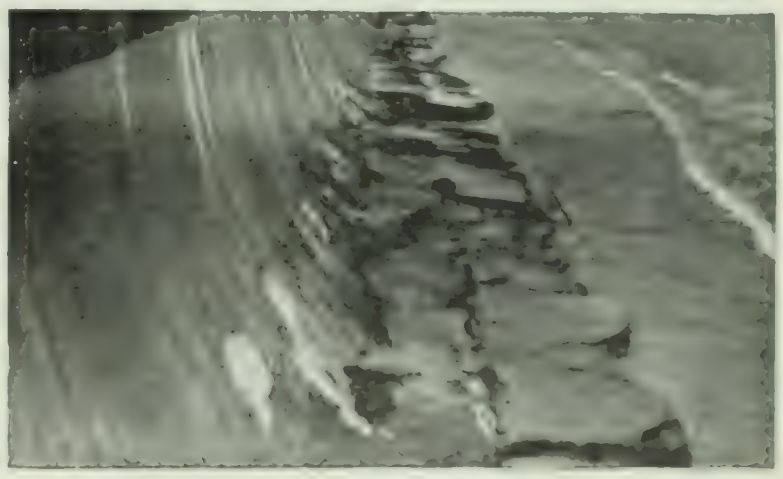


Fig. 5, Toe of Wall Rapidly Disintegrating After Sharp Corner Was Abraded



Fig. 6, Surface Tooled Off for Artistic Effect; Rapid Chemical Attack Resulted



Fig. 7, Round Piles are Not Easily Abraded



Fig. 8, Square Piles Are Easily Abraded



Fig. 9, Wood Jackets Used To Protect Piles



Fig. 10, Wood Casing Around Pier Prevented Deterioration for Twenty-Five Years



Fig. 11, Granite-Block Facing Offers Complete Protection to Eroded Concrete

the concrete occurred within a very few years after the work was completed. Such practice should be avoided, for the most invulnerable part of the structure is destroyed as far as its resistance to chemical action by sea water is concerned.

The piles used in the wharf shown in Fig. 7 are of excellent design to resist abrasion. The round shape affords less possibility of chipping than any other. Even round piles, however, may be abraded by vessels or floating fender logs rubbing against them.

Ice floating on the surface of the water frequently causes chipping of such piles, and a good example of this was seen under one of the pleasure piers on the New Jersey coast. During a severe winter considerable ice formed, and the waves and current threw it against the piles with sufficient force to cut the surface. The piles were round in this case, which probably minimized the action. Where the outer skin was removed, the concrete beneath softened. A jacket of metal or creosoted wood covering the piles between high and low water would have afforded excellent protection and prevented the trouble.

There is a concrete sea wall on the middle Atlantic coast which offered an interesting study of the comparative effect of sea water on protected and unprotected sections. This wall extends at an angle into the harbor, and near the outer end is a wooden-pile wharf which covers part of the wall. The piles serve as an excellent fender, preventing any abrasive action on the part of the wall they cover. During the winter months there is considerable ice in this harbor, and the unprotected part of the wall has been deeply cut and the con-

crete disintegrated to such an extent that frequent repairs have been necessary. The protected section has not been injured in the slightest degree.

A Canadian engineer's early appreciation of the need of protecting his concrete wharfs against abrasion from ice saved much future trouble for himself and prevented loss to the owners. The wharf is in a harbor where during the winter months considerable ice forms. Square concrete piles were used, as shown in Fig. 8. After the first winter it was found that the surface of many of the piles was eroded, and where this occurred the cement had softened. Wood jackets were at once placed around the piles. These jackets extended from below the low-water line to the top of the pile, and prevented any further erosion of the concrete. As can be seen from the view shown in Fig. 9, the wood jackets are being frayed, especially at the corners, but these can be easily replaced at comparatively small cost.

Protective Covers Prevent Destruction

Well made concrete when properly protected from abrasion will resist the disintegrating action of sea water even in localities where the winters are severe. In 1889 a number of large concrete bridge piers were built along the Bay of Fundy in connection with the construction of the Dominion Atlantic Ry. The tide rises 29 ft. or more and there is a very rapid current. There is not a great deal of ice on the water, as no fresh-water tributaries of consequence empty into the bay near these structures. What ice and floating débris there is, however, strikes the piers with considerable force. The engineer who built these piers felt that it would be wise to protect the concrete from abrasion, especially those in the most exposed position. He used wood sheathing held in place with iron hoops. In 1914 an examination was made of these piers. The wood sheathing was completely removed from one of the piers and the concrete, as shown in Fig. 10, was found in perfect condition. There were no signs of softening, and the form marks were still visible on the surface.

Along our New England coast the conditions of exposure are very severe. There is heavy wave action in many localities, and concrete sea walls are often called upon to withstand the shock from boulders thrown up by the sea. Frequently marine structures are located near where fresh-water streams empty into the bay. As a consequence large quantities of ice abrade the surface of the concrete, and this, together with the water freezing in the pores, cause rapid deterioration.

Where such rigorous conditions exist it is advisable to protect the concrete with a granite facing if permanency is to be insured. This has been done in a number of instances with successful results. In this locality repairs can usually be made best by this method. The sea wall shown in Fig. 11 was badly undercut after a few years of exposure, and a granite block facing was used to restore it. In this instance the original concrete was of poor quality, for methods of construction were followed which will not give satisfactory results for marine work.

The conditions which concrete structures in sea water are called upon to resist are most severe, and only concrete of the best quality placed with the utmost care should be used. If this is done and the concrete is properly protected by adequate fender systems, a permanent structure can be secured.

To sum up the subject in a few words, well made concrete properly placed, if not subjected to mechanical abrasion or erosion, is permanent in sea water. If the structure is so located that the concrete would under natural conditions be exposed to mechanical abrasion, chemical disintegration can be prevented only by the provision of a fender system or other protecting medium. Disintegration by chemical action will be very slow unless there is frost action or appreciable mechanical abrasion continually to remove the decomposed cement products as they are formed.

Rock-Cut Roadway on Mountain Side Built Above Railway Tracks

HAMILTON County, Tennessee, of which Chattanooga is the county seat, is engaged in a piece of roadbuilding similar in many respects to the famous Hudson River Road around Storm King Mountain, New York. The Tennessee road girdles Lookout Mountain and will greatly facilitate traffic from Chattanooga to the Wauhatchie valley, which now passes over the mountain on grades as steep as 13%. The new road, with a maximum grade of 5%, is located directly over the Southern Railway tunnel through the nose of the mountain and above the tracks of the Nashville, Chattanooga & St. Louis Railway.

The sides of the mountain, hard limestone and very steep, had to be cut without interference or danger to traffic on the tracks of the N., C. & St. L. Ry. below. An unusual method of rock cutting was followed at the most hazardous places. A channel 4-ft. wide was driven along the face of the cliff on the inside line of the roadway cut. All subsequent blasting was done so as to throw the débris inward instead of outward and down the mountain. The fragments of stone were dragged out of the heading by mule teams on a narrow-gage railway.

This method of cutting left the slope of the cut unusually smooth and true to line, and the work was accomplished as intended without interruption to the railway traffic. The contract price for the work was 80 cents per cubic yard. What it actually cost is uncertain. The original contractor, the McIsaac-Ryan Company, abandoned the job and the contract is being completed by Smallwood & Thompson, of Chattanooga and Nashville, Tenn. The county engineer is L. B. Bryan.

British Town Planning Progress

Town planning schemes totalling 138 in number and 242,230 acres in area have been submitted to the Local Government Board of England and Wales under the Housing and Town Planning Act of 1909, according to the 1916-17 report of the board. The number of communities involved is 89. Procedure under the act is slow at best. "In only ten of the cases in which authority to prepare schemes has been given, since 1911," says the report, "have schemes been submitted for our approval," and of these ten only two (both in Birmingham) had passed through all their stages and been approved.

Richmond Constructs Immense Combined Sewer

More Than Half the City Will Be Served by Reinforced-Concrete Sewer Two Miles Long—Some Heavy Roof Work Required

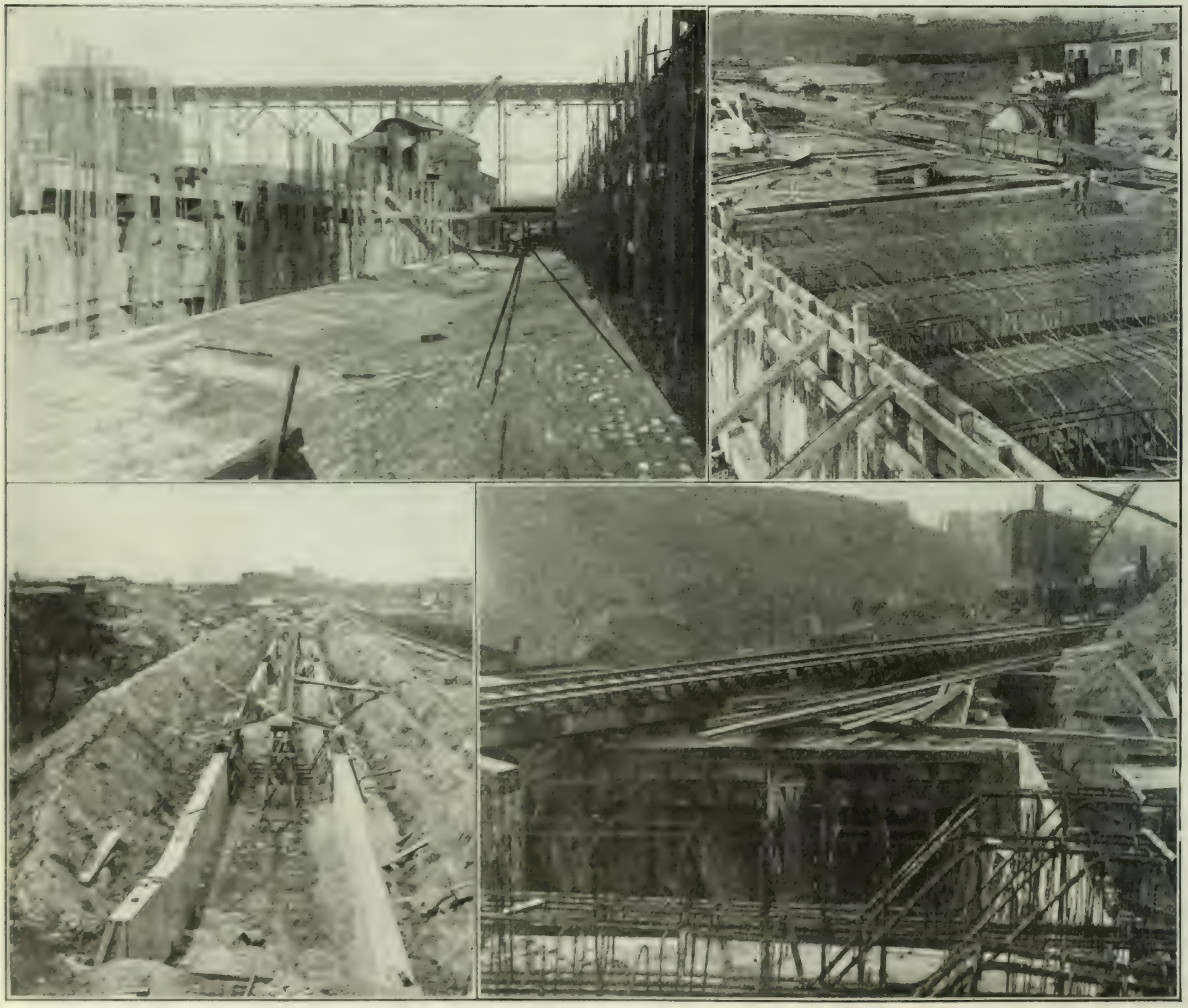
By Charles E. Bolling
City Engineer, Richmond, Va.

A LARGE combined trunk sewer 11,800 ft. long is nearing completion at Richmond, Va. It is of reinforced concrete with an invert lined with vitrified brick in cement mortar. It has a beam-and-slab roof for most of the distance.

The sewer carries the flow of Shockoe Creek, which drains about 12½ square miles or over half the area of the city, and discharges into the James River. About 1¼ miles above its mouth Shockoe Creek is joined by Bacon Quarter Branch. Nearly all the sewers in the territory named discharge into the creek and its tributaries. As nearly all the territory is thickly built up and paved, there is a quick and heavy run-off.

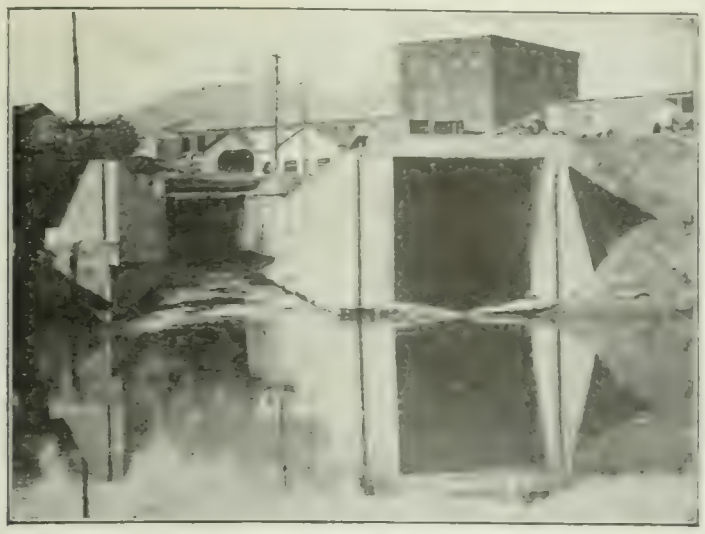
The trunk sewer is 11,800 ft. in length. At its eastern end, for a distance of 900 ft., the sewer is double-barreled. At the upper end of this section a large stream, Cannon Branch, enters. Beyond this point the sewer is 20 x 10½ ft. for a distance of 6600 ft., 18 x 10 ft. for 1500 ft., 9 x 18 ft. and 10 x 16 ft. for 2800 ft. The latter section will not be covered yet.

The natural earth is a hard, blue infusorial clay, so the sewer requires no artificial foundation. Under the main sewer, 8- and 12-in. terra cotta subdrains were laid, and provisions made for side seepage along the entire line. At intervals manholes were installed, with perforated cast-iron caps for ventilation.



BUILDING THE SHOCKOE CREEK AND BACON BRANCH IMPROVEMENT SEWER AT RICHMOND, VA.

1. Concrete invert paved with vitrified brick, reinforcing rods ready for sidewalls. 2. Reinforcing rods in place for concrete slab. 3. This portion will not be covered at present. 4. Construction of sewer under main line of Seaboard Air Line Railway



EAST END OF TWIN SEWER

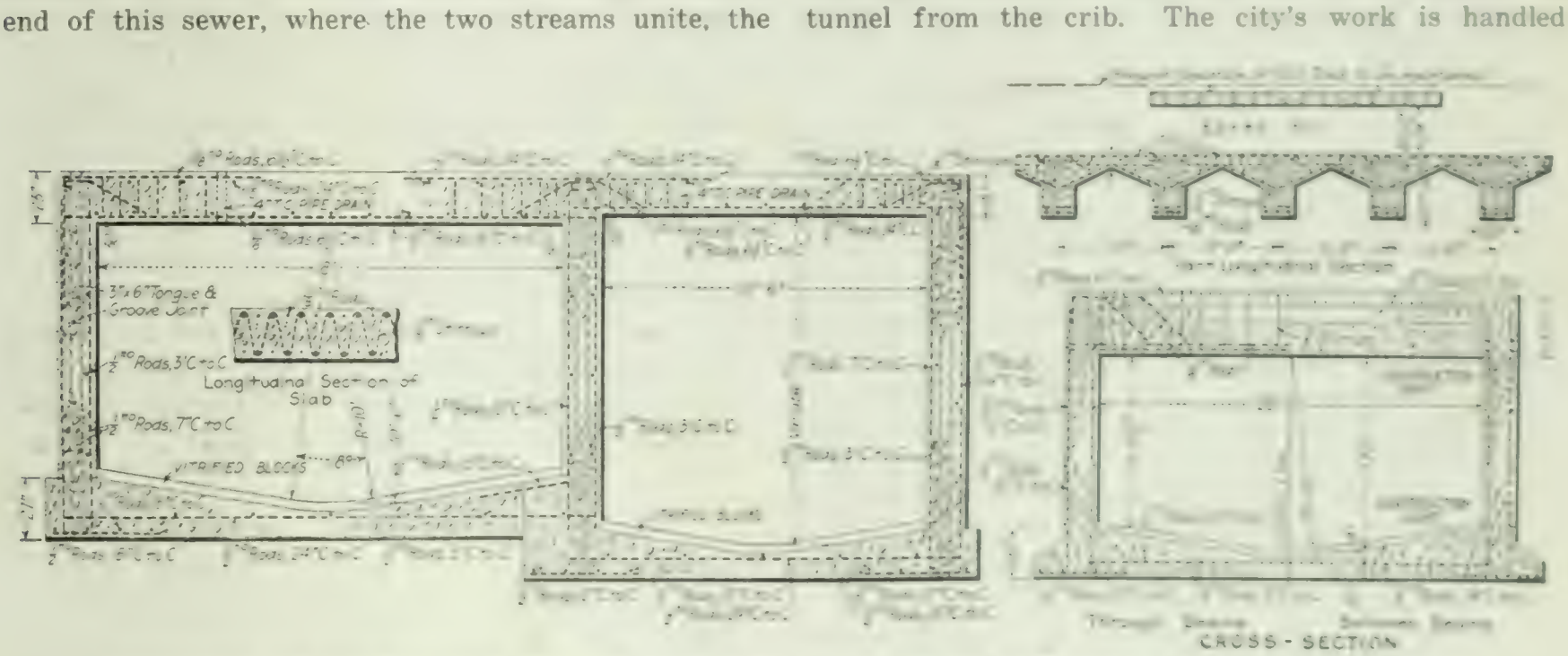
The accompanying drawings and views show the design and method of construction. At several points the main line of the Seaboard Air Line Ry. and its turnouts pass over the sewer, and at these points heavy reinforced-concrete beam construction was installed.

This sewer will result in a greatly improved sanitary condition, besides redeeming a large area of waste land along the valley, formerly overflowed by every freshet, and leaving a large deposit of sewage. Such reclamation also offers building sites for factories and warehouses, with good railroad facilities. At the eastern end of this sewer, where the two streams unite, the American Locomotive Works now has a large plant for locomotive and munition manufacture, and since this sewer has been completed, it has made large additions to its property for future development.

The total appropriations for this work amounted to $610,285, devoted to right-of-way purchase and to construction.

The shutting-in of this stream is one of the greatest benefits brought to Richmond in the long experience of the writer as city engineer. When the creek is inclosed from the present terminus of the sewer to James River, a still larger section of the city will be redeemed.

This work was planned and carried out under the direction and supervision of the writer, with M. O. Hankins, L. L. Bass and W. F. Woodson serving as assistant engineers.



SECTIONS OF TWIN SEWER AND OF SINGLE SEWER WHERE IT PASSES BENEATH SEABOARD AIR LINE RAILWAY

Year Saved by Using Excavated Rock to Line Tunnel

Keeps Up Rapid Progress Begun with Screening and Pneumatic Concrete Plants in Wilson Avenue Tunnel, Chicago

TUNNEL LINING with concrete made from tunnel-run rock and placed by compressed air has resulted in consistently rapid progress in the construction of the Wilson Ave. water-intake tunnel at Chicago. Portable rock screens and pneumatic mixers in the tunnel are used for this work. The tunnel is of notable length, 8 miles, with 3 miles under the lake, and is in solid rock. It is 12 x 12 ft. in section, except for one mile 13 x 13 ft. at the intake end. The tunnel with its construction plant and methods has been described in the *Engineering Record*, Jan. 16 and 23, 1915, and Apr. 29, 1916; and in *Engineering News*, Apr. 22, 1915, and May 25, 1916. The survey work was described in *Engineering News-Record* of July 26, 1917. Since these articles appeared improvements have been made in the methods of concreting the bench walls, and in the organization of the pneumatic mixing and placing gangs.

The work is being done by the city with day labor, with the exception of the crib and about 2000 ft. of tunnel from the crib. The city's work is handled through four construction shafts: at Mayfair (the west end), Lawndale Ave., Lincoln Ave., and the lake shore. These are a little less than 2 miles apart. The heading east from the shore shaft (under the lake) is about 3 miles long, being one of the longest headings ever driven from one shaft.

As the excavated rock is good limestone and of approximately suitable size, it was seen that it would be very advantageous to employ some method by which the rock needed for concrete could be used directly instead of being taken out of the tunnel. No such work had been done in this way before, and considerable study was required for the planning of a plant which would utilize the rock direct from the heading and would not interfere seriously with traffic between the heading and the shaft.

The pneumatic method was adopted, and the plant comprised two traveling outfits mounted on narrow-gage tracks. One carried the pneumatic mixer, with air tanks and a measuring hopper. The other carried a flat screen (with 4½-in. holes) feeding a belt conveyor which delivered the rock to the measuring hopper above the mixer. This latter outfit had an electric hoist for hauling the 1-yd. cars of tunnel rock up an incline to be dumped into the screen.

The rock rejected by the screen fell onto an iron plate on the floor and was shoveled into a car to be hauled out of the tunnel. The entire outfit occupied only one track in the tunnel. The other track was obstructed only by the car for the rejected rock. This car was pushed to the shaft every time a muck train passed through, an empty car being put in its place.

Two Blaw traveling steel forms 30 ft. long were set about 1000 ft. and 500 ft. from the mixer. The 8-in. pipe for conveying the concrete from the mixer to the forms was laid along the side of the tunnel through the first form to the second one, and there it was directed up at 45° into the top of the form. When this form was filled with concrete, the pipe was disconnected and arranged for filling the other form. As the concrete set, the forms were moved alternately toward the mixer, until about 1000 ft. of lining was completed. The mixer was then moved 1000 ft. and the same operations were repeated.

First Pneumatic Outfit Started

The first pneumatic outfit was started working east from the shore shaft in December, 1915. At first a distance of 500 ft. was planned for conveying the concrete but the distance was increased until experience determined about 1000 ft. as the proper maximum distance. The heading at this shaft was about one mile ahead of the mixing plant when the concrete work was started. With two forms, the progress of the concrete work was about 2½ to 3 times the progress of the excavation work. This machine, therefore, caught up with the heading in about six months and was stopped until the heading was further advanced.

The record for the work under the lake is given in the accompanying table. This ends with April, 1917, as since that time both machines have been shut down awaiting further progress in the excavation. Only the upper part of the tunnel section is being excavated at the present time, a bench approximately up to the springing line being left to furnish material for lining the remainder of the tunnel.

In the meantime, the heading from the Lincoln Ave. shaft was holed through so that rock could be hauled from the heading east of the shore shaft to be used for the concreting plant which had been started at the Lincoln Ave. shaft in March, 1916. Accordingly, the concrete gangs from the two machines were organized into one gang with three forms to follow the Lincoln Ave. machine and only one form for the shore-shaft machine. This arrangement made it possible for one gang to operate the two mixers alternately. Then by working three shifts, they were able to fill the three forms at Lincoln Ave. and one form at the shore shaft, keeping the concrete work going constantly on one of the two machines.

As there were four forms in use, there was no delay caused by waiting for the concrete to set or waiting for the forms to be moved. Each shift, the concrete gang found a form moved and the pipe connected up ready to start the concreting. Each gang completed one form and changed the pipe ready to start the next shift. A form-moving gang worked one shift, moving the forms and placing the sand-bag bulkhead at the forward end.

PROGRESS OF LINING WILSON AVENUE LAKE TUNNEL, CHICAGO

(Work Prosecuted from Shore Shaft Only)

Date	Dist. from Shaft, Ft.	Concrete Placed, Cu.Yd.	Date	Dist. from Shaft, Ft.	Concrete Placed, Cu.Yd.
To Feb., 1916*.	1,890	3,396	Nov.....	684	1,386
Feb.....	1,215	2,300	Dec..	432	864
Mar.....	1,325	2,508	Total, 1916	9,568	18,723
Apr..	895	1,700	1917.....		
May.....	1,056	2,006	Jan.	262	524
Aug †..	174	330	Feb.....	168	336
Sept.....	1,185	2,627	Mar.....	1,489	2,778
Oct.....	712	1,424	Apr.....	493	1,109

* Record from Dec. 9, 1915 to Feb. 1, 1916.

†Work stopped June 1, 1916, as it had overtaken the heading. Started again August 19.

The machine at Lawndale Ave. was started in April, 1915, and the one at Mayfair shortly afterward. Both of these machines used rock from the heading east of the Lawndale shaft, as the tunnel had been previously holed through between these shafts. One of the new features of placing the concrete at the Lawndale shaft was the use of the pneumatic mixer for placing the concrete in the footing wall. This is a wall about 1 ft. high, used as a guide for the forms to follow, and is usually built by hand in advance of the regular concreting. In placing this at the Lawndale shaft, the concrete was first delivered into the Blaw forms by the pneumatic mixers in the regular manner. But a key plate was left out of the forms, and a chute was placed so that the concrete being placed by the pneumatic method would overflow through the chute into a car. This car then carried the concrete ahead and dumped it into the forms for the footing wall. In this way the footing wall was placed about three times as fast as it could have been placed by hand.

Organization for Concrete Work

The organization required for the operation of the concrete work included 3 men pushing rock cars up to incline, hooking on cable, dumping same on screen and pushing back empty cars to make up train for the heading; 1 man operating motor hoist for pulling cars up incline and for operating belt conveyor; 2 men shoveling rejections from screen into cars to be hauled out of tunnel; 2 men unloading cement and storing it on a platform above the air tanks, adjacent to the mixer hopper; 3 men operating hopper over mixer, feeding cement, water and rock; 1 man operating mixer air valves; and 1 man at end of pipe in concrete form. When there was sufficient rock on hand for continuous concreting, the forms were filled very rapidly, one form having been filled in 100 min. The forms contained from 50 to 70 yd. of concrete, depending upon the overbreak. During January, 1917, one machine at Lincoln Ave. placed 2707 lin.ft. of tunnel lining.

The Wilson Ave. tunnel is the first in which the concrete work was carried on simultaneously with the driving, and using the mine-run rock from the heading for the concrete. The use of the pneumatic method made this possible, and has saved more than a year in

the construction of the tunnel. The pneumatic mixers are patented and are leased to the city by the Concrete Mixing & Placing Co., of Chicago. The construction is being done by day labor under the Department of Public Works. This plan was adopted on the recommendation of John Ericson, city engineer, and the work is being done under his direction. It is in the direct charge of Henry W. Clausen, engineer of water-works construction.

Wet Road Concrete Is Compacted by Transverse Rolling

Experiments for Removing Excess of Water from Concrete—Rolling Solves Difficulty and Improves Concrete

By P. C. McArdle
Superintending Engineer of Roads for Vermilion County, Danville, Ill.

THE elimination of the excess of water which it is necessary to use in mixing and placing concrete for roads, and the compacting of the surface, have claimed the attention of all engaged in this class of construction. This applies especially to engineers. Henry W. Bowlby, former state engineer of Oregon, has patented and successfully used a roller shaped to the contour of the road and traveling longitudinally. This is operated by a gas engine running on the side forms. Capt. J. J. Gaillard, city engineer of Macon, Ga., uses a small hand roller. City Engineer Johnston, of Sioux City, Iowa, uses dry sand-cement mortar worked in by hand floats. All of these methods are for the purpose of removing the excess of water from the concrete and compacting the surface. The writer had attempted to obtain the same effect by persistent working with templates, floats, belts, etc.

Repeated laboratory tests made by the writer and others have proved beyond question that excess of water weakens concrete, in proportion to the excess. This is true, particularly in the early periods, in both tensile and compressive strength. There can be little doubt that excess of water leaves concrete porous and tends to produce excessive shrinkage in warm or windy weather. The matter was the frequent subject of discussion between F. Kaufman, of the Portland Cement Association, and the writer. Both sought a remedy, if possible an inexpensive one, that could be tried out on our county bond roads, contracts for which had been let and for which there were no further funds available.



ROLLER REMOVES EXCESS OF WATER AND COMPACTS CONCRETE ON TEMPLATE WORK

Mr. Kaufman agreed to furnish a roller if the writer would agree to find a job on which to experiment with it. The first roller was 9 in. in diameter, 4 ft. long, made of No. 18 galvanized iron with heads of the same material. It weighed 46 lb. This was placed on Division 5 of our county bond roads. The contractor, Prendergast-Clark Construction Company, agreed to give it a trial. So impressed was Mr. Prendergast by the work done by this roller that he would not now be without one. This roller has been in use some two months and has surpassed our expectations. Its success led to our determination to further experiment with sizes and weights till an ideal roller is produced.

Four additional rollers have since been placed. The Granite City Lime & Cement Company has placed one on each of its divisions, Nos. 2 and 7. These are 12 in. in diameter, 4 ft. long, with wood heads. Each weighs 56 lb. P. M. Johnson & Company, on division No. 8, uses a roller 10 in. in diameter, 5 ft. long, weighing 54 lb. John McMahon, on division No. 6, uses one 12 in. in diameter, 5 ft. long, weighing 66 lb. The last four are of No. 20 galvanized iron. It is difficult to determine which of these is the best. All show splendid results, but the roller 12 in. in diameter 4 ft. long seems to be most convenient. The larger sizes are rather unwieldy. One man can readily handle the smaller size.

The immediate effect of the use of these rollers is a marked lessening of the water content, and a forcing down of the coarse aggregate (particularly as applied to crushed stone), leaving a smooth dense surface which is easy to finish. These rollers are popular with engineers, contractors and workmen. All seem to take particular interest in seeing them work successfully. They have prevented almost entirely the hairchecking and wind cracks which ordinarily occur in hot and windy weather. This latter effect alone would justify their use, as all familiar with this class of work can attest. The most valuable effect, however, is that it lessens the cost of finishing and makes a better finish than either the hand float or belt.

The method used on the Vermilion County bond-roads is as follows: Immediately after the template is seesawed across the forms, the roller, fitted with a 10-ft. handle (it may be longer for wider roads) is pushed slowly across the concrete and is pulled back again over the same area. The roller is then lifted forward its own length. Rolling is continued in this way until the template is reached.

After the roller is used the first time, a long-handled float is drawn across the pavement, smoothing the surface. Water rapidly collects on this surface. The use of the roller a second time disposes of this water by pushing it over the side as the roller moves back and forth. After the second rolling the concrete is ready for final finishing with a long handled float.

If a great excess of water happens to be used, rolling must be continued till the excess disappears. Concrete lumps caught in the pan may be refinished readily by using the roller.

Construction Was Speedy at Camp Lewis

Largest of the National Army Canfonments at American Lake, Washington, Accommodating 48,000 Men, Finished in 56 Days

By Nathan A. Bowers
Pacific Coast Editor, "Engineering-News-Record"

CAMP LEWIS, at American Lake, Wash., was estimated to be 80 per cent. complete on Sept. 1 and at that time Sept. 4 was set as the date for "practical completion" of the work. As the contractors were given authority to start on July 10 this makes the actual construction period for this camp about 56 days, including Sundays and two holidays. The time for the arrival of the last of the full quota of drafted men having been advanced to about Oct. 1 there was more time for finishing up the work than was at first expected. However, accommodations were ready for the 1400 officers who arrived on Aug. 29.

Perhaps the most distinguishing feature of the work at Camp Lewis has been that at such a distance from Washington and where local conditions govern so many construction features, it was often necessary for those in charge to take responsibility upon themselves. Prog-



THIS GRAVEL DIKE SEPARATES SPRING FLOW FROM MAIN LAKE ACTING AS FILTER IF SPRING SHOULD FAIL

ress was the goal to which all else was made secondary. Commanding officers and contractors agreed that the policy would be "Do your best to obey orders. If you can't obey orders, do the best you can."

When the supply of the kind of sewer pipe required was exhausted the next best was chosen. There are, perhaps, four different kinds of pipe in the main sewers—but a well-built sewer system is ready for service. This was typical throughout. Nothing was permitted to keep back the work. The progress charts which were laid out in advance were scrutinized constantly and wherever a blockade or delay in delivery was threatened, forces were concentrated, other materials or methods were substituted and somehow or other progress was maintained.

Anticipating the possible use of the site as a permanent camp, Lieut.-Col. A. R. Ehrenbeck was assigned in April, 1917, to laying out and making large-scale maps of a portion of the tract. Thus much time was saved when the contract was awarded. Most of the tract is either open country, or forested with large conifers. Very little brush clearing was necessary, and as far as possible the trees in the cantonment proper were left in place. The ground slopes gently and practically no grading was required.

The first work undertaken was the securing of a temporary water supply from driven wells. Four two-stage centrifugal pumps, driven by 100-hp. motors, deliver the permanent supply to camp through two 12-in. mains. Two of these pumps draw from wells and the other two from large springs.

A particularly satisfactory permanent supply was found in these springs because their flow, estimated at about 5.5 sec.-ft., appears at lake level. It was thus possible to build a broad gravel dike separating the cove where the springs occur from the main lake and draw the supply from this cove. If the draft should at any time exceed the capacity of the springs, water would percolate through the dike from the main lake, thus affording a filtered emergency supply.

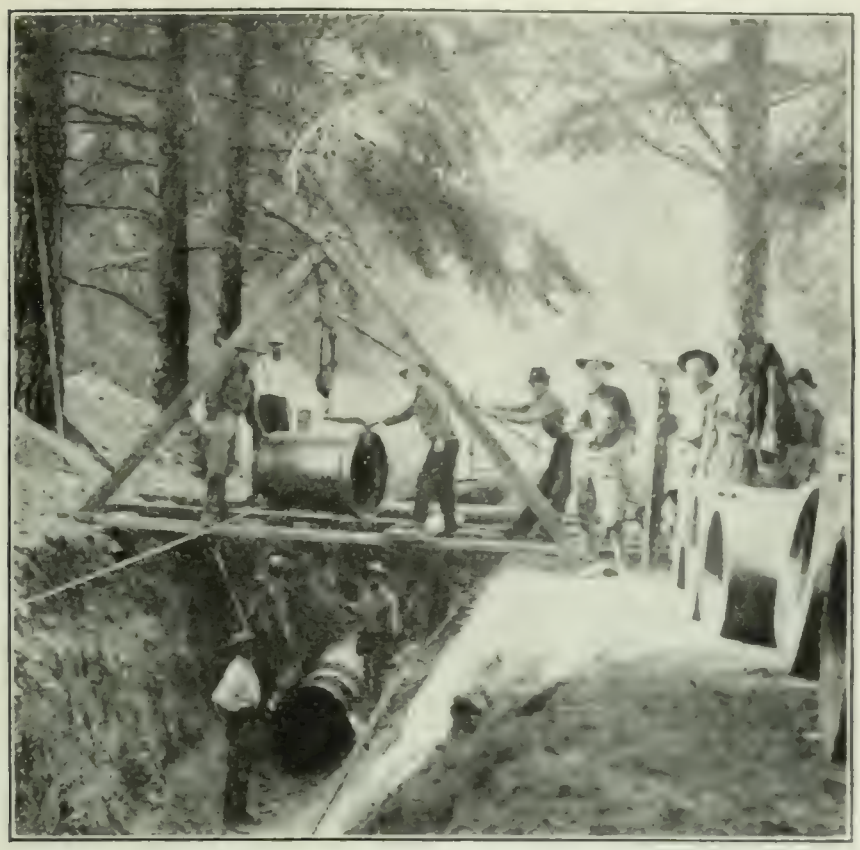
Sewage flows by gravity without pre-treatment into Puget Sound, 3 miles away. The two legs of the U are served by two main trunk sewers, varying from 10 to 21 in. in diameter. These deliver into a 30-in. outfall which is 3 miles long. In all there are 24 miles of trunks and laterals.

The chief problem in building the sewer system was to find a practicable route for the main outfall which would not necessitate crossing the plant of the du Pont Powder Company. A route to the Sound was finally located which avoided the buildings and stockade of the company. This was deemed absolutely necessary, as it would have been very difficult to guard the powder properties had the sewer gangs been allowed to work directly through the plant.

The cantonment is on the Northern Pacific Railway, 17 miles from Tacoma, and a line is being built which will give direct connection with the Milwaukee System. The contour of the ground was so favorable that the main contract was made to include about 9 miles of railroad, 5 miles of which is in a U-shaped line



TEMPORARY PUMP HOUSE AND INTAKE AT LEFT—FOUNDATIONS FOR PERMANENT PUMPS AT RIGHT



THERE WERE 3½ MILES OF 30-INCH SEWER OUTFALL TO BE LAID

reaching all parts of the work. The remaining mileage is in sidings.

This convenient rail system has been an important factor in expediting the work. Congestion has been avoided, and the very minimum haul on all materials is made possible. For example, two saw mills have been used, one on each leg of the U, each with five motor-driven saws. From the convenient sidings it is possible to keep the lumber passing through the saws at



ROAD BUILDING AND BARRACKS CONSTRUCTION PROCEED SIMULTANEOUSLY

the rate of 160.000 ft. b.m. at each saw mill per 8 hours.

From the sidings to various parts of the work the materials are taken by motor trucks. The motor equipment consists of thirty-three 3-ton Kelly-Springfields, seven 2-ton Jeffrey quads, twelve ¾-ton Reos and 57 motorcycles. It was originally planned to quarter 15,000 horses and mules at the camp but work on the stables has been stopped pending decision on a plan to "motorize" the camp and the forces on a broader scale.

A separate contract for the roads was let to the Independent Asphalt Paving Company and about 5 miles of road were built, the type being waterbound macadam with a surface of roadamite, a very heavy asphalt base oil. These roads are 30 to 60 ft. wide. The secondary roads are 24 ft. wide and about 15 miles are being built and graded now. The geological formation underlying the camp is universal, consisting of a gravel bed some 300 ft. in depth. No binding material for the roads was found at the camp, but an energetic search, instituted at once, developed a source of binding material nearby which combines with the gravel very well.

There were one hundred and forty-four 200-man infantry barracks to be built and about 1200 buildings in all. The camp is to accommodate 48,000 men and is about 13 per cent. larger than the cantonment at Louisville, Ky., the next in size. Carpenter work was done first on the buildings which could conveniently



ON SOME SECTIONS PRECAST CONCRETE SEWER PIPE WERE USED IN HAND-EXCAVATED TRENCH

be used by the workmen, and thus from the early stages, workmen who lived at the camp were well housed. At the height of the work the payroll included about 9850 men of whom 6000 lived at the camp. That there has been practically no sickness among the 6000 men is attributed largely to the excellent sanitary measures.

At the outset the contractors kept their own timekeepers on the work, checking up the workmen twice a day, the plan being to punch the time card which the workman usually wore tucked into the band of his hat. This was found to be an unnecessary duplication of the inspection which the government's field auditing system provides for. The contractor therefore gave up the plan entirely and decided to take the time records of the government timekeepers. The contractors' entire timekeeper's force was then taken over by the army officials and directed by them throughout the work. The rate paid common labor was $3 per 8 hours with time-and-a-half for over-time.

In the desire to expedite the work advantage has been taken of every short cut which seemed possible. The plan of building barrack walls on the floor and then raising the side complete was employed here in somewhat the same way as at Camp Upton, as described in *Engineering News-Record* of Aug. 23. The posts in the

17-mile fence around the cantonment were driven by small piledrivers, road scrapers were used for backfilling sewer trenches and motor trucks and electric motors were employed wherever possible.

Construction has been under the direction of Major David L. Stone as constructing quartermaster. Carl F. Pilat served as landscape architect, Charles H. Alden in charge of building construction, and W. J. Roberts in charge of waterworks and sewers. The contract for the entire work, exclusive of road construction, was held by the Hurley-Mason Company of Portland, Seattle and Spokane. The expenditure totaled about $4,000,000.

Builders of Canadian Camps Have Simplified Organization

ACCOMPANYING is a chart, showing the organization of Bate, McMahon & Co., of Ottawa, who have built all of the concentration and training camps in Canada in recent years. All of the work done has been rush work and notable records for speed have been made. It should be remembered (see *Engineering News-Record*, June 28) that the organization is self-contained, has a permanent skeleton and is mobile. Construction equipment, men and supplies are loaded on trains for transporting where needed. The construction camp is under canvas, but trains serve as the base of supplies for three weeks when required.

The managing director of Bate, McMahon & Co. is R. S. Low, commissioned colonel for the military coordination of the camp work. His place in the organization is peculiarly shown on the chart as "Colonel Low's Office," for the reason that in his absence all routine matters are disposed of as usual by his office force.

A second feature is the presence on the staff of a representative of the Militia and Defense Board of Canada or of the Imperial Munitions Board of Great Britain. This officer is virtually a coördinator placed here for the supervision and quick approval of the designing, which is done by Bate, McMahon & Company.

The sloping line to chief engineer, superintendent of construction, etc., indicates the rank of the several members of the staff. There is complete and harmonious informal confidence and coöperation among the members of the staff, although the records of requests and dispositions flow up, across and down through the regular channels.

The chart is so drawn that it shows the forces brought successively into action in the case of a new job. Rail transport arrangements are first taken up; then the purchasing agent's department moves to secure materials and to transport men, and the chief engineer's department opens up the preliminary work which paves the way for the superintendent of "construction"—meaning ground work. By this same time the office forces are transferred and the paymaster and commissary are duly on hand. The sanitary work of course starts before wood construction, and the lighting and power-supply treads on its heels.

Surge Chamber Equalizes Flow of Sewage to Pumps

Collapse of a non-reinforced concrete sewer 10½ ft. in diameter at the sewage-pumping station at East St. Louis, Ill., occurred about two years ago, and it is believed that this was caused in part by the surge resulting from a sudden stopping of the pumps. The sewer had the suction pipes of the pumps connected directly at the side, without screens. There is a gate for closing the outlet to the river when high water requires the sewage to be handled by pumping. After the accident a surge and screen chamber was built, 107 x 30 ft., the width being controlled by the boundary lines of property owned by the city. The height is 14½ ft. The structure is of reinforced concrete, built in quicksand and supported on piles. E. F. Harper is city engineer.

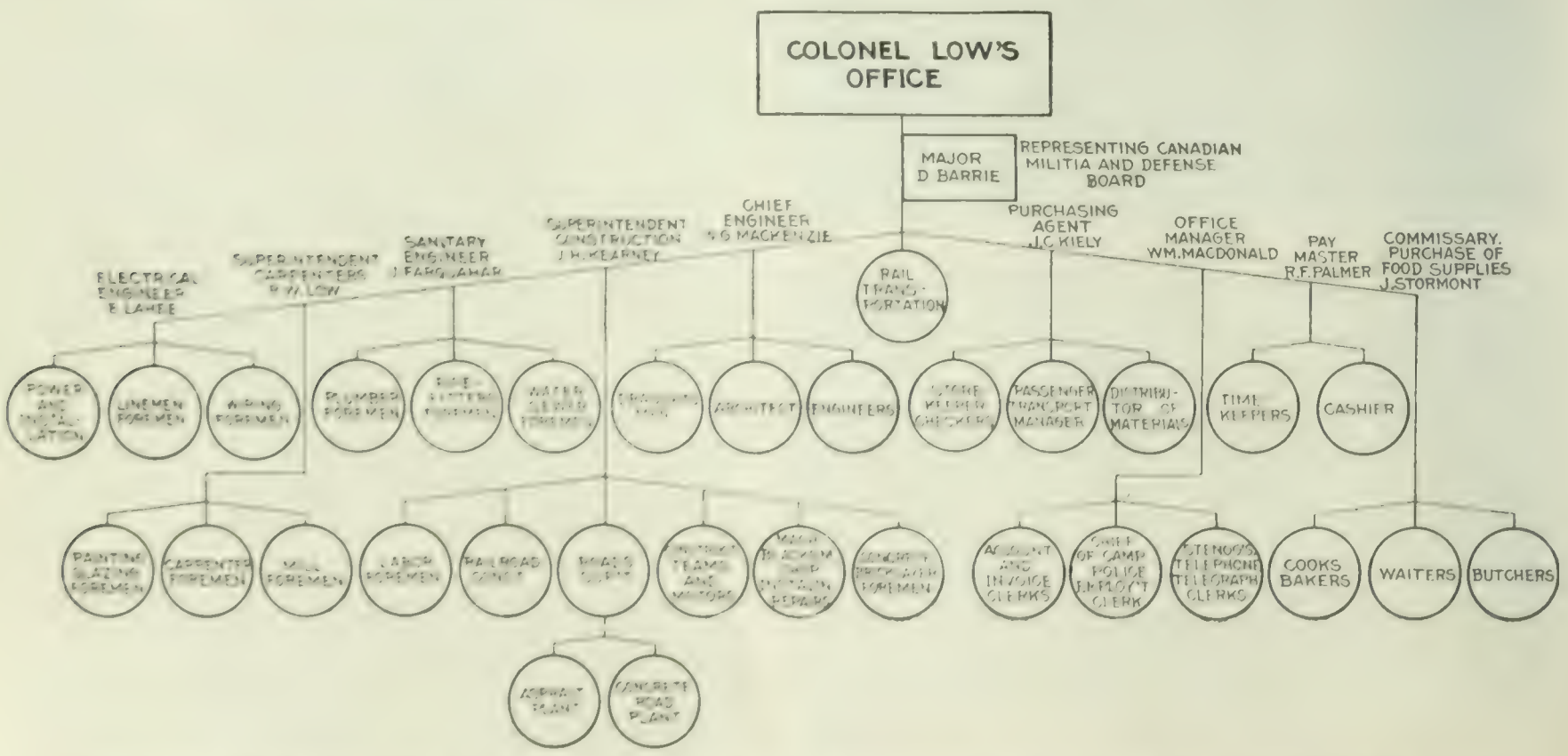


CHART OF CANADIAN CAMP BUILDING ORGANIZATION SHOWS RESPONSIBILITY AND SEQUENCE OF WORK

La Salle's Concrete Causeway Has Become Popular

Difficulty of Foreseeing Traffic Development Is Emphasized—Experience with Railing of Reinforced Concrete

By H. K. Higgins
La Salle, Ill.

IMPROVING a causeway at La Salle, Ill., with a concrete pavement has resulted in an increase of traffic which illustrates the difficulty of foreseeing and adequately providing for the vagaries of popular fancy. Municipal engineers are often blamed for lack of foresight in just such cases, when they had no reason to expect what followed and when, had they done so, they could not have secured at the outset an appropriation sufficient to meet later requirements.

La Salle is a mining and commercial city of about 10,000 inhabitants midway between Chicago and Rock Island. It is the happy owner of a concrete-surfaced causeway giving access to the rich farming land south of the city. The causeway is about 20 ft. wide on top, some 10 ft. high above the flat bottom land, about a mile long and has bridges at each end across the Illinois River and a canal. At times the river spreads out over the flats. It has been known to cover the causeway.

As there is no bridge on the east for some five miles, and none west for a mile or so, its selection for improvement by paving was justified by its importance as a traffic avenue. There are three cement factories within five miles, so the use of concrete as paving material was almost inevitable. The causeway was paved four years ago, and later the concrete paving was extended for several miles south and southeast.



REINFORCED-CONCRETE RAILING WILL NOT WITHSTAND AUTOMOBILE COLLISIONS

The combination of shade, concrete surface, river breeze and accessibility led the public to adopt the causeway as a promenade. The pleasure resorts south of town attract the motorists, and the town attracts the country people, so the net result is a traffic many times greater than the original concrete-road promoter could have anticipated. The road itself is excellent, well laid out, well built, with expansion joints on skew. The surface is excellent, with but few cracks.

The causeway was originally revetted with rock on both sides. It has electric lights on concrete poles and concrete railing between the slopes and paving. Lately some filling has been done on the upstream side with the idea of building a sidewalk for the premenaders, who have thus far shown no signs of growing tired of their adopted boulevard.



POPULAR CONCRETE CAUSEWAY AT LA SALLE

The congested traffic has resulted in frequent collisions (the local saloons do not close on Sunday) both with other vehicles and the railings, thereby calling attention to the difficulty of adapting concrete to the purposes of a railing. The posts are 6 in. square, 6 ft. long, have two mortises 2 x 6 in. at 9 and 27 in. from the top, and are set 30 in. in the ground. They are reinforced with one $\frac{3}{4}$-in. rod at each corner. The rods are held in the mold during concreting by clips of about No. 10 wire. The rails are 2 x 6 in. by 8 ft., slightly tapered at the ends, cast flat, and reinforced with one $\frac{3}{4}$-in. rod bent up and hooked at the ends. Chairs or clips of No. 10 wire were used to keep the rod in place in the mold. Evidently the maker was not satisfied with the lateral strength of the rails, so a 1 x 1 x $\frac{3}{16}$-in. angle bar was introduced at about mid-depth.

The writer believes this to have been an error, as the rod was thereby forced too near the surface of the concrete and a plane of weakness was introduced across the section.

The writer believes that two smaller rods wired to space, and without the angle, would have been stronger laterally and surely would have better resisted corrosion. While the writer finds it necessary to criticize this one item of reinforcement, he considers the work as a whole worthy of high praise.

Civic Association to Meet at St. Louis

The American Civic Association will hold its 15th annual convention at St. Louis, Mo., on Oct. 22-24. City planning and city development will be among the subjects considered, and there is to be a discussion on the subject of the best means of carrying on civic improvement work while the country is at war. The secretary of the association is H. B. Warren, 914 Union Trust Building, St. Louis, Missouri.

Atlanta Warehouse Plans Were Changed To Increase Storage

Operation of First Units Leads to Various Modifications in Design in Interests of Economy—Construction, Now Nearly Completed, a Race Between Grading and Concrete Work

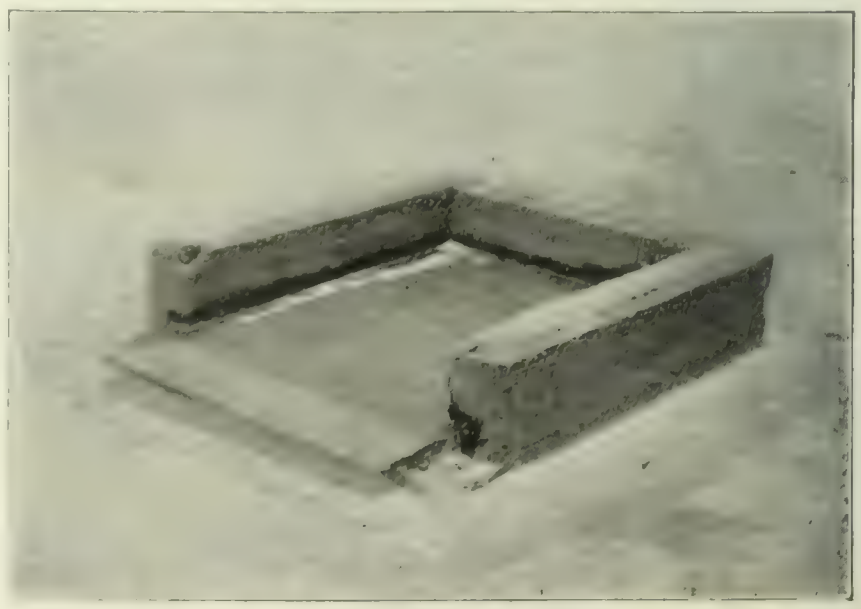


FLOOD LIGHTS MOUNTED ON TOWERS MAKE NIGHT WORK EASY

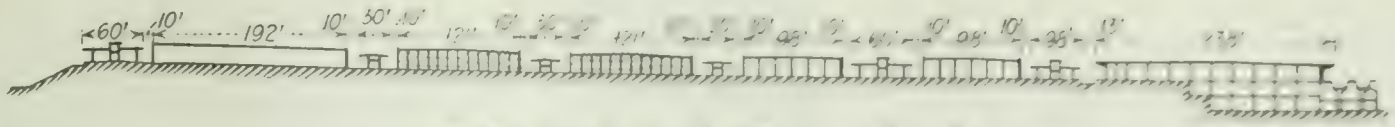
WIDER BUILDINGS and narrower aisles between them for telpher tracks, simpler sheds for the latter, an increased number of columns with greater economy in roof construction, and the replacement of monitors with concrete ventilators are changes made in the interests of economy in the central units of the Atlanta Warehouse plant, now nearing completion. Extensive grading has been required at the site, and in carrying the construction of the two center buildings through from east to west it has been a race to keep the grading work, done with a revolving shovel and teams, ahead of the concrete construction. The latter is carried on with a plant, which has been moved twice, set between the two buildings. This plant mixes concrete at ground level and hoists it to the level of the roof for distribution in buggies.

The plant was placed under construction in 1915, and its design was described in *Engineering News*, Dec. 16, 1915, p. 1190. The operation of the first units made it evident that the transfer space between buildings could be narrowed to the limit allowed by insurance standards, and the buildings correspondingly widened with increased storage space. Another economy resulting from this change is a narrower shed over the telpher tracks to protect the cotton handled in and out of the warehouses. The flat-roof construction adopted in the earlier units has been changed to a beam-and-slab design in which the spans are shortened by using more columns, resulting in a 4-in. roof slab with economy in concrete yardage over the 5-in. slab used at first. These changes and the design of the new telpher sheds are shown in the drawings.

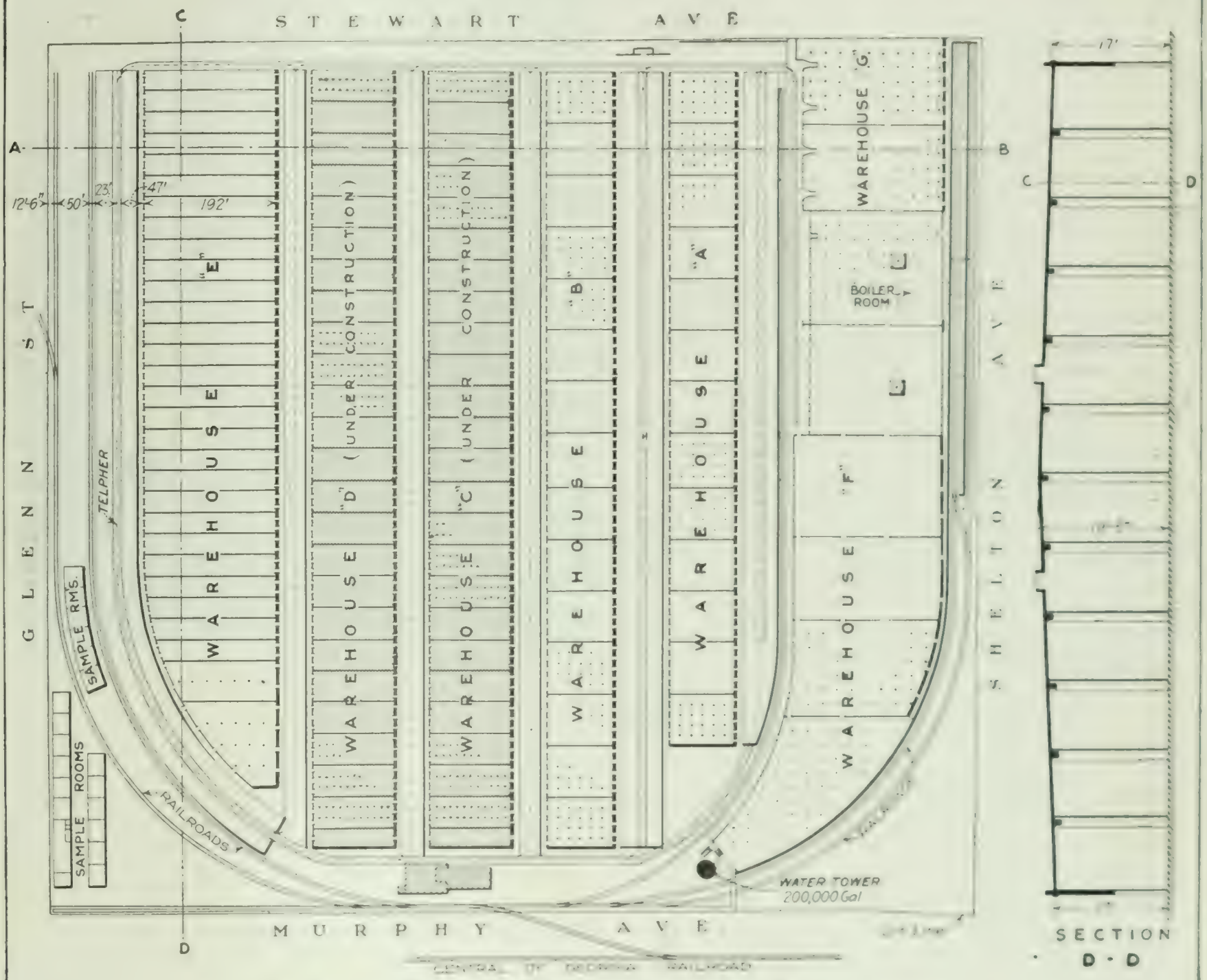
Another feature which quickened and cheapened the construction is the use of concrete ventilators and skylights, cast in one operation with the roof, in place of steel skylights of the monitor type installed on the first buildings. The concrete skylight consists of a small curb around three sides of a square hole in the roof, with a lower curb on the fourth side, away from the ridge of the roof. Above the top of this lower curb around the three high sides of the opening is a slot formed by a wooden strip in which a sheet of wire glass is set in mastic. Between the bottom of this glass and the top of the low curb is a narrow space through which air can pass, but which is protected from the weather by the overhang of the glass sheet. A change has also been made to simplify the door design. Simple sheets of corrugated iron, slightly larger than the door openings, are suspended on rollers from a bar iron track in the same way as on a box-car door.



CONCRETE AND WIRE GLASS MONITOR EASY TO BUILD

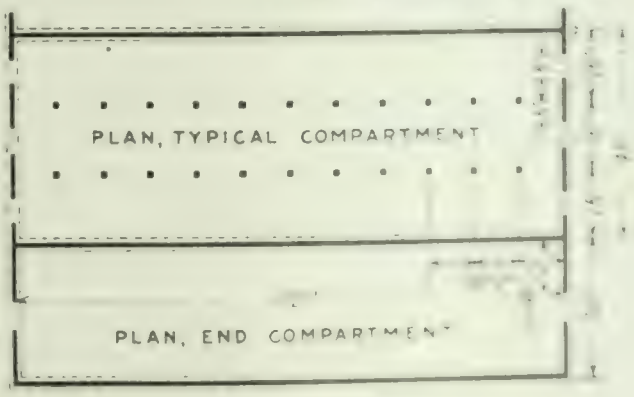


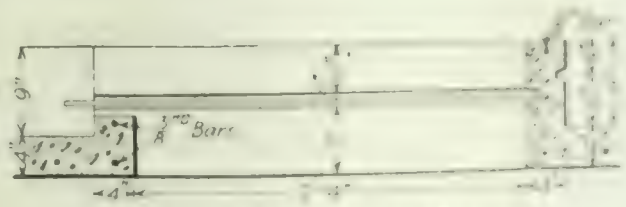
SECTION A B



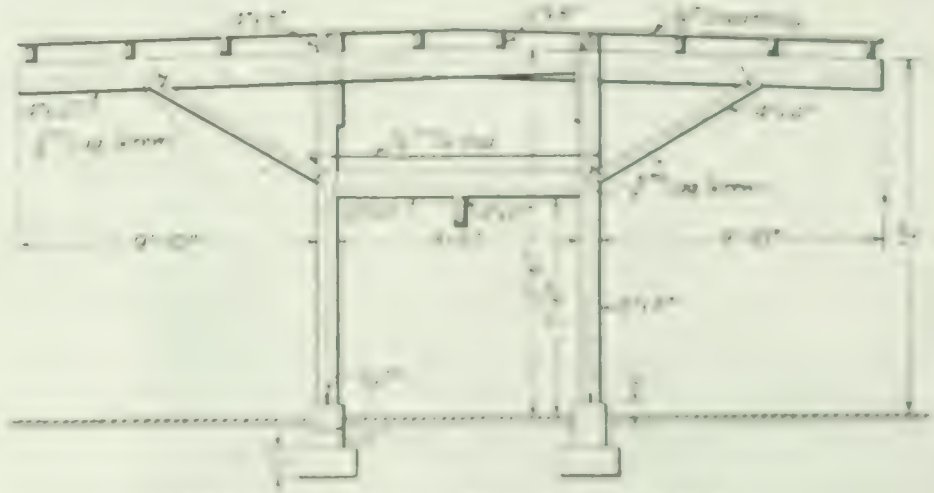
GENERAL PLAN

SECTION D-D





SECTION THROUGH SKYLIGHT



SECTION THROUGH TELPHER SHED

BUILDINGS WIDENED

As the walls and columns are poured full height, concrete had to be hoisted to the top of the buildings for most of the work, while at the same time means had to be provided for laying the concrete floors on the ground surface inside the warehouses. This is accomplished by using a concrete plant with the mixer set at ground level and distributing the concrete in buggies. The mixer discharges directly into these for the floor work, while for the rest of the work it discharges into a skip operated in a short hoisting tower to the level of the roof. As the plant is placed between two units being constructed together, a light timber bridge is built past the face of the tower level with the roof and connecting with the runways on top of both buildings. The tower is short, the mixer is on skids and the entire plant can be taken down, moved and re-erected in a couple of days. This has been done twice when the distance which the concrete was being wheeled became too great, and the plant will be moved once more before the present units are completed.

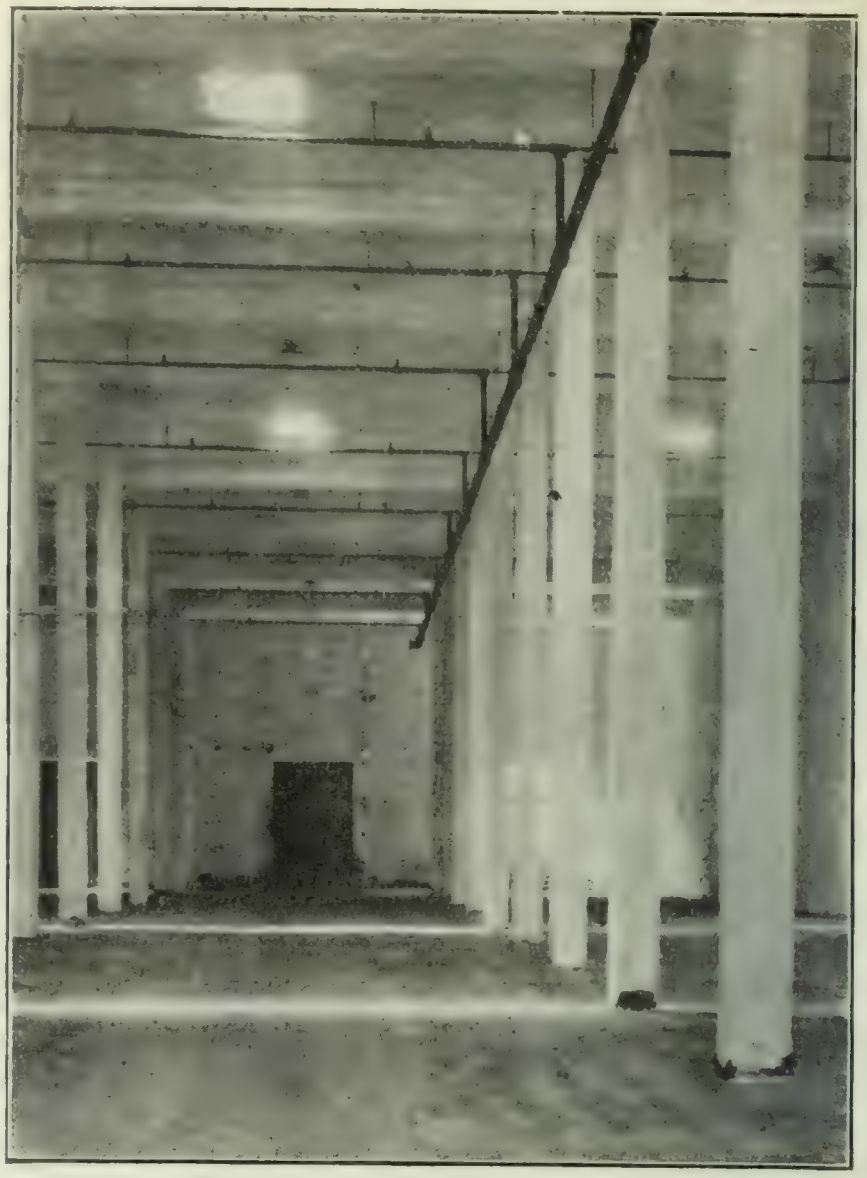
These buildings are divided into bays 45 ft. long by concrete fire walls, and the walls of a complete bay are formed and poured first on one building and then on the other. After the walls and columns of several sections on one building have been poured, the roof is concreted in slabs 120 ft. long containing 280 yd., placed and finished in one run. The walls and columns are poured full height in one operation.

The two buildings under construction at this time occupy the center of the group of warehouses. Concrete materials are delivered by rail and brought from the west side of the building. For this purpose a road was cut through along the line of the future telpher tracks, and sand and gravel brought in by teams and stored in piles in advance of the buildings.

Considerable grading was required at the site, a cut of 12 ft. or more being necessary along the line of the south building. This work is handled by a ¾-yd. revolving shovel, which was easily able to keep ahead of the concrete construction as long as teams could be supplied to remove the dirt. However, with the rush work being carried on for the United States Government at the National Army cantonment near Atlanta by the same contractor, it has become difficult to secure teams or trucks, and this shovel has had the task of keeping



TOWER DELIVERS CONCRETE TO BRIDGE AT ROOF LEVEL



BEAMS PARALLEL TO BUILDING GIVE WIDE CROSS AISLES FOR HANDLING COTTON

ahead of the work with 15 wagons, when it could easily have kept 18 busy. This was accomplished by abandoning a heavy cut where the shovel is shown working in the photograph and moving it over to the cut ahead of the other building, where but three feet of earth had to be removed. The stack of concrete materials shown stored here in the same photograph was used up in concreting the two buildings up to the point where grading on the deep cut was stopped. Meanwhile the shovel has removed the light cut, and this building was brought to completion while the hill in the way of the other unit was being removed to grade.

Form work and sometimes concreting are carried on at night, the work being flood-lighted with two 750-candlepower Davis flood lights, mounted on towers erected on top of the units at either side. Several smaller lights are used also from time to time.

The Atlanta Warehouse plant is being built by Arthur Tufts, contracting engineer, of Atlanta, with E. A. Stuhrman designing engineer, the work in the field being in charge of C. R. Justi.

Outfall Sewer with Multiple Outlet

A contract for an 84-in. concrete submerged outfall sewer 3500 ft. long at the site of the proposed easterly sewage-works for Cleveland, Ohio, has been let to the American Construction Co. for $360,000. The outer 1000 ft. will be a tapered section of concrete with 6½-in. holes spaced on 7-ft. centers, the design being similar to that of the westerly outfall, described in the *Engineering Record* of Mar. 25, 1916, page 410.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Professional Ethics and Registration of Engineers

Sir—Your editorial entitled, "Professional Questions Call for Study," in your issue for Aug. 30, p. 386, touches upon a sore spot in engineering practice. While it is true that not many who claim to be engineers are guilty of morally questionable practices, the number who ignorantly or wilfully ignore or violate what has been accepted by the more conservative members of the profession as correct professional conduct, appears, as you intimate, to be rapidly increasing, and they are becoming more and more a disturbing and demoralizing element in the profession—if we may call engineering in its present condition a profession.

Your scheme to print and comment upon special cases is laudable and should bring out much that will be interesting and useful, particularly to the younger engineers who desire to know and to do what is right.

Your conclusions will doubtless confirm the views held and practiced by honorable engineers who adhere strictly to approved codes of professional conduct. But there is reason to fear that they will be lost upon that class who seem to regard professional ethics as excellent in theory, but to be observed in practice only where convenient. They have taken up and practice engineering as a business rather than as a profession, and are controlled by commercial morals and customs rather than by codes of professional ethics; and, since the spirit of the original code of ethics:

"He may take who has the power
And he may hold who can,"

is not wholly extinct in the modern business world, they apply the modern interpretation of it to their engineering vocation. Competition and smart practice is said to be the life of trade, and there can be no doubt that advertising, publicity and skillful promotion are profitable in engineering, as in other lines of business.

Engineers of this class do not stand in awe of the disapproval of the profession and do not much fear public opinion, which is callous and indiscriminating in matters of professional ethics. Even conscious incompetence may be no bar to their ambition and enterprise. If the merchant may exaggerate the quality and value of his goods, why should not they do so in the matter of their professional wares? Unless they violate the laws—and very few do that—there is no way of penalizing them for unprofessional conduct. It is true that most of the engineering societies have in their constitutions provision for expelling members guilty of unprofessional conduct, but not one of them, so far as I know, has ever disciplined a member for offenses of that character. In the absence of an adequate code of ethics defining specific offenses these societies doubtless hesitate to take the responsibility involved. In fact, most of this class of engineers are not members of these societies.

In short, it is to be feared that neither editorial teaching, moral suasion nor professional disapproval can be depended upon to remedy the situation. What is needed is the authority of the state to prevent or punish. In the other professions such authority is provided by the statutory recognition of the profession, the registration of competent and worthy practitioners, and appropriate penalties for those assuming to practice without such registration, or who violate moral or professional rules of conduct.

Engineering can never establish itself as a real profession until it secures like legal recognition and protection from incompetents, and power to control the actions of its members. Until then unprofessional conduct, resulting mainly from the attempt to mix business customs with professional ethics, will continue to exist and to increase.

S. WHINERY.

New York City.

One Hundred Concrete Dwellings Built as One Contract Job

Sir—We notice that in your article on our concrete house job at Donora, in your issue of Sept. 6, p. 442, you have stated in the last paragraph that the cost of erecting form work is averaging about 50c. per sq.ft. This should read "$0.0765 per sq.ft.," this figure being obtained by the addition of the three units appearing in the preceding paragraph.

On the last line of the preceding paragraph the unit of $1.25 per 100 sq.ft. should read "per 100 sq.ft. of form" and not "per 100 sq.ft. of wall."

LESLIE H. ALLEN.
Aberthaw Construction Co.

Boston.

Areas of Segments of Circles

Sir—Since the matter of approximate formulas for the area of the segment of a circle was referred to in your issue of Sept. 6, p. 470, your readers may be interested in a formula on p. 652 of Molesworth's "Pocketbook for Engineers," which may not be generally known (as I have not seen it in any other book):

$$\text{Area} = \frac{4}{3}h\sqrt{(0.6366l)^2 + h^2}$$

where h is the altitude (less than the radius R) and l the *half-chord*.

Since

$$R = \frac{l^2 + h^2}{2h}$$

or

$$l^2 = h(2R - h)$$

it is readily changed into the form

$$\text{Area} = \frac{4}{3}h\sqrt{(0.6366)^2 h(2R - h) + h^2}$$

which gives the area in terms of altitude and radius.

Results obtained by the use of this formula are remarkably close. For instance, the area of a segment of altitude 12 in. and radius 60 in. is found to be 2523.194 sq.in., or

$$\text{Area} = R^2 \times 0.07021$$

as against 0.07021 in Professor Maynard's table, that

is, the error is only about 16 parts in 100,000, or 0.016 of one per cent.

And even when the segment is a semicircle the formula gives area $\div R^2 = 1.57300$, as against the actual value 1.570796...., involving an error of about 140 parts in 100,000, or 0.14 or one per cent.

Since the area of a parabolic segment of same base and altitude would be $\frac{4}{3}hc$, while Molesworth's formula for the circular segment is $\frac{4}{3}h\sqrt{(0.626h)^2 + c^2}$, it would appear that the radical is a corrected value of the factor c, to adapt it approximately to the latter segment.

I. P. CHURCH,
Prof. Emeritus, Applied Mechanics and Hydraulics
Cornell University.

Ithaca, N. Y.

There Is No Demand for Engineers, Insists Electrical Man

Sir—The writer, with other engineers, has noticed considerable discussion in your columns regarding the possible extraordinary demand for engineers which may arise at the close of the war. In the opinion of many there will be no great demand for engineers *to do engineering work*, because in the great activity which has been shown in the United States in the past few years there has been no such demand. There has been a great demand for young engineers to do clerical and semi-clerical work, but only a comparatively small demand for mature engineers to do real engineering work.

It may be somewhat difficult for an outsider to see this, but the case of the engineers of the large electrical companies shows it well. These companies send glib talkers to the engineering schools to get young engineers to enter their testing and other departments. They enter these departments under the expectation and the indirect promise that a glorious future awaits them. They start in at 20c. an hour (it used to be 10c.) and do work such as reading meters, which is of very little value and could just as well be done by mechanics or uneducated men. They are then taken into the engineering departments at the magnificent recompense of $14 per week. After about three years they are raised to something like $21 and put in charge of some special work and given some high-sounding title like "expert on relays" or other apparatus. About this time they fall for more "bunk" and get married. They may then be raised to $25 a week. After about ten years of experience they get about $125 a month. They are then more or less expert in certain lines of work.

Some day such an engineer wakes up and finds that the amount of salary he is receiving is not enough to bring up a family, especially when he has to pay about one-third of it for rent. He then attempts to improve his position by making a change, but finds out through friends higher up that it is useless to attempt to make a change while he is still employed; that is, he has to leave his job before he can get another. This, as can be easily seen, he is not in a position to do, consequently he works at the expert's magnificent remuneration until he dies, when his fellow workers take up a subscription to bury him.

The writer will concede that a brilliant engineer may get an adequate salary from one of these companies, but the trouble is that thousands of young men educate themselves as engineers to enter these companies and then are immediately given nothing but clerical work, or work which any well educated clerk could do. That there is no demand for electrical engineers *as engineers* in comparison with the number of men turned out of the engineering schools, can be shown as follows: The writer is personally acquainted with two or three hundred steadily employed engineers. These men will average eight years' practical experience. Some of them have been in charge of hundreds of thousands of dollars worth of so-called design work. Their average salary is not over $2000 a year, and scarcely that. During the past few years of good business, these men have had their salaries raised about 10%. Almost every one of them has tried to find a new location; five of them have succeeded. The writer is also acquainted with some thousands of mechanics—and there is not a man of these but has had his pay increased from 40 to 200 per cent.

This plainly shows that there is very little demand for electrical engineers, and a great demand for mechanics. Fifty graduate electrical engineers ought to supply all the demand for real electrical engineering that will occur in the United States after the war. These fifty men will not meet the demand for clerks to handle correspondence, trace up orders, work in testing departments or run errands, but they will be able to do all the real engineering work.

The writer recently was talking with an able consulting engineer making a fair living. He has handled the design of some of the biggest electrical installations in paper mills in the world. This man told me that he worked for five or six years for large power companies in Boston and that the maximum salary he was able to get was $100 a month. He was plainly told by the power company that this was all he could ever expect to get, that there was a vastly greater supply of electrical engineers than there was demand for, and that the number already in existence could do all the engineering work for the next twenty years without any new accessions.

In the opinion of a good many other engineers with whom the writer has associated, instead of increasing the number of engineering students and schools, it would be better to decrease the number of schools to about 5% the present number and the number of students to about 10%, and let the large corporations, and especially the electrical concerns, get their clerks, production chasers, repair men, etc., from the high schools and other places, which would not require seven years of training and the expenditure of about $7000 per student.

"ELECTRICAL."

[While our correspondent has presented an extreme and pessimistic view of the situation, yet it appears that the peculiar circumstances surrounding the electrical branch of the engineering profession, up to the entrance of the United States into the European war, certainly have prevented quite the same demand for electrical men as has been seen for civil, chemical or mechanical men. Since then the reports of engineering schools, as noted in our issue of Sept. 13, p. 493, have shown a heavy demand for men with electrical training.

There has long been a smaller demand for independent electrical practitioners than for civil or mechanical, since the great mass of electrical equipment is highly standardized and is produced on a large scale by comparatively few concerns. Under such conditions there is less need of new designs for each installation of machinery than is probably true of any other group of industrial accessories. It was not until ten years ago that the possibilities of this situation were at all widely recognized, and many young men were allowed to go on with electrical engineering who had started in under the old glamour of the word "electric."

Some men have remained in minor positions in the electrical branch when they might have done better to go into mechanical or chemical work, or even into business. If these men's educations had been as broad as is now universally recognized to be desirable—or rather if they had been thorough enough in natural science and a few fundamentals of engineering practice—and if the men had had ingrained into them the habit of engineering attack, they could have shifted with comparative ease. Of course, they would have had to start in minor places, but the pay would not have been far below that which our correspondent states still prevails, and promotion probably would have been more rapid. By undergoing a certain temporary hardship they would have made a large net gain.

There seems to be no reason why, in the electrical branch of engineering any more than in any of the other branches, it is useless to attempt to change positions while still employed. We venture to assert that the great majority of engineers do not give up their old place until the new one is secured. Many employers will accept an employed in preference to an idle man.—Editor.]

Making Right-of-Way Computations

Sir—In reading over your publication of my formula for right-of-way computations in the issue of Sept. 6, p. 439, I find that I omitted the parenthesis which should inclose the three interchangeable quantities following the plus-or-minus sign. The formula as copied from my reference card would then read:

$$x = D \pm \left(\frac{7AO}{180} = \frac{AO}{57.2958} = 0.0175AO \right)$$

This application of the parenthesis is perhaps not sanctioned by general mathematical usage, but I find it very convenient in recording in small space formulas such as the above, which have more than one convenient form.

P. E. STEVENS,
Consulting Engineer.

St. Paul, Minn.

Steam Jets To Thaw Frozen Ground

Sir—I notice in your issue of Sept. 13, p. 519, a description of the use of steam jets for thawing frozen ground. This method has been used locally, to my knowledge, for thawing when opening up water-pipe trenches in winter time, and where the frost was very deep. It seems rather peculiar that some of these mining methods of the far North have not been used more generally by contractors in this country. If this is supposed to be a new scheme for thawing frozen ground, it is certainly time that the matter be given some publicity through your columns.

Probably one of the best articles on this subject was printed in the *Engineering and Mining Journal* of July 3, 1915, and anyone who has work of this kind should read this article. It gives very complete information for making the steam points, as well as the method of connecting up the sweaters. There is also an interesting photograph in the *Engineering and Mining Journal* of Mar. 27, 1915.

The article above mentioned deals with thawing frozen ground for mining work in Alaska, and they have without doubt worked this question out to a point where it should be most successful.

St. Paul, Minn. AN INTERESTED SUBSCRIBER.

Machine Bolt Heads Smaller Than Nuts

Sir—Referring to the letter from F. D. Buffum, published in your issue of Sept. 6, p. 468, please note that not all of the steel manufacturers' handbooks publish only the dimensions known as the Franklin Institute or United States standard of bolts and nuts. The book entitled "Cambria Steel" shows both these standards and the manufacturers' standard sizes, as may be seen on referring to pages 334, 341, 342 and 343, in which these are given in full detail.

Manufacturers' sizes include square and hexagon nuts and square and hexagon bolt heads, which are smaller than the Franklin Institute or United States standard sizes. In the manufacturers' set of standards, however, the sizes of the bolt heads are not the same as those of the next smaller size nuts, as such figures would make the dimensions out of proportion. This is true, however, of certain sizes, such as the ¾-in. manufacturers' standard bolt heads, which have a short diameter of 1¼ in. and one of the manufacturers' standard sizes for ⅞-in. nuts, which is the same, namely, 1¼ inches.

GEO. E. THACKRAY,
Special Engineer, Cambria Steel Co.

Johnstown, Penn.

Schedule of Liquidated Damages in Highway Specifications

The Pennsylvania State Highway Department specifications for a $12,000,000 construction program, to begin soon, cover the subject of liquidated damages quite fully. In computing the contract time for completion of the work "the length of time expressed in days and parts of days, during which the prosecution of the work has been delayed or suspended in consequence of unsuitable condition of the weather or other unfavorable conditions, or by any act or omission of the Department and not by any fault of the contractor, is allowed the contractor and excluded from the contract time; and if the satisfactory execution of the contract requires work and material in greater amounts than set forth in the contract, the contract time is extended in the same proportion as the additional work bears to the original work contracted for."

Failure of a contractor to complete the work on time under these conditions will cost him as follows:

THE ENGINEER IN FIELD AND OFFICE

A DEPARTMENT DEVOTED TO DETAILS OF THE DAY'S WORK

The Cost of Isolated Road Surveys

SINCE 1913 the State Highway Department of Illinois has made more than 400 preliminary surveys of roads under conditions which have made the comparative cost rather high, although the actual cost of $26.40 is but a small item of the final cost of the road and insignificant in comparison to the cost of errors that might have resulted from less careful surveys—or no surveys at all. This work was done on roads in short and entirely disconnected sections. As a result the cost of transporting men to and from the intersections was large in proportion to the amount of work accomplished after they had arrived at the work.

All of this work was preliminary in its nature, some of the surveys being made in prairie land and some in rough country. Altogether nearly 1100 miles of road were surveyed at an average cost of $26.40 per mile. The average rate was 0.84 miles per day and the average length surveyed was 2.66 miles.

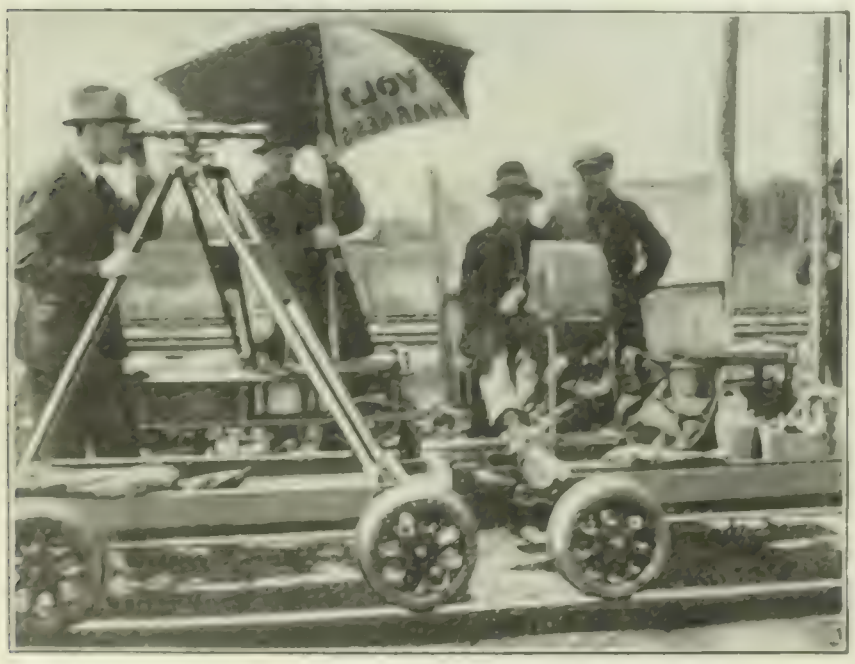
A typical party consisted of two engineers at $4 a day, three helpers at $2.50, and a team at $3. Such incidentals as transportation, board, lodging and supplies brought the total cost per day to nearly $25, and while this figure is less than the cost for similar work done by a private engineer, it does not include such charges as office expenses and profits.

Small Motor Cars Used on Precise Level Surveys

BY C. L. EDHOLM
New York City

MOTOR driven cars with flanged wheels for use on railroad tracks carry the outfit used by the United States Coast and Geodetic Survey in that part of their work which is upon railroad rights of way.

An interesting novelty is the adding machine attached to one of the cars for recording the reports of the parties engaged in precise leveling. A rigid frame, which holds the calculating device, is bolted to the body of the car. The operator is provided with a comfortable cushioned seat over the wheel, where he can do his work conveniently. The added reliability and greater speed of the machine for noting the readings of the level rods makes it a valuable addition to the equipment of parties in the field.



COAST AND GEODETIC SURVEY PARTY CARRIED ON LIGHT MOTOR CARS

Another car carries the level, the tripod being securely mounted upon the frame of the motor vehicle, and the operator standing in the space between the tracks. Flat trays, or hand barrows, on each car are available for transporting the other instruments, tools and personal belongings of the party.

The cars are light in weight, with frames formed of steel tubing, and are capable of traveling at a good speed with their load of instruments and passengers. A small gas engine under the frame supplies the motive power, and enables the party to reach its field of operations promptly and without fatigue.

Drafting Machine Automatically Computes and Plots Stream Discharge

BY W. NIMMO
Public Works Department, Hobart, Australia

A METHOD of computing and plotting stream discharge was recently developed by the writer for use in connection with a proposed hydrometric survey of Tasmania, and an instrument was devised to perform the necessary operations automatically. The principle on which the instrument operates is identical with that used in the method described by F. H. Kingsbury in *Engineering News-Record* of May 24, p. 422. Owing to the abandonment of the proposed survey, however, an opportunity of trying out the method in regular work has not yet presented itself.

The instrument is shown diagrammatically in the accompanying figure. *AB* is a straight-edge provided with a longitudinal groove. *CDEF* is a carriage consisting of four bars and having a fifth bar *GH* fixed at right angles to *CD*. The carriage runs on four wheels placed under the corners, those at *C* and *D* running in the groove *AB*. The plate *J* is a right-angled triangular plate (the center being removed to reduce weight) having a slot *K* parallel to one side and making an angle of 45° with *CD*. The plate can slide longitudinally on the carriage, being guided by the clips *L* and *M* on the bar *CD*; *N* and *O* are sleeves sliding on the bars *GH* and *DE* and carrying the tracing point *P* and the pencil point *Q* respectively. The pin *R* engages in the slot *K*, and a spring (not shown) keeps the pin *S* pressed against the template *T*.

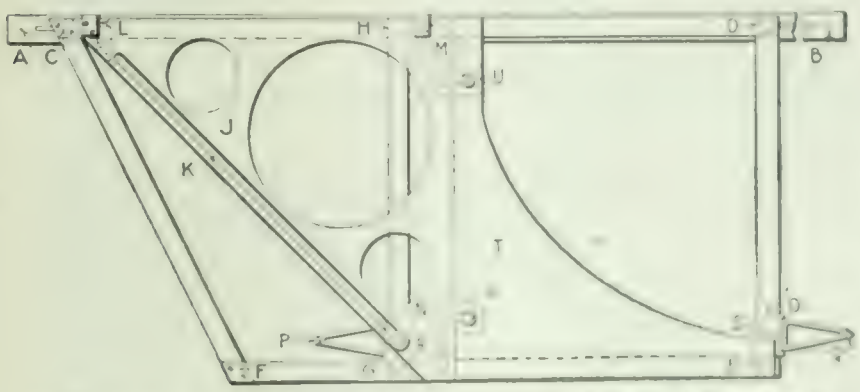
The template *T* is cut to the "station rating curve," obtained by plotting gage heights, to the same scale as used in the gage-height diagram, as abscissas, and the corresponding rates of discharge, to any convenient

scale, as ordinates. The template is secured to *J* by the milled screws *UU*. If the tracing point *P* be moved a given distance along *HG*, then the template *T* is moved the same distance to the right, and therefore if *P* is moved over the "gage-height curve," then *Q* will trace out the corresponding "discharge curve."

The area of the "discharge curve" multiplied by a factor whose value depends on the units and scales used gives the total discharge for the period represented by the "gage-height" curve. This area may be most conveniently obtained by means of a planimeter of the rolling type, and if the instrument be so arranged that the pencil point *Q* serves also as the tracing point of the planimeter, then the "discharge curve" may be plotted and its area read off at one operation.

If it be desired to investigate the discharge of the stream in detail, as, for instance, in studying flood records, the planimeter may be replaced by some type of integraph. (An integraph is an instrument provided with a tracing and a pencil point; and it is so designed that if the former be applied to any given curve, the latter will draw a second curve, the difference in height between any two ordinates of which is proportional to the area contained between the original curve, its abscissas and the two corresponding ordinates.) If the pencil point *Q* be used as the tracing point of the integraph, there is obtained a curve whose abscissas represents time to the same scale as in the "gage-height" and "discharge" curves, and the difference between any two ordinates of which is proportional to the total discharge during the corresponding time. In other words, a mass curve is obtained whose slope at any point indicates the rate at which water would accumulate if the total flow were impounded.

The methods outlined above are especially intended for use in connection with automatic water-level recorders, but even where single daily gage heights only are available, if the "gage-height" curve be first plotted, the "discharge" curve and its area may be obtained in



STREAM DISCHARGE COMPUTING AND PLOTTING OPERATIONS ARE PERFORMED BY MACHINE

one operation. Where a mass curve is to be plotted extending over a period of years, such as would be employed in investigating a storage proposition, the total monthly discharge only would be used, in order to keep the length of the curve within reasonable limits. The integraph method cannot, therefore, be applied in this case, and the monthly discharge must be first obtained with the planimeter, and the mass curve plotted in the usual manner.

The "discharge" curve cannot be plotted by the instrument on the same diagram as the "gage-height" curve, but this disadvantage may be outweighed by saving in time and the avoidance of clerical errors.

White Bridges Can Be Seen at Night

THE PRACTICE of painting highway bridges white so as to increase their visibility and thereby decrease possible accidents, is growing. A Tama County bridge on the Lincoln Highway in the Indian reservation and over the Iowa River is painted white, according to the *Service Bulletin* of the Iowa State Highway Department. People who cross this bridge at night who are accustomed to black or red bridges are struck with the ease with which the outlines of the bridge are noted. In Putnam County, Ohio, several truss bridges have been painted as shown in the view. The end posts of truss and railing are white for their full length but the inner railings and posts up to a height of 4 ft. are painted black as a protection against spatter from the road or discoloration from dog urine.



WHITE BRIDGE IS READILY SEEN

Concrete Specifications Have Some Special Features

THE specifications for concrete and reinforced concrete on the new bridge for Summit County, at Akron, Ohio, written by the engineers, Harrington, Howard and Ash, of Kansas City, Mo., contains some interesting features. In the first place the standard specifications for cement of the American Society for Testing Materials have not been used; instead, the engineers have their own specifications, the main points of difference being that the neat cement requirements are retained and the fineness is prescribed as 92% on a 100-mesh screen, and 75% on a 200-mesh screen.

In mixing and placing concrete the time of mixing is described as follows: "After the last ingredient is deposited in the mixer it shall be operated at least 1½ minutes or enough longer thoroughly to mix and incorporate all ingredients to the satisfaction of the engineers."

Consistency is defined in the following sentences: "Proper apparatus shall be provided that will insure a correct and uniform quantity of water, and it must not be left to the operator to judge the amount for each batch. The quantity of water used shall be such as will produce a mixture of concrete plastic enough to flow sluggishly in forms, and around timbers or reinforcing bars when properly spaded and otherwise agitated by proper tools. The concrete must not be so wet as to cause the aggregate to separate from the water, and water shall not be used or added in an endeavor to insure the flow of concrete in the chute. The addition of water to concrete after it has left the mixer will not be permitted."

In reference to chutes there is the following sentence: "Where concrete is transported in inclined chutes only metal chutes will be permitted. Special care must be taken to prevent the separation of the aggregate from

LUMBER SCHEDULE FOR ONE BAY

Mark	Pieces	Size	Length Ft.	In.	Panel No.
[illegible]	11	1 x7	14	0	Floor Sleeper
[illegible]	9	2 x6	6	9	Floor Joists
[illegible]	3	4 x4	12	0	Post Studs
[illegible]	9	4 x4	10	8	Post Studs
1 B 1	6	1 x8	14	0	1 BS
1 B 2	6	1 x5½	14	0	1 BS
1 B 3	6	2 x3	13	6	1 BS
1 B 4	12	1 x3	1	2	1 BS
1 B 5	18	1 x4 Sp	1	2	1 BS
1 G 1	4	1 x5½	6	4½	1 GS
1 G 2	4	1 x8½	6	4½	1 GS
1 G 3	4	1 x7½	5	6	1 GS
1 G 4	4	1 x8½	9	2	1 GS
1 G 5	2	1 x6½	3	8	1 GS
1 G 6	2	1 x3	6	9½	1 GS
1 G 7	2	1 x8	6	9½	1 GS
1 G 8	2	1½x7½	11	0	1 GS
1 G 9	12	1 x3	2	6	1 GS
1 G 10	8	1 x3	1	2	1 GS
1 G 11	4	1 x3	1	8	1 GS
1 G 12	2	1 x5½	9	2	1 GB
1 G 13	2	1 x7½	9	2	1 GB
1 G 14	2	1 x5½	12	10	1 GB
1 G 15		1 x7½	12	10	1 GB
1 B 6		1 x8½	14	0	1 BB
1 B 7	3	1 x3½	14	0	1 BB
1 G 16	2	2 x3	8	0	1 GS
1 G 17	2	2 x3	13	6	1 GS

the mortar and the chutes must not be at a flatter incline than 6 in. to 1 ft."

A novel provision is that in adding new concrete to old, not only shall the old be thoroughly cleaned by removing shavings, sawdust, débris, laitance, etc., but the surface over an area about 6 in. wide next to the form shall be *scraped* before new concrete is placed. This is evidently a provision against surface seams, for the specifications continue, "Where the old concrete has set for several days, or where large-size aggregate is used, or elsewhere when the engineers consider necessary, the above described area shall be covered with mortar of the same proportions as that in the concrete, about ¾ in. deep before new concrete is placed thereon, and in the placing care is to be taken so that the large aggregate will not appear against the form, so that no open seams will be apparent."

In the specifications for reinforcement not only rerolled steel is prohibited, but bessemer steel is also. The specification says: "Any attempt to substitute steel manufactured by the bessemer process or from old steel rails, will be considered a violation of the contract and an adequate reason for its cancellation."

The bridge is a very large one, totaling 2791 ft. long, and is to be entirely of reinforced concrete. It includes 16 arch spans varying in length from 116 to 191 ft., and 12 girder spans totaling about 300 ft. There is a 52-ft. roadway with two 10-ft. sidewalks.

Lighting a Drafting Office

THE lighting of the large drafting office of the Northern Pacific Ry. at St. Paul, Minn., was only noted briefly in the description of that office in *Engineering News-Record* of June 28. A correspondent has inquired as to the details of the electric lighting, and the following information has been furnished by H. E. Stevens, Chief Engineer, Northern Pacific Ry.

The indirect system of lighting is used. The lighting fixtures are spaced about 8 ft. longitudinally and 9 ft. transversely. The room is 11 ft. 2 in. high. Reflectors 15 in. in diameter are suspended about 18 in. below the ceiling. Photometric tests with 100-watt "C" lamps previous to installation, gave an average of about 8-ft. candles at 2½ ft. above the floor level.

The drafting room was first put into use in December, 1915, and the good results of the photometric tests led to the temporary use of 100-watt type "C" lamps in the fixtures over the drafting-room tables. These same lamps were also used during the winter of 1916-1917, but were somewhat unsatisfactory the latter part of the winter. This fall they will be replaced with the 200-watt "C" lamps originally contemplated, or with 150-watt "C" lamps if they are on the market. In that portion of the room where no drafting work is done, 80-watt "C" lamps are used.

The indirect lighting is practically shadowless, which, of course, is a very desirable feature in a drafting room. The lights are arranged in six rows, parallel with the outer walls. They are connected to the switches in rows parallel to the outer wall, so that in dark days the interior portion may be lighted as much or as little as may be required and natural light used in the outer portions.

Cut Joint Filler in Concrete Pavement with Steel-Cleated Shovel

Joint filler in concrete pavements should be trimmed so as to leave about ½ in. of the material extending above the pavement. This surplus is ironed down by the traffic and forms a better joint than if cut off flush with the concrete. An economical way of cutting off this filler according to the *Concrete Highway Magazine* is shown by the accompanying photographs. Two steel cleats on the underside of the shovel allow it to ride about ½ in. above the surface of the pavement leaving a uniform surplus extending above the road.



SHOVEL WITH CLEATS CUTS JOINT FILLER UNIFORMLY

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Raise Sunken Bridge Span with Jacks and Long Threaded Rods

By S. Standish

Standish & Allen, Engineers and Contractors, Chicago

A NINETY-FOOT pony truss span belonging to the Evansville & Indianapolis R.R., which was washed out on the White River near Rogers, Ind., was raised clear of the water without difficulty by the method



NUTS WERE USED TO ADJUST JACKING YOKE

shown in the photographs. The span had been carried about 1000 ft. downstream, and had landed in an upright position some 50 ft. from the south bank of the river. At low water the top 3 ft. of the trusses was exposed. The span lay in a nearly horizontal position.

Two gallows frames were erected, one over each hip of the span. The legs of these frames consisted of four pile towers, and the cross beams of six 8 x 16-in. stringers. Each hip joint was hung from a pair of 1¼ threaded rods 18 ft. in length. Above the cross beams each pair of these rods was connected by a timber yoke bearing under nuts screwed down on the rods. The raising was done with two 25-ton Norton jacks, the nuts being used merely to adjust successive grips on the rods. The ends of the span were raised alternately, one jack being set over each joint, and each end being raised about 2 ft. at a time. After the bottom flanges of the floorbeams cleared the water by about 4 in. raising was stopped, two additional bents of falsework placed, and the span dismembered, the pieces being loaded on scows and taken to a repair shop on the north bank of the river.

The work was done for the Evansville & Indianapolis R.R., of which C. B. Falley is general superintendent, by Standish & Allen. W. S. Allen was construction superintendent.

Carriage Guides Lengths of Concrete Sewer Placed in Tunnel

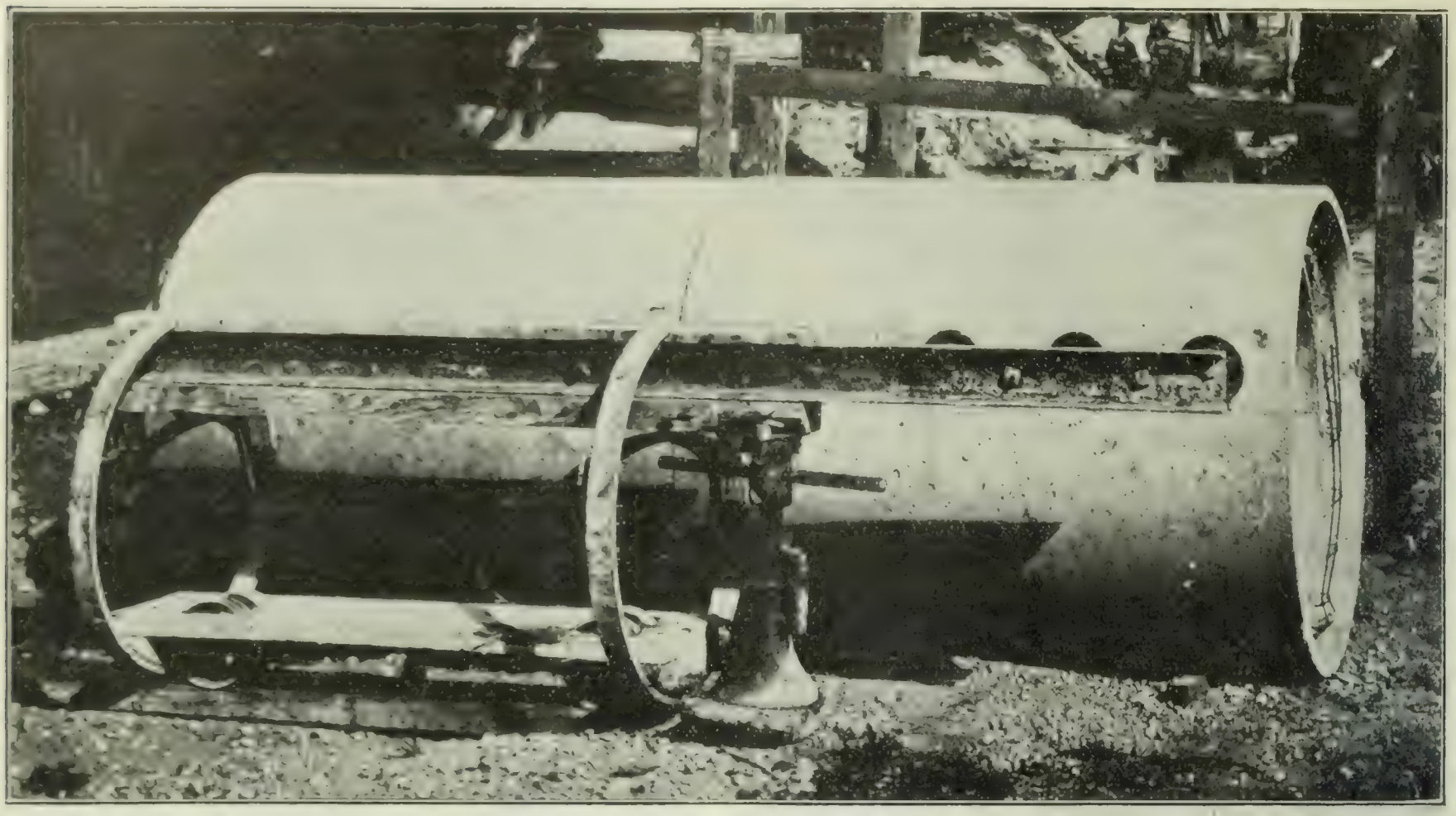
By A. G. Dalzell

Engineer of Sewers, Vancouver, B. C.

THE CARRIAGE shown in the photograph, designed by the writer to aid in jointing sections of 30-in. lock joint, reinforced-concrete pipe laid in a sewer tunnel, has proved very successful. The beam at the top of the carriage is 8 ft. long, which is equal to two lengths of pipe. It is made of two 4-in. channels let into a 6 x 8-in. timber which is shaped on the top edge to fit the inner circumference of the pipe. In the projecting part of this beam are fitted three 5-in. wheels, the tops of which are flush with the top of the wood beam. This beam is bolted to two iron hoops of about 28½ in. diam-



NINETY-FOOT SPAN RAISED APPROXIMATELY TWO FEET AT EACH END [illegible]



CARRIAGE IS JACKED UP INSIDE LAST LENGTH AND NEXT LENGTH IS ROLLED TO PLACE

eter, which are attached to a small truck on four small wheels. An ordinary screw jack, fitted with a hardwood base, shaped to the circumference of the pipe and with a square plate at the top engaging a slot in the end of the wood beam, completes the device.

The carriage was set in the first length of pipe laid in the shaft. The jack was then inserted and screwed up, lifting the entire carriage until the beam was tight against the top of the pipe. The next length was then wheeled up to the projecting end of the beam on a low truck and rolled forward, bearing on the wheels set in the beam. The length of pipe being set is thus accurately guided into place and is easy to handle. The invert of the length being placed can readily be adjusted to exact grade by lowering the jack or inserting a small filler under the top. When the joint has been made snug and the length adjusted to grade and blocked, the cantilever beam holds it in place until concrete is packed beneath it. The jack is then released and the carriage moved forward.

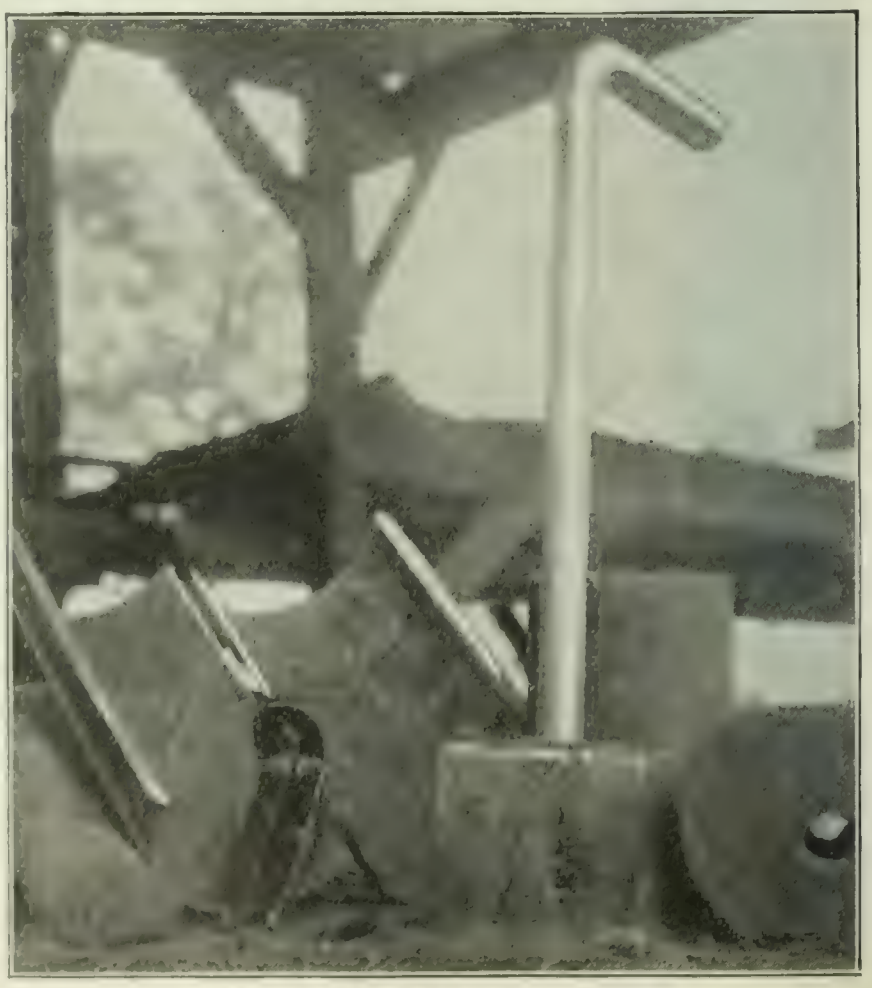
As the jack is suspended, by the square head mentioned, from the beam, it is carried along with the carriage. When the pipe layer wishes to crawl to point up the joints, however, the jack has to be taken off. It is then possible for a man to crawl through the carriage, or to propel himself along the sewer on the carriage. For a larger size of pipe two jacks would probably be necessary. About 2000 ft. of pipe was laid in tunnel under the writer's direction with this rig.

Providence Water Consumption Is Low

Supplying water to an estimated population of 284,400, including outside towns, the water-works of Providence, R. I., showed a per capita consumption of 63 gal. per inhabitant in 1916, according to the report of the city engineer for that year. About 93% of the services were metered.

Oval Concrete Spacer Blocks Save Time in High Wall Forms

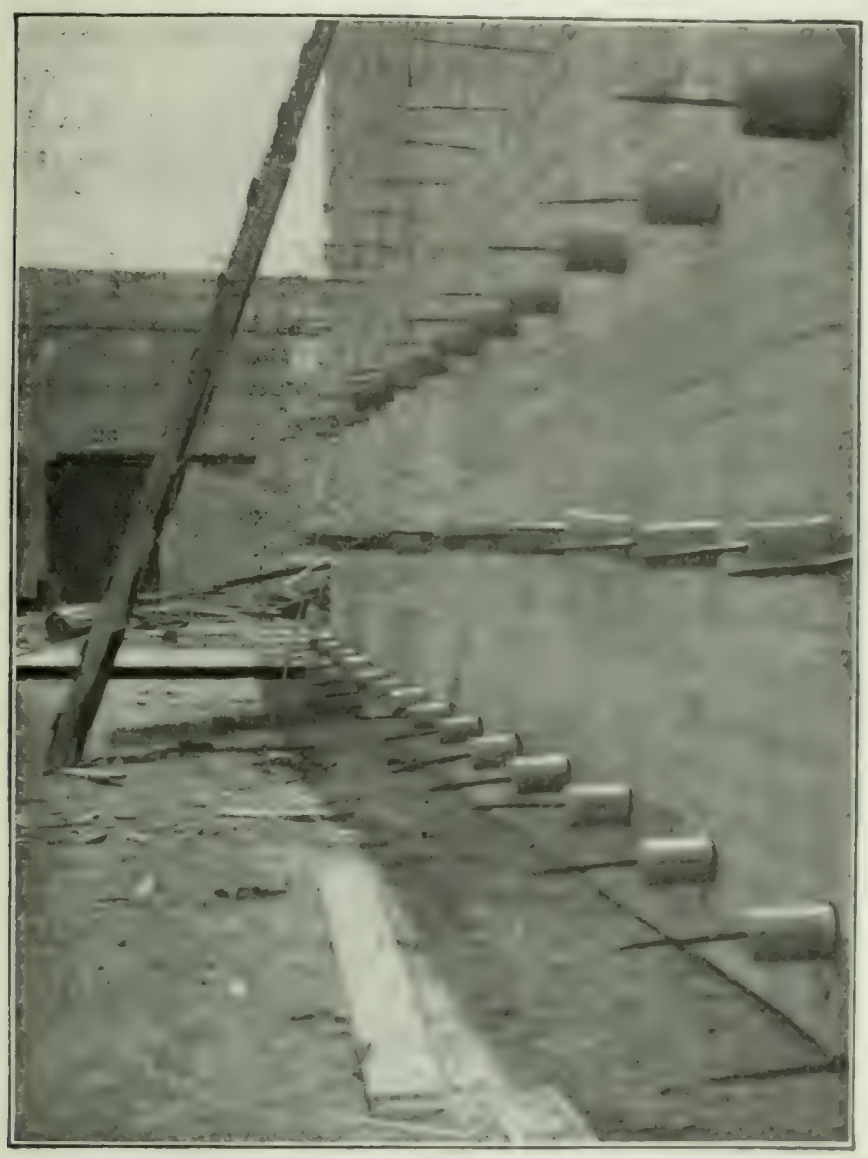
WALL FORMS used on the Atlanta Warehouse and Emery University Buildings by Arthur Tufts are held accurately in position by bolting them through the precast concrete spacing blocks shown in the illustrations. Not only are the forms held true, but the bolts are easily withdrawn by hand when stripping, and leave clean round holes which can readily be plugged. With 8-in. walls of the 18-ft. height required in the Atlanta



BLOCKS MADE IN HINGED MOLD

Warehouse, where the method was developed, it is next to impossible to line the forms up without spacing blocks, and if wooden ones are used they cannot be removed from the narrow section. With the concrete spacing blocks the wall forms are self-supporting, and do not require any bracing.

At the Emery University buildings, where appearance counts for much, oval blocks, placed with the long point down, are used to eliminate the chance of little



BLOCKS THREADED ON FORM RODS

stony pockets forming under the blocks. Where this is done the location of the blocks in the finished walls cannot be detected after the bolt holes are plugged. At the warehouse, however, where it is scarcely expected that afternoon teas will be held, less attention is paid to this point, and round blocks are used.

The blocks are made by one man working continuously, although two sets of molds are on hand at the warehouse so that the work can be speeded up when the supply of blocks runs low. The mixture of sand and cement is made just dry enough to keep its shape after packing with a wood tamping block, and removing the mold. Each mold bench has a wood plug with a hole in the center for the pin which forms the bolt hole. The mold is clamped around this plug, and filled and packed level to the top with the dry mortar. It is then taken off, the pin is withdrawn and the blocks are stacked on end to set.

The holes made by the pin are sometimes a little out of line. Therefore, in using the blocks only the inside form is bored for the bolts before assembling. This erected, the bolts inserted and the blocks threaded on them, an outside form panel is raised up and blocked in place against the bolts. The holes are then marked in this panel, and it is laid down to bore them. The outside form is then raised to place and the bolts drawn tight. The strips containing bolt holes in the outside form panels are replaced with new plank at each setting.

The work mentioned on which this method is in use is being carried out by Arthur Tufts, engineer and contractor, of Atlanta.

Mount Dirt Hopper on Inverted Timber Dollies

THE Bates & Rogers Construction Co. is using dirt hoppers mounted on timber dollies to load trucks at the excavation for the west subway approaches to the Detroit-Superior viaduct, Cleveland. Attention was called in the article describing this work, which appeared in *Engineering News-Record* of July 26, p. 148, to the contractor's choice of a locomotive crane and a traveler derrick, loading trucks by means of movable dirt hoppers, for excavating the double-track cuts in Detroit Avenue and Twenty-Fifth Street. Hoppers of larger size than could be conveniently picked up and moved by the hoisting equipment were employed by mounting each of them on six or eight inverted timber dollies and rolling them along plank runways laid on the curb. The hoppers when empty are pulled along with a runner line.



NEWS OF THE WEEK

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

Proposes That San Francisco Buy United Railroads

The plan evolved by a committee of bankers named to handle the financial reorganization of the United Railroads of San Francisco was presented to a conference of city, financial and labor interests, and was placed before Mayor Rolph, Jr., on Sept. 24 by the officials of the road. While details of the plan have not yet been made public, so far as can be learned, the plan calls for the leasing of the property by the city with stipulations that a percentage of the receipts be applied to the purchase of the property. The proposed purchase has been in issue since announcement by the president of the road, J. W. Lilienthal, that the finances of the property prevented it from granting the wage increase demanded by 1700 of its platform men who went on a strike eight weeks ago.

Jersey City Decides to Reopen Water-Supply Contract Suit

By a unanimous vote the Commissioners of Jersey City have decided to attempt to secure a reconsideration by the Court of Chancery of its decision that the water chlorination plant built at the Boonton reservoir by the Jersey City Water-Supply Co. relieved the company of any necessity of diverting the sewage of Rockaway valley towns below the Boonton dam. The resolution recites the fact that both its corporation counsel and special counsel have advised the city that the company cannot be compelled either to build or pay the cost of a trunk sewer and directs the corporation counsel to engage as new special counsel Albert C. Wall, who has given an opinion that he can secure a reopening of the case. Earlier notes on this subject appeared on pp. 481 and 522 of our issue of Sept. 13 and 573 of Sept. 20, 1917. The hypochlorite plant at the Boonton dam and the litigation and other reasons which gave rise to its installation were described at length in "Engineering News" of June 24, 1909, pp. 697-700, and editorial comment appeared on p. 693 of the same issue. The Master of Chancery report on which the decision was based in the suit Jersey City wishes to reopen was abstracted in "Engineering News" of June 9, 1910, p. 686.

Will Give Course on the Administration of Corporation Schools

At the request of the executive committee of the National Association of Corporation Schools, New York University has inaugurated a course to cover "The Administration of Corporation Schools" which will be under the Management Division of the School of Commerce and Finance, Dr. Lee Galloway, director. The object of the course will be to develop competent persons to inaugurate direct educational activity for industrial corporations.

The course opened on Tuesday evening, Oct. 2, at 7: 45, at the down-town branch of the New York University, which is at 32 Waverly Place, on Washington Square, New York City. Enrollments will be received until Oct. 20, and should be made through the University. Further information may be obtained from Major B. Foster, at the above address.

Christmas Packages for St. Louis Engineer Regiment

A committee of the St. Louis Engineers Club has been appointed to coöperate with the Ladies' Auxiliary of the 12th Engineers, who have undertaken to send every member of the regiment a Christmas present. The Engineers Club has decided to furnish 1000 packages of tobacco for these parcels, and at its meeting Sept. 12 the club authorized an expenditure to cover this gift.

Official Committee Improving War Service of Engineering Schools

Has Consulted with Heads of Various Bureaus. Suggests Drafted Engineers Be Assigned to Technical Services

THE relation of American engineering schools to the Government in the present emergency has been studied by a special committee of the Society for the Promotion of Engineering Education, appointed by Hollis Godfrey, of the Advisory Commission of the Council of National Defense. This committee includes F. L. Bishop, chairman, C. S. Howe, M. S. Ketchum, C. R. Mann, S. P. Capen, secretary. The probable needs for scientifically and technically trained men in connection with the military operations has been considered in consultation with the heads of various bureaus, divisions and departments of the War and Navy Departments. Conferences have also been held with representatives of the Council of National Defense, the Shipping Board, the Department of Labor, the National Research Council, the Federal Board for Vocational Education, and the Bureau of Education.

The committee had recommended that an engineer familiar with the equipment and capacity of the higher technical institutions of the country be commissioned in the army and assigned the task of coördinating the needs of the army for technically trained men with existing educational practice. The committee has held conferences with an officer who was appointed by the Secretary of War to study the needs of the War Department for technically trained men.

Short-Course Training Needed

It was found that there were a few definite needs in the way of short-course training wherein the technical schools might be of considerable help. A typical problem is that of the Signal Corps, which desires technical instruction for six depot companies, one for each army department, each depot company consisting of 175 enlisted men. Fortunately the committee found an institution equipped and ready to furnish this training. To save the waste of talent which would result from the use of a technically trained man in troops of the line, the committee undertook to secure for the Secretary of War lists of such students so far drafted in the National Army. The committee has compiled a list of engineering schools whose graduates may be considered eligible for competitive examination for appointments as acting ensigns in the Navy for engineering duty only. This would be in accordance with an act of Congress, which was approved Aug. 29, 1916.

The committee is not yet prepared to recommend any fundamental changes in courses of study as the result of its investigation. Certain military engineering topics, however, should be introduced into the regular courses. These will tend to satisfy the patriotic enthusiasm of engineering students, and will prove profitable to those who go into the army. Such topics as military-bridge building, laying out and sanitation of camps, the making and reading of maps, rapid reconnoissance, and the laying out of trenches, should be studied, and it is suggested that the textbook used by the army be used. The committee recommends as especially valuable "The Engineer in War," by Major P. S. Bond. The list of textbooks used in the military schools may be secured from the U. S. Infantry Association, Union Trust Bldg., Washington, D. C.

A complete report will be issued by the committee in the near future, and in the meanwhile it will be glad to answer, as far as it is able, inquiries concerning the relations of engineering schools to the National Government. Communications should be addressed to the secretary of the committee.

Road Builders!

Colonel E. N. Johnston, 23rd Engineers, needs your help in organizing a highway construction regiment of 10,500 men for immediate service in France.

He has asked Engineering News-Record to carry the message to you.

Full Details on Pages 625 and 626 of This Issue.

Portland, Ore., Relaxes Fireproof Building Ordinance

The City Council of Portland, Ore., has passed a resolution repealing the ordinance prohibiting anything but fireproof buildings in the main business district and allowing the erection of buildings up to four stories in height with fireproof walls and wooden interiors. Each floor of such a building must, however, be equipped with an automatic sprinkler system.

The ordinance, which becomes effective at once, marks the end of a long fight between property owners who have erected fireproof buildings in this district and the owners of vacant tracts and out-of-date structures. Architects are of the opinion that the repeal of the former ordinance means that building will be stimulated to a marked degree at once.

No Engineer on New Illinois Waterway Commission

Navigable waterway connection between the Chicago Drainage Canal at Joliet, and the Illinois River at La Salle, Ill., is to be investigated by a Board appointed by Governor Lowden under the new State civil code. This Board will act in connection with the Department of Public Works and Buildings. It is composed of E. S. Conway, Joy Morton, and John T. Pirie, of Chicago; George T. Pope, of Peoria; and Charles B. Fox, of East St. Louis. All are business men, and there is no engineer on the Board.

Public Health Association Changes Meeting Place to Washington

Owing to "circumstances connected with the war" both the time and place of the 1917 annual meeting of the American Public Health Association have been changed. The convention will be held at Washington, D. C., instead of New Orleans. The date has been tentatively set as Oct. 20-27, instead of Dec. 4-7. Dr. W. A. Evans, of Chicago, president, announces that the "central theme of the meeting will be the welfare of the soldier, sailor and civilian in time of war." Early hotel reservations are advised. In the absence of Secretary W. M. Guiteau with the Tuberculosis Commission in France, A. W. Hedrick, 1790 Massachusetts Ave., Boston, is acting secretary of the association.

Construction Field Is Adjusting Itself to War

Not Too Soon To Begin Looking Forward to Peace, When Great Activity Is Predicted

At present the Government, the people and our allies are attempting to consume our products somewhat faster than the labor available can produce them. At least, according to an analysis of the situation presented in the latest business letters of the National City Bank that theory will account for advancing prices and continued movements of labor for higher wages. Of course, advancing prices will ultimately check the tendency to consume more than can be produced. But the curtailment will have to take place in the consumption of the general public, as the necessities of the Government and our allies must be satisfied. One of the directions in which this curtailment is being and has been felt is in new construction. Industries that could find a ready market for increased output do not build because the labor to increase their output cannot be had. Public work is not coming out in the volume that would be expected if prices were lower. Investment in new enterprises is curtailed by the demand for money and means to carry on the war.

But because of this checking of ordinary work the country is going without new facilities which it will need all the more immediately when the normal course of national life is resumed. For this day farsighted men should now be planning. Extensions of transportation facilities, power developments, improved municipal utilities, increased building construction will all be needed. This development, held back by the necessity of the present hour, must come after the war.

Whether a period of stagnation will intervene, or whether an orderly readjustment to normal conditions will be possible must depend on public confidence. Money for private financing is of course growing scarcer. Call loans have recently advanced to 6 per cent., and the Secretaries of the Treasury and War Departments have publicly asked that private, state and municipal enterprises be held in abeyance until the requirements for the war, which will temporarily draw heavily on the thrift and resources of the public, have been met. But the enormous sums being thus raised by the nation will soon be spent, and will never represent a total loss. They are not passing out of the country, but being spent in it. Consequently this money is not subtracted from our future financial resources, but merely borrowed temporarily to make possible the production and assembly of things needed to prosecute the war. The net loss is represented only by such of these products as are consumed in waging war. It cannot be said to exceed to any crippling extent the wastage and consumption of normal times. The main thing is that the money which paid for and so called forth the production of these goods will remain in our hands, to be reinvested as capital in facilities which we are now doing without, and which will have to be provided at a rate above normal after the war is over. No period of stagnation will occur if the public, into whose hands this money will come as profits or as wages, does not become afraid to invest it during the period of inevitable readjustment after the war.

While planning for the future is a most important duty of engineers, contractors, and manufacturers in the construction field, the period of war is proving not without occupation and opportunity. The shipbuilding program and emergency construction for the Government are employing the organizations of a great proportion of engineering and contracting firms and the output of many manufacturers. Moreover, it is believed that the manpower and financial strength of the country will enable it to avoid the abandoning of normal development to the extent that has been necessary in the case of the Central Powers and of our Allies. Thus it appears that we will not have to neglect the development of our highway systems, of ports and terminals and of other facilities not vital to the waging of war, but which will greatly increase the efficiency of our efforts. Work of this sort, in addition to that for the Government ought to fully occupy our construction forces, now reduced by the drafts made on them for military service.

The fixing of lower steel prices cannot, of course, be expected to produce a building boom. But, on the other hand, Government demand for steel products, given preference over the field at fixed prices by a priority board, can hardly shut down all construction requiring steel. It must be remembered that the labor shortage, expressed in rising prices, has for some time held construction activity below the volume it would otherwise have reached. The further effect of the withdrawal of one or two million men and the conversion to war uses of a vast amount of capital will of necessity be taken up to a great extent by curtailment in the production of luxuries and nonessentials before it is felt directly in the construction field.

The outlook, therefore, as the national army and the armed war fleet are being raised, is far from forbidding. A busy future awaits the promoter and builder at the close of the war, and in the meantime some, if not all, of our construction forces seem destined to be kept extremely busy.

Government Wants Roads to Seaboard Improved

At a conference of state highway engineers held at Detroit, Sept. 25, 1917, Government representatives stated that the coming winter is likely to produce an urgent need for heavy road transportation on a large scale from Great Lakes points to the Atlantic seaboard. R. C. Hargreaves, chairman of the committee on storage of the Council of National Defense, called the meeting. The state highway departments of Michigan, Indiana, Ohio, New York, Pennsylvania and Virginia were represented. A general line of action was agreed upon for the purpose of selecting practicable through routes and getting them in shape to carry heavy motor-truck traffic all through the winter.

The thousands of army trucks recently ordered by the Government will probably have to be moved over the roads in order to avoid tying up a large amount of railway capacity that cannot be spared. Other traffic may have to be moved by way of roads in emergencies, especially when rush shipments are held up by railway congestion or interruptions. For these purposes it is urgently necessary at once to put in shape through routes from such points as Detroit, Toledo, Cleveland and Akron to Atlantic ports.

The facts set forth by the state highway engineers showed that such through routes do not exist at present—none at least that would stand up under heavy motor-truck traffic in winter. But it is possible to select through routes that offer hard surface everywhere except on short stretches which can be put in shape within the next month or two. Temporary surfacing of gravel or stone will be put on these unsurfaced sections, and continuous maintenance work throughout the winter will be arranged for.

The National Pike contains unimproved gaps too long to permit of surfacing in time for the present need—for example, the part from Lisbon to East Liverpool in Ohio. The Lincoln Highway is in good shape east of Pittsburgh, but thence west to the Ohio line and on several stretches in Ohio it is unimproved. A stretch near Monroe, Mich., between Detroit and Toledo, is almost impassable and cannot be put in shape for the expected winter use except by temporary gravel surfacing. The main road along the Lake Erie shore and east through New York is reported to have some weak bridges.

The two main routes in contemplation are the Lake Shore Road and the Lincoln Highway, the latter, however, to be used only east of Pittsburgh, being reached by a system of existing paved roads from Akron southeastward, passing west of Youngstown. State and county coöperation will be applied at once to the task of getting the routes into shape, after their selection by conference of the highway authorities of neighboring states.

It is expected that within a month the roads to be used will have been selected.

Major Ridley in Charge of Public Buildings at Washington

Maj. Clarence S. Ridley, of the Corps of Engineers, United States Army, on duty at the War Department, has been assigned to take charge of public buildings and grounds of the District of Columbia, and also as chief military aid to President Wilson. He succeeds Col. William W. Harts, Corps of Engineers, who was relieved at his own request, in order that he might perform duty with troops in the field. Colonel Harts will be assigned to the command of the Sixth Regiment of Engineers, recently organized, and now stationed at Washington Barracks, awaiting orders to proceed to France.

Major Ridley was graduated from West Point in 1905. After service in Honolulu, the Philippines and elsewhere, Major Ridley was assigned to duty in connection with river and harbor improvements in the vicinity of Wilmington, N. C., and remained on that station until the fall of 1916, when he was summoned to Washington for duty as an assistant to the Chief of Engineers.

Since the outbreak of the war with Germany he has acted as an assistant to Col. E. Eveleth Winslow, in charge of the military division of the engineer bureau, and was in immediate charge of the personnel of the Engineer Officers' Reserve Corps. Under the law, as the officer in charge of public buildings and grounds, Major Ridley will have the rank, pay and allowances of a colonel of engineers.

Admiral Capps Gives Progress of Shipbuilding Program

Rear Admiral Capps, chairman of the Emergency Fleet Corporation, has issued the following statement, dated Sept. 27:

During the past two months the Emergency Fleet Corporation has awarded contracts for 118 wooden vessels of 3500 tons dead-weight capacity each to 27 different shipyards. There had previously been awarded contracts for 235 wooden vessels of similar type to the above and for 58 vessels of composite construction.

During the past two months the designs for machinery have been completed for the manufacture of engines, boilers and other articles of equipment for these vessels, for which the facilities available of machine shops and boiler works throughout the country have been availed of.

Great difficulty has been experienced on the Atlantic Coast in obtaining suitable lumber for these ships, and it is anticipated that there will be greater delay in their completion than was expected when this movement was begun.

Since Aug. 1 there has been awarded contracts for 155 steel cargo vessels of 1,076,800 tons dead-weight tonnage, distributed among six shipyards. The most important of these contracts are for vessels of the so-called fabricated type, and special shipyards are being prepared for them. Contracts for the boilers and machinery and steel construction of these vessels have already been placed.

In addition to the above Congress in a pending bill is authorizing the construction of additional vessels whose total dead-weight capacity will be nearly 5,000,000 tons. Plans for the major portion of these additional vessels are now in course of preparation and many of them will be of special types adapted to particular necessities of war, and while substantially cargo carriers will have much greater speed than the cargo vessels now under construction.

New Safety Record on Building Construction Made

The California State Industrial Accident Commission makes the claim that a new national record for safeguarding workmen was established on the construction of the new Southern Pacific Building in San Francisco, the largest office building west of Chicago. The Commission was represented personally during the construction period by J. J. Rosenthal, now a captain in the United States Engineer Corps, and while work was rushed, not a single fatality nor even a serious accident was registered. At one time excavating, pile driving, the pouring of concrete and the erection of the steel framework was under way.

Forest Products Laboratory Makes Appeal for Men

The Forest Products Laboratory at Madison, Wis., is engaged in experimental and research work dealing with wood, especially at the present time in its application to the construction of airplanes for military purposes, and recent advices indicate that this work requires more men having an engineering or chemical training than are at present on the staff of the laboratory. Those who feel qualified to undertake work of this nature should notify the director at the address above indicated, and let him know of their qualifications and willingness.

Company Must Continue Free Fire Hydrant Service

Free water for fire protection and sprinkling must be continued by the local water company supplying Sandpoint, Idaho, according to a decision of a district court. The company's franchise, granted in 1905, provides for free water from as many fire hydrants as the city sees fit to install, as well as free water for sprinkling. In 1915 the Idaho Public Utilities Commission ordered the city to sell the company all fire hydrants and to pay the company $314 a month for public service. The court holds that the franchise has a contract that cannot be set aside by the commission and that the hydrants are the property of all taxpayers of Sandpoint. The suit to set aside the order of the commission was brought by the city.



PRESENT CONDITION OF LOWER OTAY DAM

Large Earth-Moving and Concrete Job on Columbus Channel

The Columbus (Ohio) channel improvement work is nearly ready for bids. The major part of the work is earth excavation and fill, amounting to about 2,000,000 cu.yd. However, there is an arch highway bridge, a concrete overflow dam 20 ft. high by some 600 ft. long, a reinforced-concrete levee wall 24 ft. high and 1200 ft. long to act as emergency spillway, and a considerable yardage of monolithic reinforced-concrete revetment slab.

The entire work is to be let as one contract, on account of the unavoidable interferences between the separate items. Bids will be asked on a straight unit-price basis, according to present intentions. However, the city laws permit the cost-plus contracts, provided a fixed maximum cost is set, and this method of bidding may be considered.

The excavation is channel widening exclusively. The work extends over a length of about 2 miles, and represents a depth of cut averaging 20 ft., by several hundred feet wide. No rock is encountered. The new channel side must be trimmed to an even slope, and grassed.

The excavation spoil is required to be used in part for building levee embankments along both sides of the channel. About half the total excavation, however, must be moved downstream to form levees along a 2-mile stretch below the widened section. All levees will have a top width of 80 ft. minimum (with local exceptions) and must be trimmed and grassed.

The one bridge forming part of the contract, at Town St., comprises seven arches, 78 to 105 ft. in span, with deck 60 ft. wide over all.

The entire work is in the Scioto River, between the mouth of the Olentangy and the sewage pumping station—a distance of about 4 miles. River conditions involve very low flow from April to cold weather, with the risk of occasional summer flood up to 20,000 cu.ft. per second. Winter and spring floods may range normally up to 35,000 cu.ft. per sec. and under the exceptional conditions of the 1913 flood up to 140,000 cu.ft. per second. The present channel has a discharge capacity up to levee tops of about 60,000 cu.ft. per second.

Requirements as to time of completion will probably not be specified. All reinforcing steel will be furnished by the city, delivery being expected shortly. The sand and gravel for concrete can be largely obtained from the river bed.

The enterprise is under charge of George A. Borden, Director of Public Service of Columbus. Henry Maetzel is Chief Engineer of the Department. R. H. Simpson is in charge of the channel improvement. Estimates made one year ago fixed the probable cost of construction (not including real estate) at $1,750,000, but about $2,000,000 will be available.

Urges Arbor Day Tree Planting Along Pennsylvania Roads

Planting trees along Pennsylvania roads on "Fall Arbor Day," Oct. 26, is being promoted by J. Denny O'Neil, state highway commissioner. He has sent a letter to county engineers and superintendents instructing them to have caretakers and foremen on the various state roads and endeavor to interest abutters in tree planting. In view of his belief that roads will be widened in the future, especially at curves, Mr. O'Neil advises that trees should not be planted more than 4 feet outside the fence line. He suggests the use of fruit trees and names the sugar maple as a highly ornamental tree, giving both shade and fruit. Apple trees are also suggested as low [illegible] with pruning to produce a high central top as desired. For purely shade purposes Mr. O'Neil would select the sugar maple or red oak.

Lower Otay Dam To Be Rebuilt Without Delay

After the City Council of San Diego had awarded the Wurster Construction Co. the contract for rebuilding the lower Otay dam for $420,000, the Wurster Company refused to accept on these terms, claiming they had made an error of $1 in figuring the cost of excavation. Instead of bidding $1.55 per cu.yd. the contract read 55c. The size of the contract was such that this amounted in total to a difference of $95,000 in the bid.

The City Council refusing to allow the Wurster Co. to make a change in their bid, the Wurster Co. forfeited their certified check, and in spite of a temporary injunction which was gotten out to enjoin the City Council from awarding the contract to any other contractor than the Wurster Co., on Sept. 22 the Council awarded it to James Kennedy at $505,000. The Kennedy bid was originally $586,736, but this, it was stated, had been agreed to be reduced to the lower figure in consideration of some changes being made in the plans and specifications.

At the same time the bid of the Southern California Portland Co. was accepted, under which the city will secure 85,000 bbl. of cement for this work, at a price of $2.03 per bbl.

Headings Meet in Wilson Avenue Tunnel, Chicago

The lake section of the Wilson Ave. water-intake tunnel at Chicago was holed through on Sept. 11. This section of the tunnel is three miles long, with a land extension of five miles to the new pumping station. It is 12 ft. diameter. The drift from the shore shaft is of very exceptional length, 14,848.8 ft.; the drift from the crib or intake shaft was 1054.2 ft. long. The connection was true, with an error of only 17 in. in theoretical line and 0.1 ft in grade. The sinking of the shore shaft was commenced Aug. 15, 1913. Authority to drive the heading was given on Sept. 1, 1914, this part of the work being done by day labor. The crib shaft and drift were built by contract. On the shore end of the tunnel also done by day labor up to Sept. 11 the length excavated was 17,388 ft. and of this 17,068 ft. had been lined. The work is under the direction of John Ericson, City Engineer; H. W. Clausen is in direct charge as engineer of water works construction. The survey work for this long tunnel was described in Engineering News-Record of July 26.

Oregon Road Commission May Work Men More Than 8 Hours

The State Highway Commission of Oregon, has power to declare that an emergency exists in road construction and to work its employees more than eight hours a day to meet the emergency, according to an opinion rendered by Attorney-General Brown, at the request of State Labor Commissioner O. P. Hall.

Two Lawyers and Publicity Man for Commerce Commission

Lawyers, in the persons of Clyde B. Aitchison and George W. Anderson, have been nominated by President Wilson for two of the three vacancies in the Interstate Commerce Commission caused by the death of Judson C. Clements, and the enlargement of the commission to nine members. The third appointee is Robert W. Woolley, newspaper and publicity man, and in recent years director of the Mint.

Robert W. Woolley, nominated for the term ending Dec. 31, 1920, is a native of Kentucky and is 46 years old. His early years were spent in newspaper work. In 1911-12 he was chief investigator for the Stanley Committee, which examined the affairs of the U. S. Steel Corporation. In 1912 he was chief of the publicity bureau of the Democratic National Committee. In 1913 he was made auditor of the treasury for the Department of the Interior, and in 1915 became director of the Mint. His latest notable activity was as publicity director for the first Liberty Loan campaign.

Clyde B. Aitchison has been for the last year and a half solicitor for the National Board of State Railroad Commissioners, in which capacity he has represented the board in the various valuation discussions before the Interstate Commerce Commission arising from the federal valuation of the railroads. Before that he was chairman of the Public Service Commission of Oregon, of which he was appointed a member in 1907. Prior to that he was secretary of the Oregon Tax Commission appointed to redraft the state tax laws.

George W. Anderson has been United States district attorney at Boston for the last three years. He is a native of New Hampshire and is 56 years old. He began practicing law in 1890, after being graduated from Williams College and Boston University Law School. In 1913 he was appointed a member of the Massachusetts Public Service Commission, but the following year he resigned to become United States district attorney.

Both Mr. Aitchison and Mr. Anderson are in wide disagreement with the railroads as to the governing principles of valuation. Mr. Aitchison as spokesman for the National Board of State Commissioners, and before that as member of the Oregon Commission, has opposed before the Interstate Commerce Commission most of the contentions made by the railroads in connection with the federal valuation. The title of an address, "How To Get Rid of the Reproduction-Cost Theory," read two years ago at the valuation conference, held by the Utilities Bureau, plainly suggests Mr. Anderson's attitude; while he is further known to valuation engineers for his violent attacks on one of the earliest large railroad valuations, made by one of our most eminent engineers. The predilections of Mr. Woolley, if they exist, have not been revealed.

Cleveland Will Add Public Hall to Group Plan

With the breaking of ground recently for the new public hall, Cleveland takes another step toward the realization of its group plan. Of the buildings in the group plan, the federal building, court house and city hall have been completed, and bonds have been voted and site cleared for the public library. Plans for the new union station were nearing completion when the onset of the war held them in abeyance. A bond issue of $2,500,000 for the public hall was authorized by the voters about a year ago, but on account of increase in prices of all elements of building, the funds in hand will only provide for the completion of the main auditorium and exposition section which will seat 12,000 people. The music hall section and section that will include small halls for public meetings will have to be delayed. The public hall will be bounded by E. 6th St., St. Clair Ave., Lakeside Ave. and E. 4th St.

Municipal Coal Mine To Be Opened by Pittsburgh

Bids are about to be asked for construction of a shaft and manway and for installation of machinery for a coal mine on the Marshalsea Poor Farm of Pittsburgh, Penn. The project calls for developing a capacity of 500 to 700 tons per day. A cost of $90,000 to $100,000 is estimated, of which about $13,000 is for the 60-ft. air shaft and the 140-ft. stope.

The enterprise is the sequel to very serious conditions that the city water department had to wrestle with last winter. The coal supply was so uncertain that shutdowns were threatened several times, and as it was there were occasions when single pumping units were shut down for periods of several hours in order to make the remaining coal last until a new supply came in. The city had a contract, at a price however which under last winter's conditions was very unattractive to the seller. Moreover, the railway congestion made all car movements uncertain. Prices up to $4 or even $5 per ton were paid for some supplementary coal supplies, as against the contract price of $1.60.

A further difficulty was the inability of the city to get labor, both that needed for unloading coal from box-cars (gondola cars being used elsewhere by the railroads) and labor required for filter-sand cleaning. Assistance was given by a contractor, who furnished men from his construction gangs. The labor difficulties of the water department are still serious, and a sufficient number of laborers is not obtainable.

While these factors led to the coal mining project, the latter is not likely to help out during the coming winter. The best proposals for furnishing the mining machinery and cars make it likely that 7 to 9 months will be needed after letting contracts before the mine can be operating. When operated at full capacity, however, a production cost of $1.10 to $1.50 per ton is anticipated.

The proposed mine will top the Pittsburgh seam, 5½ ft. thick, which should produce 7000 tons per acre. About 290 acres of coal on the farm can be mined.

New Industries Will Use Improved Lake Calumet Harbor

The river and harbor committee of the Chicago City Council is considering plans for the improvement of Lake Calumet, which has been deeded to the city by the State Legislature. The lake is not navigable at present, but the city plans to dredge about 500 acres for a deep-water harbor. The dredged material would be used to reclaim about 2000 acres of low land adjacent to this harbor, forming a good site for industrial and manufacturing plants. The lake is connected with Lake Michigan by the Calumet River, which will have a channel 22 to 25 ft. deep. A number of large industries are included in this territory and it is stated that new construction work amounting to $13,000,000 is contemplated, including the new shops of the Pullman Company.

Canada Seeks To Use Niagara Power Now Sent to This Country

Sir Henry Drayton, chairman of the Canadian Board of Railway Commissions, has been appointed by the Canadian Government as Commissioner to investigate the exportation into the United States of electric power generated at Niagara Falls, Ont. It will be recalled that in this connection Sir Adam Beck, chairman of the Provincial Hydro-Electric Commission, recently stated at a convention of the Union of Canadian Municipalities that the demand for hydro-electric power was increasing so rapidly in the Niagara zone that more than 83,000 additional horsepower would be required in a very short time. The commission, he said, was prepared to take proceedings to expropriate power from the Canadian Niagara Power Co. and the Electric Development Co., developing power at the Falls, of which 140,000 hp. is now exported to the American side which should be conserved for use in Canada. The commission has been granted the power to expropriate the electricity generated by these companies by an order-in-council recently passed by the Ontario Government.

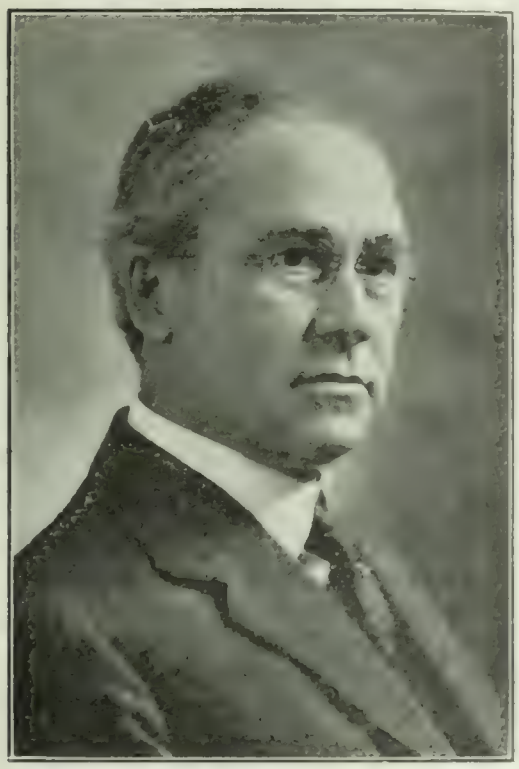
Columbia River Highway Located

The route has been selected by the Oregon State Highway Commission for the Columbia River Highway, from Hood River to The Dalles. The length of the route is 10.7 miles. The maximum elevation of the river route is 107 feet, as compared with 1107 feet on the Hill route. The new work in Hood River County will be the most difficult construction work to be undertaken anywhere in the state by the highway department this year. The department contemplates expending $500,000.

PERSONAL NOTES

EDGAR S. NETHERCUT, who was elected secretary of the Western Society of Engineers, Sept. 10, is expected to inject new energy into the administration of its business. His election fills the vacancy left by the resignation of E. N. Layfield some months ago. Mr. Nethercut was born

New Secretary for the Western Society of Engineers



EDGAR S. NETHERCUT

at Lake Geneva, Wis., in 1866. He graduated from the University of Wisconsin in 1889, and then began his career as a draftsman with Wade & Purdy. From 1893 to 1907 he was chief engineer of the Paige Iron Works and the Buda Co. For the next four years he was engaged on track valuation, at first for the Public Service Commission of New York (First District) and then for the Detroit United Ry. From 1911 to 1914 he practiced as a consulting engineer in Chicago, and in 1914-17 was in charge of the valuation of track and rolling stock of the Washington Railway and Electric Co. at Washington, D. C. This valuation amounted to over $100,000,000.

Mr. Nethercut is a member of the American Society of Civil Engineers and the Western Society of Engineers. He belongs to the Chicago Engineers Club, the Engineers Club of New York and the University Clubs of Chicago and Washington.

F. R. DEMAREST, who was connected with the engineering staff of the Turner Construction Co., New York City, is at present in direct supervision of all railroads and concrete roads in connection with the Aviation Experimental Station at Langley field, Hampton, Va., under the direction of CAPT. JOHN SLOAN.

ENGINEER COLONELS ASSIGNED TO REGIMENTS

Col. Sherwood A. Cheney, Engineers, National Army, is assigned to the One Hundred and Tenth Engineers and will proceed without delay to Camp Doniphan, Fort Sill, Okla., and report to the commanding general, Thirty-fifth Division, for duty with the regiment to which he is assigned.

Col. Edward H. Schulz, Engineers, National Army, is assigned to the One Hundred and Ninth Engineers. He is relieved from station at St. Paul, Minn., and will proceed without delay to Camp Cody, Deming, N. M., and report to the commanding general, Thirty-fourth Division, for duty with the regiment to which he is assigned.

Col. Paul S. Bond, Engineers, National Army, is relieved from station and duty at Cleveland, Ohio; is assigned to the One Hundred and Seventh Engineers; and will proceed without delay to Camp MacArthur, Waco, Tex., and report to the commanding general, Thirty-second Division, for duty with the regiment to which he is assigned.

Col. John C. Oakes, Engineers, National Army, is relieved from station and duty at Philadelphia, Penn.; is assigned to the One Hundred and Thirteenth Engineers; and will proceed without delay to Camp Shelby, Hattiesburg, Miss., and report to the commanding general, Thirty-eighth Division, for duty with the regiment to which he is assigned.

Col. Michael J. McDonough, Engineers, National Army, is relieved from duty at Plattsburg Barracks, N. Y.; is assigned to the One Hundred and Fourteenth Engineers; and will proceed without delay to Camp Beauregard, Alexandria, La., and report to the commanding general, Thirty-ninth Division, for duty with the regiment to which he is assigned.

Col. Frank C. Boggs, Engineers, National Army, is assigned to the Three Hundred and Fifteenth Engineers. He is relieved from duty as department engineer, Southern Department, and will proceed without delay to Camp Travis, Fort Sam Houston, Tex., and report to the commanding general, Ninetieth Division, for duty with the regiment to which he is assigned.

Col. George B. Pillsbury, Engineers, National Army, is assigned to the One Hundred and Fifteenth Engineers. He is relieved from duty at the training camp, Presidio of San Francisco, Calif., and will proceed without delay to Camp Kearny, Linda Vista, Calif., and report to the commanding general, Fortieth Division.

Col. Curtis W. Otwell, Engineers, National Army, is relieved from station and duty at Philadelphia, Penn.; is assigned to the One Hundred and Fourth Engineers, and will proceed without delay to Camp McClellan, Anniston, Ala., and report to the commanding general, Twenty-ninth Division, for duty with the regiment to which he is assigned.

Col. Harley B. Ferguson, Engineers, National Army, is relieved from station and duty at Boston, Mass.; is assigned to the One Hundred and Fifth Engineers, and will proceed without delay to Camp Sevier, Greenville, S. C., and report to the commanding general, Thirtieth Division, for duty with the regiment to which he is assigned.

Col. Lytle Brown, Engineers, National Army, is relieved from duty at the training camp, Fort McPherson, Ga.; is assigned to the One Hundred and Sixth Engineers, and will proceed without delay to Camp Wheeler, Macon, Ga., and report to the commanding general, Thirty-first Division, for duty with the regiment to which he is assigned.

C. MANNING, who has been in the service of the Grand Trunk Ry. for over 30 years, has been appointed vice president in charge of motive power, car equipment and machinery.

A. W. MCLIMONT has been appointed general manager of the Winnipeg Electric Railway Co., vice WILFORD PHILLIPS, who retires on account of poor health. Mr. McLimont was at one time engaged as engineer with the New York Public Service Commission, and was subsequently retained as engineer in connection with the rehabilitation of the Chicago & Milwaukee Electric Ry. He has lately been in control of the Michigan United Railway System.

ROBERT W. DAVIS, who has been road engineer of Fayette County, Kentucky, for the past four years, recently tendered his resignation to the fiscal court on account of the interferences of other county officials in the supervision of the asphalt plant. Mr. Davis' resignation was accepted

CHARLES ASH, who for the past year has been in charge of surveys and has assisted in perfecting plans for flood control of the upper Scioto River, has been appointed deputy county surveyor of Marion County, Ohio, and has charge of the surveyor's office during the absence of LORING K. WARNER, who has received a commission as first lieutenant and is stationed at Fort Leavenworth training camp.

RAYMOND BAFFREY, president of the Hennebique Construction Co., has returned from France on a furlough. He is a captain in the French army and has been in the service since the beginning of the war, being recently painfully wounded, but has now fully recovered.

ARTHUR N. DUNAWAY, until draftsman for the Chicago Sanitary District from 1908 to 1915, and for the succeeding year in private practice as a drainage engineer, with headquarters at Elbow Lake, Minn., is now captain in Company C, 17th Railway Engineers

GEORGE S. EATON has resigned as assistant professor of civil engineering at Clemson Agricultural College, S. C., and has taken up work in the pavement division of the promotion and and inspection bureau, Universal Portland Cement Co., Chicago.

BUSINESS NEWS

Joint Waterway Freight Line for New York State

Announcement has just been made of a traffic arrangement between companies operating freight lines on the Great Lakes, the New York State Barge Canal and the Hudson River whereby through all-water freight service is established between New York City and Western Lake ports. The companies involved are the Catskill & New York Steamship Co., operating on the Hudson; the Shippers' Navigation Co., operating on the canal, and the Great Lakes Transit Co., operating on the Lakes. The new route will operate as the Hudson-Great Lakes Despatch and will handle carload or less than carload lots at rates substantially lower than rail rates as far west as St. Paul, the latter destination being reached by rail. For the present the New York State Barge Canal will be utilized from Troy to Oswego, but in the coming season the through Troy-Buffalo route of the canal is expected to be put in service.

Let Contract for Record Gas-Pipe Line

A contract for what is said to be the largest gas-pipe line in the country is one of two just awarded by the Carnegie Steel Co. to the T. A. Gillespie Co., of New York and Pittsburgh. The contractor is to manufacture the 40-in. lock bar steel pipe and construct the 10 miles of line by January next. The second contract is for 5 miles of heavy railroad construction. Both are in connection with the new byproducts coke plant of the Carnegie Steel Co., at Clairton, Pennsylvania.

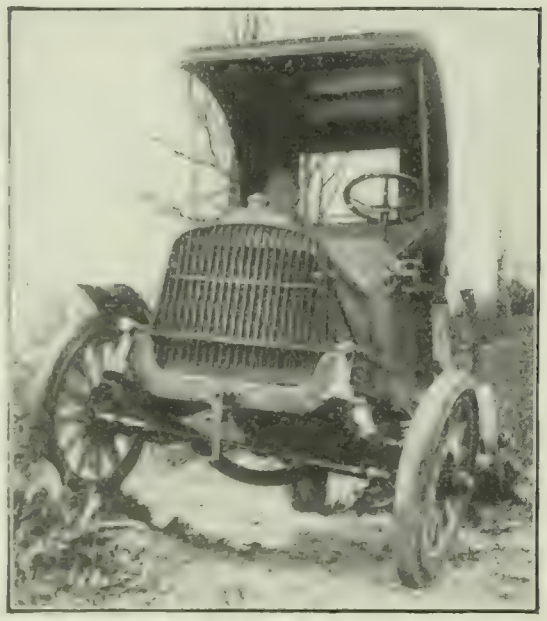
The pipe line will carry gas from Clairton to the Duquesne and Edgar Thompson steel plants of the Carnegie company, where it will be used for fuel. Work on this line is being rushed because the supply of natural gas in the Pittsburgh district, which is giving out, is at a minimum in the winter months.

The railroad, which will parallel the pipe line for a considerable distance, will connect the Clairton plant with Bull's Run, on the Union R.R., 5 miles distant. The James A. Hart Co. is associated with the T. A. Gillespie Co. on this contract. The railroad work will include 1,200,000 yd. of grading and about 75,000 yd. of concrete, largely in arch bridges. The construction of a 1700-ft. double-track tunnel is required. It is expected that the railroad will be completed by Jan. 1, 1919.

Several trainloads of pipe and construction plant will be required for both contracts, which amount in all to about $4,000,000.

Test Truck Motors with Frame Twisted

One of the road tests for United States motor truck chassis, shown in the photograph, consists in running the truck into a position where one wheel is several inches above the plane of the other three, to make sure that this twisting will not affect the starting or running of the motor. The twisting



STOP CAR WITH FRAME IN TWISTED POSITION TO MAKE SURE ENGINE WILL START

of the frame to this extent is not calculated to interfere with the running of the motor through exerting pressure on the bearings, as the "floating" power plant mounting is designed to eliminate this difficulty.

Building the Government Merchant Ships

It is probable that 200 steel ships of uniform design from 5000 to 9000 tons deadweight each will be built for the United States Government by three concerns, to whom contracts for 50 such vessels were recently let by the United States Shipping Board Emergency Fleet Corporation. The actual number of ships to be built will be decided by the Government within 60 days from date of contract. The steel for the vessels will be fabricated in different mills throughout the country and shipped to three assembling plants. The Merchants Steamship Corporation will erect 9000-ton ships at a plant at Bristol, Penn. The New York Shipbuilding Corporation (the American International Corporation) will assemble 7000- to 7500-ton boats at Hogg Island, near Philadelphia. The 5000-ton vessels will be assembled at a plant now building on the Newark Meadows, N. J., for the Submarine Boat Company.

As these three concerns will handle their contracts in the same general manner, only one of them need be considered. The Submarine Boat Co. expects to have its Newark shipways ready to operate in November or December of this year. Twenty-eight ships will be assembled at a time, and each batch should be finished in four months.

All pumping equipment is being furnished by the Worthington corporation. Motors, dynamos and electrical apparatus by the Westinghouse Electric and Manufacturing Co. The machine-tool requirements of the three ship-assembling concerns will probably be nominal. The requirements for machine tools to handle these contracts will be restricted almost entirely to such additions as may be necessary in the existing fabricating mills.

New Standard Army Truck Will Be Made in Two Models

The designing of the new standard military truck has been completed. A sample chassis will be ready by the middle of October. Deliveries are expected to begin in January, within four months after the War Department undertook the development of the truck.

Early in August about 50 truck specialists and engineers of established reputation came to Washington at the invitation of the Quartermaster Corps. The Society of Automotive Engineers also sponsored the Washington conferences. Both manufacturers and engineers generously contributed trade secrets in the designing of the military truck, just as they did in the development of the aviation engine.

After a series of conferences the design of the standard truck was completed early in September. Within 10 days detailed drawings were made and sample parts ordered. Ordinarily it requires several months to perfect and turn out such parts, but various manufacturers patriotically agreed to put ahead the Government's work and delivery of the parts, it is now expected, will be made by Oct. 1.

The new military truck will be made in two models, class A and class B. The engine used in the two will be the same in design, except for slight differences in cylinder bore, pistons, piston parts and riggings. To a large degree interchangeability of parts will be possible. The class A model will have a normal carrying capacity, under the arbitrary official ruling, of 1½ tons, with an actual commercial capacity of 3 tons. The class B truck will have a normal capacity of 3 tons and an actual capacity of 5 tons. Both trucks will have a two-wheel drive, with a speed requirement of 14 miles per hour for the class A trucks and 12 miles for class B trucks.

It is planned that the first orders for the trucks shall call for 10,000 vehicles, to be delivered in the first six months of 1918. These orders will call for 10,000 class B and 5000 class A trucks. The adaptability of the new trucks to commercial as well as military uses is indicated by arrangements now being made by a number of manufacturers to produce them for commercial purposes.

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The Demand for Civil Engineers

APROPOS of our recent treatment of the status of the engineering profession at this time of crisis, it is impressive to note that at least in some sections of the country the position of the engineer is not anomalous, but that on the contrary he occupies a well-defined place in the social scale and one, incidentally, which must be taken into consideration by every citizen. In a Dallas, Tex., daily paper there appeared recently the following advertisement: "Wanted at once—40 civil engineers, handy men, cooks, dishwashers and other high-class positions open. . . ."

Jersey City Will Let the Court Decide

THE unanimous decision of the authorities of Jersey City to let the Chancery Court itself decide whether it will permit a retrial of the water-supply contract suit, as suggested on page 481 of our issue of Sept. 13, opens a question of possible interest to every engineer or other expert who serves as a witness in contested contract cases, as well as to contractors, utility companies and municipalities. The broad question at issue is whether a suit can be reopened when it is plain to any judge or layman that the data of years of experience give ground for a directly opposing decision from that rendered on honest but premature expert opinion some years before, at a time when a new art was being given its first large-scale working test. The specific sanitary point involved is that all experts now agree that chlorination alone is not a complete bacterial defense against water pollution. Witnesses who testified in the first days of the art that chlorination alone was sufficient to meet the conditions of the Jersey City water-supply contract have since admitted their overconfidence and are now ready to go on the witness stand and say so. Jersey City has done well to let the court itself decide whether the case can be opened.

No Fee Contracts for War Building

WE ALL know that you cannot have your cake and eat it too. Nevertheless the wise men of Washington who are agitating for straight-fee construction contracts and competitive bidding on the fee are trying to tell us that you can secure by this simple system the advantage of cheapness attainable with competitive bidding and the incompatible advantage of great speed of construction attainable under percentage contracts. Where there is time to investigate all the conditions, complete a detailed design and allow contractors to estimate the cost carefully, and then to plan the work, competitive bidding may be held to promote efficiency. Where there is time for none of these things, but on the other hand where failure to finish the job at the earliest possible moment may mean the crippling of our offensive efforts, the percentage contract can be depended on, with efficient contractors of proved ability, to get the work done by the time it is needed and at the least reasonable cost. There is no necessity for resorting to a botched mixture of these two ways of handling work, grasping at the economy of one and the speed of the other, and insuring, as Mr. Goodell points out on page 687, the loss of both. If the Government cannot trust the ability and integrity of the country's best contractors, of whose services it has the pick, we had better pull our troops out of France before it is too late. On these same contractors must fall the burden of building all the facilities to transport and maintain our troops; and he who says these firms will prove crooked and inefficient on percentage work in the present emergency says in fact that we are without efficient men to carry out this essential step in our offensive program. The agitation for fee contracts is based on prejudice, not on fact and logic. The administration must disregard the agitators or they will do serious harm.

Technical vs. Social Programs

INTEREST in the social phase of engineering society work is general. It is a good symptom. Even the older, conservative engineers recognize more and more the need for drawing closer together, and are lending support to the increased social activities in engineering societies. But one danger is already in sight, as the experience of several societies indicates. That danger is the neglect of the technical work which—for most of the societies—is the bond of common interest. Once the participation of members in the reading and discussion of technical papers becomes less keen, or the social work is allowed to become ascendant, the society begins to go backward. There must be a solid basis of technical work if membership and prestige are to be increased. When speakers and papers must be drawn almost entirely from sources outside the society, and members are slow to make themselves heard, the beginning of the retrograde process is at hand. And such a condition is not a mere word-picture. Instances of such retrogression can be found. These thoughts are particularly appropriate just now. Programs for the winter are being laid out. On their character rests the welfare of the society as a truly engineering body.

English Considered as Mental Training

WHETHER Mr. Sutcliffe's contribution to the discussion of the most profitable method of teaching English, on page 599, Sept 27, is an advance over those proposed by Professors Park and Aydelotte in the *Engineering Record* of Feb. 24, 1917, will depend upon the answer it can return to the purely pragmatic question, "Does it work?" In considering the point he raises, we must remember that clear and sequential thinking is among the rarest of phenomena, and its attainment must be the definite aim of any reasonable system of pedagogics. Over the methods there may be many understandable, and indeed welcome, quarrels, but the primary object of education remains unclouded: The student is to be taught to think.

It will be recalled that Professor Park postulates that every engineering student is potentially a writer for publication, and that partly on this assumption of future authorship, all students in the College of Engineering at the University of Cincinnati are given a "course which consists of writing . . . as if for publication." Through an analysis of articles in various technical journals the student is given an opportunity to study their technique and to gain an idea of what would be an acceptable contribution, based upon a consideration of the elements of timeliness, originality, and practical usefulness. Therefore, Professor Park feels that journalistic assignments for his students should prove to be the best method of training, and consequently gives as subjects for themes matters directly connected with the students' work or neighboring construction.

On the other hand, Professor Aydelotte desires to "regard him [the student] as a member of an intellectual profession which has for its object the control of the human as well as the material forces of nature . . . a profession the members of which, working in cooperation, consider themselves the trustees of the whole body of natural knowledge placed at their disposal by modern science, and who consider their duty to be to add to this knowledge and to use it for the realization of the highest aims of society." He feels that more than merely technical proficiency should be expected from the engineering schools, calling upon these institutions to develop character and related human, though not necessarily professional, qualities. He holds that "the average engineering student has too narrow and too mechanical a view of his future profession . . . . not as a result of thought and choice but rather . . . . in obedience to a real or imaginary spirit of the age . . . which it has never occurred to him to criticise."

Therefore, whenever possible, Professor Aydelotte breaks away from purely engineering subjects and tries to have the student gain for himself a broader conception of his calling, which deals with human as well as material problems.

It may be seen that no one of these three men neglects to place some emphasis upon the necessity of teaching the thought-process. No doubt the differences which show in their contributions are similar to the differences which the minds and personalities of these men would exhibit upon critical analysis. Each has described a method which is like himself and therefore successful in his hands.

But aside from and above these differences, a most interesting significance is definitely suggested in Professor Aydelotte's article and no doubt was present in the minds of the authors of the other two. Broadly considered, it is the dawning realization that engineers must be prepared in the schools to assume a more important position in society. The profession is definitely of the character of this industrial age and the position it is to assume, as well as the time of its arrival at that point, depends much upon the ability of its individual members to carry the burdens of the new order. And to this end nothing is more essential than that the engineer be able to meet with all men, and at all times and under every circumstance make himself understood.

Two Important Factors in Designing Sea-Water Concrete

THE articles on sea-water concrete in this and in the last issue tell the worst that Messrs. Wig and Ferguson have discovered in their long studies. Their remaining articles will outline improvements in methods and materials which help in fighting the sea-water attack, but even with these precautions it is their definite conclusion that plain concrete will succumb to chemical attack if its hardened surface is removed by mechanical means, and that reinforcement near the surface will sooner or later prove a source of cracking and decay.

The first of these conclusions is not one of novelty, but one of emphatic reiteration. The vulnerability of sea-water concrete in the intertidal space is well known, though the reasons therefor have not always been so plainly stated. In spite of this, much concrete continues to be built in places where mechanical abrasion is bound to take place, in the hope that superior materials and methods will serve to prevent disintegration. The Wig and Ferguson conclusions should reduce this practice. Their observations of practically all the sea-water concrete in this country show that methods or materials cannot be brought to such perfection as to guarantee against the chemical attack on an abraded surface. Some sort of physical protecting medium must be interposed between the concrete and the flotsam. This intertidal protection is quite easily provided. Furthermore, the concrete needing such protection can usually be readily repaired before serious injury occurs.

The cracking of reinforced-concrete structures by the rusting of the reinforcement, on the other hand, is a much more serious problem. Its occurrence is so wide, the causes leading to it so fundamental, the effect on the stability of the structure so serious, and the repair of damaged members so nearly impossible as to make a consideration of its danger of the utmost importance.

Unfortunately, the remedy for this trouble is not so obvious as for the intertidal wear. It seems certain that the common 2-in. protection is not sufficient, but just how much greater the protection must be is not certain. Other ways of preventing the rusting are noted in the article in this issue, but none is generally applicable. Until further studies disclose some better protective methods, the safest design for sea-water work, at least in concrete above the water line, will avoid reinforced members of slender dimensions and lightly embedded steel.

Judge Prouty's Valuation Views

APPARENTLY Charles A. Prouty, director of the Division of Valuation of the Interstate Commerce Commission, realizes that a fair valuation of the railroads cannot be based wholly on legal technicalities. The division's solicitor, P. J. Farrell, has filed with the commission a brief defending the division's treatment of the Texas Midland R.R., but Judge Prouty has supplemented this with an interesting memorandum on questions that "will not be controlled by ordinary legal considerations." In most respects he upholds the conclusions reached by the division, although his discussion in general shows that he has been not unmindful of the arguments and engineering testimony of the carriers. But in several respects he gives evidence of personal disagreement with the official stand of the division, and lends further support to a belief long held by this journal that with more broad-minded advisers he might be more liberal to the railroads.

Among the questions covered by Judge Prouty is the much discussed one as to whether or not an ultimate value shall be found. The carriers, or some of them, have been insistent that the Valuation Act calls for this figure, and that the division's work will be useless without it. The division has apparently decided otherwise, but the director believes that an ultimate value should be stated—"an ultimate value for ratemaking purposes." As he says, "the vice of the railroad situation today is uncertainty, and . . . some way must be found to assure capital of the treatment it will receive"—which he thinks cannot be done until value has been determined.

In lucid fashion the director sets forth his views on the conditions to be assumed in reproduction cost new; on what class of industry tracks shall be included and what class excluded from the valuation; on the proper construction period to assume, and on the allowances for engineering and for general expenditures. Much money is involved in some of these items, and in most cases the director does not fully agree with the carriers. Space is not available here for the discussion of all of these subjects, and most food for thought being found in his views on appreciation, depreciation, contingencies and land, attention will be confined to these.

Appreciation and Depreciation

There is no doubt in Judge Prouty's mind that appreciation of roadbed exists in an old railroad. But he sees neither how it can be computed nor how it can be accredited. Here we have him falling back upon the commission's accounting rules. According to them, appreciation costs the carriers nothing, as there is no appreciation account. So we have the familiar argument that this appreciation has been paid for out of operating expenses and should not be allowed—which in no way answers the carriers' contention that it is an element of real cost and that it matters not how it was paid for. But the director is open-minded enough to suggest that the commission may desire to recommit the matter to the division for further study.

In the matter of depreciation, as in that of appreciation, the director proceeds on the assumption that the carrier has been allowed to earn enough to cover the costs. If this were universally true it might be fair to deduct depreciation on the ground that the carrier "has somewhere, in some form, the amount of this depreciation." The gross unfairness of it is that whatever depreciation exists by the division's interpretation, in such a road, for example, as the Pennsylvania, existed long before there was recognition of the need for depreciation allowances, and that there is no evidence whatever that the 15% or so shrinkage has ever been paid back to the stockholders.

Contingencies

Prudent engineers must always include allowances of 5 or 10% for contingencies in the estimates of new work. This Judge Prouty freely concedes. He holds, however, that such contingencies are usually of two kinds. One embraces items that were not thought of in the estimate, but show in the completed structure and are therefore included in the valuation. The other covers more difficult materials or greater quantities than were anticipated—which would also show. But his classification of contingencies is only partly complete. Surely the carriers have brought out fully the effects of bad weather, floods, labor strikes and numerous other contingencies that increase costs without leaving any marks on the finished work.

Land

"It [the figure reported by the division as the present value of land; namely, market acreage value] is not the present value of the right-of-way of the carrier if that is to be determined either by what it would ordinarily cost the carrier to acquire a piece of that peculiar shape and for that use, or by the lessening of value to the entire tract of the landowner." This statement by Judge Prouty seems strong enough to condemn the division's method of determining present value. Unhappily he is not willing to go the whole distance and work out a bona-fide reproduction cost new for the land. He finds the Minnesota rate decision in the way of that, and so he justifies the substitution of the hybrid present value for reproduction cost by a discussion of statutory construction and its application to the Valuation Act. If present value by the Government's process turns out to be less than the original cost of the land he would investigate further and probably allow the actual cost; but otherwise he would accept the division's figure. He would not in any event put the Government to the expense of determining, as the carriers ask, the cost to condemn each parcel of land.

The carriers can blame themselves in part for the Government's attitude. Instead of arguing that the fault of the railroads' treatment of land in the Minnesota rate case was in the application and not in the principle, they admitted the fallacy of the principle, and then laboriously built up a process which in a roundabout way would produce the same results. And strangely enough the director holds that if something must be added to present acreage value to show cost of acquisition it should be by means of a multiple—the very thing that, so the carriers have all too readily admitted, damned them in the Minnesota case. And so they must get what solace they can from the evidence that Judge Prouty does not agree with Solicitor Farrell that reproduction cost of land is impossible and cannot be entertained.

The Catskill Aqueduct Builders

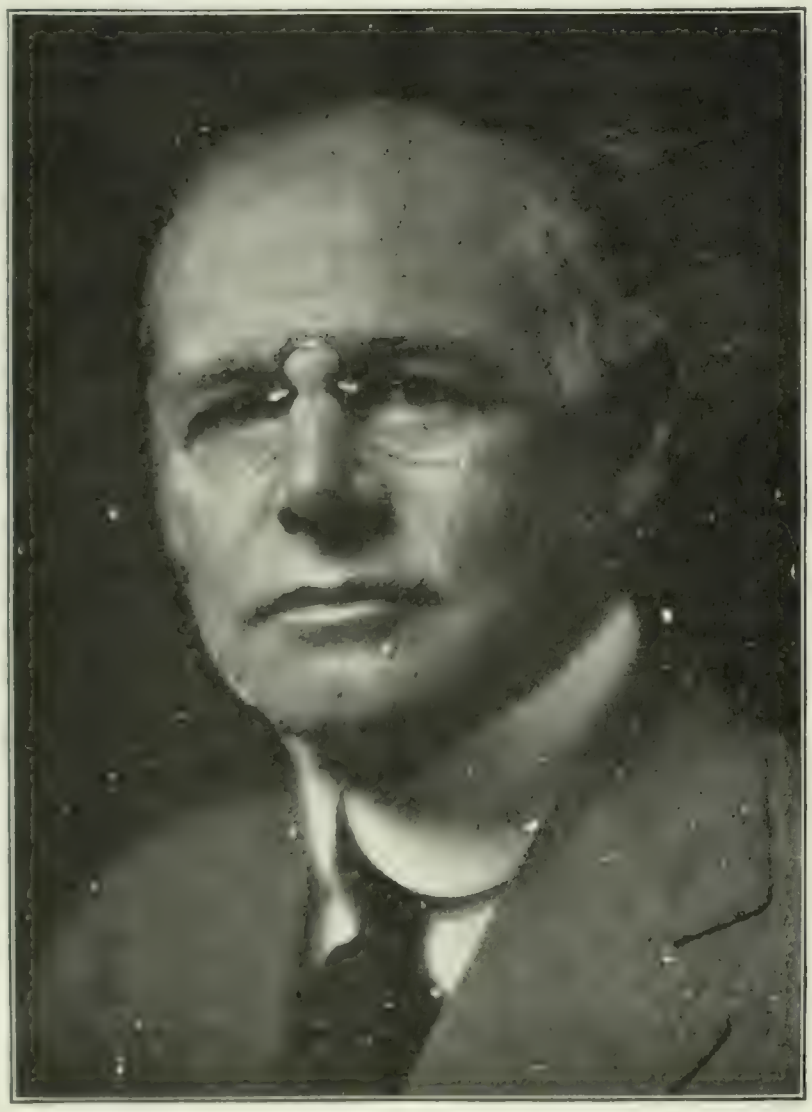
—*An Appreciation*

How J. Waldo Smith, Chief Engineer of the New York Board of Water Supply, Developed an Engineering Organization Noted for the Ability, Loyalty and Enthusiasm of Its Members

THIS WEEK will see the dedication of the Catskill Aqueduct, the formal recognition of the completion of the first installment of New York's $177,000,000 enterprise, by which 500,000,000 gal. of water can be brought to the city per day. For 12 years the aqueduct has engaged the interest of engineers. Much has been said about its massive structures; relatively little about the organization and the men who have carried the work to its successful conclusion. In the early days of the work there were announcements regarding the recruiting of the staff and the standards governing the selection of engineers. Later we heard about the "Chief's" dinners, at which J. Waldo Smith brought together his entire official family. Then, as the engineering bureau fell into its stride, the unusual character of the organization became apparent. Yet compared with the attention given to the works themselves, but little consideration has been given to the men back of the job.

In this article little is said about the work, much about the men and the organization.

Under the Inspiration of His Leadership as Chief Engineer, New York's $177,000,000 Catskill Water-Supply System Has Been Successfully Completed



J. WALDO SMITH

Any attempt to summarize briefly the accomplishments of the 12 years' labor of the engineering bureau of the Board of Water Supply would be unsatisfactory. Yet the complete picture must be kept in mind if we are to appreciate the achievements of the organization. Fortunately, the great structures have been described so often that their very names will help to bring up an impression of the magnitude of the enterprise. Among the great dams of the world now stand, as a result of the water board's work, the Ashokan and the Kensico. The Hudson River and the Narrows siphons are the only two of their kind, while the many miles of aqueduct—in tunnel, cut-and-cover and steel pipe siphon—are without precedent, capacity and length both considered, in water-works records. All of this work, involving an expenditure of millions, has been kept free from suspicion of the honesty of anyone connected with it, and from ugly controversy about the capability of the designers or the quality of the work; and this in a city where political contests have been fought bitterly, and where many efficient heads have been removed because principles were upheld. The engineering bureau has kept out the inefficient; has successfully resisted the onslaughts of those who might have sought improper advantage, and has given to the city a set of structures which experts have pronounced excellent in the highest degree.

It is patent that only an extraordinary organization could have produced so splendid a result. That organization could be diagrammed and one might say, "This is the machine that did the work," but such praise would be inadequate. We propose, therefore, to inquire into the factors that enter into the organization; into the spirit which made it so effective that in 12 years, without friction or just criticism, it brought the great Catskill work to completion.

It is apparent to anyone who comes in contact with it that the organization has a remarkable personnel. There is a distinctiveness about Board of Water Supply men. They are cleancut men, first-class engineers, each in his special place; thoroughly loyal to the organization; "regular fellows," men whom one is glad to know and meet, men on whom one can rely for help, men who are so able that each adds to the impression that they compose a wonderful team, fully competent to grapple with any problem, whether of design or construction. And yet their self-confidence includes nothing of insolence or "cocksureness," but just the reliance upon his own power of the strong man who has tried his strength, knows how to use it and has a right to feel that within his own field none can challenge his mastery. This confidence is reflected in the quality of the work performed.

What the men are, so is the organization. They were selected because they conformed to the organization type, to the high standard which J. Waldo Smith set when he started on the task of recruiting his staff. The men he wanted had to be good engineers, thorough in their work, so that no factor would be neglected in design or construction. They had to be able to work well with others. They had to be capable of enthusiasm, of throwing themselves wholeheartedly into their jobs. They had, in addition, to be gentlemen, for only where there is consideration for failings and feelings of others can there be consistent teamwork.

If an epitome were asked of the characteristics of the men of the organization that built the Catskill system, probably the foregoing description would be found to be accurate. It certainly sets forth the impression which the board's engineers have made on those who have met the men of the organization during the 12 years of its life.

But that description is necessarily a generalization. It is necessary to ask, How did these characteristics show in detail in the day's work? How was the staff recruited? How, when obtained, was it held together? How was teamwork promoted? Who was the builder of this human structure and what manner of man is he?

The Chief Engineer

The New York Board of Water Supply was organized in June, 1905, and at once selected J. Waldo Smith as its chief engineer. He had had long experience in water-supply work and had displayed exceptional organizing and executive ability as chief engineer of the Jersey City water-supply system, which, including the Boonton reservoir and a long aqueduct, bears resemblance, though on a smaller scale, to the Catskill scheme. The board's choice was fortunate, not only because of the chief's ability, but because he won quickly the absolute confidence of the board, a confidence that has never wavered. That confidence was an essential foundation not only for ultimate success but for the chief's first task, that of recruiting the men with whose aid the work was to be done.

Sensible of the magnitude and intricacy of the task, Mr. Smith saw that none but a superlatively good organization could succeed. He therefore selected with the greatest of care the nucleus of his staff, the men whom he expected to assume the major responsibilities and become his department heads. Not only did their technical attainments have to be high, but their views as to organization building had to agree with those of the chief. Upon these men he depended, in large part at least, for the selection of the other members of the engineering bureau. These men—seven in number, including the deputy chief engineer, the division engineers, engineers in charge of designing and the consulting engineers—were exempt from civil-service rules. All of the other members of the organization, however, were subject to civil service competitive regulations. This makes the story more interesting and the lesson more valuable.

Recruiting the Staff

How was a staff of the high grade desired by the chief engineer to be recruited, when civil service might admit undesirables and exclude able men who had a horror of examinations? The law had to be observed: there was no thought of trying to evade it. Accepting the situation and studying carefully its possibilities, Mr. Smith and his associates found the law an aid instead of a hindrance. It was found on study to be flexible enough to bring in the right men, and strengthened the corps against outside influence, once the men were selected.

In choosing men, merit and fitness can be determined better, of course, by personal interview than by written examination. Character, temperament, executive ability and similar qualifications cannot be measured by written tests. To be sure of getting a good staff even through civil service procedure, the board (1) encouraged men of the right class to take the examinations; (2) saw to it that the scope of each examination covered properly the qualifications needed for each position; (3) exercised fully the privilege of selection allowable under the rules and the right of dismissal without charges or without other reason being assigned than that an individual had proved unsatisfactory during a probationary period. Besides encouraging capable men to take the examinations, Mr. Smith induced the board to fix a salary scale high enough to attract the best men in the profession. It is commonly said that the board's force was the best-paid engineering organization in the country. Mr. Smith wanted superior men and he was willing to offer salary inducements to get them. The results demonstrated the value of this policy. Board of Water Supply salaries, however, have not been excessive in comparison with others. Indeed in individual cases and in averages of some classes, higher salaries have been paid in some other forces. Board of Water Supply pay, however, has been "good," although not a few men have left the work because of higher offers.

Among the definite standards set in selecting employees was one calling for men of medium age. Such men, with the right kind of experience, have ability to advance. The matter of age was deemed especially important in the selection of those who might be developed into heads of departments, divisions and sections. Men of medium age will not only do work of higher excellence than older men, but will do it with enthusiasm. Their ambition will be stimulated by knowledge that higher positions will be filled by promotion.

Holding the Men

The men having been obtained, a greater task—to hold them and to weld them into an effective organization—was encountered. Description of the method of holding the men is difficult, because there were so many influencing factors. Congenial character of the whole organization was an important desideratum. Another element of the problem was the fact that the job was the greatest of water-works enterprises, and it was necessary to place responsibility upon a man so that he could show what he could do.

Certain definite policies, however, acted directly to hold good men in the organization. Higher positions, when the preliminary organization was effected, were always filled by promotion, the examinations for the

higher places being restricted to members of the staff. Changes came at intervals, too, for the force expanded rapidly, particularly when construction was started, while good men on the staff received constantly offers of positions of high responsibility outside of the work. The staff knew well that the "Chief" would obstruct no one's acceptance of an outside offer, but rather that he would help to place a qualified man if the proferred place offered a larger opportunity. These causes for change of personnel, in addition to deaths and normal departures, afforded the members of the staff opportunities for steady progress upward.

Again, it was known that if a man of good parts failed to fit where first placed, he would be tried at other work in order to put him in a position advantageous to the work and to himself. Change of place or of work was also made if a good man began to grow "stale." So long as a man's interest is kept up he is not likely to become dissatisfied.

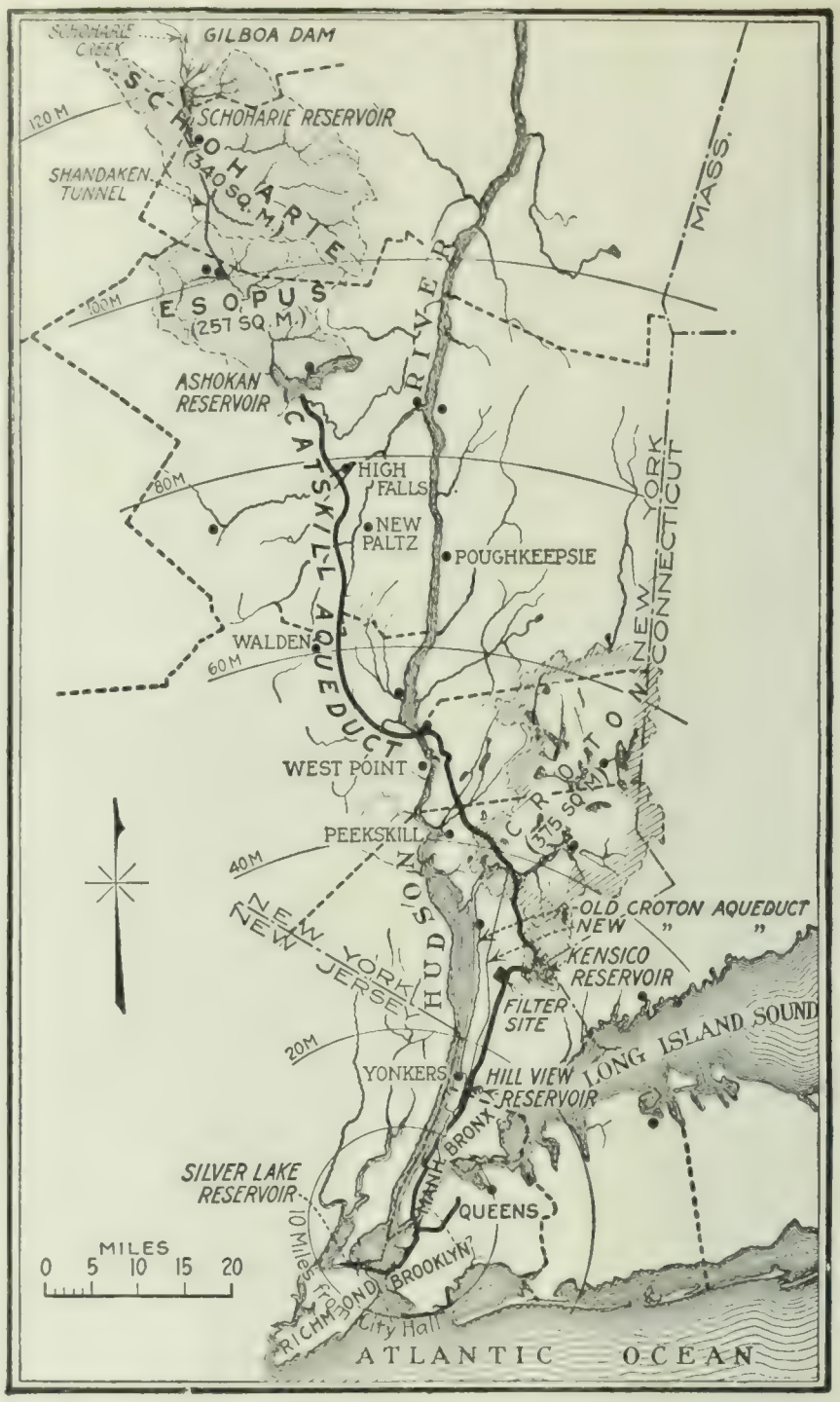
A cardinal principle of the management was that men should be encouraged to take responsibility. This was well expressed by Mr. Smith himself in these words: "Every effort should be made to encourage the taking of responsibility and to train the men so that they will be capable of advancement when the opportunity comes. You never know what a man will do until the responsibility is pushed on him, but generally he will do far better than was thought."

Added to these loyalty-inculcating policies were the convictions that the "Chief" was determined to keep a force fully equal to the huge task, and that he would stand by his men and fight for them should the board at any time, by salary ruling or otherwise, do or attempt to do anything inimical to the organization or to deserving individuals.

Of course, such policies, while tending strongly to hold the men, were not followed for the mere purpose of keeping a full force. Rather, their adoption was due to the conviction that fairness to the men and the best interests of the work demanded them.

Teamwork

In the task of developing teamwork the chief engineer was no less successful than in the selection and holding of men. In fact, his accomplishments in teamwork were especially noteworthy. Teamwork was invaluable on a job of this kind, where so much was unprecedented, the variety of work was so great, the extent of territory covered so large. Everything was done to promote acquaintanceship and mutual interest in all parts of the work. Headquarters had personal acquaintance with the man on the section, while the field man visualized the individual in the New York office with whom he dealt and with whose help he was trying to solve his knotty problems. A bi-weekly paper, the *Catskill Aqueduct News*, helped to keep everybody informed about the latest happenings on the job, the changes of position or station, the status of contracts, striking features proposed or completed, etc. Department dinners, field days, bowling tournaments, baseball games, etc., helped to bring the men together in friendly intercourse, while on several occasions Mr. Smith gathered the whole force in New York at big dinners.



THE CATSKILL ENGINEERING ORGANIZATION EXTENDED OVER A 100-MILE LINE OF WORK

The consequence was that the whole staff—approximately 1000 during the busiest years—grew into a large family. Everyone knew he had a part in a huge undertaking and gave his best to make the work a success. Beside him were others working with the same spirit, while on top was a man who was interested in their welfare, who treated them as men and not as parts of a machine, who was glad to have a word with them on his frequent visits to the field, to make suggestions and commend work well done. What wonder, then, that the force was loyal and enthusiastic, or that the big job was well done.

But that fine spirit did not end with enthusiasm for the "Chief," the organization and the job. It led every man to feel that as a member of the family he could offer suggestions freely regarding any detail of the work. Conferences, encouraged by the chief and the department heads, were frequent and were entered into with the best of spirit. Opposing views were advanced with the best interests of the work in mind and were discarded or modified as the good of the project required.

Those in responsible positions promoted teamwork by seeing to it that a man confronted with a difficult problem got all the help he needed. A method of man-

agement—or mismanagement—frequently observed is when the "boss" assigns a job to a man and then feels that he has "gotten out from under" the responsibility, leaving the subordinate to sink or swim. The modern view of management requires the "boss" to know more about the job than the subordinate and makes it his duty to see that the employee does his work in the best way. The Water Board followed that policy.

That good fellowship prevailed in the organization does not mean that there was lack of discipline or that authority was not well defined. But the spirit that obtained obviated any need of harsh disciplinary measures. When conflicting plans were proposed discussion on them was free, but when the decision was made, it was the rule of the organization for everyone to fall in line behind it.

Troublesome men, when they made their propensities known, were quickly dismissed. So also were those who were inclined to exaggerate their usefulness or to be displeased with the amount of recognition which they received. Thus high ideals regarding the personnel were maintained.

Thoroughness

An earlier paragraph mentioned the great stress that was placed on the need for thoroughness on the part of all employees. The men of the organization accepted and appreciated the responsibility. They were building a conduit upon which depended the health and welfare of a city with a population rapidly exceeding 5,000,000. The structure is to last indefinitely. Almost $200,000,000 was entrusted to the staff for expenditure. Under such conditions only the best work could satisfy. To insure the municipality getting the best, the organization drew freely on outside advice. The engineers called in were selected for breadth of experience and eminence in the profession, or for unusual knowledge and skill in specialties. A few have been attached continuously to the staff, while others have had brief engagements, depending upon the needs of the work. The group has included a few of the older men, the deans, and with them specialists in filtration and other methods of treating water, mechanical and electrical experts, sanitarians, railroad engineers, geologists, metallurgists, architects and landscape engineers. Among these consultants, to mention only a few, were the late Alfred Noble, Allen Hazen, George W. Fuller, John R. Freeman, Frederic P. Stearns, Prof. James F. Kemp, C. P. Berkey, geologists; Charles W. Leavitt, landscape engineer; York & Sawyer, architects.

In line with the determination to leave no resource untouched to obtain the best solutions of the problems encountered, the engineering bureau instituted many important original investigations in its laboratory. But its delving to the bottom of things engineering, in the search for solutions of its problems, did not stop there. It was realized that the best replies to many knotty questions could be obtained only by experiment on full-sized models, many of which were built. Each helped to point the way to an advance. The construction of trial sections of the cut-and-cover aqueduct and of reinforced-concrete pipe siphon are examples. The unusually extensive borings and geological explorations made before construction also fell in the same class and dispelled many a doubt as to conditions which otherwise would have remained unknown until difficulties were encountered as construction progressed. In this way the contract risks were lessened, and the thoroughness of the investigations was undoubtedly reflected in the prices bid on the work.

TRIBUTE

From the Chief Engineer to his Engineering Staff

NO great construction undertaking can be carried to a successful completion because of the genius or personality of any one man, although the people are prone to hero worship and to give the credit to some one person when it always rightfully belongs to many. This is particularly true of the work of designing and constructing the Catskill water-supply for the City of New York. Whatever success has been attained has been due to the spirit which permeated the organization and to the varied talents, ability and energy of the individuals composing it.

The organization has been an asssociation of individuals whose character, discipline and breadth of vision, as well as loyalty and devotion to duty, have not been excelled. Jealousy and envy, the roots of all trouble, were cast into the discard at the outset, and in their place came consideration for each other and a merging of personal interests in those of the job. The magnitude of the work and the fact that it was to provide what is as necessary to the life of this great city as the very air it breaths, and without which it cannot increase in numbers, power or wealth, served as an inspiration to a class of men who are guided by ideals and who work for accomplishment more than for money or glory.

The entire underlying spirit was one of belief in one another and of mutual consideration. This feeling extended to all connected in any way with the work, contractors, manufacturers, laborers, and combined with it was a spirit of helpfulness that worked for efficiency, economy and progress. Close association with men of this type for twelve years has brought great joy and happiness, has made life more worth living and has furnished a stock of reminiscences which will cheer the years to come.

It is hoped that every one who has been connected with the work may look back on those years as the happiest of their lives, and that they have acquired an experience which will bring advancement and honor. Credit for the success of the undertaking rests with each and every individual who steadfastly, earnestly and loyally gave of his talents toward this accomplishment. If recognition does not come in any other way, the consciousness of a service well and fearlessly performed is of itself worth while and brings with it a satisfaction which nothing can take away.

In the years of the future the people of the City of New York will come to understand better than they do today the unselfish nature of the work which has been accomplished by this organization. That they now understand it somewhat is evidenced by this great celebration which is now in progress, but not one of them now, or ever, will understand as I do the sacrifices made and the unselfish devotion given in helping the undertaking to its conclusion. I realize, too, and feel more keenly than any one else, that whatever honor has come to me personally has come as the result of individual effort, endeavor and loyalty on the part of every member of the organization, of which it was merely my fortune to be the head. Without them and their wholehearted support, success could not have been achieved.

J. Waldo Smith.

Moreover, as a result of a ruling by the law department of the city that none of the contracts could contain a clause covering the doing of unusual or unanticipated work, commonly known as an "extra work clause," it was necessary to prepare each contract with far more than the usual care. Every contingency had to be provided for, and that the entire work was completed under the original contracts was due to the thorough investigations and explorations which were made whenever there existed the least doubt as to the conditions which might be met.

It would not be fitting to close this description of the Catskill engineering organization without a further word regarding the man at its head—the man to whom the spirit which has animated the staff is attributable. At the root of his success lies love for his fellow men. He likes people. He wants to help them, to see them get ahead, to give them full credit for what they do. Despite the fact that dozens of articles describing the work have been written by the staff, and many lectures have been delivered, not once has Mr. Smith written an article, and rarely has he delivered a lecture. He was glad to have his co-workers do this and get the credit.

As he himself has said, "Everyone has his own way of handling an organization." Mr. Smith's way is to work in an atmosphere of good fellowship, to live on close, almost familiar, terms with his men, yet to do it without relaxing discipline or departing one iota from the utmost thoroughness in both design and construction. Simple and unaffected, he went about on the big job, always with a word of helpful suggestion, inspiring all not by enthusiastic outbursts or long speeches but by his poise and the apparent confidence he reposed in the members of the organization. "Not one of the men connected with the job but regrets the passing of the aqueduct days," said one of the men recently, and he added that the contractors, held to the mark but treated fairly, felt the same way.

The undertaking was carried out in an atmosphere of sunshine engendered by individual realization of the humanitarian attitude of those charged with its execution. But the atmosphere was tempered by the winds of accuracy and of thoroughness, and the tang that made for high efficiency came from the realization, emanating from the chief engineer himself, that nothing counts but progress and that there is no real joy save in accomplishment. His motto was, "Get the work done, but get it done well."

Iron-Removal Plants in New Jersey

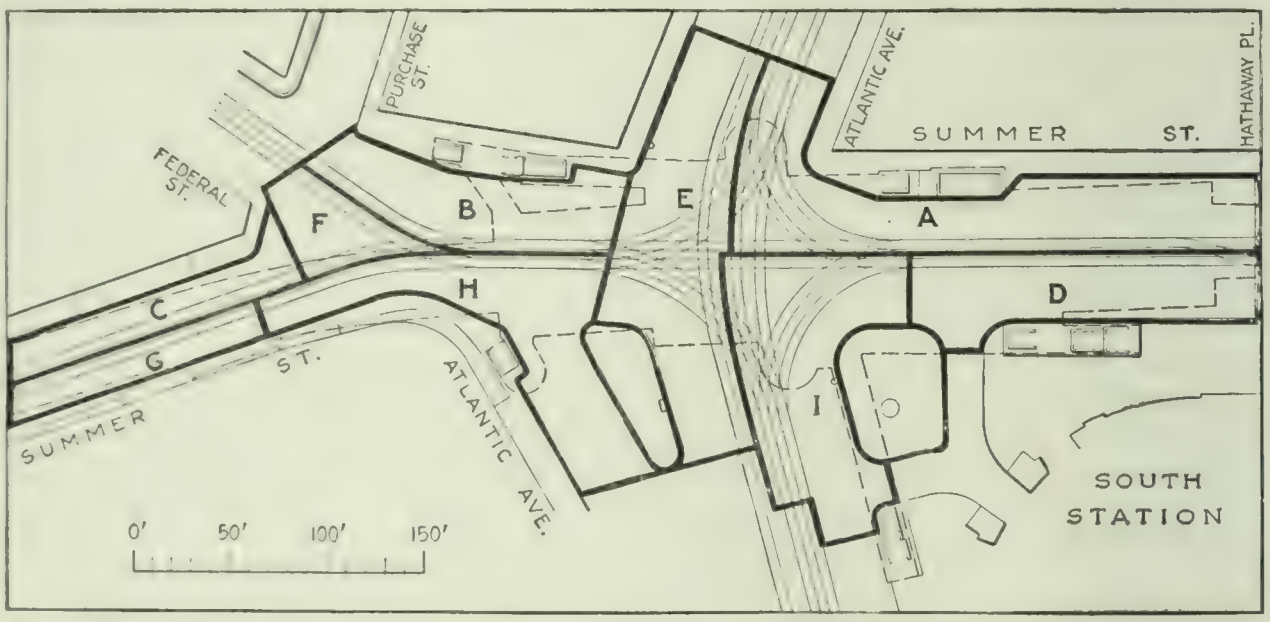
There are 23 plants for removing iron from public water-supplies in New Jersey, according to the latest report of the New Jersey State Department of Health.

Grouted Granite Block Laid Under Congested Traffic Conditions

Paving of Dewey Square, Boston, in Front of the World's Busiest Railway Terminal, Presents Special Problems

EVERY kind of traffic is met with at the intersection of Federal and Summer Sts. and Atlantic Ave., Boston, Mass.—a marginal waterfront freight railway on Atlantic Ave., double-track intersecting street railways, trucks and vehicles of all descriptions, and pedestrians passing to and from one of the busiest railway passenger terminals in the world. Overhead is the elevated structure on Atlantic Ave., and below the new subway in Summer Street.

These great streams of traffic, it was decided, should be maintained as nearly as practicable without interruption—while the paving of Dewey Square was carried on in limited areas, traffic using the other portions. The street-car service was maintained on all the tracks



BLOCKING OUT GRANITE-BLOCK PAVING JOB TO MAINTAIN TRAFFIC

except at night and on Sundays, during which periods the sections of track were removed and graded.

The plan herewith shows the method of procedure. While sections *A*, *B* and *C* were being constructed traffic was maintained in the other areas. When section *A* was completed and opened for traffic, sections *D* and *E* were closed and construction was begun in them. When section *B* was opened for traffic, section *F* was closed. When section *C* was finished section *G* was closed. After sections *C*, *F*, *B* and *E* were completed, section *H* was closed. After section *E* was opened to traffic, section *I* was closed. As soon as sections *D*, *H*, *G* and *I* were completed they were opened for traffic.

The railway companies graded and ballasted their tracks with broken stone ballast, the paving contractor doing the necessary excavation. This trackwork was all done between the hours of 8 p.m. and 7 a.m., and on Sundays. When the tracks had been relaid and ballasted, car traffic was continued for three days, or sufficient time for the track to become rigid. The ballast was then filled with a 1:2½ cement grout by the paving contractor, then the 6-in. concrete base was placed, after which the paving blocks in the space between the rails were laid on a 1-in. sand-cement bed and the joints grouted as soon as possible with a 1:1



THE PROBLEM OF PAVING AND MAINTAINING TRAFFIC AT DEWEY SQUARE, IN FRONT OF SOUTH STATION, BOSTON, WAS A COMPLICATED ONE

sand-cement grout. The grouting of the ballast and the laying of the pavement in the track areas was done almost wholly during the daytime between car movements.

During the three days that the tracks were being regraded and settling on their new ballast, the contractor excavated the adjoining area between the rail and curb, rolled the sub-grade and laid the concrete base. The paving of this area followed closely the paving of the track, and no section of the street was closed to traffic for more than about a week, except the time allowed for the grouted joints to set—about a week. Paving the tracks of the Union Freight R.R. was simpler, the only condition being that the running of trains was not to be interfered with between the hours of 8:30 and 9:45 p.m. and 1:30 and 6 a.m.

Standard Specifications Followed

The contractor was required to maintain at all times a safe roadway on one side of each street and from intersecting streets into Summer St. and Dewey Square. When necessary temporary granite paving was laid with gravel joints, for which the contractor received 50c. per square yard.

The pavement was laid under the standard specifications of the City of Boston and forms the final surfacing of the street after the construction of the Dorchester tunnel. It replaces the temporary paving which was laid on 8 ft. of filling over the tunnel roof, directly following the placing of the backfilling (in 1915). Since the new pavement is a better one than was on the street when the subway work in this locality began, the City of Boston and the Boston Elevated Railway Co. are paying the additional part of the cost. The contract price was $4.43 per sq.yd., divided as follows: $3.57 for furnishing and laying the blocks, including excavation of the sub-grade and grouting the joints; 20c. for the sand-cement bed; 91c. for the 6-in. concrete foundation and a credit of 25c. per sq.yd. for the old blocks. For grouting the ballast of the street railway tracks, the price paid was $9.75 per cu.yd. of grout.

The work was done under the direction of the Boston Transit Commission as a part of the construction of the Dorchester tunnel. William W. Lewis, assistant engineer was in charge of the work, and Henry S. Clark was the contractor. The granite blocks were furnished by the Rockport Granite Co., Rockport, Mass.

States Spent $288,000,000 on Roads and Bridges in 1916

U. S. Office of Public Roads Issues Figures Showing Total Mileage of 2,455,761 for Rural Routes

CASH expenditures on the rural roads and bridges in the United States in 1916 amounted to $272,634,424, according to figures just published by the Division of Economics, U. S. Office of Public Roads and Rural Engineering. To this should be added the value of the statute and convict labor, which can not be fixed with any great degree of accuracy, but probably amounted to not less than $15,000,000, thus making the grand total expenditure for the year $288,000,000. This total is made up of the actual expenditure for such items as labor, materials, supervision, management, and administration directly connected with the construction, improvement, and upkeep of our public roads and bridges.

This, however, does not represent the total outlay by the states and communities because of their rural public roads. At present there are outstanding more than $400,000,000 of road and bridge bonds and long-term warrants, maturing at the rate of about $20,000,000 per year and requiring about an equal amount for the payment of interest charges.

The Bond Situation

The full extent of this bond burden, however, is impossible of any exact determination. More than $40,000,000 of new road and bridge bonds are now being issued annually. Furthermore, general bonds are issued in many cases to cover actual or threatened deficits occasioned wholly or in part by the road and bridge expenditures. Outstanding road or bridge bonds or warrants often are taken up by general refunding bonds and the identity of the bonds as pertaining to road work is thus lost. "Such data as are available," says the Office of Public Roads circular, "serve forcefully to call attention to the abuses to which the bond method of financing often is being subjected. To issue bonds for the financing of road improvements frequently is both advisable and necessary. But this does not justify some of the present-day practice. Millions of dollars' worth of road bonds having a term of 30 years or more still are being issued every year, and one state has gone so far as to legalize and encourage the use of bonds having a term of 41 years for the financing of local road construction. This all too frequent practice of issuing long-term bonds in payment of improvements which can not possibly last one-half of the term of the indebtedness can be defended neither on the grounds of sound public policy nor of good business. It should be discontinued at once."

From 1904 to 1915, inclusive, the annual increase in the expenditures on rural roads and bridges amounted to approximately 12% over each preceding year. The increase of 1916 over that of 1915, however, was only 2%. This was due largely to the scarcity of labor and materials which caused an unusually large number of contracts to be carried over to this year. In New York State alone, contracts involving about 500

TABLE I. EXPENDITURES DURING THE YEAR 1916 BY OR UNDER THE SUPERVISION OF THE STATE HIGHWAY DEPARTMENTS

State	Funds: State	Funds: Local	Funds: Total	Distribution of Expenditures: Construction: Roads	Construction: Bridges	Maintenance, Roads and Bridges	Engineering	Administration	Equipment and Miscellaneous	State Funds Available 1917 (approximate)	Local Road and Bridge Expenditures, 1916, not under State Highway Department (approximate)
Alabama	$102,422	$83,962	$186,384 00	$157,257	$12,747		$7,150	$9,230		$200,000	$4,000,000
[illegible]	441,202		441,202 17	246,366	114,549	$28,130	26,976	14,712	$10,469	600,000	1,547,019
[illegible]	55,483	[1] 1,683,549	1,739,032 00	1,683,549	([2])		30,894	24,589		300,000	1,704,855
[illegible]	4,285,964		4,285,964 43	2,766,910		1,033,564	298,153	([3])	187,337	6,000,000	16,106,470
Colorado	607,628	662,829	1,270,456 59	851,970	[4] 245,610	126,110	([13])	46,767		750,000	1,042,751
[illegible]	1,865,948	85,000	1,950,947 83	377,574	151,469	1,315,028	79,713	19,756	7,407	2,000,000	1,250,000
Delaware	31,000	31,000	62,000 00	60,000				2,000		200,000	450,000
[illegible]	10,484		10,483 70				3,637	5,519	1,328	20,000	4,000,000
[illegible]										([8])	3,750,000
Idaho	100,057	348,061	448,118 00	281,956	92,072	27,534	33,976	6,080	6,500	750,000	1,500,000
[illegible]	1,119,202	1,593,953	2,713,154 48	1,830,855	587,336	33,763	171,826	53,620	35,755	1,500,000	7,643,515
[illegible]										400,000	13,500,000
[illegible]	90,821		90,821 00				90,821	([3])		200,000	14,337,056
Kansas [7]	10,000		10,000 00				([13])	10,000		([8])	5,600,000
[illegible]	708,346	1,740,187	2,448,533 00	2,357,721	([2])		64,292	26,540		750,000	2,000,000
[illegible]	184,533	274,111	458,643 30	401,599		14,768	21,828	18,803	1,646	200,000	3,000,000
[illegible]	1,055,250	453,518	1,508,768 29	1,034,340	80,519	292,406	62,197	37,402	1,905	1,000,000	1,658,447
[illegible]	2,280,000	280,000	2,560,000 00	1,500,000	300,000	650,000	70,000	30,000	10,000	1,500,000	3,000,000
[illegible]	2,701,236	447,905	3,149,141 30	1,620,647		1,212,041	200,422	57,485	58,546	3,950,000	3,350,000
[illegible]	982,939	2,350,000	3,332,939 00	3,100,000	[9] 101,176	[10] 32,169	56,738	30,849	12,007	1,500,000	6,750,000
Minnesota	1,390,525	3,376,550	4,767,075 79	2,865,381	[4] 891,353	793,254	217,088	([3])		1,500,000	3,975,192
[illegible] [7]	6,500		6,500 00				([13])	6,500		10,000	3,250,000
[illegible]	482,860	([8])	482,859 99	279,548		193,226		10,085		700,000	7,500,000
Montana [7]	26,150		26,150 06				6,589	13,539	6,023	150,000	3,449,419
[illegible]	110,000	90,000	200,000 00		180,000		6,500	13,500		500,000	4,300,000
Nevada [6]										140,000	275,000
[illegible]	414,669	430,742	845,410 48	481,512	24,473	284,224	30,853	21,039	3,300	450,000	1,200,000
[illegible]	1,167,843	2,616,511	3,784,353 61	673,845	256,350	2,449,158	150,000	130,000	125,000	2,000,000	2,000,000
[illegible] [11]	385,684	43,267	428,951 88	398,952	([2])		20,000	10,000		400,000	400,000
[illegible]	9,409,655	2,441,225	11,850,880 37	6,025,944		4,252,397	1,257,666	247,358	67,515	12,000,000 [12]	8,050,510
North Carolina [7]	10,000		10,000 00				([13])	10,000		10,000	5,500,000
North Dakota [7]										200,000	2,711,295
Ohio	2,885,071	3,107,554	5,992,624 83	4,836,404		748,778	266,464	137,741	3,248	3,800,000	7,000,000
[illegible]	300,000	1,825,000	2,125,000 00	936,000	650,000	330,000	68,000	6,000	135,000	300,000	1,500,000
[illegible]	165,662	290,000	455,661 87	151,091	290,000		7,327	7,244		500,000	5,500,000
Pennsylvania	3,663,352	322,040 [14]	3,985,392 39	478,445	53,951	2,907,498	193,817	199,823	[15] 151,880	8,000,000	7,000,000
Rhode Island	543,152		543,151 69		57,199	439,052	37,503	6,430	2,968	700,000	400,000
[illegible] [5]										30,000	1,250,000
[illegible] [7]										([8])	2,708,000
[illegible]	200,000	400,000	600,000 00	350,000	25,000	170,000	30,000	25,000		750,000	4,000,000
Texas [6]										500,000	10,500,000
[illegible]	179,400	725,760	905,160 00	607,700	88,130	96,310	([16])	11,300	101,720	560,000	950,000
[illegible]	632,800	250,000	882,800 00	454,200	44,000	340,000	9,600	35,000		500,000	725,000
Virginia	542,524	1,348,725	1,891,248 75	1,586,874	163,679	[17] 48,922	69,638	22,136		800,000	1,800,000
[illegible]	859,672	2,104,340	2,964,012 71	2,442,158	([2])	424,529	67,037	30,288		2,000,000	4,554,330
West Virginia	10,967		10,967 41				([13])	10,967		200,000	5,500,000
[illegible]	950,000	4,120,764	5,070,764 00	3,631,026	1,004,738	210,000	([13])	225,000		1,500,000	5,500,000
Wyoming [5]										50,000	450,000
Total and average	40,969,001	33,526,553	74,495,554 29	44,469,824 [18]	5,414,331	18,452,861 [18]	3,656,705 [18]	1,572,292	929,554	60,010,000	198,138,859

[illegible] by highway districts.
[illegible]
[illegible] engineering.
[illegible]
[illegible] department established in 1917.
[illegible] of all highway work.
[illegible] department educational and advisory

[8] No data
[9] On trunk line roads only.
[10] State reward funds to counties.
[11] Approximate, exact data not available.
[12] Includes $1,990,575 State aid to towns.
[13] Engineering included under administration.
[14] Does not include $712,500 93 paid as cash bonus to second-class townships.
[15] Includes $80,246.90 paid for purchase of toll roads.
[16] Included under construction.
[17] Includes $13,592.37 for 14.77 miles of surface treatment.
[18] Partial totals.
[19] Does not include $168,026 expended by the State department of engineering in improving 72 miles and maintaining 561 miles of mountain road.

miles of state and county highways were left uncompleted at the close of 1916.

The movement for state-aid and more centralized control in the management of public roads which first received definite status with the passage of the New Jersey state-aid bill in 1891, and has been practically continuous ever since, received a further impetus and still wider recognition in 1916 with the passage of the Federal-aid road act, approved July 11. This act authorizes the Secretary of Agriculture to coöperate with the states, through their respective state highway departments, in the construction of rural post roads. The particular roads to be improved are selected by the state highway department of each state and approved by the Secretary of Agriculture.

For carrying out the provisions of this act, Congress appropriated $75,000,000, of which $5,000,000 is made available for the fiscal year 1917, and a sum increasing annually by $5,000,000 for each of the following years until 1921, when $25,000,000 will be available. Three per cent. of the appropriation is available for administration and overhead expenses, and the remainder is apportioned to the several states on the basis of population, area, and mileage of rural-delivery routes and star routes, each having a weight of one-third. The state must pay at least one-half of the cost of all the roads improved from Federal-aid, and in addition, it, or its civil subdivisions according to its laws, must maintain these roads after they are constructed. Under the same act $1,000,000 a year for 10 years is appropriated for the construction and maintenance of roads and trails in or partly within the national forests, in coöperation with the state, territory, or county, upon a basis equitable to both parties. This Federal participation already has resulted in a marked activity on the part of the states, until at the present time every state in the Union has succeeded in establishing some form of state highway department.

The public rural roads of the United States at present have a total length of 2,455,761 miles, of which about 287,000 miles, or 11.6%, are improved with some form of surfacing. The mileage of hard-surfaced roads is increasing at the rate of about 15,000 miles per annum. During 1916 the states having state highway departments surfaced about 7000 miles under state supervision and also improved an additional 9000 miles by grading or otherwise. Thus, of the really constructive work of permanent improvement in the United States last year, about one-half was more or less directly under competent state supervision. In addition to this work of construction the several state highway departments also supervised the maintenance of 75,811 miles of main and trunk-line highways.

What the Tables Show

The expenditures in 1916 by or under the various state highway departments are shown in Table I, and the work accomplished is shown in Table II. Table III shows the expenditure of state and local funds for the years 1914 and 1916.

TABLE II. ROAD MILEAGE

State	Work done in 1916 under State Supervision: State and state-aid roads built in 1916	Roads maintained with state-aid, 1916	No. of bridges built by state or state-aid, 1916	Mileage of Rural Public Roads: Total state and state-aid roads built to Jan. 1, 1917	Total all surfaced roads in state (approx.)	Total all public rural roads in state	% of surfaced roads in state
	Miles	Miles		Miles	Miles	Miles	
Alabama	[3] 82		4	659	6,000	55,446	10 8
Arizona	70	214	(4)	372	375	12,075	3 1
Arkansas	[7] 380			534	1,500	50,743	3 0
California	256	1,153		1,907	12,300	61,039	20 2
Colorado	[10] 2,105	2,603	170	[9] 7,305	1,800	39,780	4 6
Connecticut	[5] 56	1,432	9	[4] 1,627	3,100	14,061	22 0
Delaware	6			160	275	3,674	8 0
Florida					3,500	17,995	19 4
Georgia					13,000	80,669	15 3
Idaho	[11] 120	380	60	413	800	24,396	3 3
Illinois	[12] 299	278	449	767	12,400	95,647	13 0
Indiana					31,000	73,347	42 5
Iowa					1,000	104,074	1 0
Kansas					1,400	111,052	1 3
Kentucky	[13] 811			1,611	13,400	57,916	23 2
Louisiana	[14] 160	355		752	2,400	24,563	9 8
Maine	[15] 229	3,402	11	1,798	3,250	23,537	13 8
Maryland	95	1,450	12	1,321	2,900	16,459	17 6
Massachusetts	[16] 192	1,100	(16)	1,998	8,900	18,681	47 6
Michigan	743	3,000	19	3,940	9,600	74,190	13 0
Minnesota	[18] 3,769	12,704	[17] 192	10,011	6,500	93,517	7 0
Mississippi					2,600	45,779	5 7
Missouri	(19)	9,000		(19)	7,250	96,041	7 6
Montana	30		127	30	800	39,204	2 0
Nebraska			7		1,350	80,272	1 7
Nevada					320	12,182	2 6
New Hampshire	104	1,150	3	1,280	1,900	14,020	13 5
New Jersey	70	2,429	14	2,054	6,000	14,817	40 5
New Mexico	[20] 315		74	846	550	11,873	4 6
New York	515	6,500		6,765	18,000	79,398	22 7
North Carolina					6,750	50,758	13 3
North Dakota					1,100	68,796	1 6
Ohio	371	1,445	227	1,299	31,500	86,354	36 5
Oklahoma	1,900	[22] 7,000	[21] 2,100	1,900	300	107,916	0 3
Oregon	39		22	413	4,875	36,819	13 2
Pennsylvania	[24] 248	9,171	24	1,988	10,400	91,556	11 4
Rhode Island		305	4	325	750	2,170	34 5
South Carolina					3,700	42,226	8 8
South Dakota					750	96,306	0 8
Tennessee	150	500	7	150	8,750	46,050	18 9
Texas					12,000	128,000	9 3
Utah	[2] 586	3,440	[1] 36	3,440	1,500	8,810	17 1
Vermont	180	4,200	67	2,011	2,100	14,249	14 9
Virginia	[25] 700		67	4,463	5,500	53,000	10 5
Washington	[26] 420	2,100		1,977	5,900	42,825	13 9
West Virginia					2,512	32,024	4 7
Wisconsin	[27] 1,159		[21] 785	5,070	14,850	75,707	19 6
Wyoming					520	44,796	1 1
Total and average	16,160	75,311	4,490	92,184	297,037	1,853,781	11 6

[1] Also 922 culverts.
[2] Includes 428 miles of grading.
[3] Includes 14 miles of earth roads.
[4] Includes 195 miles of reconstruction.
[5] Includes 25 miles of reconstruction.
[6] 847 linear feet of bridges.
[7] Only engineering and [illegible] furnished by State. Includes 70 miles of earth roads.
[8] Includes 47 miles of earth roads.
[9] Includes about 6,300 miles of earth roads.
[10] Includes 1,810 miles of earth roads.
[11] Includes 106 miles of earth roads.
[12] Includes 56 miles of earth roads.

TABLE III. CASH ROAD AND BRIDGE EXPENDITURES FOR THE CALENDAR YEARS 1914 AND 1916

	Year in which First State-Aid Law Passed	State Funds Expended by the State Highway Department		Total Cash Expenditures from All Sources		Total State Funds Expended for Road Work to Date, Percent of Expenditures for Year Jan. 1, 1917
		1914	1916	1914	1916	
Alabama	1911	$170,232	$102,422	$3,949,019	$4,186,384	$688,827
Arizona	1909	...	441,202	982,721	1,988,221	1,480,590
Arkansas	1913	115,000	55,483	1,522,696	3,443,887	220,483
California	1895	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Colorado	1909	301,274	607,628	1,937,546	2,313,208	1,632,379
Connecticut	1895	1,507,381	1,665,[illegible]	[illegible]	[illegible]	[illegible]
Delaware	1903	31,660	31,000	511,635	512,660	253,945
Florida	1915	...	10,484	2,280,255	4,010,484	11,649
Georgia	1908	...	...	3,688,172	3,750,000	...
Idaho	1905	49,812	100,057	1,371,469	1,948,115	672,867
Illinois	1905	387,989	1,119,202	8,734,713	10,356,669	2,805,829
Indiana	1917	...	...	14,233,986	13,500,000	...
Iowa	1904	74,000	90,821	10,187,507	14,427,877	346,756
Kansas	1911	9,680	10,000	5,344,048	5,610,000	48,000
Kentucky	1912	18,000	708,346	2,474,621	4,448,533	1,325,061
Louisiana	1910	161,186	184,533	1,477,572	3,458,643	790,860
Maine	1901	467,149	1,055,250	2,642,007	3,167,215	6,920,459
Maryland	1898	356,845	2,280,000	6,000,652	5,560,000	19,863,142
Massachusetts	1892	242,560	2,701,236	6,091,875	6,499,141	21,701,228
Michigan	1905	657,264	982,939	9,261,998	10,082,939	4,165,640
Minnesota	1905	1,309,956	1,390,525	6,458,940	8,742,278	5,678,699
Mississippi	1915	...	6,500	3,960,377	3,256,500	6,500
Missouri	1907	277,253	482,860	5,513,049	7,982,860	2,274,032
Montana	1913	13,516	26,150	2,888,400	3,475,569	60,496
Nebraska	1911	...	110 000	1,796,278	4,500 000	487,850
Nevada	1911	...	...	245,014	275,000	20,000
N. Hampshire	1903	491,520	414,669	1,590,464	2,045,410	3,674,458
New Jersey	1891	1,306,596	1,167,843	7,208,287	5,784,354	9,523,419
New Mexico	1909	115,732	385,684	556,399	828,952	1 048,639
New York	1898	8,544,126	9,409,655	23,231,964	19,901,391	106,032,153
N. Carolina	1901	5,000	10,000	5,215,491	5,510,000	48,500
North Dakota	1909	...	...	2,402,384	2,711,295	...
Ohio	1904	1,855,338	2,885,071	14,334,246	12,992,625	14,558,900
Oklahoma	1911	...	300,000	2,112,681	3,625,000	330,323
Oregon	1913	10,697	165,662	5,310,467	5,955,662	584,637
Pennsylvania	1903	1,976,768	3,663,352	10,424,580	10,985,392	34,464,563
Rhode Island	1902	...	543,152	446,496	943,152	4,450,936
South Carolina	1917	...	...	1,024,480	1,250,000	...
South Dakota	1911	...	...	1 217 809	2 [illegible]	...
Tennessee	1915	...	200,000	2,370,560	4,600,000	203,500
Texas	1917	...	...	9,920,079	10,500,000	...
Utah	1909	157,732	179,400	803,071	1,855,160	989,132
Vermont	1898	458,456	632,800	1,023,941	1,607,800	4,304,364
Virginia	1906	523,578	542,524	3,224,529	3,691,249	3,256,074
Washington	1905	1,343,431	859,672	7,944,717	7,518,343	8,412,461
West Virginia	1909	...	10,967	2,483,747	5,510,967	[1] 141,945
Wisconsin	1911	1,482,379	950,000	9,880,240	10,570,764	5,169,001
Wyoming	1911	...	...	[illegible]	[illegible]	[illegible]
Total		24,220,850	40,969,001	240,263,784	272,634,424	307,937,818

[1] Of this $118,000 was returned to the counties in 1914 [illegible]

Military Railway Platforms of Old Ties

Material of all sorts is so scarce now in France that the engineers laying out the various railroads behind the lines experience difficulty in getting material for the platforms on which men and equipment—mainly the latter—are landed. These platforms have to be close to the railroad track and about as high as the distance of the floor of the car from the ground. According to *Le Génie Civil*, a solution of the difficulty has been found in the utilization of old railway ties. Two forms of platforms are in use. One is built between two lines of track, where an earth fill is retained between walls made up of the ties. The other is alongside of one track where the platform fill is retained by a row of ties held back to deadmen. In the double-wall type a trench is excavated and ties set in the hole thus made are held tight by tamping in earth around them. Along the top of the ties then run scaling pieces tied across the filled area with iron rods. In the single-row type the ties are likewise set in excavation and sticks driven back of the face form deadmen to which occasional tierods from the upper part of the tie are fastened. The fill is then made up to the level of the tops of the ties. It is found easier to excavate holes for the ties and fill in afterward than to attempt to drive them as piles.

Predict Labor Demand Before Job Is Started

New Use of Progress Charts Combined with "Bogey Scores" Makes It Possible To Tell Where and Why Actual Work Varies from Estimate

By Dan Patch
Aberthaw Construction Co., Boston

IN SEEKING a record of a job's actual cost in time and money as compared with the progress schedule made for it in advance, the Aberthaw Construction Co. has modified its methods somewhat, so that it is possible to tell in advance how much weekly payrolls must amount to at each stage of the work; to tell, moreover, not only whether the material progress is up to this schedule on any date, but exactly how far behind or ahead it may be in terms of materials and labor spent; and to tell in addition, whether the work is ahead or behind in cost, and how the work actually done compares, unit for unit, with the estimates. After predicting the weekly labor expenditure, made up of the cost of all schedules to be under way in any week, these methods make it possible to tell definitely in terms of dollars and cents, and without elaborate pencil-sharpening or guesswork, whether the job is gaining or losing and exactly which features of the work are responsible for the variation from the estimate.

The writer will not enter into any discussion as to whether there is any advantage in having a prediction of the size of the weekly roll on construction work in advance of the actual expenditure. But it appears to him to be of importance to those financing the work to know not only how much money is to be spent but when, and of quite as much importance to the contractor to know not only how large gangs he must have but when he will need them.

The construction company for which the writer works has for some time plotted on a progress chart its schedule of dates for the operations to be undertaken on each of its important jobs, as an aid to the logical ordering and delivery of materials to the job and as a scheme for the job superintendent to follow in order to reach the ultimate date of delivery on time. In addition, however, the management desired a method of keeping in the central office a record of the job's effect on the schedule. As a result of this, the new method was devised.

ABERTHAW CONSTRUCTION CO. JOB 1093 FOR SINGER MFG. CO. BRIDGEPORT, CONN.

SUPT. H V. Sheahan — CHIEF CLERK Harry Mc Donah — COST CLERK R. S. Kellen — ENGINEER J. J. Keane

FOREMAN	ITEM	SYMBOL	QUANTITY	AMOUNT	1st Week Ending 4-11	2nd 4-18	3rd. 4-25	4th. 5-2	5th. 5-9	6th. 5-16
	Clear Site	Das		130	131	151 130	151 130	152 130	152 130	152 130
DEBERS	Dig Footings & Foundations	Dad	768 cy	577	39 100 45	271 30 130 328	371 449	535 130 488	538 488	538 488
	Sheeting for Footings	Dewp	3000 ♂		88	200 288	200 488	1 488 125	1 150	1 150
	" " Tunnels	Dewpt	570 ♂	71		75	50 125	25 160	31 71	31 71
	Officers & Sheds	Pen		300	64	124 20 140	161 20 40 215	180 16 56 250	180 16 71 250	180 250
	General Plant	P&		150	50 65	59 75 140 75	59 75 215 75	59 35 250 75	59 100	59 100
	Walks, Fences, etc.	Pej		50	50	10 25 75 10	10 25 100 10	10 10 110 10	11 20	11 35
	Unload Lumber	Ful		200		1 1	10 10 10	19 10 20 150	29 10 30 175	30 5 35 185
	" Steel	Ru		215	25	4 50 75 4	97 50 125 116	245 50 175 191	245 25 200 191	278 210
	" Concrete Materials	Mu ½	7400	740 250		39 50 20	88 65 115 104	194 50 165 194	194 50 215 194	219 254
	Saw Mill	Pes		100		12 50 12	17 75 125 17	19 85 210 70	19 85 295 70	19 85 380 70
MORAN	Mixer	Pem		300		26 35 20	42 35 70 42	49 70 100	53 120	54 150
	Tower, Hoist, Boom, etc.	Pels		400	8	130 20 85	144 50 70 144	149 50 120 200	152 20 140 260	57 10 150 275
	Forms to Footings		6550 ♂	498	10	14 75 85 14	21 75 160 5	98 100 260 380	105 10 270 440	105 5 275 498
	Steel for Footings & Sundries	R& z	40 T	320	36	6 184 220 6	43 178 398 52	93 100 498 79	178 96	227 107
	Concrete Footings & Foundation Walls & T	Med	517 cy	646		25 23 20	204 23 46 281	288 23 69 496	405 23 92 568	438 23 115 598
	Forms to Tunnel			132		171	171 342	171 513	41 85 598 114	48 120
	" " Foundation Walls		4688 ♂	363		27	66 41 68 185	127 39 107 106	408 22 129 273	474 3 132 301
	Backfill & Grading	Ded	1123	562		76	36 102 178 86	157 112 200 140	278 11 301 300	365 325
	Dig & Backfill for Plumber	Dedb		25			61 5	122 183 15 20	122 305 5	20 325
	KEY									
	Total to Date Total to D Chart			32865	316 424	942 1710	1679 3187	2721 4631	3986 5650	5731 7135
	" " "Bogey" " " E U					942 1020	1679 2150	2678 3695	3620 4792	5731 6431
	Chart P R				424	1286	1477	1444	1019	1485
	Actual "				316	626	737	1091	1266	1731
								998	1043	1561

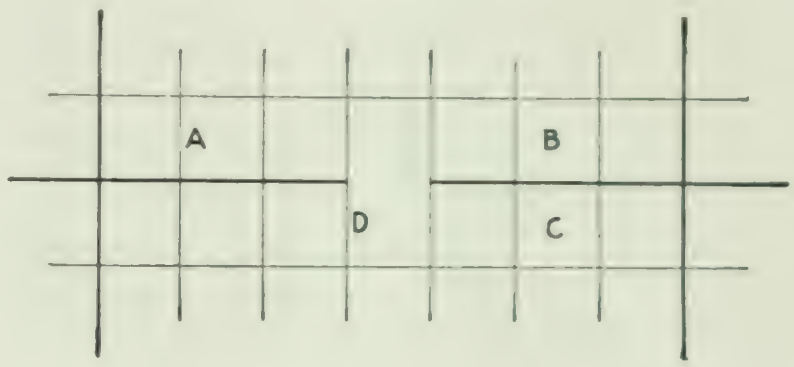
FIGURES COMPARING ACTUAL COST WITH ESTIMATED COST OF ACTUAL WORK DONE AND WITH

The progress chart now has combined with it a "bogey score," or list of items of work with the estimated quantities and amounts of money allotted for their performance. The money allotted for each item is divided up throughout the time scheduled in weekly amounts, which are placed below the schedule line in the middle of the week space. At the right of the week space, below the line, is put the sum to date of these estimated weekly amounts. This, of course, must equal at the end of the line the amount allotted in the "bogey score." When all the money has been thus distributed, each column is added and the total weekly payroll for each determined. These in turn are summed to date, the total equaling the total of the "bogey score."

The prediction of the weekly roll and the total to date are plotted on a progress curve sheet, as shown, in fine lines, the horizontal lines representing the payroll and their connections making the figure resembling the cross-section of a mountain range. The form of this figure will vary according to the type of job and speed of construction. The curve of "total to date" is the typical sinusoid of most construction costs.

With the construction of the chart and curves understood, the methods of following the performance will be grasped readily. The cost of each item is kept by the field timekeepers against the mnemonic symbols set opposite each item in the "bogey score." These costs to date are entered each week in the left-hand side, above the line for each item. But the cost of most items is made up of a quantity of work done at a certain cost. This quantity of work, at the unit cost allowed in the "bogey," is set down in the right side of the week, above the line. The total weekly roll is entered at the foot of the column under the predicted roll, and this roll, less extras, underneath this.

Now, if any one item is considered the rectangle for any week which has passed, it will look as follows:

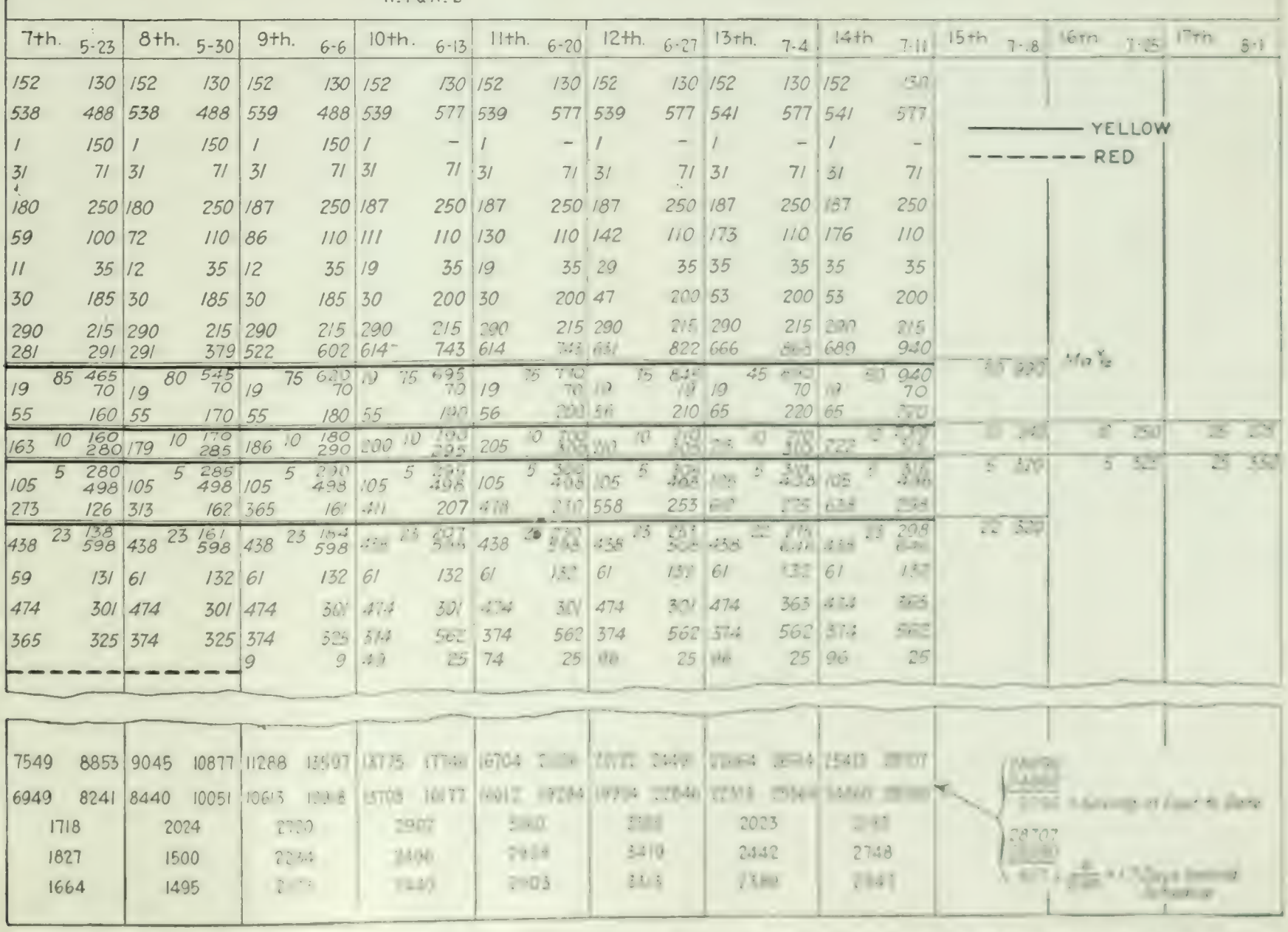


A—Actual cost of item to date.

B—What cost would be if done at the units allowed in "bogey score."

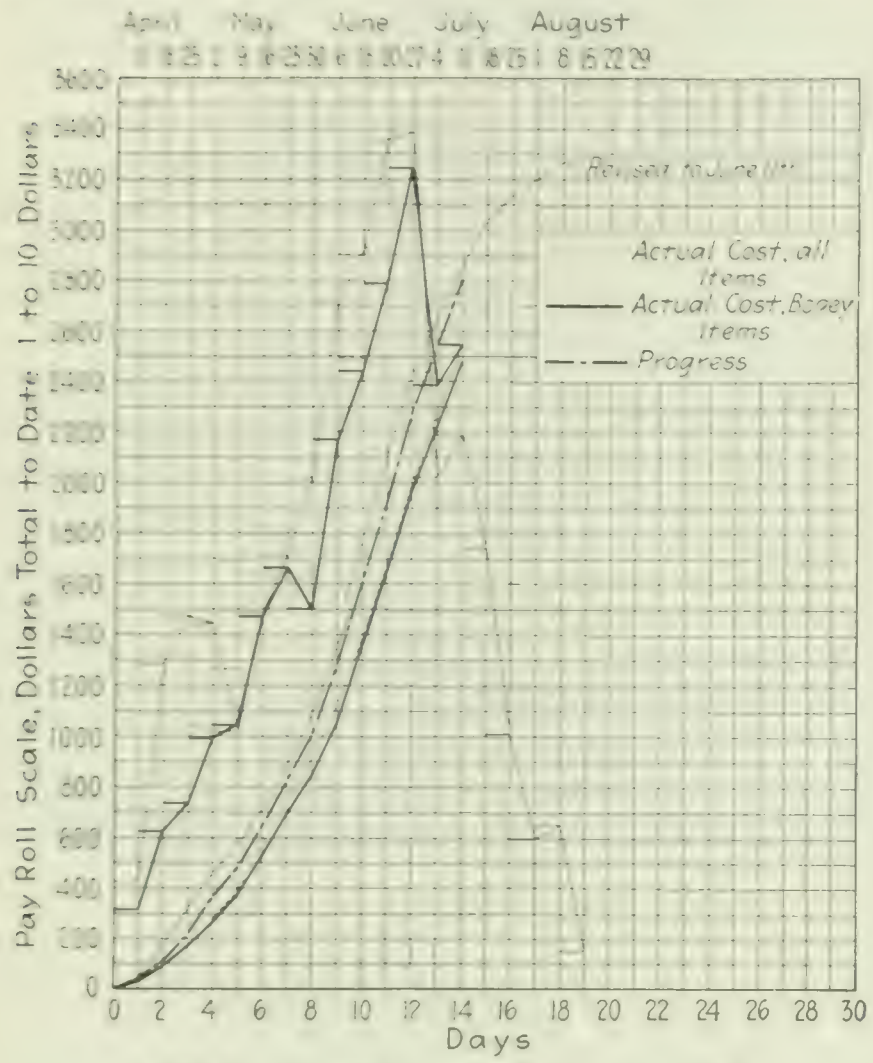
C—What cost would be if the quantity scheduled had been done at the units allowed in the "bogey score."

D—Predicted weekly expenditure on item.



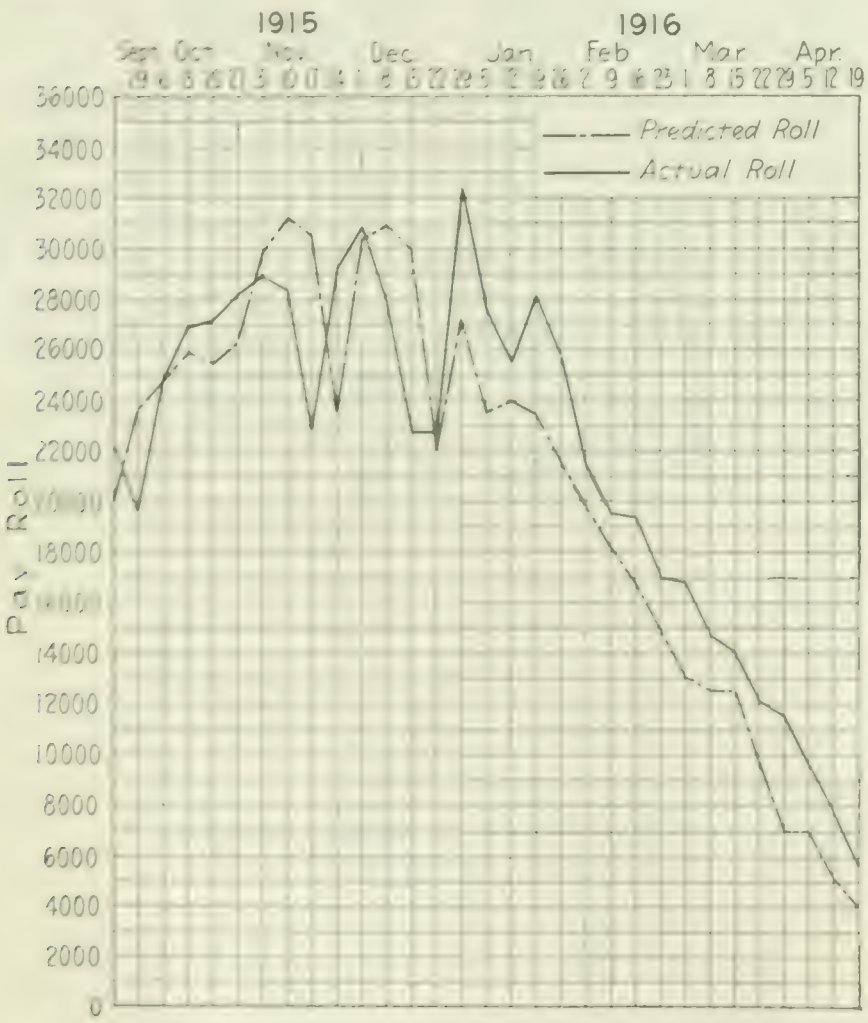
ESTIMATED COST OF WORK SCHEDULED SHOW WHETHER MONEY IS BEING SAVED OR LOST ON EACH ITEM

Then if A is less than B, the job is saving money on the item; if A is greater than B, money is being lost. If B is greater than C, the job is pushing the item ahead of schedule; if B is less than C, the item is behind.



CURVE OF TOTAL PAYROLL TO DATE

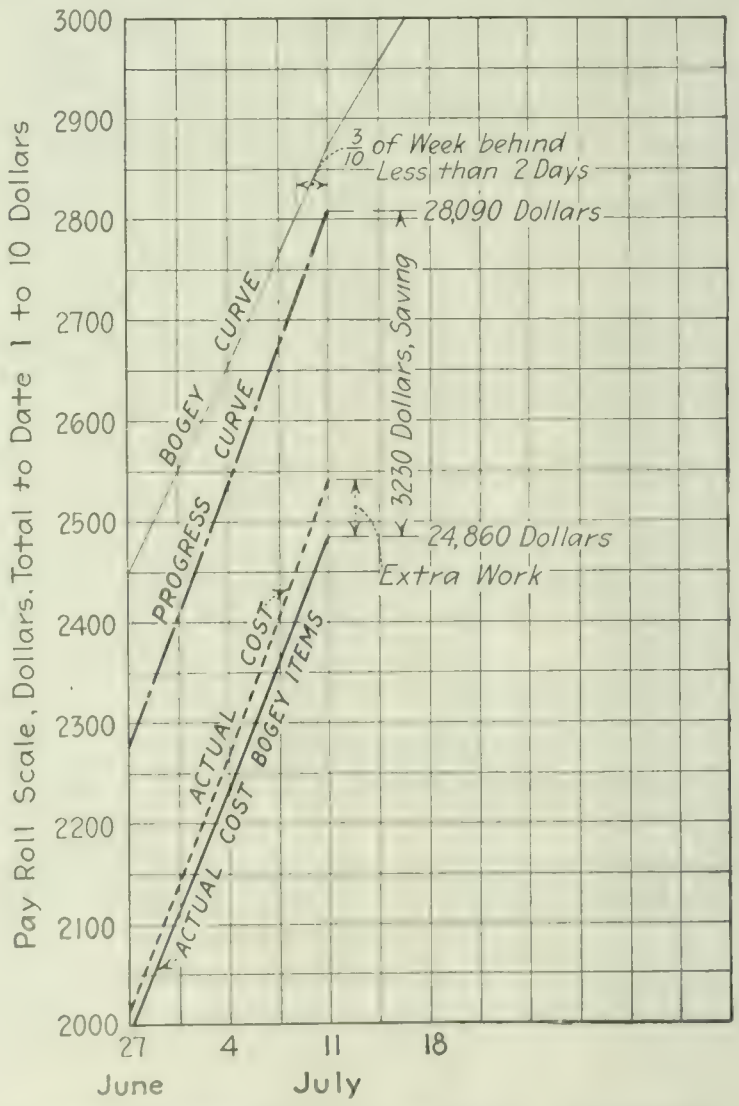
The blueprints which are posted on the central office board are not filled out each week so as to give these detail figures, but a graphic method is used to give the results.



PREDICTED AND ACTUAL WEEKLY PAYROLLS

If any item does not start on the date set, a red line is started above and continued until the item starts or is cancelled. The traveling superintendent is notified of the red line, and he either notifies the office that the item has been found unnecessary, as is sometimes true of sheeting for footings, etc., in which case a white line is drawn underneath, or takes steps to get the item started. When the item starts, a yellow line is placed beneath and drawn up to the point where the money to date, under the line, is equal to the cost to date at "bogey" units; that is, where the value of C equals B. This graphically represents the proportion of the item done, and at the completion of the item, will just reach the end of the item line. As each week is entered, a white vertical difference line is drawn through the date, so that it is more easily seen how the job stands. The bottom of the chart has the standing of the whole job plotted. These results are also plotted for the total job on the progress curves in the heavy black lines.

This description will give the reader an understanding of how the curves to which reference is made are constructed. Now, it is to be noticed how closely the actual results follow the predictions; that is, how simi-



GRAPHIC METHOD OF SHOWING PROGRESS

lar the heavy is to the light line form. This would indicate that for any given job, a very close approximation to the labor demands and expenditures can be predicted a considerable time ahead. By reference to the chart, the trade of the labor at any particular time during the job can be determined; that is, when masons will be demanded and how many, etc.

In case of large operations, covering groups of buildings, the superposing of these individual job curves, showing the predicted and actual weekly rolls, of which one of the diagrams for one of the company's large

contracts is an example, will give a resultant curve of the total operations to be financed. Labor is an active liability, and has to be met with cash. Merely dividing the total estimated cost by the length of the job gives no idea of the peak load, which may be of importance. This financial prediction is an interesting, if not a valuable, byproduct of the plans developed for following the progress of the job.

It may be of further interest to note the graphic method of showing the progress on the progress curve sheet. To do this, consider the curves for the job for which the progress chart is shown. Enlarge the section near the terminal of the lines to date of July 11, and the diagram will indicate the conditions of the job. Should the progress line be on the opposite side of the "bogey" curve, then the job would be ahead of schedule; if the curve of the actual cost of "bogey" items should be above the progress curve, there would be indicated an overrun in cost.

High Residual Stresses Exist in Pulp-Mill Digester Shells

HIGH initial stresses in the steel shells of lined sulphite digesters have been discovered as the result of an investigation by A. P. Mills and H. O. Keay, made for the Laurentide Co. and the International Paper Co. Explosions some years ago of these tanks, which in service are filled with hot acid and wood chips, led to the investigation.

On digesters at Ausable Forks, N. Y., and Grand Mere, P. Q., tests were made of the linear expansion of the steel shell before and after lining and under various conditions of service, using a Howard extensometer. The Ausable shells were lined with 1:2 cement mortar, 3 in. thick next to the shell, a 2-in. course of fireclay paving brick, a 1-in. course of cement grout and a 2-in. course of paving brick. The Grand Mere shells had a 2-in. layer of lining cement next to the shell, a 2½-in. course of digester brick, a ½-in. course of cement grout and a facing course of digester brick laid in litharge-glycerine cement. In both cases the lining cement was gaged with a sodium silicate solution.

At the Ausable plant, initial shell stresses up to 5000 lb. per sq.in. were found to have accumulated, and higher stresses than expected were found in each first cook after a cooling-down period. In the Laurentide digesters, the initial stress ran up to 5700 lb. per square inch.

The maximum stresses obtained in service were about double those given by the conventional cylindrical shell formulas. The action is expansion of the cement linings in setting.

Few Meters and High Water Consumption

With only 6.9 of its services and 21% of its consumption metered a per-capita water consumption of 249 gal. a day was indicated at Chicago in 1916, according to the last annual report of John Ericson, city engineer. On a very hot August day the pumpage was 320 gal. per capita, and from 8 to 10 a.m. the rate was 340 gal. per capita. The total pumpage at these two rates was 753,000,000 and 850,000,000 gal. Every available pumping unit was in service.

Government Cost-Plus Contracts for Emergency Building

Percentage Far Preferable to Bidding on Fixed-Fee Basis, a System Discarded Years Ago for Private Contracts

By John M. Goodell
Washington, D. C.

THE MOST conspicuous examples of hurried building operations for the Government are the sixteen national army cantonments, now completed. The essence of those building operations was speed; cost was necessarily a secondary consideration, yet careful attention was paid by the Government officials and the contractors to securing the results desired at the smallest expense. The material market was disorganized, labor conditions were disturbed and transportation was hampered by inadequate car supply and congested terminals and transfer yards. Under the circumstances, it seemed wise to those in charge of the work to offer it to selected contractors of demonstrated experience and resourcefulness on the basis of actual cost plus a percentage fixed by the Government. There was no competitive bidding and the contractor to whom a cantonment was offered merely had the opportunity to accept or decline the proposition.

Although this form of contract worked well, it met with some criticism from persons in high office, unfamiliar with the facts but having the ear of the public. There have been, in consequence, assertions that the contractors made no really earnest endeavor to obtain materials and labor at the lowest possible rates, because by doing so they would cut down their profits under the percentage form of contract. As a result, some of the Government officials are now contemplating asking for bids on the cost-plus-fixed-sum basis, extensively used ten years ago but now rarely adopted, for reasons which it is pertinent to point out at this time.

The great advantage of the cost-plus-percentage contract is that it enables the owner to get what he desires, when he desires it, at a fair cost. If he wishes the work rushed he knows what the unusual speed is likely to cost; if he wishes special care given to troublesome foundations or unusual structural details, he is in touch all the time with what he must pay for this work. If he chooses a responsible and trustworthy contractor, the cost will be as low as practicable. If he is so foolish as to rely on an untrustworthy contractor he is no worse off than he would be under a lump-sum contract, for no form of contract will make an incapable contractor do efficient work.

The Government has on hand an enormous building program in this country and France. Wharves, warehouses and storage depots must be rushed to completion at the earliest possible moment, in order to permit the free flow of supplies to our army and our allies. It is impossible to employ existing facilities beyond a limited extent without causing great hardship to many communities here, for these facilities are needed to meet everyday requirements. It has been a characteristic feature of American development to make little cooperative provision for the future in the matters of storage, warehouse and terminal facilities.

With a pressing need for storage buildings, the primary object of the Government is to obtain them as rapidly as possible. This makes it necessary to construct them under some form of cost-plus contract. Lump-sum contracts would be enormously expensive now. In such an emergency, it is doubtful that the Government should run the risks of taking bids after advertising the work. The Council of National Defense already possesses a remarkable record of virtually all contractors who have carried on construction of different kinds. These records show whether or not the work done was satisfactory to the owners, the financial standing of the companies and similar information indicating their availability for emergency work. The contractors for the national army cantonments and many other extensive emergency building operations were selected from this list, and the results have proved the wisdom of the plan. It saves time, places the work in the hands of experienced men and is not wasteful of public money.

If the cost-plus-fixed-sum contract is selected, instead of the cost-plus-percentage, the Government will find it extremely difficult to settle on a fixed sum. Ordinarily a contractor working under peace conditions estimates what the work will cost, and then adopts a percentage of his estimate as his fixed sum. So far as he is concerned, he does precisely what he would do in preparing a lump-sum bid, except that he does not guarantee to the owner what the finished job will cost, for the owner takes all the financial risk. This form of contract has been unsatisfactory because it was only nominally to the owner's advantage. As soon as the owner called for extra speed or extra work, which would increase the overhead cost of the work to the contractor, the latter hung back just as he would hang back under a lump-sum-bid contract, for his fixed sum was not based on rendering such unforeseen services.

A further great drawback has been found in asking selected contractors to name competitively the fixed prices at which they will do work with all costs paid by the owner. This plan is primarily intended to secure competition where speed is the essential factor in the work and the conditions surrounding the work are so uncertain that the cost cannot be estimated with any approach to certainty. The contractor's overhead expenses, which he must meet out of his percentage or fixed sum, as the case may be, will be about 3½%, as a rule, on large operations. Under the fixed-sum plan he must guess at the maximum cost of the work, in order to ascertain what these charges will be, and then make another guess, usually lower than the first, on which to base his profit. Then he will add the two together and thus obtain his fixed sum. These sums will vary and the owner, knowing how they are obtained, will be in a quandary—whether he should let the contract to the experienced man in that class of work, whose fixed sum is the highest, or to a reputable contractor with experience mainly in other lines, whose fixed sum is lower. He sees that necessarily there has been guessing about several elements of the work, and he wishes he had been sensible enough to escape all these uncertainties by adopting the cost-plus-percentage system.

The case is much simpler with the Government than with a private owner. The Government does not run any risks under the system adopted for the cantonments. It is willing to pay cost, when that cost is the minimum a good contractor can attain, and under the emergency laws it can give the contracts only to parties of demonstrated integrity and ability. It can determine what is a fair profit on the work, making the ratio of profit to cost larger on small work than on big work. There is none of the uncertainty about this which exists in cost-plus-fixed-sum and lump-sum contracts, and it is to be hoped that in these trying times, when the nation is responding freely and gladly to the unparalleled demands for money and services, there will be no experimenting with building contracts which experience has shown are unfitted for emergency construction.

Probable Lives of Water-Works Elements

THE Committee on Depreciation of the American Water-Works Association summarized broadly in its final report the conclusions drawn from data collected by it concerning the life of the elements of a water-works plant. In still more condensed form the figures are:

	Life in Years
Large storage reservoirs, well located	75 to 150
Heavy earth or masonry dams	75 to 150
Large masonry conduits and tunnels	75 to 150
Cast-iron pipe, large	75 to 125
Cast-iron pipe, small	30 to 70*
Wrought-iron or steel pipe, large	30 to 75
Wrought-iron or steel pipe, small	25 to 40
Wood-stave pipe, large	30 to 60
Services, wrought-iron and steel	15 to 30
Services, wrought-iron and lead	40 to 80
Small distribution reservoirs	50 to 75
Standpipes, wrought-iron and steel	30 to 60
Standpipes, reinforced-concrete	50 to 60
Valves	40 to 60
Hydrants	30 to 50
Meters	20 to 30
Pumping machinery, high duty, large units	35 to 60
Pumping machinery, high duty, small units	25 to 50
Pumping machinery, ordinary direct-action	25 to 50
Pumping machinery, centrifugal, not geared	20 to 30
Pumping machinery, centrifugal, geared	15 to 25
Steam engines	20 to 40
Boilers	15 to 30
Electric generators and motors	20 to 30
Filter plants, masonry	30 to 50
Filter plants, wood	15 to 30
Buildings, masonry	30 to 60
Buildings, wood	20 to 40
Stacks, masonry	25 to 50
Stacks, steel	10 to 25

* In slow-growing and small cities, 50 to 90 years.

Explanatory remarks and qualifying conditions are given in the report, which has been printed as a 38-page supplement to the September *Journal* of the American Water-Works Association. Discussion of the entire report on depreciation, for presentation to next year's convention of the American Water-Works Association, is invited by J. M. Diven, secretary, 47 State St., Troy, N. Y.

Shortest Railway in the World

Filing of a court action in Missoula, Mont., disclosed the fact that the Missoula Belt Line Railway is the shortest railway in the world. The attorneys for the company owning the 100-ft. railroad line filed suit in the district court for $8000, said to have been collected by the defendants in their capacity as agents for the railway. The line connects the Northern Pacific and the Chicago, Milwaukee & St. Paul lines in South Missoula, where the tracks of the former pass over the latter. The line has neither equipment nor employees.

Reinforced Concrete in Sea Water Fails from Corroded Steel

Percolation of Salt Water or Salt Air to Reinforcing Steel Causes Rusting with Subsequent Expansion and Failure of Structure—Remedies Are Difficult to Find

By Rudolph J. Wig and Lewis R. Ferguson

Third of Five Articles on the Problem of Sea-Water Concrete Written as a Result of Investigation and Inspection of Practically All the Marine Concrete Structures in the United States.

THE majority of all reinforced-concrete marine structures on the American coasts subjected to sea-water action are now showing evidences of deterioration or failure due to the corrosion of the embedded reinforcement above the water line.

Only after the most careful investigation and with indisputable evidence at hand to substantiate it, do the authors state *that steel embedded in first-class concrete to a depth of one or two inches in accordance with existing theory and practice is not perfectly protected against corrosion by sea-water action.* There is a widespread but erroneous belief among engineers that a comparatively thin coating of concrete will protect embedded reinforcing from corrosion. This view is supported by the leading authorities, and so the average engineer cannot be severely censured for following a practice which has the sanction of those whom he supposes to be well versed in the subject. For instance, the 1917 report of the Joint Committee on Concrete and Reinforced Concrete states, "Tests and experience indicate that steel sufficiently embedded in good concrete is well protected against corrosion no matter whether located above or below water level. It is recommended that such protection be not less than 1 in. in thickness." This also represents the opinion of the authors of all standard works.

Some of the structures examined by the writers are not a year old, and the oldest is but ten. Many of the older structures show signs of advanced deterioration, and some not more than four years old are badly affected, while one reinforced-concrete pleasure pier, opened to the public in July, 1916, was found to be seriously affected by October of the same year. Some of its members are shown in Fig. 1. In that short time the reinforcing had corroded to such an extent that spalling of the concrete had begun.

In many instances where a member has cracked over some of the rods, the cracking has not yet developed over all of them. That is, one corner of a beam or pile may be cracked while the other corners show no signs of fracture. This is due to the fact that some of the rods are embedded a little deeper, the concrete is somewhat denser or the exposure is not so severe.

A number of reinforced-concrete structures were found which were not cracked or deteriorated, but most of these were not over two or three years old. One, however, was ten years old.

Undoubtedly the most important information gained during the recent investigation made by the authors was the true condition of reinforced-concrete structures subjected to the action of sea water, and the cause of the trouble. There have been a number of reports and articles in the technical press describing marine structures of reinforced concrete which have shown signs of deterioration, but as far as is known no one has developed the real conditions.

Some plausible explanation has always been made which has accorded with the existing theory that reinforcing is amply protected against corrosion when embedded to a depth of 1 or 2 in. in concrete of good quality. These articles have described structures in widely separated localities, so it is evident the same forces are at work wherever there is sea water, and the trouble is not confined to any particular part of the country. The effect, however, is much more pronounced in some localities than in others, and certain conditions greatly accelerate the action. The temperature, exposure conditions, quality of concrete and depth of embedded metal all influence the rapidity of deterioration. Some of the reinforced-concrete structures examined by the authors show only slight signs of deterioration after six or seven years of exposure, while others are practically failures within four years of the time they were built.

Usually the corrosion of reinforcing is attributed to the poor quality of the concrete. Porous concrete does of course offer less protection to the embedded metal, and corrosion will be more rapid in such cases. Rein-



FIG. 1. CORROSION OF SLIGHTLY SUBMERGED STEEL HAS CAUSED CRACKING AFTER LESS THAN ONE YEAR

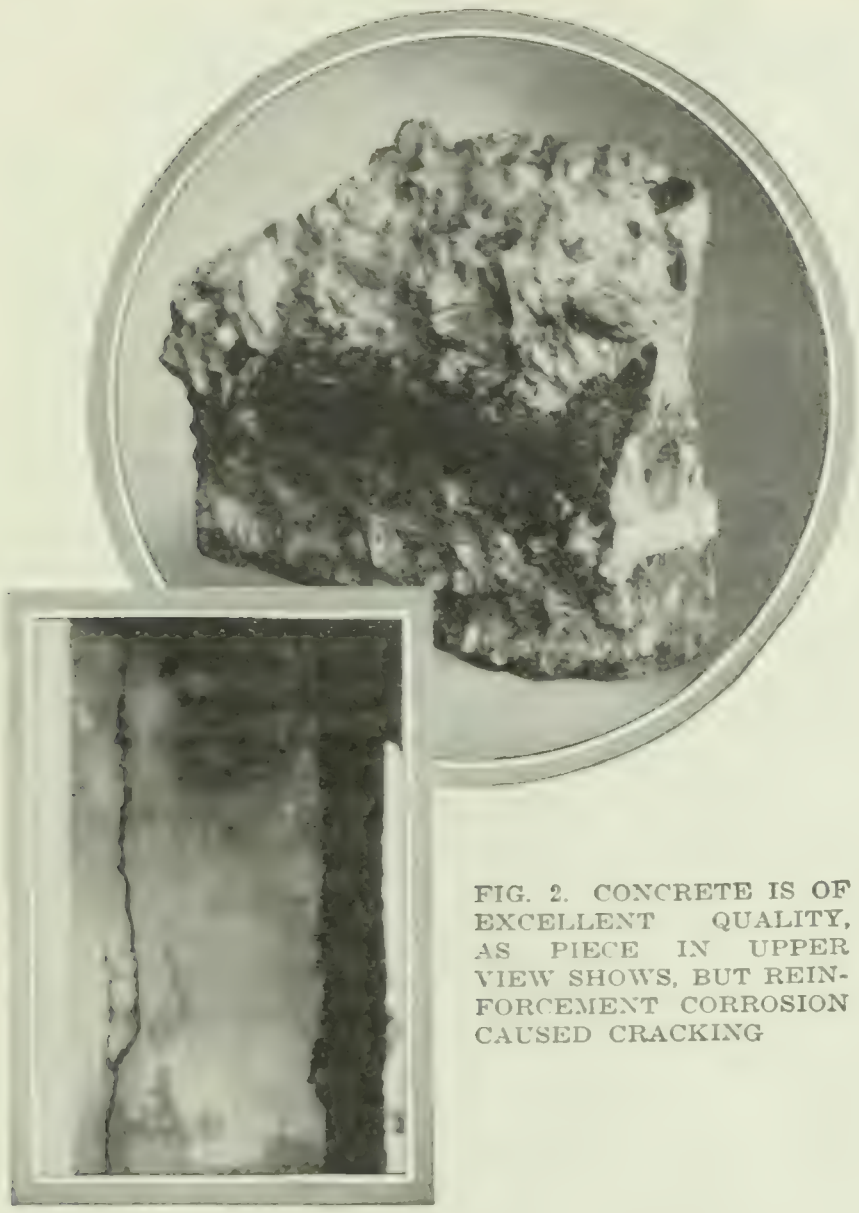


FIG. 2. CONCRETE IS OF EXCELLENT QUALITY, AS PIECE IN UPPER VIEW SHOWS, BUT REINFORCEMENT CORROSION CAUSED CRACKING

forcing will, however, corrode under certain exposure conditions in a few years, even when the concrete is of excellent quality.

There is a reinforced-concrete quay wall or wharf on the south Atlantic coast which was built in 1912 which illustrates this. The design consists of precast reinforced-concrete piles supporting a reinforced-concrete deck. The concrete for the piles was a 1:1½:3 mix, so wet that the rods were thoroughly coated. The ingredients were of excellent quality, and the concrete was mixed and placed as well as if not better than the usual practice. Fig. 2 shows one of the cracked piles and a section of concrete showing its good quality. When this wharf was examined in 1916 it was found that 60% of the piles were cracked at the corners, and in many cases the reinforcing was exposed.

There is another pier along the Atlantic coast built ten years ago which consists of precast concrete piles, but here a wood deck was used. The concrete for the piles was of good quality. In this pier there are about 2500 piles and nearly every one is cracked or spalled. Fig. 3 shows some of the piles.

In the Philippine Islands many of the reinforced structures have cracked to such an extent, due to the corrosion of the metal, that they have caused serious apprehension. The explanation advanced by J. L. Harrison, at one time district engineer at Iloilo, P. I., in an article in *Concrete*, March, 1917, is that the trouble is caused by the use of sea water in mixing the concrete.

Mr. Harrison came to this conclusion largely by analyzing specimens of concrete which had cracked and in these he found an appreciable amount of chlorine. He was on the right track, but the chlorine did not come necessarily from the salt in the water used in mixing the concrete, and, moreover, the conditions he observed would without doubt have occurred had the concrete been gaged with fresh water. He is also in error in assuming "that on the whole the conditions in the Philippine Islands are so different from those which prevail in temperate climates that the results there (in the United States) obtained are not a reasonable criterion of what must be expected here."

Exactly the same phenomena are occurring in America, and in fact everywhere that concrete is exposed to sea water. Under warm humid conditions the action is much more severe and rapid—but more or less rapidly the destructive action is in progress everywhere.

Salt-Water Gaging Not the Cause of Failure

That the gaging of the concrete with sea water, or the use of aggregate impregnated with salt water, is not the primary or underlying cause of the corrosion of the embedded reinforcing is shown by the fact that in many of the structures examined the concrete was mixed with fresh water and the aggregates were free from contact with salt water. This was true of the two piers first referred to where very extensive cracking has occurred. During the investigation made by the authors one of the matters given particular attention was the possible use of salt water in gaging the concrete, and the statement can be made with assurance that the prevailing corrosion of metal embedded in concrete cannot be attributed to the use of sea water in mixing, for with few exceptions American structures have been built with fresh water.

It has been suggested that close proximity of the reinforcing rods to the surface has produced corrosion. In an article in *Engineering Record* of Jan. 25, 1908, p. 105, there is a description of a reinforced-concrete building which was torn down six years after erection. Here it was found that corrosion of the reinforcing had occurred in the columns where the hoops were closer than ¾ in. to the surface, and the necessity of keeping the steel "at least ¾ in. from the surface" is pointed out.

In passing it might be noted that the difference between ¾ in. and 1 in. of covering which the Joint Committee recommends as giving perfect protection against corrosion is a very small margin of safety. As a matter of fact, however, neither ¾ in., 1 in. or, in many cases, even 3 in. of concrete will insure the embedded reinforcing against corrosion in marine structures. In a number of the piles of the pier previously mentioned where the concrete was proportioned 1:1½:3, it was observed that some of the rods which had spalled off the concrete were embedded 2½ in. (see Fig. 2) and were badly corroded, and in many other structures where advanced corrosion of the reinforcing was found the metal was embedded more than 2 in. When the metal is near the surface it will corrode much more rapidly than when embedded to a greater depth, but the thickness of covering must be much more than has been commonly supposed.

Perhaps the most popular theory of the cause of corrosion of metal embedded in concrete is that of electrolysis. A few years ago this was the explanation advanced for practically all the ills of reinforced con-

crete, and in some cases it was made to apply to plain concrete also. Naturally the corrosion of reinforcing in marine structures was attributed to this cause, and a number of cases were diagnosed as electrolysis with little more than a superficial examination. In other cases the examination has been carefully made, but lack of any better explanation than that of electrolysis and the firmly fixed idea that 1 or 2 in. of concrete thoroughly protects the reinforcing from corrosion have led the investigators to adopt this theory.

This seems to have been the case in the second report of the Committee on Reinforced Concrete of the British Institution of Civil Engineers. This report contains descriptions of a number of reinforced-concrete structures subject to sea-water action. Most of these show extensive cracking of the concrete along the lines of the reinforcing rods. The suggestion is made that the trouble arises from several causes—closeness of metal to the surface, improper placing of concrete, causing porous sections, and lack of bond along the plane of reinforcing—but if there is electric current near the structure it is made to take a large part of the responsibility for the failure.

There probably have been some instances where electrolytic action caused the corrosion of reinforcement in marine concrete structures, but such cases are very infrequent, and the effect from this action is different in one very marked particular from that which is occurring in practically all reinforced concrete in sea water which is deteriorating.

The cracking of the concrete in sea water always starts *above the high-water line*, although it may extend a little below this point as corrosion develops. Very seldom is it found to go down as far as the elevation of low water, and then only when the reinforcing is deeply embedded so that the spalling effect extends a considerable distance below where the metal is affected.

This condition was also noted in the report of the British Institution, and it effectually disposes of the electrolytic theory. In all the experiments made to determine the action of electric current on reinforced concrete it has been found that cracking due to the corrosion of the reinforcing starts where the current leaves the rods. Therefore, if electrolysis were the cause the corrosion and cracking must occur below the elevation of high water, where the current leaves the metal. In a reinforced-concrete marine structure in which the corrosion and deterioration do not extend below the water line, electrolysis cannot possibly be the cause. For this reason, also, the corrosion of the reinforcing referred to in the report of the British Institution cannot be caused by electrolysis, for it is stated that the cracking of the concrete occurs above the level of high water.

At Long Beach, Calif., a large number of reinforced-concrete piles were cast in 1911, the intention being to use them in constructing a pier. After the piles were cast the work was stopped. The concrete piles have remained where they were cast, about 50 ft. from the shore, without covering and without any electric current near them. The tide never rises high enough to reach the piles, and so they are constantly dry except from such wetting as they get during the rainy season. Evidently the piles were molded in two operations, one set being of a little better quality—apparently because of the use of a somewhat drier consistency of concrete.

Practically every one of the set made from the very wet concrete has cracked. (Fig. 4.) Cracking has not yet developed in the set made of the drier concrete. Certainly electrolysis cannot possibly be the cause of the corrosion of the reinforcing rods. Fresh water was used in mixing the concrete.

Another very good bit of evidence that corrosion of reinforcing with resultant cracking of the concrete is not due to electrolysis was found in one of the rivers emptying into the Atlantic Ocean. At the mouth of the river there is practically undiluted sea water. About 15 miles from the mouth the water is just perceptibly brackish and 10 miles farther up the river the water is fresh. In this river there are more than 25 beacon lights, and those extend from the mouth to a point beyond where the fresh water is always found. The supports for these lights consist of four precast reinforced-concrete piles supporting a reinforced-concrete slab deck to which is attached the superstructure, consisting of steel members or pipes in the form of a tower.



FIG. 3. THESE PILES HAVE ALL CRACKED ABOVE HIGH WATER



FIG. 4. THIS PILE WAS ON BEACH HIGH ABOVE WATER, BUT NEVERTHELESS CRACKED FROM POROUS PERCOLATION AND SUBSEQUENT CORROSION

This supports the beacon light. All of these lights burn gas or oil, and none of them is operated by electricity; nor is there any electric current near them. In all cases the deck slab is at least 6 ft. above the high-water line, and in a number of the structures it is 10 or 12 ft. above this point. Knee braces were used frequently to stiffen the deck slab.

A very careful examination of these structures showed that not one of those situated in fresh water was cracked or deteriorated. Holes drilled through the concrete into the reinforcement proved that no corrosion whatever had occurred. On the other hand, every structure below the point where brackishness of the water could be detected was cracked from the corrosion of the reinforcing, the action being markedly more severe as the salt content of the water increased. All of these structures were built about the same time, during 1912 and 1913, by the same contractor. The same materials were used for the concrete for all the structures, and it was of excellent quality. It might be mentioned also that fresh water was used in gaging the concrete. All the cracking was above the water line, and in many of the structures the deck slab and knee braces are the most affected.

Undoubtedly the real cause of the trouble is the accumulation of salts in the pores of the concrete above the water line by capillarity and evaporation, and the absorption by the concrete of air carrying very minute particles of sea water. Moisture in this form is transported by the wind a much greater distance than is usually believed. This is shown by the presence of chlorine in the form of sodium chloride. If the moisture from the sea were simply in the form of water vapor from evaporation there would be no salt found in the atmosphere. The studies made on this subject by the United States Geological Survey indicate that finely divided salt spray from the ocean is carried by the air a distance of many miles inland. This probably accounts for the sodium chloride Mr. Harrison found in some of the concrete in the Philippine Islands.

Chlorine and oxygen together form a very active corroding agent. Of course this has long been known, but what we did not before appreciate was that the salt air could penetrate concrete to anything like the depth it really does.

When steel corrodes it occupies about twice its previous volume. The expansive force thus developed by metal embedded in concrete is enormous, and the concrete is soon stressed sufficiently to cause cracking.

The question has been raised as to whether the cracking comes first and the corrosion is a secondary action which in turn further develops the cracking, or whether the primary cause of the trouble is the corrosion of the reinforcing, with cracking as a secondary action. Of course, if structural cracks occur local corrosion of the embedded metal may be accelerated. A number of conditions were observed, however, which seem to furnish conclusive evidence that structural cracking is not the fundamental cause of the trouble, but that the reinforcing corrodes first and this causes the concrete to crack. The cracking is always along the lines of reinforcing, and very frequently no other cracks could be found in the member. It seems probable that if cracking had started first it would be more widely distributed.

Usually when a pile is affected all four corners tend to spall, and if one pile in a structure is cracked many others will be found in a similar condition, and the beams and slabs, if of reinforced concrete, will also be cracked. It is conceivable that in removing the forms from a pile a corner, if the concrete is green, may be slightly cracked; but it is not probable that all four corners would be cracked, and it is still less probable that such careless work should be done throughout the structure. As a matter of fact, most of the structures which were examined and found cracked were built by competent, experienced contractors under rigid inspection. During the construction of one of the piers referred to in the early part of this article, in which cracking has been very extensive, one of the authors had an opportunity personally to observe the work during construction. It was done quite as well as, if not better than, is usually the case; in fact, the firm which had the contract is noted for the excellent quality of its work.

Pile Failures Not Due to Shattering

It has been suggested that the cracks in concrete piles are caused by shattering of the head during driving. This cannot be the case, for most frequently the cracking does not extend to the top of the pile, and many of the piles observed were jetted into place.

There is one pier in the southern Atlantic which is supported on Braxton piles. These piles are made with a heavy cast-iron shoe at the bottom which projects beyond the shaft of the pile. The pile is driven by means of a sleeve which is threaded over the concrete and rests on the shoe, so that the driving is done on the shoe and not on the concrete. A number of piles in this wharf are cracked over the reinforcement.

Of course the cracking of beams and slabs cannot possibly be accounted for in this way. If the cracking is the first action which takes place it is most probable that some indication of this action would have been observed in the beacons in fresh water previously referred to. As was stated before, no evidence of cracks in the concrete could be observed in these. In most cases the cracking stops at the high-water line or a little below it. This is a striking characteristic of the phenomenon. It is inconceivable that if the cracks occurred first they would always be in the same place. The supposition that the corrosion of the metal is originally caused by cracks

in the concrete must be dismissed. The metal first corrodes and then the concrete cracks.

It is very significant that the cracking does not extend below the high-water line. The reason for this is probably because the air does not as readily penetrate the concrete below this point.

Methods of Preventing Deterioration

Just how to overcome the widespread deterioration of reinforced concrete caused by the corrosion of the embedded metal is a difficult problem, and the exact treatment and method to be followed will depend upon the exposure conditions, design and location of the structure. The use of rods of smaller diameter seems to have a beneficial effect. Increasing the distance of the reinforcing from the surface also assists greatly the resistance to corrosion. In precast piles the added weight due to increasing the covering of concrete over the reinforcing must be considered. In many cases the stresses due to bending after the pile is in position are not great above the water line. This condition may be taken advantage of in designing concrete piles for marine structures. For instance, the vertical reinforcing may be bent in toward the center at a point a little below the water line. Usually ample strength in flexure can be provided by care in the design, and the vertical bearing strength of the pile will be but slightly diminished.

In many concrete structures the members are considerably over-reinforced. This is especially true of piles. Every effort should be made to diminish the amount of reinforcing, and if at all possible a design should be adopted which eliminates the metal entirely for the work above water. Perhaps gravity sections and massive work will cost more in the first place, but the additional expenditure will ultimately prove an economy unless special precautions are taken to insure the reinforcing against corrosion. Frequently a combination of reinforced concrete below the water line with plain section above will prove best.

If the reinforcing is made non-corrosive by galvanizing in the vulnerable part of the structure—that is, above water—the destructive action of the moist air will be prevented or greatly lessened, and the life of the structure materially increased. Painting or impregnating of the exposed parts of a concrete structure will be at best only a temporary expedient unless better materials can be found than those now at hand.

Proper Design Difficult to Make

The proper methods to be pursued and the design to be adopted to prevent the deterioration of reinforced concrete subjected to sea-water action depends upon a number of conditions, such as the type of structure, its purpose, the severity of exposure and the climatic conditions. The latter consideration has considerable influence. In warm, humid climates the corrosion of the reinforcing and the consequent cracking of the concrete proceeds much more rapidly than in cool climates where the amount of moisture in the atmosphere is less. It is an interesting fact that reinforced concrete is subject to most rapid attack in localities where plain concrete is but slowly affected by sea-water action, and where the concrete itself is most rapidly disintegrated the corrosion of the reinforcing proceeds more slowly.

Stone-Gravel Road Proves Its Usefulness in Michigan

State Highway Department's Specifications Also Permit Use of Slag for Base and Surfacing

By Donald A. Thomas
Michigan State Highway Department

POSSESSING both strength and supporting power, the gravel-top road with macadam base, evolved by the Michigan State Highway Department, is proving more satisfactory and can be maintained more easily and economically than a wearing course of plain water-bound limestone. The specifications, however, permit a base and top course of slag, instead of gravel. The slag, because of its porous character, is particularly adapted to take and hold a bituminous carpet-coat but only a small mileage has been constructed in this manner. Over 275 miles of the stone-gravel type, known as a class C road, have been built in the state.

For a few years after the creation of the Michigan State Highway Department in 1905 macadam roads constituted as much as 50% of the mileage constructed according to the state's specifications. As the use of the automobile became more widespread, however, the problem of maintenance became a serious one. Some of the roads were rebuilt to a higher type, others were given bituminous treatments, and the construction of macadam roads dropped until now only about 20% of the roads constructed each year are of this type, most of which, after being opened to the traffic until thoroughly "seasoned," are given a bituminous carpet-coat.

Experience with Gravel Roads

Gravel roads, on the other hand, reacted more favorably to the automobile traffic. They did not ravel readily and, when once compacted and maintained in such a manner as to give perfect surface drainage, demonstrated their ability to carry from 200 to 500 vehicles per day, 70 or 80% of which were automobiles, with an annual maintenance charge of from $100 to $300 a mile per year. For this reason and due also to the fact that large deposits of gravel suitable for road metal are well distributed throughout the state, the construction of gravel roads has increased until it approximates 60% of the yearly mileage built.

The success with gravel roads constructed as such led to the resurfacing of a considerable mileage of old macadam roads with a gravel top. The specifications for the class C road recognize the advantages of this combination. Such a road is capable of sustaining heavy loads and at the same time provides a surface that is easy and economical to maintain up to a certain limit. Also, in utilizing local materials for the top course, a cheaper road is provided than any other type of like capacity.

The specifications for the Class C road provide for the construction essentially as follows: Before building any state reward road the plan and profile must be submitted to and approved by the State Highway Commissioner. In the case of trunk line roads the surveys are made and plans prepared by the State Highway De-

partment as required by law. No grades may exceed 6%. The road is graded to conform strictly to the plans and specifications, with due attention given to drainage. Shoulders are formed on either side to retain the metal within the width and depth specified.

Slag Allowed

After the road has been graded and rolled in the manner above described, a layer of crushed stone or slag, not less than 4 in. deep after thorough rolling and compacting, is spread on the prepared bed to such uniform thickness as may be specified by plans or special specifications for the road in question. The material for this course may be an approved grade of crushed limestone, cobbles, trap rock, or slag. When limestone or slag is used for this course it must be that part of the crusher product passing over the 1½-in. section and through the 3½-in. section of a cylindrical screen perforated with round holes. When cobbles or trap rock are used the permissible range is from ¾ in. to 3 in. It is required that the stone or slag be placed upon the road uniformly mixed and, after being spread be rolled with a roller weighing not less than 10 tons, then covered to a uniform depth of from ½ to ¾ in. with stone or slag screenings and rerolled. Water is applied in advance of the roller after the binder is added except on clay subgrades where permission may be obtained to omit the water. The screenings may be that part of the crusher product passing through the ¾ in. screen when crushing the stone or slag for this course.

If it is determined to construct the top course of slag, the same crusher product used in the bottom course is deposited to such a depth as to make the total thickness not less than 7 in. at the edges and 8 in. at the center for roads from 9 to 16 ft. in width, the thickness to be measured after the road is thoroughly compacted. Virtually the same provisions apply to this as to the first course, and, when completed, it should be uniformly smooth and hard and conform to the proposed grade and cross-section.

Gravel Quality

For a gravel top course good, clean bank or screened material is used. For single reward roads this gravel must test 60% by weight—a larger per cent. if possible—pebbles that will be retained on a screen of ¼ in. mesh and will pass through a circular screen with 1½-in. holes. For trunk line reward roads the gravel must test 75% by weight pebbles retained on a ¼-in. screen and passing a 1½-in. screen. If clay gravel is used it should contain only clay enough to coat the pebbles with no free lumps and in no case may the clay exceed 10% of the mass, for clay makes mud and adds no wearing qualities. These requirements are based on the experience of the State Highway Department during the past 12 years which has shown that Michigan gravels are valuable for road purposes as follows:

1. Almost in direct proportion to the percentage of pebbles constituting the mass.

2. In direct proportion to the value as road material of the rock fragments constituting the pebbles.

3. In direct proportion to the value as a cementing material under all conditions of weather, of the finer particles of earth matter constituting the filler or binder.

The gravel is spread on the road to such a uniform thickness as to be not less than 3½ in. deep after compacting, after which it is harrowed, floated, and rolled until thoroughly compacted, and is even and firm and conforms with the grade and cross-section set forth in the plans. Rolling is done only when the gravel has been thoroughly wet by sprinkling or recent rains and at all times begins at the sides, rolling lengthwise of the road, but gradually working toward the center. In the final rolling the whole surface of the roadway, including the shoulders, is rolled from ditch to ditch and the whole road grade left in such perfect condition that water will flow without obstruction to the side ditches.

No matter how painstaking the work of construction may be, however, the final set of the gravel on the ordinary country road will come only under travel, and to insure a good surface the road must be kept smooth during the formative period. For this purpose the most effective tools are the plank and log drags, or some of the various types of steel drags that accomplish the same purpose. These drags should be systematically used after rains, when the gravel is in a packing condition, and in the subsequent maintenance of the road.

Relative to the cost of this type of construction, an aggregate of 26 miles constructed in different sections of the state under representative conditions during 1916 cost on the average $3255 per mile for a 9 ft. width. For a 16-ft. width a total of 17¾ miles averaged $6170 per mile.

Philippine Government Will Analyze All Bad Concrete

THE Bureau of Public Works of the Philippine Islands has started a campaign to determine, if possible, the cause of such failures of concrete and reinforced-concrete work as have developed in the public works on the island. To begin the investigation D. T. Henry, chief constructing engineer, has issued to all the responsible engineers in the department a series of forms for the collecting and listing of data on any structure which does not seem to be up to the required standard. Particularly, reports are expected on structures where failure has started or has been complete. The local engineers are asked to send photographs of the structures, and to make particular notes of a number of items, among which the memorandum notes as most important that samples of sand and water should be sent and that special note should be taken of cases of exposure to salt water, the possible deterioration of cement, porous concrete resulting from too little cement, leaky forms, etc.; weakness of mortar from laitance due to excess water in gaging, corrosion of reinforcement and splitting of concrete. All of these items and many others are recorded on the blanks, which will be kept on file at Manila. When a sufficient number of them has been received, compilations of consequent conclusions will be made.

Author of Ore Dock Article

Through an unfortunate oversight the name of George C. Newton, of Milwaukee, was not given as author of the article on the new ore dock at Duluth, published in *Engineering News-Record*, Aug. 9, p. 257.

Making the Valuation Records Permanent

Forms Used by Chicago, Rock Island & Pacific Railway Keep Information Up to Date Regarding Track, Buildings and Other Structures

By James G. Wishart
Office Engineer, Chicago, Rock Island & Pacific Ry., Chicago

THE FEDERAL valuation now in progress on many of the railroads of the United States bids fair to be the means by which the lines of this country will obtain a complete and up-to-date record of all facilities, including rail and ballast in track, sidetracks, buildings, bridges, fences and other miscellaneous structures owned by them or used under contract or lease. This information is being obtained at a large expense to both the railroads and the Federal Government, and the railroad companies should take advantage of the opportunity and see that the data so obtained are compiled in such shape that they will in the future be authentic, readily accessible to everyone and easily revised and kept up to date.

A system of periodical reports should be required from the operating or maintenance department from which additions, removals or changes can be recorded. Simple forms for reports which can be readily understood by the man on the ground, who will in many instances be a roadmaster or section foreman of limited education, should be adopted. These forms should be printed on letter-size paper, and made in pads. The headings on the blanks should call for all the information desired for incorporation in the records, and a rule should be made and strictly enforced that each report must be completely, accurately and legibly made out before being transmitted to the office of record. The forms should bear complete instructions, on the face where they can be plainly seen, as to the manner in which they are to be filled out and the office to which they are to be sent, care being used in the wording to see that nothing but simple words and plain language is used.

Each report should be carefully checked over in the division office, as this will save subsequent correspondence with the office of record in explanation of discrepancies in the report or indefinitely described items of work with which the recorder in that office is not familiar. It is a good rule to follow in the making up of these reports that the showing of plenty of details will give better satisfaction and more complete records than the showing of only the cardinal features of a piece of work.

After the information from the various reports has been entered in the records the reports should be attached to the copy of the "authority" file covering the work in the chief engineer's office.

Five Most Important Records

The five most important records are those of rail and ballast in main tracks, buildings, sidetracks, bridges (including turntables) and right-of-way fence. These records, as used on the Rock Island, are of letter size, except those for rail and ballast. The originals are made on tracing cloth, thus making it possible to blueprint as many copies as desired and supply each interested officer with a set. These records should be compiled and kept up to date by the engineering department, this department usually being better equipped for this class of work than any of the other departments. Blank forms for the records may be printed on tracing cloth from an electrotype in offices equipped with a printing press, thus saving the draftsman's time and labor of ruling and lettering the headings by hand.

The record and report forms have been used on the Rock Island for several years and have proved satisfactory. They are made out by various officers reporting to the division superintendent. They are checked by the division engineer in the superintendent's office and forwarded to the chief engineer. A report on each form must be made each month whether work is done or not, and where no work has been performed during the month a "blank" report is submitted. These reports are due in the chief engineer's office on or before the fifteenth of the month following that in which the work is completed. The submission of reports for every month is required for the purpose of keeping a check on the making of reports, as the failure to receive any report by the specified date results in the delinquent division being traced for the missing report.

As a further check on the divisions an "Authority for Expenditure" record is maintained by the chief engineer on a form for the purpose. All approved A. F. E.'s pass through the recorder's hands and are entered on this form, and as completion reports are received notation of same is made opposite the A. F. E. entry. A glance over this record enables one to see in a moment A. F. E. work not reported completed which has been shown on the weekly A. F. E. progress report as 100% finished, and the necessary steps can be taken to secure the necessary reports. The weekly A. F. E. progress report is required of each superintendent to show the status of all authorized improvement work on their respective divisions. When all items on a sheet of the A. F. E. record are reported finished, the sheet is destroyed, as this is not a permanent record, being used merely for check purposes.

Sidetracks

The sidetrack-record form is shown in Fig. 1. The headings in this form cover practically every kind of information desired in reference to ownership, cost, date of construction, location and length. In the column headed "Item No." the official track number should be shown. These numbers are assigned by the chief engineer and shown on the station plats, copies of which are sent to the district and division engineers, and are referred to on reports covering changes in existing tracks.

The tracks at several towns may be shown on one page, space being left between towns for the insertion of additional items as changes or additions are reported. The towns may be arranged either alphabetically or in

SIDE TRACK RECORD.

Item No.	Date Laid Removed Etc.	A. F. E. No.	What is Track Used For and Whom Does it Serve	Location From Station No.	Location To Station No.	Length in Trk. Ft. from Headblks. Outside Corporate Limits	Length in Trk. Ft. from Headblks. Inside Corporate Limits	Length in Trk. Ft. from Headblks. Total Length	Weight of Rail Per Yard Wgt	Weight of Rail Per Yard Track Ft	Kind of Switch Splt or Stub	Kind and Number of Frog	E. W. N. or S of Main Tk	Kind of Ballast	Kind of Joints	No. of Tie Plates	No. of Tres Ties	Remarks State if Owned Wholly or Partially. Give Contract No. Other References, etc.

FIG. 1

Form M. W. 30

ROCK ISLAND LINES

REPORT OF SIDE TRACKS LAID, EXTENDED, TAKEN UP OR LOCATION CHANGED.

LOCATION _____ DIVISION _____ COUNTY: _____ STATE: _____

ITEM NO.	DATE AND REMARKS ETC.	A.F.E. NUMBER	WHAT IS TRACK USED FOR AND WHOM DOES IT SERVE	LOCATION FROM AT OR NEAR	LOCATION TO AT OR NEAR	LENGTH IN TRACK FEET FROM HEADBLOCKS: NEW TRACK LAID FEET IN SIDE OF CORPORATE LIMITS	NEW TRACK LAID FEET OUTSIDE OF CORPORATE LIMITS	OLD TRACK EXTENDED FEET IN SIDE OF CORPORATE LIMITS	OLD TRACK EXTENDED FEET OUTSIDE OF CORPORATE LIMITS	TRACK REMOVED FEET IN SIDE OF CORPORATE LIMITS	TRACK REMOVED FEET OUTSIDE OF CORPORATE LIMITS	TOTAL LENGTH.	WEIGHT OF RAIL PER YARD WEIGHT	WEIGHT OF RAIL PER YARD TRACK FEET
1														
2														
3														
4														
5														

FIG. 2

ITEM NO.	KIND OF SWITCH, SPLT OR STUB	KIND AND NUMBER OF FROG.	KIND OF BALLAST	REMARKS: STATE IF OWNED WHOLLY OR PARTIALLY. IF OWNED PARTIALLY, GIVE NAMES OF JOINT OWNERS AND SAY HOW MUCH EACH COMPANY OWNS.
1				
2				
3				
4				
5				

BUILDING RECORD

Date Built	Description of Building	Foundation	Plan No.	No. of Stories	Dimensions	Material	Kind of Roof	Cost	Present Value	Condition	REMARKS Line References, A. F. E. No. Contractor, etc.

FIG. 3

ROCK ISLAND LINES

Form M W 34

DETAILED REPORT OF

Buildings, Coal Chutes, Platforms, Scales, Sidewalks, Stock Yards, Tanks, Turntables, Wells, Suction and Discharge Pipe Lines, Constructed, Renewed, Extended or Removed

_____ DIVISION MONTH OF _____ 191__

STATION OR MILE POST LOCATION	FOR WHAT PURPOSE IS STRUCTURE USED	DIMENSIONS	NO. OF STORIES	KIND OF MATERIAL IN FOUNDATION	KIND OF MATERIAL IN STRUCTURE	KIND OF MATERIAL IN ROOF	COST OF STRUCTURE COMPLETE	DATE COMPLETED	A. F. E. NUMBER	WHAT WAS CHARACTER OF WORK DONE

FIG. 4

ROCK ISLAND LINES BRIDGE AND CULVERT RECORD

FIG. 5

Bridge No.	M. P.	Kind of Structure and Material	Drainage Area	Angle of Skew	Date Built or Renewed	Number and Description of Spans and Culverts	Length: Timber Trestles	Length: Steam and Iron	Length: Combination & Embankment	Length: Total	Height Above Ground to G. E.	Total Overhead	Timber Trestles: Size and No. Per Bent	Ties: Size	Ties: No. to Rail Lap	Ties: Date	A. F. E.	Cost Close Out Report: Operating	Cost Close Out Report: A & B	Cost Close Out Report: Total	

Form M. W. 35

ROCK ISLAND LINES

DETAILED REPORT OF BRIDGE OR CULVERT CONSTRUCTED RENEWED, EXTENDED OR REMOVED

Division _____ Line. Month of _____ 190__

Bridge No. _____ M. P. _____ over _____ Alignment _____ Superelevation _____ A. F. E. No. _____

Old Structure _____ Length _____ New Structure _____ Length _____

Linear Feet of Old Bridge Filled—East End _____ West End _____ Date Filled _____

Culvert—Kind _____ Size _____ Length _____ Date of Completion _____

Truss or Girder—Kind _____ Length _____ Date of Placing _____

Ties Kind _____ Size _____ Guard Rail—Kind _____ Size _____

Cost Superstructure _____ Substructure _____ Culvert _____ Filling _____ Raising Grade _____

Total Cost _____

SUBSTRUCTURE

Bent No. or Abutment	Kind of Material: Footing	Kind of Material: Piers	Piles: No. and Kind	Piles: Length	Built By	Date Finished	Character of Foundation

For Timber Trestles show on the sketch the size and kind of stringers, number per span, and whether single or double length. Show distance center to center of bents, number, kind and length of piles, also bearing of piles under the cap. Show whether framed bents are on piles, masonry or mud sills.

FIG. 6

FIGS. 1 TO 6. THESE ARE THE PRINCIPAL RECORD FORMS FOR SIDE TRACKS, BUILDINGS AND BRIDGES

station order, the latter being preferable for many reasons. Nothing but track actually owned should be entered under the headings to the left of the "Remarks" column. Notation of other tracks used but not owned should be made in the "Remarks" column, as should also such notations as contract references, ordinance rights, joint ownership or other pertinent information not included in the other columns.

The monthly report from which this report is kept up to date is shown in Fig. 2. The lower half of this form has space for a descriptive sketch, the same being true of the forms Figs. 4 and 6. This is a printed form which is filled in by the division engineer on the completion of construction, one blank being used for each job. Where necessary to show clearly the location and alignment of a track a blueprint is attached to this report giving all data necessary to enable the recorder to plat the track accurately on the maps.

Buildings and Structures

The form of buildings-and-structures record is shown in Fig. 3. This is also made up on tracing cloth and includes, in addition to all buildings owned or leased, such items as platforms, sidewalks, pipe lines, stockyards and all other miscellaneous structures owned or leased, except those included in the other records. Each structure is numbered and the number shown opposite the entry in the record; and at points where there are a large number of structures it has been found desirable to paint the numbers conspicuously on the structures. These numbers should also be shown on the official station plat and be referred to in the same manner as track numbers.

This record contains, in addition to the column for "Cost," columns for "Present Value" and "Condition," the entries in which are revised annually by the division engineer. Fig. 4 illustrates the monthly report covering the changes, renewals, removals and new buildings erected. This report is handled by the division engineer in the same manner as the sidetrack report. The sketch called for showing location of structure should be in sufficient detail to allow the platting of same accurately on the maps.

Fence records are kept by similar forms, which give a full description as to kind, length, location, age and cost. In this record notation should be made of all instances where the fence is not located on the right-of-way line. This will enable the real-estate department to investigate the reason and where necessary take precautions to protect the company's title to its property not fenced.

Bridge Records

Detailed information required by the bridge engineer's office is kept on form, Fig. 5. On the back of this form, which is printed on heavy or ledger paper, space is provided for a sketch of each structure, and such information as high- and low-water marks, kind of bents, number, kind and length of piles, length of spans, kind of masonry and date built is shown. These sketches are carefully drawn to scale, and an attempt is made to have this record give a complete history of the construction and reconstruction of each bridge from the time of its original installation. Particular stress is laid on the recording of high-water marks at flood periods.

The monthly report by which these bridge records are kept up is shown in Fig. 6. The headings when completely filled in and supplemented by a pencil sketch give a complete record of work done. A separate form is kept for turntables.

Rail and Ballast

One of the most important sets of records is that of the rail and ballast in main tracks. These records are the most elaborate of all, and in complete form consist of five forms of charts and tables maintained by two kinds of reports. The charts and tables serve many purposes and will always be found useful in the engineering department of any large railroad. They give data on the life of rail, disposition of new rail for relaying programs, depth of ballast in track for determining addition-and-betterment charges on reballasting work, and mileage of rail of various weights or of ballast of various kinds in track at any specified date and for reports for the Interstate Commerce Commission or the president's annual report, and for recording the progress of rail relaying or reballasting. These are a few of the many uses to which this set of records is constantly being put.

The five forms of charts and tables are: A chart for recording the monthly reports of completed work; one for permanently recording each year's rail renewals; one for permanently recording each year's ballast renewals; a book record of mileage of various kinds and weights of rail, and a book record of mileage of various kinds of ballast in track.

Monthly Chart of Completed Work

The chart for permanently recording the monthly reports of completed work, of both rail relaying and ballasting, is shown in Fig. 7. This chart is made up on tracing cloth with the lines of two or three divisions, having a total of approximately 800 miles, on a roll. The charts are drawn to a horizontal scale of 5 miles to the inch, and the different lines are arranged in such a way that they can, when blueprinted, be trimmed in sheets and bound in book form, each sheet bearing a complete title, legend and subheadings.

The heavy black line along the top of this chart is for the purpose of bringing out the location of stations. Immediately above this line are shown the station names, 10-mile points and state lines. The 10-mile points are platted with light vertical lines running from top to bottom of the chart. Immediately below the heavy lines are six horizontal spaces extending the entire length of each line or branch. These spaces are for recording the statistics of the rail in track at the end of the previous year as indicated by the headings opposite each space. Two more spaces are provided below these for recording the authorized and completed work. These data are entered on the charts as shown on the diagram. Spaces are also provided as shown for the kind of ballast in track, authorized reballasting completed, kinds of joints in track and those installed during the year.

This chart must be renewed each year, as it is intended primarily as a yearly progress record. To save the time and expense required to retrace these charts

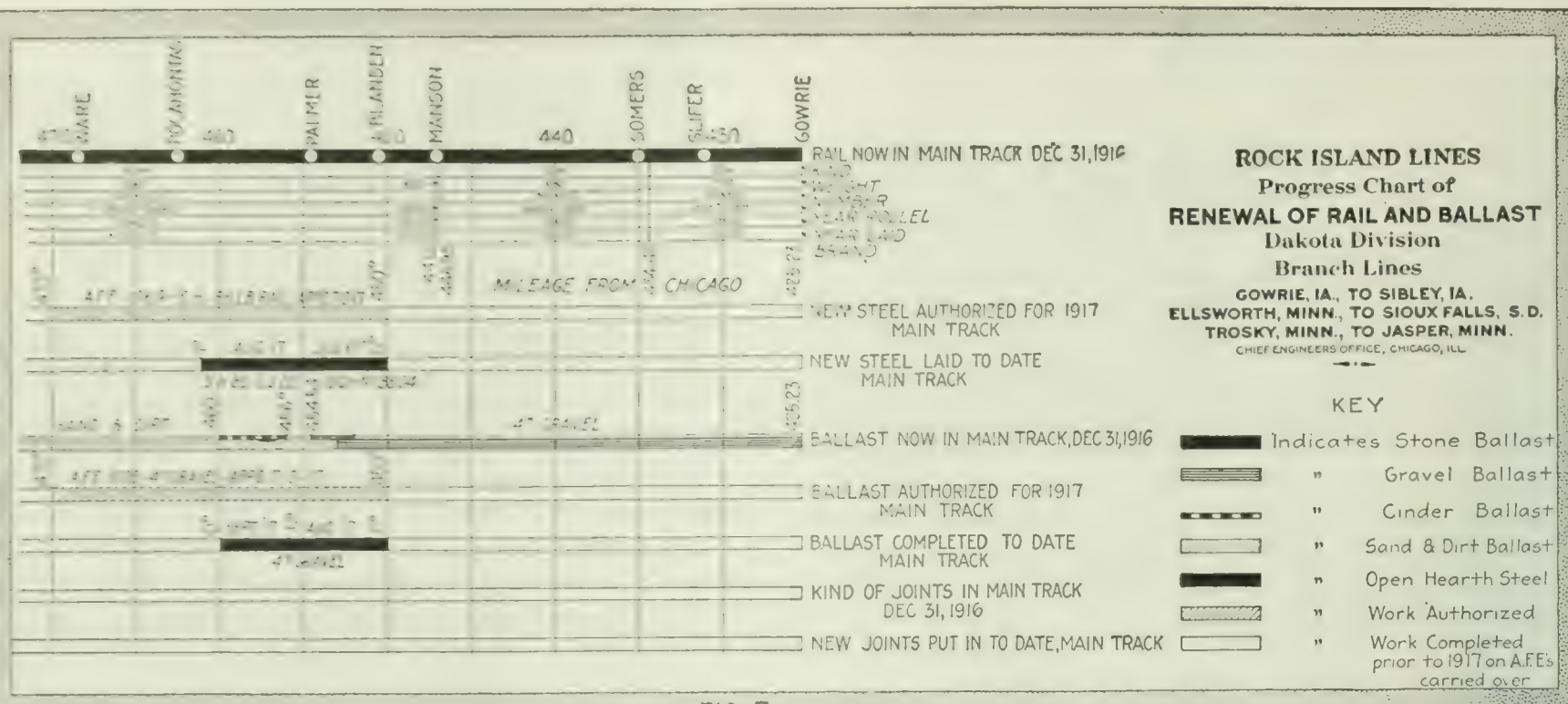


FIG. 7

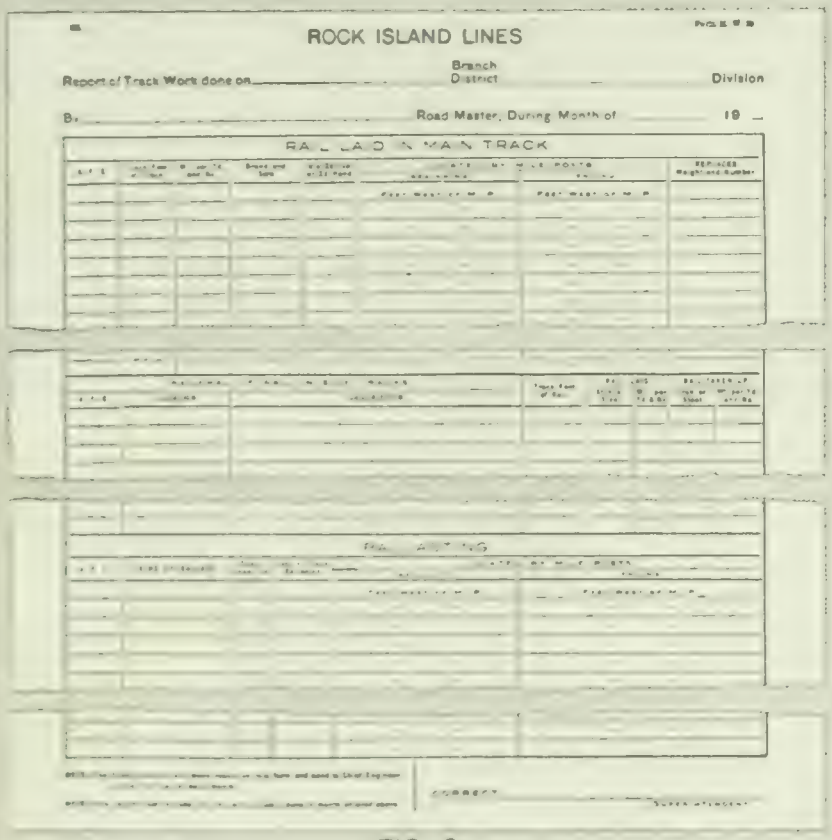


FIG 8

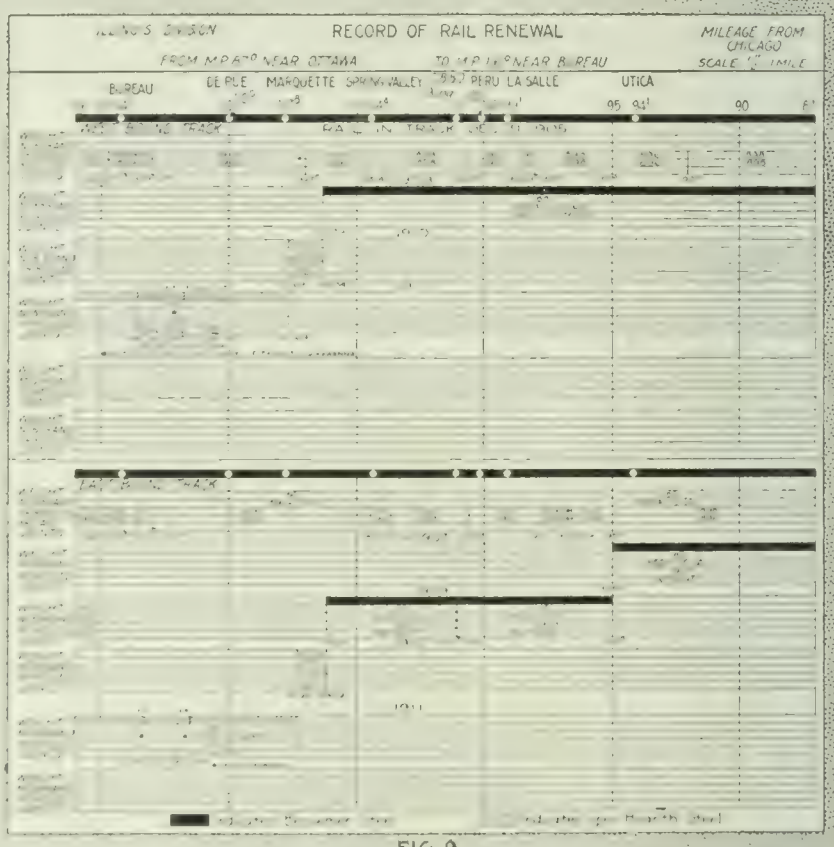


FIG. 9

PROGRESS RECORD OF RAIL RENEWAL - 1915

IOWA DIVISION

FIRST DISTRICT — MAIN LINE

STATIONS FROM	TO	STATE	RAIL WT.	SECT.	BRAND	YEAR ROLLED	YEAR LAID	MILES INTR'K 12-31-14	JAN TO MAR MILES LAID	REM	INTR'K	APR TO JUNE MILES LAID	REM	INTR'K	JULY TO SEPT. MILES LAID	REM	INTR'K	OCT TO DEC. MILES LAID	REM	INTR'K
E. DES MOINES																				
N.W. WYE	TO SHORT LINE	IOWA	85	A.S.C.		1912	1912	0.02												
S.W. "	"	"	"	"	"	"	"	0.02												

FIG. 10

FIGS. 7 TO 10. THESE FORMS, WITH TWO SIMILAR ONES FOR BALLAST, COVER RAIL AND BALLAST FULLY

where the mileage of the road is large, vandyke prints on thin cloth are made at the close of the year's work and filed for record, the tracings being then revised to show conditions at the beginning of the following year. In this way the tracings can be used for many years before wearing out, and can finally be filed as the record for the last year in which they are used.

The report form by which these records are kept up to date is shown in Fig. 8. This is a monthly report made up and handled in the same manner as the previous reports described. On divisions where a large amount of rail-laying or ballasting is in progress a weekly report has also been required, on a form for the purpose. However, unless close tab is to be kept on the

progress of work, this report is unnecessary. The monthly report is taken as final; where the weekly report is used it serves as a check on the accuracy of the other.

The chart for permanently recording each year's rail renewals is shown in Fig. 9, and a similar one records ballast renewals. These records show in condensed form the work done from year to year and the improvements made in rail and ballast conditions. The total depth of ballast at any point can be readily determined from the ballast record, this being necessary information required in making up estimates for this class of work in order to determine A. & B. charges.

Fig. 10 shows the form of book record in which are recorded the miles of different weights and kinds of rail, and a similar one shows the mileage of different kinds of ballast in track. These mileages are revised at the end of each quarter-year, and a summary is compiled by divisions separating main and branch lines.

The records described, as previously stated, are all blueprinted and bound in book form by divisions, and every officer interested in any way is furnished with a complete set of the records covering his district or division. The division engineer is instructed to keep a copy corrected up to date, so that it will at all times reflect the true situation on his division. At the close of the calendar year, which is now the close of the fiscal year also, the division engineer is required to send his corrected copy to the chief engineer. The chief engineer's office also keeps a copy corrected monthly from the reports as they are received. At the close of the year the tracings are revised to agree with the corrected copies and monthly reports received from the division engineer, and new sets of blueprints issued to all concerned.

Run-Off Equaled Rainfall

A RAINFALL of almost 0.20 in. an hour for eight hours, under conditions that probably caused a run-off of the same rate, occurred at Chicago on Jan. 20 and 21, 1917. Many of the sewers tributary to the 39th St. sewage-pumping station of the Sanitary District of Chicago, designed for a run-off only a third of the rate stated, were overcharged. This resulted in flooding the basement of the 68th St. water-works pumping station, the pollution of the suction wells and a subsequent outbreak of typhoid fever. Months afterward a joint investigating committee representing the Health Committee of the City Council and the Engineering Committee of the Sanitary District of Chicago was appointed. From the report of the committee, submitted during the present year, the following notes on the heavy rainfall and run-off, the heavy loss of capacity in some centrifugal sewage pumps, running in one case to 55%, and the water-supply pollution and typhoid outbreak have been taken. Langdon Pearse and Isham Randolph were engineering members of the investigating committee.

The rainfall under consideration began about 8 p.m., Jan. 20. It was preceded on that day by warm weather which thawed snow on the ground, but for seven days prior to Jan. 19, the maximum temperature was below freezing and on four of the seven days the minimum was below zero, "so the ground was frozen and impervious at the time of the rainstorm."

From about 8 p.m. to 11 p.m., Jan. 20, the rainfall was 0.24, the next hour it was 0.18, and from 12 to 7 a.m. it averaged 0.20 in. per hour. In the next hour only 0.05 fell. Between 11 and 11.35 a.m. 0.04 in. came. Then the storm was over, with a total of 1.91 in. These figures were recorded at the Federal Building, which is the only one of the five stations which shows the rate per hour. At four other stations the rainfall was 1.97, 2.04, 2.29 and 2.54 in., the latter station being in the center of the sewerage district. The 1.91 in. recorded at the Federal Building exceeds all January records at Chicago for 45 years. There have been heavier rainfalls at Chicago in other months, but "very few that have caused a run-off from the territory under consideration that has exceeded the run-off from this storm."

Tests of four centrifugal pumps of the 39th St. sewage-pumping station showed loss of capacity, compared with official contract tests, of 6.2% to 55%. The figures are as follows:

Pump No.	Head or Lift, Ft.	Rated Capacity, Sec.-Ft.	Loss of Capacity, Official Test, Per Cent
1	24	75	55.0
2	24	75	36.0
3	7	250	14.4
4	7	250	6.2

The heavy loss of capacity, especially in pumps Nos. 1 and 2, is attributed to the condition of the impellers. The report states that "the impeller clearances have never been taken up nor have the pumps been examined internally since installation." In addition to the impeller defects, the main shafts of Nos. 1 and 2 "revolve with an eccentricity of approximately ⅜ in.," due to wear in the main bearings and displacement of the crank disks.

Flooding the basement of the 68th St. water-works pumping station with sewage at the time of the storm was followed by 223 cases of typhoid fever in the water-supply district, of which cases 105 had nothing in common except the water-supply. The cases continued to be reported, notwithstanding the prompt disinfection of the suction wells. Tests made at the time indicated that one of the suction wells was infected by polluted groundwater that entered through old brickwork.

More Water Meters Would Pay

With 90% of its 10,871 services metered, Duluth, Minn., had a daily water consumption of 82 gal. per inhabitant and 91 gal. per consumer in 1916. The metered consumption was 57% of the total. Allowing 20% for leakage, the 10% of flat-rate consumers used about 25% of all the water supplied, or 2½ times as much as the average for all customers. This is all the more notable when it is considered that only small consumers were on the flat rate. If the 10% of flat-rate consumers who are using 25% of the water pumped should have their consumption reduced to the same average rate as 90% who are using 55% of the water, says D. A. Reed, manager of the Duluth Water Works, in his 1916 report, the saving would be 25% — 5% = 19%, or 555,250,000 gal. a year. The cost of power alone thus saved would be $3000 a year, which in four years would be sufficient to finish metering the whole city.

Resurface Old Macadam Roads with Rock Asphalt

Method Employed in Kentucky Costs from $6000 to $7000 Per Mile for a Roadbed 14-Feet Wide

ROCK ASPHALT for resurfacing worn-out macadam roads is used largely in Kentucky in those counties which have not money enough for more expensive types of construction. In fact, so little work has been done on some of the routes that large portions of county bond issues, ranging from $100,000 to $1,000,000, are being spent for grading, particularly in the mountainous sections.

To save the old waterbound roads has been one of the chief tasks of Rodman Wiley, state road commissioner. He has met with such success in the use of



CENTURY-OLD TELFORD FOUNDATION ON DIXIE HIGHWAY ROUTE

rock asphalt surfacing that he is of the opinion that this material offers an almost ideal solution to the problem in Kentucky. The rock asphalt is mined in the southern part of the state near Bowling Green, and can be purchased on cars at Bowling Green for $4 a ton. It is easily handled, does not harden unless compressed, and requires none of the equipment necessary to build bituminous pavements of other types. In fact, the only machine used is a pulverizer in the form of two spiked



ONLY EQUIPMENT REQUIRED IS PULVERIZER



LIMESTONE MACADAM SURFACED WITH ROCK ASPHALT

rolls driven by a small gasoline engine, which is used to break up lumps and cakes after the material has been unloaded on the road. In appearance the rock asphalt looks like a very lean sheet-asphalt mixture, but it is not sufficiently sticky to leave marks on the hand when grasped. It contains from 8 to 12% bitumen.

An old macadam road to be repaired is first scarified, new material is added and thoroughly rolled. The process is exactly the same as for the construction of a waterbound road, except that the screenings and binder are not added, the surface being left rough and coarse. On the surface thus prepared is spread about 3 in. of the rock asphalt exactly as it is received. This layer is thoroughly rolled; in fact, it requires more rolling, if anything, than sheet asphalt paving. A 3-in. layer of loose material compresses to about 2 in. The best results are obtained on the hottest summer days.

The road is ready for traffic almost immediately after the rolling is completed. The surface resembles sheet asphalt and, according to the Kentucky road officials, shows excellent wearing qualities. In the vicinity of Lexington some rock asphalt has been down for nearly two years and has required little or no maintenance. When repairs are required, however, the process is as simple as the original construction, for it is only necessary to square up the edges of the hole and tamp in the necessary amount of bituminous material, which, apparently, will keep "green" an indefinite time when not compressed.

Compared with mixed asphaltic concrete surfacing, the rock asphalt surfacing costs about half. It can be laid by a county gang of ten or a dozen men at a cost of from $6000 to $7000 a mile for a 14-ft. road, including the cost of reshaping and preparing the macadam.

Storage Closets Under Stairs Dangerous

Renewed warning against the practice of building storage closets under stairs or near fire-escape exits is voiced in a bulletin just issued by the Pennsylvania Department of Labor and Industry. The warning is directed chiefly to the case of school and factory buildings of non-fireproof construction. Brooms, papers and rubbish are likely to be stored in such closets, and in the location described the resulting fire danger is a serious menace to the occupants. Experience of the department in examining plans for buildings shows the renewed warning to be needed.

Professional Questions

Engineers are urged to send to the Editor comment on cases presented in this section or statements of their own experiences in matters of professional ethics.

Communications must be signed, but names will be withheld from publication, if the writer so desires.

One Method of Securing Tentative Bids for Estimates

IN PREPARING designs and estimates for submission of a bid for engineering services, in which the advance estimate was to be included, a firm sent notice to contractors calling for bids in such form that the contractors would be inclined to think that the firm had already been retained as engineers for the work. Claim has been made that this is misleading and amounts to sharp practice or possibly unprofessional practice. No specific showing is made that anyone has been damaged other than with respect to publicity value.

Should Advertising by Engineers Be Controlled?

WHILE the old standards of proper professional practice were opposed to advertising by engineers, such advertising is done nowadays to a considerable extent. Well-known consulting firms follow the practice. The old rule seems to be obsolete. Some advertising of "engineers" has recently been brought to the attention of *Engineering News-Record* of which the following is a sample, taken from a daily newspaper in a small city:

> A——B——, Consulting Engineer
>
> Expert advice given on machinery repairs and new work, foundations, buildings and machinery of all kinds. Will superintend any work at a moderate price. All kinds of trouble corrected. Address

The advertisement will not mislead an engineer, but it can mislead many laymen. The result of employing the advertiser is likely to hurt the reputation of the profession. However, there is no agency by which such advertising is restricted. Do conditions through the country indicate a need for such control?

Does Engineering Etiquette Restrict Advice?

A QUESTION involving professional courtesy or etiquette recently arose between two Eastern engineers. One of them is regularly employed by a large corporation owning several important structures. Foundation extension seemed to be required for a structure among them, and the corporation instructed its engineer to prepare plans for the work. Subsequently the president of the corporation desired to have an outside opinion on these plans, and he took the matter to a consulting engineer. The latter's associate, it happened, was a personal friend of the corporation's engineer, and because of this circumstance no question was raised by the consulting engineer.

The subject was studied and a report rendered, condemning the plans first prepared and suggesting a conference with the corporation's engineer for determination of best procedure. Soon after this report was sent to the corporation, the latter's engineer wrote a strong protest to the consulting engineer. He claimed that the report condemning the first plans was rendered in violation of professional etiquette, as the agreement of the original engineer to the second investigation had not been asked. On this ground he requested that the consulting engineer withdraw his report.

The propriety of this protest was conceded by the consulting engineer and the report was withdrawn. The corporation is left with the first set of plans, subject to its own engineer's revising his original views.

Public Officials Ask Engineers To Guarantee Cost

MODERN methods of carrying on engineering business brought about a singular complication in the case of a large highway bridge about to be built in one of the central states. Sharply divergent views concerning the proper attitude of an engineer in such a complication have been expressed. The case therefore, is sure to repay study. The propriety of an engineer's guaranteeing the cost of a structure which he designs, or rather making his fee depend on getting bids within the guaranteed cost, is involved as the main issue.

This particular case is complicated by numerous difficulties which have nothing to do with the contingent-fee question. The following abstract is limited to those elements that bear on this question.

County officials found that a bridge was required at a new location. Before going before the people for a bond-issue note they employed an engineering firm to make preliminary studies as a basis for fixing the bond-issue amount.

Thereafter the amount of the issue was fixed (about $1,000,000), and when put to vote of the people the bond-issue was approved. It was now necessary to secure an engineer to design the bridge and supervise its construction.

The data collected in the preliminary study were placed at the disposal of half a dozen engineers prepared to undertake the work. In asking for their proposals, the county commissioners called attention to the necessity of constructing the bridge within the bond issue. The engineers submitted their propositions, and two of them accompanied it with an estimate of cost; of these, one offered to guarantee his cost figured by forfeiting his fee if the bids proved to be too high. The other engineers were then requested to make similar guarantee, but several of them declined to do this.

The county commissioners first dropped from consideration all but the two engineers who had presented estimates of cost, and then decided in favor of the engineer who was willing to guarantee the estimate

The contract made with this engineer provides for paying him a percentage fee if the lowest acceptable bid plus the fee does not exceed a specified amount (which is well below the bond issue), and absolves the county from any obligation toward him if the bids fail to come within this limit. If on the first call for bids no bids within the limit are received, a second call for bids may be issued; the time of issuing the calls for bids is not restricted.

The case has many interesting sides. Questions that arise at once are: Is this a contingent-fee case? Is it good practice for consulting engineers to design work under guarantee of cost, it being assumed that the extent of the work is so fixed that topping off a part to reduce cost is not practicable? Are objections to such practice merely traditional or is the practice such as to threaten unsound results? Do the exigencies of public bond-issue affect the case? Is such design comparable with architectural design in respect to consideration of sound professional practice?

Architects commonly oppose conditional contracts as unprofessional, though it is said that this rule as well as the rule governing fee percentages is frequently broken. Lawyers recognize contingent-fee contracts as permissible. The engineering profession appears to have no rule on the subject.

Tolls for Road Maintenance Collected in Virginia

(*Editorial Correspondence*)

JUDGING from a motor trip across the State of Virginia practically all the improved roads are toll roads, but with some few exceptions these roads are owned by the public and toll is collected for maintenance and not for profit. A good example of this Virginia practice is in Augusta County, of which Staunton is the county seat. This county owns and operates a 125-mile system of toll roads, nearly all of it improved with some form of bituminous macadam. The monthly income from tolls amounts to $3500 and all but the 15% required for collection goes back into the roads. The law requires that it must be used for maintenance. Not over $200 of it can be expended for equipment. The attempt has been made, as far as possible with available data, to adjust the amount of toll to the damage done the road surface by various kinds of traffic.

The following toll schedule is of interest as showing the sources from which the maintenance fund is derived and in what proportion: For 20 hogs or sheep, the rate of toll per mile is 1c.; 20 cattle, 2c.; a horse, mule, mare or gelding, ½c.; 1-horse vehicle, ½c.; 2- or 3-horse vehicle, 1c.; and 5-horse vehicle, 1½c.; 6-horse vehicle, 2c.; ponies and cart and ponies horseback, ½c.; 2-passenger automobile, 1½c.; 4- and 5-passenger automobile, 2c.; 7-passenger automobile, 2½c.; traction engine, water tank attached, 6c.; each machine or wagon attached to engine, 2c.; motorcycle, 1c.; trucks of capacity up to 1000 lb., 3c.; trucks of capacity from 1000 lb. to 2 tons, 4c.; trucks exceeding 2 tons capacity, 5c.

For the collection of tolls gate-houses are provided about every 5 miles. The gate-tenders are given free house rent and fuel, and are paid $15 to $25 per month. As the housewife or older children can take in the tolls, the head of the family pieces out his income in any available manner.

Of course it is practically impossible to keep any close check on the cash taken in by the gate tenders, so that both for convenience of the traveling public and to insure the money reaching the county treasury mileage books have been devised. These are similar to railway mileage books, each coupon representing one cent. Books of 500 coupons are sold at a 30% discount. Where the distance traveled does not amount to a one-cent toll, one cent is charged except that in the case of vehicles taking children to school the gatekeeper may keep an account of the actual mileage and the patron may settle each week.

Rules and regulations are provided governing the use of the road, and farmers living along the line are appointed special policemen to see that these rules and regulations are enforced. Any violation of the rules is deemed a misdemeanor and is punishable by a fine of not less than $5 nor more than $100.

In most instances the roads are originally improved under road-district bond issues, and the people of the county are not free from road taxes because of the toll system. The interest on these bonds must be paid by taxation and there is a general tax for the maintenance of earth roads not in the toll system. But the burden of upkeep on the most traveled roads is put squarely on the users of the roads. Obviously, however, there would be difficulties in collecting toll on roads carrying congested traffic, as some of those leading out of large cities.

The Virginia toll roads are not unpopular with the farmers who live along the way, but they are very unpopular with the city motor-vehicle owners and with tourists.

Concrete Base Is Laid on Old Paving

Laying concrete base of new pavement on top of old asphalt pavement is a peculiar construction followed in some cases in Chicago where settlement has occurred due to deep foundations for buildings. On Jackson Boulevard west of Wabash Ave. there has been settlement recently resulting from the construction of the new Kimball Building and Lyon & Healy Building. Where the settlement has been enough to permit construction of a new concrete base, at least 4 in. thick, the old asphalt paving is not removed. Wherever the settlement is not enough to permit this, the old asphalt is cut out and the required grade obtained with either concrete or binder, according to the thickness required. In some places the settlement has been found to be as much as 12 inches.

In many cases where buildings of this character, with concrete pier foundations and deep basements, are constructed, a settlement of the adjoining street surfaces results. The worst case was that of the Karpen Building on Michigan Ave., where the settlement extended clear across Michigan Ave., a distance of over 80 ft. This repaving work is under the direction of the South Park Commission, of which Linn White is chief engineer.

Motor Trucks Haul Heavy, Bulky Loads Up Mountainside

Steel Support and Million-Dollar Mirror for Great Mt. Wilson Telescope Safely Delivered in Nine Trips

By Frank Reed
Los Angeles, California

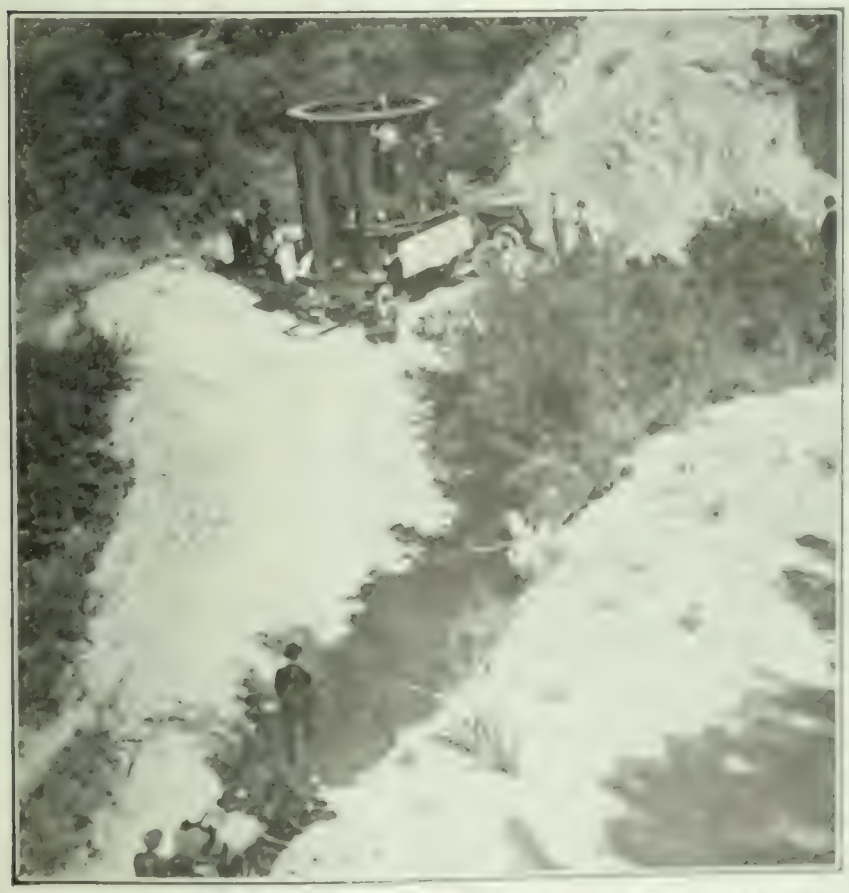
SAFE delivery by motor truck of the great mirror for the telescope of the Carnegie Solar Observatory at the summit of Mt. Wilson, near Pasadena, Calif. (described in *Engineering Record*, June 17, 1916, p. 802), terminated a series of nine notable motor truck haulage trips. The last trip was noteworthy for the extreme value of the load rather than any difficulty in transporting it. Nominally valued at $1,000,000, the mirror is at present considered to be an almost priceless piece of property. The safe delivery by motor truck justified the confidence of the observatory officials in this method of transportation up the difficult mountain road from Pasadena to the summit, which had been successfully employed in hauling the huge structural steel units of the telescope and its support.

The mirror for the telescope is 100 in. in diameter, 13 in. thick and weighs 4½ tons. To facilitate haulage, provision was made for a mounting which would accomplish two essential objects: First, reduce risk to the mirror by providing a type of attachment which would make truck body and load practically a rigid unit; second, cushion the mirror against road shocks. This result was accomplished by supporting the mirror in a heavy timber cradle from which it was separated by coil springs and rubber bumpers. The mirror was transported to the summit upon a 5½-ton Mack bulldog type truck driven by J. A. Stoner, western manager of the International Motor Co. and Los Angeles distributor of Mack and Saurer trucks. This trip, necessitating an ascent to 6000 ft. altitude in 9 miles, was made in only 5 hours, 10 min.



MOTOR TRUCK WITH COSTLY TELESCOPE MIRROR NEGOTIATING HAIRPIN TURNS ON STEEP GRADES

The complete series of trips made in delivering the telescope material constitutes a noteworthy record of successful reliance on high factors of safety provided in the motor trucks used. Eight trips prior to the delivery of the mirror were made with loads of structural steel units for the telescope and base. Two of these were made with Mack trucks and seven with Saurer trucks. The largest single loads delivered were two 13-ton steel girders taken up with a 6½-ton Saurer truck, and the worst load from the standpoint of difficulties encountered and overcome was the huge 10-ton base carried up on a 3½-ton Mack truck. The latter piece was so wide and so high that it scraped down chunks of rock from the inner side of the mountain roadway, forcing the wheels of the truck to slide laterally toward the chasm at the outer edge of the road. In fact, at one point near the upper end of its journey the wheels were so close to the edge that the crushing strain caved the road and the outer rear wheel went down until the axle touched the ground. For two hours the truck was in a highly distorted position while supports were being placed and the rear axle was jacked up to a level position again. Then the engine was started and the truck went forward under its own power as if no accident had occurred.



THE 3½-TON TRUCK SAFELY DELIVERED THE [illegible] TELESCOPE BASE—AT PLACES LIKE THIS MULE TEAMS WOULD HAVE BEEN USED. OWING TO FREQUENT [illegible]

Without motor trucks the delivery of the materials to the observatory would have been an engineering problem of extreme difficulty. The steepness of the grade, combined with sharpness of the turns, made it impossible to use mules, as a sufficient number of mules to move the load would have wound themselves up on the turns. The only alternative, apparently would have been to build runways and use the laborious process

of winching, which would have required blocking the trail to all other traffic and months of time and extraordinary cost for moving up each piece.

Delivery of materials by motor truck was started with an irregular shaped structural steel unit of 22,235 lb. Other loads, varying in size from 8 to 13 tons followed, the mirror taken up on the ninth trip being the only load which did not constitute an overload for the rated capacity of the trucks.

Pennsylvania Will Build Only Heavy Traffic Highways

State Highway Department Will Concentrate Efforts on 3300 Miles of Intercounty Routes with City Pavement Surfacing

CHIEF ENGINEER W. D. Uhler, of the Pennsylvania State Highway Department, has a $6,000,000 construction fund to spend between June 1, 1917, and June 1, 1919. As practically all the state highway work is done on an equal payment basis with the local authorities, the actual money available for new construction will amount to $12,000,000 or more.

With the creation of a state highway system in 1912 and by subsequent acts of the legislature, the burden of building and maintaining 10,000 miles of road was shifted from the local authorities to the State Highway Department. The attempt to pass a bond issue for the improvement of this system of roads was defeated by popular vote. Whatever pavements have been constructed have been paid for either out of the motor-vehicle license fund, or the state aid construction fund.

The utter impossibility of paving 10,000 miles of road under one bond issue or according to any one program has always been recognized by the engineers of the Highway Department, and under Mr. Uhler's administration every effort has been made to concentrate immediate attention on really important routes. To this end a 3300-mile system of intercounty roads has been recommended, the construction of which Mr. Uhler considers absolutely essential before any state money is expended for permanent pavements on other roads.

Only Heavy-Traffic Pavements To Be Built

According to the policy adopted by Mr. Uhler only those types of pavement capable of carrying heavy traffic will be built on these 3300 miles of road. As a general proposition no pavement will be built into the construction of which cement concrete does not enter either as a base or wearing surface.

This decision has not been reached without due consideration. The maintenance division of the Highway Department has struggled for five years with the upkeep of various forms of macadam construction under constantly increasing traffic. Under present conditions and with the prospect of greatly increased use of the roads by motor trucks, Mr. Uhler has decided he "must build for the future." That means a city type of pavement.

The concrete foundation for pavements is to be 5 in. thick unless otherwise provided for. The mixture is to be 1:9, and the mixing must be continued for a period of 1½ min. in a batch mixer making not less than 14 nor more than 20 revolutions per minute. A mixture must be produced "which will flatten out and quake when deposited in place, but not be wet enough to flow or for the mortar and coarse aggregate to settle; the quantity of water is determined by the engineer and not varied without his consent."

The standard one-course concrete pavement will be 16 ft. wide, 7 in. thick at the center, and 5 in. at the sides. The mixture will be 1:5. The fine aggregate will consist of sand or a combination of sand and stone grit. The stone grit is dustless stone screenings of which not more than 25% shall pass a No. 50 sieve and none shall be larger than ⅜ in. in diameter.

The surface of concrete pavements is to be finished by striking off with a steel templet and rolling with a long-handled steel roller, approximately 10 in. in diameter, 6 ft. in length, weighing not more than 100 lb. After the rolling is completed the final finish is obtained by the use of a canvas or rubber belt 12 in. wide. When reinforcement is used, it is placed 2 in. below the surface.

Other Types of Pavements To Be Used

Sheet asphalt will be laid in some instances. This will consist of a 1-in. binder course and 1½-in. wearing course. Specifications for bituminous concrete surfacing include those for Filbertine, Warrenite and Amiesite.

In constructing brick pavements both the sand bed and dry cement-sand bedding methods will be employed. Both grout- and bituminous-filled joints are provided for. Hillside brick are to be used on grades of 5% or more. Specifications have also been prepared for wood-block and stone-block pavements as well as for water-bound and bituminous-treated macadam, but neither of the last two types will be used on new construction of through routes, except under very unusual conditions.

According to Mr. Uhler, the secondary roads or those not a part of the intercounty system can be made to answer every real need—if intelligently maintained—until such future time as traffic and importance justify their absorption as primary routes. It is considered as economical and satisfactory to maintain these in the condition of dirt roads as to pave them with some "obsolete type" of surfacing.

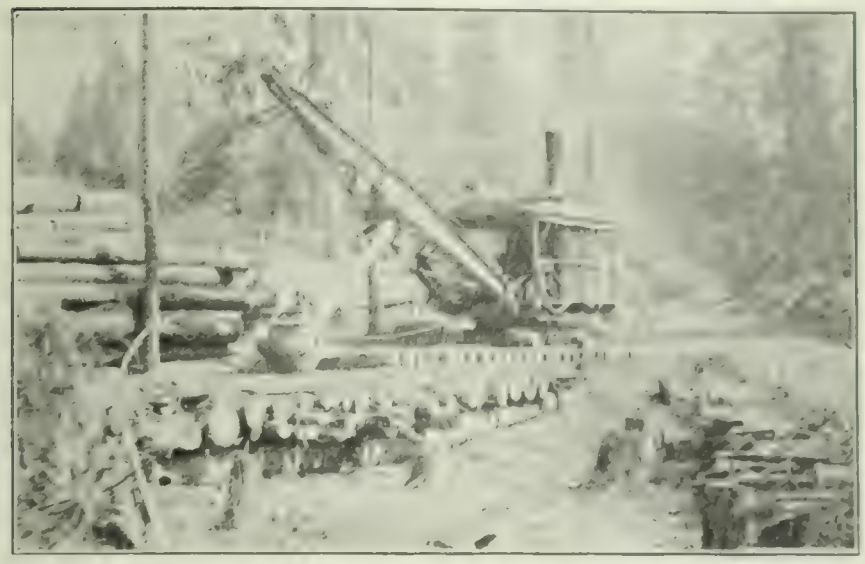
This conclusion, too, is based on extensive experience with earth-road maintenance as well as with bituminous-treated macadam. An earth road can be kept in serviceable and satisfactory condition for at least nine months in the year for $100 to $200 per mile per year, while bituminous-treated macadam is costing now from $500 to $700 per mile per year for unsatisfactory results.

Detroit Does Some of Its Paving Work

In order to utilize more fully its $185,000 asphalt plant, heretofore used only for repairing and repaving its streets, the City of Detroit has recently decided to put down new pavement surfaces. Contracts are still let for excavation, concrete base and curbing, the city confining its work, other than maintenance, to new sheet asphalt, or asphaltic concrete. Thus far five asphaltic-concrete jobs have been undertaken. Before this practice was begun, this asphalt repair plant was worked at only half capacity.

Railway Ditcher Does Grading and Tracklaying

CONSTRUCTION of logging railways in the Northwest is facilitated by the use of a railway ditcher. This is a small revolving steam shovel which travels along a short section of track placed either on the ground or on a flat car. It can be converted into a locomotive crane by removal of the dipper arm and dipper. The accompanying views show a ditcher of this kind, in use as a shovel and as a crane. This machine was built by the American Hoist & Derrick Co., of



DITCHER USED AS STEAM SHOVEL FOR GRADING AND PLACING LOG CRIBBING

St. Paul, Minn., and is shown at work on logging road extensions for the Potlatch Lumber Co., of Deary, Idaho.

The grading is made as inexpensive as possible, and the work is of a rough-and-ready character as compared with ordinary railway work. With the ditcher in use as a steam shovel, and traveling on the ground, as shown in one of the views, it does the grading. The work is left mainly to the judgment of the operator. When the machine cannot reach sufficient material for the required fill, logs are hauled in and cribbed or piled up like cordwood to form the base, as shown. The machine then places earth on top to form a roadbed at the proper elevation.

The machine mounted on a flat car and used as a tracklaying crane is shown in the other view. A car of rails and splice bars is coupled next to the tracklayer, with a car of ties at the rear. Two men on the latter car pile the ties in bundles. The crane picks these up in a sling, swings them around and drops them ahead of the machine, where men distribute them on the roadbed. The rails are handled by tongs on the hoisting cable.



DITCHER USED AS TRACKLAYING CRANE

The tracklaying gang consists of 16 men, distributed as follows: Two on the tie car putting ties in bundles; 2 on rail car, 1 to place splice bars and the other to attach the rail tongs; 6 distributing ties on the roadbed; 2 laying rails and putting on bridles to hold them to gage; 1 bolting up joints; 1 carrying bridles forward; 2 men on the ditcher.

Behind the train is a gang of 18 men completing the track work; these include 15 spikers, 1 spike peddler and 2 bolters. This crew of 34 men can lay 3000 ft. of track per day, using 60-lb. 33-ft. rails.

Pressure Type Rapid Water Filters Still Have a Place

THE extent of the use of mechanical or rapid sand filters of the pressure type and some reasons for their continued use were brought out by George A. Johnson in the course of a paper on rapid sand filters at the recent convention of the New England Water-Works Association. Mr. Johnson said, in part:

"Pressure filters of the rapid sand type are now operating on municipal supplies in this country in 140 places with a present total population estimated at 1,946,000 The combined capacity of these 140 plants is 257,200,000 gal. daily. The individual plants range in size from 100,000 gal. daily up to the 21,000,000-gal. plant at Atlanta, Ga. Pressure filter plants constitute 20.5% of the total number of municipal rapid sand filter plants in the United States, 10.8% of the total filtering capacity and 10.6% of the total population served.

"The pressure filter was, and still largely is, of stereotyped design. The model pressure filter of today can be fitted with rate controllers and devices for accurately proportioning the dose of coagulant. Everything that can advantageously be built into a gravity filter system is equally applicable in a pressure filter system.

"The pressure filter is particularly adapted to water problems where double pumping would be an important item of expense, since with this type of filter one pumping may be avoided. Along the general line of filter-operating economy it is significant that of all the pressure filter plants operating on municipal supplies in this country more than one-third are owned by private companies. Such companies certainly operate their properties as economically as possible, the first thought of the business man naturally being to furnish satisfactory service at the lowest possible cost. Such operators of pressure filter plants evidently are able to secure good service for less money than would be possible with gravity filters.

"Since water sterilization gained an accredited standing the requirements of water filters, per se, have been altered materially. With the realization that cheap and efficient means had been found whereby dangerous bacteria in water could be readily killed, the necessity of relying upon the filter for high bacterial efficiency passed away. The filter is still needed to remove color and turbidity, but sterilization of the physically satisfactory water may be relied upon to insure satisfactory bacterial results."

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

The Engineer Title

Sir—With reference to the letter of Emile Low in your issue of August 23, p. 369, as well as other discussions that have appeared in the technical press recently, in regard to the use of the title "Engineer," it may be well to call attention to a recent pamphlet sent out by the Office of the Chief of Engineers, United States Army, entitled "The United States Needs Skilled Engineers in France." Among the "skilled engineers" needed are listed the following: Bridge carpenters, masons, firemen, concrete foremen, riggers, machinists, clerks, cooks, sawyers, teamsters, drill runners, foundrymen, chauffers, handy men, etc. It would seem from this that the problem of teaching the public the use of the word "engineer" in its proper meaning will necessitate a little home missionary work, for how can we expect a newspaper reporter to use the word correctly when prominent public officials of the profession use it incorrectly?

E. W. ROBINSON,
San Antonio, Tex. McKenzie Construction Co.

The Lucrative Profession—a Protest from Dr. Waddell

Sir—In your issue of Sept. 13, p. 493, there is an article with large headlines which read, "No Promise of Lucrative Practice Made to Engineering Students." This statement is supposed to be based upon a consensus of opinions from a number of prominent engineering educators, obtained by your submitting to them four questions. A perusal of the article caused me seriously to doubt the correctness of your conclusions; and, in order to settle the matter, I have prepared a summary of all the answers to the said questions as reproduced by you. The following are the results of the analysis:

Ninety-one per cent. reported a great demand for graduates in civil, mechanical, electrical, chemical and miscellaneous groups; 9% reported a normal demand and none a small demand.

A dearth of engineers in these larger groups was reported by 72% of those replying, normal conditions by 28% and an over-supply by none.

The war was felt by 85% to have taken an appreciable proportion of engineers; 15% were non-committal and none reported "No."

Thirty per cent. knew of sufficient cases of improvement in engineers' pay and status to support the view that engineering is soon to be the most lucrative of professions; 53% were uncertain or doubtful, and 17% reported "No."

Now, how in the name of common sense can you deduce from such figures the statement in your headlines? The answers to the first three questions are a total contradiction to your deduction. You, therefore, must have based your conclusion entirely on the replies to the last question. Evidently you must have assumed that these uncertain or doubtful answers indorse the stand you took. If so, was that a logical procedure?

In acting as you have done in this matter, you are, in my opinion, assuming a grave responsibility by discouraging attendance at our technical schools—at a time, too, when so much depends upon America's taking the lead in world-reconstruction after peace is declared, to say nothing about the present demand for young trained engineers on the part of the manufacturers of all materials and apparatus needed for the conduct of the war. Six of the leading educators of our country, acting as a committee on behalf of our leading colleges, have combined to urge upon the public, through wide advertising in the press, that young men who have any taste or penchant for that line adopt technics for their lifework, and that they begin their studies at once. Do you wish that the good work which these most prominent and worthy men are doing should be nullified? Possibly not. Your exception was evidently taken to the "Appeal" which I circulated about the end of July in the public press and among the deans and presidents of our technical schools. Perhaps it was presumptuous on my part thus individually to circularize the public and the schools, but the conditions of the times are abnormal and call for unusual procedure. At any rate, my appeal met with wide approval, as was evidenced by calls for more copies of it from all over the country. One man asked for 8000 to circulate in Ohio, and another for 1000 to distribute in the State of Washington. Again, Bishop Thomas J. Shahan, Rector of the Catholic University of America, reprinted the "Appeal" immediately, appended his indorsement and then distributed several thousand copies among the Roman Catholic schools and newspapers of the United States.

Engineering graduates are needed in various ways to carry on the war, to do an enormous amount of reconstruction work soon thereafter and to take care of the demands of both new enterprises and repair work in this country after peace is declared. They are needed also to exploit trade and engineering in all the Latin-American countries, and in China and Russia, so as to extend American influence abroad, with the ultimate object of making the United States the permanent creditor nation of the world and the center of its supplies and manufactures.

To accomplish this great object we must all pull together, and there must be no slackers in this endeavor; for they would be just as harmful to the nation as those other slackers who are opposing the endeavors of the Government to bring the war quickly to a successful close.

J. A. L. WADDELL.

Kansas City.

[Perhaps the use of the phrase, "Visions of a high-paying profession" in the sub-head of the article in question was ill-advised. There is a possibility, also, that question (*d*) was not put in a form likely to draw the type of answer on which definite conclusions could be based; yet, conversely, neither is Dr. Waddell justified in his recapitulation of the relation between questions and answers. As was pointed out in an editorial in the *Engineering News-Record* of June 7, p. 515, "Except in a matter where the elements are simple, clearly defined and not susceptible to varied interpretation, the value of a questionnaire is slight, if not entirely negli-

gible. Strictly speaking, there can never be a consensus of opinion, for opinion is based not merely on facts as they are met with, but so much upon the answerer's previous and disconnected experience, as well as upon tradition, that an attempt to draw an average conclusion is bound to be misleading. It is safe for one to rest on the general principle that questionnaires should not attempt to deal with opinion, but should cover only accomplished fact—that is, things which exist or actions that have been taken.—Editor."]

Engineering Talent in Training Camps Should Be Utilized

Sir—Your editorial in *Engineering News-Record* of Sept. 20, on the exemption of engineering students from military service, emphasizes again a most critical question.

A large number of our engineering students and graduates have enlisted, have gone to the training camps or are now being drafted. Many of these men have been in the training camps for several months. This training is no doubt necessary before they become of military value.

On the other hand, the Government, the railroads and the industries are urging us to recommend men to them for naval construction, for the ordnance department, or for the conduct of transportation and industry. We are unable to suggest men because of the large amount of engineering talent in the training camps. This same talent would be available for Government work immediately if put on a work requiring some engineering training. The engineering world has waited very patiently for the Government to formulate its policy for the utilization of our trained engineering talent to its best advantage, and it seems time that the great engineering societies should offer their suggestions as to how best to conserve our engineering ability and to direct it along lines as immediately productive of results as possible.

R. L. SACKETT,
Dean, School of Engineering,
Pennsylvania State College.

State College, Penn.

Selection of Engineers for Everglades Drainage District

Sir—In your issue of Aug. 23 I notice a communication from George B. Hills, manager for Isham Randolph & Co., entitled "Everglades Drainage District Considered Merits of Engineers." The writer is familiar with the proceedings referred to and he desires to correct a wrong impression given by the article.

Competitive bids for engineering services were received by the supervisors of this drainage district, who stated that the lowest bid received was from Isham Randolph & Co., represented by S. W. Randolph, according to the terms of which proposition Isham Randolph & Co. proposed to serve as both chief engineer and consulting engineer for the district for a fee of $250 per month, and that bids from other engineers ranged from $5000 to $11,000 per year for services as chief engineer only. I quote from a published letter of the supervisors:

"July 14, we appointed Isham Randolph & Co. as consulting engineers of the district at a salary of $250 a month. Isham Randolph & Co. are, without question, the leading drainage engineers of America and have been connected with practically every reclamation project of any prominence that has been undertaken in this country for a number of years past."

Mr. Hills states that "the selection of engineers for the district was not made on the basis of competitive bids, but was made after the district had thoroughly considered the merits of different firms *according to their own views.*" It is not clear whether he means the views of the engineers or the views of the board of supervisors, but in either event this qualification is highly significant.

It is natural to assume that engineering merit is in all cases the criterion according to which engineers are selected for public work. This assumption is based upon the most generally accepted principles of economics and requires no argument. Neither does professional greatness and supremacy require argumentative and self-proclaimed praise.

V. W. HELM,
President, Everglades Sugar and Land Co.
Miami, Fla.

Road Maintenance in the War Zone of France

Sir—An article of more absorbing interest than that by William J. Weir on "Road Maintenance in the War Zone of France," in your issue of Sept. 13, page 488, has seldom appeared in any technical publication. The writer of this article, with a literary skill too rarely found in the writings of engineers, has drawn a brilliant picture of conditions in the war zone as he observed them, particularly as to the road-maintenance work that he encountered.

As complete as this article appears, it does not seem that one would be justified, from the actual facts disclosed, in drawing from it any very definite conclusions involving basic road economics. From what the writer of the article himself states, and from known facts not stated in the article, it does not seem possible to arrive at the deduction made in your editorial in the same issue, that a macadam road, or any other particular type of road, is best for war traffic.

Mr. Weir writes that the French roads were of but one type—macadam. He states that he had occasion to see the roads only at times when weather conditions were most favorable, but the chief point, on which the article is silent, is the effort that was necessary to keep these roads in any way serviceable under the war traffic. There is no intimation as to how many men were necessary per mile for the minute-by-minute maintenance. The writer, however, has been informed that one thousand, two thousand and even a greater number of men per mile have been found necessary to keep the roads in even a possible condition while under the stress of war traffic.

The number of vehicles which it is stated used these roads is extraordinary but not unprecedented. There is nothing to indicate, nor can one conceive, that a rush of vehicles in war time has any greatly different effect on a road surface than a similar rush of vehicles would

have in peace time. By far the greater mileage of French roads under war traffic is not within the shelled zone, yet, because of the effect of the traffic alone, they have required the most extraordinary efforts to keep them day by day in a condition to take care of the traffic.

Therefore, far from concluding from Mr. Weir's article that macadam roads are best in war time, it would be much more reasonable to suppose that had the French roads been constructed in a more durable manner they would have given far better service and would have required but a small fraction of the number of men that has been found necessary to keep them in even passable shape. This saving in man power might even be a factor in the ultimate result. Surely there is no evidence of such remarkable efficiency on the part of the macadam road that one is warranted in drawing the conclusion that "macadam roads are best for war traffic."

A. R. HIRST,
State Highway Engineer of Wisconsin.
Madison, Wis.

Sir—I have read with great interest Mr. Weir's article on "Road Maintenance in the War Zone of France," also your editorial entitled "Macadam Roads Best for War Traffic," appearing in the issue for Sept. 13, page 488.

Mr. Weir's observations are interesting and instructive, particularly because of his former connection with the Office of Public Roads. That they should be used as a basis for conclusions as to the "best type of road for war traffic" is hardly conceivable. In the first place, comparison between macadam and other types is impossible because no other types were observed. This is evident from his statement that "no bituminous macadam, concrete, brick or any of our American so-called permanent types were encountered." Even the macadam roads were observed during only a part of the year for, again quoting Mr. Weir, "the severe test of this type (macadam) would, of course, come in the summer when the wear due to loss of binder in the wind and to raveling must be very great. Unfortunately, I was not in the war zone during that period and so cannot judge." One can imagine no more serious objection to macadam than the ever-present cloud of dust which envelops vehicles when the road is under constant use in dry weather.

To be selected as "best for war traffic" the macadam road must have merits which outweigh the objections to it and be preëminently superior to all other types. Has the case for macadam been proved? It is true that these roads been kept in usable condition by constant and expensive maintenance, but who would question the ability of French road engineers to solve this problem on concrete roads? In considering this question we must assume that the concrete road would be built to the same standard as the French macadam road. This would not mean a "6-in. concrete" as mentioned by Mr. Weir, for no road engineer would think of using such a thin slab on a road having 33 ft. of metal.

With foundation and drainage such as we find under all main roads in France, I have no hesitancy in asserting that the entire maintenance repairs of a concrete road under similar traffic could be taken care of with tar and sand. Such repairs are quickly made and necessitate no delay to traffic. This assertion is made on the basis of performance of concrete roads which have been in service for ten years under heavy traffic.

Even if the above were not true and the repair of macadam roads were the simplest problem, there still remains the following advantages of concrete for war-traffic roads:

Less tractive effort required and, therefore, less gasoline and oil. (About one-third of that for macadam. See Prof. J. B. Davidson's results in your issue of Aug. 23); less wear and tear on tires; less wear and tear on machinery; greater speed possible; equally satisfactory in good weather and bad; no clouds of dust in dry weather.

Engineering News-Record might well set a good example to the American engineer who is prone to draw conclusions from incomplete data by modifying the conclusions drawn from this article of Mr. Weir's.

WILLIAM M. KINNEY,
Engineer, Promotion Bureau, Universal
Chicago. Portland Cement Co.

Concrete Must Be Well Worked

Sir—I have noted several recent references to the compacting of fresh concrete in roads by rolling it. In view of my experience, that there cannot be too much working of concrete in the process of mixing and placing, I would recommend to your interested readers the roller treatment or any other method of thoroughly tamping.

Nearly all the little troubles noted during the construction of the aqueduct of the Greater Winnipeg Water District can be and have been cured by the general prescription, WORK!

Mixing for two minutes is required by our specifications. Too much water is not approved, although there is a great temptation to contractors to supply in the mixture enough water to make the concrete slide easily. The proper proportions of water require therefore a little more of work in the act of placing and tamping the concrete into the forms.

With a wet mixture we find a considerable settlement of the solid material and a corresponding upward flow of excess water which washes certain portions of the fines with it. The settlement occurs vertically and from the crown of our aqueduct it is necessary to force the concrete materials over the curve of the arch down into the walls and to make up the consequent deficiency of the materials upon the crown and for a period extending until the concrete in the crown by the process of setting becomes too stiff to work. I appreciate that this last specification is contrary to the usually accepted theory, that concrete should not be disturbed during or after the initial set of the cement.

Whether it be in the manufacture of road pavements, in the construction of foundations, in the manufacture of water-tight concrete structures, or in the prevention of segregation, on a large or small scale, too much working cannot be given to the raw concrete. Manufacture of good concrete is not a job for an unintelligent workman, nor for an indifferent foreman, nor for a lazy, selfish or cheap contractor, nor yet for an easily satisfied inspector or engineer. W. G. CHACE,
Chief Engineer, Greater Winnipeg Water District.
Winnipeg, Man.

THE ENGINEER IN FIELD AND OFFICE

A DEPARTMENT DEVOTED TO DETAILS OF THE DAY'S WORK

Salvaged Steel Shows a Saving of 75 Per Cent

BECAUSE of the scarcity and high price of reinforcing steel, it was decided to attempt a recovery of as much as possible of the steel originally used in one of the several bridges destroyed in North Carolina during the July floods of 1916. The particular instance was a concrete structure over the Catawba River at Sloan's Ferry, a photograph taken immediately after the flood being shown herewith.

Under the personal supervision of George N. Syme, division engineer of the North Carolina State Highway Department, a gang of negro laborers broke up the concrete with sledge hammers. Dynamite was used only sparingly, since it merely made a small hole in the slab which could be used only as a starting point for the sledge-hammer crew.

By this means a total of about 100,000 lb. of steel was recovered, cleaned, straightened and stacked at a total cost of $1250, or 1¼c. per pound. This is not more than 25% of what new steel would have cost delivered at this work. The salvage was accomplished entirely on the approach spans, which were of the beam and slab type of construction, and were high and dry at all ordinary stages of the river. No attempt was made to break up the channel span.

The structure will be replaced with one of similar design, using the old pier foundations which, with one exception, are still in perfect condition.



NEGROES WITH SLEDGE HAMMERS RECOVERED 100,000 POUNDS OF STEEL FROM THE WRECKED SPANS AT A COST OF ONE AND ONE-QUARTER CENTS PER POUND

Ruling with Common Ink Saves Time

IN MAKING scale sketches on desk designing sheets for direct tracing by the draftsman, one engineer finds it a great convenience to use ordinary, in place of india, ink. This requires a german-silver ruling-pen, such as is made for bookkeepers' use. A time saving results from the fact that when the pen is laid aside with its ink filling it will not dry out, but will be ready for instant use even after a quarter or half an hour.

Drawing the sketches in ink, rather than pencil, is far easier for the tracer as well as being safer against errors in tracing. The method applies to a great many parts or objects of such simple character (or to be shown so generally) that no fuller detailing is needed than the designer's sketch contains. However, lines as fine as may be desired may be drawn.

Concrete-Road Problems Recommended for Student Research

SEVEN subjects for student-thesis research have been recommended to American technical schools by A. N. Johnson, consulting highway engineer of the Portland Cement Association, Chicago. All bear on problems of concrete road work and the list is the outcome of requests by educators for topics of practical value and live interest.

(1) *Methods and Effect of Various Ways of Finishing Concrete Pavements.*—The various methods of finish-

ing concrete pavements are of vital interest since the strength of the resulting concrete may be greatly modified by the manipulation which it receives. The evenness of the surface is also of great importance. A method which has a tendency to form transverse waves is evidently not desirable. Investigate what degree of evenness may be reasonably expected, and to what extent various degrees of unevenness of the surface affect the comfort of traffic.

(2) *Various Factors That Influence the Making of Good Concrete.*

(3) *Methods To Determine the Wear of Concrete Pavements.*

(4) *Methods To Determine the Relative Value of Various Aggregates for Use in Concrete Pavements*—Subjects 3 and 4 are somewhat interrelated, although they may be treated separately.

(5) *Effect of Frost Action on Road and Pavement Design*—There has been but little investigation as to the effect of frost upon soils, at least in so far as this has a bearing on the design of pavements—particularly the rigid and rigid-base types. Drainage has been provided, usually in an empirical way, but no designs have been based upon actual knowledge.

(6) *Investigation of Pavement Temperatures*—The action of pavements under varying temperature and moisture conditions calls for much careful study. It will be necessary to develop a method which would give reliable information as to the temperature gradient from the air immediately above the pavement to the soil at the base. This might well be a separate study by itself.

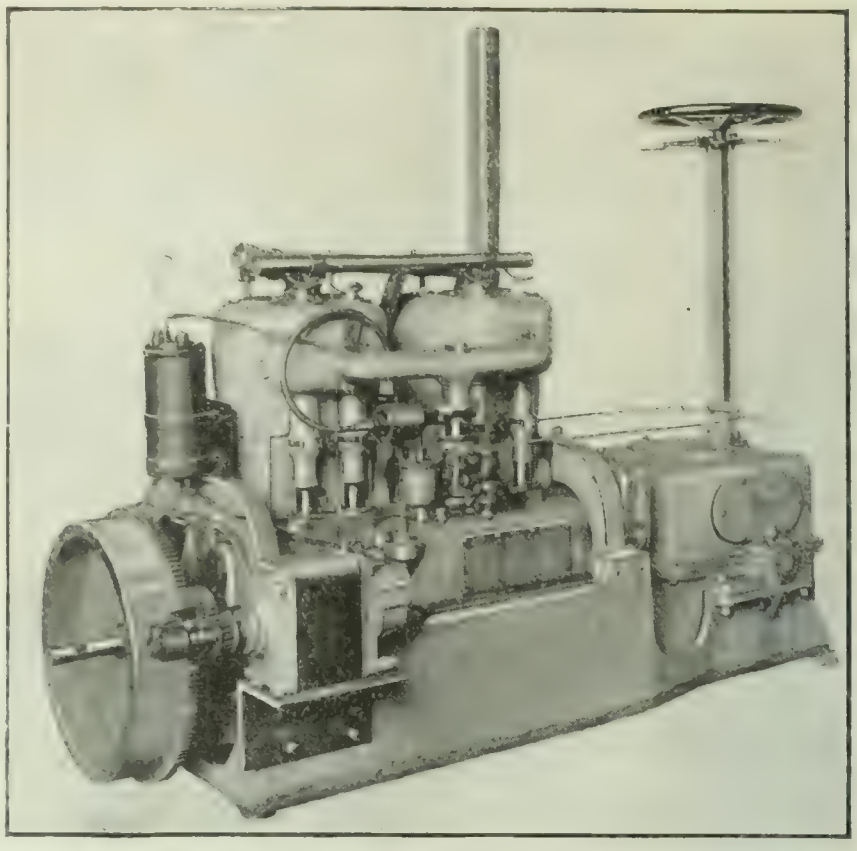
(7) *Equipment Required for Concrete Paving Work*—There has been no paper or committee report dealing comprehensively with this phase of concrete-road work. Any collection of accurate data will be valuable, however incomplete it may be. The data should endeavor to give an outline of the conditions under which the work was constructed so that it would be apparent why it was necessary to use any peculiar equipment or arrangement of equipment.

Gasoline Motor Actuates Movable Bridges

SINCE the power to operate movable bridges is required only intermittently, and as two independent sources of supply are usually required on large railroad bridges, it is argued that the light high-speed automobile engine, occupying but a little space, particularly lends itself to this class of work. Furthermore, its ease of starting and its present-day reliability give it an advantage over slow-speed engines.

Where these engines have been used they have usually been connected through a clutch and reduction gearing to the operating machinery. When operating only as auxiliaries, they are geared down to open the bridge at one-fifth to one-twelfth the speed obtainable with the main power.

All engines over 40 hp. are provided with heavy flywheels, governors and self-starters. Under 40 hp. they can be readily started by hand. The illustration shows a 50-hp. 900-r.p.m. engine and reversing clutch mounted on a sub-base. The engine is started by a 110-volt d.-c. motor, which is automatically thrown out when the engine gets up to speed. The vacuum system of



GASOLINE MOTOR AUXILIARY ON 450-FOOT DRAWSPAN

gasoline feed is used. The reversing clutch, in an oil bath, operates through bevel gears and is thrown in and out, and reversed, by the handwheel on top of the gear case. This engine is used as an auxiliary on the 450-ft. double-track drawbridge over the Missouri River at Kansas City on the line of the Chicago, Burlington & Quincy Railroad.

C. H. Norwood, contracting engineer, Chicago, who has given much attention to the development of this phase of movable bridge operation, is responsible for this, as well as several other similar installations.

New Water-Sample Shipping Case

A SHIPPING CASE holding eight 4-oz. water-sample bottles and having an ice capacity to maintain a temperature of 10° C. for 48 hours is described by R. R. Spencer, assistant surgeon, and H. P. Setton, sanitary engineer, U. S. Public Health Service, in *Public Health Reports* for Sept. 14, 1917.

The case is of 20-gage galvanized iron, 8 in. wide, 15 in. long and 13 in. high, outside dimensions. It is insulated with 1 in. of pressed corkboard and lined with 24-gage galvanized iron, which makes a water-tight joint with the outer casing. The case has two covers: (1) An insulated cover, which has a tapered edge so it will drop easily into place, and a flange to support it; (2) A protecting cover of 22-gage galvanized iron, strengthened at the edge with wire, and provided with hinges and a padlock hasp. The case is carried by means of a rope handle, secured to strap iron eyelets riveted to the sides of the case. The container for the sample bottles is a can 5 in. in diameter and 10 in. high, made of 26-gage galvanized iron, and provided with a slip cover 2-in. deep. The can is held in place by a galvanized iron bond attached just above midheight. The space around the can will hold 13 lb. of ice. If desired, a liter bottle can be packed in the can instead of eight 4-oz. bottles. The cost of 25 of these cases complete was $6.50 each in 1915, and $8 in 1917, the increase being due to the rise in the price of galvanized iron.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Pull Bridge Pins with Jacking Grip Engaging Nut

BY E. S. NEEDHAM
Livingston, Montana

THE DEVICE shown in the photograph was used in removing the pins from an old truss bridge on the Northern Pacific Ry. In using it the nut on one end of the pin is unscrewed just enough to allow the short bent ends of the bars to slip under it. Two jacks bearing against the chord member are used to extract the pin.

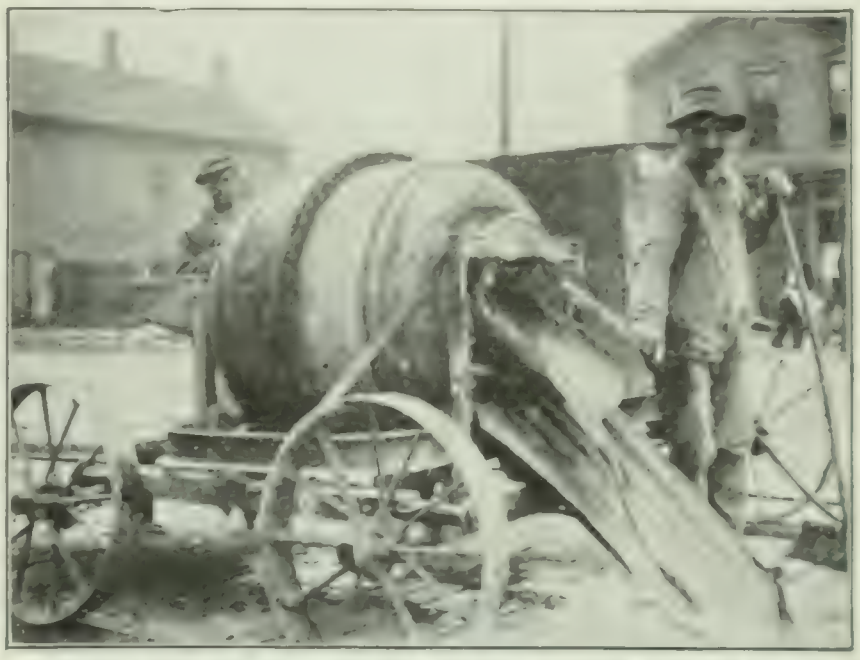


GRIP ENABLES SMALL JACKS TO PULL PIN

The wood block between the bent bars keeps them apart, but it has been suggested that a more solid arrangement could be made by riveting a straight bar across the top. The work on which the device was used was carried out by McCreary & Willard, of Spokane, Washington.

Turns Side-Discharge Mixer Around To Grout Pavement

THE PHOTOGRAPH shows how George Czerwinski, a paving contractor of Milwaukee, converted a 4-ft. Rex mixer from a side loader into an end-loading machine for grouting pavement. The advantage, of course, is that the mixer can be pulled along the street as the work progresses, and will still discharge directly to the rear where the grout is wanted. As may be seen from the picture, the change was accomplished by taking the wheels off the mixer putting them on a new pair of



MIXER TURNED AROUND ON ITS TRUCK FOR PAVING WORK

axles, and clamping the old mixer frame with axles at right angles to the new ones. This, of course, simply brought the loading platform to the front of the carriage, and the discharge to the rear. The machine is reported to be working in a first-rate manner.

Apply Hose and Roller Finishing Method to Roof 120 Feet Wide

THE METHOD of finishing concrete roads with a long-handled roller and a piece of rubber hose, developed in Georgia and described in the *Engineering Record* of Nov. 4, 1916, p. 572, is being applied successfully to finishing roof slabs 120-ft. wide on the last units of the Atlanta Warehouse, which was described in last week's issue, p. 654. The main difficulty developed was to secure a light enough roller to leave an even surface after pressing in the aggregate and bringing the mortar to the surface. The 8-ft. roller shown in the photograph is made of narrow 1-in. wood strips nailed to three transverse 5-in. diameter drums of 1-in.



LONG-HANDLED ROLLER USED TO FINISH ROOF

plank, the whole being covered with galvanized iron. Through its center passes a 1-in. round rod, the ends of which are bent back, flattened and bolted to a 20-ft. wood handle turned round from a 2 x 4 piece. The runways are taken up, and the roof slab just poured is rolled with this tool. Next a rubber hose 140 ft. long is draped clear across the ridge of the roof and dragged from end to end of the section by two men walking at the edges of the roof. Although the dragging length of hose is more than 120 ft. between ends and passes across a ridge at the center of the roof, there is no tendency to cut into the soft concrete of the ridge and an even finish is secured. The cost, naturally, is far less than with the trowel and float method used on the first units. No coating or other finish is given the roof. The pitch, while slight, insures quick drainage, and no leaks have developed.

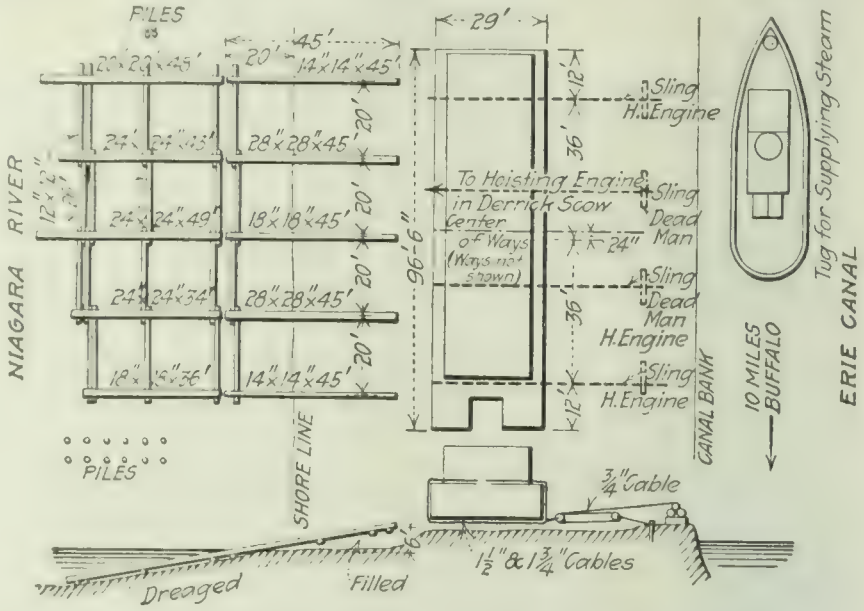
The work is being done by Arthur Tufts, contracting engineer, of Atlanta. E. A. Stuhrman is designing engineer and C. R. Justi is in charge of the work in the field.

Pull 525-Ton Dredge Up River Bank and Launch Into Canal

By Emile Low
U. S. Assistant Engineer, Buffalo

THE HYDRAULIC dredge "Niagara," the displacement of which is 525 tons, after being dragged bodily up timber ways over the bank separating the Niagara River from the Erie Canal was launched into the latter on Sept. 5 last. Originally built in North Tonawanda and used in dredging a section of the Barge Canal between Tonawanda and Lockport (see *Engineering News*, Apr. 10, 1913, p. 717), this dredge was sold on the completion of the contract for work at Hamilton, Ont. It was gotten out of the canal into the Niagara River during the closed season for navigation by taking it through a gap cut in the bank between the river and the canal after the level of the latter had been drawn down. This procedure was resorted to because the size of the dredge, 96 ft. 6 in. by 29 ft., forbade taking it through the old Erie Canal locks, which are only 18 ft. wide. It could not be repeated when the same dredge was repurchased by the Empire Engineering Co. for additional work on the same section of the canal, because the contract was let during the summer and it was not possible to wait until the navigation season closed before starting work.

The water level in the Niagara River at the point where it was decided to take the dredge into the canal is



PREPARATIONS, INCLUDING GRADING FOR WAYS, CARRIED OUT AND TRANSFER OF DREDGE TO CANAL COMPLETED IN TWO MONTHS

about 6 ft. below the latter. A survey of the site was made and timber ways designed as shown in the drawing, up which the dredge could be pulled by hoisting engines to the top of the bank. It was necessary to excavate along the shore of the river in order to place these ways, and to make a fill of about 6 ft. in part of the river bank. The material to be handled, a very hard clay, proved too stiff for a derrick scow with an orange peel bucket, and a dipper dredge was called in to do the work. As soon as the excavation was finished 12 x 12 timbers were laid down and the ways placed on them. The dredge was floated in and four slings of $1\frac{1}{2}$- and $1\frac{3}{4}$-in. wire cable passed around the hull. Three-fourths-inch wire rope falls of three and four parts were



BIG DREDGE TO BE LAUNCHED INTO CANAL ON NEAR SIDE WAS HAULED OUT OF RIVER BY FOUR HOISTS

fastened between these slings and deadmen at the top of the bank, the lead lines passing to three hoisting engines anchored to these deadmen and one hoist on the deck of the derrick scow. The hoists on the bank were 8 x 10 in., while that on the derrick scow was a 10 x 12. Steam was furnished to the three hoists on the bank by a tug anchored in the canal.

After the scow had been pulled to the top of the bank, the ways were rearranged and the dredge launched into the canal in the usual way. This was accomplished Sept. 5 last, about two months having been occupied in making the transfer. The work was done under the direction of F. W. Allan, superintendent for the Empire Enginering Co., the contractor.

Derrick Mounted on Tower Erects Lumber in Mill Construction

THE PHOTOGRAPH shows a type of derrick which has proved very useful in constructing Southern cotton mills of the slow-burning brick wall, timber frame and floor construction. These mills, which can be erected very rapidly, are generally rectangular structures about 100 ft. wide, 500 ft. or more in length, and two or three stories high. In the method of constructing these followed by the F. E. Thompson Brothers Co., contractors, Charlotte, N. C., these long-boom derricks mounted on a high four-legged tower play an important part. The platform for the operator is at the top of the tower and is high enough for him to see over the roof of the structure. Lumber and other construction material are transferred directly from wagons to the upper floors or roof by the derrick operator. The materials are then distributed throughout the length of the structure by two-wheeled man-operated trucks on temporary runways or on the completed sections of floor or roof.



OPERATOR [illegible] OVER BUILDING

Float with Pole Handle Makes Finishing Easy

By James A. Cain
Wilkinsburg, Penn.

BY RAISING and dipping the handle of the float shown in the photograph while sliding it to and from the user a smooth surface can be secured on a concrete



MAN FINISHES NINETEEN SQUARE YARDS AN HOUR

base for road work at a rate exceeding 5000 sq.ft. per 10-hr. day. The float is made from a block of 2-in. plank 18 in. long and 12 in. wide. A handle made from a 2-in. sapling is cleated to this block. On paving construction in Pittsburgh, supervised by Douglass & McKnight, where the writer used this float for J. I. Dick, contractor, of Scottdale, Penn., one man was easily able to finish 250 lin.ft. of concrete base on a roadway 21 ft. wide in ten hours.

Evanston Rapid Filters Are Raked

Once a week the water is drawn off the rapid sand filter beds of the water-works of Evanston, Ill., and the surface of the beds inspected. If needed, said John W. Gaffeny, superintendent of filtration, in a paper read at the recent convention of the New England Water-Works Association, the surface of the beds is raked and cross-raked and at the same time lightly washed. The beds are then washed with two or three times the regular amount of wash water, sprinkled with chloride of lime and again washed before being put in service.

NEWS OF THE WEEK

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

Release Labor for War Work by Consuming Less

Country Is Trying To Do More Work Than There Is Labor To Do It With

After a careful study of the labor situation, the *Bulletin* of the National City Bank of New York has this to say in its October issue:

"The situation is disquieting in all parts of the country, and but for the good crop yield it would be alarming. It is not surprising that with high prices prevalent on all sides wage earners should claim more pay, but the disquieting thing is that higher wages mean still higher prices, and thus we travel in a circle. At last the explanation is that the country is trying to do more work than there is labor to do it with.

"A vast amount of work is being done under rush conditions for the Government, and the contractors have offered wages that would bring labor out of the regular industries. Sixteen cantonments have been built in different parts of the country at a cost of $150,000,000, in three months, and about 8000 to 10,000 workmen have been employed on each. The influence of this upon the labor situation has been widespread. Numerous shipyards are under construction, steel works and munition plants are crowded with orders and hundreds of new coal mines are struggling to get a share of the labor supply. The point has been reached where it is a serious question whether any further construction work should be done unless directly required by the war emergency. Where is the use in enlarging capacity when the present capacity of the industries cannot be manned? It may seem to an individual that he can enlarge his business profitably, but if he can only operate the new capacity by hiring labor away from other equally important work there is no gain, and the entire level of costs is being constantly raised by this process. The real remedy all around is indicated by the high wages and prices; it is for the public to curtail consumption, in order that labor may be relased for the war work.

"The United States Steel Corporation has led off with another wage advance of 10%, and the other steel companies are following. The coal miners, with whom a liberal settlement was made in April, are insisting upon another advance. In the textile industries of New England a movement is on for a further round advance in wages.

"The railway trainmen achieved a great victory last March by establishing the unit eight-hour day in train service. Train runs have remained practically unchanged, because they could not be changed except by moving division points or running lighter trains, which would increase costs more than the payment of overtime. The effect has been to add greatly to 'overtime.' It is understood that further requests from the trainmen are in preparation.

"The final effect of this situation in the manufacturing industries is to constantly attract labor from the farms, thus curtailing the food supply. It is evident that at some point in this circle an influence should develop for the return of workers to the farms. Raising wages in the cities will never compensate for declining supplies of foodstuffs, if the higher wages continue to draw labor from the farms."

Course on Ports and Terminals Offered by Columbia

A special course of lectures on the planning and equipment of ports and harbors is offered this year by Columbia University, under the direction of Dr. R. F. MacElwee, department of economics. The course, which consists mainly of lectures, will be given at the downtown rooms of the School of Business, 203 Broadway, Mondays from 5:10 to 6:50 p.m. during the winter, 1917—that is, from October to February. There will be 30 lectures in the course. The object of the course is to lay down the principles underlying the work which a port must perform as a coördinated and assembled piece of machinery; then to take up in detail each of the various parts and its relation to the whole. While the mechanical and engineering details will be emphasized, great attention will be given to the economic side of the port handling question.

Coal Situation Becomes Critical in Cleveland

If after using every other means possible to get coal not only for industries but for domestic use, success does not attend such efforts, Mayor Davis, of Cleveland, announces that he will "seize every ounce of coal in the vicinity." The supply of coal at several of the city institutions is practically exhausted and the shortage is being felt by the citizens.

The Cleveland situation with respect to coal has been mentioned in these columns Aug. 23, page 381, and June 7, page 522, in which places the movement to purchase a coal mine to supply the city needs was mentioned and a brief record made of the progress attained at those dates.

Washington State Highways To Spend $9,000,000

Budget for 1918 Shows Much Work Will Be Undertaken—Not all Counties Heard From

The annual budget compiled by the various counties in the State of Washington for 1918 show a gratifying sum set aside for highway construction work, which, taken together with the sum of $1,500,000 to be expended by the State Highway Commission on road work next year, shows a probable total of $9,000,000 available. The counties reporting to date are as follows:

Snohomish County—Bond issue roads, $750,000; general road and bridge fund, $105,000; three road district funds, $150,000. Clallam County—General road and bridge fund, $60,000; four road district funds, $88,000. Clarke County—General road and bridge, $60,400; three road districts, $88,700. Lewis County—General road and bridge, $84,250; road districts, $174,000. Grant County—General, $45,000; nineteen road districts, $80,000. Franklin County—General, $9000; gravel roads, $44,750; road district fund, $54,400. Pierce County—General, $300,000; five road districts, $240,000. Okanogan County—General, $36,500; three road districts, $19,000. Benton County—General, $52,000; three road districts, $57,600; San Juan County—General, $6000; three road districts, $13,650. Skagit County—Road and bridge fund, $56,135; three road districts, $105,000. Chelan County—Road district fund, $10,000. Whitman County—Road and bridge, $135,000; 13 road districts, $164,000. Whatcom County—Road and bridge, $100.000 Cowlitz County—Road and bridge, $37,000; six districts, $79,200. Douglas County—General, $46,880; 16 districts, $82,450. Pend Orielle County—General, $18,000; three road districts, $34,000. Adams County—Road and bridge, $79,500; 16 districts, $56,500. Grays Harbor County—General, $95,000; six road districts, $225,535. Mason County—General, $23,250; eight districts, $49,735. Kitsap County—General, $27,850; six road districts, $37,170. King County—General, $350,000; three districts, $650,000; bond roads, $400,000.

Fifteen counties have yet to be heard from, but will probably average about $25,000 each.

Public Health Association Meets October 17-20

The date of the meeting of the American Public Health Association at Washington, D. C., is Oct. 17 to 20, instead of Oct. 20 to 27, as erroneously announced in these columns last week.

Ordnance Department Needs Many Inspectors

Executive Ability and Experience in Manufacturing Desirable—Draftsmen Called For

The Ordnance Department of the army is in urgent need of inspectors of ordnance equipment at salaries ranging from $1500 to $2400 a year. Men of good education are wanted, since they will have to superintend the work of a force of assistant inspectors and prepare reports of the inspection, shipment and payment for articles inspected. The bulk of the materials inspected will consist of manufactures of leather, such as saddles, bridles, etc.; of duck and webbing, such as belts and pouches; and of metal, such as meat cans, canteens, cutlery and intrenching tools. Applicants must have the education and experience called for in one of the following groups:

(a) Graduation from a college or university of recognized standing and one year's experience in a manufacturing plant producing articles described above, or in a related industry.

(b) Graduation from a college or university of recognized standing and two years' experience in a responsible executive position in any producing industry or in an industry requiring the handling of stores and materials.

(c) Graduation from a college or university of recognized standing and three years' service in the United States Army, Navy, Marine Corps or National Guard.

(d) Graduation from a four years' high-school course, or four full years of study in a school offering a course equivalent to that of a high school, or graduation from a well-established trade school fitting its graduates for higher positions in manufacturing lines producing articles similar to those described above; and, in addition, four years' experience in a manufacturing plant producing articles described above, or similar experience in a related industry.

EXECUTIVE ABILITY WANTED

Applicants should submit evidence of executive ability, together with a definite and detailed statement of all the experience they have had. Additional credit will be given to those familiar with the best practices in connection with the manufacture of the articles named above, and to those experienced in the employment and handling of men and in keeping records. Applicants must be 23 years old at the time of making application.

The Ordnance Department is also short of assistant inspectors. Assistant inspectors of cloth equipment are wanted particularly, at salaries ranging from $1000 to $2000. Applicants should have completed a two years' textile course in a textile school or recognized college, or must have had at least one year's experience in the inspection and manufacture of articles made from cotton stuffs, or they must be discharged soldiers with the rank of company quartermaster sergeant or higher.

There is, of course, the perennial demand for mechanical draftsmen. The work of the Ordnance Department is seriously hampered by the lack of applicants for such positions. There are two grades, the first paying from $800 to $1400, and the second from $1400 to $1800. Applicants for the higher grade must have a college degree and two years' drafting-room experience, or the degree of mechanical engineer with one year's experience in the drafting room, or the completion of two years in a mechanical engineering course and three years' experienec as a draftsman.

For the lower grade, senior students in a mechanical engineering course without practical experience or college graduates who have had six months' drafting-room experience will be accepted. All "red tape" has been dispensed with. Applicants are required merely to fill out the application form which contains space for a complete statement of education and experience. Appointments usually are made in from one to three weeks' time. In the case of draftsmen, a sample of work must accompany the application. At the request of the Ordnance Department, the National Civil Service Reform League, located at 70 Wall St., New York City, is now receiving inquiries concerning these positions and will furnish application blanks on request.

Columbia River Highway Bridge Is Paying Well

The interstate bridge between Oregon and Washington over the Columbia River at Vancouver, Wash., has now been in service about six months and the travel over the structure, as indicated by the toll receipts, has far surpassed expectations. The present rate makes the bridge more than self-supporting, and, in fact, if the present conditions continue, it will pay for itself in a few years. The income since the bridge was thrown open to traffic has been as follows:

	[illegible] Railway Tolls	Vehicle Tolls	Total
February	$1,702 76	$2,019 84	$3,722 60
March	3,515 91	4,472 74	7,991 65
April	5,011 13	6,218 11	11,229 24
May	4,695 58	7,066 75	11,672 33
June	4,930 97	9,308 60	14,239 57
July	5,925 84	11,426 87	17,352 71
Totals	$25,695 19	$40,512 91	$66,208 10

The location of the Government training camp for engineer troops at Vancouver, Wash., has notably increased traffic over the bridge. It is notable also that much freight now goes by motor truck which could not be sent by that means when the ferry had to be relied upon. The average day's receipts have been $396, and the highest $837, which was taken in on July 4. The average daily operating expense is $57.62. The bridge was described in the *Engineering Record* of July 8, 1916, p. 36, and *Engineering News*, Mar. 29, 1917, p. 530.

Oppose Special Commission To Build Subway

Cleveland Engineers Feel That Study by City Planning Board Is Sufficient Now

The executive board of the Cleveland Engineering Society has declared against the Rapid Transit Commission ordinance which is to be voted on at the coming election in November. The declaration came with the adoption of an adverse report of a special committee on the plan of proceeding to develop a subway system by a commission to be appointed under legislative enactment. While members of the committee were not opposed to the building of subways, they assert that the time is ripe only for a complete study of all phases of the problem, and attention is called to the city charter provisions which authorize the city planning commission to make such a study.

Until a report by the city planning commission is made, and the public is fully acquainted with the proposed improvements, the engineering society's position is that there is no need to appoint a commission for constructing subways. Questions of subways, location and size of streets and main traffic arteries are held to be functions within the jurisdiction of the planning commission. It was pointed out that when such a study has been completed and plans have been approved by the city no part of the subway should be built unless it is an integral part of the general scheme of relieving traffic congestion.

Testing Materials Society Adopts New Specifications

The letter ballot of the American Society for Testing Materials on the amendment of the by-laws and the adoption of four new standards was canvassed on Aug. 15 by a committee of tellers consisting of W. H. Fulweiler and L. H. Kenney, who have reported the following results:

	Affirmative	Negative	Not Voting
Proposed Amendment of the By-Laws:			
Article II, Section 1	833	4	74
Article III, Section 1	833	3	74
Proposed New Standards for:			
1. Paint Containing other than Turpentine	113	1	276
2. Shellac	110	1	279
Methods for:			
3. Sampling Asphalt at Work	384	1	206
4. Sampling and Analysis of Cement (a)	81	11	298

The four new standards included in the above ballot are accordingly effective from Aug. 15, 1917, and bring the total number of standards adopted by the society to 101.

The proceedings of the recent annual meeting (Vol. XXVIII) will be issued shortly in two parts, as usual. Part I will be devoted to the committee reports and tentative standards, and Part II to the technical papers. It is expected that they will be distributed early in November.

Chicago-Milwaukee Hard Road Seems Assured

Early completion of the new hard road between Chicago and Milwaukee seems assured since state and Federal aid to the extent of $400,000 has been allotted to Cook and Lake Counties, without definite apportionment to either, for constructing a 24-mile stretch from Chicago to the Wisconsin state line. Contracts have been let for the Wisconsin section.

The portion through Lake County is along the lake shore and does not benefit directly a large number of the property owners in the central and western areas. By mutual agreement between the county boards Lake County's portion of the $400,000 is to be $325,000 to apply on 14 of the total 24 miles. This will permit the county in an issue of $500,000 to build a much-needed east and west connecting road. These bonds will be voted upon Oct. 30.

Cook County has expended practically all of the $2,000,000 issue from which the last two seasons' mileage has been constructed. Several small links totaling 49 miles are missing in the system already started, most of which can be completed with a $1,000,000 issue. The voters in Cook County will be asked for this amount in the November election. Of those now under consideration, in addition to the Chicago-Milwaukee road, the most important are 12 miles on the southwest outlet toward Joliet on the designated Federal-aid Chicago, Springfield and St. Louis route, and 9 miles to complete the Lincoln Highway west of Chicago Heights. Estimates of $22,000 a mile are being made, based on the cost of $19,900 per mile for 33½ miles of 18 ft. widths built and under construction in 1916 and 1917.

Cleveland To Vote on $3,000,000 Sewer Bonds

On Sept. 25 the Cleveland City Council adopted a resolution submitting a $3,000,000 sewer bond proposal to the electors of Cleveland at the election Nov. 6. This proposal was adopted without debate as was a similar one to provide $1,000,000 in hospital bonds.

Robert Hoffman, chief engineer of the Public Service Department, reports that many of the old sewers of the city are inadequate and that several million dollars could be expended to advantage on such work.

National Old Trails Road Dedicated

The first paved section of the National Old Trails Road was dedicated in Marion County, Indiana, on Sept. 15. This section of the old and historic national road extends from the county line at Cumberland west to the city limits of Indianapolis, a distance of nearly 6 miles. It is paved with concrete. The next section to be paved extends west from the city to the county line near Bridgeport. The dedication was arranged by the Marion County Commissioners and Charles E. Cheney, county surveyor, who has charge of the road work. Apart from the addresses of officials and invited guests, the ceremonies included a parade through the city and a trip over the 60-mile system of hard-surfaced roads in the county. Most of these are of concrete, with a small extent of brick and asphaltic-concrete.

Nashville Votes Million-Dollar Sewer Extensions

A bond issue of $1,000,000 for sewer extensions was authorized by popular vote at Nashville, Tenn., on Sept. 29. A vigorous campaign for the bonds was made, in view of the fact that half the population is without sewer facilities, that there are 12,000 open privy vaults in the city, and that up to Aug. 31 of this year 213 cases of typhoid fever had been reported in Nashville.

Ohio University Erects Buildings for U. S. Airplane School

The Ohio State Emergency Board, composed of the governor, the attorney general, the auditor of state and the chairmen of the two legislative finance committees, has appropriated $80,000 for the erection of four new buildings to be used for the Government aviation school located at Columbus, Ohio, on the grounds of the State University. The money comes out of the fund of $250,000 appropriated each year by the State Legislature for emergencies that may arise in state offices.

The buildings will consist of two frame barracks, one machine gun range and one laboratory. The two barracks buildings will be frame structures, each housing 200 men. The machine gun range has been found necessary because previous practice with these guns behind Robinson laboratory attracted so much attention that a dangerous situation was created. The laboratory itself is to be the most elaborate structure. One end of it will contain hangars, where two airplanes will be placed and used for experimental purposes.

Maintains That Garbage Is Private Property

Right to the garbage from their restaurants and to dispose of it as they see fit so long as the method is sanitary is claimed by J. B. Pantlind and W. W. Lawrence, two restaurant proprietors of Grand Rapids, Mich., who have secured a temporary injunction supporting their claim. The city has been collecting this and other garbage and turning it over to Henry Hartman for feeding to hogs. Originally, the plaintiffs claim, the ordinance under which the city is operating was designed solely for sanitary protection, but for some years past the city has been attempting a monopoly for commercial gain. The plaintiffs want their garbage to feed to hogs on their own farms, outside the city.

Cincinnati Will Vote on New Charter Nov. 6

A home rule charter for Cincinnati, Ohio, has been framed by a charter commission and will be submitted to popular vote on Nov. 6. The home rule section of the charter merely provides that the city "shall have all powers of local self-government and all other powers possible for a ctiy to have" under the state constitution. Beyond this the new charter seems to differ from the present one chiefly in lengthening the terms of appointive officers (some of the latter to eight and even ten years); in adding slightly to the number of officials appointed by the mayor; and in creating the office of director of street railroads and providing for a city-planning commission. The mayor, councilmen and auditor will be elected for terms of four years. Other chief executive officers will be appointed by the mayor. The director of street railroads will succeed to the powers now vested in the mayor and street railroad commissioner and to some of the powers vested in the board of rapid transit commissioners, but apparently his powers will be confined chiefly to regulating street railroad companies.

The planning commission will consist of seven members. Of these five will be the mayor, director of public service and the three park commissioners and two will be citizens appointed to serve for six years, without pay. The commission will have broad planning powers, some of which will be advisory and some exclusive and final, unless overridden by a two-thirds vote of the council. The planning commission will serve as the platting commission of the city. In this respect it appears that its powers will be exclusive over layouts of streets, alleys, commons or other ground for public use, within and three miles outside the corporate limits of the city.

Alvord Put on Illinois Resources and Conservation Board

Governor Lowden, of Illinois, has appointed John W. Alvord, of Alvord & Burdick, hydraulic and sanitary engineers, Chicago, a member of the Illinois State Board of Natural Resources and Conservation, which is to study the resources of the state, the work of its departments under the lines indicated, and advise the governor and the legislature from time to time on matters in which the welfare of the state may be promoted. The other members of the board, all of whom serve without compensation, are: Geology, Prof. Thomas C. Chamberlain; biology, Prof. John M. Coulter (both of the University of Chicago); chemistry, Prof. William A. Noyes; forestry, Prof. William Trelease (both of the University of Illinois.

Mr. Alvord is to advise on water resources. President Edmund J. James, of the University of Illinois, is ex-officio member and will act as chairman of the board.

Hearing To Be Held in Newark on Wanaque Watershed

The North District Water-Supply Commission, Newark, N. J., will hold a hearing at the City Hall on Oct. 18, at which may be represented such municipalities as desire to enter the Wanaque watershed development project. At the hearing the Board of Works will make application to the Water Commission to construct a reservoir and pipe line for an additional water-supply of 10,000,000 gal. daily for that city.

May Stop Burning Garbage

A proposed change in the method of garbage disposal at Minneapolis, Minn., now under consideration by a committee of the city council, would involve an abandonment of the incineration and heat utilization plant as well as giving up the practice of draining garbage and wrapping it in waste paper in kitchens before depositing it in the garbage can. Agitation for a change was started by objectors to the present central loading station and accelerated by the conservation movement sweeping over the country. Three plans for a new method of disposal are before the city council: (1) Delivery by the city to a central point for loading on cars, under a contract with Rogers & Rogers, St. Paul, who offer 50c. a ton if the contract is for three years and 55c. if for five years. (2) Delivery by the city to the United States Engineering Co., of Chicago, which offers to build a reduction plant outside the city and pay prices, not yet made public, depending in part on the length of the contract. (3) A municipal piggery.

The Board of Aldermen have applied to the State Public Safety Committee for $100,000 or $150,000 with which to establish a municipal garbage piggery, the money to come from the $1,000,000 State War Fund at the disposal of the committee. In a report made by F. W. Cappelen, city engineer, before this request was filed with the committee, it was estimated that garbage disposal at a municipal piggery would yield the city a profit of $70,000 as compared with the present net expenditure for garbage incineration at the joint plants for garbage burning and for heating and lighting certain public institutions and some adjoining streets.

Oregon State Highway Department Designs 25 County Bridges

During the present year the State Highway Department of Oregon has drawn plans for 25 county bridges, the total cost of which aggregates about $500,000. Most of the structures are at present under construction. The principal one is the steel and concrete bridge across the Willamette River at Salem, which is being erected by Marion and Told Counties jointly. The cost of this structure is about $250,000, and next in cost comes the proposed concrete arch across the Des Chutes River, being erected by Sherman and Wasco Counties. This new bridge will replace the present toll bridge. Other structures on which work is being done in the highway office are 10 structures for Coos County at $32,000; 10 bridges for Columbia County, totaling $46,000; four bridges for Hood River County, totaling $11,400; three for Wasco County, $14,700; and three structures for Tillamook County, totaling $46,000.

Fewer Granite Paving Blocks Sold in 1916

According to figures reported to G. F. Loughlin, of the U. S. Geological Survey, Department of the Interior, there were sold in 1916 44,795,796 granite paving blocks, valued at $2,288,486, a decrease of nearly 7% in quantity and of nearly 3% in value compared with the figures for 1915. The average price per thousand, however, increased from $48.85 to $51.09. Four of the 18 producing states, Maryland, New Hampshire, North Carolina and Wisconsin, showed increase in quantity and value of sales.

The decrease in quantity in 1916, though smaller than that in 1915, was even more general. As there has been a growing recognition among city engineers and street commissions of the suitability of granite paving blocks for streets supporting heavy traffic, the decrease in quantity of paving blocks sold in 1916 appears due to a decrease in the amount of heavy traffic construction work, rather than to competition with other paving materials.

The quantity and value of paving blocks sold in these and in states producing more than 1,000,000 blocks during 1915 and 1916 were as follows:

	1915	
	Number	Value
Wisconsin	19,229,714	$577,758
Maine	10,910,032	475,527
New Hampshire	4,243,753	205,456
Massachusetts	3,180,441	28[illegible]612
North Carolina	4,024,677	191,796
Georgia	[illegible]659,970	108,177
Minnesota	1,859,715	128,940

	1916	
	Number	Value
Wisconsin	11,003,358	$[illegible]622
Maine	8,823,252	430,753
New Hampshire	5,486,815	247,177
Massachusetts	[illegible]994,777	28[illegible]640
North Carolina	4,376,383	200,851
Georgia	3,168,927	105,350
Minnesota	1,292,186	[illegible]186

The average price per thousand varied from as low as $32 in California and $33 in Georgia to $66 in Minnesota and Rhode Island. There was little geographic significance to differences in average price, other than a relatively low price for labor in the Southeastern States. The principal controlling factor was apparently the ease with which the blocks could be prepared. Thus the average price in New York ($45) and in Georgia ($33), where easily worked granite blocks are abundantly produced, were in contrast to that in Massachusetts ($53), where many of the granites are unusually hard, and with those in Wisconsin ($36) and Minnesota ($60), which are characterized by hard granites.

The value of sales of "Belgian" granite paving, reported by two producers, is not included in the foregoing figures.

Interior Department Wants Engineers To Classify Lands

The large appropriation for the work of classifying public lands in Western States with regard to their value for grazing and raising forage crops having become available in June, Secretary Lane, of the Interior Department, has instructed the United States Geological Survey to undertake the work on the more than 20,000,000 acres scattered through 15 states. A number of qualified men are urgently needed who will serve on the survey staff after certification by the Civil Service Commission. Open competitive examinations have been announced for the position of junior land classifier at salaries of $1080 to $1200 a year, assistant land classifiers at salaries of $1500 to $1800 a year, and classifiers at salaries of $1800 to $2400. Expenses while on duty will be paid by the survey.

Applicants will not be subjected to formal written examination nor will they be required to assemble for examination in any particular place, but will merely have to file with the commission certificates as to their training and experience. Recent college graduates who have specialized in agricultural or civil engineering are especially desired, though there are openings in the higher positions for men who are trained in plant ecology, geology and forestry. Further information can be secured by addressing the Director of the Geological Survey, at Washington, and proper application forms and detailed instructions as to their use can be obtained from the Civil Service Commission in Washington or any of its local secretaries.

The completion of classification is hoped to result in a large increase in the production of live stock.

War Conditions Postpone Another Convention

Owing to conditions arising from the war, the Society for Street Cleaning and Refuse Disposal of the United States and Canada has decided to abandon its annual convention this year. The labor situation is so acute that officials in charge of street cleaning and refuse disposal feel reluctant to leave their work for even the short time necessary to attend a convention.

Charleston Buys Water-Works

The water-works plant of the Charleston Light and Water Co., Charleston, S. C., passed into the hands of the city named on Oct. 1. The purchase price was $1,500,000. Bonds to the amount of $140,000 for extensions have been authorized. For some years the works were under the direction of John M. Diven, now superintendent of water-works at Troy, N. Y., and secretary of the American Water Works Association. The manager of the works under municipal ownership is J. E. Gibson, who was principal assistant engineer on the construction of the works for the American Pipe and Construction Co.

PERSONAL NOTES

CAPT. HOWARD SCOTT, with the Imperial British Munitions since the beginning of the war, and formerly of the contracting firm of Scott & Law, Buffalo and Rochester, N. Y., has accepted a position as superintendent with the Bates & Rogers Construction Co., at Camp Grant, Rockford, Ill. Abroad he was employed at the Woolwich Arsenal constructing works for electric products, acetone and cordite. Toward the end of his 28 months' service he was sent to the Rhone Valley, France, on hydro-electric plant construction. Testing high explosives on the Nancy-Verdun front he was disabled six months ago and returned invalided after four months in the hospital. From 1907 to 1910 Captain Scott was with S. Pearson & Son, London, on hydro-electric development and railway and dam construction in Central America and Mexico until the Mexican difficulties curtailed further activities in that country. He was then for two years with the Brazilian Government on the Paraña hydro-electric and irrigation development, and later for a few months with the Ambursen Hydraulic Construction Co. on the Eugena Dam in Ontario.

GARDINER S. PLUMLEY, who for the past 10 years has been connected with the Blue Creek Coal and Land Co. and the Kanawha & West Virginia Railroad Co., in the capacity of chief engineer, has opened an office at Charlestown, W. Va., to engage in private practice of civil and mining engineer. He will still retain his connection with the Blue Creek Coal and Land Co. as consulting engineer.

PAUL O. SULTZER, formerly with the Montana Power Co., has purchased the Inter-Mountain Map Co., of Boise, Idaho.

R. F. MACDOWELL is located at Camp Sherman, Chillicothe, Ohio, as resident engineer representing R. Winthrop Pratt, who is consulting engineer on this work.

ALBERT H. BAUM, JR., is at present superintending the construction of the new high school being erected for the Redfield Independent School District No. 20, of Redfield, S. D. Mr. Baum is representing William B. Ittner, architect, St. Louis, who designed the building.

CAPT. J. MCLEAN JASPER, formerly with Alvord & Burdick, Chicago, is now in charge of signaling instructions at the English Officers' Cadet School, near Maresfield, Sussex, England. At this point there are about 1000 cadets training for the heavy artillery, they being kept under instructions for a period of about four months. The camps are turning out about 125 men every two weeks. Early in the war Captain Jasper, who lacked but ten days of getting his final United States citizenship papers, left for England and was placed in command of a battery of field guns. Later he was in charge of constructing horse standings for the 36th Division, and then was placed in charge of gun-pit construction and on communication work. He was transferred to the Royal Engineers, but was wounded before he could assume his new work. He then entered the Reserve Training Brigade as examiner of gunners upon his recovery, and was later placed in command of the school of signaling mentioned above.

JOHN T. KEENAN, an assistant engineer for the Providence Water-Supply Board, has been commissioned major in the Engineer Officers' Reserve Corps.

C. M. HALL was elected president of the Atlanta Association of Members of the American Society of Civil Engineers. Mr. Hall is a consulting engineer, with offices in Atlanta. PROF. T. B. BRANCH, of the civil engineering department of the Georgia School of Technology, was elected vice president, and W. C. SPIKER was elected secretary and treasurer.

JAMES K. JAMES, who for the past seven years has been resident engineer of the fuel oil department of the Southern Pacific Co., at Taft, Calif., has been commissioned captain in the Engineer Officers' Reserve Corps, and is now at Vancouver Barracks, Washington.

HERBERT M. PALMER is at present in the employment of the Staten Island Shipbuilding Co., Mariners Harbor, Staten Island.

CAPT. D. M. OLTARSH has been assigned to Newark, N. J., for the construction inspection on materials which are being made for the Government.

F. H. LANE, manager of the department of examinations and reports of H. M. Byllesby & Co., Chicago, will have temporary charge of the engineering and construction department of this company, succeeding CAPT. W. R. THOMPSON, now located at Battle Creek, Mich., on cantonment work; and A. H. FAYCE, who has joined the Second Reserve Officers' training camp, has left for Fort Sheridan.

ROY E. WENK, formerly draftsman for the Public Service Co. of Northern Illinois, is at present in charge of construction of a milk condensary at Fox Lake, Wis., for Libby, McNeill & Libby, of Chicago.

M. O. ELDRIDGE, of the Office of Public Roads and Rural Engineering, whose article on "Serial Bonds" appeared in the issue of Aug. 30, has just returned from a trip of inspection through the Southern States.

MANCHE O. BENNETT, division engineer of the eastern Oregon highway district, at Pendleton, and FRANCIS E. KURTZ, district highway engineer of Jackson County, recently tendered their resignations to Herbert Nunn, state highway engineer. No appointments have been made to fill these vacancies, and the work being done by them will be taken over by enlarging other divisions.

W. C. HAWKINS has been appointed engineer, maintenance-of-way, of the Coal and Coke Ry., with office at Cassaway, W. Va., succeeding F. D. COSNER, resigned.

J. H. GUMBES, formerly superintendent of the Philadelphia Terminal Division of the Pennsylvania R.R., has been appointed general superintendent of the Western Pennsylvania Division. Graduating from the University of Pennsylvania in 1888, Mr. Gumbes entered railroad service as a rodman on the Middle Division of the Pennsylvania R.R., being transferred to the maintenance-of-way department in 1890 and promoted to assistant supervisor at Freeport, Penn., in 1891. Transferred to a similar position at Mifflin, Penn., in 1893, he was promoted to supervisor at Millersburg in 1897, and in 1899 was transferred to the Monongahela Division as supervisor, returning to Mifflin as supervisor in 1900. In 1901 he was transferred to the position of supervisor at Florence, Penn., and in 1903 was promoted to division engineer in the Monongahela Division. In 1905 he was transferred to division engineer of the West Jersey & Seashore, and was made division engineer of the Pittsburgh Division in 1907. Promoted to assistant superintendent of the Pittsburgh Division in 1911, he was made superintendent of the Renovo Division in 1913.

W. K. PALMER, who for 16 years has been engaged in consulting engineering practice as the head of the firm of W. K. Palmer Co., engineers, Kansas City, Mo., has accepted a commission as major in the Engineer Corps, U. S. A., and in consequence will discontinue his practice and the business of the company of which he is the head for the period of the war.

H. R. ADAMS, formerly on the Federal-aid highway improvement work in northern Alabama, is at present connected with the topographical branch of the United States Geological Survey, with headquarters at Washington.

E. N. TODD, civil engineer and superintendent of construction, Quartermaster Corps, U. S. A., has recently been transferred from Ft. Morgan, Ala., to the Quartermaster Depot, St. Louis, Mo., where he will have charge of the construction of several large warehouses. Mr. Todd returned last September from the Philippine Islands, where he spent one year in the department quartermaster's office as designing engineer.

L. R. P. REESE has resigned his position of assistant city engineer of Fort Collins, Colo., to join the second training camp for reserve officers at the Presidio, California.

CAPT. T. M. WARD, engineer of bridges and buildings on the Seward Division of the Alaskan Government

Rys., has been assigned to the Engineer Corps, U. S. A., and ordered to report at the cantonment at American Lake, Washington. Captain Ward served in the Spanish-American war as captain of volunteers.

ROBERT W. THOMPSON has been appointed district engineer by the Government of British Columbia and will have headquarters at Kamloops.

OBITUARY

LIEUT. EDWIN AUSTIN ABBEY, of the Fourth Canadian Mounted Rifles, has been killed in action. Born in Mt. Holly, N. J., he graduated from the University of Pennsylvania and became connected with the construction and valuation department of the Canadian Pacific Ry. In October, 1915, he enlisted in the Second Canadian Pioneer Battalion, and after being in training camps both in Canada and in England, saw his first service at Ypres, where he was wounded on Apr. 23, 1915. After his recovery he was commended for a commission, took the course at the Officers' Training School at Shorncliffe and returned to the front December, 1916, as lieutenant of the Fourth Canadian Mounted Rifles. Since that time he was in continuous service, being killed by an enemy sniper at Vimy Ridge, Apr. 10, 1917.

ROYAL CANFIELD PEABODY, president of the Combustion Engineering Corporation, died Sept. 15.

EDWARD MEAD, at one time city engineer of Nashville, Tenn., and later connected with the engineering department of the Nashville, Chattanooga & St. Louis R.R., died in Nashville, Sept. 16.

CRAIGE RIDGWAY, for 54 years head of the Craige Ridgway & Son Co., manufacturers of steam hydraulic machinery, Coatesville, Penn., died recently.

BUSINESS NEWS

To Investigate Slack in New York City Building

Progress is being made in the movement inaugurated by the New York City Building Materials Exchange to stimulate new construction work, according to reports recently received. At a meeting held Oct. 2 in the office of the president of the Borough of Manhattan, Elliott Smith, president of the exchange, appointed five subcommittees to care for various phases of the present slack condition of building. These committees are: (1) On the demand for buildings, (2) on the supply and price of building materials, (3) on the supply and price of labor, (4) on the supply and price of mortgage money, (5) on building laws.

C. J. Curtin, a member of the exchange who has been prominently identified with the movement, said to a representative of the *Engineering News-Record* that owners, loaning institutions and tenants must realize that conditions are now at a different level, and that they must therefore adjust themselves to the new conditions. This statement, Mr. Curtin says, is particularly true of the loaning institutions. A fairer appraisal must be made upon which loans should be based. These new appraisals must not be based upon values as they existed last year. Since there is little likelihood that prices will be adjusted on a lower basis for a long time to come, it costs more today to produce a building than ever before. The effect of Federal price revision will only influence building at the present time to a certain extent, and it becomes necessary therefore to obtain better loans in order that industry may keep step with the demands of the Government and its citizens.

Goethals Heads Wright-Martin Airplane Company

At a meeting of the directors of the Wright-Martin Aircraft Corporation, held Oct. 4, Maj. Gen. George W. Goethals was elected president. Since his retirement as general manager of the Shipping Board as the result of friction with Chairman Denman, he has been engaged chiefly in undertakings of his engineering firm, Goethals, Jamieson, Houston & Jay. As head of the company manufacturing airplanes, he will continue to act in an advisory capacity on consulting engineering work.

Notes from

MAKERS OF PLANT AND EQUIPMENT

Walter Lochen, 86 Michigan St., Milwaukee, has been appointed sales representative in Milwaukee and vicinity of the National Fireproofing Co., Chicago Metal Weather Strip Co. and the Donley Bros. Co., Chicago.

The United States Terminals Co., 400 Lewis St., Weehawken, N. J., has been incorporated with a capital of $1,000,000 to build piers, wharves, etc. The incorporators are Lionel Isaacs, William F. Harney and Frank Galland, all of 400 Lewis St., Weehawken.

R. M. Howard, who was formerly assistant construction engineer for the Berger Manufacturing Co., Canton, Ohio, is at present in the sales department of the Trussed Concrete Steel Co., at Youngstown, Ohio.

The Portable Machinery Co., Inc., Passaic, N. J., has issued a leaflet describing its Pomato Scoop Conveyor for loading, unloading, storing or reclaiming coal, stone, sand and manufactured products of a similar character.

The Patterson-Kelley Co., Inc., 20 Cortlandt St., New York City, has been formed from a combining of the interests of **Frank L. Patterson & Co.** and **Benjamin F. Kelley & Son.** The new firm will specialize as water-heating engineers and manufacturers of heaters.

The Worthington Pump and Machinery Corporation announces the opening of a new branch sales office in the American Trust and Savings Bank Building, Birmingham, Ala. This new office will take care of the portion of the very large territory hitherto controlled by the Atlanta office and has been established with a view of rendering better service to the trade and affording more direct connections with the home office to that portion of the territory which will come under its direction. Edward Stauverman, formerly with the Atlanta office, will be in charge of the new branch. The territory controlled from the new office will be all of the State of Alabama, excepting the following counties: Choctaw, Clark, Monroe, Washington, Conecuh, Mobile, Baldwin and Escambia, and all of the State of Florida, except the counties of Okaloosa, Escambia and Santa Rosa, and all of that portion of the State of Georgia south of the Seaboard Air Line running from Columbus, Ga., to Savannah, Georgia.

The El Paso Bridge and Iron Co., El Paso, Tex., has contributed to the present war the following men of its staff: E. P. Rankin, Jr., captain, engineers, Fort Leavenworth, Kan.; Henry E. Robertson, captain, infantry, Camp Travis, San Antonio, Tex.; L. L. White, captain, artillery, Camp Travis, San Antonio, Texas.

The Blaw-Knox Company, of Pittsburgh, owing to conditions created by the war, has decided to close its Boston office until peace is declared. All inquiries and all work in the Boston territory will be handled through the company's New York office, 165 Broadway.

The Asbestos Protected Metal Co., of Pittsburgh, announces the appointment of Ole K. Olsen, 822 Pardido St., New Orleans, as sales agent for the State of Louisiana and the southern portion of Mississippi.

W. P. Anderson, president of the Ferro-Concrete Construction Co., of Cincinnati, has gone to Belvoir, Va., on duty as captain, Engineer Officers' Reserve Corps.

The Atlas Cement Construction Co., Ltd., of Montreal, is building a self-propelling reinforced-concrete ship, with a hull varying in thickness from 3 to 5 in. The ship's dimensions will be: Length, 125 ft.; beam, [illegible] ft.; moulded depth, 12 ft. Metal for the keel is in place and many of the structural ribs for the hull have been set up.

J. K. Robinson, Chicago representative of the Westinghouse Electric Export Co., died at his summer home, Naples, Maine, Sept. 7.

The F. H. Letson Co. announces the opening of an office at 50 Church St., New York City, for the handling of hoisting and power machinery and contractors' equipment. Mr. Letson has

associated with him Frederic Glander, electrical and mechanical engineer. Because of the unusual conditions prevailing and the difficulty of securing new equipment promptly, a used machinery department has been organized and the company is prepared to quote on requirements in this line. Mr. Letson for 17 years was New York sales manager for the American Hoist and Derrick Company.

The officers of the American Steel Export Co., New York, on Sept. 13, at the Waldorf, gave a farewell dinner of twenty covers to Samuel Armstrong Benner, who has resigned his position as general sales manager of the company to become vice president of the Federal Export Company.

The Macleod Co., Cincinnati, Ohio, in order to take care of expanding business in sand blast equipment and metallurgical furnaces, has enlarged its plant and increased its capital to $100,000.

H. E. Linden, of the Beckman & Linden Engineering Corporation, of San Francisco, is making an extended trip throughout the East in the interest of his own company and also in the interest of the Pacific Electro-Metals Co., of which the Beckman & Linden Engineering Corporation are the engineers and managers.

TRADE PUBLICATIONS

The Link-Belt Co., 39th St. and Stewart Ave., Chicago, Ill., has issued Book No. 246, illustrating and describing electric hoists, and Book No. 342, entitled "Casings and Lubrication for Link-Belt Silent Chain Drives."

The Marion Steam Shovel Co., Marion, Ohio, has issued a new general catalog on steam and electric shovels, dredges, excavators, ditchers, etc.

David White Co., 419-421 East Water St., Milwaukee, Wis., has issued a new catalog and price list of surveyors' instruments.

Locomotives for industrial and contractors' service are described in Record No. 86, just published by the Baldwin Locomotive Works, Philadelphia, Pennsylvania.

The Whiting Foundry Equipment Co., Harvey, Ill., has issued three new catalogs, as follows: Catalog No. 129 on brass foundry equipment; Catalog No. 129 on the Whiting converter; Catalog No. 131 on the Whiting cupola.

Bulletin W-308, covering duplex piston pattern pumps, and Bulletin W-400, on outside packed plunger pattern pumps, have been issued by the Worthington Pump and Machinery Corporation, 115 Broadway, New York. These bulletins give tables of sizes and capacities.

The Walter A. Zelnicker Supply Co., St. Louis, Mo., is sending out Bulletin No. 220 on rails, locomotives, cars, steel piling, etc.

"Machines That Do the Work of Men" is the title of an illustrated booklet issued by the Allied Construction Machinery Corporation, of New York, a coöperative selling organization under the management and direction of the American International Corporation. Explanatory text and typical views show the varied service to be expected from power-driven machinery such as concrete mixing and spouting outfits, revolving shovels, grab buckets, heavy steam shovels, road-grading equipment, rock crushers, steam rollers, tractors, trenching machines, pile drivers, etc.

APPLIANCES AND MATERIALS

Roller in Lumber Truck Body Expedites Unloading

The Chicago Pneumatic Tool Co., of Chicago, maker of the "Little Giant" motor trucks, are turning out trucks fitted with a special body for lumber dealers. In the platform of the body are five rollers projecting above the floor, so that the load rests on them. When the loaded truck is to be unloaded, a crank is applied to one of the rollers and the entire load, moving as a unit, is backed partly off. A chain is then put around the pile and the timber is placed crossways on the ground. The load is then turned off backward by cranking one of the rollers until one end rests on the ground. Then another chain is placed around the pile at the other end and the truck is run a few feet ahead so that the load drops in a perfect pile. The single timber between the pile and the ground allows the chains to be removed quickly. Portable platforms provided with similar rollers are used for loading lumber out of cars and transferring the load as a unit to these trucks.

Trackless Electric Locomotive with Dumping Body Goes Anywhere

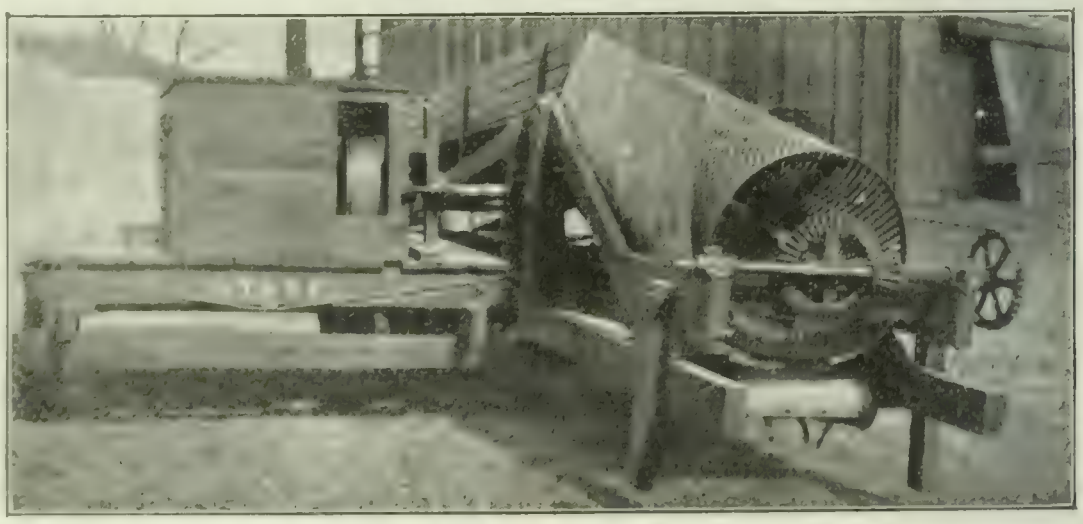
The latest thing in industrial trucks appears to be a small industrial electric (storage-battery) locomotive fitted with flangeless wheels and rubber tires and carrying a Lee side-dumping hopper of 1½-yd. capacity, made by the Buda Co., Railway Exchange Building, Chicago. The overall dimensions of the machine are: Length 8 ft., width 4 ft., height 4 ft. Similar units are made with the body dumping front or back.

Rotary Machine Screens Stone Ballast Alongside Track

A rotary screen for cleaning stone ballast alongside the track has been patented by G. C. Harris, of Chapman, Kan., and used by him on the Atchison, Topeka & Santa Fe Ry. The machine is now being put on the market by the Madden Co., of Chicago.

A rotary perforated screen with an inclined belt conveyor feeding into one end is mounted on skids placed at the side of a motor section car having a 3-hp. gasoline engine. The screen and conveyor are outside of the track but parallel with it. They are not permanently attached but can be removed for transportation. The screen is 4½ ft. long and is revolved at a speed to suit the character of the material handled. It is driven by a bevel gear, with chain drive from the engine shaft to the bevel pinion shaft, as shown. The weight of the machine complete is about 600 pounds.

The stone ballast shoveled from the track is thrown upon the belt, which delivers it to the upper end of the screen. The cleaned stone is delivered from the end of the screen along the side of the track, or between the tracks, the machine being moved ahead as the work progresses. The dirt which passes through the holes in the screen is caught on a belt conveyor and discharged by a chute or apron at one side of the machine. It may be discharged on the roadbed or into a wheelbarrow, etc., for removal.



BALLAST SHOVELED ONTO BELT IS RETURNED TO TRACK CLEANED

With a gang of 14 men, 12 will dig out the ballast and shovel it into the conveyor, while the others will attend to the machine and the handling of the dirt. This gang can screen 2000 ft. of track in a 10-hr. day. By the old method of using ballast forks they could clean only about 300 ft. In one test, a gang of 11 men cleaned 1780 ft. of track in 10 hours, during which time they had to remove the machine for 18 trains. On the same day a gang of 45 men with ballast forks cleaned only 1400 ft. of track in 11 hours.

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The Second Liberty Loan

THERE REMAINS but a week before subscriptions will close for the Second Liberty Loan of 1917. That means a week of opportunity—of opportunity to oversubscribe the issue vastly, of opportunity to readjust oneself mentally in order to make a personal subscription that will tax one's ability to meet. For that is the frame of mind to which everyone must come. We must expect the war to pinch us, to force us to hitherto unthought of economies and self denial. That attitude will come naturally if the war continues for a year or two, but if it could be attained quickly it would insure an earlier end of the conflict. We have not learned yet, as have England and France and Canada and Germany, to bend every energy to the war, the efforts of individuals as well as of the government and of industry. We are making progress, and these Liberty loans make us hasten our pace. No man can say truthfully that he has done his part unless his subscription is so large that the payments can be met only with difficulty and at the price of personal sacrifice.

Road Builders Are Responding to Call

IN AN effort to secure quickly volunteers for the new road-construction regiment, the 23rd Engineers, the commanding officer of that unit two weeks ago called upon this journal for help in securing the right type of men. To the appeal for highway-builders, published in our issue of Oct. 4, the results, as set forth on page 762 of this issue, have been highly gratifying. From all parts of the country the replies are pouring in. It must be remembered, however, that the plans for the new regiment, as previously announced, will make it the largest in the United States Army—practically the size of an ordinary brigade. In spite of the great volume of applications received to date, therefore, there is still room for more. Men with practical construction experience are the ones particularly sought. The campaign for men must continue with unabated effort until the ranks are filled. Engineers can be of immense help by rounding up recruits and by getting their local papers to pass the word along.

Army Camps Will Save Food and Other Wastes

WASTE utilization at national army and embarkation camps, under a plan worked out by Colonel Ellison for the War Department, bids fair to yield to the government a revenue of a million dollars a year, besides saving a million of capital outlay for destructors and other plant for final disposal of wastes, and a half million to a million annually of operating expenses. This is not all. The conservation of the various wastes will add materially to animal feed and to the fertilizer and grease resources of the country in a time of great need. This is no time to bury or burn the immense food wastes of either camps or cities.

Providing Against Tornado Losses

IN CERTAIN sections of the United States the danger to life and property from storms is greater than that from conflagrations, because not only is the expectation of occurrence greater, but the protection afforded is less. Against fire a city has the protection of safe construction and public fire-fighting facilities, to say nothing of the growing precautionary measures which tend to reduce occurrence of fires. Against extraordinary wind, only sturdy construction will prevail. Wind cannot be prevented and it cannot be fought. Probably because of this human helplessness in the presence of the great natural forces, destruction of structures by storm is still looked upon generally as an act of God against which precautions are futile. Building codes, which are fairly advanced in fire-protection details, rarely pay any attention to structural details to reduce loss by excessive wind in any but the highest class of steel frame. The framers of such codes would do well to read the analysis of three recent tornadoes in the middle west, as given by Mr. Ingberg on another page of this issue. This analysis shows that there are certain elementary rules of construction which will reduce wind losses materially, not only in the small buildings where such losses predominate, but also in some of the larger structures which fall within the provinces of the architect and the engineer.

Another Large City Adopts Commission Plan

ANOTHER VICTORY for better city government was recorded on Oct. 9, when the voters of Newark, N. J., by a large majority, indorsed the commission plan. Newark is the fourth city of more than 300,000 population to adopt commission government, the other three being Buffalo, New Orleans and Jersey City. Large and small, five hundred cities of the United States have discarded their overlapping and conflicting councils, boards and single-headed commissions and put all their municipal affairs in the hands of small commissions. By this means power is centralized, responsibility fixed and efficiency made more readily possible.

What We May Come To

BY THIS DATE the Road Stone Control Committee, having control over road-stone quarries and slag dumps and works in England and Wales, will have put in full force their regulations or memorandum of procedure promulgated under date of July 11, this year. So drastic are these regulations and so fully do they recognize national necessity that the individual consumer has been practically pushed to one side—the quarry owners being permitted to retain but 5% of their present output to meet the urgent (sic) requirements of their private customers. Furthermore, they can supply no materials to any one, no matter whom, unless authorized by the committee, and they must furnish weekly reports of all materials supplied, indicating the amount and nature of the materials sent even to government departments, and to local or other authorities. Contractors and others carrying out services for the various government departments must submit their requirements to the committee on special forms, and furthermore must give due regard to the economy of railroad facilities in selecting the quarries from which they are to buy their materials.

It seems almost impossible that a contingency such as this indicates should arise. Of all construction materials stone is the most universally distributed. But there are, no doubt, other objects in the creation of the Stone Control Committee than merely the prevention of waste of the stone itself. Man-power as well as explosives and mechanical plant are being used to such a high degree of completeness that to waste a ton of rock may be equivalent to many lives on the battle front.

It is hard for us here in America to realize the press of circumstances which may bring about a situation of this intensity, but we are only a few months in the war and perhaps before the passage of another year—unless peace comes in the meantime—we may find ourselves in a like situation. And perhaps, after all, the utilization of certain modern governmental extensions, misnamed "socialistic principles," may be carried into our peaceful years with no damage to our individual freedom but with an actual and worth-while increase in our individual well being.

Closed River Gives Water-Front Streets

CLOSE the Milwaukee River to navigation by lake steamers. This is the main recommendation of a report made recently by local engineers at Milwaukee, Wis. The action indorses the editorial statement made in *Engineering News-Record* of July 19 to the effect that harbors in small rivers are obsolete as ports for the modern traffic of the Great Lakes. The Milwaukee report is based on an investigation which was commenced more than a year ago, and its conclusions were little, if at all, influenced by the river accident noted in the former editorial. The river is narrow and winding, crossed by numerous old drawbridges which are a hindrance to the city's busy street traffic. Near the river mouth there are conditions favorable to the development of up-to-date harbor facilities. The fact that such a development—long overdue—is now under consideration, is a strong argument in favor of the proposal to close the river, which would still be available for barge traffic. One of the most interesting features of the report is the proposal to build a viaduct along each side of the river, within the waterway, in order to provide new thoroughfares and relieve congestion in the strets of the busy section of the city. Thus new traffic routes would be established without encroaching upon the flow capacity of the channel, and without taking valuable property which is needed for buildings and other purposes. The plans, as noted elsewhere, are only tentative. But the general scheme is an excellent example of what may be planned by far-seeing men.

The Riddle of the Roads

ALTHOUGH scientific road cost data are becoming more and more valuable each day, highway engineers, in many cases, are putting into their files information which is seriously lacking in a number of particulars. This result is due to the fact that many men do not understand what cost data are, what items should be charged to maintenance, what segregation should be made of the various operations. Neglect of these matters has produced more or less doubt and confusion when records are consulted. But better times are in sight. Through discussion of these features of keeping road cost data a considerable improvement has been made, so that there are becoming available daily a larger and more and more valuable amount of road maintenance costs from many widely separated sections of the country.

One of the chief objects of these cost data is to determine the all-important question of the relative economy of various types of pavement under given conditions. This is the riddle which public officials, as well as taxpayers, expect the engineer to answer. A few highway engineers have ventured to make such an answer; the majority, however, very wisely have refrained. But in so doing they have called forth the criticism that they are remiss in a most important duty to the public. The few answers that have been attempted have resulted only in condemning the judgment of the engineers who made them, as it is manifest that their conclusions are not based on practical facts, but are in the last analysis, merely a tabulated statement of their personal opinions. Criticism of highways engineers in general follows: "They should have the proper data at hand, and be able to make a logical answer to the question as to the relative economy of various types of pavement," says the layman. Such criticism, *Engineering News-Record* believes, is not only unwarranted but betrays a lack of appreciation of all the conditions which surround this very complex problem.

The error lies in not considering how few the number of years has been since self-propelled vehicles, carrying heavy loads and moving at greatly increased rates of speed, created a new condition. This change has necessitated the construction of roads of far greater strength and durability than was ever before necessary. There are to be seen upon our country roads types of construction almost unknown for such work fifteen years ago. New methods and new types have been devised, as is evidenced in the remarkable development and use of the concrete road.

The wisdom that appreciates the necessity in normal times for the construction of roads giving promise of great durability has been impressed to a gratifying ex-

tent not only upon the minds of public officials but also upon the public generally. And so the demand for an answer as to what is the economical type of road becomes more and more insistent.

To determine definitely the real economy of a particular type of pavement we must have the results of long-time service tests. The essential factor is *time*. Many more years of experience with modern types of construction under the new traffic conditions must be had before engineers can determine with any reasonable precision their true relative economy.

Far from being a criticism for lack of foresight of highway engineers that such determinations have not been generally made, the situation demonstrates rather that nearly all highway engineers appreciate that they lack the essential element for making such determinations—and that those venturesome individuals who dare now to proclaim from their inner consciousness the answer to such a question only display total ignorance of the problem.

Engineers and the Typhoid Honor Roll

THE ENGINEERS and other sanitarians who have fought typhoid fever so persistently and successfully for the past three decades have reason to be proud of the typhoid record for 1916. The fifth annual typhoid survey made by the *Journal* of the American Medical Association shows that of the 60 cities of the United States having populations in 1916 estimated as 100,000 or more, 16 had typhoid death rates of less than 5 per 100,000, 19 of 5 to 10, 17 of 10 to 20, and 8 of more than 20 per 100,000.

From figures for 26 states (including the District of Columbia and Hawaii) made available in *Public Health Reports* for Sept. 21, it appears that one state had a typhoid rate in 1916 of less than 5 per 100,000; 11 of 5 to 10 (really 7.5 to 5.1); 8 of 10 to 20; and 6 of 20 to 34.2.

Two decades ago a typhoid death rate of 20 or less per 100,000 was regarded as creditable. In 1916, 52 of the largest cities of the country and 20 of the 26 states reported typhoid rates less than 20. In 1897, these states and cities might perhaps have been entitled to a place on a typhoid honor roll. Times have changed since then. With so many low records as were shown in 1916, the honor roll limit should now stop at say 5 per 100,000 for the cities and 7.5 for the states. With such standards, the roll for 1916 contains 16 of the 60 cities and 12 of the 24 states (District of Columbia and Hawaii here omitted) under consideration.

That 1916 was not an exceptional year is shown by the *Journal* survey. Half the 60 cities showed rates higher in 1916 than in 1915, yet except for a few cities the 1916 figures show a steady decline when compared with averages for the two previous half-decades.

Unquestionably, typhoid is vanishing. This was also shown, from a somewhat different viewpoint, in a quarter-century editorial retrospect in *Engineering News* of Mar. 29. Further evidence supporting the same conclusion is afforded by figures given in George A. Johnson's recent New England Water-Works Association paper on "Slow Sand Filters." These show that for the whole urban population of the United States the typhoid death rate was 48 per 100,000 in 1890, 40 in 1900, 27 in 1910 and (estimated?) 13 in 1917.

Encouraging as is the typhoid decline, the 1917 rate of 13 per 100,000 for a population estimated at 51,000,000, and also the 44 large cities and 12 states that have not yet attained the respective honor rolls of 5 and 7.5 per 100,000, show that while typhoid is vanishing much remains to be done in many quarters before it is vanquished.

The complete disappearance of typhoid is not to be expected. That a year may pass with almost no typhoid in a city of considerable size is shown by the leading city on the 1916 honor roll, Cambridge, Mass., with a rate of 0.9 per 100,000. Paterson, N. J., with 1.4, Spokane, Wash., with 2.0 and six other cities, making 9 in all, with rates of 3.5 or less per 100,000 in 1916, show possibilities which should be a stimulus to better sanitation and improved health board work in other cities.

The states which still have high typhoid rates should be stimulated to more vigorous and efficient action by the Massachusetts rate of 4.3, the Washington rate of 5.1 and the records of the ten other states on the honor roll of rates below 7.5.

What is pushing typhoid to the vanishing point? Where very high endemic rates have been cut down, the greatest factor has doubtless been purer water, including the substitution of public water-supplies for polluted private wells and of relatively pure for polluted sources of public supply. The better sanitary protection of sources of supply has played its part. Of great importance has been the widespread adoption of water purification by storage, sedimentation, coagulation, filtration, and chlorination. The installation of sewerage systems has contributed largely to typhoid reduction by speed in the removal of possible typhoid infection from houses and premises, and by making possible the abolition of cesspools and privies as polluters of private wells still in use for water-supply and as harbors for the typhoid-carrying fly. Many other agencies have helped in the campaign against typhoid but important as they are they need not be noted here, since engineers have much less to do with them than with improvements in water-supply and sewerage.

Anyone familiar with the water-supplies of the country is impressed by the fact that many of the cities with very low typhoid rates are not treating their water-supplies, or at most are only chlorinating them. But, broadly speaking, all the cities with low typhoid rates have good water-supplies, whether the latter are so naturally or are made so by purification; and there are numerous instances of low typhoid rates for which water filtration deserves chief credit.

In his own domain there is still much the engineer can do to vanquish typhoid—if only the cities will give him a chance to provide pure water and to remove and properly dispose of sewage. Money and trained men to operate these works, particularly to operate water-treatment plants under skilled supervision, are essential. Given a free hand to build properly and to operate efficiently, and freedom from political influence, the engineer and his brother sanitarians would soon transfer many a city and state from the roll of typhoid dishonor to the typhoid honor roll.

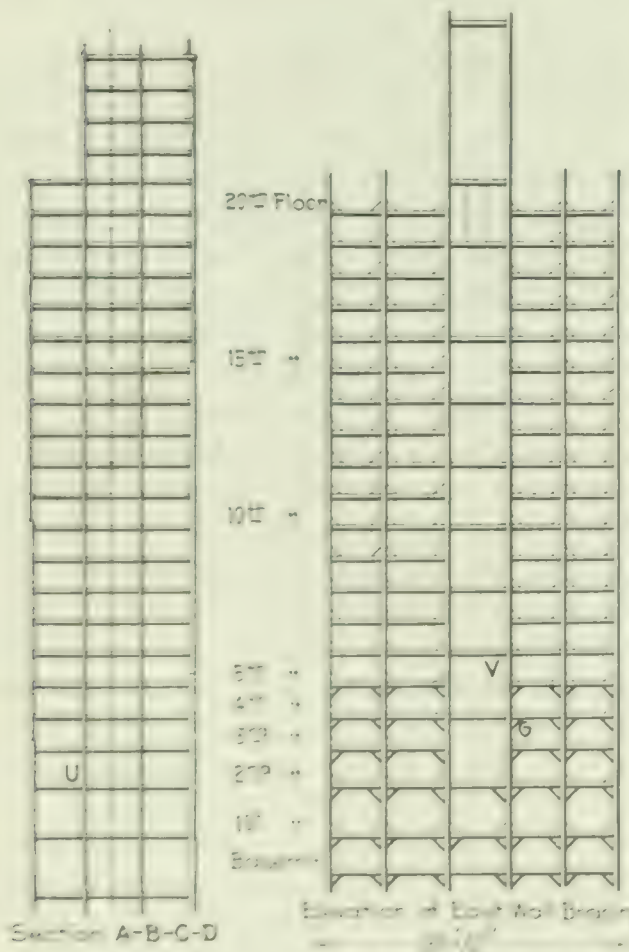
Tower Building Occupies Entire New York City Lot

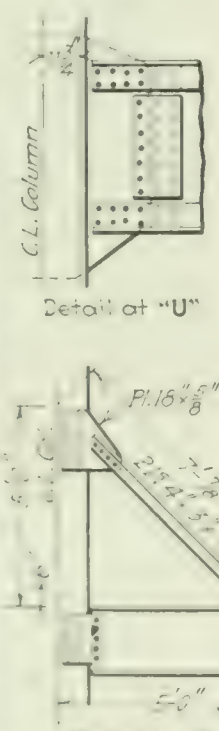
Though Covering the Full Area of a 50 x 90 Foot Lot, New Bush Exhibition Building Has Been Made To Look Like a Tower by Special Brickwork on Party Walls To Simulate Offsets

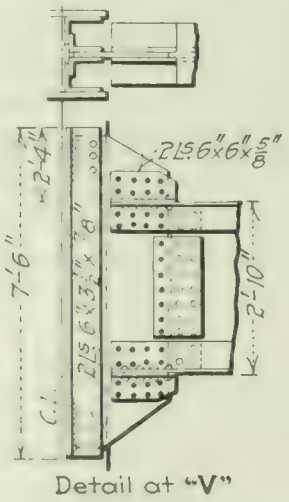
ONE PROVISION of the new zoning law in New York City prohibits the erection of a very high building over the full area of the lot. As a result the tower, made familiar by the Singer, Woolworth and Metropolitan Life buildings, will probably become more common in the Metropolitan area, because such a construction permits the recessed elevation and the decreasing of plan area with height authorized by the law. Just before the law went into effect, however, one building was started in up-town New York, which while conforming to the old type of full-lot occupancy for the entire height, at the same time was so treated architecturally as to give it the appearance of one of the more modern forms of towers. This is the Bush Building, recently completed on the south side of 42d St. near the corner of Broadway. Not only is it the highest building in up-town New York, but it is of such striking and original appearance as to make it conspicuously attractive.

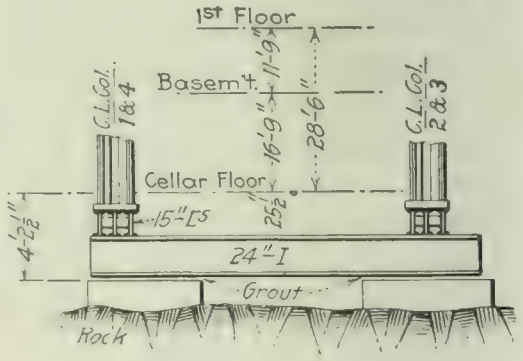
The Bush Building was built by Irving T. Bush, head of the Bush Terminal in South Brooklyn, originally as an exhibition building where the manufacturers from the terminal might exhibit their goods. It has grown to be a permanent exhibit building, and each of its 28 usable floors is given over to stores of sample merchandise of one sort or another for the attention of the visiting buyer. At one time it was planned to have hotel facilities in the house, but this has been abandoned, although meeting rooms are provided on the first floor.

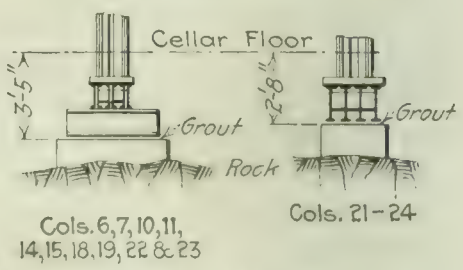
The original lot on which the building stands was 50 ft. wide and 90 ft. deep. On this lot was erected the

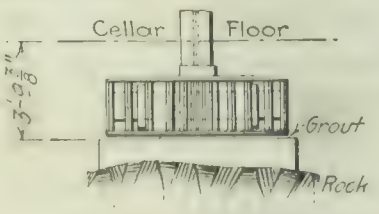


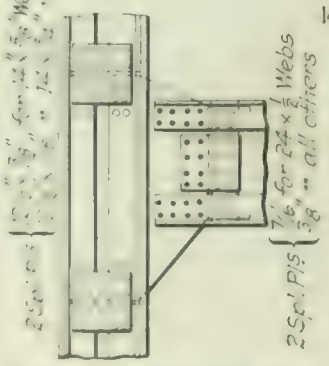


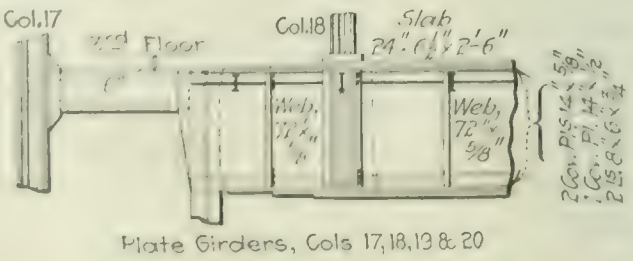


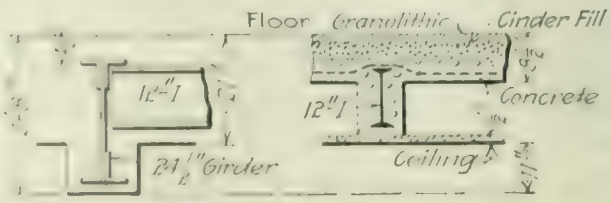












DETAILS OF COLUMNS

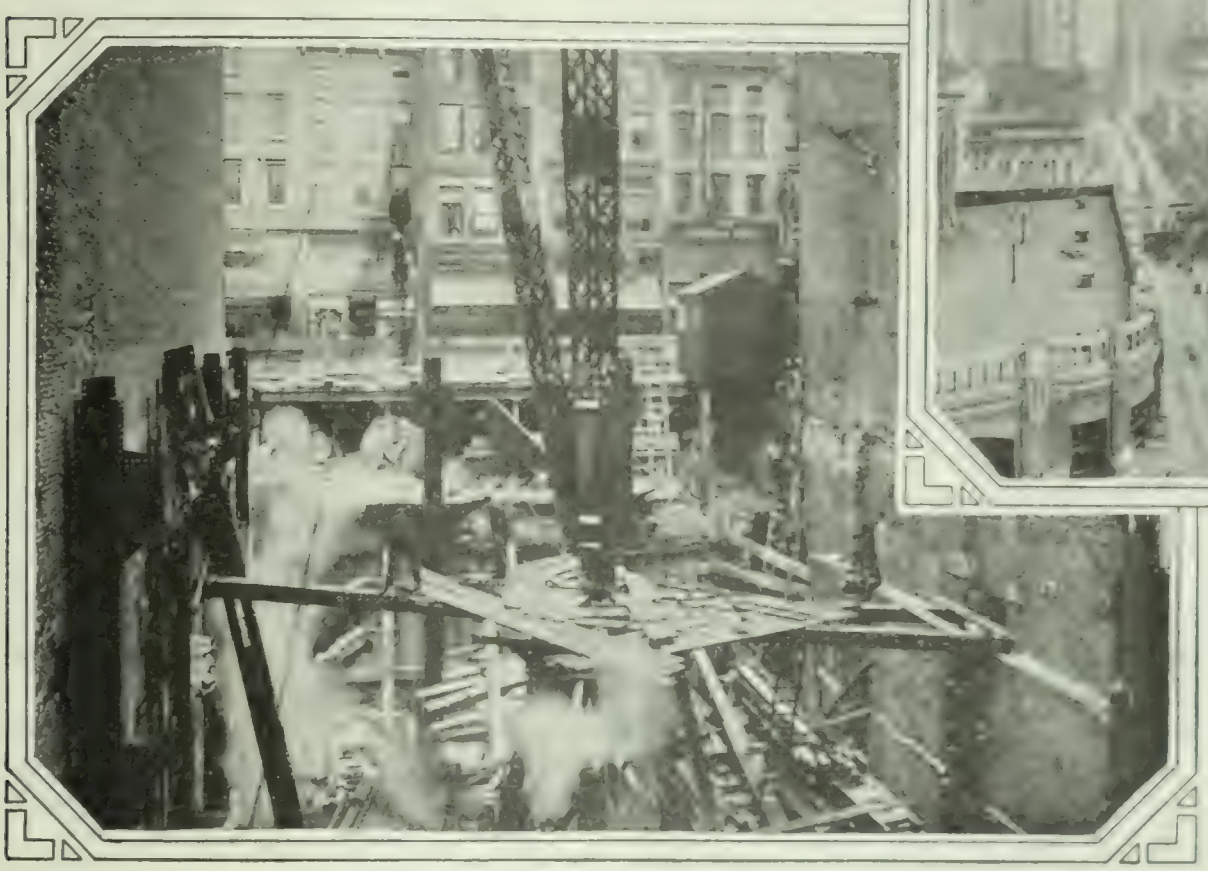
DETAILS OF STEELWORK OF THE THIRTY-STORY BUSH BUILDING IN NEW YORK CITY

steel frame of the building, 30 stories high. After this work was started the lot width through to 41st St. was acquired, and on this section there is now being built a nine-story reinforced-concrete building, the floors of which match and form one with those of the higher structure.

The new zoning law, which was by that time in force, limited the height of the 41st St. part. Brackets were placed on the rear columns of the steel frame, and the concrete girders of the rear portion were rested upon them. The concrete floor surface was then made continuous over the reinforced-concrete floor slab of the concrete building and the cinder-concrete slabs of the steel section.



BUSH BUILDING TOWERS FAR ABOVE NEIGHBORS OF GREAT WHITE WAY



FOUNDATION WORK IN BUSH BUILDING CARRIED OUT IN NARROW QUARTERS

The general details of the steel frame are shown in the accompanying drawings. They do not represent any great novelty, but furnish an example of high narrow framing. The plan is symmetrical, columns being placed on about 16-ft. centers in the narrow direction and in 18-ft. bays, with end bays of 16 ft. 3 in., over the long way. Girders are then framed across the building, with beams meeting the girders at the third points. This framing continues for 20 stories, when corner angle cut-offs reduce the plan somewhat to the 27th story, above which there is a further reduction in plan for architectural effect. The columns, however, continue through on their original lines.

One variation in the general plan occurs at the second floor, where two columns in the rear of the building are carried on a plate-girder across an auditorium area on the first floor. This girder, which is 29 ft. 10 in. between columns, is a box plate-girder section and is shown in detail on the drawing. The columns carrying it are offset from the regular position and are braced against the adjoining wall columns as shown.

On the east side of the building the party wall is broken by an inset bay which gives light to the floors. The west wall is plain up to the 20th floor but has windows above that height, because the adjoining building under the law cannot come that high. The east wall bay is braced by a cross-beam every second story.

The wind-bracing details are shown in the drawing. They consist of upper and lower diagonal braces on the long side of the building up to the fifth floor, and upper diagonal braces up to the 20th floor. The narrow section of the frame is braced with heavy gussets as shown. No additional anchorage was necessary at the footings to take care of the overturning moment.

The floors are of cinder concrete reinforced as shown in the detail with a cinder fill and granolithic finish. The columns are of built-up H-section, generally made up of a web with outstanding angles, and plates where needed. The wall columns, however, have two additional angles turned inward from the outer legs of the building-line angles of the column section.

The footings are on rock, which was found some 30 or 40 ft. below street level. They comprise concrete pedestals carrying independent I-beam grillages in the middle of the building, built-up girder grillages along the adjoining walls and cantilever I-beams along the 42d St. front. Considerable difficulty was had with the footing work on account of the very narrow space in which to work and because, too, of wet ground which required constant pumping. One of the views shows the foundation after the footings had been placed, the adjoining walls underpinned and the columns placed.

As has been noted, the building has a most striking appearance. No little part of its novelty is due to the



CAMOUFLAGE IN BUILDING. THE VERTICAL RIBS ARE NOT OFFSETS BUT COLORED BRICK

apparent pilasters on the side walls, giving the structure the appearance of a tower architecturally complete on all four sides. These offsets are in fact nothing but colored brick, so arranged as to simulate the shadows of vertical ribs, which simulation is helped by two horizontal bands of tile corbels, which are triangularly indented to represent the juncture of two angular surfaces. Up to the 27th floor the east and west walls of the building are flat and on the lot line, except for the window inset mentioned and the 4-in. projection of the tile corbels. The building is finished in two-toned brick and terra-cotta, with a finial of decided ecclesiastic touch.

The architects for the Bush Building are Helmle & Corbett, of Brooklyn, the structural steel designers, Post & McCord of New York, and the general contractor, the Thompson-Starrett Co., of New York.

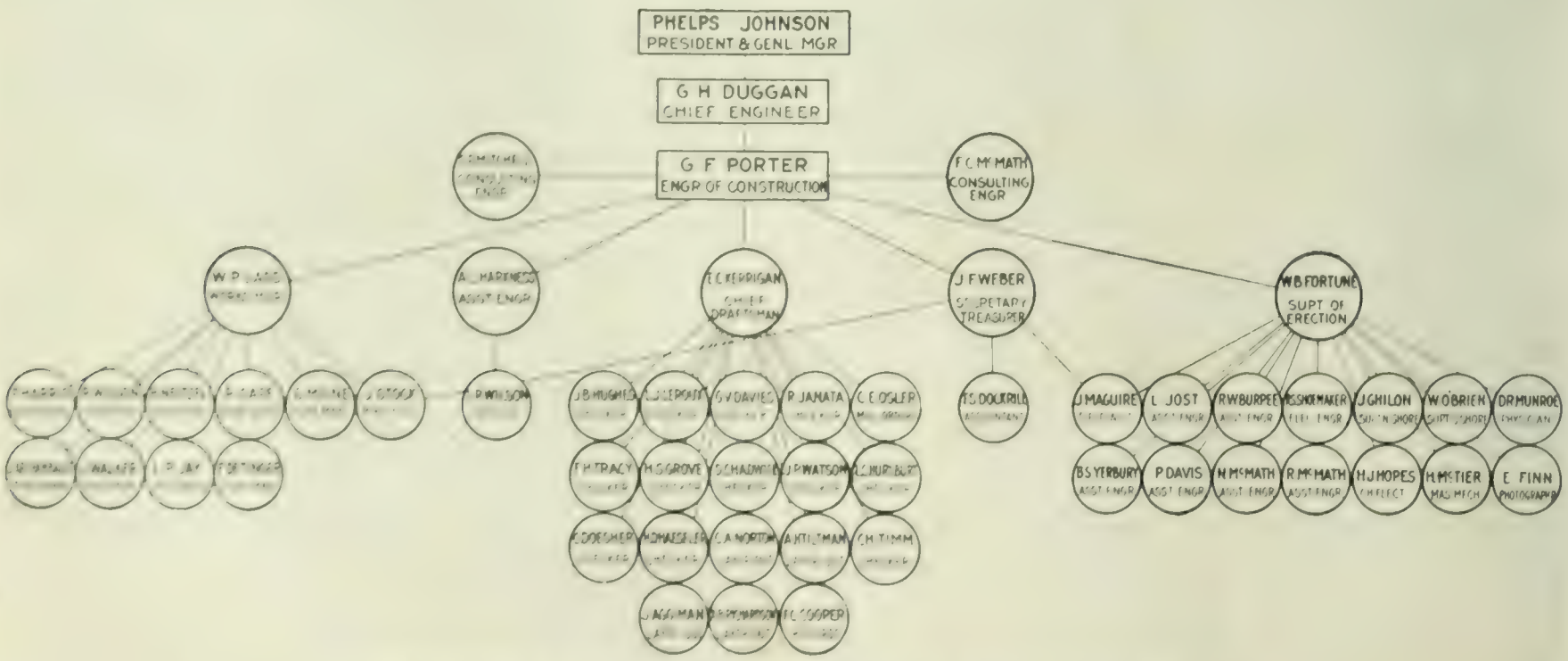
The Men Who Built the World's Greatest Bridge

Remarkable Organization Developed for Erecting Giant Structure at Quebec After Disaster of 1907

THE ENGINEERING world is familiar with the names, at least, of the men most closely connected with the second and successful attempt to construct the world's largest bridge, across the St. Lawrence River above Quebec. It is appropriate, however, as the work passes through its final stage following the raising of the suspended span, chronicled in *Engineering News-Record* of Sept. 27, p. 580, to publish their photographs for the benefit of the large part of the profession in this country and abroad which cannot have the privilege of knowing them personally.

In addition to the better known men most closely and continuously identified with the carrying out of the project as a whole, many others have contributed to the success of the undertaking years of their lives spent on the different sides and phases of the problem. The names and responsibilities of the men brought together in this work by the St. Lawrence Bridge Co. are shown in the diagram below. Of the organization formed by the Dominion government to carry through this great project after the failure of 1907, the names of the members of the Board of Engineers, at first composed of C. N. Monsarrat, chairman and chief engineer, Ralph Modjeski and C. C. Schneider, and after the latter's death of the first two and H. P. Borden, are well known.

Besides the men whose names appear on the chart below, the organization included Joseph Mayer, principal assistant engineer; A. J. Meyers, chief draftsman; M. B. Atkinson, assistant chief draftsman; H. W. McMillan, chief shop inspector; C. J. Yarnall, chief mill inspector; J. D. Wilkens, resident engineer, 1909 to 1915; John Rankin, resident engineer since 1915; W. P. Copp, chief inspector of erection; H. E. Bates, assistant engineer in shop and field work, and E. H. Pacy, assistant engineer.



ORGANIZATION CHART OF QUEBEC BRIDGE ENGINEERING FORCE

DESIGNERS *and* BUILDERS *of the* QUEBEC BRIDGE



Lt. Col. Monsarrat



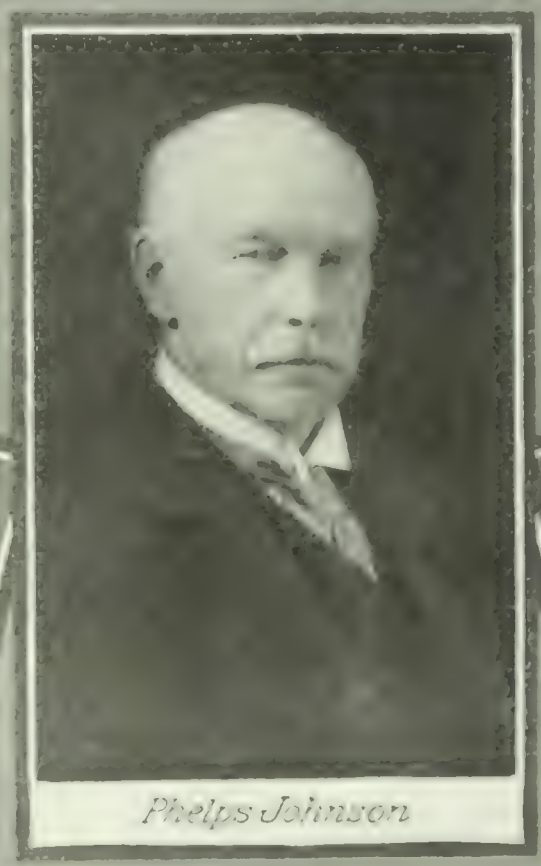
Ralph Modjeski, C.N. Monsarrat, C.C. Schneider



H. P. Borden



S.P. Mitchell



Phelps Johnson



Geo. H. Duggan



Walt. P. Ladd



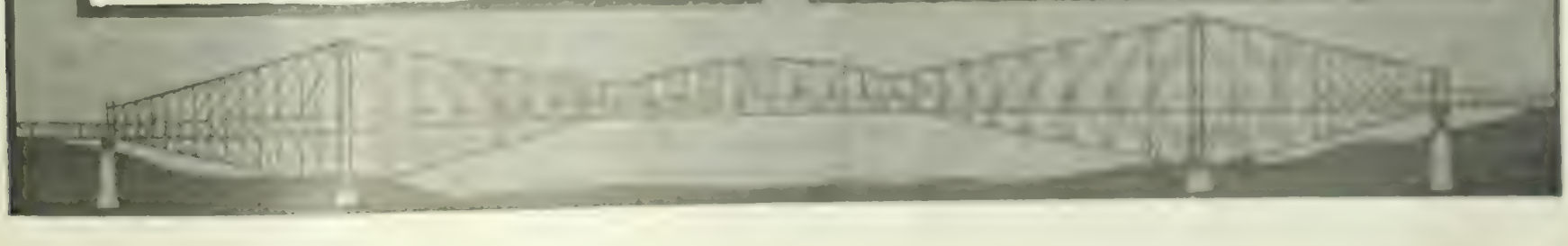
G.F. Porter



W. B. Fortune



J.S. Williams Geo. F. Porter D.D. McCallum



Special Features of the Miami Conservancy Contracts

Flood-Prevention Work To Be Placed Under Contract Next Month Will Cost $10,000,000 Five Earth Dams and Seven Sections of Channel Included

FEATURES of special interest to operators of suction dredge, dipper dredge and dragline equipment and to concrete contractors are found in the twelve large contracts soon to be let for Miami Valley flood-protection work in Ohio. This article points out some of these features, on the basis of statements by Arthur E. Morgan, chief engineer of the Miami Conservancy District, Dayton, Ohio, supplementing the information which has been furnished to intending bidders.

The contracts on which bids are to be opened Nov. 15, amount to about $10,000,000 and cover 80% of the construction work to be done by the district. They include five earth dams of great size and seven sections of channel improvement, in contract amounts ranging from $25,000 to over $2,000,000. Numerous small contracts totaling about $2,000,000 are to follow in six months or a year, and work to the amount of $2,000,000 or $2,500,000 will have to be done by the railways in the vicinity of the dams.

The present contracts are essentially machinery jobs and require relatively small labor forces, at least after the first season. Further, they involve enough work that the machines may be worn out on the jobs economically.

Estimates Revised to Present Cost Basis

Two points of special moment are: (1) The engineers' estimates have been revised only recently from the figures submitted a year ago at the court hearing; the unit prices were raised 20% to 40% or more, averaging perhaps 30% increase, to bring them well up to present cost standards. (2) The district is fully prepared to undertake any part or all of the work by force-account, should the bidding not prove satisfactory. The organization has been developed partly with this end in view. However, the district would prefer greatly to have the work done by contract.

The great bulk of the work is earth moving and concrete construction, both classes running to very large amounts. Single contracts contain up to 4,000,000 cu.yd. earth excavation and placing and more than 40,000 cu.yd. concrete. The channel work, divided into seven contracts, includes 20,000 cu.yd. monolithic concrete revetment and 12,000 to 15,000 cu.yd. flexible-slab revetment. Specially high quality will be required in the linings of the outlet conduits. These conduits and the discharge channels of the dams range in quantities from 20,000 cu.yd. at the Germantown dam to 56,000 cu.yd. at the Taylorsville dam, and the larger part of this concrete must be placed during 1918.

Materials Not a Great Problem

Much of the construction material required is found within the area of the operations.

As to concrete materials and soil for building tight dams: The district has located deposits of sand and gravel satisfactory as to quality and quantity and conveniently located, both in upland and valley bottom sites. This is one result of continuing the exploration work—including extensive borings—all through the past year, though prior explorations had furnished sufficient data for complete designs and estimates as presented at the court hearing in November, 1916.

As to steel and cement: Arrangements have been made that assure a sufficient supply of steel sheet piling. The required reinforcing bars are likely to receive priority treatment by the steel control authorities; however, in thorough revision of the plans during the past year, plain concrete has been substituted for reinforced wherever possible, and the amount of steel needed is thus reduced to a minimum. No serious difficulty in securing a supply of cement is apprehended.

The following figures illustrate the cost-estimate situation affecting the concrete work:

	Estimate of Summer, 1916	Revised Estimate
Cement, per bbl	$1.60	$2.30
Steel, per lb	.04	.08

The revision of the plans was largely in detail, without modifying the factors of safety anywhere but including slight changes of location to fit the ground better, etc. Considerable reduction of the estimate quantities was accomplished in this revision, so that, in spite of the unit-price increase, the total cost was increased only about 10 to 15 per cent.

Wide Choice of Excavating Equipment

With respect to the earthwork, different types of equipment are applicable. The specifications are so drawn as to make possible the use of any of several different types. Moreover, the cross-sections of the channel improvements, and to some extent the cross-sections of the dams, will be modified if necessary to fit such equipment as may be most available.

Hydraulic Suction Dredges—The general methods used for the construction of the Calaveras, San Fernando and other dams in California, by means of the hydraulic suction dredge, as described in *Engineering Record*, Vol. 74, No. 8, page 220, and Vol. 70, No. 2, page 46, are entirely feasible in the construction of the Conservancy District dams. In the valleys of the streams above the dams there is an abundant supply of material consisting of a mixture of gravel, sand and clay, particularly suitable for the construction of the dams.

At the Huffman dam, as an illustration, a suction dredge can be located about 500 ft. upstream from the base of the dam, where suitable material exists for the entire 3000-ft. width of the valley and to an indefinite depth. The suction dredge would be allowed to dig as deep as would be found feasible. The material would be deposited in the toes of the dam, the gravel and sand settling near the point of deposit, the clay and fine material finally settling in the pool in the middle of the dam and making an impervious core. A certain amount of dry embankment would be necessary, but the larger part of the 10,000,000 cu.yd. of embankment in the five dams can be placed by hydraulic suction dredges.

About 4,000,000 cu.yd. of material are to be removed from the river channel at Dayton and Hamilton. Here too the hydraulic suction dredge is adaptable.

Draglines and Dipper Dredges—The removal of perhaps 2,000,000 cu.yd. of material at Dayton and Hamilton by means of draglines is entirely feasible. Regardless of the other equipment used, the use of draglines will be necessary to a considerable extent, to move the earth along the margins of the channel to a point where it can be reached by other equipment. There is also good opportunity for use of draglines at some or all of the dam sites.

In the construction of some of the dams it may be desirable to excavate the material from the river channel above the dam by dipper dredge, load it to barges and deliver it to a suction dredge at the base of the dam, in order to avoid long discharge pipe lines. These dipper dredges could also be used in digging the cut-off trenches under the dams. The channel work can be adapted to a very considerable extent to the use of dipper dredges, supplemented by draglines for trimming up the margins of the channels. It would be feasible to use from six to a dozen dipper dredges on the job, ranging in capacity from 1½ to 5 yd., though the work would be so planned that one or two types would handle it.

Ladder Dredges, Steam Shovels, and Cableway Excavators—Most of the channel excavation at Dayton and Hamilton, involving about 4,000,000 cu.yd., could be done by means of ladder dredges, and the cross-section of the channel can be modified to suit this equipment. In case material for the construction of the dams is transported to the dams in barges, ladder dredges could be used for the excavation of five or six million yards at the dam site.

At the Lockington and Taylorsville dams the conditions are especially favorable to steam shovel work, if this method can compete in cost with suction dredge work. In this case, the material would be obtained from the hillside, the bulk of it requiring little or no lift. At the dam the material would be either sluiced in from the sides or spread and rolled.

One contract of about a million yards of channel excavation is peculiarly suited to certain types of cableway or tower excavating machinery, and some of the other work could be adapted to this type of equipment.

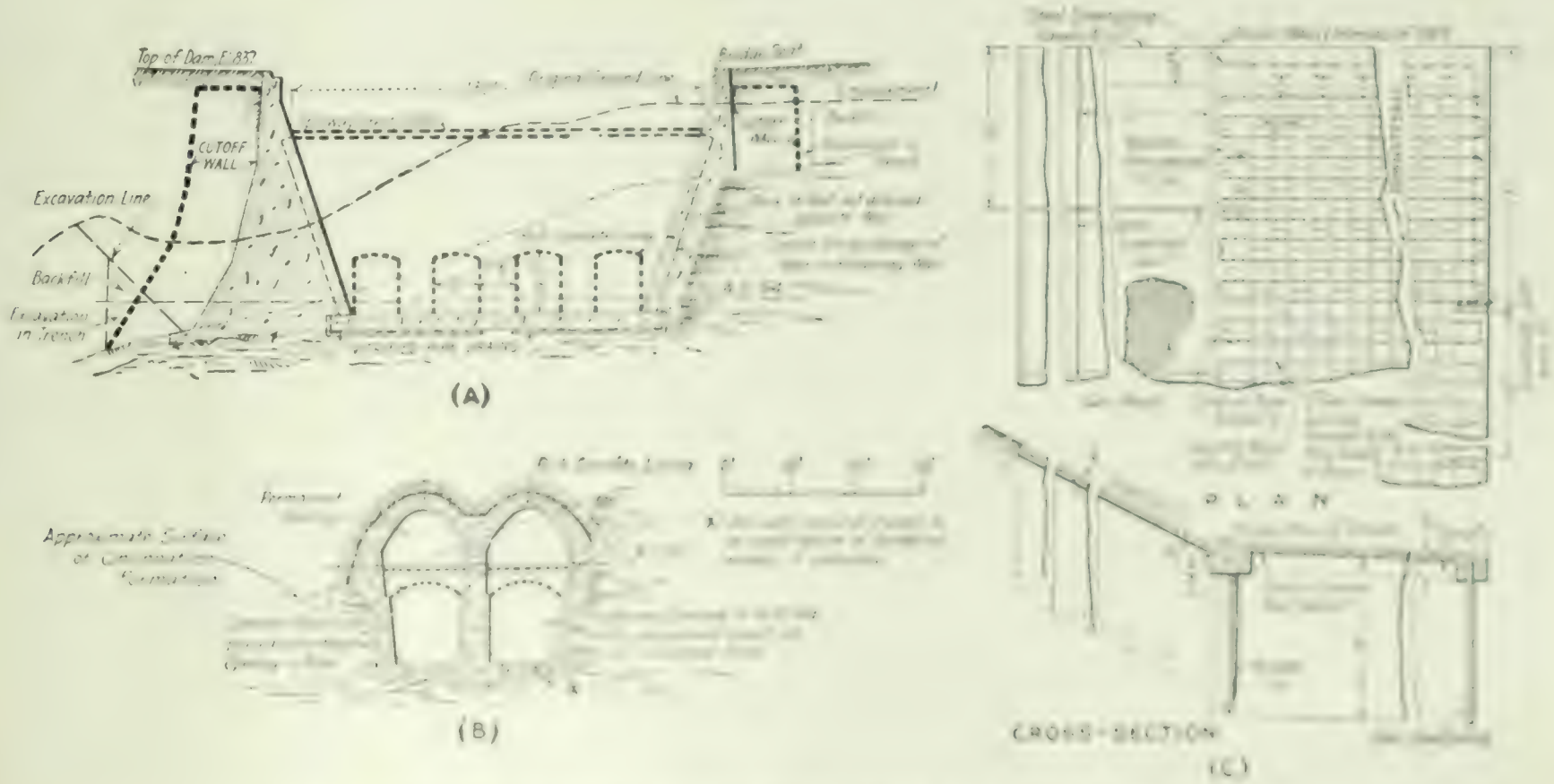
Forty or fifty acres of timber land must be cleared and grubbed. A large amount of soil stripping is necessary, which will require suitable excavating equipment. In the construction of the Englewood dam, for instance, 75,000 cu.yd. of earth must be removed in stripping the top-soil, and 85,000 cu.yd. must be replaced in the operation of surface dressing and grassing.

Barges and Cars as Alternatives to Pipe Lines—A large part of the earth excavated in the river channels and a considerable part of that to be used for building the dams must be transported by means of barges or cars, unless handled through the discharge pipe lines of suction dredges. In some cases one of these methods will be more economical and in some cases another, but in any case the use of barges may be an important item in the completion of certain of the contracts.

All sections of the work permit of cheaply ponding the stream to a depth sufficient for floating barges. At Hamilton a sufficient depth is already available in all seasons.

Extensive Concrete-Block Making Required—The plans for channel improvement at Dayton and Hamilton call for about 400,000 reinforced-concrete blocks, 24 x 12 x 6 in. These should be made during a period of about 18 months, which means that an output of at least 1000 blocks per day will have to be reached.

Stream-Control Risk Reduced—The stream control problem, which in the plans and specifications of a



A—Stream-control dams at Taylorsville, Lockington, Germantown Dam, the [illegible] after the dam is completed. Cofferdams and flexible pavement mat at Dayton and Hamilton, totaling [illegible]

year ago was left to the contractor, at his own risk of loss and damage, has been worked out in detail during the past season. It has proved possible to develop methods that greatly reduce the risk.

At three of the dams the method of stream control is as indicated in Fig. 2, and sketch *A* of Fig. 1, showing work at Taylorsville during the first two seasons. The spillway notch, all of concrete, is built first and the river later diverted through it while the dam is completed to a safe height. At the other two dams the method shown by Fig. 3 and sketch *B* of Fig. 1 for Germantown dam is to be used. Here the discharge conduits, temporarily built several times as large as the final size, are used for stream diversion. The lower part is subsequently filled and covered by a concrete deck to throttle the conduits to the dimensions desired in the final structure.

Other provision is made to assist the contractor in carrying on his work, such as furnishing camp sites, arranging for power and telephone service, assisting in finding subcontractors, etc.

Time of Completion—It is likely that unusual vigilance will be exercised in seeing that the contractors maintain satisfactory rates of progress. On the other

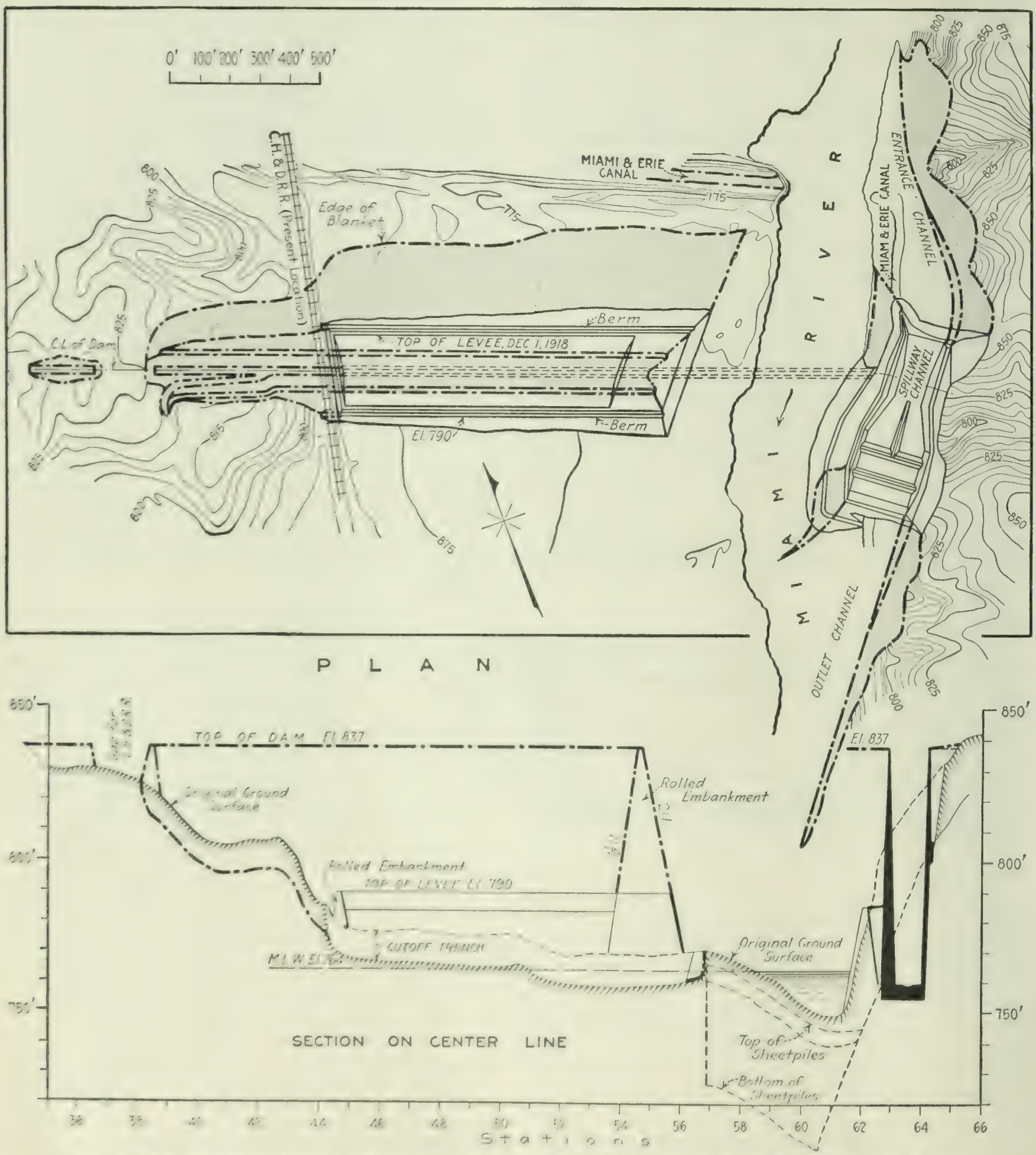


FIG. 2. RECOMMENDED STREAM-CONTROL METHOD AT TAYLORSVILLE DAM, GREAT MIAMI RIVER
Shaded part indicates second season's work, superimposed on that of first season

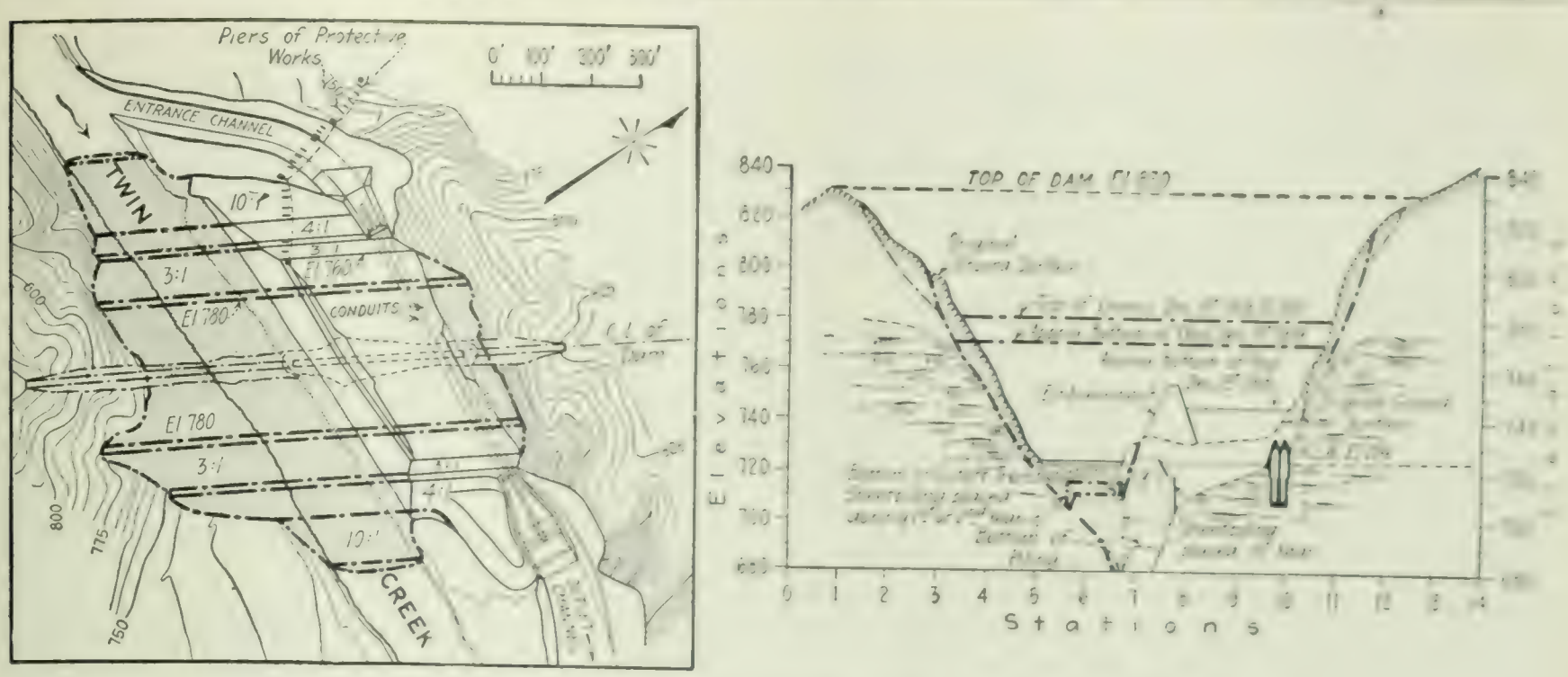


FIG. 3 STREAM CONTROL AT GERMANTOWN DAM, TWIN CREEK
Shaded part indicates second season's work, superimposed on that of first season

hand, the times of completion have been so fixed as to give about one season's leeway. In general, the stream control problem is expected to be disposed of by the end of 1919, but under certain circumstances the second season's work, carrying the project beyond all flood danger, may have to be executed during 1920. There is a similar margin of one season in final completion, making the whole work extend over either five or six seasons.

The enterprise has been financed. Assessment collections are coming in, and a bond issue for all needed funds has been assured. Work is to begin at once after contracts are let, and the end of the period of preparation has been fixed at Apr. 1, 1918.

The work will not necessarily be let to the lowest bidder, the Conservancy Act authorizing the court to sanction an award to other than the lowest, on the recommendation of the directors of the district.

Camp Wastes Yield Large Revenue to the Government

Colonel Ellison Describes Plan Under Which Garbage and Other Wastes at Nineteen Camps Have Been Sold

THE FEDERAL Government has established at the national army cantonments and embarkation camps a system of selling garbage, manure, tin cans, paper, bottles, etc., which will yield hundreds of thousands of dollars a year, besides saving heavy outlay for waste disposal plants and operating expense.

The comprehensive system of waste utilization being put into effect rapidly has been devised by Col. J. A. Ellison, First Delaware Infantry, who has for some time been in the Federal service, detached from his regiment. Col. Ellison recently prepared for the Secretary of War a comprehensive report on this subject, which, slightly condensed, reads as follows:

"On May 22, 1917, I communicated with the Secretary of War, suggesting that from my experience with troops I believed that a scheme could be devised whereby the garbage, manure, and waste material at the various cantonments could be handled in a sanitary manner, and at the same time the Government would be able to sell all wastes instead of incinerating them, which has been the general practice in the army for many years past.

"On June 17, 1917, I was ordered to Washington in pursuance to the above communication and reported to Col. I. W. Littell of the Cantonment Division, and was immediately assigned to develop a plan to conserve waste materials at cantonments. As a result the following plan approved by the Secretary of War on Aug. 25, 1917, was formulated:

Wastes Will Be Sorted at Each Camp Kitchen

"At each kitchen all waste materials will be sorted and placed in separate cans, thereby making a complete separation. By this means all of the various materials, such as garbage, bones, fats, grease, paper, tin cans, and bottles, are rendered marketable.

"In handling garbage the two-can system will be adopted. When filled cans are removed from the kitchen they will be replaced with clean cans. All cans will be provided with close fitting covers. These cans will be placed in Government trucks and removed to a transfer station under supervision of the sanitary inspectors. The contents of the cans will then be dumped into the contractor's trucks. The transfer station will consist of platforms and storage sheds together with hot water facilities and tanks for sterilizing cans. At this point all waste materials will be turned over to the contractor who will remove them to a point at least three miles from the reservation.

"In devising this plan for the sale of waste materials, the fact was recognized that some were more valuable than others. Consequently, a plan was developed whereby all waste materials except manure were sold at a certain price per capita per month. By this plan all waste materials other than manure at all of the national army cantonments and embarkation camps have been sold. This not only gives a substantial return

to the Government, but will also save $700,000 capital outlay for incinerators and also about 60c. per ton for fuel to burn such waste materials as would accumulate at army cantonments. It is estimated that forty tons of such wastes accumulate each day at each cantonment, and that their incineration would cost $122,275 a year.

Manure Will Yield Large Revenue

"The hardest problem has been to dispose of the manure to advantage. As there are 12,000 animals at each cantonment, manure would necessarily accumulate in large amounts, estimated at not less than 120 tons per day per camp. The cost to the Government of hauling or incinerating this manure would amount to 60c. per ton. At the date of this report, the manure at eleven cantonments has been sold—in some cases on the per animal per day basis, and other on a flat rate per month—resulting in a net return of $240,900.

"The total return to the Government, including money derived from sales and savings over incineration, amounts to $1,725,839.

"From a standpoint of conservation, attention is called to the fact that these waste materials will be converted into valuable commercial products, such as pork, grease, glycerine, soap, paper stock and fertilizing material.

"Garbage from 13 of the cantonments will be fed to hogs. The garbage from 10 to 15 men will feed one hog one day. Hogs will gain on the average of 1 lb. per day on this ration for the first 150 days, according to tests made by request of the War Department by Henry Knight & Sons of Louisville, Ky., at the Chillicothe cantonment. Large rough hogs will do considerably better and gain much more. The garbage from each cantonment should be sufficient to feed 4000 hogs. The hogs on the above average would gain 1,460,000 lb. per year per cantonment. Thirteen cantonments should produce 18,980,000 lb. of pork per year. In the remaining cantonments the garbage will be reduced to reclaim grease, and should yield from 3 to 4 per cent. From this grease, soap, candles, and glycerine are made.

"Heretofore it has been the custom to incinerate all dead animals. According to this plan their hides will be removed and the carcasses degreased and sold for fertilizer material. This will result in increasing the supply of leather, grease, and fertilizer.

National Guard Camps Not Included

"Were it not for the fact that the National Guard camps are considered of a much more temporary character, it would have been possible to adopt this scheme for the disposal of their wastes. Many contractors have made inquiries about the purchase of the waste materials at these camps. These have been referred to the camp quartermasters. The installation of plant and equipment of sufficient capacity to handle all waste materials at a cantonment would cost $100,000 or more."

"The figures given in the above report," Col. Ellison said, in discussing it with the Washington correspondent of *Engineering News-Record*, "were tentative. They have been improved, from the Government's point of view, since the system was put in operation. There has been the greatest opposition to the plan. It seems unbelievable, but the old idea of incinerating wastes is a hard one to down. Not only contractors who have incinerators they want to sell to the Government, but also army officers, who have been accustomed to burning up everything, advocate the use of incinerators. That's old-fashioned sanitary engineering. Nowadays, contractors come into this office with incinerators to sell and before leaving they beg me to let them buy wastes. Formerly I was obliged to go out and show contractors the money they might make; now, I am happy to say, many contractors are bidding against one another, trying to obtain this waste material from the Government."

Who the Contractors at Each Camp Are

The contractors at the 16 cantonments and three embarkation camps are as follows:

Camp Devens, Ayer, Mass., S. A. Meagher & Co., Boston, Mass.
Camp Upton, Yaphank, N. Y., Products Mfg. Co., New York City.
Camp Dix, Wrightstown, N. J., General Mfg. Co., 30 Market St., Philadelphia, Penn.
Camp Meade, Admiral, Md., General Mfg. Co., 30 Market St., Philadelphia, Penn
Camp Lee, Petersburg, Va., National Contracting Co., Norfolk, Va., Care Virginia Hide & Fur Co.
Camp Jackson, Columbia, S. C., Henry Knight & Son, Louisville, Ky.
Camp Gordon, Atlanta, Ga., Henry Knight & Son, Louisville, Ky.
Camp Sherman, Chillicothe, Ohio, Henry Knight & Son, Louisville, Ky.
Camp Zachary Taylor, Louisville, Ky., Price & Vogt, Louisville, Ky.
Camp Custer, Battle Creek, Mich., United Disposal & Recovery Co., Corn Exchange Bank Bldg., Chicago, Ill.
Camp Grant, Rockford, Ill., United Disposal & Recovery Co., Chicago, Ill.
Camp Dodge, Des Moines, Ia., United Disposal & Recovery Co., Chicago, Ill
Camp Funston, Ft. Riley, Kan., National Products & Salvage Co., Oklahoma City.
Camp Pike, Little Rock, Ark., Guy Carron, Little Rock, Ark.
Camp Travis, San Antonio, Tex., Valverde Farm Co.
Camp Lewis, American Lake, Wash., U. C. Bates.
Tenafly, N. J., Products Mfg. Co., New York City.
Newport News, Va., National Contracting Co., Norfolk, Va.
Jacksonville, Fla., Henry Knight & Son, Louisville, Ky.

At the time of the interview with Colonel Ellison contract prices for the 19 camps in the list could not be given out, since all had not been computed.

Full-Time Road Patrols in Michigan

Maintenance of the gravel road system in Genesee County, Michigan, previous to a year ago was largely in the hands of farmers who were deputized to drag the roads following rains. Prior to 1914 the county devoted all of its attention to building roads just good enough to receive the state award, but it neglected maintenance to such an extent that this system was found unsatisfactory. The work of the farmers was much criticised. Recently a change was made to the patrol system, thus making it worth the time of a competent man to keep a stretch of road in good condition.

The county gravel roads have been divided into 21 districts, each from 10 to 15 miles long. A man with a team is employed full time on each district. He must keep the roads properly dragged after rains, maintain supplies of gravel along the roadside so that holes may be filled promptly, and care for drainage. A large mileage of the roads was in such poor condition when these men undertook their maintenance that it is hardly possible, with the funds available, to put them into good shape this season. This is particularly the case on account of the difficulty in getting labor, but the fact that the patrolman has steady employment has materially improved the labor situation. The work is on a thoroughly businesslike basis under the county engineer, to whom daily reports are made of work accomplished, and of costs. The reports are preserved and utilized in such a way that any unusual expense is immediately indicated.

Tornado Effects on Structures in Three Recent Storms

Suggestions As to the Design of Dwellings and Small Structures To Resist High Winds Deduced from Observations of Buildings Wrecked by Tornadoes in Middle Western States

By S. H. Ingberg

THE SPRING of 1917 was a period of frequent high winds in the Middle Western States, and was particularly marked by three tornadoes in each of which many buildings were wrecked, and a number of lives lost. The writer visited portions of the three wind-swept areas immediately after the storms and made a study of the effect of the wind for the purpose of considering improvements in design which would make structures more resistive to the sudden and severe stresses imposed by tornadoes. The present article will outline some of the damage observed, and suggest improved details of design.

On Mar. 11, New Castle, Ind., an industrial center of about 15,000 inhabitants, was visited by a tornado that swept centrally through the city, causing the death of 22 persons and severely injuring as many more. The attendant property loss was estimated to be about $500,000, consisting chiefly of residences and greenhouses. The general course of the storm was from northwest to southeast, and the widths within which it proved destructive to buildings varied from 100 to 600 ft. The buildings affected were chiefly of frame construction, with an occasional brick or concrete block residence.

Before reaching the city the tornado hit the buildings of the Indiana Rolling Mills. These were all one story structures of different types of design. The northeastern portion, shown in Fig. 1, was of steel frame and corrugated metal roof, the walls below the windows being of brick, and above of plaster on wood or on metal lath. The sheet-metal roofing and steel-sash windows were generally torn out, but the steel frame of the building remained intact, as shown in the view, the only storm damage that can be noticed being where the steel chimney struck it in falling.

The southeast building of the plant was of heavy timber construction with long span roof trusses and corrugated iron roofing and siding. This was completely demolished, as was also the southwest building, which was of light, short-span timber construction with sheet-metal sides and roofing. The office and storage building had brick walls laid in double thickness of 4 in. each, with ½-in. air space between the two. Parts of the wall and the roof of the eastern wing of this building were torn out. A steel water tank inside the plant area, which was full of water, apparently withstood the full impact of the storm, probably due to its laterally braced frame support.

In the city proper the wreckage was generally confined to residences. Fig. 2 shows some of the worst storm effects in this section. Brick residences withstood the storm with less damage than frame, although the latter were so much more numerous that definite conclusions are not possible. In some blocks where the storm was particularly intense, all the houses within the whole block were leveled.

A brick school building, shown in Fig. 3, was pretty well wrecked. Fortunately no one was in the building. This building is of the ordinary brick exterior with frame interior. The roof was lifted off and all the windows were blown out. One house with hollow concrete block walls 8 in. thick stood up fairly well, although surrounding wreckage would indicate that it received the full impact of the storm. The walls and the floors remained in place, though the frame roof was destroyed. Six persons who were in the house when the storm struck were uninjured.

One particular form of damage was the entire removal of a house from its foundation and its consequent wreckage. Another common form was where the wall on the side away from the source of the storm was wholly or partly blown off. This leeward wall failure was common in all three of the storms observed. In every case where houses were completely blown from



FIG. 1. WALLS AND WINDOWS OF BRICK BUILDING CUT OUT BUT STEEL FRAME INTACT



FIG. 2. HOW A TORNADO THROWS FRAME HOUSES AROUND

their foundations, there was no evidence of any anchorage between the frame and the foundation, which if present might have prevented complete failure where the foundation was heavy enough to supply the required resistance.

On Mar. 23, another tornado passed through a part of southern Indiana causing heavy loss of life and severe property damage in New Albany, Ind., a city of about 21,000 inhabitants, on the Ohio River opposite Louisville. Here the destructive portion of the storm varied in width from 1000 to 4000 ft. The number of deaths was about 40 with 50 cases of severe injury, and the damage to property is estimated at $1,100,000. As in the case of New Castle the downtown business section was spared, the area devastated covering outlying residence and manufacturing districts.

The general direction of the travel of the storm was from southwest to northeast, and as in the other case practically all the damage was in small brick and frame houses, although where larger structures were in the path of the storm they suffered more or less.

An instance of a factory building is shown in Fig. 4. This building has walls of concrete blocks, the hollow spaces of which were filled with concrete reinforced with twisted square steel rods. The blocks of the lower story are 12 in. thick, and those of the upper 8 in. thick. The vertical wall reinforcement was evidently not continuous at the second-floor line. This, together with the large undivided room area, open except for the roof and roof framing, accounts for the complete failure of the second-story walls.

At New Albany the storm overturned several monuments in the cemetery located in the northern part of the city. Of eight fallen monuments of the heavier



FIG. 3. TYPICAL SCHOOLHOUSE BUILDING IS WRECKED

type that were examined, three fell toward the northwest, two toward the west and one each toward the north, northeast and east, which, as far as it goes, confirms the presence of the whirling air motion generally associated with tornadoes, since on this assumption only is it possible to have strong air currents flowing in different or opposite directions over the same locality in the brief space of time required for the passage of the storm.

On May 26, a tornado passed through south central Illinois and Indiana, causing heavy loss of life and property damage, two large centers of population in its path being the neighboring cities of Mattoon and Charleston, Ill. The widths of the devastated areas here averaged about 1800 ft., the general direction of travel being nearly due east. In both cities the main business district is outside of the storm's path, although in Charleston two railroad depots and some warehouses adjacent to them were destroyed. The total number of fatalities in Mattoon was 65, and in Charleston, 35, most of whom were killed by falling or flying timbers and débris.

The buildings wrecked in the stricken area of Mattoon numbered about 800. They were chiefly of light frame construction. Some of the foundations were of single brick 4 in. wide, which gave neither anchorage nor sta-



FIG. 4. CONCRETE BLOCK WALLS HAD HORIZONTAL JOINT AT SECOND STORY

bility. Many of them were lifted entirely from their foundations and carried some distance away. Such a house is shown in Fig. 5. This was blown 15 ft. south, and is the only building standing within several blocks. None of its inmates was injured. In another part of the city a house with 8-in. hollow concrete block walls laid up with lime mortar was completely destroyed.

The overturned roof trusses shown in Fig. 6 were of 80-ft. span, and rested on 12-in. one-story walls with a pilaster of 4 in. added thickness at points of support. The roofing supported on these trusses, rested on 2 x 8-in. stringers spanning between trusses and toe-nailed to the top chord of the trusses. The only other lateral bracing was one 6 x 8-in. timber similarly secured to the top chord at each quarter point.

The public utilities system of Charleston was severely hit, both the gasworks and the electric plant being put out of commission. Fig. 7 shows the former, which was almost completely wrecked, and in Fig. 8 is shown the wrecked part of the electric plant. The brick walls of the latter had an air space, as shown in the view, which materially weakened their resistance to the storm.



FIG. 5. TYPICAL EXAMPLE OF SMALL HOUSE PICKED FROM FOUNDATION



FIG. 6. INSECURELY BRACED TIMBER TRUSS ROOF IS BLOWN DOWN

A three-story frame hotel located near the Big Four Ry. was wrecked, while an elevated signal tower, one block to the west of the building and in the direct line of the storm, was practically undamaged. The tower was of wood, braced with rigid iron and timber framing.

The tornado motion is a combination of rotation and translation. The direction of the whirl, as far as it concerns the storm areas in our own country, is generally conceded to be anti-clockwise and the general course of the tornado toward the east. It will be evident that the highest wind velocity obtains in the southerly parts of the whirl, since here it is the sum of the two velocities of translation and rotation. Of the two the latter is generally the largest component, since the forward movement seldom exceeds a speed of 40 miles per hour.

Considering the large size of the tornado whirl with respect to that of most structures in its path, its action as far as wind effect is concerned must be similar to that produced by a straight air current of equal intensity. Whether or not the low air pressure supposed to exist in the whirl has any damaging or so-called explosive effect on buildings is difficult to determine, since the amount of the diminution cannot be ascertained, and the relatively slow approach of the whirl as a whole permits full or partial equalization of pressure as between the room spaces of buildings and the outsides. Most of the storm effect attributed to this cause can be readily explained on the basis of direct wind pressure. As the effects on structures and methods of making them more resistive to storms does not depend primarily on theories of storm action, the matter is best approached from the standpoint of linear air motion.

The familiar expression for total wind pressure, expressed in terms of wind velocity in miles per hour is, in pounds per square foot, $P = 0.004v^2$. For surfaces as large as those presented by buildings, the average pressure will be lower than that indicated by the above expression.

On analyzing the necessary upsetting moment on the cemetery monuments noted earlier in the article, it was found that for the three that fell toward the northwest the computed total unit pressures required for overturning were 27, 31 and 37 lb. per sq.ft. respectively, for those falling toward the west, 29 and 31 lb. per sq.ft. respectively, and for each of the ones falling toward the north, northeast and east, 45, 39 and 20 lb. per sq.ft. respectively. The higher pressures obtained for those falling toward the north accord with the presence of an anti-clockwise whirl, since their location was in the right or southeast part of the path of the storm whose general progress was toward the northeast. According to the foregoing formula these pressures would give velocities varying from 70 miles per hour for the 20-lb. pressure to 106 miles per hour for the 45-lb. pressure.

It is difficult to analyze the method of destruction when that destruction is as complete as it was in a number of small dwellings. More information can be gained from cases where the destruction was arrested at an intermediate stage.

In the case of frame construction two distinct forms of this intermediate stage can be discerned. In one, the house was blown off its foundation and totally or partly wrecked by the resulting impact and racking strains. A little calculation will show that frame houses have not sufficient weight to resist wind velocities of tornado intensity without anchorage to substantial foundations. The weight reaction of the house on the foundation is often reduced at the moment of wind impact, due to the blowing in of windows and doors on the windward side, which may momentarily cause uplift pressures equal to the impact pressure of the wind, thus greatly decreasing the resistance of the house to sliding.

In the other case the house is destroyed in place, the weaker parts giving away first. The blowing out of the wall on the leeward side is of frequent occurrence. After the wind obtains access to the inside of the house this wall is subjected to both the impact and negative-pressure components of the wind, and also generally obtains less support from the floor framing, partitions and walls than is the case for the wall on the windward side. This is particularly true where the floor joists and roof rafters are parallel with it.

Brick and other forms of heavy block construction are similarly destroyed in place by lifting of roofs and overtopping or piecemeal destruction of the walls.



FIG. 7. GAS-HOLDER BLOWN OVER BY WIND

While it may be impossible to make all types of buildings fully resistive to storms of tornado intensity, much can be done to make them more resistive, and thereby reduce the large loss of life and property damage which is incident to tornadoes. A building whose walls and floors remain in place is a safe refuge, even if it is damaged so as to make it almost useless for purposes of subsequent habitation. The outside during the storm is filled with objects flying and falling with great velocities, and the wind pressures are such that human beings are freely blown about. These pressures are, perhaps, rarely in excess of 60 lb. per sq.ft., so that structures designed for wind pressure of 30 lb. per sq.ft., with a factor of safety of two or more, come through intact, as far as main structural members is concerned, which accords well with the performance of engineering structures in storms.

As previously indicated, frame construction is too light to maintain itself in place of its own weight, and must be anchored to substantial concrete or masonry foundations. The resistance of a light concrete foundation can be increased by a footing offset around the outside, thereby utilizing the weight of some of the surrounding earth fill and also increasing the bearing power of the foundation. The anchorage must be designed to prevent both uplift and sliding, the strength to be proportioned according to the height and area of the building, using as horizontal pressure 30 lb. per sq.ft. of vertical projection and as vertical pressure 20 lb. per sq.ft. of horizontal projection, subtracting in each case the dead-load resistance of the construction, and using working stresses with a known factor of safety of two or more.

While calculations of the kind are seldom made for this type of construction, empirical rules accomplishing the desired object can be embodied in state and municipal ordinances in regions where tornadoes and other severe storms are of probable occurrence. The experimental knowledge on strength of anchors in concrete and masonry, as well as that of bolted and nailed timber joints, is now such that strength calculations can be made with a fair degree of accuracy. Most woods have an ample amount of strength if properly utilized.

The transverse strength of frame construction can be increased by proper utilization of the sheathing and, where openings occur, by bridging diagonally between uprights. The walls should be secured into the floors and partitions at intersections, and the roof into the walls at the eaves, the latter by means of outside or inside braces extending downward to the studs or uprights. The end walls can be securely tied by notching an outside joist partly into the studs even with the sheathing and extending the floor boards for nailing into it. This also serves the purpose of a fire stop, where no other is provided. The roof sheathing should be laid up close and be well nailed to the rafters to resist the lateral and upward pressures and prevent the latter from carrying away the roofing material.

Long-span timber truss work should have properly proportioned diagonal bracing and be anchored into side walls of sufficient stability and weight to take care of the uplift and side pressure. The framework of steel mill buildings is quite generally designed to transmit a lateral pressure of 30 lb. per sq.ft. of vertical projection into the ground with working stresses; and, in the one case in point at New Castle, such construction stood up intact while adjoining long-span timber construction was completely wrecked, there being nothing in this incident that shows that the latter would not have stood up equally well if it had been designed for the same external forces.



FIG. 8. ELECTRIC-LIGHT AND POWER PLANT WRECKED

Brick and concrete blocks in exterior walls should be laid in portland cement mortar, and, for buildings of more than one story, should be not less than 12 in. thick and be well bonded at corners and floor lines. Where large, undivided areas occur, with high walls, the latter should be figured for the given lateral pressures acting as cantilevers, with tensional stresses within safe limits. Mullions between windows act as beams, resisting the forces acting on both window and mullion. Windows and doors of ordinary design are unable to withstand the full force of a wind of tornado intensity, but from the standpoint of safety to the lives of those within, this does not appear very serious, to judge from several incidents in these tornadoes.

Selection of Materials for Sea-Water Concrete

Any Standard Portland Cement May Be Considered Safe, as May Also Sea-Water Gaging—Great Care Should Be Exercised in Choosing Aggregate

By Rudolph J. Wig and Lewis R. Ferguson

Fourth of Five Articles on the Problem of Sea-Water Concrete, Written as a Result of Investigation and Inspection of Practically All the Marine Concrete Structures in the United States.

IN THE previous articles the authors have shown that unless protected against abrasion plain concrete is apt to disintegrate following the chemical attack of sea water on the softened interior, and that reinforced concrete is subject to percolation which permits the rusting of the reinforcing steel and subsequent failure of the concrete. It is therefore necessary, in order to resist this action, to have as good, dense concrete as possible and to reject any material, be it cement, aggregate or water, which may tend to accelerate the sea-water disintegration. In this article will be taken up the selection of the various materials.

All well-made portland cements will resist disintegration in sea water *if properly used.* This statement must be defended, as many engineers are of the opinion that no cements are durable in sea water, or at best only such cements as have some peculiar composition. This belief is founded largely upon laboratory tests or investigations made under abnormal conditions of test, or a misinterpretation of data obtained from the chemical analysis of concrete which has disintegrated in sea water. No more conclusive evidence is required by the engineer to support the statement that all well made portland cements will resist disintegration in sea water if properly used than the fact that concrete structures have been standing in sea water for the past 30 years and more without showing any deterioration. Let us see what the experience has been with portland cements of widely different composition.

During the period from 1888 to 1890 many concrete bridge piers were built along the Bay of Fundy in Nova Scotia by the Dominion Atlantic Ry. and the Provincial Government. White Brothers English portland cement was used, and these piers, where protected from abrasion or not exposed to severe erosion, are in excellent condition, as shown in Fig. 1.

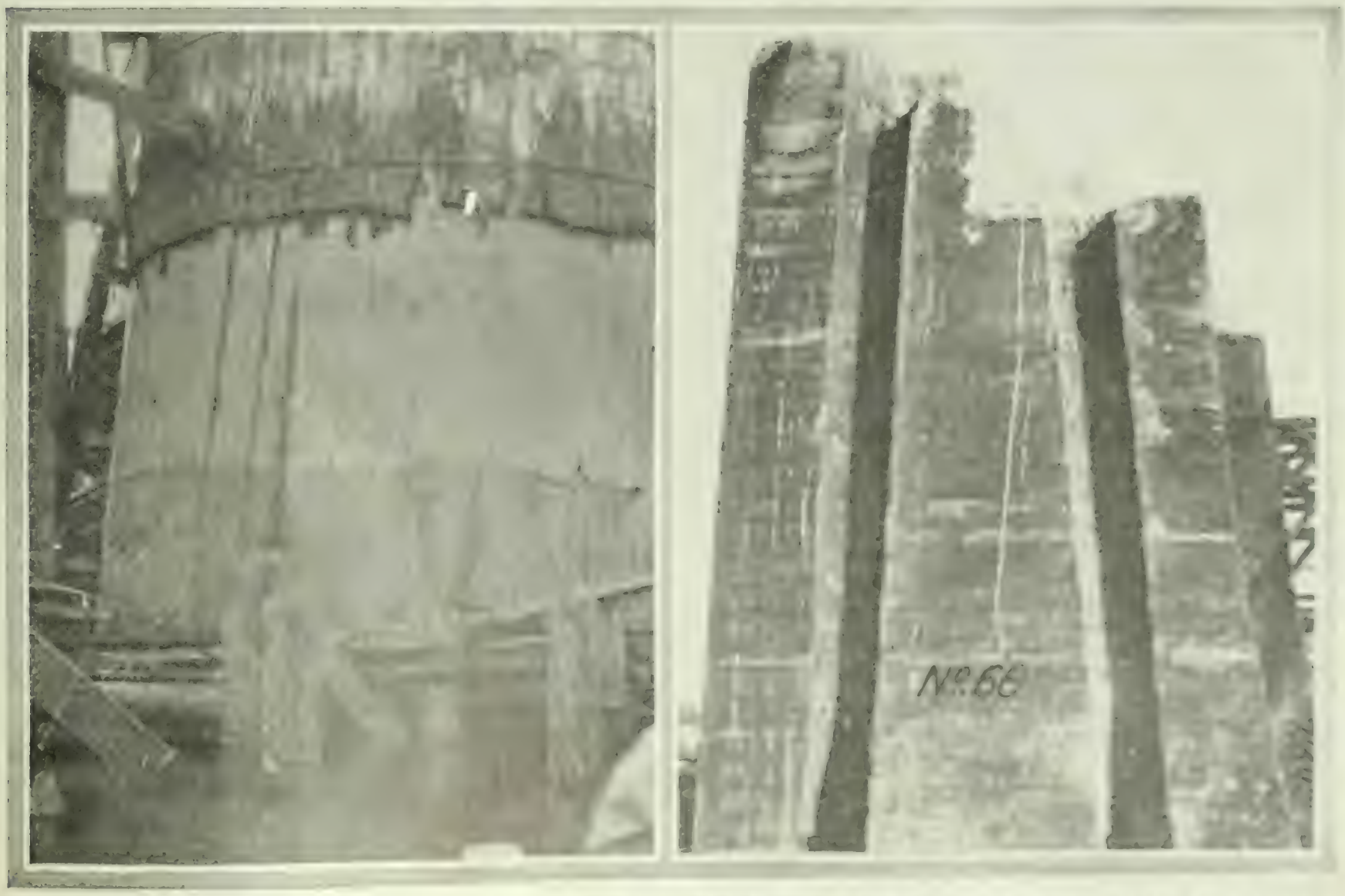


FIG. 1. THIS PIER WAS BUILT OF ENGLISH CEMENT 25 YEARS AGO. BEING PROTECTED THE CONCRETE IS STILL GOOD

FIG. 2. CONCRETE BLOCKS SUBMERGED IN NEW YORK HARBOR 18 YEARS. NO DISINTEGRATION VISIBLE AFTER REMOVAL TO AIR

In New York harbor are several miles of bulkhead walls of which the substructure is made of precast concrete blocks weighing from 40 to 80 tons. These walls were built at various periods dating from 1877 to the present, and various brands of portland cements were used. Two of these blocks were raised after immersion for 10 years, and their perfect preservation can be seen from the view shown in Fig. 2.

At different times from 1892 to 1900 cement-mortar jackets were placed around the wood piles of the Spreckels wharf at San Diego, Calif. Fig. 3 shows, in excellent condition still, the top of one of these jackets, placed in 1892.

There are a great number of structures built since 1900 which show this same excellent preservation in sea water; in fact there are no authentic cases of disintegration of concrete which is at all times wholly immersed that are not accounted for by the use of poor materials or workmanship. Among the cements used in the concretes which have shown practically no deterioration after a long period of exposure are those given in the accompanying table. An examination of this table shows that the composition varies between relatively wide limits—particularly the alumina, magnesia and sulphur trioxide, which are the three elements which are generally considered very deleterious by many engineers.

CHEMICAL COMPOSITION OF CEMENTS USED IN CONCRETE WHICH HAS RESISTED SEA-WATER ACTION

Brand	Percentage of Various Constituents							
	SiO_2	Fe_2O_3	Al_2O_3	CaO	MgO	SO_3	Loss	In. Res.
Alpha	20 88	2 65	7 89	62 54	2 62	1 23	1 06	0 27
Atlas	21 30	2 55	7 35	61 48	3 21	1 53	1 77	0 22
[illegible] (German)	21 52	2 90	6 54	62 96	2 41	1 40	1 76	0 27
[illegible] (English)	19 75	5 01	7 48	61 39	1 28	0 96		
Lehigh	22 70	2 30	5 72	63 04	3 19	1 59	0 93	0 19
Old Dominion	20 82	2 65	6 95	62 66	2 68	1 62	2 20	0 40
[illegible]	21 82	2 20	6 44	62 76	3 33	1 58	1 55	0 30
Pennsylvania	21 84	2 30	6 14	62 38	3 91	1 61	1 29	0 45
Rosendale (Natural)	25 80	4 60	11 44	33 51	16 38	1 10	7 41	
Santa Cruze	22 26	1 85	8 23	63 48	1 64	1 72	1 23	0 41
Vulcanite	22 76	2 18	7 58	62 98	2 09	1 30	0 98	0 15
Washington	22 96	1 90	4 64	64 38	1 84	1 38	2 71	0 28
White Bros. (English)	21 17	4 14	7 35	61 94	0 91	1 38	1 65	0 87

Providing the cement is properly manufactured, one containing 8% of alumina will resist sea-water action just as well as one containing only 4%. The solubility experiments made by P. H. Bates, as noted in Technologic Paper No. 12 of the Bureau of Standards, show that a cement containing only 3% of alumina and 7.5% of iron oxide may be even more soluble in sea water than one containing 8.5% of alumina and less than 1% of iron oxide. The most convincing proofs to the engineer, however, are the many structures which have been made of cements containing more than 7% of alumina and have withstood sea-water action for a period of years without disintegration or deterioration.

Many engineers have an idea that magnesia is deleterious in cement because when a sample of concrete which has disintegrated in sea water is chemically analyzed it is found to contain a relatively high amount of this material. If a comparison had been made of the amount of magnesia in the cement used with the amount found in the concrete after disintegration had occurred it would have been found that the magnesia content had materially increased.

The increased magnesia found in the disintegrated concrete is precipitated from the sea water as a magnesium hydroxide. The magnesia in the cement originally is wholly inert to the sea water and in fact may be



FIG. 3. MORTAR JACKET EXPOSED TO SEA WATER 22 YEARS. NO DETERIORATION. CEMENT HAS 7 PER CENT. ALUMINA

considered one of the most stable elements of the cement. For use in sea water it is really preferable to have the magnesia run as high as permissible without causing unsoundness; that is, about 8 per cent.

So many structures have been built in sea water of cements containing from 3 to 4% (the maximum permitted by American specifications until 1917) of magnesia that are now wholly sound where not exposed to abrasion that the evidence is conclusive from the practical as well as the theoretical and laboratory source. Magnesia within limits is not a deleterious element in the cement.

Until 1917 the American specifications limited the sulphuric trioxide content of cement to 1.75%. Therefore practically no cements have been used in sea water in this country which contained more than this quantity, and the majority of American cements range between 1.30 and 1.60%. Most of the sound structures on the North American coasts are made of such cements, which is evidence that up to this limit, at least, the sulphuric trioxide is not detrimental.

There are concretes that have been standing in European waters for 10 or 15 years, which are made of cements containing from 2 to 2.5% of sulphuric trioxide, without showing any evidences of disintegration below the water line. Solubility tests made by P. H. Bates show that there is no difference in the solubility in sea water of cements containing varying amounts of sulphuric trioxide up to 1.75%, this being the maximum amount in the cements he investigated. Thus all available data on this subject concord and show that there is no advantage in limiting the content of sulphuric trioxide below 2%, which is now allowed by American specifications.

The most vulnerable and chemically active material in a cement when exposed to sea water is the lime, which comprises 60% or more of the composition. It is not possible to decrease the quantity of lime in the cement appreciably without destroying its cementing and hydraulic properties.

To summarize, it may be stated that, contrary to the opinion of many, there is no definite relation between the chemical composition of properly manufactured portland cements and the ability of concretes made from them to resist disintegration in sea water. If properly manufactured and properly used, all normal portland cements are durable in sea water. The constituents of such cements generally range between the following limits: Silica, 19-25; alumina, 4-9; iron oxide, 2-6; lime, 60-65; magnesia, 1-5; sulphuric trioxide, 1-2.

Sea Water Can Be Used in Mixing

Sea water or brackish water can be used for mixing unreinforced concrete without deleterious effect. Nothing but fresh water; however, should be used in mixing concrete above water which is to be reinforced. The salts contained in sea water have no appreciably deleterious effect upon the chemical action which takes place when cement sets. In reinforced work, however, the presence of the salts may have an injurious effect upon the embedded metal in accelerating corrosion above the water line.

A study of what has been done and the results obtained will throw much light on this phase of the subject. Practically all of the concrete structures built along the Bay of Fundy in Nova Scotia were made of concrete gaged with sea water. In Fig. 1 is shown a bridge pier on the Bay of Fundy. These structures have been personally examined by the writers and are in excellent condition except where abraded. The concrete is of excellent quality and shows no peculiar characteristics which would indicate that sea water instead of fresh water had been used in mixing.

The one extensive American operation upon which sea water was used in mixing the concrete is that of the Florida East Coast Ry. for the work between Homestead and Key West, Fla. (See Fig. 4.) Several hundred pier structures have been built since 1909, involving several hundred thousand yards of concrete, practically all of which has been gaged with sea water. These structures, while not very old, show no deleterious effect whatever from the use of sea water.

A. B. Fletcher, state highway engineer of California, has used sea water in mixing concrete used in road construction without any effect on the quality of the concrete.

There have been a number of small marine structures built in this country in which the concrete was gaged with brackish or undiluted sea water, but no other extensive works. American specifications have quite generally required the concrete to be mixed with fresh water, and so we shall have to turn to foreign structures subject to sea-water action to see what the effect has been of mixing sea water with the concrete.

Sea water was used in mixing concrete for the construction of the marine railway piers in Algoa Bay by the government at Port Elizabeth, South Africa, in 1902. This pier was in excellent condition in 1914 and showed no defects which would indicate that the sea water was detrimental. There are numerous other extensive marine structures in good condition in this same district which were built at different periods since 1878, and it has generally been the custom for the government t use sea water for mixing concrete for this class of work

A half-and-half mixture of sea water and fresh water was used in mixing the concrete for the quay walls and breakwaters at Saloniki, Greece, constructed prior to 1906 by a French syndicate. These works were all reported to be in excellent condition in 1914 where not abraded.

The Government of Tasmania used sea water in mixing the concrete for the construction of the Huon lighthouse in 1906. This was reported to be in good condition in 1915 and showed no deleterious effect from the use of sea water.

British specifications have generally, for many years, permitted the use of sea water for mixing unreinforced concrete. Among specific cases may be cited the sea wall built in 1909 at Methil, on the Firth of Forth, about 18 miles northeast of Edinburgh. This was reported in 1915 to be in good condition. The specifications of 1913 for the new works of Aden Port Trust, Aden, Arabia, state that "the water for mixing concrete may be sea water"; also those for the extensive sea wall and dock works at Rossyth naval base on the north shore of the



FIG. 4. CORAL SAND AND ROCK WERE USED IN FLORIDA EAST COAST PIERS AND GAGING WAS DONE WITH SEA WATER, BUT CONCRETE IS IN GOOD CONDITION

Firth of Forth, about five miles south of Dumfernshire, Scotland, and for the dock at Newport, Monmouthshire, England, which was built in 1905, sea water being used in mixing the concrete.

Where sea water is used less than 0.1 lb. of cement is required to react with the salts in each gallon of water. If large masses are being poured and the concrete is mixed very wet, a larger quantity of laitance will accumulate on the surface of the concrete than if fresh water were used. This added laitance consists mainly of magnesium hydroxide precipitated from the sea water.

If proper construction methods are followed there will be no difference in the appearance, workability, or resulting quality of unreinforced concrete, whether gaged with fresh or sea water.

It is well known that under conditions where oxidation of the steel can occur the presence of sea water has a most marked effect in hastening corrosion. That the corrosion of the steel is occurring in the exposed section of many reinforced-concrete structures in sea water has been fully set forth in an earlier article, and there-

fore if sea water is used in mixing the concrete it will accelerate the oxidation. If the structure is exposed to stray electric currents the deleterious effect of the presence of the sea salts will be still more strongly emphasized, and disintegration from electrolysis may be rapid.

The same rules that apply to selecting fine aggregate for land structures also apply to concrete structures exposed to sea water, except that in Northern latitudes the sand should be selected so that it will produce a

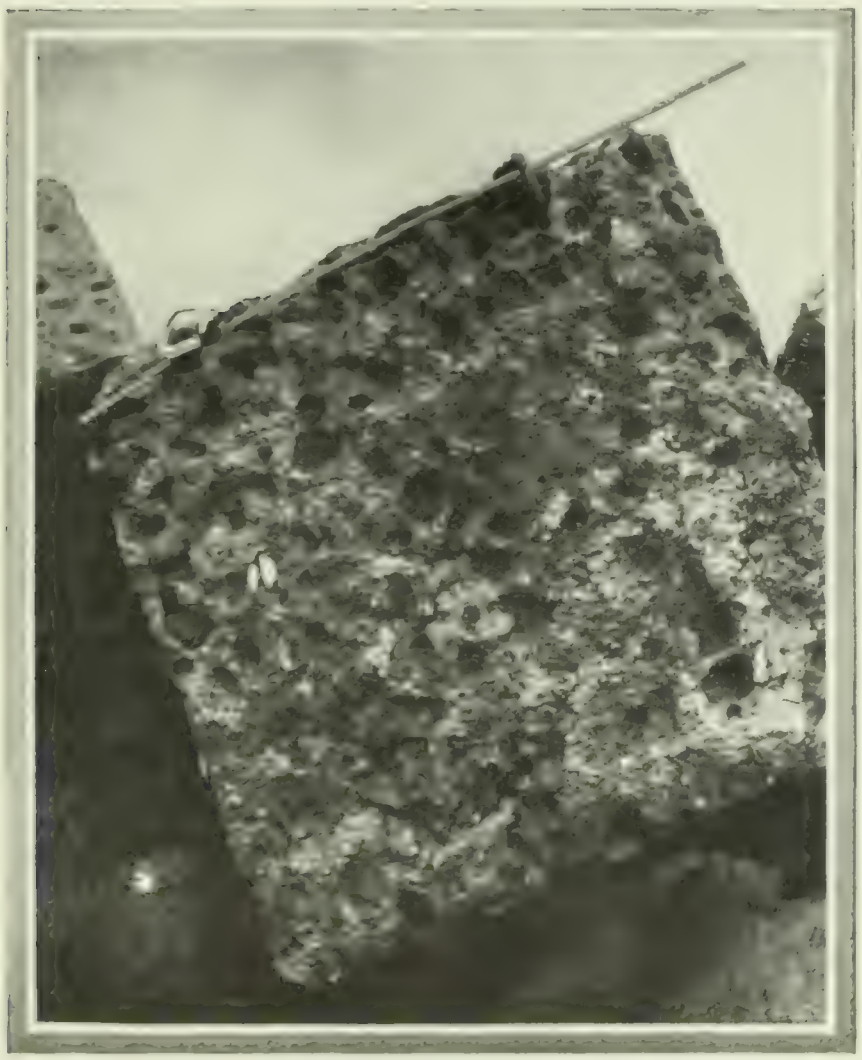


FIG. 5. CONCRETE BLOCKS AT PANAMA SHOW PITTING WHERE MECHANICAL EROSION TAKES PLACE

concrete of minimum porosity which will offer the greatest resistance to frost action. This practically eliminates natural sands and stone screenings containing large quantities of fine particles or dust, and also soft or porous aggregate.

In the South where there is no frost, uniform, fine sea sand and relatively soft limestones, coral rocks and shell sand are successfully used. The relatively soft, so-called coral sand found off the Florida Keys has been and is now being successfully used by the Florida East Coast Ry. in its very extensive marine structures, and by the United States Navy at Key West. Fig. 4 shows some of the concrete piers of the Florida East Coast Ry. in which coral sand and rock were used as aggregate.

Seashore sand was used in making the concrete jackets on the wood piles at San Diego previously referred to and illustrated in Fig. 3. It has been successfully used in a number of other marine structures in the South. Shell sand was used in the construction of sea walls at Port Royal, S. C., built in 1899 and 1900. These walls, though poorly constructed, are still in serviceable condition. Some seashore sand was used in the construction of the piles of Municipal Pier at Santa Monica, Calif. This sand contained a small quantity of shale. These small pieces of shale have swollen in the concrete, causing it to crack and spall even though embedded as much as an inch from the surface.

It is always safe to use well graded, clean, hard sand, but under certain conditions successful and wholly satisfactory work can be done in Southern latitudes with sands which would generally be considered wholly unsatisfactory. Where extensive works are contemplated it will pay to make a careful study of the available fine aggregate.

The statements made relative to the hardness of fine aggregate also apply to coarse aggregate. That is, in Southern latitudes under certain exposure conditions softer aggregate may be used than would be permissible in the North where frost conditions exist. Shale or other material which will expand when exposed to water and air should, of course, never be used. The partial or complete failure of several concrete structures has been caused by the use of aggregate containing only a small quantity of shale.

In 1886 the French made, at Panama, 580 concrete blocks of 1:2:3 mixture using portland cement, beach sand and conglomerate argillaceous sandstone. The blocks were used in shore protection at Cristobal. Fig. 5 shows some of these blocks as they appeared in 1910. The holes seen here and there over the surfaces are caused by the disintegration of the embedded aggregate. The markings on the original surfaces are plainly visible on some of the blocks.

Some engineers will not use limestone as aggregate because they believe it disintegrates in sea water. But limestone, which is a calcium and magnesium carbonate, is stable and insoluble in sea water, and is therefore safe to use.

Gravels are preferable to crushed-stone aggregate, particularly for underwater work, because they mix and settle into place more easily. Either crushed stone or gravel may be used, however, if carefully handled. Bank-run gravel should never be used, as its quality is not uniform.

How About Waterproofing Materials?

With the failure of concrete structures in sea water engineers have experimented with waterproofing compounds as a possible remedy. Structures were examined in which a number of these materials were used, such as Toxement, Impervite, Keystone, Trus-Con, Hydrolithic, Wemco, Medusa and others. In no case was there any difference in the appearance of the structure which would indicate that a waterproofing compound had been used, the same defects and deterioration being present in the treated structures as in those untreated.

In one case many concrete piles had to be discarded on account of the reduction in strength due to the use of a waterproofing compound. The piles were remade without the compound and were driven without breakage.

Complete failure of concrete containing compounds has also occurred in certain cases. Reinforced concrete containing waterproofing compounds has cracked and deteriorated in the same manner as the untreated reinforced concrete. It appears that at best waterproofing compounds are of doubtful value and their use is not recommended.

To sum up this matter of the effect of materials used in concrete subjected to sea-water action it may be stated that:

1. All well made portland cements will resist disintegration if properly used.

2. The gaging of the plain concrete with sea water will not be deleterious if proper methods of construction are followed.

3. Aggregates should be carefully selected, particularly with the idea of securing density and toughness. although in localities where there is no frost action local materials, of what might be considered inferior quality, may be successfully employed for unreinforced work. Where the conditions are severe, as along the north Atlantic coast, only the very best aggregate will produce concrete able to resist the action of the sea water.

4. Waterproofing compounds have no beneficial effect.

Good Rails the Result of Inspection

RAIL INSPECTION as an aid to securing good rails was dealt with at the recent annual meeting of the Roadmasters and Maintenance of Way Association, held at Chicago, in a paper by C. W. Gennet, Jr., manager of the rail inspection department of R. W. Hunt & Co. The present detailed system of inspection of the steel and the rails was inaugurated in 1912, after the rail failure record of a severe winter had called attention to the necessity of closer supervision of rail manufacture. It includes the employment of inspectors day and night in each important department of the mill. These inspectors, employed because of their experience with the work of the department to which they are assigned, act as monitors in that department. Thus there are openhearth or Bessemer steel inspectors, blooming mill inspectors, rail mill inspectors and drop test inspectors. Each man keeps an individual record of the work of his department, and his reports become part of a complete record of each heat of steel made and the treatment it later receives in the rolling process.

Mill Inspection System

This record begins in the open-hearth or Bessemer works, and is passed on to the inspectors in the succeeding departments. Thus each one in turn is able to anticipate just what conditions are to be met. The men are instructed not to interfere with the operation of the mills in any way except by appealing to the moral responsibilities and obligations of those in charge. This they do by first reporting verbally to the foreman any deviation from recognized good practice, and then confirming that report in writing to the higher officials in charge. Immediate opportunity is therefore afforded the manufacturer to divert the metal affected by bad practice or workmanship to other uses or orders, and to take such action as will prevent shipment of the rails which might otherwise go forward.

This feature of the mill inspection system has resulted in the greatest check imaginable on errors of mill practice and lack of judgment due to the employment of workmen on the tonnage basis. Mr. Gennet pointed out that the workmen apparently realize that an inspector watches every move, with the interest of the final purchaser of the rails so much at heart that any evident carelessness or lack of good judgment may be promptly reported to the officials and consequent disciplining result. This also has been the principal feature of special inspection that has so largely appealed to the officers of the manufacturing companies, for they, unquestionably desiring to make and ship only rails of the best quality and workmanship possible, have been quick to appreciate the great advantage gained from such a system.

Many cases show the advantages of special inspection. For instance, the open-hearth inspector complains of the general appearance of the steel as it comes from the furnace, possibly from the treatment it has received there. Its analysis proves correct and the mill decides to roll it into rails. At the drop test some of the pieces break and others stand. But in further testing the preponderance of broken test pieces and their appearance are such that the mill decides to take no chances and to reject the whole heat, even though under a strictly literal interpretation of the specifications it might be accepted.

Complete Record of Manufacture and Tests

The reports of the special inspectors are accumulated eventually and made up to comprise a complete record of each heat rolled. This is furnished to the purchaser as desired. A splendid opportunity is thus afforded for keeping definite record of the data concerning the manufacture of each heat of rails and the later serviceability of those rails.

In fact, Mr. Gennet stated that a plan has been advanced whereby the linking together of the manufacturing record with the failed-rail records might afford great benefits in the solving of the ultimate problem of what constitutes good rails. This plan has not yet been taken advantage of except in isolated cases, but he thinks that undoubtedly it will be adopted more generally by the railway companies.

The inspection during manufacture, above outlined, is additional to the usual inspection of the finished rails which for many years has been and is now applied. The rail inspectors go over carefully each rail in a search for flaws, seams and similar surface defects, as well as to examine the mechanical finish of the rails.

In this they are greatly assisted by the results of the special inspection, for word may come to them from the men in the open-hearth or blooming mill or rail mill that some condition has occurred and to be on the lookout for evidence of that condition in the finished rails.

Thus the inspection work is progressive from the time the furnaces are charged until the rails are on cars ready for shipment. Of course, the chemical composition and the physical test specified must continue to bear an important part in the effort to make good rails.

Airing a Reservoir Bottom

Spirogyra caught on the shallower parts of the 15,000,000-gal. impounding reservoir of Windsor, Conn., caused bad odors in the water-supply, according to a paper by Homer R. Turner, superintendent and engineer, read at the recent convention of the New England Water Works Association. The reservoir was drained, thus exposing the bottom to air and sunlight. After ten days' exposure "the offensive matter was sufficiently oxidized so the sluice gates could be closed."

To Meet State Laws Austin Proposes Thoroughgoing Sewage Works

Automatically Controlled Pumps, Imhoff Tanks, Sludge-Drying Beds, Four Dosing Tanks, Trickling Filters and Liquid-Chlorine Disinfecting Apparatus Are Included in Design

By John H. Gregory
Consulting Engineer, New York City

TO COMPLY with the laws of the State of Texas, which prohibit the pollution of watercourses within the state by the discharge into them of untreated sewage or other polluting wastes, and to meet occasional low river-flow conditions, the City of Austin, the capital of the state, has recently had plans prepared for thoroughgoing sewage works. It expects to proceed with the construction of the works as soon as funds are available. Austin, which is sewered on the separate system, is situated on the Colorado River, into which the sewage is now discharged without treatment. Notwithstanding a drainage area of some 37,000 sq.mi. above Austin, the flow in the river below the city is, at times, exceedingly small. Flows as low as 40 sec.-ft. have been observed for days at a time; and during one period of 31 consecutive days the average flow was as low as 77 sec.-ft. It was conditions such as these which determined the type of works to be installed.

The sewage works (see plan) will consist of a diversion chamber, pumping station, Imhoff tanks and sludge-drying beds, dosing tanks and trickling filters, and apparatus for disinfecting the effluent with chlorine gas, when and as may be required. The works will have a capacity of treating an average of 2,500,000 gal. per 24 hours, but are designed to handle the sewage at a maximum rate of 4,600,000 gal. per 24 hours, or at about 85% in excess of the average rate of flow. The present population of Austin is about 37,000, but the works have been designed to serve for a period of years before extensions will be necessary.

Diversion Chamber in Existing Sewer

The sewage at present passes out to the river through the existing Holly St. sewer. On this sewer, at the site of the works, a diversion chamber will be built, where the sewage will be intercepted and diverted into a so-called inlet sewer, through which it will flow to the suction well of the pumping station.

After having passed through the works, and after having been treated with chlorine gas or not, as the case may be, the sewage returns to the diversion chamber and passes through it back into the Holly St. sewer, just below the point at which the raw sewage is diverted. It then flows through the lower end of this sewer, being discharged into the river through a submerged outlet.

In the diversion chamber, by means of stop planks and suitable openings in the diverting wall, the raw sewage can be caused to flow continuously through the Holly St. sewer, instead of being diverted into the inlet sewer, thus bypassing the sewage works entirely, should repairs or extensions require such a temporary method of operation. Automatic relief is also provided for allowing the raw sewage to flow into the lower end of the Holly St. sewer in case the pumping station should be shut down without the stop planks in the diverting wall first having been raised. The diverting wall also serves to prevent the river from backing up and flooding the Holly St. sewer during periods of freshet.

Screen and Suction Well

From the inlet sewer the sewage flows into the suction well, at the entrance of which the screen is located. This is of the bar type, the bars being spaced ¾ in. apart in the clear. The individual bars of the screen, and the upper and lower racks holding them, are removable, so that by the insertion of other racks the spacing between bars can be easily changed, if desired. The bars are made sufficiently heavy so that they will maintain the desired spacing between them without the use of tie rods and separators, thus greatly facilitating the cleaning of the screen.

No grit chamber is provided, as the sewage all comes from a separate system of sewers.

The suction well is 8 ft. wide by 22 ft. long and has a depth of 7 ft. below mean high water. A range of 4 ft. between mean high and mean low water is allowed for controlling the operation of the pumps. Below low-water level the ends and sides of the suction well are sloped inward so as to reduce deposition and dead corners to a minimum, and facilitate cleaning. Openings in the platform and floor above the suction well provide access so that the walls and bottom can be cleaned with a stream of water from a fire hose.

Automatically Controlled Pumps

The pumping station is located immediately adjacent to the suction well, one wall of which serves also as one of the substructure walls of the pumping station.

The pumping equipment to be installed at first will consist of two horizontal-shaft centrifugal pumps, each pump being direct-connected to a horizontal-shaft electric motor. Space has been provided for a third pumping unit. Each pump has a rated minimum of 750,000 gal. to a maximum of 2,500,000 gal. per 24 hours against a head of 31 ft., and is driven by a 25-hp. variable-speed alternating-current motor of the commutating brush-shifting type. Current for operating the motors, which will be 220-volt three-phase 60-cycle, will be obtained from the municipal power plant.

The specifications provide that the pump cases shall be so designed as to permit of the changing of impellers so that the capacity of each pump can be increased to 4,000,000 gal. per 24 hours, and also provide that the subbases on which the pumps and motors are mounted shall be so built as to permit of the substitution later of 35-hp. motors for the 25-hp. motors first installed.

The operation of the pumps will be regulated by a master controller that will automatically govern the

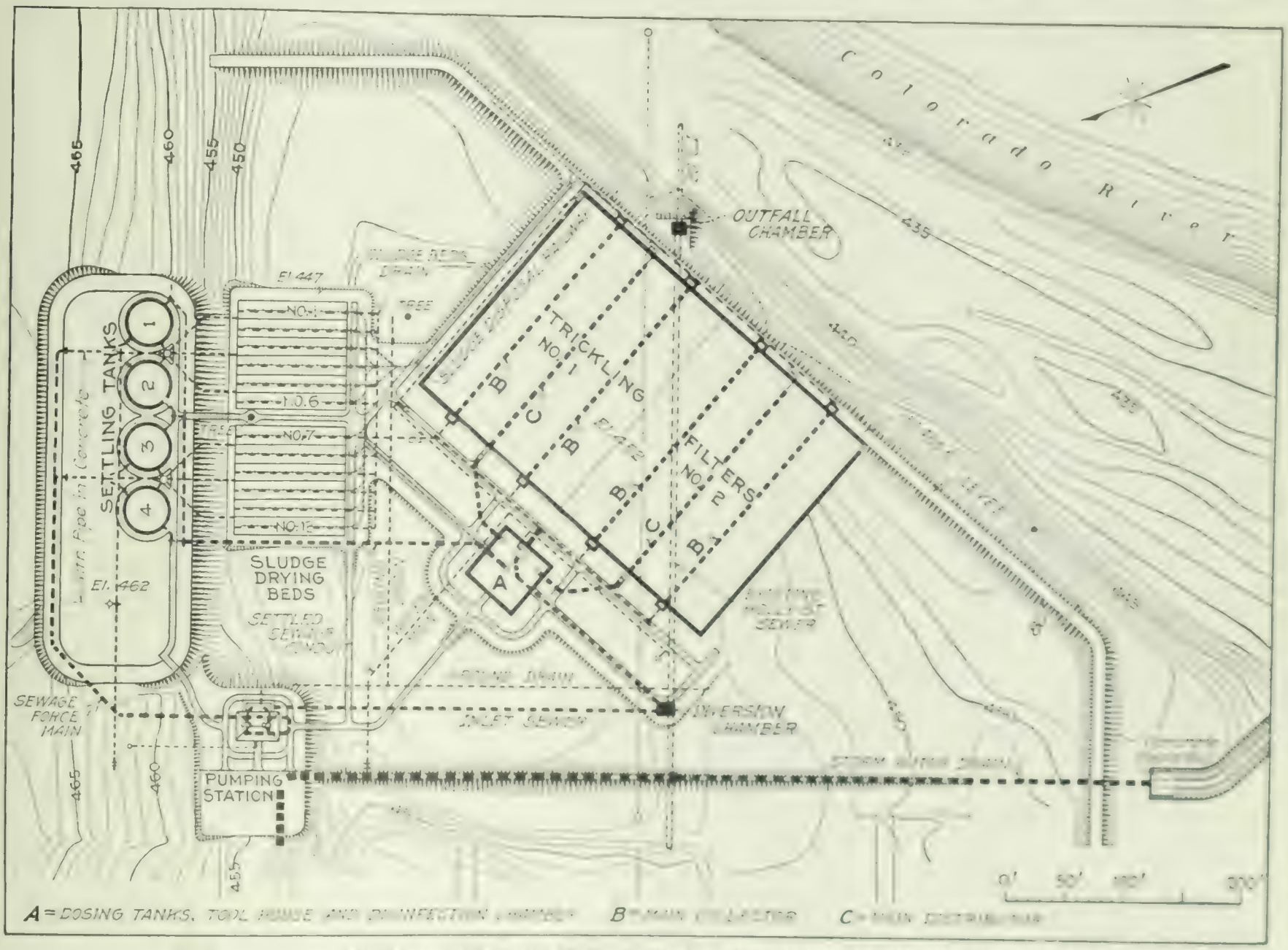
starting and stopping of either or both of the pumps, or any one or all of the three pumps after the third pump has been installed. The operation of the master controller will be governed by the level of the sewage in the suction well by means of duplicate heavy floats.

The sewage will be automatically pumped out at substantially the same rate at which it flows into the suction well. The pumping will be continuous, and without intermittent operation involving the stopping of all pumps for even short periods, thus making the rate of pumping, or outflow, as smooth and uniform as is consistent with the inflow. For this method of pump control a variation of sewage level in the suction well of 3 ft. is allowed with two pumps in service, but of 4 ft. after the third pump has been installed. Manual control of the pumps is also provided for. The pumps are self-priming with sewage at high-water level in the suction well.

The volume of sewage pumped will be measured by a 24-in. Venturi meter placed in the force main leading to the Imhoff tanks. By the use of a return loop in the force main it was possible to place the meter tube in the substructure of the pumping station and just above the switchboard gallery floor, with the indicating and recording apparatus close by. With such an arrangement it was possible to omit the construction of a meter vault outside the station. This arrangement also not only has the advantage of short piping connections between the meter tube and registering apparatus, but also permits of the ready inspection and cleaning of the meter-tube pressure chambers. The differential pressure from the meter tube will be transmitted to the operating parts of the register by means of compressed air. Open float tubes containing sewage, or intermediate oil seals, will not be used.

On the main floor of the station, in addition to an office and lavatory, space has been provided for a chemical and bacterial laboratory.

For the first installation four Imhoff tanks are provided, each tank (see details) being 37 ft. in diameter inside and 30 ft. deep below the water line. Although

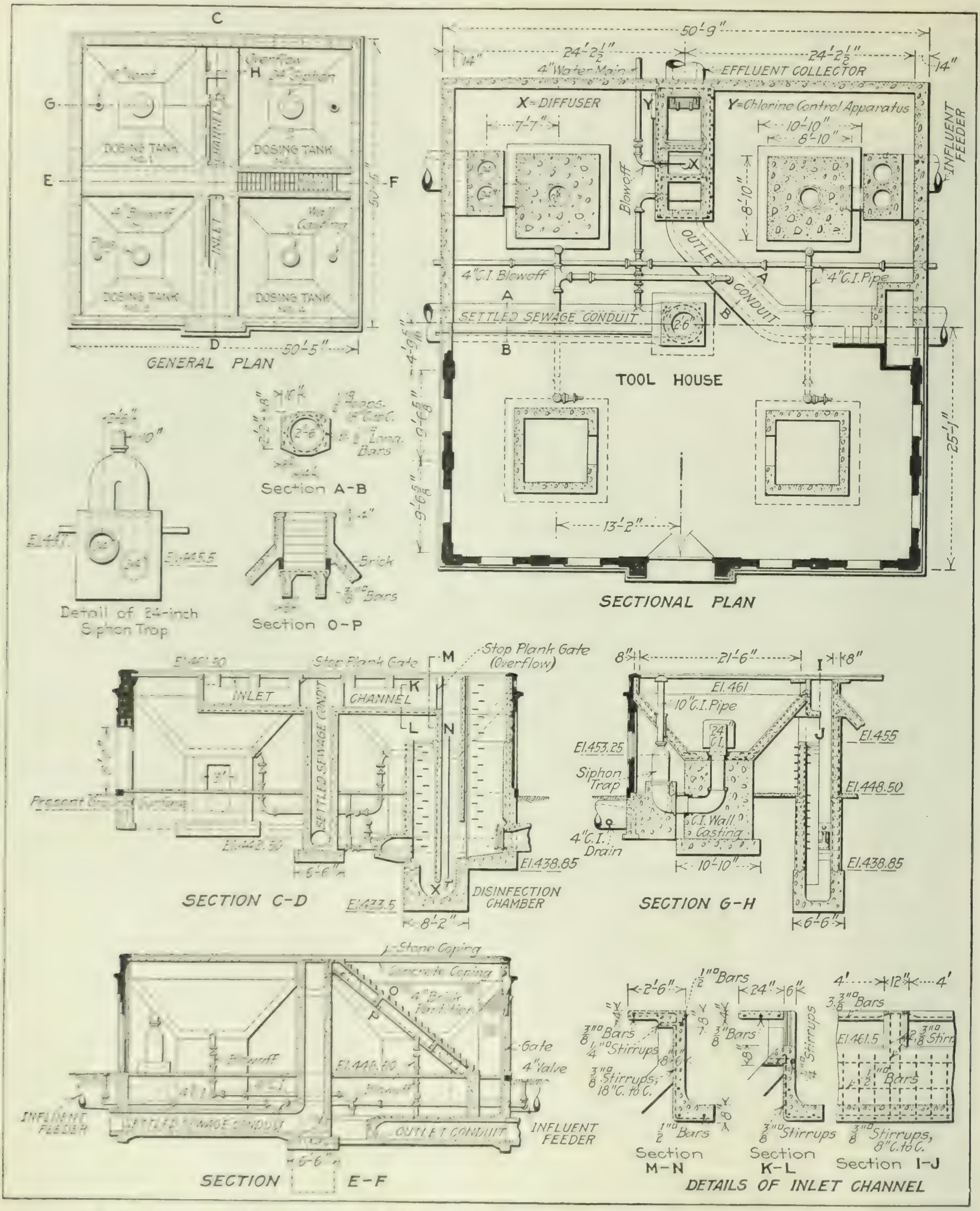


THE GENERAL ARRANGEMENT OF THE WORKS AND PIPING IS SHOWN BY THE PLAN

circular, the tanks are not of the radial-flow type. The screened sewage will be admitted over the weirs of an inlet chamber located on one side of the tank, and on the opposite side of the tank the settled sewage will pass off over the weirs of an outlet chamber.

Each tank has been so designed as to permit of the collecting of the gas escaping from the sludge chamber, for use in the pumping station if it should be found desirable to thus use it, but the installation of the house piping and equipment for collecting and storing the gas will be deferred for the present.

The sludge pipes from each set of two Imhoff tanks terminate in an open sludge-discharge manhole close by, in which the sludge valves are located and where the character of the sludge withdrawn can at once be observed. The two sludge-discharge manholes also serve to control the flow of sludge to the sludge-drying beds.



FOUR DOSING CHAMBERS, A DISINFECTING CHAMBER AND TOOL HOUSE ARE COMBINED

Twelve sludge-drying beds are provided, arranged in two batteries of six each, with piping connections so that sludge from either of two Imhoff tanks can be run onto any one of six drying beds. Each bed is 15 x 93 ft. in plan and has a track of 2-ft. gage running up the center of the surface of the bed. The filter medium has an average thickness of 12 in. The walls and partitions, inclosing and separating the beds, will consist of concrete boards held in place by concrete posts.

Although only two trickling filters are to be built in the first installation, four dosing tanks, with hopper bottoms, will be constructed but dosing siphons will be placed in only two of them at present. As the topography at the site is such that the dosing tanks would

have to be built up above the surface of the ground, it was found that economy in construction and improved appearance of the works would result by building four instead of two tanks, by walling in the four tanks and by using the space under and between the tanks as a storage and tool house and disinfection chamber. Such an arrangement saved not only the construction of a separate tool house, but also that of a separate disinfection chamber and house. In addition to space for the storage of the miscellaneous tools and equipment needed for operating the works, there is sufficient room for the housing of a motor truck or automobile. In appearance the dosing tanks will resemble a large gatehouse. Access to the dosing tanks is provided by a stairway between two of the tanks and reached from the outside.

Settled sewage from the Imhoff tanks is received in an inlet channel, from which it flows over weirs into the dosing tanks. A stop-plank gate is provided at one end of the inlet channel. This gate also serves as an overflow in case too many lateral distributors in the trickling filters should be shut off by accident, thus leaving an insufficient number in service to take the sewage flow. By raising this stop-plank gate the settled sewage can be caused to flow directly into the disinfection chamber, thus bypassing entirely the dosing tanks and trickling filters, although still permitting of the disinfection of the settled sewage. Such a method of operation might be found desirable during flood stages in the river.

The disinfection chamber is located between two of the dosing tanks. The walls of the chamber are carried up above flood level in the river, and back-flooding of the trickling filters is prevented by a flap valve set on the lower end of the effluent collector running from the trickling filters to the disinfection chamber. The application of the chlorine gas to the effluent will be by manual control.

Trickling Filters

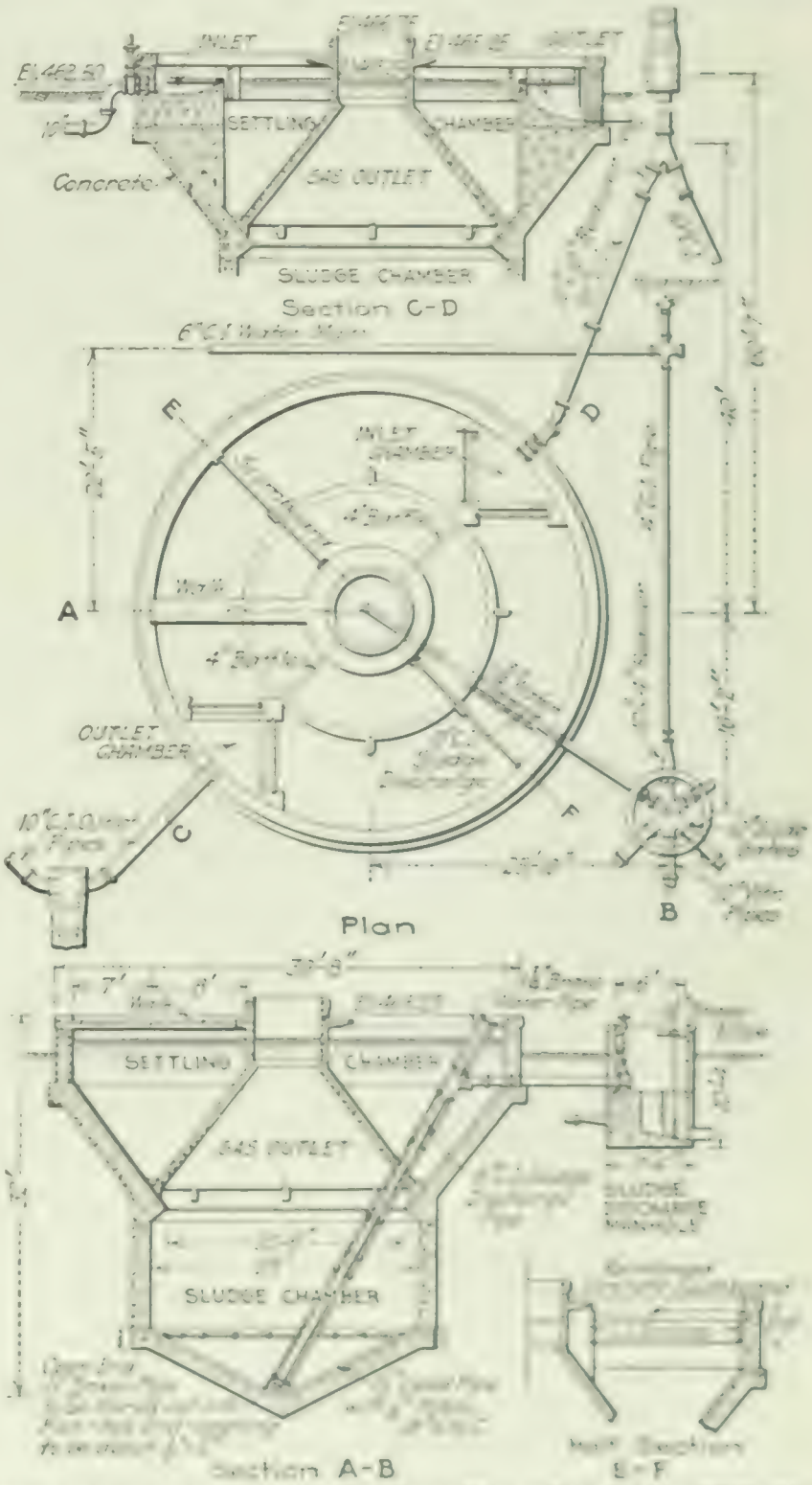
There are two trickling filters, each 157 ft. 10 in. wide by 209 ft. long on the neat lines. The floors are of concrete, 4 in. thick, with 6-in. split tile bedded in and laid thereon. Each filter is divided by the main distributor into halves, a main collector running up through the center of each half. Access to each main collector is had through a manhole at each end.

The 30-in. main distributors, one to each filter, are of 6-in. Universal cast-iron pipe, laid in and near the top of, and supported by, the filter material. Each lateral distributor is fitted with a gate valve located immediately adjacent to the riser connecting the lateral distributor with the main distributor.

For purposes of comparison under regular operating conditions the filters will be equipped with three types of nozzles. One filter will be fitted throughout with modified Columbus nozzles; each half of the other filter will be fitted with Worcester and Taylor nozzles, respectively. The nozzles will all have the same screw thread, so as to be interchangeable.

The filter material, which is from 1 to 2 in. in size, has a minimum depth of 6 ft. The filters have been so designed, however, that the depth of filter material can be increased somewhat, at a later date, a procedure which will be considerably less expensive than the increasing of the filter area, when extensions become necessary.

As with the dosing tanks, the trickling filters set up above the ground. After comparative studies and estimates, it was found that an L-shaped retaining wall of the cantilever type will best meet local conditions. Not only will it keep the volume of filter material at a minimum, a condition which is desirable under Austin conditions, but it will provide a means by which a concrete walk can be built around and at the surface of the filters, and without great expense, a feature much desired for proper operation, by simply constructing a



THE FOUR IMHOFF TANKS RECEIVE SCREENED SEWAGE

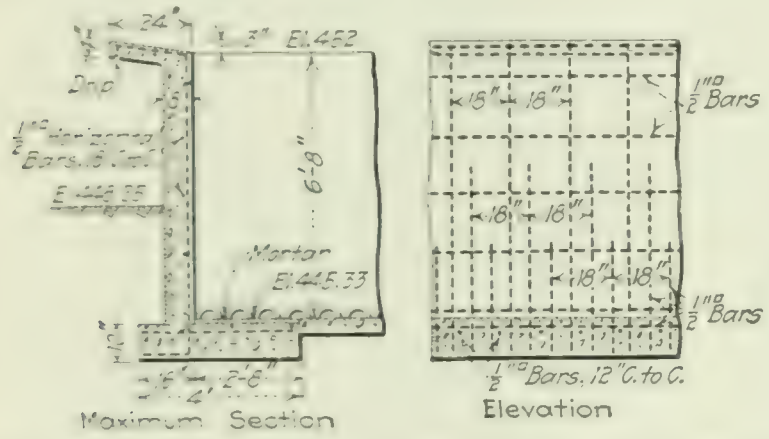
cantilever slab out from the top of the wall. Also the grading around the filters is brought to such an elevation that in walking around the filters an observer can easily see all over the surface of the filters.

Means and equipment for disinfecting the effluent from the works have been provided. As previously stated, the disinfection chamber, where chlorine gas can be applied, is located in the storage house under the dosing tanks. No retention tank for the sewage to flow through after the application of the disinfectant has been provided at present, as a sufficient period of time for contact can be obtained with the effluent flowing through the outlet conduit, the lower end of the

Holly St. sewer and the submerged outlet pipes in the river.

To insure a slow flow through the outlet conduit and Holly St. sewer, an outfall chamber is to be built at the end of the sewer, in which stop planks will be placed across a widening of the sewer. The stop planks will serve not only to make the outlet conduit and Holly St. sewer act as a retention tank but also to provide the outfall weir over which the effluent finally flows just before passing into the pipes leading to the submerged outlet.

As the works will be in full view of a proposed boulevard, every attempt has been made to make them as attractive as possible. Thus, the exterior walls of the pumping station and of the diversion chamber (which extends up above the surface of the ground, as do the dosing tanks), as well as the walls inclosing the dosing



SPRINKLING FILTER RETAINING WALLS HAVE L-SHAPED CANTILEVER SECTION

tanks, will be faced with red tapestry brick, laid in Flemish bond, with Bedford Indiana limestone trimmings. The roof of the pumping station will be covered with red Spanish tiles. Gravel walks have been laid out about the works so that, with the grading and planting contemplated, the works will have more or less the appearance of a park. A water main, with a number of connections and hydrants, provides ample facilities for flushing, cleaning and sprinkling. Sufficient land has been obtained so that the works can be more than doubled in capacity.

The sewage-disposal works will be built under the direction of the Department of Streets and Public Improvements, of which P. W. Powell is superintendent, and of M. C. Welborn, city engineer, who will be in immediate charge of the work. The plans and specifications for the works were prepared under the direction of the writer while a member of the late firm of Hering & Gregory, of New York City.

Utility Roads First Is Utah's Policy

Hard surface roads are considered by the present state administration of Utah of secondary importance to furnishing fertile back-country farming districts with possible outlets. In consequence, the highway department is bending its efforts toward supplying several such valleys with roads which are of simple construction, yet mean much to the districts tapped. For two such roads projected this summer, a 165-mile stretch from Thompson Springs to Grayling, and 55 miles from Helper to Duchesne, it is hoped to get approval to use the Federal Aid allotment.

Suggestions for Paving Parkway Drives and Boulevards

Bituminous Carpet on Concrete Base Advocated—Admixture of Mineral Dust with Bitumen Favored

By S. Whinery
Civil Engineer, New York City

While paving practice for city streets has become fairly well standardized, with a consequent accumulation of data on construction and maintenance methods, the amount of really useful information on the less heavily traveled parkway drives and boulevards is comparatively meager. Mr. Whinery's article, therefore, should appeal to a wide circle of city engineers and road officials, most of whom are responsible for a certain mileage of park routes. The bituminous carpet on concrete base is the type advocated by Mr. Whinery, who lays particular stress on two points which are held to be all-important if this form of construction is to be a success.

THE REVOLUTION that has taken place during the last three decades in the character of the travel over our park drives and boulevards has made necessary a radical change in the kind and character of pavements for this class of highways. It is admitted by all that the waterbound macadam and gravel pavements, so well suited to the earlier conditions, are inadequate where rubber-tired wheels prevail. The problem of the present is to find the best and most economical pavement to substitute for them to meet present conditions. This problem has not yet been satisfactorily solved.

What is needed is a pavement that shall be smooth, dustless, easily cleaned, not slippery, and that can be constructed and maintained at so low a cost as to be most economical. Great durability is not necessarily a controlling factor except as it may affect ultimate economy. Broadly stated, the element of economy resolves itself, other things being equal, into the question: What pavement can be constructed and maintained through a long period of years at the least cost per square yard per year? In other words, what pavement will give the largest returns in satisfactory service for each dollar invested in it?

The writer is of the opinion that these requisites will ultimately be found in what is called a bituminous-carpeted hydraulic-concrete pavement. This type of pavement is not new, but it is still in the experimental stage of development that all our standard pavements have passed through. Most of those so far built give promise of reasonable success, but there have been not a few failures. This was to be expected when we consider the differing materials used and the varying methods of construction followed. Most of the failures to secure satisfactory results, are, in the opinion of the writer, due, in some degree, to the use of inferior materials, but mostly to faulty construction.

We must constantly keep in mind that any satisfactory pavement must possess two primary requisites; it must have the supporting strength to carry the max-

imum wheel loads to which it will be subjected, and the ability to resist the surface abrasion and wear of travel. The first requisite may be met with a good concrete foundation. We now have ample knowledge and experience, if intelligently applied, to guide us in the design and construction of concrete pavement foundations and little need be said on that subject.

But in the matter of bituminous carpet-coatings we greatly need further knowledge and experience. The best material to use, its proper preparation, its consistency and the methods of its application, are all matters about which there is more or less difference of opinion and practice among engineers. It will probably be found that the best material (bitumen) for the purpose is a natural asphalt, though there is evidence that some of the coal-tar preparations will give good results. The exact composition, consistency, and treatment of the bitumen that will give the best results can not yet be stated definitely—it will vary more or less with conditions of travel and climate.

Add Mineral Dust

Our experience with sheet asphalt and other bituminous surfaces should help us here. In carpet-coating work we have apparently overlooked the very important function of colloidal matter—mineral "dust" as it is called in the asphalt paving industry—in increasing the toughness and wearing qualities of bituminous cements. The writer's first suggestion is, that the bituminous cement should be specially prepared by the intimate admixture with the melted bitumen of as much such "dust" as it will carry without impeding the spraying of the mixture on the street. Not less than 25% by weight doubtless can be and should be used—more if possible. In asphalt pavements the weight of the dust used is often almost equal to that of the asphalt cement. The consistency of the bituminous cement will vary with conditions, but we safely may say that it will be harder than the heaviest road oils and softer than the asphaltic cement for asphalt pavements.

In the methods of applying the two coatings of cement to the street, the quantity to be used, the application of screenings or gravel and the rolling, present best practice is, probably, about right—subject, of course, to further experience.

The most frequently observed and most serious source of trouble with bituminous carpet-coats on concrete roads is the failure of the coating to adhere to the concrete. The practice is almost universal of finishing the top of the concrete with a surface of rich, fine concrete or mortar alone, gaged to the proper grade and practically "troweled" so that it sets to a smooth, dense, glassy surface almost, if not quite, impervious even to water. The liquid bitumen does not penetrate or "take hold" of this surface even when perfectly dry, and if the concrete is damp the hot bitumen generates a film of vapor between the two surfaces, still further preventing proper adhesion. The result is that under travel the carpet-coat is easily displaced, breaks up, and is carried away, leaving the concrete perfectly bare.

This defect should be easily remedied. Since the resistance to abrasion is no part of the intended function of the concrete foundation, the rich, dense, glassy finish is not necessary. If ordinary good concrete is used throughout, its top surface gaged to the true grade and compressed by tamping, or what is far better in this case, rolled with a hand roller, say 30 in. long and weighing about 750 lb., such as is commonly used in the asphalt pavement industry, an ideal surface should result. It will be true, hard and strong, but not dense or glassy, and the hot bitumen will penetrate it slightly and become firmly anchored thereto. It will be noted that, recently, many engineers of experience in this line of work require that the concrete shall be thrown open to travel for some months or even years before the bituminous coating is applied. The rationelle of this practice is, obviously, to secure the roughening of the surface of the concrete so that the bituminous coating will adhere to it. Why not secure this effect at once by the treatment here suggested?

It will be noted that the construction herein suggested differs materially from approved present practice in two particulars only; the special preparation of the bituminous cement by the addition of mineral colloidal matter, and the finishing of the concrete with a somewhat rough and porous surface. Other details of some importance might be discussed, but the length of this article forbids; and they may safely be left to the intelligent engineer.

A pavement for parkways and boulevards of this type, when further experience shall enable us to perfect it, should be comparatively low in first cost and cheaply maintained. It is true that, with present prices of portland cement, no pavement with a concrete foundation can be built very cheaply, but if the carpet-coat can be made to shield the foundation effectually from wear, the latter should be practically permanent. The bituminous surface coat should be quite inexpensive and even if it should require renewal every four or five years the average cost of maintenance per yard per year should be quite low.

Illinois Has New Civil Administration

The numerous departments, commissions and bureaus which have gradually and unsystematically developed in the state government of Illinois have now been consolidated into nine departments, under a new civil administration code. This was drafted by Governor Lowden in order to concentrate authority and increase efficiency and economy. It went into effect in July. These departments and their directors are as follows: Department of Public Works and Buildings, Leslie Puterbaugh, of Peoria; Department of Health, Dr. C. St. Clair Drake, of Springfield; Department of Public Welfare, Charles Thorne, of Winnetka; Department of Mines and Minerals, Evan D. John, of Carbondale; Department of Trade and Commerce, William H. Stead, of Ottawa; Department of Labor, Barney Cohen, of Chicago; Department of Agriculture, Charles Adkins, of Bement; Department of Finance, Omar H. Wright, of Belvidere; Department of Registration and Education, Francis W. Shepardson, of Chicago.

The former State Highway Department is now the Division of Highways in the Department of Public Works and Buildings. This division is headed by E. Bradt, superintendent of highways. The death of W. W. Marr, chief highway engineer, is noted elsewhere in this issue.

Four-Slip Shipyard Compactly Arranged on City Property

Labor Conditions Made City Location Desirable and Yard Was Accordingly Laid Out for Maximum Economy of Space

THE Supple-Ballin Shipyards at Portland, Ore., were located on the Willamette River within the city limits in preference to sites where more space was available but which were some distance away, because it was believed that the problem of keeping an adequate force of men at work would be less near trade and residence centers. It then became an important problem to develop the most economical layout of the yard and its equipment so that the maximum use could be made of a limited amount of this higher priced frontage. The plant covers about 7½ acres.

The accompanying plan shows the general arrangement of four slips which are so spaced that a gantry crane can pass between each pair and by means of an 80-ft. boom, deliver material to any point on the slips. By beginning and keeping the work on each slip a little in advance of that on the next slip it is possible to make the most efficient and economical use of the several crews which are trained for speed in certain specialties.

The lumber yard, 200 x 200 ft. in plan, could not be located on river frontage and is separated from the main portion of the yard by a 60-ft. street. However, a railroad siding serves the yard, and a gantry crane is used to handle the lumber. This crane has a 100-ft. span and extends the full length of the yard so it can deliver and pile lumber at any point. This crane takes the lumber from the cars and stacks it near the saws. After going through the saws it is taken by motor truck across the street and to the desired point in the main yard.

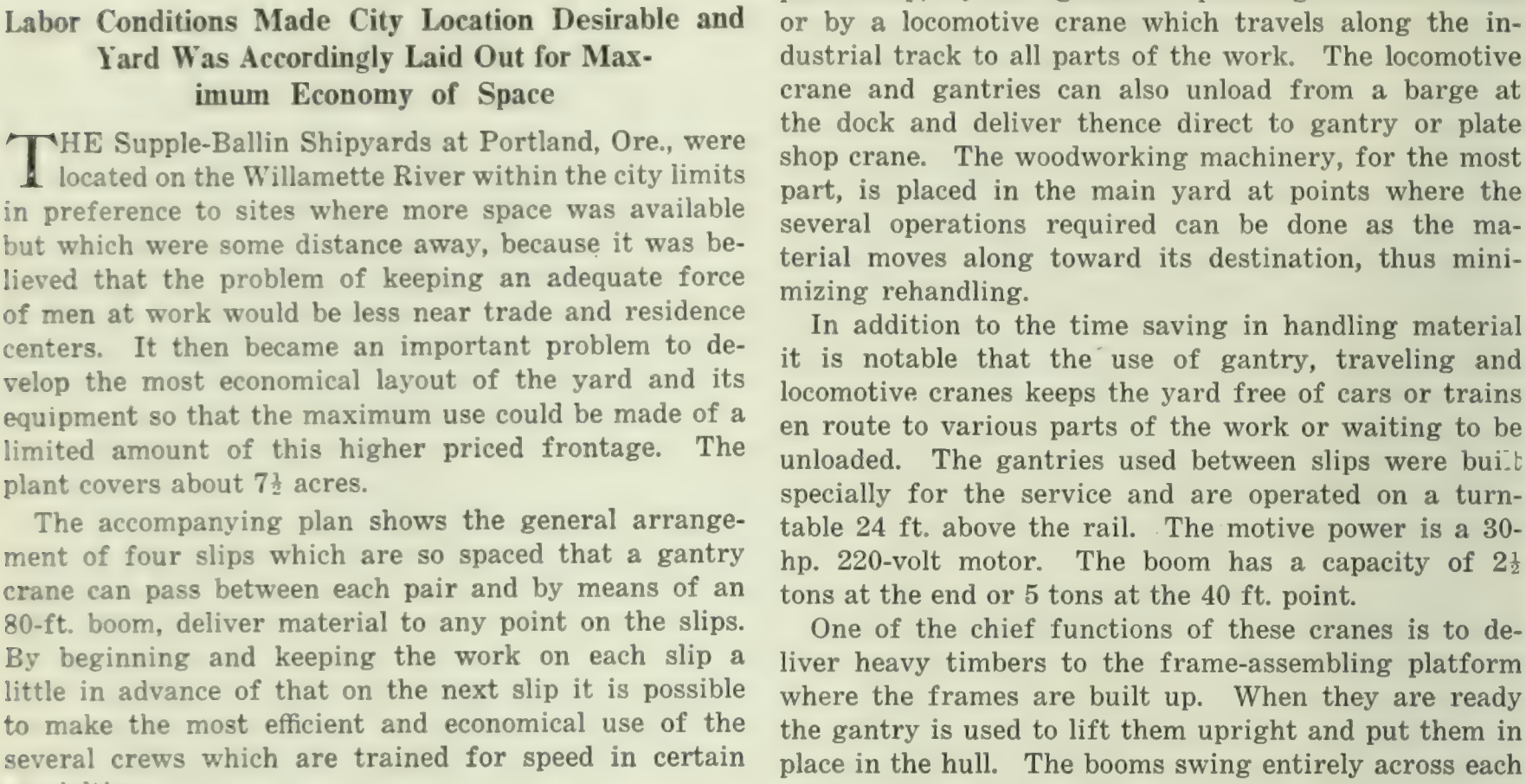
The main yard has its own railroad siding and it is notable that freight can be taken directly from the railroad cars by the electric traveling crane in the plate shop, by the gantries operating between boats or by a locomotive crane which travels along the industrial track to all parts of the work. The locomotive crane and gantries can also unload from a barge at the dock and deliver thence direct to gantry or plate shop crane. The woodworking machinery, for the most part, is placed in the main yard at points where the several operations required can be done as the material moves along toward its destination, thus minimizing rehandling.

In addition to the time saving in handling material it is notable that the use of gantry, traveling and locomotive cranes keeps the yard free of cars or trains en route to various parts of the work or waiting to be unloaded. The gantries used between slips were built specially for the service and are operated on a turntable 24 ft. above the rail. The motive power is a 30-hp. 220-volt motor. The boom has a capacity of 2½ tons at the end or 5 tons at the 40 ft. point.

One of the chief functions of these cranes is to deliver heavy timbers to the frame-assembling platform where the frames are built up. When they are ready the gantry is used to lift them upright and put them in place in the hull. The booms swing entirely across each vessel.

The locomotive crane, which burns wood, has a 50-ft. boom with a capacity of 15 tons, and is geared so as to give a speed of about 10 miles per hour. Because of its ability to quickly pick up material and deliver it speedily to any part of the work it is an important factor in the rapid rate of construction demanded at these yards. The plate shop crane has a 31-ft. span and a capacity of 5 tons.

About a half mile up the river the company is now building a plant which will be able to manufacture boilers and engines complete for the vessels built in the



ECONOMICAL LAYOUT OF YARD AND EQUIPMENT WERE IMPORTANT BECAUSE OF THE HIGH PRICE OF THE WATERFRONT PROPERTY OCCUPIED WITHIN THE CITY LIMITS



GANTRY BETWEEN WAYS IN PORTLAND SHIPYARD

yard just described. Here the boilers will be built, cylinders will be cast, and an up-to-date machine shop will turn out all parts and accessories. The equipment includes an 84-in. lathe with a 40-ft. bed, a 30-in. slotter, and a large open side wall planer weighing 50 tons.

The frontage owned is such that by making vessels fast two abreast, four 300-ft. boats can lie alongside the main yard and two alongside the engine building plant.

Oxyacetylene Welding for Track Repairs

Repairing of frogs and track crossings by building up the worn places by oxyacetylene welding is being practised in side-track repair work on the Chicago & Northwestern Ry. The work is done by the section gangs, and the success has been such that it is intended to provide an outfit for each roadmaster's division. The same outfits are used for cutting rails, boring bolt holes and welding pieces of angle-bar under the rail base to serve as anchors. Particulars of the work were given at the recent annual meeting of the Roadmasters' and Maintenance of Way Association by P. J. McAndrews, roadmaster of the Chicago & North Western at Sterling, Ill. The welding and cutting have been confined to side-track work as yet, but Mr. McAndrews considers that with proper care the process can be employed in main-track repair work.

May Higher Shear Values Be Used in Concrete Design?

Low Figures Now Accepted Based on Tests of Beams Which Did Not Fail Primarily in Shear —Higher Tests Cited

By W. P. Anderson
President, Ferro Concrete Construction Co., Cincinnati

THERE is a tendency among some engineers to use unnecessarily low unit stresses in reinforced-concrete construction, causing an uneconomical design. In beam-and-girder construction, particularly, the total allowable unit shear value may materially affect the cost. Within certain limits, the extra steel required in a beam with a high unit shear stress does not entirely offset the saving in concrete, and the net saving may run 8% of the total cost of the beam. The use of a high total shear value also gives greater flexibility in design. In buildings with varying floor or roof loads, corresponding beams can be kept the same size by using higher shear values with higher floor loads, and although the saving in the beam with the high shear value may not be great itself, there will be a great saving where the formwork can be reused without remaking. Considerations other than shear may determine the width of a beam, such as the spacing of the bars or the compression at the support, but that is no reason for adopting unnecessarily low shear values.

Improper Design of Test Pieces

The generally low unit shear values used and proposed by various specifications are a result of tests in which low maximum shears have been obtained. It is the opinion of the writer that such low values are due to the improper design of the test pieces, which have not failed in shear but through lack of sufficent compression or tension area, proper broading of the member at the support, insufficient bond or a combination of these things.

The writer has knowledge of at least three series of tests which were designed so as to insure initial failure in shear, and in each of these the unit values obtained were high.

In 1907 the Ferro Concrete Construction Co. made some tests under the writer's direction in which shear values as high as 1032 lb. per sq.in. were obtained. In these tests a narrow web was used with an excessive amount of tensional steel and of concrete in compression, and the tensional steel had ample grip in broad supports. In 1915 a series of tests was made at the University of Cincinnati, where shear values as high as 1340 lb. per sq.in. were obtained. An account of these tests appeared in the April, 1917, issue of *Concrete*.

The tests made by the Ferro Concrete Co. showed that very fine hair cracks due to shear develop with total unit shear values of from 200 to 300 lb. per sq.in. In the tests at the University of Cincinnati, the first diagonal shear cracks appeared after the vertical cracks due to direct tension, and at total unit shear values in numerous cases as high as 370 lb. per sq.in. In the beams carrying high shear values, the first shear cracks were very fine hair cracks, which would ordinarily go unnoticed.

These results are confirmed by a series of tests made by R. Saliger of the Technische Hochschule, of Vienna, and published in *Zeitschrift für Betonbau,* Nos. 8 and 9, 1913, and No. 1, 1914. The test pieces are shown in the accompanying drawing. In all the beams 12 round rods 13 mm. in diameter were arranged in four layers of three rods each, but the number bent up to the flnages was three in beams 23 and 24, six in beams 25 and 26, and nine in beams 27 and 28. None was bent up in beams 21 and 22. The omission of stirrups was intentional, in order not to obscure the results by their influence. Half of the beams were of reduced stem width as shown. In order to keep the moment resistance high, high-carbon steel was used.

The carrying capacity of the beams with wide stem was, in all cases, greater than with narrow stem, and the inclined reinforcement in all cases increased the carrying capacity.

Professor Saliger gives the following formula where the initial failure is in the inclined reinforcement:

$$V = V_c + V_s = bdv - (d\ x)A_b \mid 2\ f_{es}$$

where V = total ultimate shear value; V_s, steel shear; V_c, concrete shear; b, width of beam; d, effective depth; v, shear unit stress in concrete; x, distance from support to application of load; A_b, area of bent-up steel, and f_{es}, elastic limit of steel.

This formula combines the truss action of the reinforcement with the shearing value of the plain beam. The stem of the beam must, however, be wide enough to take the compression within it caused by the truss action.

Professor Saliger's Conclusions

1. The carrying capacity of beams is limited by the resistance of the tensional area. This resistance does not amount to much more than the elastic limit of the steel (at a maximum about 8% more) if figured in reference to the center of gravity of the reinforcement. Therefore it is the elastic limit and not the ultimate strength that determines the capacity. On this account steel of a higher elastic limit may be used to advantage.

2. Beams that have not inclined reinforcement attain their highest load when subjected to an average shearing strain of 426 lb. per sq.in.

3. In beams that have their inclined reinforcement correctly arranged the causes of failure were found to be (a) in the exceeding of the elastic limit of the inclined steel, or (b) in the crushing of the concrete (in the web) if the compression exceeds the compressive strength of the concrete. This is the case when the calculated shearing force exceeds 1065 to 1280 lb. per sq.in.

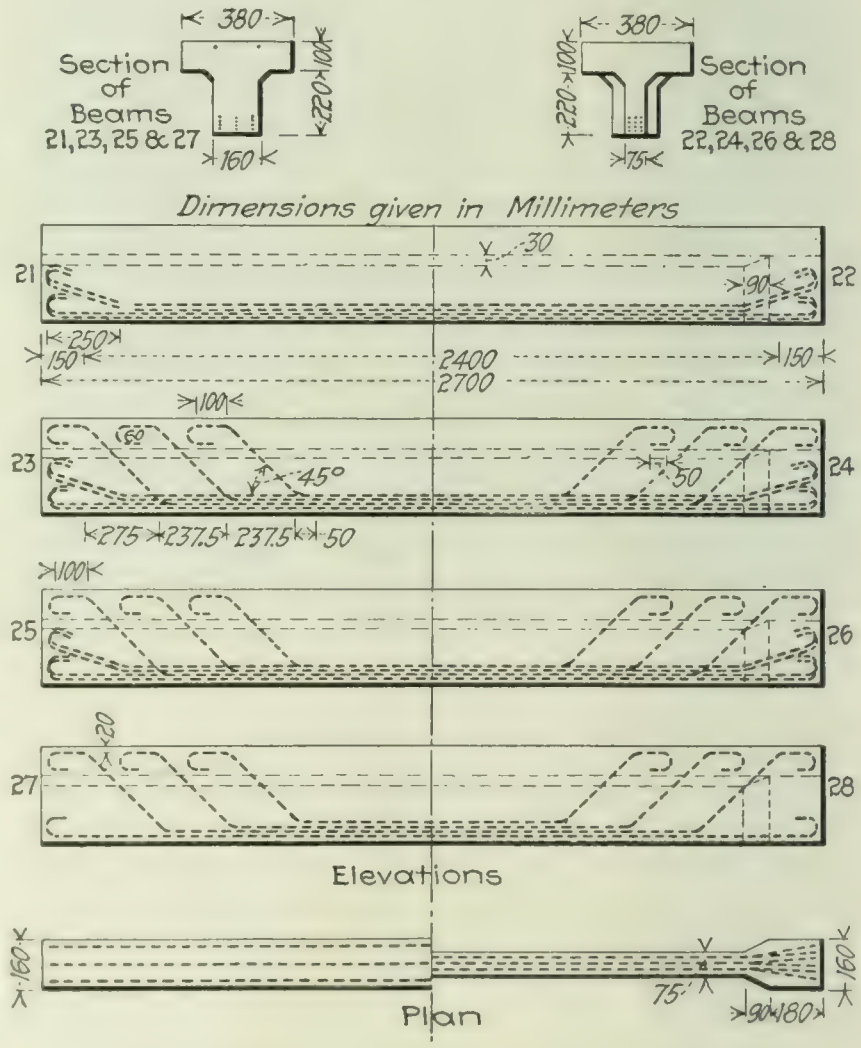
4. In case (a) the total shearing resistance is naturally the sum of the resistance of a beam that has no inclined reinforcement and the resistance furnished by the inclined reinforcement due to truss action. With a 1:4 concrete and an allowable value of 71 lb. per sq.in. for the shear value of the concrete and from 14,200 to 17,300 lb. per sq.in. on the steel, 298 lb. per sq.in. can be taken as the total unit shear value with a factor of safety of 3½.

5. In case (b), with the gradual elimination of the concrete shear resistance, the total shear resistance consists of that furnished by the inclined reinforcement only. With allowable stresses on the steel of from 14,200 to 17,300 lb. per sq.in. a shearing value of 355 lb. per sq.in. will give a factor of safety of 3½.

6. The highest shearing strength obtained by the investigation amounts to a calculated stress of 1270 lb. per sq.in. in beams without stirrups, which would equal an allowable working stress of 355 lb. per sq.in. with a factor of safety of 3½.

Professor Saliger also states in this article that 213 lb. per sq.in. is the shear value allowed in the Austrian regulations of June, 1911, and that these appear much too low.

The writer wishes to call attention to the high value of 426 lb. per sq.in. which Professor Saliger gives in conclusion 2 for beams without inclined reinforcement.



BEAMS TESTED SHOW HIGH SHEAR VALUES

This result is due to the firm anchorage of the straight bars, whch causes an arching action in the beam.

As a result of these three tests the writer concludes that a total unit shear value of 180 lb. per sq.in. for beams in the interior of buildings will be found economical, and, where desired, a stress as high as 240 lb. per sq.in. for uniformly loaded beams can be used to advantage. He would recommend a somewhat lower stress for girders carrying concentrated loads, because in uniform loading the high shear value is confined to a short distance near the support, which is not the case with concentrated loading. With proper design shear cracks will not appear at these values, and should they occur inside a building, they will not be noticed. For outside or under-water work, where moisture may get to the steel and cause rusting, lower values will probably be safer.

ENGINEERING LITERATURE

A REVIEW OF BOOKS AND A LISTING OF NEW PUBLICATIONS

Pioneer Book on an Important Subject

EXCESS CONDEMNATION: By Robert Eugene Cushman, Instructor in Political Science, University of Illinois. New York and London: D. Appleton & Co. Leather; 5 x 8 in.: pp 323. $2.

Engineers who plan improvements which involve taking private land for public purposes should welcome this volume. In fact, it deserves double welcome: First, because it is a pioneer book and second because it presents ample data on the many perplexing phases of the subject and discusses in a judicial spirit the evidence on both sides of controverted questions.

Although practiced under various names for nearly a hundred years abroad, excess condemnation is a relatively new term in this country and has been more written of than practiced. Even in Europe it has passed beyond the experimental stage only in Great Britain, France and Germany. Its growing importance is largely due to the aid it promises to give to city planning, using that term to cover both minor and major improvements.

Mr. Cushman defines excess condemnation as "the policy, on the part of the state or city, of taking by right of eminent domain more property than is actually necessary for the creation of a public improvement, and of subsequently selling or leasing this surplus." The three main objects of excess condemnation are (1) to solve the vexing problems of remnants of land, which the city almost inevitably has to pay for but which ordinarily remain in private ownership, unused and unkempt or used in a way detrimental to other property and to the city as a whole; (2) for the protection of improvements against the prejudicial use of adjacent land; (3) to take for the benefit of the city the increase in values of land adjacent to public improvements, due to the improvements themselves, and thus pay or help pay for the cost of the improvements.

After a brief introductory chapter the author discusses at length each of the three objects of excess condemnation just noted. He then takes up "gains and risks" administration, and the constitutionality of excess condemnation. A few bibliographical references and a list of cases cited are given.

The judicial spirit shown by the author throughout adds greatly to the value of a book dealing, as does this one, with a subject relatively new to this country, promising much, but still involved in legal and financial uncertainties. The legal uncertainties are probably all subject to removal by constitutional amendments. The financial doubts can best be resolved by actual tests. Of the three objects of excess condemnation noted, the author seems to have least doubts as to the desired ends being attained as regards handling remnants and protection of improvements. Profit making standing by itself is in more doubt, both as to results and constitutionality. Moreover, making abutting benefited property meet at least a part of the cost of many municipal improvements has long been practiced in this country through special assessments for benefits.

The book deserves the careful attention of engineers and other city officials concerned in planning, financing and protecting municipal improvements, broad- minded real estate men and all who are interested in helping on the orderly and economical growth of municipal improvements, including taxpayers who have their own and their city's interests at heart.

Street Problems and Details

PRACTICAL STREET CONSTRUCTION—Planning Streets and Designing and Constructing the Details of Street Surface, Subsurface and Supersurface Structures.—New York: Municipal Journal and Engineer. Reprinted from a series of articles that appeared in "Municipal Journal." 1916. Cloth; 6 x 9 in.: pp viii + 248, 151 illustrations. $2

That part of city planning which relates to the alignment, construction and use of city streets is the subject of this volume. It is a collection of articles which already have been published serially in the "Municipal Journal."

It is the professed aim of the authors to make the book of practical value to the city engineer in connection with his professional work, and in this purpose there is every reason to believe they have succeeded. They have gathered together a wealth of practical information on the alignment, widths, uses and treatment of city highways, combining in one volume a great deal of information which would otherwise have been widely scattered in periodical literature.

Pavement work is purposely left out, as it is recognized this subject is adequately covered in many textbooks; but the discussion covers street alignment, grade and cross-section; the location of sewers and other underground structures, of fire-alarm boxes, shade trees, street signs, and the other internal and external factors which enter into the construction, maintenance and operation of city streets.

The text is well illustrated with both half-tones and line-cuts showing either good or "horrible" examples of the points brought up. The illustrations include many details in the solution of grade, drainage and traffic problems which will be found very helpful to city engineers facing similar conditions.

The two chapters on street and sidewalk widths by H. C. Hutchins will be found of particular interest, as they contain data of an unusual kind, which are of practical utility not only in the design of new streets but also for the drawing of intelligent traffic rules and regulations. This is a matter which deservedly is receiving more and more attention by municipal engineers and is more within their province than in that of city police departments.

While the text contains no matter on pavement construction, it does contain, as the above account will show, a variety of material which can and should be used in the selection of pavement types. Although the proper surfacing of a street is very likely the most important

phase in street construction, it is a problem which cannot be intelligently attacked unless there is a thorough understanding of a great variety of minor details not ordinarily treated in books on pavement construction. It is the aim of the book before us to supply these details.

Railroad Handbook and Textbook

Reviewed by M. P. PARET

Lake Charles, La.; Late Valuation Engineer, Interstate Commerce Commission

RAILROAD CONSTRUCTION THEORY AND PRACTICE: A Text-Book for the Use of Students in Colleges and Technical Schools, and a Handbook for the Use of Engineers in Field and Office—By Walter Loring Webb, C. E., M. Am. Soc. C. E. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited. Leather; 4 x 7 in.; pp. 831; illustrated. $4.

As three earlier editions of this book have already been noticed in these columns (*Engineering News*, July 5, 1900, April 16, 1903, and Dec. 7, 1908) and as the reviewer finds little to blame and much to praise in the present edition, he will merely raise a few questions regarding the scope of the work and then pass on to some general comments.

The chapter on rolling stock seems too detailed for the field man and also for the student, unless the latter is studying to be a mechanical engineer.

Would not some chapters on electric railway construction naturally be expected in a book bearing the title of this one? Why does not the chapter on rails tell something of rail failures and their cost? Why does the author steer entirely clear of so important a railroad construction subject as steel bridges?

The reviewer hopes that Mr. Webb or some other writer on railroad construction will suggest to students and field men the educational value of knowledge of the practical methods used by successful contractors; of doing work at low cost and in short time; and of handling men and materials to advantage. The reviewer also hopes that Mr. Webb or some one else will tell a young man what it is that he can learn best by service with a railroad contractor, and also with a railroad company in the way of maintenance and train service, all to the end that he may gain wisdom for supervising railroad construction.

Not infrequently a field engineer on railroad construction has to grade, lay track, build minor bridges and buildings and operate trains. If such matters were made a part of the early education of the railroad engineer he would be prepared sooner and better to supervise work and to inform his superiors whether or not a piece of work under his charge was being done at an excessive cost, and why.

A Valuable Compendium on Wood

MECHANICAL PROPERTIES OF WOODS GROWN IN THE UNITED STATES. By J. A. Newlin, In Charge of Timber Tests, and Thomas R. C. Wilson, Engineer in Forest Products, Washington: Department of Agriculture. Paper; 6 x 9 in.; pp. 47; illustrated.

All of the data available in the United States Forest Service on the mechanical properties of wood grown in this country are presented in tables in this bulletin. This is information of particular timeliness and value.

The possible use of the data is well set forth in the prefatory paragraph of the book. As therein stated, the bulletin makes available for general use data which will serve as a basis for the comparison of species, the choice of species for particular uses, and the establishment of correct working stresses. A number of the standard species of wood are now becoming scarce. The properties of these woods are quite well known, but it is doubtful if those who will now have to find substitutes for them can readily match those properties in some other equally available but less widely known timber.

The data given in the bulletin should be of great assistance in this respect. For example, suppose it was desired to find the wood for flooring to be used in the place of maple; for flooring, hardness is the ruling factor, provided the wood possesses other strength properties to a reasonable degree. Using hardness as a basis for comparison, white oak should be as good, or better, than maple for flooring, which is true. Using modulus of rupture, which is a very important strength value in structural material, but of very little importance in flooring as a basis for comparison, long-leaf pine or Douglas fir would unjustly be given preference to both oak and maple.

The data are based upon about 130,000 tests, probably the greatest number ever made in one series upon any material and 126 species of wood have been tested. An effort has been made to cover every usable property. As the authors state, there are few uses of timber to which at least some of the properties given in the table are not of importance.

Another Landscape Gardening Classic

HINTS ON LANDSCAPE GARDENING—By Prince von Pückler-Muskau. Translated by Bernhard Sickert and Edited by Samuel Parsons. [In coöperation with the American Society of Landscape Architects.] Boston and New York: Houghton Mifflin Co. Boards, with cloth back; 6 x 9 in.; pp. 196; 44 plates and two folding maps in pocket. $3.50 net.

In coöperation with the American Society of Landscape Architects the publishers have now added a second volume to a proposed series of the writings of the masters of landscape gardening. Like the first of the series (Humphry Repton's "The Art of Landscape Gardening," noted in *Engineering News*, Jan. 16, 1908, page 81) the present volume is presented in most attractive form.

Prince Pücker, who was born in 1785 and died in 1871, was heir to a large estate in Silesia upon the improvement of which he spent vast sums through many years in accordance with carefully formulated plans based on extensive study, including the best landscape gardening in England.

After an appreciative introduction by Samuel Parsons, himself a well-known landscape gardener and writer, the book consists of two parts: Prince Pücker's "Hints on Landscape Gardening in General" and his "Description of the Park in Muskau and Its Origin." The work is an epitome of the art of landscape gardening with particular reference to large estates, followed by an example of the practice of the art by the author on his ancestral acres. Neither of these sections is long. Each is entertaining and instructive, with much of human and personal interest.

The book is unique. It is to be hoped that the series will be continued—and that without so long an interval as has passed between the appearance of the first two volumes, for art is long and time is fleeting.

Final Report on Depreciation

The final report of the American Water-Works Association Committee on Depreciation has been published as a 38-page supplement to the September *Journal* of the association. Written discussions for presentation at next year's convention may be sent to J. M. Diven, secretary, 47 State St., Troy, N. Y. John W. Alvord, Chicago, was chairman of the committee. The other members were Prof. D. W. Mead, Madison, Wis.; C. B. Salmon, Beloit, Wis.; W. F. Wilcox, Ensley, Ala.; and J. N. Hazlehurst, Atlanta, Ga. The last named dissented from the majority opinion in the portion of the report dealing with "Loss Due to Age and Straight-Line Depreciation." Appendices to the main report include some definitions of terms used in the report and also the general conclusions of the committee as to the life of various elements of a water-works system.

"Cleveland Engineering" Appears

As a further evidence of enterprise and service the Cleveland Engineering Society began the publication of a weekly bulletin on Sept. 4. Of its four pages one is devoted to current periodical literature. The Bulletin Committee of four members is headed by J. A. Moffett, and is assisted by J. W. Macklin, Chamber of Commerce Building, Cleveland, Ohio.

PUBLICATIONS RECEIVED

ASPHALT, RELATED BITUMENS, AND BITUMINOUS ROCK IN 1916—By John D. Northrop. Washington: Department of the Interior. Paper, 6 x 9 in.; pp. 284.

A MUNICIPAL EXPERIMENT, OR THE HALL OF RECORDS POWER PLANT—By Reginald Pelham Bolton. New York: The Bureau of Public Service Economics, Inc., 55 Liberty St. Cloth; 5 x 8 in.; pp. 221; illustrated. $1; $1.10 postpaid.

A PLAN OF ORGANIZATION FOR NEW YORK CITY—A Mayor, as Chief Public Representative and Framer of Policies; Relieved of Detailed Administrative Responsibility; A Board of Directors and, as a Corollary of These Changes, A City Manager. Suggestions for Charter Changes by Henry Bruère, Former Chamberlain, City of New York. [Municipal Reference Library, 512 Municipal Building, New York City.] Paper; 7 x 10 in.; pp. 44; illustrated.

BUSINESS LAW FOR ENGINEERS—By C. Frank Allen, M. Am. Soc. C. E. Part 1, Elements of Law for Engineers. Part 2, Contract Letting. New York: McGraw-Hill Book Co., Inc. London: Hill Publishing Co., Ltd. Cloth; 6 x 9 in.; pp. 494; $3.

CORPORATE ORGANIZATION AND MANAGEMENT—By Thomas Conyngton, of the New York Bar. Revised by H. Potter, of the New York Bar. New York: Ronald Press Co. Cloth; 6 x 9 in.; pp. 758. $6 postpaid.

A combination of the author's two books "Corporate Management" published in 1903 and "Corporate Organization" published in 1904. The book seems to fulfill the author's purpose, to furnish a compact, practical and conveniently arranged manual of corporation law and procedure."

COST OF HEALTH SUPERVISION IN INDUSTRY. Compiled for the Conference Board of Physicians in Industrial Practice—By Magnus W. Alexander. West Newton, Mass.: The Author. Paper, 6 x 9 in.; pp. 8.

NEW JERSEY DEPARTMENT OF HEALTH. Annual Report, 1916. Trenton, N. J.: The Department. Cloth; 6 x 9 in.; pp. 335; illustrated.

Contains considerable information regarding the water-supply and the water- and sewage-control plants of the state.

EMPIRICAL FORMULAS—By Theodore R. Running, Associate Professor of Mathematics, and Walter R. Hamilton, Professor of Mathematical Mensuration, Cornell University. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited. Cloth; 5 x 8 in.; pp. 113; illustrated. $1.25.

EXAMINATION OF WATERS CHEMICAL AND BACTERIOLOGICAL—By William P. Mason, Professor of Chemistry, Rensselaer Polytechnic Institute. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited. Cloth; 5 x 8 in.; pp. 144; illustrated. $1.25.

The author states that in his present revision of this well-known work, first issued in 1893, he made an effort to harmonize the analytical methods described with the 1917 "Standard Methods" of the American Public Health Association.

GRAPHICS—By H. W. Spangler. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited. Cloth; 6 x 9 in.; pp. 95; illustrated; $1.25.

INGENIERIA DE FERROCARRILES—La Teoría y Práctica Fundamental De Ferrocarriles, Desde la Concepción Del Plan Hasta la Terminación Del Tráfico—By Verne Lauer Hayes, M. Am. Soc. C. E. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited. Leather; 5 x 7 in.; pp. 357; illustrated. $2.50.

A handbook in Spanish, fashioned after the American railroad handbooks. The tables are not elaborate, however, the headings being carried to five pages only, while the text seems to cover ground, such as the economics of railway location, not ordinarily covered in the American books. Thus meeting the shortage of supplementary reference books in the Spanish language.

LIABILITY AND COMPENSATION INSURANCE—Industrial Accidents and Their Prevention, Employers' Liability, Workmen's Compensation, Insurance of Employers' Liability and Workmen's Compensation. By Ralph H. Blanchard, Instructor in Insurance, Wharton School of Finance and Commerce, University of Pennsylvania. New York and London: D. Appleton & Co. Cloth; 5 x 8 in.; pp. 534. $2.

MAINE PUBLIC UTILITIES COMMISSION: Report on Topography, Geology and Water Resources, Department for 1915-1916. Augusta, Maine: The Commission. Cloth; 6 x 9 in.; pp. 228; illustrated.

MONOGRAPHS AND REPORTS ON MUNICIPAL PROBLEMS: Some Recent Reports of Exceptional Interest Published by the City of New York. New York: Municipal Reference Library, 512 Municipal Building. Paper; 6 x 9 in.; pp. 8.

NATIONAL SEPTIC PROCESS PROTECTIVE LEAGUE: Report of Special Conference, Chicago, Aug. 14, 1917. Paper; 9 x 6 in.; pp. 15. Address: Frank G. Pierce, Secretary, Marshalltown, Iowa.

NEW JERSEY PUBLIC UTILITY STATISTICS, 1916.—Trenton, N. J.: The Commission. Cloth; 6 x 9 in.; pp. 222.

NEW YORK STATE WORKMEN'S COMPENSATION LAW With Amendments, Additions and Annotations to July 1, 1917.—Albany, New York: Bureau of Statistics and Information. Paper; 5 x 8 in.; pp. 79.

PROCEEDINGS OF THE FIRST INDUSTRIAL SAFETY CONGRESS OF NEW YORK STATE, Held Under the Auspices of the State Industrial Commission, Albany, New York. The Commission. Paper; 6 x 9 in.; pp. 131.

NEW YORK PUBLIC SERVICE COMMISSION, SECOND DISTRICT. Report for 1916. Albany, N. Y.: The Commission. Cloth; 6 x 9 in.; pp. 1085.

STREET RAILWAY EMPLOYMENT IN THE UNITED STATES—Washington, D. C.: Bureau of Labor Statistics. Paper, 6 x 9 in.; pp. 1111. Free from Superintendent of Documents, Washington, D. C.

Exhaustive data, mostly tabular, on wages, hours of labor, rates or day's works, conditions of employment, accident and death benefits, associations of employees and employers, and agreements between employers and employees.

STREET RAILWAY FARES: Flat Rates to Longer or Short and Out of Service. Report of Investigation Carried on in the Research Division of the Electrical Engineering Department of the Massachusetts Institute of Technology. By Donald C. Jackson, Professor of Electrical Engineering, and David J. McGrath, Research Assistant in Electrical Engineering at the Massachusetts Institute of Technology. New York: McGraw-Hill Book Co., Inc. London: Hill Publishing Co., Ltd. Cloth; 6 x 9 in.; pp. 190; illustrated. $2.50.

THE COMPOSITION OF TECHNICAL PAPERS—By Horace Andrew Watt, Assistant Professor of English, Iowa State University. New York: McGraw-Hill Book Co., Inc. London: Hill Publishing Co., Ltd. Cloth; 5 x 8 in.; pp. 141; illustrated. $1.

THE EFFECT OF MANUFACTURE ON THE FLOW OF WATER THROUGH A SUBMARINE OUTFALL PIPE—By Prof. J. Soule Associate in Theoretical and Applied Mechanics, Dean Walter Loyd Engineering Experiment Station, and Professor Clarence Hall, Head of Department of Civil Engineering, University of Illinois, Urbana, Ill. Paper; 6 x 9 in.; pp. 11; illustrated. Reprint from Engineering Experiment Station Bulletin No. 93, University of Illinois.

THE ESSENTIALS OF EFFECTIVE SALESMANSHIP—By H. Bittner, M. E., Professor and Head of Department of Executive Engineering and Director of the Night Extension Courses of New York University. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited. Cloth; 5 x 8 in.; pp. 138; illustrated. $1.50.

The phrases within italics [illegible] the text of the first edition, published in March, 1915, the present issue having been rewritten and a chapter on salesmanship [illegible] added.

THE JOURNAL OF THE HIGH ACTS STEEL INSTITUTE, Edited by George C. Edgar, Secretary. New York: Wm. B. Prankard, London: The Institute. Cloth; 6 x 9 in.; pp. 433; illustrated.

THE FIVE TYPES OF THE SOCIETY MOVEMENT—By George B. Mangold, Professor of Sociology, Washington University, St. Louis, Mo. Columbia, Mo.: The Author. Paper; 6 x 9 in.; pp. 48; illustrated.

THE PRINCIPLES OF HIGH EXPLOSIVES—By Oscar Guttmann, M. Inst. C. E. New York: Macmillan Co. London: Hill Publishing Co., Ltd. Cloth; 6 x 9 in.; pp. 532; illustrated. $5.

WATT AND THE STEAM ENGINE, A Concise History of the Life of James Watt, Inventor and Master Engineer, Together with Descriptions of Early Steam Engines and Boats—By John W. Hyde, C. E. London: Hill Publishing Co., Ltd. Cloth; 5 x 8 in.; pp. 111; illustrated. $1.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Highway Relief for Railroad Congestion

Sir—I have just re-read the editorial which appears in your issue of Sept. 27, p. 578, and believe it to be a splendid exposition of the real function of our highway system. As supplementing the work of the railroads and acting under certain conditions in conjunction with and as auxiliary thereto, the necessity of considering motor transportation resources and the highways over which they will be required to travel besomes increasingly important. Apart from the primal necessity of actually moving products England has found necessary the functioning of motor transportation, as described above, in order to meet increasing traffic demands with a diminishing supply of fuel and men.

I sincerely trust that your editorial may be read by those men who are giving most of their thought to problems which bear on our winning this war, and that they will appreciate that, aside from the fact that the system of roads is needed for our common defense, at the same time they are adding something of permanent and increasing value to the country.

A. C. HARGREAVES,
Chairman, Storage Committee, War Industries Board, Council of National Defense.
Washington, D. C.

Safe Filter Operation Requires Skilled Attention

Sir—In a Western filter plant recently visited the influent water was pouring over the gutters upon a bare sand surface and seeping away too fast to maintain a head on the filter. The attendant was busily engaged in "making up" a new batch of chemical solution. He explained that the filters were operating faster than the supply could be got to them, and, "anyway, the chemical did all the work." Indecision on the writer's part as to whether or not to take a mud bath in the fluid flowing from the hotel spigots indicated that the overworked chemicals had been unable to produce a finished product. Technical supervision might not have been able to produce a better effluent, but at least it could have insisted on choking the effluent valves enough to get as much as possible out of the filters.

That laymen city officials are not wholly to blame for the conditions outlined is indicated by a paragraph in a recent report by a consulting engineer, on waterworks extensions in a Western city. It stated that a mechanic of ordinary schooling could operate successfully a proposed filter plant after 30 days' instruction by the filter company's operator.

Parsimonius city fathers often force non-technical operation upon plants designed by engineers. This is bad enough, but when a consulting engineer suggests it, the case is much worse. From one end of the country to the other appeal after appeal has been made to the general public to employ technically trained men to do technical work. No one calls in a tailor to remove an appendix, although he knows how to cut and sew. What protection has the unsuspecting consumer against typhoid fever when an intricate piece of mechanism like a filter plant must depend for successful operation upon a mechanic with ordinary schooling?

The feeding of chemicals to meet the ever-changing turbidity and pollution is no small problem even to one trained in chemistry, bacteriology and sanitary engineering. With expert direction the mechanic can manually operate a filter plant successfully, but observation of plants all over the country shows that the undirected mechanic is not getting efficient results out of his plant. Even when he produces a clear effluent he is depending too much on chlorination to make the indifferently filtered product bacterially safe. Engineers should not belittle the every-day operation of plants, on the successful supervision and control of which depend lives doubly valuable at this time. INTER. NOS.

"Best Buy" in Pavements

Sir—The article in *Engineering News-Record* of Sept. 27, p. 592, seems to condemn the selection of pavements by popular vote. It is probable that if the selection of the kind of pavement had been left to an engineer, the decision would have been unanimously in favor of some particular kind of pavement. If it had been left to a board of, say 12 engineers, there would probably have been as marked a divergence in the vote as there was in the popular vote. The board of engineers would doubtless have been less swayed by oratorical effort and would have voted more in accordance with the merits of the several offerings. The people were paying for the pavement, however, and if it is not satisfactory they have themselves to blame.

If the speeches of the several agents had been followed by a few words of advice from a competent engineer, or if such an engineer or public official had the veto power to prevent the selection of a positively poor pavement, I see no reason why the town meeting method of selection is not as good as the method of selection by council, which is the usual method. In fact, the town meeting idea for a small community is not to be sneered at. I do not think it would be advisable in a large community where indifference to public affairs is a besetting sin. If the judgment of an engineer were infallible—that is, if the decisions of several engineers were the same, or approximately the same—the sneer at the town meeting would be more justifiable. It is a fact, though, that the engineer is human. I have met a good many engineers and some of them were almost supermen, but I have met none that were quite beyond human limitations. Some that I have come in contact with, were, in spite of technical training, experience and knowledge, about on a par with the average mechanic or farmer, so far as business sense was concerned.

Much more serious affairs than the selection of a pavement are often left to the popular vote. The bond issue for the whole improvement is usually decided thus, so why not the minor matter of the use of brick or asphalt pavement, or stone or concrete curb? The main objections are that the method is cumbersome and that probably in time indifference on the part of a large

majority might occur; also that the town meeting might be influenced by bombastic and extravagant claims of promoters. But if the engineer is "on his job" and is a man of parts, he can usually pull the meeting his way if he knows his subject thoroughly and is willing to crawl out of his shell and tell what are his views.

In my opinion, a sound proposition would have a better chance before a town meeting than before a council the majority of which had been "seen" by one of the promoters of a rival proposition.

I trust that the day will never come when the people will become so indifferent to matters of public welfare that they will delegate all authority to experts. When that day comes we shall need also a "Kaiser" to control the experts.

The community or town-meeting plan of government is, I am informed, still in vogue in several large places in New England. It would be interesting to hear from some of the technical advisers to these large towns as to how far they are controlled by the popular vote in directing public affairs.

N. F. HOPKINS,
Of Harrop, Hopkins & Taylor, Civil and Mining Engineers.
Pittsburgh.

The Spacing of Stitch Rivets

Sir—In *Engineering News-Record* of May 10 you printed a few paragraphs from me on the spacing of stitch rivets in which I considered the maximum spacing allowed by the slenderness ratio only. E. J. Squire and P. J. Markmann in your issues of June 21 and Aug. 2, respectively, introduce the strength of the rivet as a controlling factor. As a matter of fact both of these tests should be applied.

In the case of the strut made up of two 6 x 3½ x ½-in. angles spaced ½ in., if it is desired to use a ¾-in. rivet Mr. Markmann's solution, giving a spacing of 19.2 in., seems to be satisfactory. And since this is less than 32 in., the maximum allowable uniform spacing as determined by the slenderness ratio, it may be adopted. Two ⅞-in. rivets at each of the one-third points would more than take care of the shear for the 32-in. spacing. Since this would require four rivets, however, there is no question but that these four rivets would give better service if equally spaced singly at one-fifth of 96 in. or 19.2 in. than if spaced in groups of two each at the one-third points.

Mr. Markmann has too many rivets at the ends. As he says, the rivets there must take care of both the thrust and the moment.

For $L/r = 66.2$, total thrust may be $11{,}370 \times 2 \times 4.5$ or 102,330 lb. This calls for 10 rivets.

The moment, $\frac{1}{12}WL^2$ is 23,300 in.-lb. and the corresponding stress in the extreme fiber is 4630 lb. per sq.in.

The shear is $\frac{70L}{r} \cdot \frac{Q}{c}$ (using Mr. Squire's notation), which calls for 1 rivet.

But this does not take care of the bending moment. The center of pressure in the angles is not at the surface of the gusset plate but is $\frac{1}{2}\left(\frac{23{,}300}{6000}\right)$ or 1.94 in. from the central plane of the gusset plate; and there results a tendency to pull the angles away from the surface of the gusset plate. This causes a tension in the rivets. Supposing the extreme rivets of the connection to the gusset plate to be 12 in. apart (which is probably too small), and that the end rivets alone hold the angles against the gusset plate, we have a tension in the end rivet of (not over) $\frac{1}{2}\left(\frac{23{,}300}{12}\right)$ or 970 lb. Twelve rivets, probably 11, would be ample.

Using Mr. Markmann's figures, total shear due to moment is 46,800 lb. and one-half the thrust is 49,950 lb. One angle should be capable of carrying both of these or 96,750 lb. This would mean an average of over 20,000 lb. per sq.in. on the entire sectional area of the angle.

The original paragraphs were written to call attention to the danger of neglecting the slenderness ratio of some of the component parts of a column, and to make a definite numerical illustration. The introduction of the rivet strength as suggested by Mr. Squire and Mr. Markmann is an equally important though distinct consideration, and thanks are due to both men for their criticisms and additions to the original idea.

Lewis Institute, Chicago. ALEX. W. MOSELEY.

Macadam Roads Not Best for War Traffic, Says Engineer

Sir—It is generally recognized that the macadam road is not the type of construction that is adapted to modern highway traffic. In those localities where a considerable investment had been made in macadam roads, experience has shown that it has been impossible to maintain these roads in suitable condition for today's traffic except at a nearly prohibitive cost for maintenance, many times that which was necessary one or two decades ago.

Highway engineers have for many years striven to impress upon the public the ultimate economy of more substantial construction and their work today is bearing fruit. It seems, therefore, to the writer, unfortunate that there should appear in such an influential paper as *Engineering News-Record* anything which would seem to destroy the public's confidence in the extensive road expenditures which are being made and contemplated for substantial road improvement in so many sections of the country.

I have reference to the headline in your editorial in your issue for Sept. 13, reading "Macadam Roads Best for War Traffic." This editorial reviews briefly the splendid article by William J. Weir, in the same issue.

Mr. Weir is careful to state in his article that he had but limited time for observation, and also that his observation was confined to macadam roads, as these were the only ones that had been built by the French Government in the war zone and in areas tributary thereto. His article also gives a very clear intimation that these roads were kept in condition for war traffic only by the most strenuous efforts. Just how many men per mile it was necessary to keep along the roads to make the constantly necessary repairs is not stated but it is well known that it was very large indeed—at times a matter of thousands. A logical conclusion to be drawn from his description of the work that was necessary to keep the macadam roads in passable condition is that

the macadam road system did not break down because of most extraordinary and highly organized effort to keep traffic going.

That far from indicating that macadam roads are best adapted for war time traffic, the facts to be gained demonstrate that war time traffic made an even greater maintenance necessary than the demands of peace time traffic. That where there has been shown to be true economy in more durable types of road construction than macadam for peace-time motor traffic, there is even greater need for war-time motor traffic to have the most durable type of construction available if man power is to be conserved and the roads to be kept passable without the frightful cost that has been necessary to keep the macadam roads in France in condition for the severe test to which they are now subjected.

A. N. JOHNSON,
Consulting Highway Engineer,
Chicago. Portland Cement Association.

[The editorial note to which Mr. Johnson refers was based mainly on the following statements in Mr. Weir's article:

"One is inclined to wonder just what would happen to our bituminous highway surfaces, to our 6-in. concrete, or to our brick construction if these were subjected to the continuous pounding of traffic such as occurs, for instance, on the Amiens road. They would develop severe weakness, of course; no standard surface would withstand such wear. I believe that the difficulties in repairing them in kind would be enormous, owing to absolute lack of time for necessary refinements."

Further on, under "conclusions," Mr. Weir says: "The general type, water-bound macadam, has proved itself well suited to special maintenance requirements of war conditions. Surfaces requiring prior mixing, careful laying, special equipment, or time for setting would have been a source of great difficulty."—Editor.]

Should Engineer or Council Decide What Material to Use?

Sir—Should the engineering department of a city or the city council decide what materials are to be used for sewers, pavements, water mains, etc., in the various branches of the municipal service? My own opinion is that the function of a city council is to determine matters of policy, in a legislative sense, and it does not seem to me that this function should be sufficiently inclusive to cover such technical matters as fall properly to the city engineer in his administrative capacity.

A city council does not pretend to determine the size or slope of a sewer; no more should it decide the material of which the sewer should be constructed. In the matter of sewerage, it seems to me that the function of a city council is to determine that a certain area or street should be improved by the construction of sewers. Similarly, the function of the council should cease when it is decided which new street should be constructed.

When this matter is carried further to the question of resurfacing of streets, there is more room for argument. The city engineer or department of public works of a city must present an annual budget, and in order to support this budget intelligently should show a carefully prepared program of proposed work. In passing on this budget the city council naturally has the right to question the necessity of certain items and in the matter of resurfacing of streets it would be extremely difficult to prevent "log rolling" among the councilmen. However, I believe that in this particular matter the council's power should be limited to making a cut in the amount appropriated for resurfacing streets and the decision as to which improvements shall be eliminated to meet this cut should be left to the city engineer.

The whole question undoubtedly comes back to deciding just what is a representative government. There is no doubt that in our desire for efficiency our natural inclination is toward curtailing the power of the council.

H. S. MORSE,
Bureau of Governmental Research.
Detroit.

Road-Shoulder Maintenance in New York

Sir—My attention has been called to an article in *Engineering News-Record* of Sept. 20, p. 530, entitled "Road Shoulders Must Be Kept Clean." I note that you state you have made quite a continuous trip through several states, and in only one locality were highway officials making a practice of scraping the shoulders of improved roads. I beg to call your attention to the fact that the New York State Highway Commission for several years has made a practice throughout the state of reshaping shoulders, usually with road scrapers. This year, in this division, we have scraped shoulders amounting to 20 miles of road in Tioga County, about the same amount in Chemung County and probably half that amount in Schuyler and Allegany Counties. The amount in Tompkins County will probably be slightly greater and the amount in Steuben County will approximate 15 miles. Two other divisions that I am familiar with in this end of the state also make a practice of keeping the shoulders in shape.

Owing to the great increase in motor traffic since the first highways were built the 14-ft. roads on main lines are too narrow to accommodate this increase. Consequently, the fast traveling motor vehicles run with the right wheels on the shoulder of the road, which is noticeable where the older roads have become roughened with constant use and patching. This forms a small gutter alongside the macadam and keeps the water from reaching the ditches, a condition that we are trying all the time to change by continuous shoulder work. This year, it was very noticeable, owing to the extensive rains in this section, that grass and weeds made their appearance within two months after the old sod had been scraped away. Grass growing on the shoulders catches more or less of the fine material which is worn and washed from the macadam roads, causing in a great many instances a slight raising of the shoulders, which has the same effect as that noted above. At the beginning of the present year this division purchased three large road scrapers for this shoulder work, to be added to smaller scrapers purchased in former years.

I hope that this will give you an idea that this shoulder work is general throughout New York State.

CHARLES M. EDWARDS,
Division Engineer, New York State
Hornell, N. Y. Highway Commission

THE ENGINEER IN FIELD AND OFFICE

A DEPARTMENT DEVOTED TO DETAILS OF THE DAY'S WORK

Steel Stack Is Erected by Ditcher

PLACING a new steel smokestack by the use of a railway ditching machine as a crane was accomplished recently at the shops of the San Antonio, Uvalde & Gulf Ry., at North Pleasanton, Texas. The photo-



RAILWAY DITCHING MACHINE USED AS A CRANE TO ERECT A STEEL SMOKESTACK

graph and accompanying notes have been furnished by E. R. Breaker, chief engineer.

The stack was 4 ft. in diameter and 70 ft. high, and was placed on top of a brick setting 12 ft. high. It was riveted up alongside the boiler house where it was to be erected. The railway company's "American" ditcher, mounted on a car, was brought to the site, and with dipper and dipper handle removed formed a revolving crane. The length of the steel boom was increased 18 ft. by means of an 8 x 8-in. timber bolted to the end. The head of the timber was mortised for a sheave, over which was led a single cable direct from the drum.

A chain was wrapped around the steel stack just above its center of gravity. With the boom of the ditcher lowered, the end of the hoisting cable was hooked to the chain. The boom was then raised so that the stack would clear the building while being hoisted, and the hoisting cable then lifted the stack till it was about 1 ft. above its final position.

The ditcher was then swung around and the boom lowered to bring the stack into proper position. This stage of the work is shown in the view. The hoisting line was then slacked off sufficiently to lower the stack upon the seat prepared for it. The stack was held in position by keeping a tension on the line until the guy wires were adjusted and secured.

The work was done in about four hours by four men, including the man in charge and the engineman on the ditcher. It was under the supervision of A. S. Case, superintendent of bridges and buildings.

Maintaining an Extensive County System of Shell Roads

IT HAS been found by R. M. Sias, county engineer of Galveston County, Texas, that the amount of traffic on shell roads can be measured by the amount of new shells added per year. In his report for the year ended July 1 he indicates that it required an average of 352 cu.yd. per mile for the 56.7 miles of main road, and only 47 cu.yd. per mile for the 74.4 miles of lateral road. The greatest amount required was on the road from the city limits to the causeway, where 1006 yd. per mile were required to keep the road in shape—this section getting practically all the traffic coming into the city.

The roads are originally constructed to a thickness of 8 inches. In dry weather and under heavy traffic the shell pulverizes and forms regularly recurrent cor-



rugations from 20 to 24 in. on centers. Sometimes these corrugations extend across the pavement. Satisfactory repairs can be made only in wet weather, and simply amount to cutting down these corrugations, reshaping with a grader, and adding the necessary quantity of shells.

On account of the excessive wear exhibited by this type of pavement, Mr. Sias expects to repair the causeway branch and the road to Houston with two or three inches of broken stone or gravel, to take the abrasive wear. Some form of bituminous binder and mat will be used with this wearing surface.

Formulas for Excess Volume in Flared Concrete Column Heads

IN COMPUTING the volume of the capital or flare in a column for girderless concrete floor construction, a simple method is to determine the volume of the flare outside of the column shaft, which is itself figured as running from the top of one floor slab to the bottom of the next slab above. Formulas for this additional volume have been deduced by Edgar H. Mosher, of Washington.

Where V = volume of concrete to be added to the volume of a straight column figured to the bottom of the slab; D, diameter of flare or top of capital, and d, diameter of column, the formulas are as follows:

For square columns,

$$V = \frac{(D - d)(D + 2d)}{6}$$

For round columns,

$$V = \frac{(D - d)^2(D + 2d)}{7.63}$$

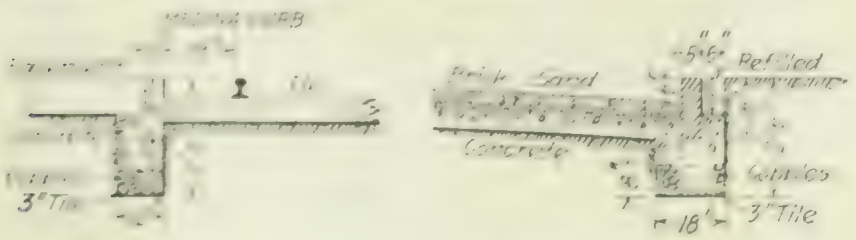
For octagonal columns,

$$V = \frac{(D - d)^2(D + 2d)}{7.23}$$

These formulas are deduced from the truncated cone formula, assuming 45° to be the slope of the flare.

Syracuse Uses Tile Drains Under All Street Curbs

THE accompanying sketches show how the City of Syracuse drains all pavement foundations. The curbing is set in a block of concrete 18 in. wide and 12 in. deep. Under this block of concrete is 18 in. of cobblestone filling, along the edge of which is laid a 3-in. tile drain which empties into the sewer catch-basins. Wherever there are street railway tracks a 5 x 16-in. Medina curb or header is placed against the ends of

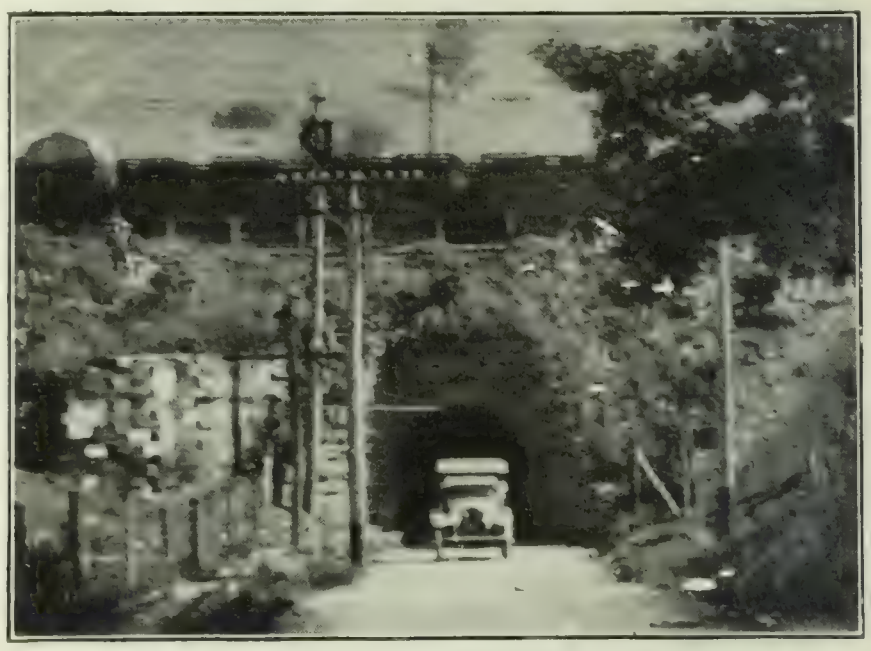


STANDARD DRAINAGE DETAILS FOR CONCRETE CURB (LEFT) AND SPECIAL CURB AT RAILROAD (RIGHT)

the ties and a similar construction, as is shown in the right-hand sketch, is used. It is said that in the spring, when the frost is coming out of the ground, these drains empty a continuous flow into the sewer catch-basins, and there is no question but that they save many pavement troubles. They are used in all kinds of subsoil and beyond the price of the tile they add practically nothing to the cost of the pavement.

Culverts for Highway Underpasses

THE GENEROSITY of early railway engineers in the designs of culverts has made it possible to use some of them as highway underpasses in parts of West Virginia. The accompanying view, taken on a road leading from Bluefield west, shows a waterway converted into a highway. It is intended to utilize culverts in McDowell County in the same way. Evidence



RAILWAY CULVERT SERVES AS HIGHWAY UNDERPASS

exists that some of these culverts have been altered to admit the passage of vehicles. Most of them are damp continuously and undoubtedly there are times when the roads which they span are impassable.

Earth-Road Maintenance Handled by Contract in Kentucky County

By C. S. Bennett
State Engineer and Inspector, Greenup, Ky.

AS SOON AS the well-graded, crowned and drained state-aid earth-road system was completed in Greenup County, Kentucky in 1915 and 1916, the question of proper and adequate maintenance arose. Earth roads, especially in hilly country, require a maximum of maintenance, and the continuous system is the only proper way to keep them in shape. The roads had all been relocated, being placed above the high water from the Ohio River and its small tributaries; were graded to a maximum of an 8% grade, with a general ruling grade of 5%; and were drained thoroughly by means of galvanized pipe and reinforced-concrete box culverts.

After considering various methods of maintainence, it was decided to adopt the contract method. The specifications as finally drawn up embody provisions for dragging, cleaning ditches and culverts, cutting weeds on the county's right-of-way, maintaining a crown, etc. Bids were then asked for and work on each section was let to the lowest responsible bidder. Mileage was considered the basis for payment, while slides and washouts were paid for by the cubic yard. The work was usually let in five-mile sections.

A road drag, two drag scrapers, one wheel scraper, shovels, and mattocks, were furnished to each contractor, being charged against him with the provision that at the expiration of his contract he account for all tools supplied to him. In addition, two large blade road graders were purchased by the county, being lent to the various contractors as they were needed in shaping up the roads in the spring season. A contractor was required to own at least one team.

The work was under the supervision of the county road engineer, who notified the contractors when they were to drag the roads and when to cut the weeds on the county's right-of-way. He also issued to them instructions as to other details of the work.

Payments were made quarterly, the payments being so distributed as to make a maximum payment fall at a time when the greatest amount of maintenance was necessary. Thus, for instance, a contract dated Jan. 1, 1916, stated that payments would be made to the contractors as follows: 20% Apr. 1; 40% July 1; 15% Sept. 1, and 25% Dec. 31. The maximum payment, 40%, was made at the end of the spring season, during which time the greatest amount of work is necessary to keep the roads in condition. In addition, each contractor was required to give bond for the faithful performance of the work called for in his contract. Strict adherence to the terms of the contract, especially in regard to dragging the roads, was insisted upon.

The cost of maintenance on seven sections of road for the year 1916 is as follows:

Contract No.	Length, Miles	Bid per Mile per Maintenance	Bid per Cubic Yard for Earth	Bid per Cubic Yard for Rock	Total Cost per Mile
45 D 1	4	$45 00	0 35	0 40	$48 50
45 C 1	5	56 00	0 37	0 57	61 05
45 G 1	5	40 00	0 24	0 35	40 35
45 G 2	5	60 00	0 30	0 50	76 22
45 E 1	3	53 00	0 35	0 40	55 00
45 A 1	5	100 00	0 20	0 50	138 00
45 G 3	3	75 00	0 35	0 60	75 00

From a comparison made with similar work done in other counties under various other methods, the writer is led to believe that the contract method, properly looked after, is the cheapest method of continuous maintenance for earth roads. The contractors, being local men, take a certain amount of pride in their work and seem to enter into friendly competition as to which one can have the best looking section of road.

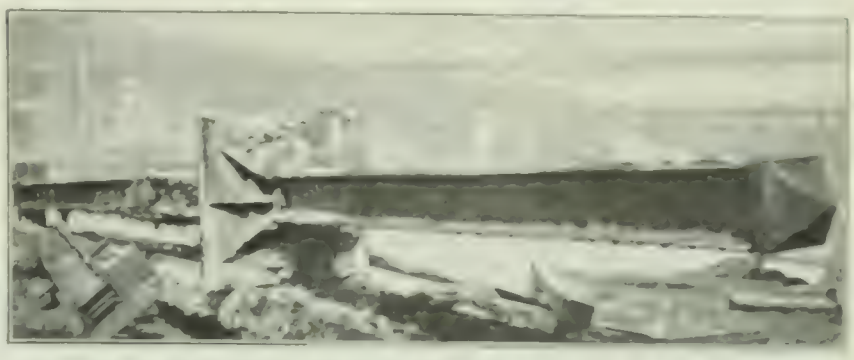
All of the maintenance work in this county is under the direction of R. M. Scott, county road engineer. The writer was resident engineer and inspector for the state on the construction of the system of intercounty roads then being built.

Report Stream Measurements in Missouri River Basin

A report that will be useful to engineers and others interested in the utilization of the streams of the Missouri River basin has just been issued by the United States Geological Survey, Department of the Interior, as Water-Supply Paper No. 386. The report represents the results of coöperative work between the Federal survey and the States of Colorado, Montana, Nebraska and South Dakota and includes descriptions of the stations at which the measurements were made and tables of daily and monthly discharge. Copies may be obtained without charge by applying to the Director, United States Geological Survey, Washington, D. C.

Iron Bearing Pile Survives a Quarter Century of Submergence

IN THE construction of the new Ozama River bridge in Santo Domingo described in the issue of Aug. 23, p. 353, excavation brought up some old iron bearing piles which had been placed in the former bridge in 1893. One of these piles is shown in the accompanying



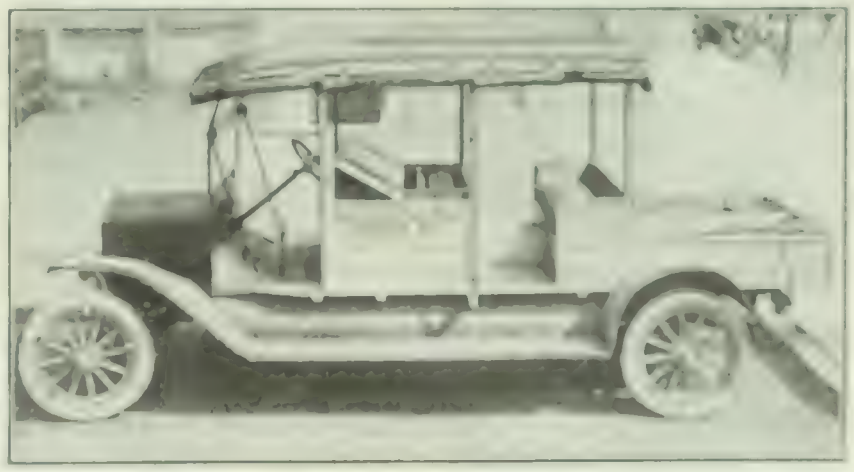
UNDER WATER FOR TWENTY-THREE YEARS—STILL IN GOOD CONDITION

picture. They consisted of a wrought-iron section with a cast-iron point, and a cast-iron bearing plate about one-third the way up from the bottom. This plate is 3½ ft. square and distributed a part of the load on the river bottom.

The bridge in question was built of iron of English manufacture. Although neglected for years in a tropical climate it was remarkably free from corrosion when removed. The pile itself was hardly damaged.

Manchester Public Works Field Parties Use Remodeled Ford

THE DEPARTMENT of Public Works of Manchester, N. H., has lengthened two Ford chassis and provided them with special bodies for the use of its field parties. Each car carries six men and their instruments, the third seat being formed by the cover



FIELD PARTY OF SIX AND THEIR INSTRUMENTS CAN BE CARRIED BY THIS CAR

over the space occupied by the transit and level just back of the driver's seat. In the view shown this cover is partly removed, disclosing the two instrument cases. Tripods and other accessories are shown lying flat in the open box back of the rear seat. Each remodeled car cost $826, as follows: Chassis, $626; lengthening chassis, $100; special body, $200; extras and accessories, $210. Samuel J. Lord is director of public works of Manchester.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Run 20-Inch Pump with Shattered Shell Incased in Concrete

By W. C. Lemen

Assistant Engineer, U. S. Corps of Engineers, Savannah, Ga.

A DREDGE being operated by the U. S. Engineer Office at Savannah, Ga., was saved last summer from shutting down on account of a badly shattered casing by the use of the broken pieces of the old shell as



CONCRETE REPAIRS BIG PUMP SUCCESSFULLY

an inner wearing surface for a new shell of concrete. A new casting had been ordered, but owing to rush of work in all the large foundries its delivery was delayed.

The old pump shell was found to be failing rapidly in a number of places, but at first those in charge tried by putting on cast-iron patches to make it last until the new one should come. This, however, proved inadequate, and it was found necessary to cover the upper part of the shell with reinforced concrete to a depth of 4 in. The concrete patch worked so well that preparations were made to incase the lower half of the shell as well. Before the concrete could be placed, however, the pump picked up a piece of railroad rail 4 ft. long, and drove it through the discharge side of the lower half of the shell, breaking out a section 1 ft. wide and 2 ft. long.

To patch this last hole more extensive concrete reinforcement was needed. The hole was first covered with pieces of cast iron, approximately the shape of the shell, and they were held in place with expanded metal. This reinforcement was about 4 in. from the form for the concrete. The form was bolted to the old casing with strap iron, as shown in the photograph, and the entire space inside it was filled with 1:3 cement mortar.

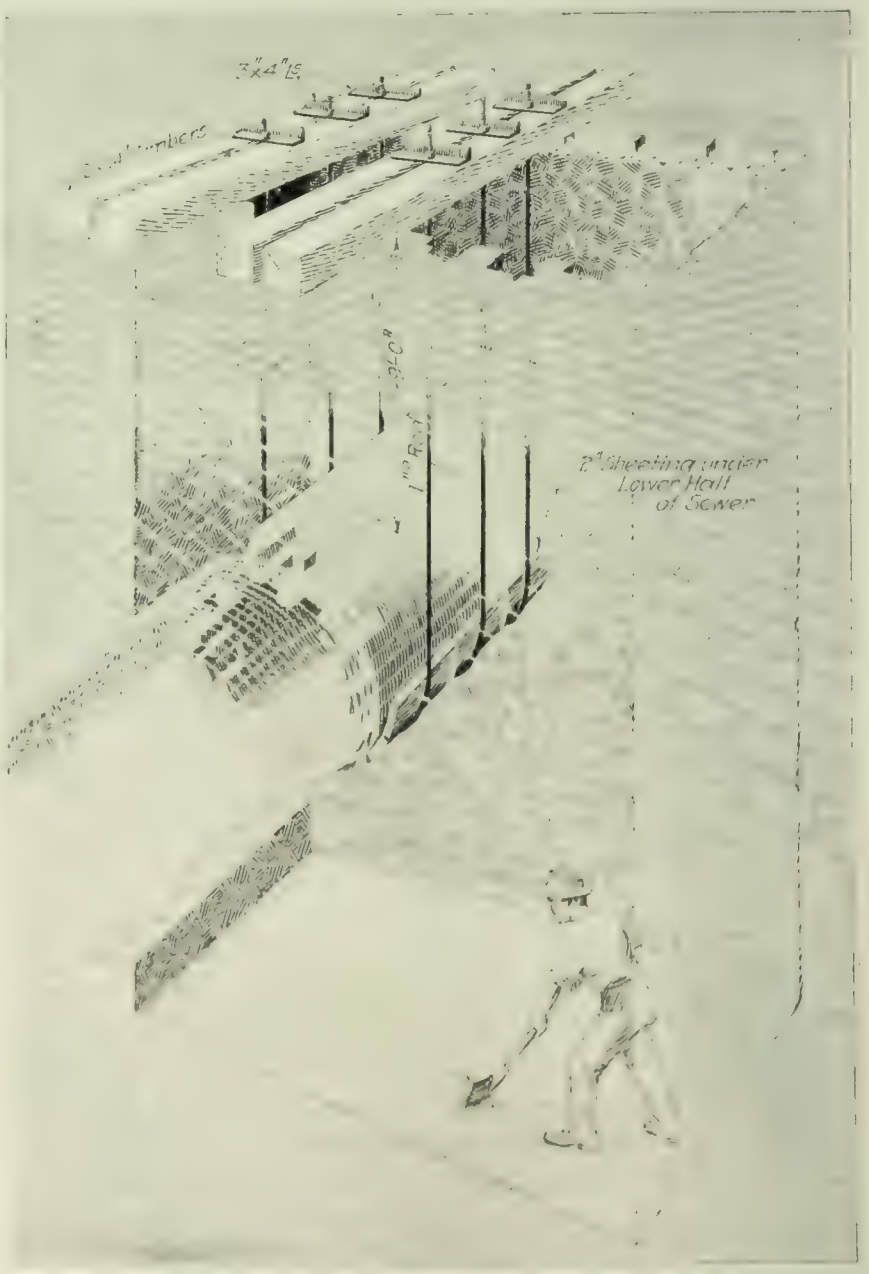
This work was done on July 15 last, and the pump has been in continuous operation since then with very satisfactory results.

Suspend 5-Foot Brick Sewer in Lagging by Hanger Bolts

By C. Louis Zull

Cincinnati

THE SUCCESSFUL suspension of a brick sewer of 5-ft. inside diameter was accomplished recently in Cincinnati. As indicated in the sketch, a large manhole which extended some distance below the sewer was built



SEWER SUSPENDED WHILE CONSTRUCTING DEEP MANHOLE

around it. The manhole is part of a conduit system being built by the Foundation Co. for the Union Gas and Electric Co. in connection with its power house, described in *Engineering News-Record* of Sept. 27, p. 593.

The manhole, located at the intersection of three streets, had to be of unusual depth in order to be located beneath all existing pipes, sewers and conduits. A brick sewer with an outside diameter of 7 ft. 2 in. ran directly through the manhole, its top being about 9 ft. below street level. Excavation was first carried down to about the center of the sewer, and the dirt under the sewer then removed in 3-ft. sections. As soon as a section was cleared, 2-in. sheeting in 3-ft. lengths was braced against the lower half of the sewer ring. As soon as a full semi-circular section of this lagging was in place the hanger bolts were set and drawn up. These bolts, by the way, were made by welding together a lot of old 1-in. round stock on hand to make 20-ft. lengths. The lower end of each rod was bent to a quarter circle, and the rods on opposite sides of the sewer fastened together under the center of the sewer by a compound lug, thus forming a big U-bolt out of each pair of rods.

At street level four 12 x 14-in. timbers were placed across the manhole excavation and the rods run up between them and bolted to pieces of 3-in. angles. As each set of rods was placed and the strain taken, the next 3-ft. section was excavated. In this manner 9½ ft. of the sewer was successfully caught up and held while the manhole was carried down 10 ft. below it.



U-BAR CHAIRS SUPPORT BRIDGE AT INTERSECTION

Channel Bars on Stakes Furnish Rigid Support for Strike Boards

THE VERY wide streets and consequently wider intersections recently paved at Ogden, Utah, obliged the contractors to finish the concrete pavement from long trussed bridges and to carry the strike board on stakes capped with channels. Plank runways laid on U-bar chairs carry the wheeled bridge at intersections.

One of the photographs shows a 50-ft. street spanned by a trussed wooden bridge from which the concrete was struck off. Belts completed the work. At intersections the usefulness of such a long bridge is limited. Improvised bridges are often used over manhole tops if these happen to be available. If satisfactory bridges are not arranged for beforehand, workmen may attempt to use a board resting directly on the new concrete. A method found to work well for these long spans is to provide U-bar chairs of ¾-in. round iron or steel bars with pointed ends. Several can be driven across the intersection along the prolongation of the curb line and planks laid over the tops to make a runway for the finishing bridge.

Rigid supports for straight edge are considered desirable when the street widths are 50 ft. or more. It is the practice in Ogden for the engineer to set parallel rows of stakes across the street, with the tops slightly below grade at intervals of 10 to 20 ft. The stakes in the rows are 3 to 4 ft. apart, and are capped with 4-in. channel iron laid flanges downward. On these channels the straight edge rides across the street.

All street work in Ogden is carried out under the supervision of Joseph M. Tracey, city engineer.



NEWS OF THE WEEK

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

Southwestern Engineers To Hold Meeting at El Paso

The Southwestern Society of Engineers at its convention to be held at El Paso, Tex., Oct. 18-19, will be addressed by Dr. I. N. Hollis, president of the American Society of Mechanical Engineers and of the Worcester Polytechnic Institute. On the morning of the 19th a paper will be read by Dean G. M. Butler, of the University of Arizona. In spite of the fact that 20% of the members of the Southwestern Society are serving in the military forces of the United States, it has been felt best to hold the annual convention.

Standardized Ships Delayed by Boilers and Engines

The standardized steamship, of which there was much talk when the Shipping Board began its work and which has been carried to such a point of perfection in England that large ships are being launched within sixty days, has not contributed as yet to speeding up shipbuilding in the United States. A shipbuilder who has a Government contract and has given special attention to the problem, declares that the board will have more trouble getting the boilers and machinery built on time than it will the hulls.

Liberty Motor Truck Gets Trial

The two Liberty trucks that have been assembled have exceeded the expectations of not only General Chauncey B. Baker, of the Quartermaster Department, which has directed the work, but also of the engineers and draftsmen who worked on the design. Early tests of the engine showed 58 hp. at 1350 r.p.m., and the engine torque curve is better than anticipated. It is now assured that the U. S. heavy-duty war truck is one of the greatest engineering successes of the war, and that the truck will play a large part in affecting truck design in commercial circles.

Ohio Now Has Coal Dictator

As a result of the recent shortage of coal in the State of Ohio, H. A. Garfield, Federal Fuel Commissioner, appointed Homer H. Johnson, of Cleveland, coal dictator for the state. The situation had become very serious and mayors of cities throughout the state were preparing to seize coal from every source to prevent widespread suffering.

In several small communities light plants had been closed several days previous to Oct. 12 because of the lack of coal, many schools having been dismissed, and public utilities all over the state had to keep running on a very low supply of coal. On Oct. 12 the Columbus street car system was tied up for nearly an hour because of no coal in the bunkers, this being the second time within two days.

According to the latest reports, however, the condition of stress was being relieved.

Road-Building Regiment's Ranks Fill Rapidly

Men from All Parts of Country Seek Admission to 23rd Engineers as Result of News-Record's Campaign

As the result of the campaign which *Engineering News-Record* launched in its issue of Oct. 4, to secure volunteers with road-building and general construction experience for immediate service with the 23rd Engineers in France, applications are pouring in upon Col. E. N. Johnston, commanding officer of the new highway unit, which will be the largest regiment in the United States Army. On Oct. 15 this journal's representative was informed at Colonel Johnston's headquarters in Washington, D. C., that more than 1200 men had signified their willingness to serve with the road-building regiment now being organized. Scores of additional applications are being received in every mail, and to these is added a large volume of telephone and telegraphic inquiries as to enlistment.

In point of number of applicants and quality of men volunteering, the results have exceeded all expectations of Colonel Johnston and the members of his staff, who are outspoken in their praise of this journal's effective work in mobilizing the nation's road-builders for such use as the War Department may wish to make of them.

During the first few days after the issue of Oct. 4, carrying the recruiting message to the profession, had appeared, applications for enlistment came principally from men located in the Eastern States, a fact explainable by the distribution of *Engineering News-Record* from New York City. As time went on, however, and copies were put into circulation within a wider radius, the Middle West and South began to be heard from, while this week the mails contain scores of applications from the far Western States. One thing is clear: The 23rd Engineers will be, in no sense, a sectional organization, but will represent the best road-building talent of the entire country.

While the ranks are filling up rapidly there are still open in the new unit positions for men with the proper experience. Colonel Johnston wants to hear from men who have served as superintendents or foremen on road building or other construction jobs, steam-shovel men, roller runners, blacksmiths, quarrymen, powder men, road-grader operators, bridge carpenters, etc. On account of the huge size of the new organization, men of this type can still be assigned to positions of responsibility as noncommissioned officers. It should be repeated, however, that no man can offer himself for enlistment who has been called in the draft or been exempted. All applicants, too, must be physically fit, and must be ready for immediate service. A number of men have offered to join the 23rd Engineers provided their services were not needed for several months.

The commanding officer's desk at headquarters, 1419 F St., Washington, D. C., is piled high with application blanks, letters and telegrams regarding enlistment. These men are being carefully sifted with respect to age and experience, and to those who are considered to be qualified telegrams are sent directing them to report at the nearest recruiting station for enlistment. When sworn in, the military road-builders are directed to report at Camp Meade, Admiral, Md., where the military training of the highway regiment will be completed. From the information received in the applications it is often possible for the officers of the 23rd Engineers to make tentative offers of noncommissioned rank to the applicants. Many men have already been assigned to duty as corporals and sergeants.

Road-builders who wish to join the 23rd Engineers and who have not yet sent in their applications should do so immediately. Details regarding experience and method of making application were given in *Engineering News-Record* on Oct. 4, on pages 625 and 626. For the benefit of those who have not a copy of this issue available, applications should be mailed to the Commanding Officer, 23rd Engineers, National Army, 1419 F St., Washington, D. C., and the following form should be used in supplying information:

(1) Name
(2) Address
(3) Age
(4) Nationality
(5) Married or single
(6) Have you been called in the draft?
(7) Will you enlist for period of the war?
(8) State briefly your road-building or other construction experience
(9) What machinery can you operate?
(10) Your present or a former employer must certify to your qualifications by signing here and must give his address at which h can be reached by telegram.

Canada Feels U. S. Embargo on Iron and Steel

The iron and steel industry of Canada is being seriously embarrassed on account of the embargo imposed by the American Government on the export, except under license, of many iron and steel products which form the raw materials for manufactures in many cases extremely essential to the prosecution of the war. So threatening has the condition become that it seems likely that the at least temporary closing down of some plants will be a matter of the immediate future. A conference between leading iron and steel manufacturers and Sir George Foster, Canadian Minister of Trade and Commerce, was held at Ottawa on Sept. 28, which looks forward to a government supervision and conservation of iron and steel supplies.

In the meantime an attempt will be made to secure a statement of the immediate requirements, showing in detail the quantities and specific purposes for which the goods are needed by Canadian manufacturers. This statement will be forwarded to the United States Priority Board in the hope that the materials required will be released. Following is the composition of the committee which is preparing this statement:

P. L. Miller, of the Canadian Vickers, Ltd.; R. M. Davey, of the Dominion Bridge Co.; D. W. Fraser, of the Montreal Locomotive Co.; R. Harmer, of the Sawyer-Massey Co.; T. McC. Hutchison, of Drummond McCall & Co.; F. R. Humpage, of the Wilkes Twist Drill Co.; C. A. Waterous, of the Waterous Engine Company.

Oregon Will Have $3,000,000 for 1918 Road Work

The Oregon State Highway Commission will have available for next year's construction a fund approximating $3,000,000. Of this fund $2,000,000 will come from a bond issue, $220,000 from the quarter of a mill tax, $308,000 from auto-license fees and $472,000 from the Post Road appropriation, half of which is contributed by the Federal Government. If the assessed valuation of the state is taken as a basis of apportionment, 25%, or $750,000, will go to eastern Oregon and 75%, or $2,250,000, to western Oregon.

Springfield Turns from Garbage Burning to Hog Feeding

Owing to a reduction in the amount of garbage being collected and to the advisability of feeding garbage to hogs during the period of the war, construction was stopped on an incinerating plant being built for the City of Springfield, Ohio, under the direction of Charles E. Ashburner, city manager.

Ship-Building Companies Combine

To expedite the construction of shipping, the Bethlehem Steel Co. has formed a new corporation known as the Bethlehem Shipbuilding Co., with headquarters at Bethlehem, Penn. E. G. Grace, president of the Bethlehem Steel Co., will be president of the shipbuilding company.

The shipbuilding plants affected by the consolidation are: The Fore River Shipbuilding Co., at Quincy, Mass.; the Harlan and Hollingsworth Corporation, Wilmington, Del.; Samuel L. Moore & Sons Corporation, Elizabeth, N. J.; Bethlehem Steel Corporation, Sparrows Point plant, Sparrows Point, Md., and the Union Iron Works, San Francisco.

Upper Court Rules Against Bone Retaining Wall Patent

The United States Circuit Court of Appeals for the Seventh Circuit on Oct. 2 affirmed the lower court decree of Jan. 26, 1916, in which a bill brought to enjoin infringement of the well-known Bone patent for reinforced-concrete retaining walls was dismissed. The case was Bone vs. Marion County, Indiana, and the claim was that a cantilever reinforced-concrete wall at Indianapolis infringed patent No. 705,-732, issued July 29, 1902, to Frank A. Bone, of Cincinnati, Ohio. The upper court, Judges Alschuler, Evans and Landis sitting, affirmed the lower court in every particular. The decision, written by Judge Evans, holds that numerous publications, mostly in Europe, disclose prior invention of the reinforced-concrete retaining wall of the cantilever type and reaffirms the lower court opinion that had the judge in the Akron case, which was decided in favor of Bone, had before him the later evidence presented in the Marion case, he would have decided against the Bone patent.

The history of the Bone patent and a number of its predecessors was given in *Engineering News*, Feb. 3, 1916, p. 46. The lower court decision in the case of Bone vs. Marion County appeared in *Engineering News*, Feb. 10, 1916, p. 254; Feb. 17, 1916, p. 338, and in the *Engineering Record*, Feb. 12, 1916, p. 230.

Captain Nixon-Miller Commands American "Camoufleurs"

The company of American "camoufleurs," now in training at Camp American University, near Washington, D. C., is commanded by Captain Martin Nixon-Miller. Captain Nixon-Miller's company consists of artists, sculptors, architects and civil engineers. Captain Nixon-Miller was a member of the Pennsylvania National Guard for more than seven years. He served as assistant engineer under Major General Goethals on the Panama Canal and supervised the erection of an industrial plant at Pottstown, Penn., not long ago. After three attempts to obtain his services the Government finally secured them. Recently he has had charge of construction at the Frankford Arsenal. Captain Nixon-Miller and his men are working in conjunction with the Signal Corps of the army at Ft. Myer, Virginia.

New York City Accepts Catskill Aqueduct

At Dedication Ceremonies Last Week J. Waldo Smith and His Staff Receive Praise

The Catskill Aqueduct, on which construction for the first installment of 250,000,000 gal. per day has been completed for a number of months, was formally accepted on behalf of New York City by Mayor Mitchel on Oct. 13. Upon J. Waldo Smith, chief engineer of the Board of Water Supply, high praise was bestowed for his able conduct of work costing $177,000,000 and covering a 12-year construction period.

In accepting the great water-supply system Mayor Mitchel said:

"Great has been the contribution, the executive direction, the business judgment on the part of the members of the Board of Water Supply, and for that the people of the city will thank them through future generations. But, gentlemen, never has there been a bolder engineering conception or a more capable execution than that of Chief Engineer Waldo Smith in this great enterprise. It has been truly said that this work belongs to a class by itself. It equals in magnitude the construction of the Panama Canal; in the engineering difficulties of its conception and its execution, in my judgment, it exceeds the Panama Canal.

"One contribution that the Chief Engineer has made and which those who have not followed this undertaking closely might overlook, was the organization of the engineering staff. Nowhere, I believe, has there been gathered together a staff of engineers with more loyal spirit or devoted purpose.

"It is indeed a great achievement and a mark of distinction upon which these men who have carried out this great work and those who have dealt with them as contractors may congratulate themselves today."

At ceremonies in Central Park in the afternoon, Mayor Mitchel turned on the Catskill water, which leaped from the fountain to a height of 80 ft., while about 2000 persons cheered.

Men Nominated for American Society Offices

The Nomination Committee of the American Society of Civil Engineers have presented their report to the board of directors. The men named for the offices to be filled at the annual election Jan. 16, 1918, are as follows: For president, Arthur N. Talbot, Urbana, Ill.; for vice presidents, John F. Coleman, New Orleans, La., and Nelson P. Lewis, New York City; for treasurer, George W. Tillson, Brooklyn, N. Y.; for directors, George W. Cochran, New York City; Andrew M. Hunt, New York City; Samuel Tobias Wagner, Philadelphia, Penn.; Edward E. Wall, St. Louis, Mo.; Milo S. Ketchum, Boulder, Colo., and Harry Hargood, Los Angeles, California.



LIBERTY LOAN MEETING OF EMPLOYEES OF THE McGRAW-HILL PUBLISHING CO., INC., ON OCT. 9
A service flag with 42 stars was unfurled at the meeting, indicating that 42 members of the company had entered the military service of their country. Since that meeting four stars have been added to the flag

New York Building Zone Regulation Attacked in Court

The validity of the resolution establishing building zones in New York City, passed by the Board of Estimate in 1916, is attacked in a case now before the Court of Appeals (Estelle P. Anderson against Steinway & Sons). The concern just named refused to accept deed for property at 112 West 58th St., New York City, alleging that the passage of the zoning resolution subsequent to the signing of the contract to purchase placed an incumbrance on the property and made the Anderson title unmarketable because it places it in a residence district.

Steel Prices Satisfy Gary

E. H. Gary, chairman of the Steel Corporation, feels that, while the profits of some manufacturers would be reduced by the fixing of steel prices, conditions in the trade would be improved. Speaking as a member of the American Iron and Steel Institute Committee, which conferred with the War Industries Board over prices, he said:

"Our committee was in conference with the War Industries Board on Wednesday and Thursday of last week and agreed upon recommendations to the President concerning the prices to be fixed for many of the leading semi-finished and finished steel products, and these were adopted by the President as published. On the whole, it may be said, the negotiations with the War Industries Board and the results were satisfactory to the steel producers, although the prices named are lower than had been expected."

Construction Men Wanted for Service in France

Men who have had experience in any work connected with building construction, railroad construction or other engineering construction work are offered an opportunity to see immediate service in France with the Sixth United States Engineers, Colonel Harts commanding. This regiment will do general construction and engineering construction both behind and on the front line. The regiment has been fully organized for some time, but on account of increasing the personnel of the companies from 164 to 250 men it is desired to get the men best fitted for the work.

Construction men who wish to join this unit should send their applications, accompanied by statement of age, experience, etc., to the commanding officer, Sixth United States Engineers, Washington Barracks, District of Columbia.

Atterbury Nominated To Be Brigadier General

W. W. Atterbury, vice president of the Pennsylvania R.R. system, who is now supervising railroad operations for the troops in France, was nominated on Oct. 2 to be a brigadier general in the National Army. Mr. Atterbury was appointed director general of transportation of the United States Expeditionary Army in France on Sept. 14 after a month's service in active charge of all railways, docks and highways under General Pershing. Other nominations for promotion to the rank of brigadier general, which were sent to the Senate by President Wilson at the same time, were: Col. Isaac W. Littell, of the Quartermaster Corps, and Col. Frederick V. Abbott and Col. E. Eveleth Winslow, of the Engineer Corps.

Resume Lining Gunnison Tunnel

At the end of the present irrigation season, or about Nov. 1, work will be resumed on the placing of the concrete lining of the Gunnison Tunnel, Uncompahgre Valley Project, United States Reclamation Service, Montrose, Colo. This work will be continued throughout the winter and will give employment to about 150 men, including concrete subforemen, carpenters and motormen.

War Trade Board Appointed by the President

Proclamation Contains Regulations on Use of Enemy-Held Patents During the War

President Wilson has now established the administrative machinery to carry out the purposes of the Trading with the Enemy Act, approved Oct. 6. He has appointed a War Trade Board, with a war trade council to assist it. The machinery, established by proclamation, will take the place of the Exports Administrative Board, although Vance McCormick, chairman of the latter, will be chairman of the new War Trade Board. The members of the old exports board will also continue, and there will be additions to the new War Trade Board, as well as appointment of a number of officials, among them an Alien Property Custodian, not yet selected.

The regulations contain important items to administer the Trading With the Enemy Act, which contains various provisions as to the application for patents by citizens of the United States in enemy and ally of enemy countries during the war, and for the use in the United States by citizens of the United States of enemy-held patents during the war; and also for the suspension of certain information as to certain patent applications made in the United States, secrecy as to which is necessary for military reasons.

The Federal Trade Commission is empowered by the President to deal with all these patent matters, receiving applications and granting licenses with regard to them. The Commission is the power to which is granted the right to fix the prices of articles and products manufactured under licenses necessary to the health of the military and naval forces of the United States.

All correspondence in regard to exports should be addressed to the Bureau of Exports of the War Trade Board, the headquarters of which, for the present, will be at 1435 K St., Northwest.

In his proclamation creating the War Trade Board for the purpose of administering the Trading With the Enemy Act, the President also created a censorship and other boards which will have charge of carrying out some of the provisions of the Espionage Act. A representative of the War Trade Board will sit on the Censorship Board, as well as representatives of the Post-Office Department and the Committee on Public Information. This board will have full powers to censor cable, radio and mail communication passing between the United States and foreign countries. Control over communications with the enemy, forbidden by the Trading Act, are thus provided for in the proclamation, and the President has also established control over foreign exchange and transfers of gold, as well as censorship over foreign language newspapers printed in the United States, the transportation of entries and clearances of vessels transporting cargo.

The proclamation is in part as follows:

"XVII. I further hereby vest in the Federal Trade Commission the power and authority to issue licenses under such terms and conditions as are not inconsistent with law or to withhold or refuse the same, to any citizen of the United States or any corporation organized within the United States to file and prosecute applications in the country of an enemy or ally of enemy for letters patent or for registration of trade-mark, print, label or copyright, and to pay the fees required by law and the customary agents' fees, the maximum amount of which in each case shall be subject to the control of such Commission; or to pay to any enemy or ally of enemy any tax, annuity or fee which may be required by the laws of such enemy or ally of enemy nation in relation to patents, trade-marks, prints, labels and copyrights.

"XVIII. I hereby vest in the Federal Trade Commission the power and authority to issue, pursuant to the provisions of Section 10 (c) of the Trading With the Enemy Act, upon such terms and conditions as are not inconsistent with law, or to withhold or refuse, a license to any citizen of the United States, or any corporation organized within the United States, to manufacture or cause to be manufactured a machine, manufacture, composition of matter, or design, or to carry on or cause to be carried on a process under any patent, or to use any trade-mark, print, label or copyrighted matter owned or controlled by an enemy or ally of enemy, at any time during the present war; and also to fix the prices of articles and products manufactured under such licenses necessary to the health of the military and the naval forces of the United States, or the successful prosecution of the war; and to prescribe the fee which may be charged for such license, not exceeding $100 and not exceeding 1 per centum of the fund deposited by the licensee.

"XIX. I hereby further vest in the said Federal Trade Commission the executive administration of the provisions of Section 10 (d) of the Trading with the Enemy Act, the power and authority to prescribe the form of, and time and manner of filing statements of the extent of the use and enjoyment of the license and of the prices received and the times at which the licensee shall make payments to the Alien Property Custodian.

Detroit To Allow Use of Concrete Segment Blocks in Sewers

Final confirmation of the decision of the Detroit City Council to allow the use of concrete segment blocks in sewers has been secured. As was indicated in these columns Aug. 30 and Sept. 6, the restriction now lies only against vitrified clay and shale segment blocks, all other types being permitted in the lesser-sized sewers.

Dr. E. F. Roeber Dead

Eugene Franz Roeber, Ph.D., editor of *Metallurgical and Chemical Engineering*, one of the McGraw-Hill Publishing Co.'s papers, died Oct. 17. He was born Oct. 7, 1867, in Torgau, Germany, and received his education in the universities of Jena, Halle and Berlin. He came to the United States in 1894 to engage in electrical engineering work, later becoming editor of *Electrochemical Industry* and its successor, *Metallurgical and Chemical Engineering*. The latter paper developed with astonishing rapidity under Dr. Roeber's able direction. It was first issued as a monthly, but its growth in influence soon justified the change to a semi-monthly publication. Dr. Roeber was an indefatigable worker and to him is due the position of leadership in its field which *Metallurgical and Chemical Engineering* occupies.

Newark To Adopt Commission Form of Municipal Government

At a special referendum election held Oct. 9 in Newark, N. J., the supporters of the commission form of municipal government polled 19,000 votes against their opponents' 6000. The change in form of government will take place on Nov. 19, when the five commissioners, who will be elected at a special election Nov. 13, will take office. It has been estimated by the Newark Board of Trade that at least $100,000 a year will be saved by this change in the form of government. It has been estimated, also, that 160 city officials will be retired on account of the greater efficiency that will be gained.

Work Begun on Philadelphia Subway Loop

Preliminary work on the subway delivery loop which runs from Broad and Arch Sts. under Arch to Eighth St., under Eighth to Locust and under Locust to Broad St., in Philadelphia, has been begun with the starting of the excavation west of 10th St. on Arch St. and on Arch St. just east of 13th St. The work is being done by the Keystone State Construction Co. and the cost will total about $7,000,000. Under the present conditions of labor it seems likely that the work will take several years for completion. In prosecuting the work one section will be completed at a time to avoid interfering with the use of property along Locust Street.

Engineer Corps Wants Men for Non-Combative Service

A call has been issued by the Office of the Chief Engineer, War Department for topographers, topographic draftsmen and surveyors for work in other capacities than that of combatants. Men of the above professions who have been drafted, expect to be drafted or who desire to volunteer their services are requested to communicate with the Survey and Printing Battalion, War Department, Room 193, Washington.

PERSONAL NOTES

ROBERT B. KLINE has been appointed supervising engineer for the construction of the Emergency Fleet Corporation. Mr. Kline graduated in engineering from Harvard University in 1893, and after two years of construction work he became county surveyor of Montgomery County, Ohio, and superintended the construction of about 300 miles of interurban railways being built at that time. During 1904-5 he was in partnership with Charles Hoglen, building numerous bridges and steel structures in Dayton, which work he continued during his partnership with E. M. Gebhart, which is still effective. In 1906 Mr. Kline was appointed city engineer of Dayton. He is at present vice president of the Barkelew Metal Products Co., of Dayton, and maintains his office as consulting engineer in the Callahan Bank Building. During his service with the Government his business will be continued by his brother, Hubert M. Kline.

GEORGE B. ROTH has succeeded E. W. WENDELL in charge of the construction of the New York State road, which starts at the level of Brant Lake and runs to Graphite, at which place the mines of the American Graphite Co. are located. Mr. Wendell has been placed in charge of the state work in Clinton County and has his office at Plattsburg.

RAOULD RINFRET, who has been in private practice as consulting engineer for the past 30 years, has been appointed city engineer of Shawinigan Falls, Quebec.

BAYLY HIPKINS is at present connected with the engineering staff of the Foundation Co., and is now located on construction work on the Pacific Coast.

J. C. MCLEOD, of the office of the State Highway Commission of Oregon, has transferred his office from Roseburg to Curtin, in northern Douglas County, where work has been started on two new units.

RICHARD L. O'DONNEL, formerly general superintendent of the western Pennsylvania division, Pennsylvania R.R. system, became assistant general manager of the Pennsylvania Lines east of Pittsburgh and Erie on Aug. 20. During the Mexican border troubles last year, Mr. O'Donnel handled the entire transportation problem for the Eastern department, and he became adviser to the War Department in the question of troop handling when the present war was declared. Mr. O'Donnel was graduated from the Polytechnic College of Pennsylvania in 1882, and was employed for a short time thereafter as rodman in the construction of the Cornwall & Lebanon R.R. Entering the service of the Pennsylvania R.R. in 1883, as rodman, he became assistant engineer in the principal assistant engineer's office in 1886. Appointed assistant supervisor at Holidaysburg in 1887, he was in charge of a force of men at the time of the Johnstown flood in 1889. The same year he became supervisor in the Altoona yards, and two years later assistant engineer of the Tyrone division, being transferred to the Pittsburgh division as assistant engineer in 1894. Promoted to assistant superintendent of the Pittsburgh division in 1897, and later to superintendent of the same division, in 1903, he was appointed general superintendent of the Buffalo & Allegheny Valley division, and in 1911 general superintendent of the western Pennsylvania division.

H. M. PAFFORD has resigned as city engineer of Waycross, Georgia.

JOHN B. PAYNE, chief engineer and secretary of the Board of Commerce and Navigation, New Jersey, has tendered his resignation from that position and will retire from the state service after a tenure lasting 40 years. He was appointed to the position he is vacating some months ago, succeeding B. F. CRESSON, JR. Since his first connection with the New Jersey Riparian Commission in 1877, Mr. Payne has devoted himself principally to questions connected with this work. The resignation will take effect Oct. 1.

H. S. ROGERS, maintenance engineer of the Delaware & Hudson R.R. at Albany, N. Y., has been appointed division engineer in charge of maintenance-of-way on the Susquehanna division, with headquarters at Oneonta, N. Y. F. C. HOHN has been appointed division engineer on the Pennsylvania division, with headquarters at Carbondale, Penn., and G. D. HUGHEY has been appointed division engineer on the Champlain division, with headquarters at Plattsburg, New York.

A. J. RUSSELL and J. C. PARKER have opened offices as consulting civil engineers and architects in the National Realty Building, Tacoma, Washington.

C. R. MORRILL has been appointed assistant general manager of the Southern Pacific Railway, with headquarters at Houston, Texas. Mr. Morrill entered the railway service with the Southern Pacific in 1892, and was made roadmaster in 1897—being promoted four years later to division engineer. In July, 1904, he became assistant superintendent and in 1915 was appointed superintendent with headquarters at Houston, which position he has held until his appointment as assistant general manager.

PAUL C. GAUGER, structural engineer for the George J. Grant Construction Co., which has the contract for the new union depot at St. Paul, has been named the representative of the St. Paul Civil Engineers' Society on the committee which is to aid the commissioner of schools in making final plans for the new buildings to be erected under the bond issue recently passed in that city.

F. W. SCHREIBER, who for the past seven years has been city engineer of Watertown, S. D., has been appointed assistant highway engineer of the South Dakota Highway Commission.

FRANK S. PECK, who had charge of the planning and construction of the hard-surface highways in the Black Hills, has accepted the position of highway engineer with the above commission.

CAPTAIN WALTER R. METZ, Quartermaster Corps, U. S. A., who was formerly mechanical engineer and superintendent of buildings of the Government Printing Office, Washington, D. C., is at present stationed at Clintonville, Wis., on inspection work in connection with an order for approximately 4000 automobile trucks for the War Department.

HUGH L. WILEY, civil engineer and author, of Portland, Ore., has been commissioned first lieutenant in the 18th (Railway) Engineer Regiment, now in France.

F. W. GUERNSEY has been appointed city engineer of Dayton, Washington.

W. JACKSON, chief engineer of the Edmonton, Dunvegan & British Columbia Ry., has resigned.

R. B. BENNETS, of Tacoma, Wash., has been appointed chief engineer of the Ladysmith Smelting Corporation, Ladysmith, British Columbia.

L. O. MARDEN, formerly chief draftsman with the Oklahoma Department of Highways, has been appointed chief draftsman for the State Highway Commission of New Mexico.

N. CAUCHON, consulting engineer, Ottawa, has become associated with THOMAS H. MAWSON, the English town-planning expert, to collaborate in the replanning of Saloniki, for which purpose he has been commissioned by Premier Venizelos, of Greece.

ARTHUR F. SHUEY, formerly assistant engineer, Florida State Board of Health, has been appointed superintendent of the Tampa Water-Works Co., Tampa, Fla.

PROF. E. V. WALKER, head of the department of civil engineering of the Pennsylvania State College, has been commissioned captain, Fifth Regiment of Engineers, which has left Plattsburg for foreign service. PROF. HUGO DIEMER, head of the department of industrial engineering of the same school, has received a commission as major in the Ordnance Department, and is at present located at Lowell, Mass., inspecting firearms. Other members of the faculty who are in military service are: J. J. LIGHT, of the department of mechanical engineering, who has been commissioned captain; LIEUTENANTS STEEL, LONG and BRYANS, of the depart-

ment of civil engineering, are on duty at various camps. MR. MILLS, of the electrical engineering department, is in Washington on naval construction.

H. K. RUBEY, instructor in civil engineering at the University of Washington, has resigned to accept a similar position on the faculty of the Carnegie Institute of Technology at Pittsburgh. No successor to Mr. Rubey has been appointed as yet.

J. T. GEAR, recently city engineer of Kelso, Wash., has been appointed city engineer of Puyallup, Washington.

FRED H. CLARK, superintendent of streets, Springfield, Mass., has been reëlected for a five-year term.

DR. D. B. STEINMAN has been appointed associate professor of civil engineering in the College of the City of New York for the current year. He will retain his connection with the firm of Waddell & Sons, consulting engineers.

PROF. ALMON H. FULLER, dean of the department of engineering, University of Washington for the past 19 years, has resigned to accept a position as head of the department of civil engineering at Lafayette College, Pennsylvania. Professor Fuller has been with the University of Washington since 1898. So far no permanent appointment has been made to fill the position vacated by him in the University of Washington.

MAJ. ELLIOTT J. DENT, who has been in charge of the United States Engineer's Office, Seattle District, Portland, Ore., since the departure of LIEUT. COL. J. B. CAVANAUGH, has been promoted to the rank of colonel and has been assigned to the 26th Regiment of Engineers at present being mobilized in New Jersey. Colonel Dent will be succeded in the district by CAPT. ALBERT H. ARCHER, of the United States Engineer Corps, lately stationed at Vancouver, Washington.

HENRY M. SPERRY has been appointed publicity representative for the Union Switch and Signal Co., General Railway Signal Co., Federal Signal Co. and Hall Switch and Signal Co., with headquarters at 120 Broadway, New York. He was connected with the Union company and then with the General company for several years. Mr. Sperry began his career in 1881 in the engineer corps of the Pennsylvania R.R., and in 1887 became supervisor of signals on the New York Division. In 1905 he was consulting signal engineer for the Hudson Companies, New York City, in the preparation of plans for signaling in the Hudson River tunnels and the large terminal station at Church Street.

HAROLD D. HYNDS has resigned as engineer of the Atlas Portland Cement Co. and has accepted a position in the contract department of the Turner Construction Co., New York City. Mr. Hynds was in the technical service division of the Atlas company under E. D. BOYER. He is secretary of the American Concrete Institute, and the secretary's office therefore changes from 60 Broad St. to 244 Madison Ave., New York City.

H. I. DE BERARD, for 18 years chemist and bacteriologist for the Denver Union Water Co., has resigned his position and will continue his consulting work at Ontario, Calif. Following graduation from Beloit College in 1897 he took a postgraduate course in biology and bacteriology under PROF. E. O. JORDAN, Chicago University, when the application of these branches to water-supplies was in its infancy. Although Mr. De Berard's main energies have been spent in maintaining the integrity of Denver's intricate system of slow and rapid sand filters, lake, river and underground sources, he has also been engaged to handle the quality end of lawsuits at Raton, N. M., and Pueblo, Colo., and to help many of the other cities in the Rocky Mountain region with their algæ and sanitary problems.

B. K. COGHLAN has resigned as associate professor of highway engineering at the Agricultural and Mechanical College of Texas, having received a commission as captain in the Engineer Officers' Reserve Corps and detailed to Fort Leavenworth, Kansas. E. O. FRANCISCO, assistant professor of civil engineering at the Agricultural and Mechanical College during the last season, has received a commission as second lieutenant and has been detailed to the same post.

H. F. JOHNSON, formerly resident engineer on the construction of the Union Station Terminals at Kansas City, Mo., and later engineer in charge of the sewer division of the city engineer's office, Kansas City, Mo., has accepted a position as assistant engineer with the Union Pacific Railroad Co., and is now located at Hastings, Neb., having charge of terminal facilities now under construction at that point.

OBITUARY

WILLIAM WALTER MARR, chief state highway engineer of Illinois, died at Chicago on Oct. 3. He was born at Chicago in 1876. He graduated from Notre Dame University in 1895. Two years later he entered the engineering service of the City of Chicago, where he remained for several years, becoming a division engineer on the staff of the Board of Local Improvements. Later he was a member of the engineering firm of Marr, Green & Co. In 1913 he was appointed chief engineer of the State Highway Department and held this position (but with a different title) up to the time of his death. Mr. Marr will be best remembered as one of the first highway engineers to work out a rational system of choosing highway routes from the service standpoint. Early in his work for the state he deplored the haphazard manner in which laymen county commissioners rushing into road building chose routes and types of roads. Starting on the same basis as he would for a local improvement for proportioning a water or sewer system he evolved the method described briefly on page 536 in the *Engineering Record* of Apr. 22, 1916.

BRIG. GEN. HIRAM M. CHITTENDEN, U. S. A., retired, died in Seattle, Oct. 9, in his 59th year. He was graduated from West Point in 1884, commisioned second lieutenant in the Engineer Corps, and three years later admitted to the New York State bar. In 1886 he was promoted to first lieutenant, gained a captaincy in 1895, then successively became a major and lieutenant colonel. In 1910, while superintending the building of roads in Yellowstone Park, exposure brought about disability, including blindness. He was then appointed brigadier general and was retired on Feb. 10 of that year. During his career as executive officer of the Board of Engineers to investigate canal routes between Lake Erie and the Ohio River and as secretary of the Missouri River Commission, he conducted extensive investigations in arid regions. In 1897 the report was published and was one of the first American books to enter critically into the problem of controlling floods. From 1889 to 1906 he was in charge of the improvement of Missouri River and tributaries and of work in Yellowstone Park, and built or rebuilt the greater portion of the park's road system. He was the inventor of the type of movable dam known as the Chittenden drum weir. He served as consulting engineer for the Spring Valley Water Co., San Francisco, in 1912, and on the Dayton, Ohio, flood problem in 1914. He was the author of a number of books and a contributor to geenral as well as technical magazines.

THOMAS H. HUMPHREYS, advisory engineer in the Quartermaster's Department of the War Department, died Aug. 21 at his home in Washington. Mr. Humphreys was born in Oldham, England, and after his parents moved to this country he became an irrigation and drainage engineer in California. Entering the War Department in 1882, during the following 14 years he was engaged in various engineering projects in Western states. For the last 16 years he had been stationed in Washington and had had many assignments as supervising engineer in the construction branch of the United States Quartermaster Corps.

WILLIAM J. WOOD, member of the Indiana Public Utilities Commission and formerly attorney examiner for the Interstate Commerce Commission, died in Indianapolis on Oct. 5. At the time Mr. Wood was third vice president of the Louisville & Nashville R.R., having charge of the legal department.

CHARLES W. KEMPTON, consulting mining engineer, died July 29 in Westboro, Mass. Mr. Kempton's

death was the result of illness brought on by exposure and fevers contracted on the Isthmus of Darien while engaged in making geological examinations for an interoceanic canal. Receiving his early education in engineering in the office of I. Herbert Shedd, of Boston, he accepted a position in the office of the engineer of locks and canals at Lawrence, Mass., where he remained about ten years, devoting all his spare time to the study of geology and mining engineering. In 1880 he went to New York City and opened an office as mining engineer. In 1910 his health had become so broken that he was forced to give up active practice.

THEO. STARRETT, founder of the Thompson-Starrett Co., building contractors, died Oct. 9 at his home in Prospect Plain, New York.

WILLIAM MURDOCH, city engineer of St. John, N. B., died Oct. 7.

ELMER ELLSWORTH COLBY, a consulting engineer of Chickasha, Okla., died Sept. 27. Entering railroad service in 1881 as rodman for the Chicago, Milwaukee & St. Paul Ry., he remained in this work until 1888, when he became county engineer for Greene County, Missouri, at the same time opening an office for the general practice of consulting engineering. During the following years he designed and superintended the erection of steel bridges over various rivers in the neighborhood of Springfield, Mo., and constructed concentrating mills and other mining work in the lead belt of Missouri. From 1900 to 1903 he was in charge of segregation and surveying for town sites in the Chicksaw Nation, Indian Territory, for the United States Department of the Interior. From 1906 to 1914 he was city engineer of Chickasha, Okla., and at the time of his death he was inspecting road work between that city and Fort Sill, Oklahoma.

BUSINESS NEWS

Advocates Government Credit To Aid the Railroads

It is not too early to begin to plan for the period of readjustment in the United States after the war, says the October *Bulletin* of the National City Bank of New York. Here, as in other parts of the world, there is no lack of work that ought to be done, and which, if done, will provide full employment, but there is danger of hesitation and loss of confidence in passing from war conditions to peace conditions. There is wanted for that time a big, definite program of construction work which will put a backbone into the situation.

The opportunity for such a program, is afforded by the railway situation, according to the *Bulletin*, which advances the following reasons for its belief: "It has been demonstrated that notwithstanding the great amount of capital expended upon the railways in the last 17 years, their development has not kept pace with the growth of traffic. Furthermore, it is apparent that the railway problem cannot be adequately dealt with by the companies acting independently and alone. The situation requires comprehensive treatment, particularly at terminals, looking far to the future, and requiring an amount of capital which the companies alone cannot undertake to raise in the state of the world's money markets in the near future, nor can expenditures planned upon a scale to care adequately for the future be expected to be immediately remunerative to the railroads, although the improved service would be advantageous to the country.

"An extensive scheme to develop and improve the country's transportation system would do more to equip the country for economical production and to enable it to hold its own in world's markets than perhaps any other single thing that can be done, and if such a program could be ready for announcement at the close of the war, it would put an end to all uncertainty and apprehension about business conditions in the United States in the period following the war.

"The Government's relation to the railroads up to this time has been wholly restrictive, but the time has come when it ought to be also constructive. Regulation is inevitably restrictive in some respects, and this phase of it tends to divert capital to other employment. To offset this effect the Government's relation to the railway business should be likewise constructive, giving some positive aid to the support and development of the great transportation industry, which it recognizes as holding a vital relationship to all the other industries.

"Such a program can only be promptly and adequately carried out, under the conditions which will exist at the close of the war, by the aid of Government credit, and it should be done under a just and reasonable arrangement between the companies and the Government, which will ultimately reimburse the Government, and at the same time provide an incentive for the initiative and enterprise of private management, and secure to the public the benefits of adequate and progressive service."

Conference of the Paving Brick Industry To Be Held

The annual meeting of the National Paving Brick Manufacturers Association will be held in Cleveland, Ohio, Nov. 19 and 20. As evidencing the spirit of the meeting, the office board of the association says: "A complex situation is created by the country's requirement for the greatest transportation facilities when that very need hinders the receipt of materials and fuel needed in the manufacture of brick, and delays paving work which should furnish transportation relief. Then, too, the Council of National Defense is recommending short-haul freight to be transported over the highways which either do not exist or are not in condition for this service."

The office board of the National Paving Brick Manufacturers Association is convinced that more good to the country and to the industry can be effected by a conference in which the entire industry is represented by its active executive officials, than by any other undertaking. All members of firms, board members of companies and other persons having financial interests in the business are invited and urged to attend the Cleveland meeting. Detailed information regarding it will be sent all manufacturers of paving brick as soon as prepared.

Notes from

MAKERS OF PLANT AND EQUIPMENT

Hydrated Lime Bureau, Pittsburgh, has appointed Tyrrell B. Shertzer, formerly city manager of Portsmouth, Va., to the newly created position of Eastern district engineer, with headquarters in New York City. C. W. Freitag, formerly construction superintendent for S. R. Smythe Co., construction engineers, Pittsburgh, has been appointed Western district engineer, with headquarters at the home office of the bureau in Pittsburgh. Appointments were effective Oct. 1.

Vulcan Steel Products Co. has opened an office in Havana, under the management of G. O. Simpson, to take care of its rapidly growing business in Cuba. In connection with this office, there will be maintained a permanent exhibition of machinery, and steel and iron products, in which the company deals. The company's branches or agencies are now maintained at Paris, France; Hongkong and Shanghai, China; Yokohama, Japan; Milan, Italy; Barcelona, Spain; Melbourne and Sydney, Australia; San Juan, Porto Rico; Singapore, Straits Settlements and Havana, Cuba. The company is also represented by well-known business houses in the following trade centers: London, Brazil, Portugal, Argentine, Uruguay, Paraguay, Peru, Chile, Bolivia, Venezuela.

Dodge & Dodge, dealing in contractors' supplies and equipment, and machinery for concrete work, have moved from 140 West 38th St., to 501 Fifth Ave., New York City, in order to have larger executive offices for handling their increased business. The firm still represents the Byers Machine Co. (auto cranes); Oshkosh Manufacturing Co. (mixers, saw rigs, pumps, back filling machines, etc.); Kent Machine Co., Kent, Ohio (continuous concrete mixers). Dodge & Dodge report that they are making headway with the Elgin motor street sweeper, manufactured by the Elgin Street Sweeper Co., Elgin, Ill.

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ENGINEERING NEWS-RECORD

A WEEKLY JOURNAL
DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

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A Significant Note on Reconstruction

LAST WEEK'S issue contained a personal note that was significant of what will be one of the post-bellum activities of engineers—the reconstruction of devastated areas. It related that a Canadian engineer had become associated with an English town-planning specialist in replanning Saloniki. We have long foreseen that such work was coming. Now it is here, and its activities have affected the profession even on this side of the Atlantic.

New Promise of Engineering Solidarity

INDICATIONS from many cities that local engineering societies are starting the season with increased activity give hope for continued progress in the direction of engineering unity. If large attendances and interested discussions at club meetings mean anything, it is that engineers feel the need of getting together; united, they can accomplish what their separate efforts would fail to achieve—a simple truth, but one which engineers, above all men, have ignored largely in the past. The stress of the times and the effective cooperation of engineers in patriotic endeavors to meet the nation's needs have been powerful factors in bringing them together in spirit. Today the greatest as well as the least perceive the need of standing shoulder to shoulder, a united profession—or, at least, they are beginning to perceive it. In this perception lies a splendid augury: The solidarity that has been lacking in the profession may come to be soon a reality.

Advertising the 23rd Engineers

WE ARE BECOMING accustomed to an unprecedented openhandedness in the support that individuals and business are giving to the Government. We are surprised agreeably by the new ways of doing this that manifest themselves daily. The banks and manufacturers are using their advertising space, not for solicitation for business for themselves, but for selling Liberty bonds. Many companies are lending their salesmen for the bond campaigns, while the Red Cross has received a degree of support second only to that tendered to the Liberty loans. The manufacturers of engineering supplies and contractors' equipment have taken places in the front of this patriotic activity. As evidence of what they are doing we may cite this issue of *Engineering News-Record* and also the [illegible]

Three weeks ago this journal appealed, in behalf of Colonel Johnston, for recruits for the 23rd Engineers, the road-building regiment. The response was most gratifying, but with a determination to do all that was possible, a representative of Colonel Johnston suggested to a number of manufacturers that they devote their advertising space to an appeal for recruits. As a consequence, the two issues carry about 15 pages of advertising regarding the highway regiment, donated by some 30 manufacturers. Unfortunately, when the history of this war is written it will be impossible to record the contributions of money and effort by individuals and corporations. Therefore, the patriotic manufacturers who are assisting, by the donation of their advertising space, in the recruiting of the 23rd Engineers must be content with the knowledge that they have done their share in the accomplishment of the great end.

War a Reason for Holding Not Postponing Convention

SOME of our national technical societies have given up their meetings this year on account of the war. Others have seized upon the war as a means of making their conventions of even greater value than usual. Notable among the latter was the meeting of the American Public Health Association held at Washington, Oct. 17 to 20. War problems had a large and useful place on the program, as may be seen from abstracts of some of the papers beginning on page 777 and in the report of the meeting on page 811. Naturally, the proceedings of the Sanitary Engineering Section receive most attention in our columns. This section has done much good work since it was organized a few years ago. Special commendation is due the committees mentioned on page 811, whose code for the sanitary control of waterways and definitions of sewerage and sewage disposal terms were adopted by the section at the Washington meeting.

A Visit to Washington

NOT UNTIL there is universal recognition of the fact that today the first business of the nation is war will we be fully armed for the conflict. Many of us, having given our sons, or having changed our normal occupations or strained our resources to lend money to the Government, know that we must make sacrifices. But even among us there is not full realization of the magnitude of the conflict or of the extent of our preparation. A visit to Washington gives one a true perspec-

tive. A new spirit would animate our national life if every citizen could go to the capital and see what the war and navy departments and the committees of the Council of National Defense are doing.

Our people have not an adequate conception of what is entailed by our war preparations, principally because the activities are so many and so varied that the press of the country has been unable to describe them adequately. The newspapers have tried to interpret Washington's activities. There was some publicity regarding the cantonment construction, much on the liberty motor, the liberty truck and the Government's aëroplane program. These, being details of the great scheme and being expressed in figures within reach of the popular imagination, have made some impression on the people. But when the press reports the passage of a $7,000,000,000 appropriation bill or announces that the war, in its first year, will cost $19,000,000,000, the statements carry no conviction. The figures are too stupendous. Our experience furnishes no yardstick by which to gage them. We need details.

Certain classes have a clearer comprehension than others of what is going on in Washington. The manufacturers whose normal procedure has been completely upset realize the situation best. Second to them, we believe, are the engineers of the country. They have been called on in such large numbers to help the Government that even those who are not taken into service have hosts of friends on duty at Washington or at the front. Not until one visits Washington, however, does one get an adequate idea of the extent to which engineering underlies the whole great military business. One gets some conception when he is told that while the Ordnance Department figured in the hundreds the cannon that it made in years of peace, it must now turn out 16,000 pieces, of various calibers, within 18 months. One division of the Corps of Engineers office has normally ordered $50,000 worth of supplies per annum. In July, August and September of this year its commitments were no less than $90,000,000. And these supplies have been bought by engineers, under engineering specifications. The marvelous story of the cantonment division of the Quartermaster's Department is probably the best known of the Government's war engineering activities, yet it is matched by the work of more than one other department. And when one is told at the end of two or three days of inquiry and study that the height of our engineering purchasing and other engineering activities will probably come on the day before the war stops, one goes away with the solid conviction that war is truly the nation's business at the present minute, and that war will continue to be its business until our men come back victorious.

One feels, too, after a visit to Washington that those in the capital have done a magnificent job, have accomplished wonders, and that the country at large both fails to understand what has been done and has been niggardly of praise.

As the war goes on, more and more of these interesting facts will become known, and our attitude as a people will change so that all right-thinking persons will be in a mood to make all needful sacrifices and will be content to get merely a bare living, if so much of sacrifice be required, until the war is won. Everyone cannot visit Washington in order to receive the inspiration of its activities. Therefore, Washington must be carried to the people by a persistent telling of the story of the war's activity.

More Toying with a Big Problem

READING New York's newspapers, even those that favored the scheme tentatively agreed upon by the Board of Estimate and the New York Central Railroad, one would be likely not to realize the futility, not to say absurdity, of the steps recently made toward a solution of the so-called West Side improvement problem in our first city. Apparently a joint committee of the Board of Estimate and the Public Service Commission has been giving the whole problem the most careful study, and has evolved a plan made public early this month, which eliminates practically all of the features objected to by various organizations in the 1916 plan. These organizations admitted this at the public hearing last week—a hearing where all seemed to be harmony. And already the great acumen of certain men in finding such simple remedies to the glaring defects of the 1916 plan is being cited as an additional reason for the election or reëlection of these men to important offices next month.

The New York Central, which many people think will be a party to whatever arrangement is finally made, did not send a representative to the hearing. Several days before the hearing Ira A. Place, vice-president and chief counsel of the railroad in this matter, announced his company's absolute rejection of the new plan. Some of the propositions, such as the one that the company pay rent for land it now claims as its own, and that the city be allowed to terminate the entire lease in twenty-five years, he characterizes as astounding. All of the changes suggested, states Mr. Place, were proposed by various interests as well as by the New York Central prior to the tentative agreement of 1916, and were rejected as either unwise or impracticable.

Although by the law passed last spring this joint committee must step down and drop the problem if a solution is not found by Dec. 1, Mr. Place points out that the committee's proposals are not accompanied by any new maps, estimates or figures of any sort, and he does not see how they could be given the 30 days' publicity before Dec. 1 required by law. It occurs to this journal that there may be very serious engineering flaws in this new plan, some of whose new features are mentioned in the news section of this issue. But important as these questions may be, they are insignificant compared with the flat refusal of the New York Central to do business on the basis of the general terms of the proposals of the joint committee.

For six years the Board of Estimate had been thrashing out with the New York Central the various points involved, and had, it appears, made a good bargain. In order to get the facilities it sorely needed the company was willing to pay for practically the entire improvement, and even do much park-improvement work for the city. On the other hand, the company was confident that the courts had established its title to its present right-of-way, and the Board of Estimate saw the folly of disregarding that title. Last spring, after these six years, when board and railroad had virtually agreed, the Legislature passed and the Governor signed an

ill-considered law which virtually took the matter out of the hands of the board. Until Dec. 1 the board and the Public Service Commission were to work together for a solution, but in the event of failure the entire problem was to be turned over to the commission.

Engineering News-Record was convinced at the time of passage that this law destroyed the chance of an early settlement of the matter. The developments of the last three weeks bear out that conviction. Mayor Mitchel showed a fine scorn for the possibility of a better settlement than the Board of Estimate had advocated by giving all three places on the joint committee to opponents of the board's scheme. They were given a free rein, and apparently they have not discovered yet that they are not headed anywhere. In five weeks more, unless they effect a miracle, they too will be eliminated from the negotiations, and the Public Service Commission will be in sole command of the situation.

In six years possibly the commission, having studied the matter from all angles, as the Board of Estimate did, having debated each point with the railroad, will make the headway the board had made in 1916. Perhaps following a course more in accord with its present views, it will force a different solution. Perhaps city and state will pay for their share of the improvement according to the terms of the state grade-crossing law—25 per cent. each. Possibly legislation yet to come will give the city better terms than that. But *Engineering News-Record* is sure that no early solution will come except substantially along the lines of the 1916 plan, and as sure that no solution will ever come that is enough better than the 1916 plan to compensate for the delay.

The Engineer's Interest in Foreign Trade

"IT IS of the highest importance to familiarize our people with the fact that . . . . the next important task for this country will be that of financing the rehabilitation of industry throughout the world." In the foregoing sentence, John Clausen, vice-president of the Crocker National Bank of San Francisco, addressing the Southern Commercial Congress at New York City on Oct. 17, summarized a situation of great importance to the engineers of this country. It is becoming evident that this country will have, at the close of the present struggle, an unequalled opportunity for useful development, both because of its great financial resources and because of its possession of the labor, equipment and materials for economical production. It is equally certain that this country will miss its opportunity of rendering the greatest service to the rest of the world, thereby increasing its own strength and prosperity, unless these resources are organized in ways the very necessity for which the people of this country do not appear to realize yet.

The average man, especially the average engineer, must learn to appreciate the tremendous influence which foreign trade will have on domestic affairs after the close of the war. We shall reach the time of peace with a great accumulation of capital. Most of the important nations with which we trade will be in our debt. To discharge these debts, they will be obliged to send goods to us. To regain their position as creditor nations, they will be obliged to force production, restore and expand their foreign trade and reverse the unfavorable trade balances now standing against them. With these ends in view the business men of these countries are already organizing efficiently.

Unless this country can hold its own in the face of such competition, it will not expand as it should. Industrial development will not take place unless the manufactured products can be sold. If we cannot sell our products abroad and if they have to meet in domestic markets the competition of powerful combinations of foreign producers, a sufficient volume cannot be sold to guarantee the further development of our industries. In order to sell our products abroad, we must be able to finance the purchasers, and to invest in the development of the countries to which we sell, so that they may produce more and buy more.

To do this, there must be some systematic method of handling the foreign banking business of the country, while the investing public, which controls our great accumulation of capital, must be taught to absorb the securities of foreign enterprises. We have made as yet scarcely a beginning of these things. Even the Webb bill, which would permit merchants and manufacturers to combine for the extension of their foreign trade, passed the House of Representatives by a bare majority and has yet to be acted upon by the Senate. Although the Federal Reserve Act provides for the establishment in foreign countries of branches by member banks, and permits coöperative participation in the organization of banking interests beyond our borders, few institutions have taken advantage of it. One engineering firm estimates that development work which is ready to go forward in South America alone at the close of the war would require at least $500,000,000 worth of new construction, yet little has been done toward popularizing the securities of such enterprises with our investing public.

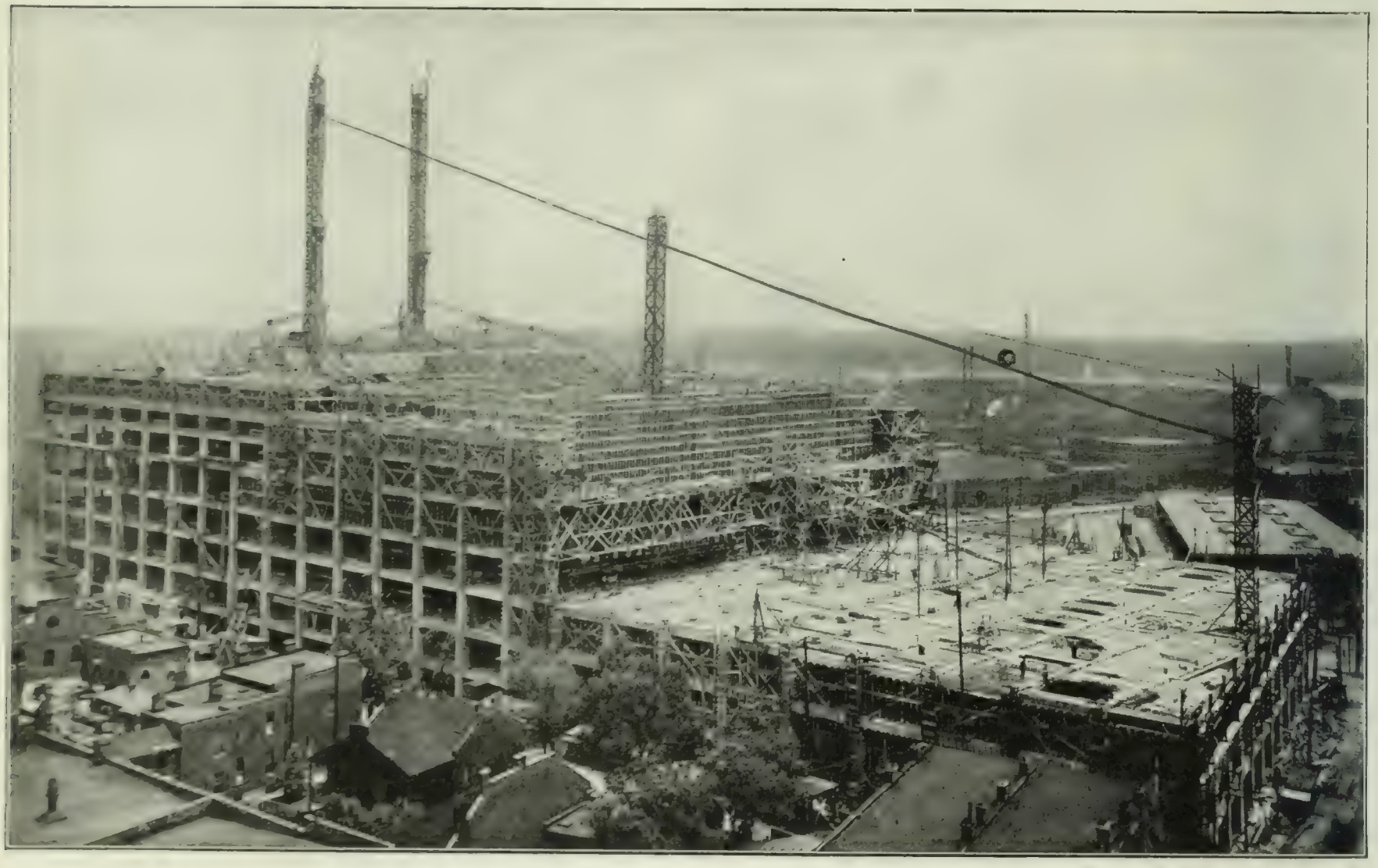
Mr. Clausen suggests, in addition to the passage of the Webb bill, the formation of a foreign credit institution of national scope, connected with our Federal reserve system, to do the work of the British corporation referred to; measures for awakening the business men of the country to the necessities and opportunities of the situation; and the education of the rising generation of business men in those subjects which have a bearing on the development of foreign trade.

When the public recognizes that our part in international commerce must be an important one, if we are to grow at all; when it is understood by our business men and bankers that we must have, to achieve this result, efficient methods of handling foreign credits; when investors realize that our capital must be devoted, to an increasing extent, to the development of other countries, if they are to prosper sufficiently to trade with us; and when we begin the systematic education of a great proportion of the rising business generation in the numerous new subjects which must be mastered for the successful development of foreign trade, there need be no further anxiety about our domestic progress. We have assumed an international rôle in commercial affairs. Unless we prepare to play it intelligently, we need not expect industrial and commercial development of a character to present new opportunities in our engineering and construction forces.

Largest Concrete Building Now Under Construction at St. Louis

Bevo Bottling and Shipping Plant Is Eight Stories High and Covers Three Acres—Simple Beam and Girder Design—Expansion Joints Divide Building Into Three Sections

By W. J. Knight
Contracting Engineer, St. Louis, Mo.



CONCRETE ON LARGEST CONCRETE BUILDING IS PLACED THROUGH CHUTES NEARLY 600 FT. LONG

THE NEW plant in which the Anheuser-Busch Brewing Association will bottle and ship its non-alcoholic beer, known as Bevo, will be the largest reinforced-concrete building ever built, so far as available records go. It occupies an entire block near the St. Louis, Mo., river front, 542 ft. 9 in. on one side, 601 ft. 10 in. on the opposite parallel side and 252 ft. in the other direction. There will be eight stories above grade, the upper three of which form two balconies, and there is a 26-ft. receiving and shipping story below grade. The total floor area for the seven stories and two balconies is 1,078,012 sq.ft., or 24.75 acres. The cubic contents of the building and of a subway leading to it is 21,335,000 cu.ft.

This is slightly smaller in acreage but larger in cubage than Buildings 19 and 20 of the Bush Terminal group in Brooklyn, N. Y., which has hitherto been considered the largest concrete building. However, the Bevo building is far ahead of the Bush unit in its material content, which will total 8600 tons of reinforcing steel and 75,000 cu.yd. of concrete.

The building is to be used for the bottling and shipping of the beverage, which is brewed in an adjoining building and pumped to large tanks on the upper floors. The complications of machinery and the presence of 13 loading tracks running into the basement were the governing features of design; the former having its effect on the loadings and hence on the layout and member design, the latter requiring a very high basement story and a long viaduct carrying the marginal street over the tracks entering the building.

Before the final system of design was adopted, an exhaustive study of the various floor systems in general use was made, for the purpose of ascertaining the most economical construction consistent with the arrangement of machinery units, established requirements, floor loads, etc. The fixed arrangement of machinery units and floor openings for conveyors, chutes, escalators, stairs, etc., proved to be the dominant features in controlling the nature of system finally employed throughout the construction. The sizes of machinery units determined the spacing of all columns, which are spaced uniformly with few exceptions, 25 ft. c. to c. north and south and 16 ft. 6 in. c. to c. east and west. The floor system consists of two intermediate beams 5 ft. 6 in. c. to c. in each panel, spanning 25 ft. and supported by girders between columns.

All floors, with the exception of the fifth and sixth and the upper balcony, are designed for a uniformly distributed live-load of 275 lb. per sq.ft. A portion of

the fifth floor is designed to support pasteurizers and tanks, the former weighing 125,000 lb. and the latter, 10 ft. 6 in. in diameter, weighing 75,000 lb. each. The load on a large portion of the sixth floor consists of a series of machines each weighing 130,000 lb. A large portion of the upper balcony is designed to support tanks averaging about 500 lb. per sq.ft. of floor.

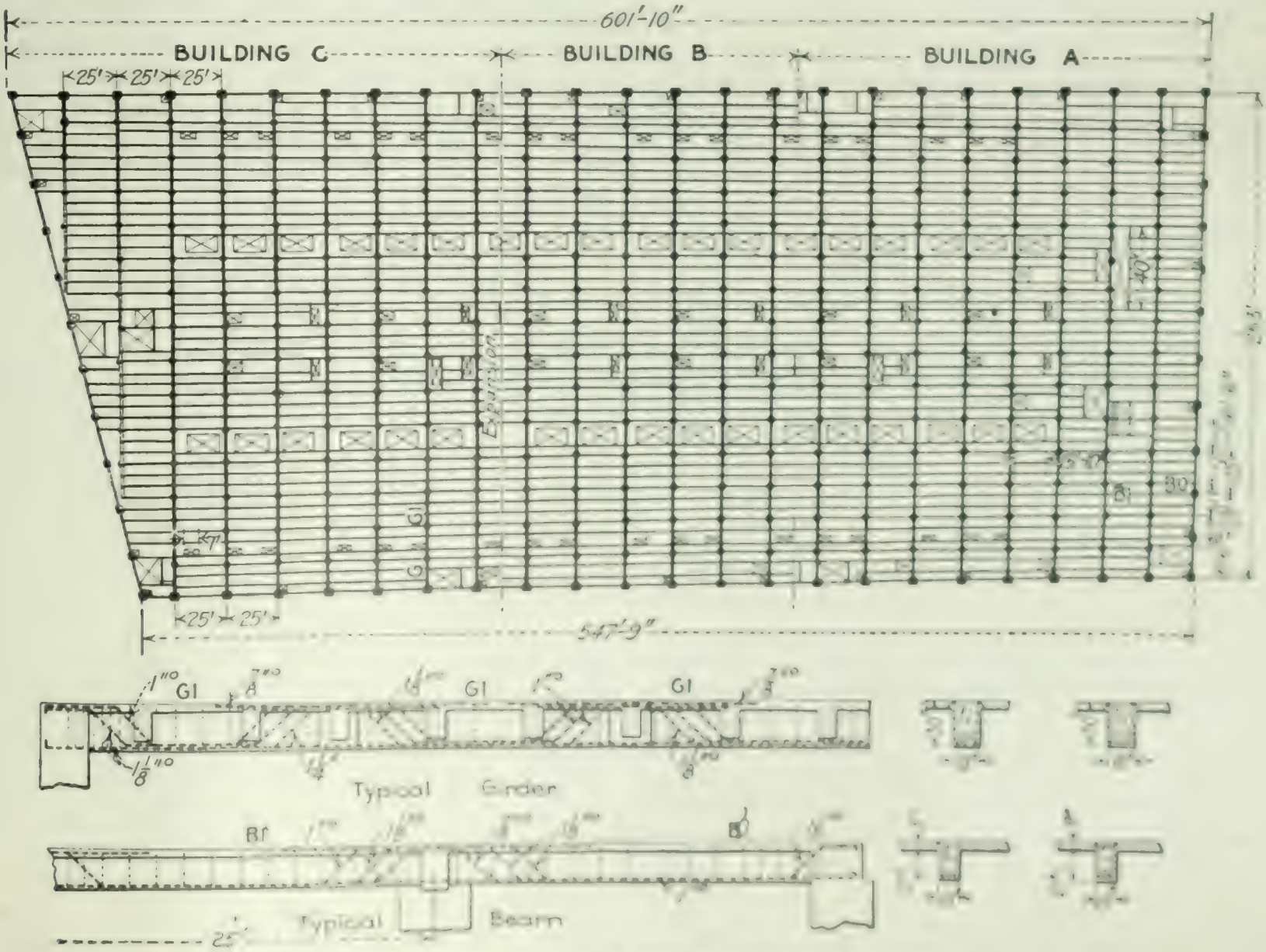
The typical interior beams, continuous at both ends and spaced 5 ft. 6 in. c. to c. with 25-ft. spans supporting a 5-in. slab and 275 lb. uniformly distributed live-load, are 13 in. wide by 26 in. deep. Reinforcement consists of two 1-in. rounds and two 1⅛-in. rounds, one-half the steel area being bent up at angles of 45° near the supports to provide for diagonal tension and negative moments. All diagonal tension in excess of 40 lb. per sq.in. is resisted by bars bent up at 45°. Stirrups consisting of ⅜-in. rounds bent in U-shape, spaced at intervals increasing toward the center, are employed primarily to assist in making the mass a more homogeneous unit, without accepting the generally adopted assumption that vertical U-stirrups serve as a medium of resistance to diagonal tension.

The typical continuous girders, spanning 16 ft. 6 in., are 18 in. wide by 30 in. deep and are reinforced with four 1-in. round straight and two 1-in. round and two ⅞-in. round bent rods. The latter are bent up at points beginning at concentrated loads. The ⅜-in. stirrups are spaced 6 in. c. to c. at ends and 18 in. between concentrated loads. In this instance, as in the case of beams, the bent-up rods and additional rods at supports are employed to resist all diagonal tension.

The intensity of varying stresses in all members were established by moment diagrams according to method adopted by Prof. Emil Morsch, by first considering the member fully loaded with adjacent member unloaded and then with loading condition reversed. This method establishes accurately the points of maximum and minimum positive and negative moments throughout the length of the members, permitting a more accurate distribution of the steel.

In a building of this length the question of providing for expansion and contraction was given much study. The many contradictory opinions on this subject made it one of particular concern to the designers of this structure, with the result that two joints were adopted, separating the length of structure into three separate units. The joint, 1½ in. wide in each case, is located on the center line between east and west columns, the floor construction being supported by cantilever floor-beams spaced 5 ft. 6 in. c. to c. A detail of typical cantilever member is shown in the drawing of the expansion joints.

The joints were located in this manner to avoid any possibility of frictional resistance, which has so often proved a detriment in other structures when sliding plate or roller bearing joints failed to fulfill the assumptions of the designers. Twin columns separated by joints were considered undesirable and awkward in appearance. At the time of writing this description, observation showed that the joints had lessened in width a maximum of ¼ in. from the original measurement of 1½ inches.



PLAN OF SIXTH FLOOR OF BEER BUILDING IF TYPICAL

All interior columns of the building are round and reinforced with hooping. They vary from 40 in. in diameter in lower story to 26 in. and 24 in. in the upper two stories. In order to facilitate the design and ordering of steel bars, all columns in the lower stories were designed for identical loads, assuming the maximum condition of machinery weights on fifth and sixth floors as well as the omission of many columns in sixth story. The final distribution of machinery and column omissions were not fixed at this stage of the design, which accounts for maximum assumptions made in computations. The lower-story columns are designed for a total dead- and live-load of 1,500,000 lb., being 40 in. in diameter and reinforced with twenty-six 1¼-in. round longitudinals and $\frac{9}{16}$-in. round spirals with 2-in. pitch.

Considère's formula was assumed as a basis for column design, stressing the concrete core to 750 lb. per sq.in., and assuming a modulus of 15.

All exterior columns are square, varying from 33 x 33 in. in the first story to 21 x 21 in. in the upper stories. The lower- or basement-story portion of exterior columns forms an integral part of retaining walls on four sides of building, with the exception of columns along the side opposite the viaduct. All splices of columns longitudinals are secured together by ½-in. U-bolts.

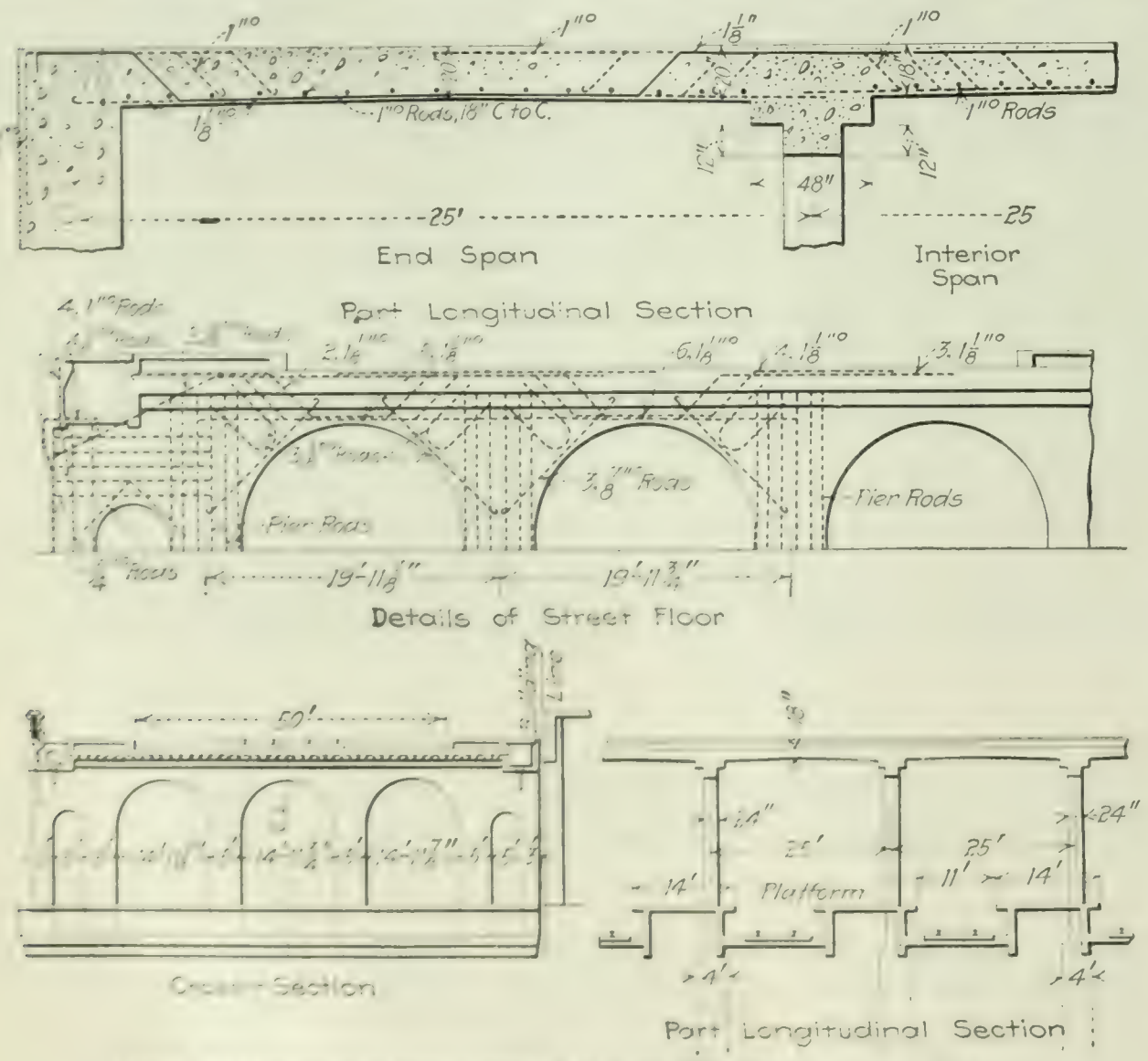
The retaining walls on four street fronts are 30 ft. high, 3 ft. 5 in. and 4 ft. thick, with base 11 ft. wide and 3 ft. deep. They were designed strictly as retaining walls to resist earth pressure, without assuming any lateral resistance offered by the first-floor construction. This method of procedure in design was adopted on account of the unusual depth of story below street grade. Before any other excavation was done, deep trenches approximately 12 ft. wide were dug to solid rock for the reception of the retaining-wall footings. The erection of retaining walls at the beginning of operations for the purpose of holding earth banks intact proved a great advantage in permitting the excavating for lower story to proceed almost simultaneously without interruption and with dispatch.

The expansion joints of the building are extended continuously through the retaining walls to rock foundations. All interior as well as exterior columns are supported on concrete pedestals 7 ft. square extending without exception to solid rock.

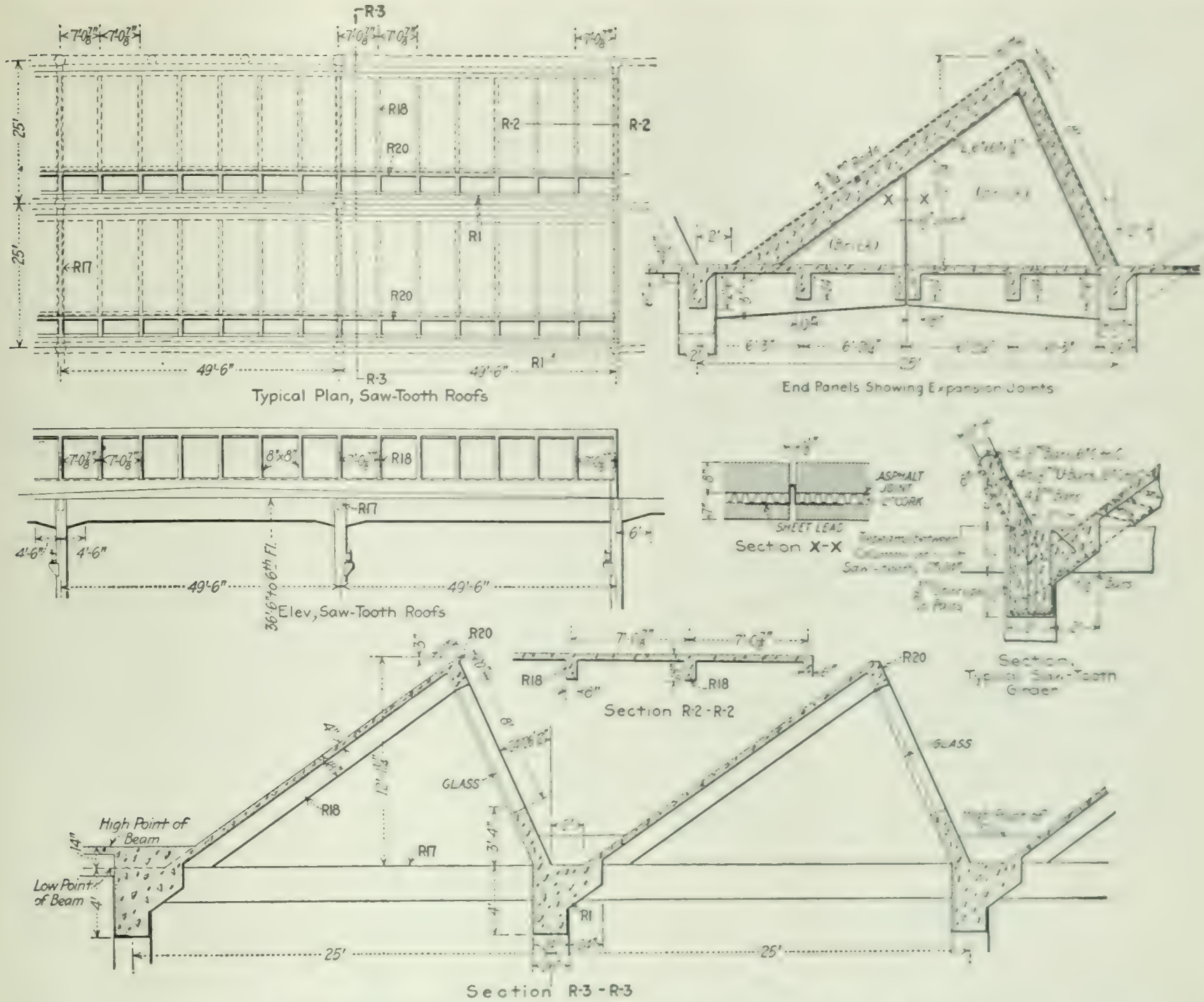
The roof over the balcony openings is of sawtooth construction, consisting of a series of reinforced-concrete girders 25 ft. c. to c. and spanning 49 ft. 6 in. between center lines of column supports. These girders are unsymmetrical in section, 48 in. deep and 24 in. wide. The girders continuous at both ends are reinforced with seventeen 1⅛-in. round rods. On account of the excessive lengths of rods that would be necessary to sufficiently provide for negative moments if made in one unit, it was found expedient to splice all the bent rods of the 49-ft. 6-in. girders. The point of splice in each case occurs approximately where positive moment changes to negative at continuous ends. As in the design of other supporting members, all diagonal tension in excess of 40 lb. per sq.in. is resisted by rods bent at 45° with efficient anchorage. Stirrups are also provided.

From the roof layout in one of the drawings herewith, it will be seen that it was somewhat difficult and awkward to establish an effective expansion joint that would be directly in vertical line with the joints below. The joint is continued through the flat portion of roof on both sides of the sawtooth end walls and then up through the end walls, which in this instance consist of brick. All other end walls of sawtooth are reinforced concrete 6 in. thick. At the pinnacle of sawtooth, three ¾-in. rounds additional have been provided; extending into each beam of the inclined roof and into the small columns, the rods being located in the top of the section to reduce the appearance of expansion cracks at this point.

A reinforced-concrete viaduct of simple design was adopted to facilitate erection, by avoiding as much as possible the use of beams or girders in the floor system. Bents consisting of arches and piers 24 in. wide are spaced 25 ft. c. to c. and located directly in line with columns of the building. The slabs between bents are



LONG REINFORCED-CONCRETE VIADUCT CARRIES STREET OVER BASEMENT ENTRANCE



A REINFORCED-CONCRETE SAW-TOOTH ROOF LIGHTS TOP FLOORS

18 in. at the crown and 20 in. at the pier for all spans continuous over two supports and 20 in. and 22 in. respectively for end spans. The continuous slabs are reinforced with 1-in. rounds and 1¼-in. rounds alternating 6 in. c. to c. for a width of 25 ft. symmetrical about the center line of two car tracks above. For roadways and sidewalks the same size bars, 8 in. c. to c., were used.

Pipe spaces for electric conduits, water mains, gas mains, etc., are concealed beneath sidewalks along both sides of the viaduct. The top slabs of these pipe chambers, which also form a part of the sidewalks, are made removable for future convenience should it become necessary to replace broken pipe or place additional pipe line.

The viaduct is 375 ft. long by 81 ft. 9 in. wide, with two expansion joints 1½ in. wide, each located 100 ft. from each end. A joint 1½ in. wide is also provided on the west side, separating the viaduct from the building. All piers or bents are carried to solid rock foundations.

The question of adequately supporting and spacing bars in a reinforced-concrete building has been conspicuously absent from the requirements of most specifications in the past. The erection of a building employing constantly from 100 to 200 iron workers, some skilled and others unskilled, made it imperative to eliminate as much as possible any uncertainty in the proper execution of this vital part of the work. Every slab and beam bar in the building is held up from the forms and spaced according to the engineer's design, by means of Securo supports and spacers. The results have been gratifying and most effective.

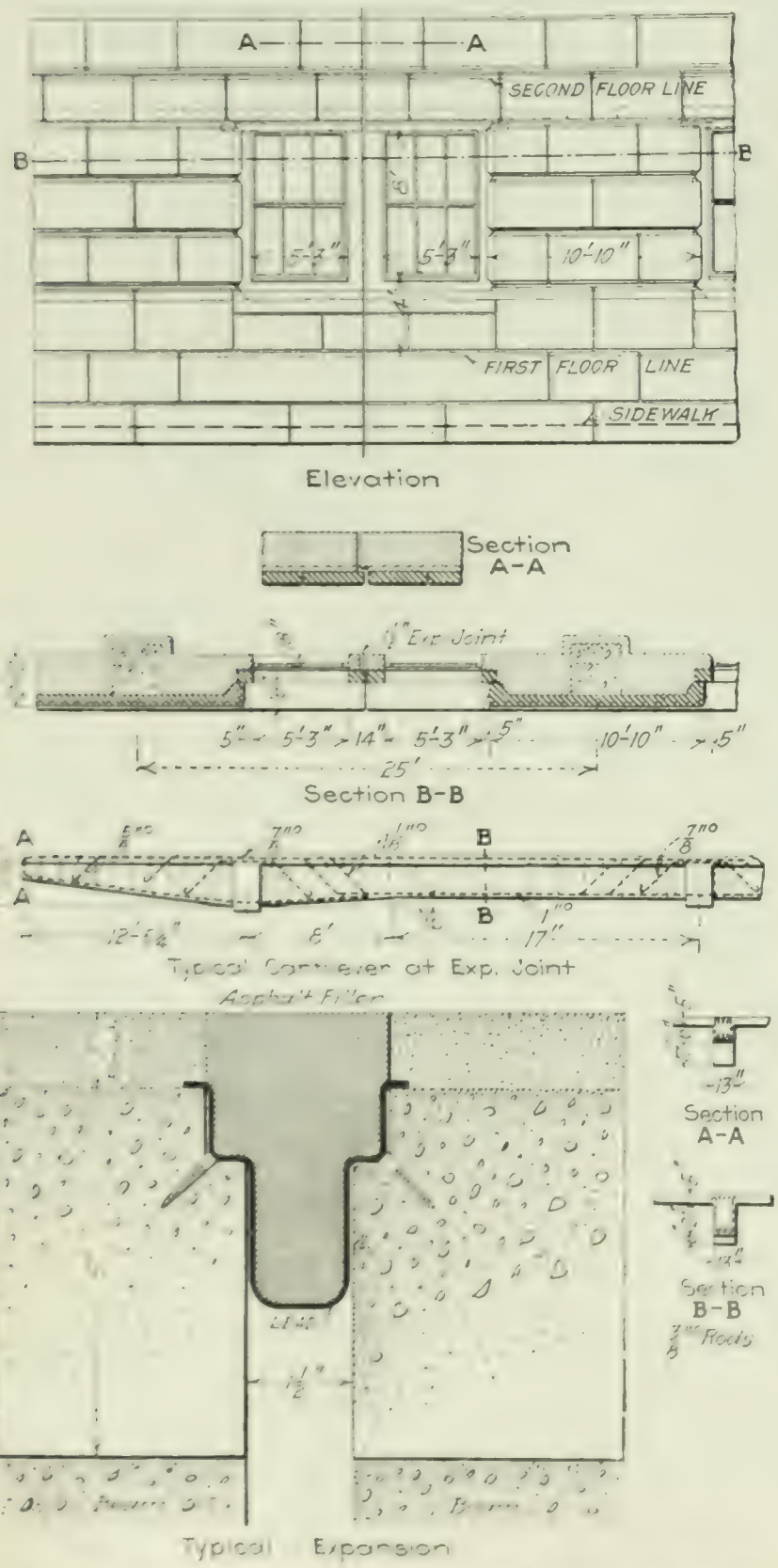
The exterior of all four sides is architecturally harmonious in design, consisting of a 6-ft. granite base, buff Bedford rusticated limestone facing in the first two stories, red mat brick with wide raked joints in the upper stories. The cornice is of buff-colored terra cotta with wide overhang and terra cotta brackets. The entire interior of building in all stories will be faced with white enameled brick, a feature that will add considerable light, besides presenting an immaculate appearance.

The construction will be as fireproof as modern practice will allow, consisting in the aggregate of reinforced concrete, brick, stone, terra cotta, metal windows with wire glass, steel stairs with fire-wall inclosures, metal doors and trim throughout. Nine inclosed emergency stair towers furnish ready egress from the building in case of emergency, while an electrically operated escalator is provided from the first floor to the top story for the use of employees coming to and leaving work. In addition to freight elevators for materials, electric

elevators for the exclusive use of officers of the company and guests will be provided.

Unexcelled toilet accommodations, wash and shower rooms, locker rooms and lunch rooms will be installed in the most convenient localities throughout the building for the use of all employees. A well-arranged modern clinic with every appointment designed to meet all emergency cases is located in the first story. Heating, ventilating, electric-lighting and sprinkler systems are installed throughout the plant and are operated exclusively by electric power.

On account of the convenience offered by an old railroad switch entering the third panel from the north end of the building at the first floor level, provision was made in the design to retain this switch on a temporary wood trestle until the completion of the structure, to permit cars of material to enter the building and deposit their contents direct into bins located immediately south of track. Two gravel bins, each with a capacity of 1500 cu.yd., and one sand bin capable of storing 2000 cu.yd. are located near two 30-cu.ft. mixers. The sand and gravel of the bins are fed direct to the mixers by gravity. Two towers, each 310 ft. high, accommodating a 30-cu.ft. hopper, elevate the concrete to any desired height and through chutes inclined about 3 in. to the foot the mixture is conveyed to any part of the building.



EXPANSION JOINTS DIVIDE LENGTH OF BUILDING INTO THREE PARTS

The arrangement of the plant has proved most efficient, and at no time have the two mixers failed to keep pace with the carpenters and other trades engaged in erecting falsework, placing steel bars, etc., preparatory to concreting.

The structural design for the entire plant was prepared by W. J. Knight & Co. and F. C. Taxis, Associate Engineers. Windmann & Walsh and Klipstein & Rathmann are the associate architects.

The general contract is being executed by the Gilsonite Construction Co., of this city, of which L. J. Haenni is the Vice President and General Manager.

Due credit is given Dr. Rudolf Gull, Chief Chemist of the Anheuser-Busch Brewing Association, for his superior ability and initiative in dictating the general arrangement and future operation of machinery units, chutes, conveyors, etc., the proper distribution of which was so essentially fundamental to the correct execution of the design, to fulfill the requirements of a comparatively new and original enterprise.

New Port and Railway for Brazil

Additional railway facilities and a new port in the State of Sao Paulo, Brazil, are included in a project for developing the port at San Sebastian and constructing a railway from that city inland to Campinas and Pouso Alegre. At present the only line from the coast is the Sao Paulo Ry. from the port of Santos to Jundiahy, 86 miles. There it connects with lines reaching interior points, including Campinas. This present line surmounts the Serro do Mar, the steep coast slope of the great tableland, by means of the famous cable inclines of 8 and 10% grades, described in *Engineering News* of Nov. 23, 1916, p. 976.

The San Sebastian Ry. is to be about 350 miles long, with the Brazilian standard-gage of 5 ft. 3 in. The ascent of the Serro do Mar will be accomplished by a 20-mile section with very steep grades (but the actual grade is not yet determined). This section, it is estimated, will cost about $150,000 per mile. For 12 miles from the port to the foot of the incline, and for all of the line beyond the summit, the cost will be about $40,000 per mile. The port of San Sebastian is said to have the advantage of a depth of 60 to 160 ft., while at Santos large steamers cannot enter on account of shallow water. The cost of the new harbor works is estimated at $3,756,000.

Concessions for these works have been asked from the government of Brazil by Luiz Barretto Filho, civil engineer, of Sao Paulo, and it is hoped to interest American capital. The necessary funds cannot now be raised in Brazil and the war has prevented a French syndicate from undertaking the project.

War and Sanitation at Public Health Convention

Abstracts of Papers on State Laboratories, Saving City Refuse in War Times, Activated-Sludge Process, State Control of Garbage Disposal, Presented Last Week at the Annual Meeting of the American Public Health Association in Washington, D. C.

State Public Health Laboratories in Time of War

By Dr. Henry Albert

Iowa City, Iowa; Chairman Laboratory Section, American Public Health Association

As a result of a questionnaire sent to every state, territorial and provincial public health laboratory of the United States and Canada, comprehensive data were obtained on the service already rendered by such laboratories in connection with the mobilization of troops, as well as a survey of the problems confronting such laboratories and the methods by which such problems should be solved. Data were also obtained from the Medical Corps of the U. S. Army and Navy and from the U. S. Public Health Service on the manner in which state board of health laboratories may be useful at this critical time.

The public health laboratories of more than one-half of the states of the United States and the provinces of Canada have made a considerable number of examinations in connection with the mobilization of troops in their respective states or provinces. The principal examinations which state laboratories have been making are for diphtheria, typhoid fever, typhoid and paratyphoid carriers, tuberculosis, meningitis and meningococcic carriers, gonorrhoea, syphilis, malaria and hookworm disease. The making of typhoid vaccine has also been an important activity.

Laboratories Prepared To Do Field Work

More than one-half of the state public health laboratories are prepared to do field work, including water examinations and other diagnostic bacteriological examinations and the investigations of epidemics. This phase of laboratory service should be made possible in every state and province. It is highly desirable that all states except the smaller ones should have branch or coöperative laboratories, in order to serve best the communities situated at a considerable distance from the central laboratory, and, more especially, communities in the neighborhood of rather permanent encampments of soldiers. A movable laboratory will serve to a certain extent and in many instances may be even more serviceable than stationary plants.

The work of many state health laboratories has already been hampered by the enlistment of some of the staff in the Medical Corps of the Army and by the calling of others by the draft. It seems very important that the efficiency of the state health laboratories should be increased at this time rather than diminished. Training for this kind of service requires considerable time. It is therefore very desirable that the selective draft should provide for the leaving at their posts of duty of those who are greatly needed in the public health laboratories of the country.

Owing to insufficient appropriations, a number of laboratories are unable to meet all the war demands. No time should be lost in making good the deficiencies, nor should more liberal appropriations cease with the end of the war. After the war there will be need for strong, vigorous, efficient men and women for constructive health work.

Activated Sludge Promises To Solve Packing-House Wastes Problem

By Langdon Pearse

Division Engineer in Charge of Sewage Disposal Investigations, Sanitary District of Chicago

Activated-sludge plants for the treatment of packing-house wastes have been tested by the Chicago Sanitary District, using 75% packing-house and 25% domestic sewage, by a number of individual Chicago packing houses and by packers at Fort Worth, Tex. The following notes are based on experiences at the various plants.

The best tank arrangement has not yet been determined. The Sanitary District has tried two schemes. In one the sludge is aërated entirely in contact with the sewage; in the other, the sludge and sewage are aërated for a short time and the settled sludge is reaërated and resettled before return to the initial point. The latter arrangement has shown somewhat smaller requirements in the amounts of air needed, and a reduced volume of sludge to be returned.

Air Requirements and Distribution

At the plant of the Sanitary District 4 cu.ft. of air per sec. per gal. of sewage is apparently sufficient to produce a virtually stable effluent in summer weather. In winter, with the same amount of air, the effluent is of lower stability, when tested by incubation at room temperature. If a stable effluent is then required, 6 cu.ft. or more of air per gal. of sewage may be needed, according to the temperatures of the sewage and air.

The distribution of the air appears at present to be served best by the use of filtros plates. Perforated pipes have been tried both at Chicago and Fort Worth. More air is required than with the filtros. The ratio of gross area of plate to tank area at Chicago was 1 to 6.3, with net area of 1 to 8. At Fort Worth, 1 to 7 has been used.

The experience of the Sanitary District indicates that the settling period may be short, ½ to 1 hr., depending mainly on the condition of the sludge and the season of the year, and that the bottom slopes of hopper bottom tanks should be about 60 degrees with the horizontal. Velocities should be low.

In the Sanitary District work, with screened sewage, exclusive of screenings, about 46,500 gal. of liquid sludge, containing 99.2% water, accumulated per 1,000,000 gal. of sewage over a period of nine months. This is equivalent to 2420 lb. of dry solids per 1,000,000 gal. The amount of dry solids appears to vary between 1100 and 4500 lb., exclusive of screenings. The screenings caught on a 30-mesh screen will vary from 500 to 1200 lb. of dry material per 1,000,000 gal. of day flow. During a period of 6.5 months the reduction of suspended matter was 2820 lb., as against a sludge removal of 2680 lb. of dry material per 1,000,000 gal.

The essential point is to remove the water. With very liquid sludge, direct filter pressing is difficult, owing to the large amount of liquid to be handled. Preliminary treatment by settling with or without acidification is very helpful. Quiescent settling from 3 to 6 hr. will reduce the moisture content to 98 or 98.5%. The addition of about 6 lb. of sulphuric acid per 1000 gal. of sludge (containing 98% moisture) seems to aid in filter pressing, and makes a sludge which leaves the cloths cleaner. A 2.5-hour pressing with acid-treated sludge is equivalent to 3½ to 4 hr. of pressing with settled sludge. Acid-treated sludge apparently keeps better and shows a higher nitrogen content.

Effect of Acid

The effect of acid on activated sludge is not at all the same in different places. On the Sanitary District sludge, the effect of acid is apparently a minimum, whereas at Fort Worth, on packing-house activated sludge, the addition of acid produces a rapid coagulation, with immediate flotation of the sludge, the moisture content being reduced quickly. The water used in the packing houses there is very high in alkali. The sludge can be reduced further by drainage and retreating to about 85% moisture or lower. This phenomenon does not occur at Chicago. Furthermore, it is estimated at Fort Worth that about 11,000 lb. of dry material can be recovered per 1,000,000 gallons.

Plain settling has considerable value in reducing the moisture content. However, its effectiveness depends on the condition of the sludge. The settling is not as marked as on domestic sewage at Milwaukee or on packing-house sewage at Fort Worth.

Filter pressing has been tried by the Sanitary District on a small "Simplex" press, with plates 15 x 15 in., loaned by the Simplex Ejector Co. and demonstrated by W. Buckley. This press was the one used at Milwaukee, with the addition of six radial ribs on each plate. The plates in the press have perforated steel strainer plates over the corrugations. Cakes from ⅞ to 1½ in. have been made by 2 to 4 hr. pressing, with pressures varying from 20 to 150 lb., according to the character of the sludge and the preparatory treatment. Occasional steaming helped in keeping the cloths clean. The moisture content of the cake was varied, in general being around 80%.

Fertilizer and Grease Values

There appears to be considerable fertilizer value in activated sludge. Analyses show a high nitrogen content, compared to the screenings. Occasional analyses show press cake, particularly with acidified sludge, running from 5 to 6% of nitrogen on the dry basis.

The value of fine screening as a treatment preliminary to aëration is worth consideration. Our experiments show that a 30-mesh screen will remove from 500 to 1200 lb. of dry material per 1,000,000 gal. of day flow. The screenings contain about 80% moisture after natural drainage. The nitrogen content is low, equivalent perhaps to barnyard manure. In fact, the material is largely paunch manure. From the operating standpoint, the removal of this material by screens seems desirable, as it is largely inert, of vegetable origin and slow to decompose. From the standpoint of handling the sludge, however, when the screen is running the sludge is somewhat harder to press. The screenings seem to act as a fibrous binder which aids pressing.

General indications at Chicago show that grease and fertilizer may be recovered. The grease may be worth about 4 and 7c. a pound at normal and war prices. The activated sludge, dried, if containing regularly 5% of ammonia, may be worth about $12 per ton dry, under normal conditions, or possibly $18 per ton under present war conditions.

The activated-sludge testing plants operated at Fort Worth, at Chicago by Armour & Co. and by Sulzberger & Co., and by the Sanitary District, have been remarkably free from odor. The sewage tested in all cases has been fresh.

Further development in the activated-sludge process appears to lie along the lines of reducing the amount of air used, of improving the settling tanks, and of the more rapid reduction of water content of the sludge. Such development will tend to reduce both construction cost and operating charges.

Ways and means of reducing more rapidly the water content of the sludge should be studied, either in preparation for filter pressing or as a direct preliminary to drying. This is a complex problem, verging on the domain of physical chemistry.

The activated-sludge process offers better promise of a solution of the problem of treating packing-house waste than any other that has been suggested.

Effects of the War on Garbage Production and Disposal

By I. S. Osborn

Head of the Division of Utilization of Food and Household Wastes, U. S. Food Administration, Washington, D. C.

THE EFFECT OF THE WAR on the production and disposal of garbage has become very apparent during the past nine months. At the present time the question is a vital one. The education of the public in food conservation is tending to change the problem of garbage disposal. What the ultimate result will be is uncertain, as we are just beginning to realize that a great change, which no doubt will revolutionize this branch of sanitary engineering, is taking place.

Returns to the United States Food Administration show that in 60 cities there was an average decrease of from 12 to 15% in garbage collection in the first nine months of this year, although in some cities an increase over previous years is shown. Some of the decrease is due to less thorough public collection, and some to more extensive private collection for pig feeding or for reduction. The increase would have been considerably

greater, it is believed, except for the large amount of vegetable wastes going into the garbage pail from home gardens.

The amount of grease recovered from garbage is a better indicator of saving than the quantity of garbage collected. The actual percentage of grease per ton of garbage shows a reduction of approximately 15%. No doubt there has been a greater reduction in the consumption of meats than is indicated by the decrease in the amount of grease recovered from garbage. At virtually every meat market, scraps, gristle, rind and bone, which were formerly trimmed off and sold to rendering companies, are now pushed off on the purchaser at the price of edible meat. Evidence of this is found in the reduced amount of scraps purchased by rendering companies.

Pig Feeding for Small Cities

The current methods of garbage disposal are burial, dumping, incineration, feeding and reduction. Burial and dumping are carried on at low cost, but they produce no revenue and unless proper attention is given to them they are likely to create a nuisance.

Until recently there has been a strong tendency toward incineration, especially among the smaller cities. This method, in nearly every case, has been followed at considerable expense to the municipalities, both for installation and operation, with no returns except in the very few cases where power has been developed—but in most instances the cost of power development has been greater than the revenue obtained.

There is now a strong tendency to adopt some method of garbage utilization instead of incineration. Garbage piggeries will be found desirable in many cities. Each thousand population produces food wastes sufficient to fit 25 hogs for market. At the present price, a ton of garbage will produce from $7 to $8 worth of pork. In the smaller communities, no other method of garbage disposal will show returns as desirable from an economic viewpoint as feeding garbage to pigs.

For the larger cities, no doubt garbage reduction will prove to be the most advantageous method. The decrease in quantities of by-products will to a large extent be offset by their increased values, and at the same time there will be a tendency to recover additional by-products that now are lost.

There is an ever-increasing demand for the tankage produced from garbage, for use in the manufacturer of fertilizer. The price of nitrogenous fertilizer is determined by the available nitrogen. The old form of tests showed a low available nitrogen in garbage tankage, but the soil tests now made by the U. S. Department of Agriculture show that the material decomposes readily, affording a rapidly available nitrogen supply

Garbage By-Product Values Run to Millions

The values of the by-products from the existing garbage reduction plants, at present prices, will amount to $8,500,000 for grease and $2,250,000 for tankage. From the tankage can be produced annually about 9,000,000 lb. of nitrogen, 25,000,000 lb. of bone phosphate lime and 2,500,000 lb. of potash. The grease that is recovered is split up into various by-products, the glycerine content being the most valuable. From the garbage grease produced in the plants operating in the United States, 8,000,000 lb. of nitroglycerine can be extracted, and still leave grease from which can be made approximately 200,000,000 twelve-oz. cakes of soap.

There is a great shortage of the materials that can be produced from garbage. Utilization is not solely a question of profit. Every community should utilize its wastes and make available from this source everything which may be gained thereby for the country's needs.

The food problem will not end with the war. The shortage of fats and fertilizer will continue for years. The installation of proper methods of garbage utilization will be not only a present help, but also a benefit in future years. The public will not forget soon its present lessons in economy. Never again will it waste so much through the garbage can as it has wasted in the past.

State Health Boards Should Control City Refuse Service

By Edward D. Rich
State Sanitary Engineer, Lansing, Mich.

SEVERAL STATES have laws giving to their boards of health supervision of sewerage and sewage disposal. It would seem that similar supervision of the collection and disposal of municipal refuse would result in valuable assistance to cities and towns in solving disposal problems economically and in accordance with the best practice. If it did no more than protect municipalities from the unscrupulous vender of untried or worthless devices, it would accomplish enough to justify its existence.

In order to see that sanitary principles are not violated in carrying on the work, the law should require that the methods and specific plans of procedure proposed must receive the approval of the state board of health before the work is begun. The statute should also give the board power to order such changes in equipment or methods as may be necessary to prevent nuisances or protect the public health, or even to require the installation of an entire system if local circumstances are such as to demonstrate its need.

Inquiries made in Michigan showed as an average for eight cities having municipal collection of garbage that only 60% of the householders took advantage of the service while four cities having private collection showed that less than half that percentage (actually 28%) patronized the collector. These figures agree with general observations. From the viewpoint of nuisance, garbage claims the attention of the municipality before the other waste products, but from the standpoint of the spread of disease, street cleaning is, no doubt, of first importance, and should certainly come within the scope of a state law enacted to cover all forms of city wastes. The lack of system and efficiency noted above in regard to garbage collection and disposal undoubtedly would be found to apply to street cleaning were a similar investigation to be undertaken. To any one familiar with what is possible in this line, the methods pursued almost universally are little less than disgusting and it would seem that state supervision is the only means by which material general improvement may be accomplished in cleaning streets with a minimum of cost and a maximum of sanitary efficiency.

Bridge Spans Moved Endwise To Rest on New Piers

Increased Length of New Union Pacific Drawspan at St. Joseph Necessitated Shifting Fixed Spans 140 Feet—Pneumatic Caissons Used for Foundations

MOVING three long truss spans of a railway bridge to rest on new intermediate piers was involved in the improvement of the Missouri River bridge at St. Joseph, Mo. Defective condition of the substructure necessitated the building of new piers. An increase in length of the drawspan necessitated a change in the position of the piers and the consequent shifting of the fixed spans to their new positions, the bridge remaining on the old center line. The superstructure, which was built in 1904, is in good condition and safe for carrying modern traffic and loads.

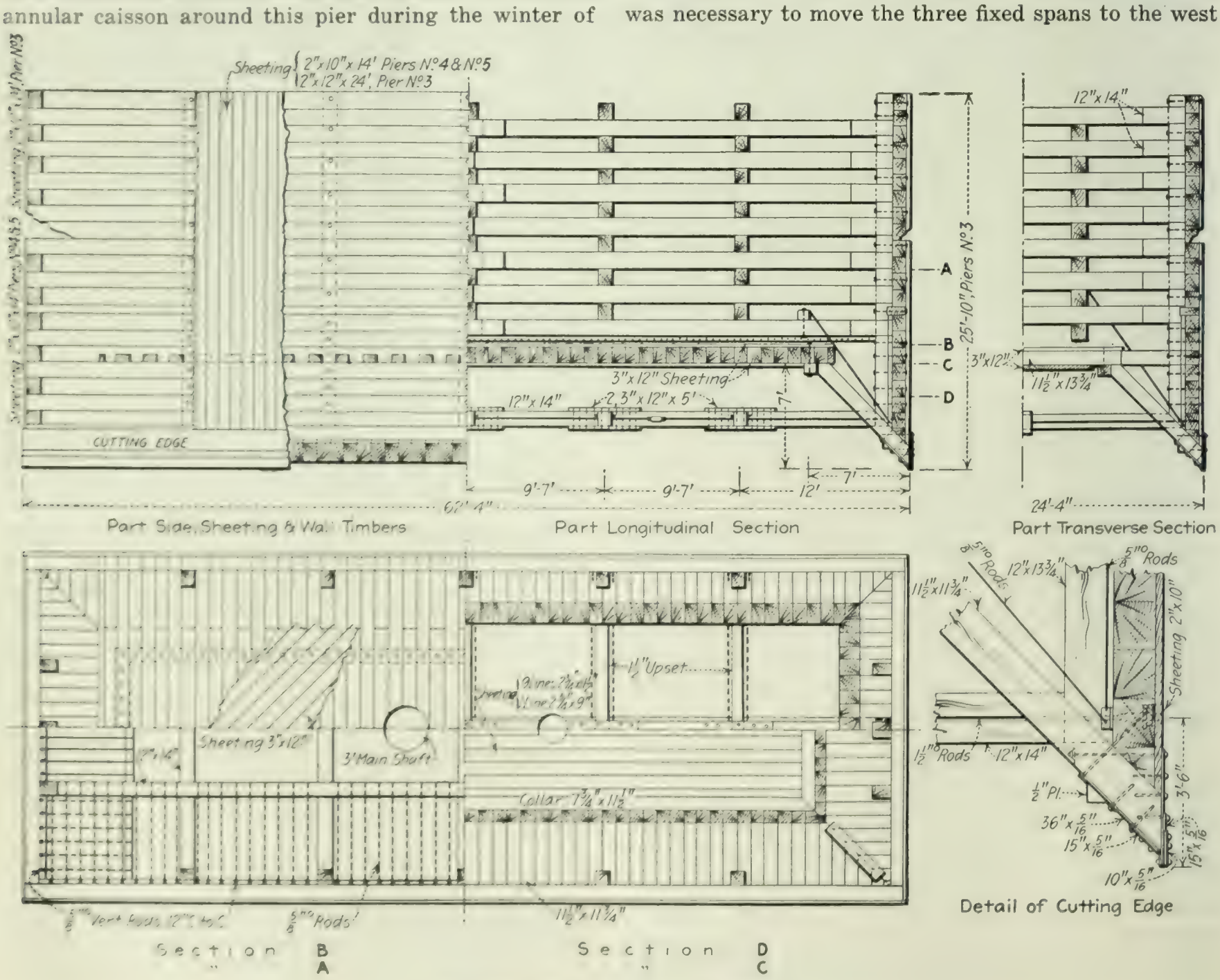
The bridge is that of the St. Joseph & Grand Island Ry., which is a subsidiary of the Union Pacific system. It consists of a 465-ft. swing span (replacing the old 358-ft. span), with three truss spans of about 297½ ft. c. to c. of end pins at the west end, and two girder spans at the east end.

The pivot pier was first found to be in poor condition. This is attributed by the engineers mainly to improper foundations and scouring around the base. Plans were drawn and construction started to build an annular caisson around this pier during the winter of 1915-16. An early movement of a large field of ice, which formed just above the bridge, destroyed the caisson just before it was to have been landed. Further investigation showed that the other piers were in bad condition, but not so bad as that of the pivot pier.

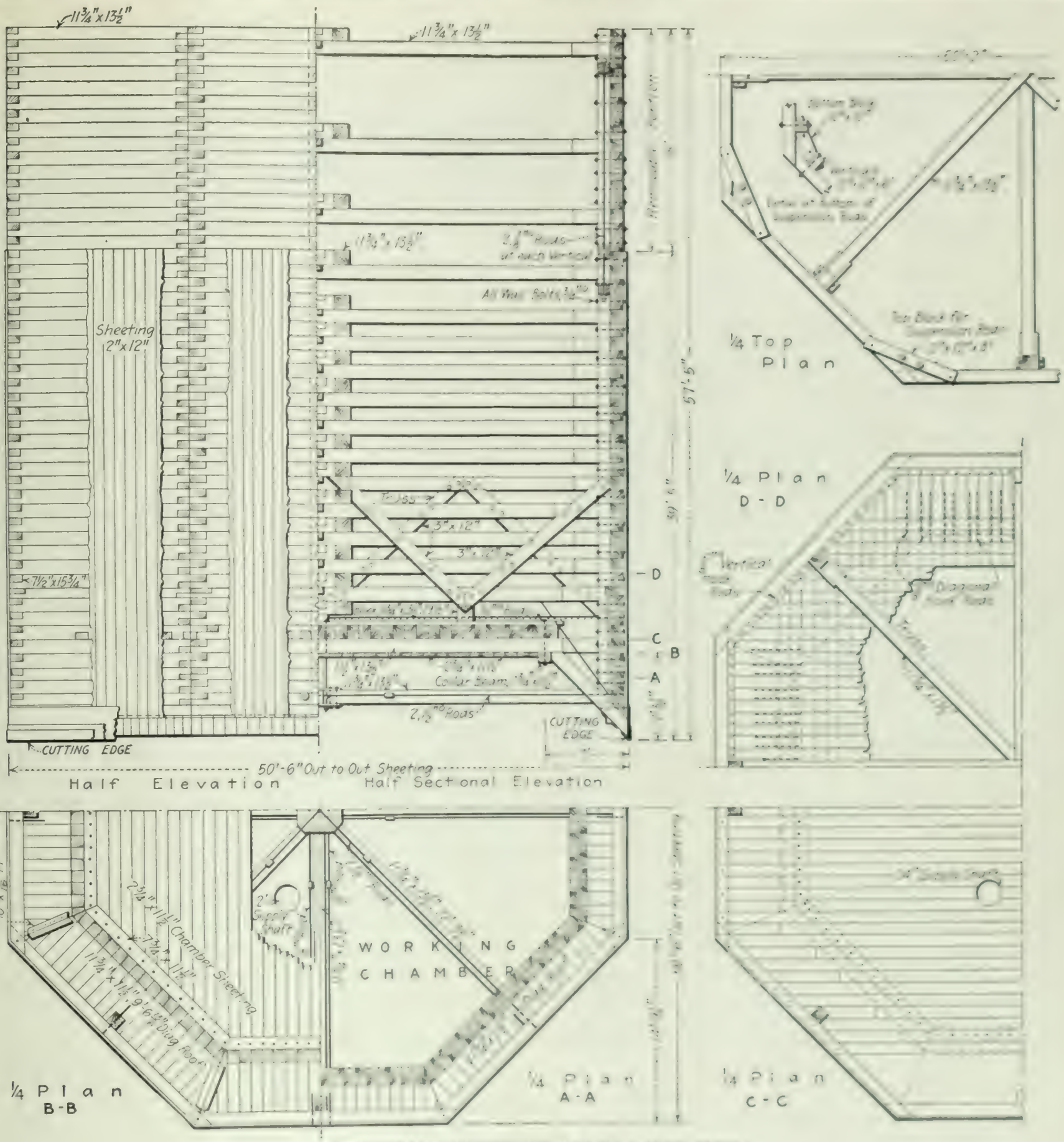
After much consideration had been given to the repair of the old piers, it was decided at first to build new piers in line with the down-stream from the old ones, and to shift the spans laterally to the new position.

Plans were submitted to the War Department on this basis, but the requirements of the Department would not permit moving the old drawspan to new piers. The old span provided openings only 150 ft. wide. The War Department ruled that the company must furnish a drawspan giving two openings 200 ft. in width at low water. This was probably on account of the swift current at this point, and also because several accidents to steamers occurred at this bridge some years ago. This 200-ft. width is also specified for the opening at a bridge recently built over the Missouri at Kansas City.

To provide for the extra length of the new draw, it was necessary to move the three fixed spans to the west



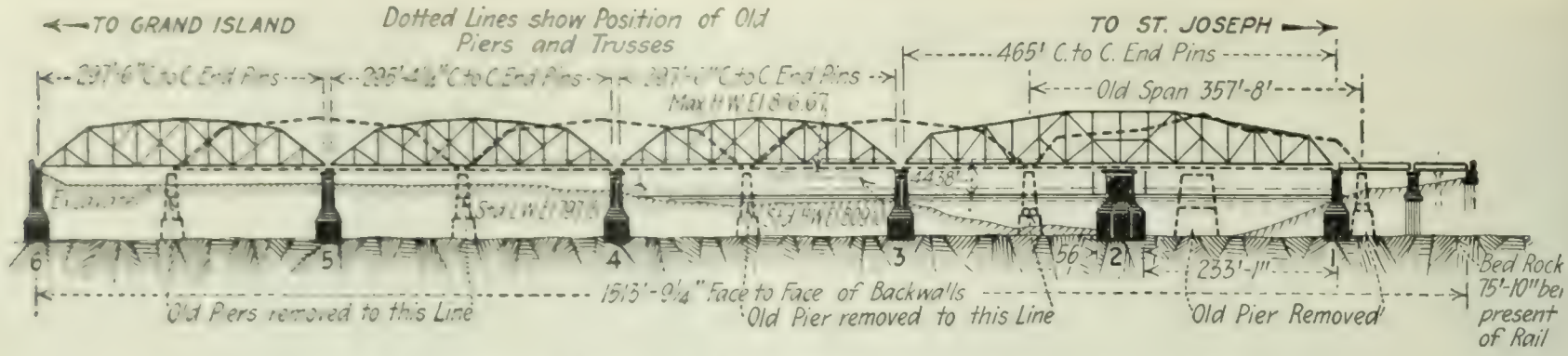
TYPICAL RECTANGULAR CAISSON



to new piers, and to keep the alignment of the new bridge the same as that of the present bridge. This plan made use of the fixed spans, but required moving them about 140 ft. lengthwise. The new masonry consists of seven piers constructed by the pneumatic process, and one pier and abutment supported by piles. The piers are of reinforced-concrete, designed for a single-track superstructure. The new and old arrangements of the bridge are shown in one of the drawings. The new swing span is 56 ft. wide, with trusses spaced 18 ft. 6 in. c. to c. In the fixed spans the trusses are spaced 17 ft. c. to c.

The pivot pier is 31 ft. in diameter under the coping, with octagonal footing courses and an octagonal base 50 ft. 6 in. wide. The upstream rest pier, at the head of the fender, is of flat-iron shape, with a width of 42 ft., and a length of 49 ft. 8½-in. from the rear face to the pointed nose. The piers for the fixed spans are rectangular in plan. Old piers 2, 3 and 4, in the channel, will be cut off at about 6 ft. below low-water level. The others will be cut off at about the extreme low-water level.

The caissons have the sides of the crib and the roof of the working chamber built of 12 x 14-in. timbers, thoroughly drift-bolted together and caulked. The working chamber has sloping sides, the ends of which are shaped for the attachment of the steel cutting edge. The roof is designed of sufficient strength to take the weight of a reinforced-concrete beam built over it. This beam takes the load of the pier during the sinking, until the caisson is landed and sealed. The caissons are sunk to bedrock, which is found to be a clean hard



NEW DRAWSPAN AND OLD AND NEW POSITIONS OF FIXED SPANS

limestone, overlaid usually with 3 to 4 ft. of gravel. The depth to rock is about 52 ft. below low water and 80 ft. below base of rail. The rock surface across the river bed varies several feet in elevation. Each caisson has a 36-in. main shaft and a 24-in. supply shaft.

The octagonal caisson for the pivot pier is 50 ft. 6 in. over the 2 x 12-in. vertical sheathing and inside the cutting edge. Its construction is shown in one of the drawings. The roof of the working chamber has two courses of 12 x 14-in. timbers, with 3 x 12-in. sheathing on the inside and on the top. Over the top sheathing is the concrete bed, reinforced by ½-in. horizontal bars spaced 6 in. c. to c. in both directions. Inclined and vertical rods extend into the triangular mass of concrete filling behind the sloping sides of the roof. Within the working chamber each side is braced by a radial timber strut 12 x 14-in. with a 1½-in. tie-rod on each side of this timber. Above the roof the crib is braced by eight radial timber trusses, built up of 3 x 12-in. plank.

The total depth of the caisson is 57 ft. 6 in., with a working chamber 7 ft. 3½ in. high in the clear. The upper part of the crib is a removable section 18 ft. deep, secured to the permanent part by ¾-in. vertical rods 26 ft. long. Across each corner of the top of the removable section is a diagonal timber through which the suspension rods are passed, and on which they are held by nuts and washers. The lower ends of the rods of each pair are secured in a similar manner. They pass through a short crosspiece fitted beneath a pair of 12 x 12-in. verticals, 6 ft. long, which are bolted to the wall timbers of the crib, as shown.

The caissons for the other piers are of generally similar construction, but are rectangular in plan, and have only a single course of 12 x 14-in. timbers for the roof. The caissons for piers 3, 4 and 5 are about 62 x 24 ft., and the others are about 48 x 24 ft. In these the working chamber, 7 ft. 3 in. high, is braced at mid-height by one central longitudinal strut and five cross struts. Each is a 12 x 14-in. timber, with a 1½-in. rod on each side.

The caissons for piers 1, 2 and 7 were built in a pontoon of octagonal shape, 60 ft. in diameter and 9 ft. high. The bottom, on which the caisson rests, has 16 holes 3 in. in diameter, fitted with plugs. When the caisson is completed to a height of about 12 ft., these plugs are removed, allowing the pontoon to fill with water. One side of the pontoon, which is fitted with hinges, is then lowered, and the caisson is floated out. The movable side is raised, the water pumped out, and the pontoon is then ready for the building of the next caisson.

The caissons for piers 3 and 4 were built on platforms near the west bank of the river. These were supported on screws by means of which the platforms were lowered into the water so that the caissons could be floated off. The caissons for piers 5 and 6 were built in place on the ground, as they were located above ordinary high water.

At the end of August, 1917, piers 4, 5 and 6 were completed, and piers Nos. 1 and 3 had been sunk to rock. The timber caisson for Pier No. 7 had been built up to a height of 30 ft. and floated into position. The construction of the caisson for pier 2 (the pivot pier) had been commenced. Considerable difficulty was experienced in sinking pier 1, on the St. Joseph shore, on account of riprap. The other piers were sunk in very short time. It is expected to complete the work on the piers by the middle of October.

The contract for constructing the piers is on a basis of a lump sum for the work of sinking the piers and unit prices for all other items, involving an expenditure of about $350,000. The railway company furnishes the cement, reinforcing steel and lumber, except the form lumber. The contract was let to the Missouri Valley Bridge & Iron Co., of Leavenworth, Kan., covering a design by that company which figured cheaper than that of any other plan submitted.

The contract for fabricating and erecting the new drawspan and moving the old fixed spans has been let to the American Bridge Co. The plans for the caissons and steel work were prepared in the offices of the Union Pacific Railroad.

This work is being handled under the direction of E. E. Adams, consulting engineer, and R. L. Huntley, chief engineer of the Union Pacific R.R., as consulting engineers for the St. Joseph & Grand Island Ry. A. C. Everham, terminal engineer, has general supervision of the work and H. M. Stone is assistant engineer in immediate charge.

Motor Traffic on Pennsylvania Roads Shows an Enormous Increase

THAT an enormously increased tonnage is passing over Pennsylvania's main highways, due to the rapid increase of motor-truck traffic, is indicated by a report submitted to Commissioner O'Neil by the automobile division of the State Highway Department. The heavy traffic on state roads, particularly the Lincoln Highway, by the enormous freight trucks now running, has already begun to play havoc with the highways, according to the department. In certain sections this important route has begun to break and probably will have to be rebuilt next spring.

When the present roads were built it was never thought that they would have to support so immense a tonnage as is now passing over them daily. If the increases indicated by this survey continue for the next few years, especially in motor-truck traffic, the highway problems in Pennsylvania, state highway department officials predict, will assume such proportions as to dwarf many other big questions with which the commonwealth will have to contend. This subject was dealt with in one of its phases in an article in *Engineering News-Record* of Oct. 11, p. 704, giving the views of William D. Uhler, chief engineer of the State Highway Department.

Registration of Motor Vehicles

The following are the official statistics on number and character of motor vehicles in Pennsylvania:

There is 1 motor vehicle for every 27 inhabitants and 7 motor vehicles for every 2 miles of public roads. Motor license receipts from Jan. 1, 1917, to Sept. 30, 1917, aggregated $3,204,606, as against $2,268,942 for the same period in 1916, or an increase of 41%. An increase of nearly 38% is shown over the fees derived from these sources during the entire year of 1916, when the total was $2,325,057.50.

Registrations of motor vehicles for the first nine months of 1917 exceeded, in all classes, those for the entire year of 1916. Solid-tired motor vehicles, weighing from 4000 to 5000 lb., show the largest increase in any class, as 3084 have been registered, as against 1550 during 1916, or an increase of nearly 100%. Solid-tired motor vehicles, weighing from 5000 to 10,000 lb., numbered 8078; in 1916 the number was 5163. Trucks, weighing from 10,000 to 15,000 lb., increased during the same period from 1582 in 1916 to 2360, while the class weighing from 15,000 to 24,000 lb., numbered 1631, as against 1081 during 1916. The lighter trucks, weighing less than 4000 lb., showed an increase of only 121 over the registrations for 1916, when 1933 were registered, 2054 being the number for 1917.

During the year 1915 there were 8139 solid-tired motor vehicles registered in the state; in 1916 the number was 11,732; for 1917, as of Sept. 30, there are 17,726. The figures for 1917 show a greater proportionate increase in the heavier types of trucks. During this same period the registration of solid-tired motor vehicles increased over 51%, as compared with 1916 figures, while that of pneumatic-tired motor vehicles increased only 36 per cent.

Pneumatic-tired motor vehicles showed a greater increased registration in cars of lower horsepower, the registration of vehicles under 20 hp., increasing 43%; those from 20 to 34 hp., 36%; from 35 to 49 hp., only 12% and the ones above 50 hp., 25%. There were 297,660 pneumatic-tired motor vehicles registered this year, while in 1915 the number was 152,024 and in 1916 there were 218,846.

There were 2720 tractors registered as against 2701 during 1916, a gain of only 19; of these 15 were free registrations. Trailers increased from 496 in 1916 to 806, showing a further development in this new phase of transportation over the state highways. Motorcycles gained only about 12%. There were 14,063 registered, while the total for the year 1916 was 11,439.

Rapid Sand Filtration Recommended for Catskill Water Supply

A RECOMMENDATION of the rapid sand or mechanical type of filtration for the Catskill water supply is contained in the 1916 annual report of the New York Board of Water Supply, just issued. That portion of the report dealing with the subject of filtration is as follows:

"The year 1916 saw a practical conclusion to the preliminary studies made to decide the type of filtration plant to be constructed at the Eastview site, two miles east of Tarrytown. In the course of these studies the board's engineers visited and inspected plants in actual operation in Washington, Baltimore, Philadelphia and Little Falls as well as other plants of less importance.

"A summary of the investigations indicated that, apart from variations which have been introduced in the fundamental methods of operating such plants, there were, in fact, only two general types to be considered: Slow-sand filtration and rapid-sand (frequently called mechanical) filtration. While the opinion of the engineers on the staff of the board, and of experts specially retained, was somewhat divided respecting the two methods, the fundamental proposition that either type will do the work effectively and provide efficient treatment of the Catskill supply is generally admitted, the difference of opinion being based on collateral or related matters, and not at all upon the basic proposition involved. All things considered, the adoption of the rapid-sand or mechanical type of filtration was recommended as best suited to meet the conditions encountered, for the following reasons:

Reasons for Choice

"1. Numerically, by far, the largest number of all those consulted favored a mechanical plant.

"2. It appears to be conceded that, considering interest, sinking fund, operating and maintenance expenses, the yearly charges for conducting either type of plant would be about the same; whereas, the first cost of construction and installation indicates a saving of approximately 25% in favor of the rapid-sand type. The item thus saved is estimated, in round numbers, at two million dollars.

"3. It appears that mechanical filters can be most readily modified to conform to strange or unexpected conditions; that they are more quickly responsive to requirements, and by the very nature of their construction can be better and more quickly adapted to met every state of the water they may be called upon to treat.

"4. The factors involved in the labor problems have also an important bearing, as in the case of the mechanical filter a small, trained force is kept continuously engaged; whereas, the slow-sand plant involves the employment of a considerably larger force at more or less uncertain times and frequently when exigency arises, which, in a very large municipally-operated plant, would probably result in great complication and uncertainty.

"5. It has been established that mechanical filters will require for their construction a materially smaller ground area.

"6. It is to be noted, also, by statistics obtained from the United States Department of Commerce and labor, that since 1908 only three slow-sand filters were constructed anywhere in the United States, and none whatever since 1910, and it is conceded that the mechanical branch of the art has very rapidly developed in the last ten years, during which improvement in the design and construction of filters of this type has been very marked.

"7. It is conceded, further, that the handling of the sand for cleansing in the mechanical plant is much quicker and more flexible than in the slow-sand type.

"8. Since the inauguration of the work on the Catskill aqueduct about ten years ago, methods of sterilization have been devised which are almost universally applied in connection with both types of filters, and as adequate means of sterilization intended to make the water safe against disease have been provided, the question to be decided became to a large degree one of clarifying the water, which it was determined will be efficiently accomplished with a mechanical plant."

Freight Belt Line and Terminals for St. Paul

New and Existing Lines To Be Linked Up to Form an Outside Route—Local Freight Yards Part of Project

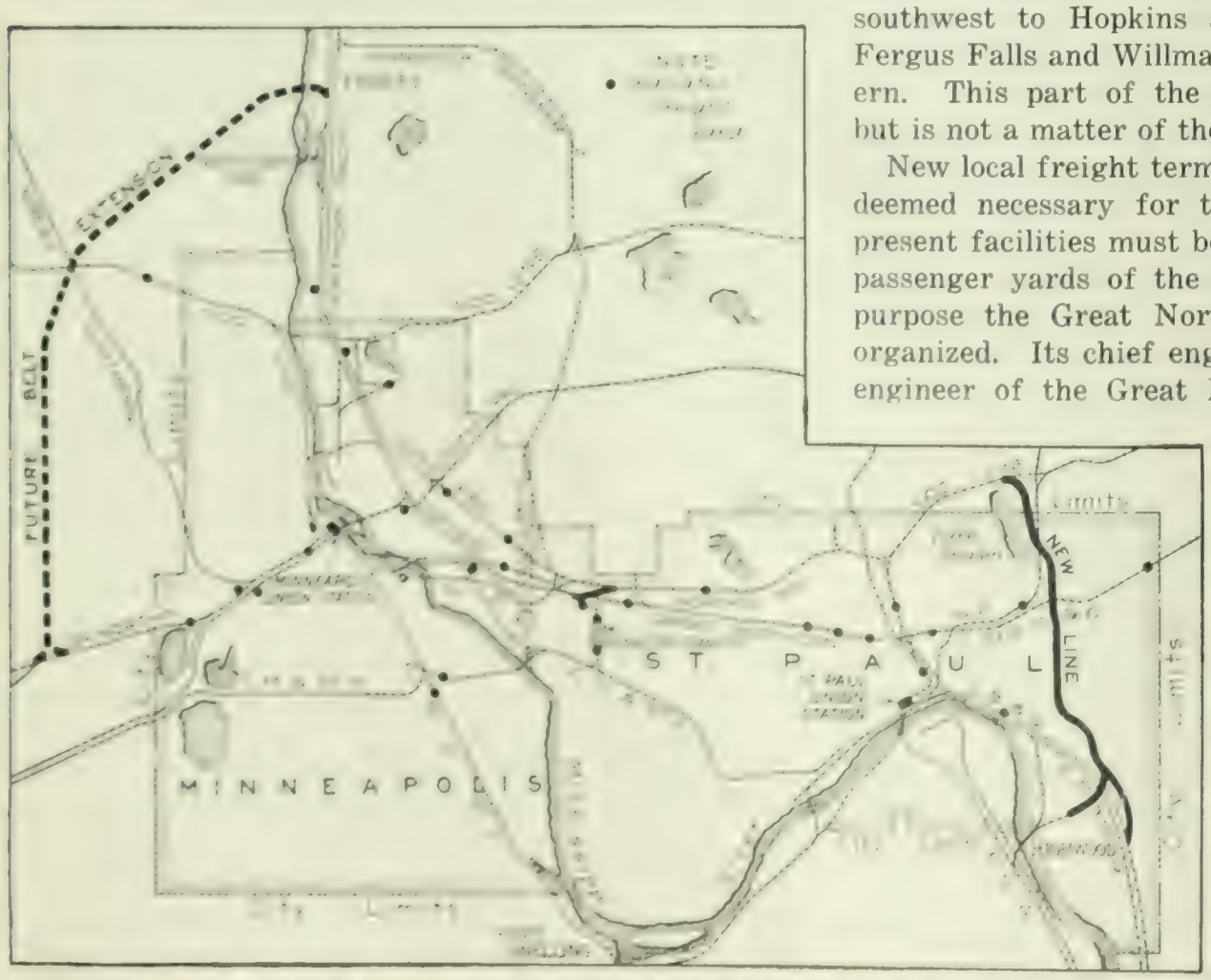
DIVERSION of through freight traffic around the City of St. Paul is to be effected by the Twin City Belt Ry. The purpose is to keep local terminals and the new Union Station line clear of this traffic. The new line will thus facilitate the handling of passenger traffic and through and local freight traffic and relieve the congestion at this very large railway center. The company is controlled jointly by the Great Northern Ry., Northern Pacific Ry. and Chicago, Burlington & Quincy R.R., and the line will serve a number of the railways centering at this point. The chief engineer is M. A. Butler, who is now with the army, being constructing quartermaster at Camp Dodge, near Des Moines, Iowa, as noted in *Engineering News-Record* of Aug. 16, p. 300.

The present and future parts of the new route are shown on the accompanying map. The first part of the project is the construction of a road six miles long from Highwood, on the Chicago, Burlington & Quincy (southeast of St. Paul), northward to Gloster, on the Soo line. The latter road will be utilized for about two miles west to the connection with the Northern Pacific. This road will then be used for about six miles, and then a new short link will afford connection with the Great Northern at Minnesota Transfer, which is northwest of St. Paul.

The maximum grade on the new line will be 0.8%, while the present line out of the Great Northern freight terminals at St. Paul has a grade of 1.75%. The line is in rolling country and the excavation will average about 125,000 yd. per mile. It is intended to build the roadbed and structures for double track, but to lay only a single track at present. Streets will be crossed by girder spans carried on reinforced-concrete abutments and bents on the curb lines. It is hoped to get some construction work done this season.

A prospective extension of the Belt Line provides for a diversion of through freight traffic around the City of Minneapolis. For this the Great Northern would be used from Minnesota Transfer to the new yard now being built at Northtown, a few miles north of Minneapolis. There a new line would extend approximately southwest to Hopkins Junction to connect with the Fergus Falls and Willmar divisions of the Great Northern. This part of the project is shown on the map but is not a matter of the near future.

New local freight terminals and yards at St. Paul are deemed necessary for the Great Northern, since the present facilities must be removed to make way for the passenger yards of the new Union Station. For this purpose the Great Northern Terminal Ry. has been organized. Its chief engineer is A. H. Hogeland, chief engineer of the Great Northern Ry. The immediate expenditure is expected to be about $300,000. Land for these new terminals has been obtained in the neighborhood of Eighth and Pine Sts., but definite plans of the layout have not yet been decided upon. Part of the site will be utilized for freight houses and yards and part for the development of a manufacturing and industrial district, the various establishments of which will have direct railway service.



NEW BELT LINE AND TERMINALS AT ST. PAUL AND MINNEAPOLIS

St. Maurice River-Control Works Are Nearing Completion

A 70,000-Yard Dam Will Create the Largest Reservoir in North America—Construction Difficulties Arose from Isolation of Site—Attractive Camp Built in Bush

THE MASONRY DAM which is being thrown across the St. Maurice River in Quebec to create the largest reservoir in North America is 80% completed. The work has been pushed with dispatch in spite of difficulties in securing deliveries of material and in the employment of labor, and in spite of the isolation of the dam site—170 miles north of Montreal in unsettled bush which heretofore has been traversed only by the wandering Indian, the lumber cruiser and the fur trader.

This work has been projected for many years, as the regulation of the St. Maurice River is of the greatest value to the important developed powers at La Tuque, Grand Mère and Shawinigan Falls. But there are many undeveloped power sites, and the equitable assessment of the cost of the regulation work was not possible until after the creation of the Quebec Streams Commission as a provincial conservation body. This commission investigated the possibilities of regulation, designed the dam, let the contracts and issued bonds to cover the cost.

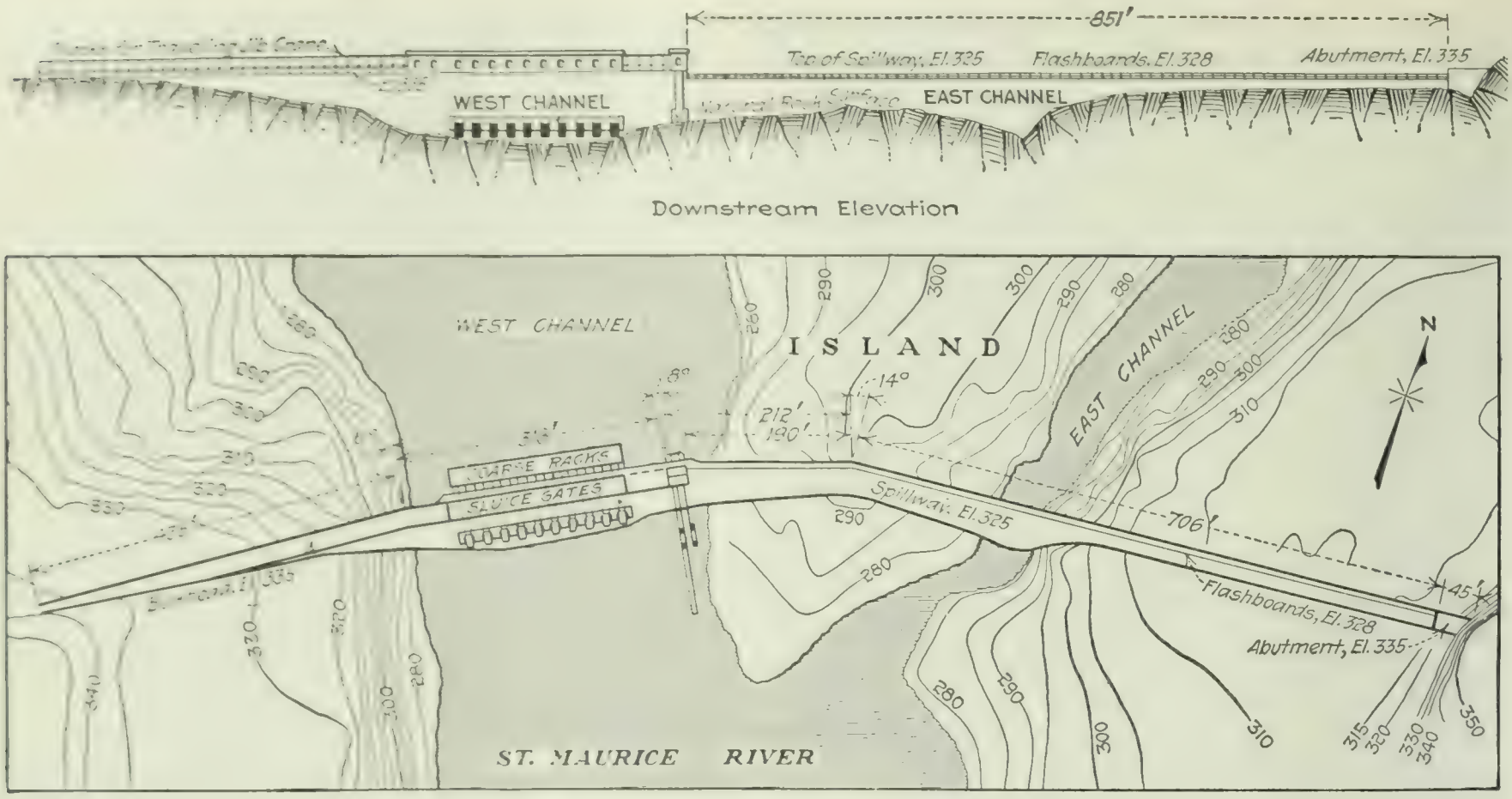
As noted in *Engineering Record*, Oct. 10, 1914, and *Engineering News*, May 11, 1916, the interests back of the great Shawinigan power development organized the St. Maurice Construction Co. to bid on the work, insuring by this connection the early and careful completion of the project. This company employed Fraser, Brace & Co., of Montreal and New York City, as supervising engineers of construction.

The general plans for the dam are shown in the accompanying sketches. Some changes are noted over the earlier descriptions which have been published. There is now no power plant at the dam. The log sluice has been moved 45 ft. west into the east channel—and the permanent sluices have been moved 20 ft. west to accommodate this change. Also the stilling pool and measuring weir, 300 ft. downstream from the dam, have been eliminated.

The permanent sluices through the dam are of interest. Steel conduits of square cross-section and sloping bottom have been embedded in the masonry from the gate chambers down to the outlets. The gates themselves are simple steel frames and are hand or motor operated.

The nearest railway connection is the Canadian Government Ry. (National Transcontinental Line) 128 miles north of Montreal. The St. Maurice River is navigable for light-draft boats for 32 miles above the railway, although there is much swift water. The river has been used for all of the material and supplies needed. For covering the final 20 miles from the head of navigation to the dam site, a standard-gage railway has been built, employing a 3½% maximum grade and 17° curves—uncompensated. The rails used on the main line and for general work around the dam have been about 60-lb. The railway equipment includes six dinkies (one 35-ton at the railway base, two 27-ton for quarry trains and three 25-ton for





SOME CHANGES HAVE BEEN MADE FROM THE ORIGINAL PLANS AS PUBLISHED

supply and gravel trains), 20 flat cars, two box cars, one 6000-gal. fuel-oil tank car, 35 6-yd. side-dump cars, and two railway-type steam shovels (which since the completion of the railroad have been used at the quarry and at the sand pit opened up).

Up to July, 1917, the company had accumulated two stern-wheel towboats of 3½-ft. draft, one river tug, five gasoline launches, one "alligator" towboat, one gasoline tow and 24 scows of 18-in. draft, 12-ft. beam and 60- to 80-ft. length overall. The larger of these scows had a capacity of one car of cement, which for convenience in handling was loaded in 50-sack skips. The "alligator" tow is a peculiar craft (see photographs)—a twin-screw wood-burning steam barge carrying 5000 ft. of cable on a large drum geared to the engine. The cable is made fast to a tree at the head of the rapids and as the boat descends it lays the cable on the channel bottom.

The contract was signed on July 25, 1915, and the contractors put four survey parties in the field to investigate the river and the railway routes. Quick decisions were made and railroad construction was begun in September, 1915.

Nine hundred men were at work on the railroad early in October and there was great difficulty in taking supplies up the river for so many. The river was at a low stage, the country was scoured for light-draft boats to take in supplies, supplementing the boats which were being built on the work. The climatic conditions were so severe, including rain and snow almost every day, that tents were of little use and comfortable shacks had to be provided all along the railroad. Gangs of bush men followed up the engineers, building camps in readiness for the construction gangs. A telephone line was run over the entire 50 miles following up the clearing gang on the railroad right-of-way.

During the following winter season it was possible to continue some railroad work, to build a temporary hydro-electric plant, to get the siding yard and camp built at the railway base (Sanmaur on the National Transcontinental) the camps and yard at the transfer station from river to rail (Chaudiere Rapids) and the camp at the intermediate point where the "alligator" was stationed (Nine-Mile Rapids). During the first winter the camp at the main dam site was carried along. Three million feet of logs were also cut and hauled and the sawmill started.

The river froze over on Nov. 5, and from that date until the following May all materials had to be hauled over snow roads which drifted badly in the slightest wind. The power house machinery and sufficient equipment to begin work at the dam was then hauled in at very great expense.

In the spring of 1916 the great scarcity of labor due to munition work made it very difficult to obtain men. This condition resulted finally in the almost complete suspension of this class of work in Canada. However, the same rush of munition work, with insistent demands for hydro-electric power, made it more important than ever to complete the dam. Therefore the power interests behind the contractors determined to complete the dam. The contractors procured labor from the internment camps to replace the Italians who had been called home to fight. But this labor proved expensive and inefficient. Ever since, there has been great difficulty and expense in keeping sufficient labor on the work. The railroad was finally completed on Aug. 12, 1916, six weeks behind the contractors' schedule. To catch up, the contractors put in additional plant and arranged to work during the second winter.

To avoid the transportation of fuel for the work the contractors built the hydro-electric plant already referred to, at a point two miles below the dam site. Here in one branch of the river, where it divided, a concrete substructure was built and the tailrace and headrace channels were deepened and a head of about 18 ft. was obtained.



A GOOD SITE EXISTED FOR AN ATTRACTIVE CAMP

Two 350-kv.-a. 2400-volt three-phase direct-connected horizontal-shaft units were installed. Two 2400-volt circuits were run to the dam site, where the power is stepped down on various transformers to the voltage required for the motors. This plant was completed on Aug. 1, 1916. This plant proved just large enough to operate the plant during the past summer.

With the steam plant hauled in during the winter, work was started in the east channel at the dam site in May, 1916. Cofferdams were thrown across the east channel to unwater that part of the dam and concreting this section of the dam started in September.

In placing the concrete across the east channel, arrangements were made to carry the entire flow through this channel and to coffer the whole west channel at one time. Five temporary sluiceways were left to be controlled by stop logs. The rest of this part of the dam was stopped at El. 293, to provide a flashed spillway for floods which the sluices could not pass. After the west cofferdam was completed the entire flow of the river was turned through these sluiceways. The west channel coffer and those sluiceways permitted the storing of 100,000,000 cu.ft. of water which insured good navigation for this summer when the bulk of the cement was taken up the river. The regulation was successful and will result in the completed dam beginning business this winter with a substantial storage of water already on hand for use in February and March which are low water months in this region.

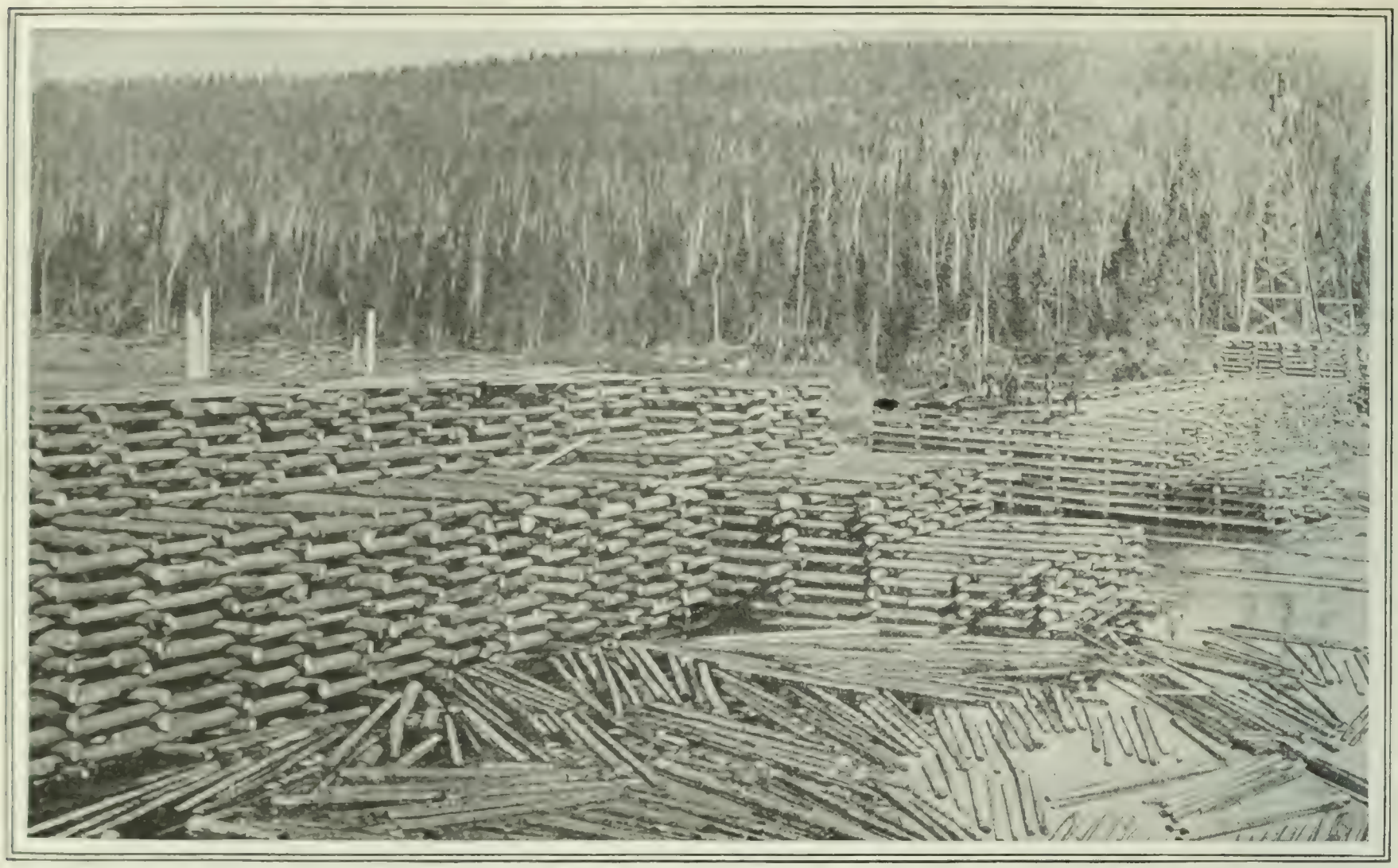
The construction of the upstream coffer in the west channel was one of the main features of the contract. Work was started when the west channel was passing about 10,000 sec.-ft. of water at a velocity of 5 ft. per second. Both the upper and the lower coffers were begun in August, 1916. They were built in three pieces; two shore lengths with a 60 x 60-ft. closing key to be placed when the sluices in the east channel were ready.

These coffers were log cribs, framed floating, and scribed to fit the bottom as found by close soundings. The green timber sank by the weight of the framing above—plus a few weighted platforms. Once down the crib was filled and backfilled with rock and sheeted on the pressure faces.

Work on the east end concrete and on the unwatering of the west channel occupied the open season of 1916 and the winter of 1916-17. The coffer filling and construction of the trestles for tracks of the four stiffleg traveling derricks and the narrow-gage concreting tracks were pushed along in spite of temperatures as low as 49° below zero. Ice up to 6 ft. in thickness inside the cofferdams was cleared to rock for the trestle bents. Earth and rock excavation in the deepest part of the west channel was begun in March, 1917. The first concrete in the west channel of the dam was placed in the middle of April. Up to Sept. 1, 58,000 cu.yd. had been laid out of a total of 73,000 in the completed dam. Moreover, this includes practically all the difficult work. Thirty thousand yards were placed during the two months ending Aug. 31 so that the entire amount is expected to be in place by the end of the present season. The work will thus be completed on contract time although the contract quantities have been very largely exceeded. It should be noted also that the increase occurred in the foundation where it could not be foreseen and it taxed the organization to keep up with the schedule.

The timbers were framed up in 10 x 10-ft. panels with a whole section floating to fit the bottom profile as found





COFFERDAMS WERE FRAMED UP FLOATING TO FIT THE RAGGED BOTTOM WHEN SUNK

by soundings. A floating section was anchored by upstream cables while being sunk. The key sections were framed up floating near the shore and were towed into place and sunk. The rock fill for coffers proceeded out from the west shore—a track being laid from the fill quarry to and upon the crib. Run of quarry was put in, including the overburden. As the rock fill proceeded the sheeting followed. Care had to be used that the sheeting did not proceed too rapidly in advance of the backfill, as on one occasion, when the sheeting was pushed ahead, a small deflection resulted.

The upstream coffer backed up the water until it overflowed the stop logs in the east-channel sluices, creating a head of about 40 ft. on the bottom of the upstream west coffer and giving a head of about 56 ft. on the lowest rock excavation. But the entire leakage is so small that it is handled by a 10-in. centrifugal pump run below normal speed.

The great expense of bringing in cement made placing plums desirable. Two quarries have been opened up; a lower one for plums and a high-level one for crusher supply. Derricks and hand labor are used in loading the plums into skips after shooting. A steam shovel places the quarry run for the crusher on 6-yd. side-dump cars, which are switched to an inclined cable hoist. For both quarries the company uses 12 tripod drills and nine hand hammers, the latter for breaking up larger pieces.

The rock is a blue granite, which reduces in the big crusher to a large proportion of small sizes. At the top of the crusher house is a 54 x 36-in. Buchanan jaw crusher discharging to a No. 7½ Telsmith gyratory, from which the stone goes to a screen and the rejections pass to a No. 3 and a No. 4 Austin crusher. The jaw and No. 7½ crushers are each driven by a 75-hp. induction motor; the No. 3 has a 25-hp. and the No. 4 has a 30. The quarry car hoist is back-belted from one flywheel of the large crusher.

Provision has been made for dumping hand-picked rock on a bypass platform from which it can be shot past any of the upper crushers that may be temporarily out of service.

After the screen was used for a short time, run-of-crusher was permitted to be used directly for concrete. The average quantities of natural sand to be added for a proper mix (1:2½:5) were determined, and care is taken in drawing from the bins to get an average mixture on each car going to the mixer plant.

Two 1-yd. Chain-Belt and one Ransome mixers are installed, discharging into 1¼-yd. bottom-dump buckets on narrow-gage cars drawn by horses or small oil-burning steam dinkies. From these cars the buckets are taken by two 5-ton 60-ft. stiffleg derricks, each on two cars. There are also six 65- to 75-ft. guyed derricks scattered about the work.

Special attention has been paid to securing a high percentage of plums, a low-level quarry having been opened, as noted, for this purpose and a direct track run from it to advantageous places. The percentage of plums has run this summer from 10 to 25%, and it is expected that 35% will be reached. To secure this, careful planning is necessary, and good teamwork between the mixing, placing and train gangs.

Rock and sand from the crusher unit are lifted by a steel bucket conveyor (Link-Belt) 80 ft. to bins of 600 cu.yd. storage capacity. Difficulty has been experienced in getting rock from the quarry fast enough to fill the bins. For conveying rock to the mixer, two cars are kept on parallel tracks leading down on a 2% grade

to the top of the mixer. They are connected by a cable running over a sieve at the end of the bin, so that the loading car going down pulls up the empty. The rock goes into small bins above the measuring hoppers of the mixers.

At the mixer, sand is dumped from the pit yard directly into six-car bins with wooden grizzly top at track level. In the winter a 3000-yd. sand-storage pile is maintained close by. Cement from the mixer auxiliary storage is dumped into a measuring hopper and on signal let down through a tin-lined wood chute into the sand and stone previously let into the mixer hopper in desired quantities.

All the repair work is done at the dam site, and here are maintained the machine and forge shops as complete as the needs have shown necessary. In it are found a double spindle, 24-42-in. lathe, 18-in. lathe, 20-in. shaper, 20-in. drill press, two-wheel emery stand, 6-in. machine hacksaw, ½- to 2-in. bolt machine, 2½- to 6-in. pipe machine, three coal-burning forges and three oil-burning forges. In a separate building is a motor-driven air compressor furnishing 1100 cu.ft. of free air at 100 lb. pressure (for drills and oil forges).

The St. Maurice Construction Co. for the work has at the railroad base (Sanmaur) a five-track yard beside the river and a dock with a transfer derrick and 10-ton

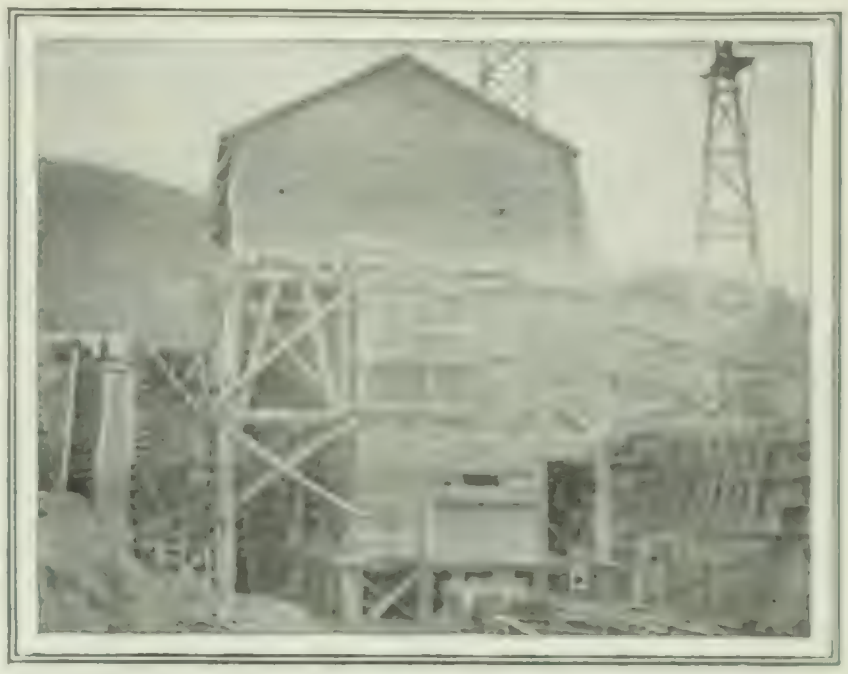


ABOVE THE MIXERS WERE THE ROCK AND SAND BINS WITH A DUMP-CAR SHED ON TOP

steam hoist. Here are coal-storage bins, cement and supply warehouses, etc. There have been about 45 men in this camp, including the boat crews, but accommodation is provided for up to 100 workmen coming or going to the dam site.

At the transfer station from river to railroad there is a four-track yard on a bluff above the boat landing. Here a 10-ton derrick is used to swing the cargo directly from boat to yard. Cement, coal and supplies can be stored in small quantities. About ten men are kept here to check and transfer 150 tons of material per day.

At the dam site there are six yard tracks, not including the sand and rock tracks on which, entirely or largely, are operated dump cars for the supply of local



THE CRUSHERS FED ROCK BINS OVER TRANSFER TRACKS

materials. There is storage for 50,000 lb. of cement and warehouse room for seven months' provisions.

The main camp layout is shown. The houses are of logs calked, lined and sheathed. (The camp of the Quebec Streams Commission is on the opposite side of the river and houses only the engineers, inspectors and camp employees of the commission.)

The company boards the men, charging $25 a month for quarters and meals. Only about 25 men have families there, and these are mostly engineers and foremen. To these the company store sells supplies, and a few dollars house rent is charged.

The camp is "bone dry." Not only are no alcoholic beverages sold, but a rigid guard is maintained to prevent liquor from being brought in by incoming men. No cash transactions of any sort are carried on at the company stores. The men are paid monthly by check and all supplies from the store are charged, even to postage stamps at the post office. In this way a check can be kept on the use of food and supplies, which are brought in with some difficulty and expense.

The company maintains a small hospital, and a doctor is in constant attendance. There have been very few accidents and little sickness.

The St. Maurice Construction Co. is organized with Julian C. Smith, vice president and chief engineer of the Shawinigan Water and Power Co., as president. C. E. Fraser, president of Fraser, Brace & Co., supervising engineers, is managing director of the St. Maurice Company. J. J. McCarthy has been general superintendent in charge of all work. His assistants are John Menzies, master mechanic, George Bullock, chief electrician, E. A. Eyar, paymaster, L. J. McNally, storekeeper and Charles Lussombe, resident engineer.

The work has had the close attention of O. Lefebvre, Chief Engineer of the Quebec Streams Commission whose resident engineer is J. B. D'Aoth. The great interest taken in this first great conservation structure undertaken by the Province of Quebec, is shown by the fact that Premier Sir Lomer Gouin and most of the Cabinet as well as the Hon. S. N. Parent, Chairman, and all the members of the Commission have made the long journey necessary personally to inspect the work at critical stages.

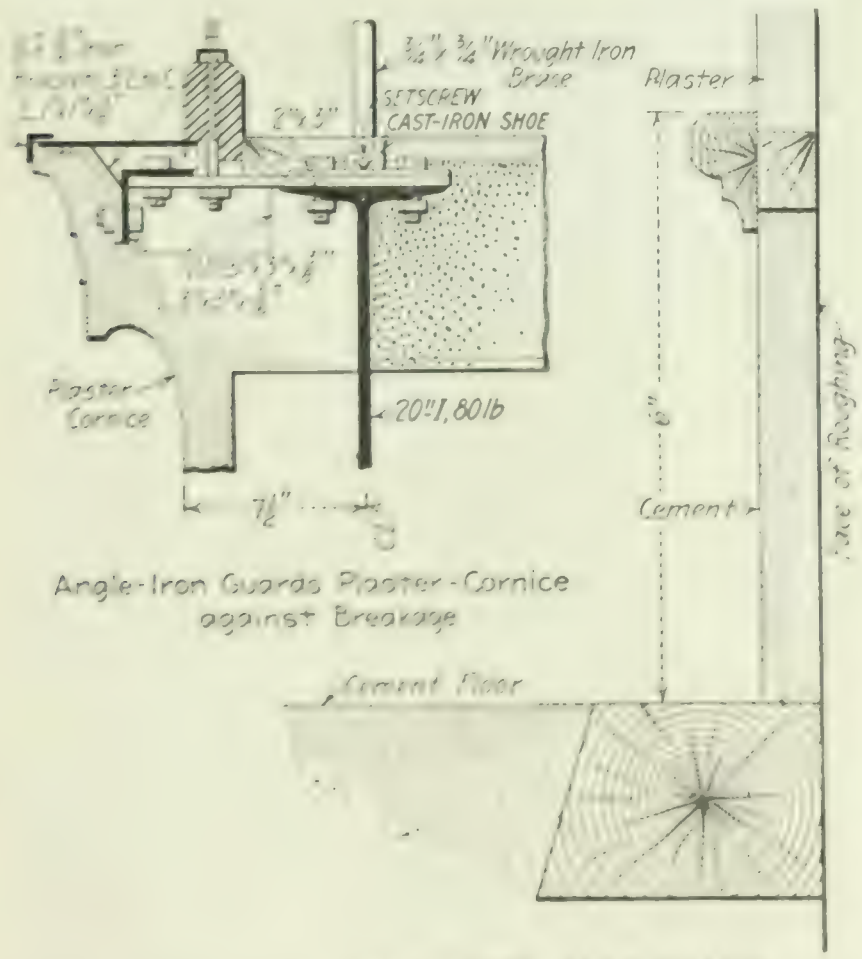
Minor Structural Details Improved in New Hotels Statler

Partitions, Baseboards, Stair Treads and Ballroom Floor Details Were Developed in Successive Designs

IN THE construction of the Hotels Statler in Cleveland, Detroit and finally in St. Louis, the architects, George B. Post & Sons, have worked out a number of small details both of structure and fittings. Some of these details, as installed in the latest hotel now nearing completion in St. Louis, may be applicable to other buildings of the same or similar character.

The floors throughout are of flat tile arches, with a 3½-in. cinder-concrete fill and a 1-in. surface of 1:3 cement mortar troweled smooth. In bathrooms and service rooms the usual tile surfacing was applied, but in the bedrooms and corridors a special baseboard and carpet nailing strip was placed. In the bedrooms, as shown in one of the details herewith, the wooden baseboard has been omitted and a 5½-in. strip of 1:3 cement mortar has been plastered on the partition blocks instead. This base strip was found to be cheaper and easier to apply than the usual wood base. Above the mortar strip is a wooden chair guard molding tacked on wooden grounds, and below the strip is a 2 x 2-in. tacking strip set into the concrete floor, for the carpet.

In the corridors the detail is varied by the use of a base of precast terazzo, which takes the place of the baseboard and extends out into the floor with a sanitary cove to the tacking strip. Corridor carpets are then tacked inside their edges and cover the joint between the strip and the terazzo.



CONCRETE BASE BOARD

UPPER LEFT-HAND VIEW STEEL ANGLE TO GUARD PLASTER CORNICE OF OFFICE. RIGHT-HAND VIEW PORTLAND CEMENT BASEBOARD AND WALL-TACKING STRIP

The partitions throughout the later hotels are of hollow clay tile. In the Cleveland house gypsum-block partitions were used, with gypsum plaster facing on each side. On account of some shrinkage in the gypsum blocks this plaster cracked at the junction of the partitions with the outside walls. In the bathrooms also, where face tile was applied to gypsum blocks, cracks developed in the tile throughout the entire building. This condition was apparently caused by the use of uncured blocks.

To avoid this condition in the later houses, terra cotta was used as a backing for all tile work.

In the ballroom of the St. Louis hotel an innovation in flooring has been made. This is the use of tar joints in the rough flooring. The base floor is of rough boards nailed to sleepers set in the cinder concrete but placed ⅜ in. apart. Into this joint tar is poured, the matched maple flooring laid, tacked to the lower boards. It is believed that this detail will give greater resiliency to the dancing floor and prevent creaking.

The detail drawing herewith shows a steel edging put on the corners of interior balconies to protect the plaster cornice there from damage by cleaners' ladders. This edging is a 1 x 1 x ⅛-in. angle riveted to a plate which forms part of the steel structure on which the plaster cornice hangs. In previous structures these cornice corners have been found to be easily broken or disfigured.

The stairs between upper floors are of course only occasionally used, so the tread finish may be rough. A pressed steel form of stair is used, in which a unit comprises a riser and the next lower tread, the riser extending about 1½ in. above the tread plate. The tread proper is then formed by a 1½-in. layer of either magnesium oxide or 1:3 portland cement mortar, which is screeded flush with the top of the riser plate and a small projection in the face of the next higher riser. The use of ordinary cement mortar for these treads has proved quite successful.

Light Motor Trucks Replace Heavy Trucks on Sandy Soil

Consideration of soil as a factor in the use of motor trucks on construction work was found necessary in building the army cantonment at Camp Custer, near Battle Creek, Mich. In the early part of the work two companies with 30 to 40 trucks each were furnished by the Quartermaster's Department, U. S. Army. One company had 3-ton trucks and the other had 1½-ton trucks. The soil is sandy and both the main road and the temporary roadways for construction work were soon cut into deep ruts of loose sand that offered no traction for the wheels. The trouble was greater on the grades, where the sand flowed away as the driving wheels revolved. Attempts were made to improve conditions by covering the roads with hay and straw, but this only improved conditions for a few hours. Rain helped for a time, as the wet sand would hold better than the dry.

The 3-ton trucks became stalled so frequently that they were shipped away to other work. The 1½-ton trucks had little difficulty in getting around, even when the sand was dry and loose.

Centralized Engineering Succeeds in Wisconsin

A Dozen Scattered State Engineering Bureaus Were Consolidated Under a State Engineer in 1915—Dual Control of Bureaus Practicable

By Sidney J. Williams
Engineer, Industrial Commission of Wisconsin

THE Wisconsin legislature in 1915 created a Department of Engineering to control all engineering and architectural work done by or for any state department, board, or institution. The experiment was looked upon with misgivings, especially by existing state departments which already had well-organized engineering staffs; while *Engineering News* remarked editorially that the courts might be called upon to determine just what activities should be classed as "engineering." Now, after two years, the department is recognized by law-makers and people as an indispensable and highly efficient branch of the state government. The functions of the department have been largely increased, in some cases beyond the strictly "engineering" field, by Acts of the 1917 legislature and also by the voluntary action of other state departments, some of which were at first hostile to the engineering department.

Broadly speaking, this success has been due, first, to the care which was exercised by the framers of the law in making the department non-political; and second, to the wise policy of John G. D. Mack, state chief engineer (formerly professor of machine design in the University of Wisconsin). Mr. Mack has consistently refused to disturb existing engineering departments and employees who were doing good work, and has declined to force his services and supervision upon other departments whose work was partly engineering, preferring to wait until such departments voluntarily sought his coöperation. This they all did, sooner or later.

System Before 1915

Previous to 1915 the state's engineering and architectural work comprised many bodies and functions. There was practically no coördination between them, except that in a few instances an engineer from one department was assigned to special work for another.

The railroad commission and tax commission joint engineering staff had been in existence 12 years, under the direction successively of Prof. W. D. Taylor, later chief engineer of the Chicago and Alton; Prof. W. D. Pence, who resigned in 1913 to join the engineering board of the Division of Valuation, Interstate Commerce Commission, and C. M. Larson.

The highway commission engineering staff, under A. R. Hirst, was organized in 1907.

The state hygienic laboratory, located at the state university, had made sanitary surveys for the state board of health. This board also included a division of plumbing inspection.

The industrial commission did engineering work in inspection of factories, buildings and boilers.

The university architect, Arthur Peabody, did all the architectural work for the University of Wisconsin while its engineering work was done by members of the engineering faculty.

Private architects were employed by the Normal School Board, the Board of Control, which manages all the state penal and charitable institutions, and the separate governing boards of the School of Mines, the Stout Institute and the Wisconsin Veterans' Home. The new State Capitol was constructed under the direction of a special commission, which also employed architects.

The Capitol power plant was in charge of a competent operating engineer. The power and heating plants of some of the other state institutions had received some attention from a consulting engineering firm; the remainder (except the university, as already noted) were unburdened by any engineering supervision. At one of these plants it was recently noticed that a section of the lower chord of one of the roof trusses had been permanently removed to permit the installation of a larger boiler.

Engineering Department Created

Combination of all engineering and architectural work into one department was the idea of Governor E. L. Phillip. A man of large business interests, he wished to have these important activities, which involve so large an expenditure of state funds, placed under the control of an organization which would be equal in efficiency to any similar organization in a great commercial enterprise. In property interest alone the state is such an enterprise, as it owns property valued at about $33,000,000. The functions of the engineering department in connection with state-owned property are, however, only a fraction of its total activities.

The bill first introduced was considerably changed at the suggestion of engineers already in the state service. As finally passed, and with minor revisions made this year, it provides as follows:

1. The state chief engineer is appointed by the railroad commission, with the approval of the governor, for an indefinite term. The appointment is thus effectually divorced from political influences, as the railroad commission is a fairly permanent body, the term of only one of its three members expiring every two years. The engineer's salary also is fixed by the railroad commission (with the governor's approval); at present it is $6000.

2. He appoints such assistants as he deems necessary, subject to the approval of the governor, but not subject to civil service rules. Such assistant engineers may be assigned permanently to other state departments where continuous engineering service is required, and may be given appropriate titles, such as highway engineer or university architect. Appointments for such service are subject to the approval of the head of the department concerned.

3. State departments or boards which require temporary or special engineering or architectural services

must requisition the same from the engineering department. Up to the present the state engineer has not interfered with the employment, by certain boards, of private architects working under the general direction of the state architect.

4. All contracts and payments for public works must be approved by the state chief engineer.

5. All heating, lighting and power stations in state institutions are subject to the engineer's direction and their superintendents must report operation data to him.

6. He exercises the powers and duties of the capitol commission (since July). Construction work on the Capitol is now practically completed but the maintenance of this $7,000,000 building is no small task.

7. The engineering department receives a yearly appropriation of $18,000, out of which is paid the salary of the engineer and architect and other general expenses. All other salaries are charged to the department for which the work in question is done.

While not required by the engineering department statute, the state engineer has been appointed engineer member of the state council of defense, member of the new cement-purchasing board, and member of the board to restore the old territorial capitol at Belmont. In an important new statute which provides for the interchange and coördination of work between different departments, the state engineer is given the initiative in proposing specific plans for such coöperation, and is made a sort of balance wheel between the departments interested.

Dual Control of Engineering Staffs

In this system, the feature which might be expected to cause the most trouble is that whereby assistant engineers are appointed in charge of the engineering work of other departments (for example, the railroad commission), to work under "the general direction of the chief engineer, and the immediate direction of" the department concerned. In practice this plan has worked very smoothly. The former chief engineers of the railroad, tax, and highway commissions have been continued in office, and have continued to direct the engineering functions of these departments, the commission itself in each case deciding all questions of policy. The state chief engineer has strictly limited his supervision to the engineering functions of the various departments, and he has not attempted to advise the latter as to the work which they should give their engineers, or the use which they should make of such work.

Present Organization

The engineering department is organized in six divisions: Railroad and Utilities, Highway, Architectural, Power Plant, Sanitary, and Industrial.

The Railroad and Utilities Division is a continuation, practically without change, of the former joint engineering staff of the railroad and tax commissions. It makes regular yearly valuations of all steam and electric roads and certain other public utilities for the tax commission, and of electric, gas, water, and telephone plants for the railroad commission in rate or municipal purchase cases. There is also a large amount of routine service inspection of gas, electric, and telephone companies, and many special investigations and reports relating to these utilities and to the railroads as well (for example, grade separation). Waterpower developments too are supervised by this division, with respect both to valuations and to the design and construction of dams.

The Highway Division, also a continuation of an existing engineering staff, makes surveys and prepares plans and specifications for and supervises all state-aid road and bridge construction and a large part of the county-aid bridge work. Last year about $3,600,000 was spent on 1227 miles of state-aid roads of various types, and about $540,000 on 352 state-aid bridges. This year under the Federal highway law a state-wide system of trunk highways 5000 miles in length is to be outlined.

State Architect

The state architect, the former university architect, has continued in immediate charge of the design of new and remodeled university buildings. He has not tried to supplant the five architectural and two engineering firms which are employed by the state engineer on building projects for the normal schools and various institutions, but has closely supervised their work with notable economies to the state in some instances. Architects are required to turn over their tracings to the state engineer. On all large buildings there is an inspector reporting directly to the state architect and engineer, even where a private architect drew the plans.

The Power Plant Division operates the power plant at the capital and also supervises the operation of plants in 27 educational, penal, and charitable institutions, including purchase of fuel and supplies and keeping of records. It prepares plans for improvements, superintends construction work, investigates and advises on repair work, checks architects' plans for plants in new institutions, and analyzes bids.

Sanitary Division

The Sanitary Division is in charge of the former director of the state hygienic laboratory. It makes sanitary surveys for the State Board of Health, relating mostly to industrial waste and other sewage disposal, stream pollution, and water supply. Since 1913 the board has had a division of plumbing inspection, and it has recently agreed to recognize this as "engineering and architectural," so that the state plumbing inspector becomes a member of the sanitary division of the engineering department.

The Industrial Division conducts the engineering and inspection work of the Industrial Commission, including inspection of factories, tenements, public-assembly buildings and boilers, and fire-prevention work, the last-mentioned having been recently transferred from the insurance department. This division includes an engineer in charge, an illuminating engineer, eight factory inspectors, two building inspectors (engineers), a boiler inspector, and a superintendent of fire prevention who supervises the fire-prevention inspections of local fire departments. The present factory inspectors are not technical men, but as vacancies occur it is planned to appoint only graduate engineers. The problems of present-day industrial safety and sanitation demand the engineering background most of all.

The experience of one state department in engineering and architectural work is usually parallel with and therefore helpful to other departments. One result of the centralization of the state's engineering work is the ease with which transfers of men with special experience may be made to assist the various departments. Many instances of exchange of service have occurred within the two years of the engineering department's existence.

For certain highly specialized professional work, in which only occasional service is required, so that it is not practicable to maintain the required degree of special skill on the regular staff of employees, consulting engineers are employed. Special problems often contain elements of great danger, and for its protection the state should have the aid of the best professional skill in their solution. As occasion has required, the following consulting engineers have been appointed: Mead & Seastone, for consultation on the safety of the Wissota dam, now under construction; W. G. Kirchoffer, for consultation and design on institution sewage, water supply and drainage; F. E. Turneaure, for consultation on stresses in Wells St. viaduct, Milwaukee; H. V. Tennant, consulting engineer in charge of the Portage levee construction.

The engineering department has secured greater economy in the design, construction, and maintenance of state buildings. It has helped other departments, which were trying to do engineering work without realizing it, to organize their work on an engineering basis, and thus increase its efficiency. It has not interfered with existing well-organized engineering staffs, but has secured for them a more general recognition of their importance. It has brought about greater coöperation between engineering divisions, and has helped to secure coöperation between non-engineering departments. To important special problems it has brought the services of high-grade consultants, who have given to the state the benefits derived from their experiences and observations.

It has been able to do these things partly because it is an engineering department, but more because it is a department based on merit and free from partisan influences. This, after all, is the key to the engineer's opportunity as a public servant. As an expert pure and simple, his sphere, though important, is limited. But if, when called in as an expert, he can show, slowly and unobtrusively, a capacity to handle delicate and important administrative problems, if he can build up a department whose very efficiency will defend it from partisan attack, then his contribution to the cause of material state improvement and better government will be great indeed. Probably there is no state in the union, in which the engineer could not render similar service to the public.

Drift Catcher at Erie Completed

A REINFORCED-CONCRETE drift catcher, the first unit in the Mill Creek flood-control project at Erie, Penn., has just been completed, as shown in the accompanying view. The purpose of this structure is to intercept drift which comes down the stream during times of high water, and thus to prevent it from blocking the entrance to the tube under construction for the purpose of carrying the flood waters through the City of Erie.

The drift catcher is 18 ft. high and 220 ft. long. It consists essentially of 20 piers spaced 10 ft. c. to c. across the valley. Arches spanning the piers at the top carry a walkway which connects with the concrete stairway leading up the high bank on the west side.



CONCRETE STRUCTURE PREVENTS DRIFT FROM PASSING INTO TIDEWATER CHANNEL

A heavy concrete strut is located near the upstream edges of the piers, about halfway between the base and the top of the structure. Two heavy chains in each bay are hung from this beam and are anchored into the concrete footings at the upstream edge, these chains being for the purpose of intercepting small drift which would otherwise find its way to the openings between the piers.

The construction of the flood protection work in Erie is under the supervision of Gannett, Seelye & Fleming, consulting engineers, of Harrisburg, Penn. The details of the drift catcher were shown in a drawing in *Engineering News* of Oct. 26, 1916.

Lumber Cut Lags Behind Shipments

Because of strikes and other unsettled conditions, the lumber production of the country in August was 18.5% less than in the same month last year. Shipments, however, were 6.6% greater, because of the heavy demand for building material by the government and for factory construction. During the eight months ended Aug. 31 the 701 mills reporting to the National Lumber Manufacturers' Association cut 2.7% less than in the same months in 1916, but they shipped 7.5% more. The total production of lumber of all kinds will be, according to estimates made recently, 38,000,000,000 feet in the current year.

Good Workmanship Necessary To Make Sea-Water Concrete Safe

Correct Proportions, Judicious Use of Water, Tight Forms, a Good Contractor and Efficient Inspection Are Needed To Bring Concrete to Proper Condition To Resist Sea-Water Action

By Rudolph J. Wig and Lewis R. Ferguson

Last of Five Articles on the Problem of Sea-Water Concrete, Written As a Result of an Investigation and Inspection of Practically All the Marine Concrete Structures in the United States.

THE CHARACTER of the workmanship has an important bearing on the ability of concrete to resist the action of sea water. Only contractors of experience, employing competent men, should be intrusted with important work in sea water, where the difficulties usually encountered cannot be overcome by any but the best of organizations thoroughly equipped with the necessary tools and machinery. Letting of work to the lowest bidder usually proves a costly procedure.

Extreme Care Necessary in Building

No matter how carefully the structure is designed, careless methods used in construction will cause trouble. Unfortunately, imperfections cannot be detected at once, and frequently patches and a wash of cement grout over the surface hide for a little while defects which ultimately result in failure.

But the defects due to workmanship cannot always be attributed to carelessness. Engineers have employed methods which they believed would produce superior results but which as a matter of fact frequently caused failure. The necessity for extra care in building concrete structures subjected to sea-water action has not been appreciated. As a rule engineers have followed common practice and permitted about the same quality of work in their sea-water structures as they secure for those on land.

This must be changed if the trouble now so prevalent with concrete in sea water is to be overcome. It is not only necessary to erect better concrete structures in sea water than on land, but this must be done in the face of increased difficulties. Engineers must provide more rigid and intelligent inspectors, in whom are placed implicit confidence, and they must insist upon the contractor following instructions. And when controversies arise the engineer must support the inspector—but these requirements must be made plain in the specifications, so that misunderstandings will be avoided and all will work in harmony, for only by so doing will the best results be secured.

Minor Defects Cause Trouble

The necessity for extreme caution in every detail of the erection of a concrete structure in sea water cannot be too strongly emphasized. Even what would be considered very minor defects in a land structure must be avoided in sea-water work, for these defects are points of weakness which are readily attacked, and disintegration once started spreads to adjoining sections, causing failure.

The experience gained in one very large project which included several thousand pier structures is interesting in this connection, as it shows how greatly the quality of concrete in sea water can be improved by the exercise of extreme care. The piers were built in forms sealed at the bottom with concrete deposited through a tremie. This seal acted as the footing for the piers, and after it had set the water was pumped out of the forms, and the balance of the pier was constructed in the dry.

In the first work, embracing more than two hundred structures, which was done in accordance with usual methods, more than 50% of the footings were found to be seriously defective. When this condition was discovered, the necessity of using far more care was seen, and a marked improvement in the character of the workmanship was insisted upon for the next several hundred structures. The result was that only about 1% of these piers had any defects. The engineers were not yet satisfied and insisted upon even more attention to details, and as a result the last several hundred piers have shown practically no defects whatever.

According to the reports of inspection, the defects were caused by improper use of the tremie, by leakage of the forms at the bottom edge, by lack of thoroughness in the removal of sand which had washed into the forms before the concrete was deposited, by lack of care in thoroughly cleaning the surface of the old concrete when resealing was necessary, and in some cases by the breaking of corners in the removing of forms.

The defects in the piers have been repaired, the same care being used as in the recent work, and now they are all in good condition.

General Principles to Be Followed

The methods to be followed in sea-water concrete work depend in certain details upon the location of the structure, as this governs the rigor of the climatic and sea action, and also upon the particular design employed, this too being governed considerably by the conditions to which the structure will be subjected. Certain general principles can be followed, however.

The forms should always be made tight, so that leakage of the concrete will be prevented. For work below the low-water line this is just as true as for that above. The best under-water work is secured by erecting a cofferdam and building in the dry, but this is expensive and at times impossible. When the bottom of the work is at a depth below water which prevents its being seen from the surface, the services of a diver

are essential, for the forms must be carefully examined to insure their tightness. Leakage is most likely to occur around the bottom edge of the forms where they rest on the ground. In such cases the washing of the tide carries away the mortar from the concrete, leaving honeycombed sections which are readily cut away as soon as the forms are removed. This undermines the supporting parts of the structure, and settlement and cracking result. A very simple and effective method of preventing the trouble is to plug the crevices around the bottom edge of the forms with bags filled with sand, or better still, bags of concrete.

A popular form of construction where limnoria and teredo are not found is that of wood piles cut off at or near the low-water line and supporting a wood platform on which rests a gravity-section concrete wall. Where this type of structure has been used it is not unusual to find the lower outside edge disintegrated. This is due largely to the fact that the joint between the face form and the platform on which the wall rested was not made tight. The bottom layer of concrete is deposited when the tide drops to the lowest point. This, however, is frequently but little below the platform, and so the water rises to that elevation shortly after the concrete has been placed. If there is any leakage along the bottom edge of the front form the fresh, soft concrete is very likely to have the mortar washed from it along this section. This results in a porous mass which is readily attacked.

The bottom joint, however, is not the only one which should be tight. They should all be tight. It is advisable to use lumber surfaced on the edges and inside face; and in some instances where the wash of water is severe, tongued and grooved material should be used. Smoothness of the exposed face of the concrete assists materially in resisting sea-water attack, and this cannot be secured unless forms are carefully made of surfaced lumber.

If the forms are oiled, and this is preferable, a mineral oil should be used. Practically any kind of mineral oil is suitable, and cylinder oil has been much employed. Two or three applications of kerosene serve better than cylinder oil in preventing the sticking of concrete, and this has the added advantage of not staining.

The forms for the concrete wall of a Canadian wharf were coated with fish oil. This caused a soft pitted and chalky surface which is porous and easily abraded. Very soon after the removal of the forms places were observed where the fish oil had disintegrated the concrete. See Fig. 1.



FIG. 1. FISH OIL ON THE FORMS CAUSED SOFTENING OF CONCRETE SURFACE

Correct Proportions Important

After the materials are selected the concrete must be proportioned to secure the maximum density. Density and strength are closely related and generally the concrete with the greatest density will possess the most strength—that is, when made from given ingredients.

Proportioning by means of void measurement is not satisfactory, nor is a mixture based upon granulometric measurement. The best method of arriving at the proper proportions is actually to mix the cement, sand, and stone together with the amount of water to be used and by trial determine which mixture produces the minimum resulting volume from given amounts of the ingredients, measured separately. This subject is discussed at length in Technologic Paper 58 of the Bureau of Standards, and in many other technical articles.

The stronger and tougher the concrete the less likely it is to be chipped and abraded, with the consequent exposure of the interior of the mass to chemical attack. The denser and more compact the concrete the less will be the absorption of moisture, and with the diminishing of the absorption the possibility of initial disintegration from frost action will be materially lessened. The present almost universal method of arbitrarily specifying the proportions of the concrete is not scientific and in most cases does not produce the best grade of concrete from given ingredients. Far more care than has previously been used must be exercised in determining the best proportions, and then there must be insistence that the proportions determined upon are rigidly adhered to by the contractor.

Generally it is advisable to use richer mixtures than would be used for similar structures on land. The sand or stone will vary somewhat, even though it comes from the same source, and so it may be necessary to vary slightly the proportions as the work proceeds. In order to secure continuously the best grade of concrete the engineer should make tests at frequent intervals, not only of the ingredients of the concrete, but also of the concrete itself as mixed by the contractor

A city on the Pacific coast which has been spending millions of dollars in improving its harbor facilities and building large concrete docks maintains a well equipped laboratory exclusively for this work. Here tests are made daily to determine the quality of concrete the contractors are producing and also to keep a constant check upon the aggregates being supplied. In this laboratory the proportions for the concrete are determined, and as it becomes necessary these are varied from time to time. The inspectors on the work are given power to insist that these directions be explicitly followed.

The amount of water used in mixing is of even greater importance, perhaps, than the proportioning of the concrete. This is particularly true for sea-water work. If too little water is used the concrete is porous and the surface lacks smoothness and density; if too much is used the concrete is also porous and the surface chalky and weak. The proper consistency is one just dry enough to permit of *light tamping* but not so dry as to require any effort to bring water to the surface. This

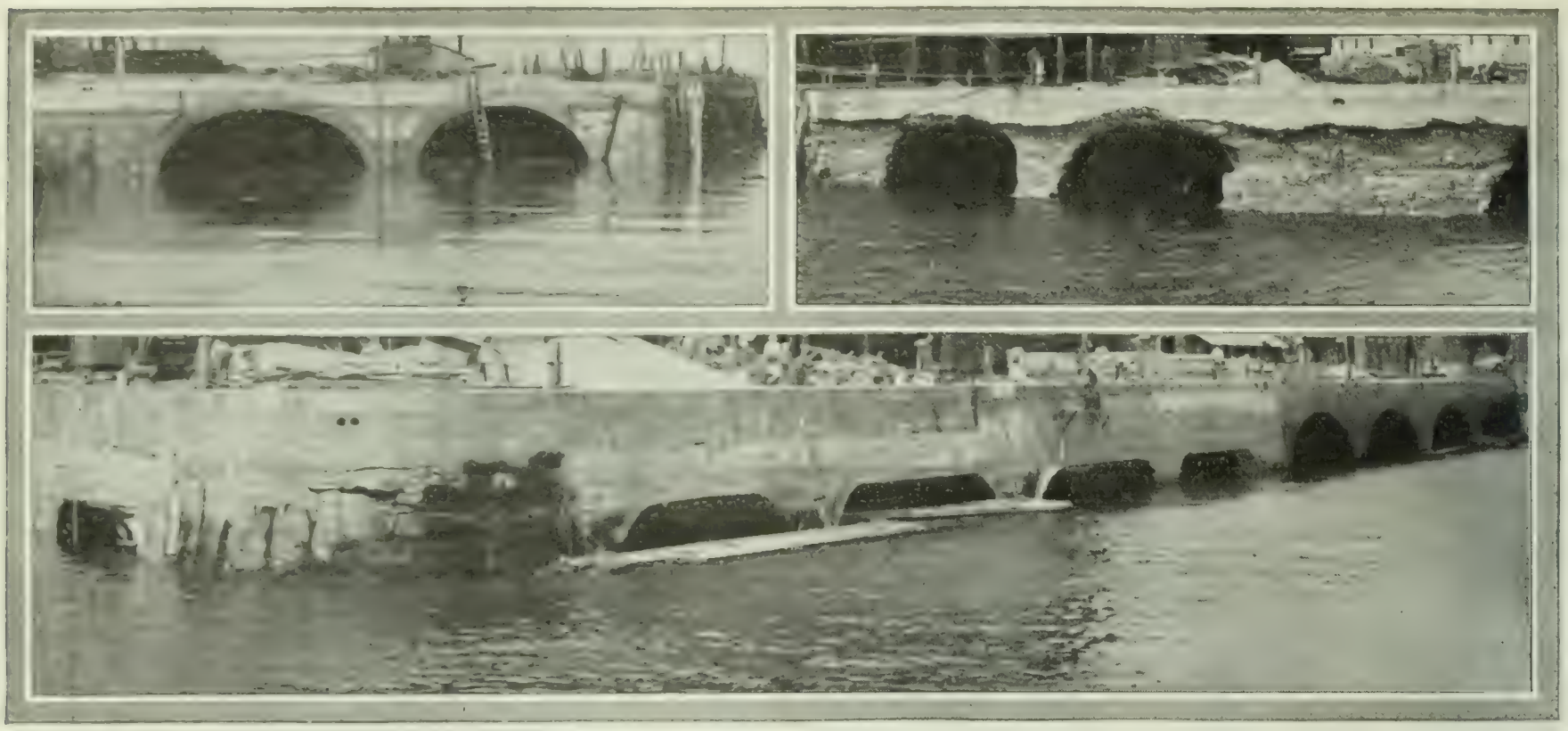


FIG. 2. HOW CONSISTENCY AFFECTED THE WEAR OF ONE CONCRETE PIER

Upper left-hand view is outboard end of pier made with dry concrete just after completion. Upper right-hand view shows same section eight years later. The lower view shows excellent condition of medium consistency concrete at right in comparison with wet consistency at left

is hardly wet enough to use for reinforced work, and for this class of construction a little wetter consistency must be used; but a very slight addition in the amount of water used in the mixing will produce a marked effect. The influence upon the strength and porosity of the concrete exerted by varying the amounts of water used in mixing has been emphatically demonstrated in recent publications. The use of excess water may decrease the strength 50% and greatly increase the porosity and friability.

The effect of the consistency employed on the ability of the concrete to resist sea-water action was forcibly emphasized in many instances during the examination made by the writers.

There is a pier on the New England coast which illustrates this excellently. This pier was built under two contracts, the outboard section being completed first, after which the inboard section was begun by another contractor. The designs for both sections were exactly the same and the ingredients used in the concrete were identical. There is practically no difference in the exposure condition. The outboard section was constructed under the direction of an engineer who believed thoroughly in dry concrete, as did most engineers at that time. Even before this section was completed there were evidences of disintegration in some parts of the work as shown in one view in Fig. 2. The condition of the same wall 8 years later is shown in another.

About the time the inboard section was started another engineer was put in charge of the work. He decided to allow a little more water to be used, though not so much that tamping could be dispensed with. The inspectors stated, however, that very little tamping was sufficient to settle the concrete into the forms. The conditions of exposure to which this pier is subjected are severe, but in spite of the fact that there is no adequate fender system, the inboard section is in excellent condition after 15 years of use, while the outboard end continued to disintegrate to such an extent that about five years ago extensive repairs became necessary to prevent collapse of parts of the structure. When these repairs were made the wets were in power and a sloppy consistency was considered the proper thing for all concrete work. The engineer in charge of the repairs used a very wet mixture, partly on account of the fact that the work was reinforced. This concrete has also disintegrated to a considerable extent and is at present in much worse condition than the inboard section of the pier, on which no repairs whatever were made.

Here we have three specimens of concrete of similar ingredients, exposed to the same conditions, the only variable being the amount of water used in mixing. The very dry and the very wet concrete have been decidedly unsatisfactory. That of a medium consistency has successfully resisted disintegration under very severe exposure.

In another harbor along the North Atlantic coast are several miles of concrete quay walls, built during the past twenty years. Some of them were erected while engineering practice dictated that a minimum amount of water should be used in mixing the concrete; some were built during the transition period when the amount of water was being increased, and those constructed since about 1905, especially those built recently, were of a much wetter consistency. All of these walls are of the same design and materials of the same quality were used throughout the work. The exposure conditions are practically the same in all parts of the harbor. All of the walls built prior to 1900, when dry mixed concrete was used, have disintegrated to such an extent that they have had to be frequently repaired and several sections entirely rebuilt. Those erected since 1905 of wet concrete with few exceptions have also been replaced on account of deterioration, or have needed a considerable amount of maintenance, but those built between 1900 and 1905, or during the time the concrete was made of a medium consistency, have needed no repairs at all and are found to be in excellent condition at present.

It is evident that the amount of water used in mixing concrete exposed to sea water action has a most important bearing upon the durability of the structure. *Either too dry or too wet a consistency will cause failure.* A medium consistency must be used if permanency is to be secured under severe exposure conditions.

The effect of thoroughness of mixing upon the quality of the concrete warrants more consideration by engineers, especially those engaged in designing sea-water structures. Any expedient which makes for better concrete should be seized upon, for only the very best material can successfully resist the rigorous conditions to which structures in sea water are exposed. Up to a certain point there is a rapid and consistent increase in the strength of concrete with the thoroughness of mixing. The amount required to give the best results is dependent upon the conditions, such as type of mixer, proportions, consistency and character of materials.

Perhaps this phase of the subject will be made more impressive if put in this way. A better quality of concrete at less cost can be secured by omitting a considerable part of the cement and increasing the thoroughness of mixing.

Concrete Must Be Properly Placed

After the concrete is mixed comes the placing it in the forms. In this, especially, more difficulties are encountered in sea-water work than in land structures, and yet only the best quality of work will be permanent.

Unless a cofferdam is built and the concrete placed in the dry, either a tremie or a bottom-dump bucket is used. Both methods have proved successful, although the tremie is preferable if correctly operated. This, however, is far from a simple thing to do. Contrary to the supposition of many engineers, the concrete cannot be forced up above the bottom edge of the tremie for more than a few inches, even when the pipe is long and kept full. In order to start the flow the bottom of the tremie must be raised slightly so that the lateral movement of the concrete restrained by friction is permitted. As soon as the concrete starts to move it tends to discharge rapidly, owing to the combined hydrostatic and velocity head, and this frequently results in the loss of the charge—for a very nice balance must be maintained in order to control the rapidity with which the concrete leaves the pipe.

Of course a tremie should always be plugged when first charged; otherwise a layer of separated stone, sand and cement mixed with laitance will be deposited in the bottom of the forms, or a seam of such material made in the structure.

The bottom-dump bucket method possesses the disadvantage of permitting at least a slight settlement of the concrete through water and the precipitation of a small amount of magnesia on the surface of each batch. This will cause some laitance to permeate the mass, and may also cause some segregation. As with the tremie, successful results can be obtained only by the exercise of extreme care.

If the work below the low-water line is carried on intermittently trouble may occur unless particular precautions are observed thoroughly to clean the surface of the concrete previously deposited before the placing of concrete is resumed. This is what happened in a large pivot pier along the middle Atlantic coast. The depth of water in which the pier was built is about 45 ft., and the pier is 18 ft. in diameter.

It was intended to construct a cofferdam and place the concrete in the dry. Leakage through the bottom and sides caused this plan to be abandoned, and the concrete was deposited in the water by means of bottom-dump buckets. The work was carried on only during the daytime. Upon resumption of concreting in the morning no care was taken to clean off the surface of the concrete placed the day before; in fact, the necessity for this was not even thought of. Of course the water covered it, and it was taken for granted a good joint would be secured between the days' work.

The cofferdam was left in place and it was not until a number of years after the work was completed that any apprehension was felt by the engineers as to the stability of the structure. By that time the planking of the cofferdam had rotted and enough of the boards had fallen away to expose a considerable section of the concrete. Only the part between high and low water



FIG. 3. RIVETED IRON SHELLS FORCED OPEN BY FREEZING OF MOISTURE IN SOFT MATERIAL

could be seen. Here, however, the concrete had the appearance of a layer cake, with the soft material between the layers cut out to a considerable depth.

In order to determine the real condition vertical holes were drilled through a considerable depth of the pier. For about 6 in. the drilling was hard, then a soft section was struck, then a foot or so of hard material, then another layer of soft, and this continued to the bottom of the drilling. The soft sections were of varying thicknesses, some being as much as 24 in., while others were only about 6 in. thick. It was quite evident that these layers were formed between successive days' work. This pier is now in a serious condition and means will have to be taken soon to prevent failure.

A somewhat similar cause is responsible for a peculiar condition discovered in the supporting columns of a pleasure pier. In this case 18-in. riveted steel shells used as forms were sunk to the required depth, and the sand was pumped out. Water leaked in through the bottom, partly filling the shells, and concrete was deposited through this water. Here, however, the work was carried on continuously until the concrete was brought up to the elevation of high water—the shells being of sufficient length to reach to the deck. After the concrete reached the highwater line the forms for the beams and deck were built and concreting continued.

As the deck was about 15 ft. above high water the supporting columns had to be extended this much.

No effort was made to clean off the surface of the concrete previously placed in the shells before the upper section was deposited. After the pier had gone through the winter an interesting condition was discovered in the supporting columns. It appeared as though the rivets in each shell for a distance of from one to two feet near the elevation of high water had been cut out and the shell pried open at the joint. Some of these shells are shown in Fig. 3. This exhibited a cavity in the column which in some cases was as large as a man's head. Instead of concrete a soft chalky material was found. This had come to the surface as the shells were being filled to high water, and then it was covered when the filling of the section above the high-water line was completed. During the winter the moisture in this soft layer had frozen and burst the shells and as soon as the steel protection was removed the waves washed out the soft material. Since then chemical disintegration of the concrete has progressed until many of the columns have failed completely and have had to be renewed.

Construction Seams Must Be Prevented

For the work above the low-water line every precaution should be taken to prevent the formation of construction seams of laitance. If the tide rises and covers the section before completion of the work the surface of the concrete should be thoroughly cleaned by scrubbing with a stiff broom and washing with a hose before resumption of concreting.

In a harbor on the Pacific coast was found an interesting illustration of the value of extra precautions in this respect. Here there are a number of concrete sea walls built at different times but of similar design and materials. Although the specifications called for thorough cleaning of the surface of the concrete at construction joints, it was evident, this was frequently not as carefully attended to as it might have been, for thin horizontal seams could be seen. (This is a criticism which applies to most of the concrete sea-water structures along our coasts, for almost always the place where work was stopped due to the rising tide is conspicuous.) In one section of the walls just referred to, however, no construction seams could be found. The inspector who had been in charge during construction explained the reason for this. The contractor had covered the concrete with a canvas held in place with heavy weights whenever he had to stop concreting, so that a clean surface was found when the tide receded.

The simplest way to prevent disintegration at construction seams is to not have any such seams. If the work is done in short sections bulkheaded between the forms the concrete can be brought up faster than the tide rises.

While the concrete is being deposited it should be compacted so that the densest condition possible will be secured. If the proper consistency is used it will permit of light tamping, and under this treatment the concrete will quake and settle into a very compact mass, free from pockets and void spaces. The concrete next to the forms should be spaded so that a dense smooth surface will be secured, such a surface when exposed offering the greatest protection against the disintegrating action of the sea water. If it is firm, strong and tough, chipping and abrasion will be greatly lessened and the possibility of deterioration of the structure decreased.

Under many conditions a mortar face richer than the body of the structure will prove economical; and where local materials are not of the highest quality this mortar surfacing can be made of imported aggregate of good quality, which if properly applied will protect the interior concrete made of poorer material.

It is impossible to apply a mortar coating to concrete after the forms are removed and have it adhere to that part of the structure below the high-water line, and it is between the elevations of high and low water that it is needed far more than anywhere else.



FIG. 4. LEAVING A JOINT SUCH AS TO BE MADE ON PILE IN CENTER OF VIEW MAKES WEAK SECTION

Many structures may be most economically built by using precast members. The concrete can be prepared and placed under far less difficulties, and it can be allowed to harden and cure thoroughly before being acted upon by sea water. But in precast work as well as work deposited in place, porous concrete, rough surfaces, leaky forms, and seams and joints will cause deterioration.

The practice of making precast piles of such length that a joint must be made between the elevation of high and low water, as shown in Fig. 4, should be discontinued. Often precast piles are found to be too short and have to be extended after they are driven. It is almost impossible by present methods to make a satisfactory joint between the elevation of high and low water. However, if a joint must be made at this elevation the utmost care must be exercised to clean the top of the pile before the concrete for the extension is deposited, and no leakage of the forms can be permitted if disintegration is to be prevented. The numerous structures which are showing signs of trouble at these construction joints give evidence that the need for the utmost care was not appreciated.

Deterioration of concrete structures in sea water is progressing in many places along all our sea coasts. When within a few years, or even months, a concrete structure costing hundreds of thousands of dollars shows marked signs of disintegration just because the necessary care was not exercised in its construction it is time to sound a note of warning. Concrete can be used successfully in sea water, but the price of success is eternal care.

Specially Ruled Sheets Have Wide Use in Drafting Room

Printed from Wax Plates, Little Trouble Is Experienced with Shrinkage—Not Adaptable to Large Structures

By Richard T. Dana
Consulting Engineer, New York City

THE USE of a standard cross-section paper for the plotting of curves which were to be blueprinted was found to be so convenient for other uses that in the writer's office it has practically supplanted other methods, except for maps and plans of large structures on which many of the details, such as rivet spacing, etc., require the use of extensive sheets. The success obtained resulted in the development of a set of methods employing a specially ruled paper for nearly all of the work for which, previously, the ordinary kind of tracing cloth, cross-section sheets and profile rolls have been employed.

The principal objections to the use of tracing cloth are that it turns opaque with age, and stretches unequally in various directions. Sometimes this stretching is considerable, and will vary with the weather. Furthermore it is ruined by water, so that if left by an open window, in a damp atmosphere, or over a radiator from which the steam is escaping, an expensive drawing may easily be spoiled.

Nor can it be satisfactorily used in a typewriter. Since it is easily cracked, it cannot be folded without injury, and hence is not conveniently portable. The small red ants, which infest the foundations and walls of buildings in hot climates, eat holes in the paper in endeavoring to get the sizing. Where these ants are present it is not safe to leave a tracing on the drawing table overnight.

Another objection to the usual systems lies in the fact that small tracings are of a good many different sizes, and are difficult to file satisfactorily. They must be kept flat and, when filed in large envelopes or folded in a sheet of heavy paper, are not readily at hand when wanted. They often become turned around in the drawer, the title of the desired sheet is seldom where one expects to find it; and consequently a certain amount of time is lost.

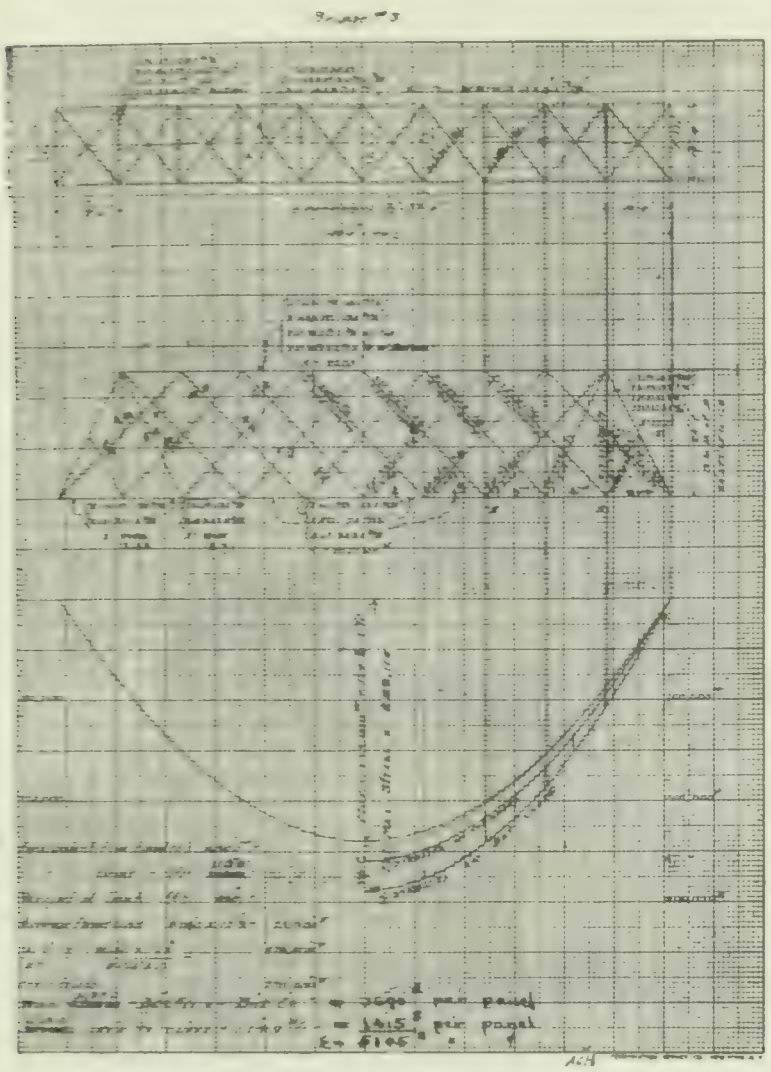
Ordinary Cross-Section Paper Is Faulty

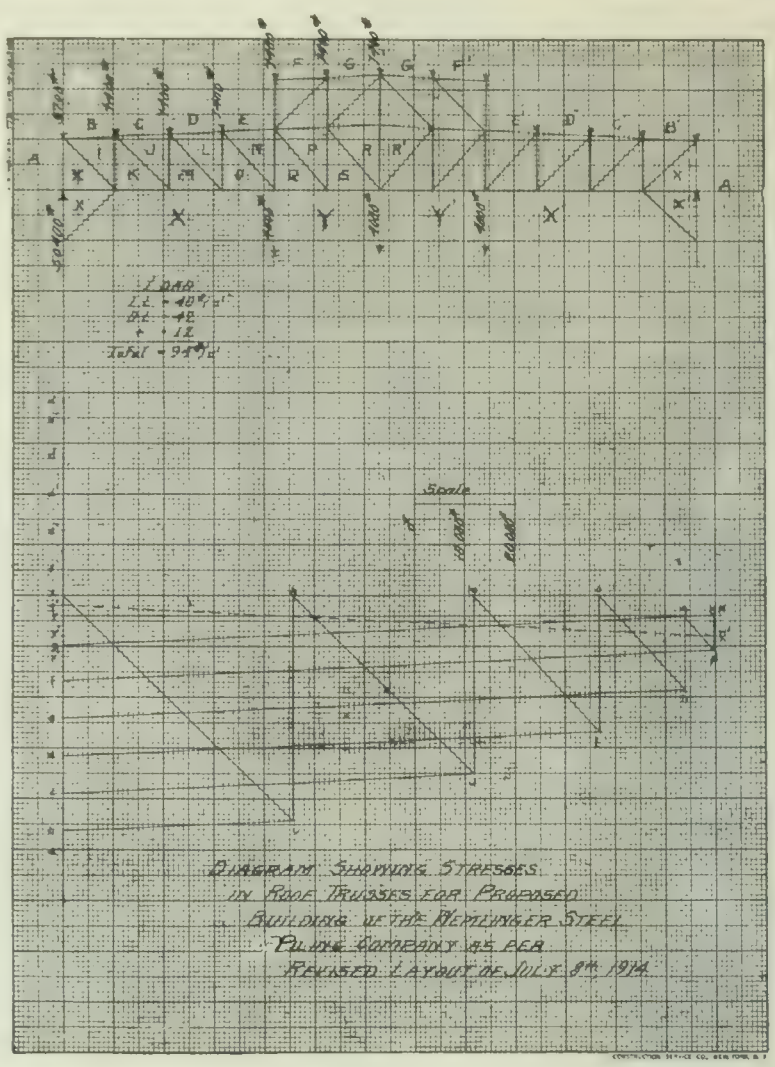
The ordinary cross-section sheets which are ruled to tenths of an inch have been found to have the following objections: (1) The paper is so thick that they cannot be satisfactorily blueprinted. (2) They are of an inconvenient size—too large for the letter file and too small for the map file. (3) They are too stiff to lie flat and are constantly curling. (4) The ruling is not convenient for the listing of tabular data on the same sheet with the cross-sections, the lines being so close together ($\frac{1}{10}$ in.) as to offer no guide for any but the smallest figures, whereas the inch lines are either too near together or too far apart to be used as column rulings. (5) The sheets cannot be satisfactorily folded on account of their thickness and stiffness, and when rolled for the sake of portability they acquire the rolling habit and object to lying flat ever after. (6) The use of a scale of 10 ft. = 1 in. for plotting cross-sections is not satisfactory, since the eye does not accurately interpolate between the $\frac{1}{10}$-in. lines; consequently the plotting is actually accurate to the nearest $\frac{1}{100}$-in., ordinarily representing $\frac{2}{10}$ of a foot. The same degree of accuracy in plotting can be accomplished on a paper ruled to about half this scale.

Nor Will Profile Paper Answer

In the case of profile paper we found that for most purposes there were the following objections: (1) It cannot be blueprinted unless tissue papers are used, and these are easily destroyed by careless handling, or even by heavy gusts of wind when they are not properly tacked down to the drawing paper. (2) It does not take erasure well. (3) The horizontal spacing of the heavy lines (4 in.) is inconveniently great for the plotting of 100 ft. stations, and the $\frac{4}{10}$-in. space is a little too small for the same purpose where two or more pluses must be entered between two 100-ft. stations. The approximate location of the pluses cannot be marked closer than to the nearest 10 or 15 ft. except with the use of a scale, which involves a serious waste of time. (4) The vertical spacing is usually not convenient, the heavy lines indicating feet or 10 ft., etc., and the light ones feet, or $\frac{1}{5}$ ft. To obtain greater precision than $\frac{1}{10}$ ft., a scale of 1 ft. per in. must be used, involving a value for the smallest space of $\frac{1}{5}$ ft., which is neither necessary nor convenient. (5) The profiles when rolled up are most inconvenient to carry about, and they occupy a very large space in the files, due largely to their shape. (6) In making use of them much time is lost, rolling them back from end to end to find the point wanted where the profiles cover a considerable length of line.







A PRECISION OF ⅛ OF 1 PER CENT. IS POSSIBLE OF ATTAINMENT

The inconveniences mentioned before came to mind with such monotonous regularity that after a number of years it was decided to experiment with sheets of paper 8½ in. wide by 11 in. long—the size of a standard letter head—punched in the left-hand margin for filing in a loose-leaf book, and ruled to $\frac{1}{20}$-in. with every fifth line heavy and every tenth line extra heavy.

For various reasons it was necessary that the ruling be as accurate as possible without making the cost of the paper prohibitive. Lithographed rulings were tried but it was found that in the process of printing from the stone the paper absorbed considerable water and shrank very decidedly in drying out. Moreover, in common with tracing cloth the shrinkage was not uniform in all directions, and the resultant error, while not a fatal defect, was nevertheless inconvenient for those operations involving the use of a scale upon the paper. The plan adopted was to rule a plate on wax with a dividing engine, the probable error of which was less than 0.001 in., or ¼ of the thickness of the fine lines on the plate. The plate itself measures 7½ in. by 10 in., which allows sufficient leeway on the paper for marginal notes and for binding. For convenience of handling the paper was made up into pads of 100 sheets each.

At first a bright red ink was used on the theory that this would blueprint better than other colors, but experiment showed that an olive green was much less fatiguing to the eye while working on the paper and gave entirely satisfactory prints. With the proper quality and thickness of paper it was found that pencil marks were readily transmitted to a blueprint. In this manner copies of pencil sketches were obtainable which were sufficiently legible for all practical purposes.

The paper when printed and after having been stored a number of months in the office and becoming thoroughly dried out is apt to show a slight shrinkage amounting generally to something less than $\frac{2}{10}$ of 1%. For our purposes this has never been enough to make it worth while to eliminate it, but it could probably be entirely removed by having the paper stored for several months before printing. Whatever shrinkage takes place seems to be nearly uniform, so that diagrams made on the paper appear in their true proportions.

In making detail sketches dimensions are furnished by the lines on the paper instead of by drawing lines and marking out points with a scale as when sketching on blank sheets. Sketches can be made in this manner very much more rapidly, and with the same degree of accuracy, as in the old way.

Good Paper Makes Record Permanent

The record thus made on a durable grade of paper is as nearly permanent as anything of this sort can be. It will probably be as fresh and clear and legible fifty years hence as the day after it was made. The sheets may be filed in a standard letter file with the papers belonging to their particular piece of work, or they may be filed in loose-leaf books or bound in permanent form with special binders. All these methods have been used interchangeably.

For use as cross-section paper these sheets, containing an area of 30,000 sq.ft. on a $\frac{1}{20}$th scale, are sufficiently accurate for most purposes, and can be plotted to the nearest 0.2 ft.

For surveys involving a very large number of sections it has been suggested that blueprints from these sheets on thick paper be used, determining the areas by cutting out the sections and weighing each on a chemical balance. Cross-section paper is sometimes objected to for plotting sections which are to be plani-

metered, as its shrinkage necessitates a planimeter setting that is difficult to determine. Where the weighing method is employed shrinkage is of no importance as the section is to be compared by weight to a unit section which has shrunk uniformly.

For use as profile paper these plates have been entirely satisfactory, each sheet running for 20 stations horizontally and for 150 vertically to an accuracy of 0.2 ft. or 15 ft. vertically with an accuracy of 0.02 ft When so used it has the advantage that mass diagrams and cross-sections can be placed on the same sheet, together with the tabular data accompanying the latter.

This paper has been used a great deal for progress diagrams, for which a 31-day month may be listed the short way of the paper, reading vertically when these sheets are filed in a loose-leaf book, and allowing a range for plotting of from 0 to 20 or any multiple thereof.

The original purpose for which the paper was designed was the plotting of curves, and for this the $\frac{1}{20}$-in. ruling has turned out to be very well adapted, since across the paper it runs from 0 to 150 and lengthwise from 0 to 200, thus giving a range sufficiently great for almost any kind of work.

Stress Diagrams and Equilibrium Polygons

One of the most convenient uses of the paper, and perhaps the last one which ordinarily would suggest itself, is for stress diagrams and equilibrium polygons in graphical statics. It would appear that small diagrams on this paper could not be made to sufficiently great precision to give a satisfactory check, but experience with it has shown that this is not the case. If the points are set with care, and the parallel lines ruled with a pair of small but accurate triangles and a wedge-pointed pencil, the resultant precision of the work is remarkable. It is entirely possible to obtain results within $\frac{1}{3}$ of 1%, which is satisfactory for most purposes. Very long lines on tracing cloth will be found not to be as accurate as they appear.

A convenient size of the equilibrium polygon is half the length of the paper or 1000 divisions. Working to one-fifth of one division for half of this length gives an average error of one in five thousand. This is very much smaller than the error in the setting of the rolls for the manufacture of structural steel shapes, and therefore any greater degree of refinement than this is a bit ridiculous.

The paper is used very largely in computing and tabulating figures, as will be noted by reference to the three plates accompanying this article which have been taken more or less at random from the files of this office. It is often convenient to typewrite titles and notes on this paper rather than taking the trouble to letter them on freehand. When this is done, a piece of carbon paper placed underneath the section paper with the carbon side up will so strengthen the imprint of the type that most excellent blueprints are obtained.

A curious feature of this paper is that it can be used as a protractor, and is more accurate than the ordinary paper protractors on the market. A great many other uses for this paper will suggest themselves to men in the various branches of engineering, but the above are given as suggestions and have been taken from actual experience in the use of the paper. About a year ago we turned the idea over to a publishing company which has placed it on the market, and I am informed that it is coming into extensive use.

The principal objection to the paper is its lack of adaptability for very much erasing. Pencil marks can be erased without difficulty or injury to the ruling, and ink lines may be taken out by the use of a sharp knife and a moderate rubbing with a medium rough eraser. Any heavy general erasing of the ink lines, however, is destructive to the ruling.

Convict Labor and Patrol System for Texas Roads

IMPROVED road maintenance organization for Dallas County, Texas, is recommended by J. F. Witt, county engineer, in a report based on an extended visit of inspection to central and eastern states. The county has about 600 miles of surfaced roads and 800 miles of earth roads, with an annual income of $200,000 from the road and bridge tax. It is divided into four districts, each having a commissioner.

By Mr. Witt's plan, in each district the 200 miles of earth road would be maintained by convict labor and new construction would depend upon the time that could be spared from maintenance work. It is thought that this restriction of the opening up of new roads would be offset by the extra attention given to the existing roads. The annual cost of the camp and of the bridge, timber and road machinery for the maintenance work would be $11,500. The remaining $38,500 for maintaining 150 miles of surfaced road would be allotted as $600 per mile for 25 miles; $300 per miles for 25 miles and $160 per mile for 100 miles.

There should be a general superintendent of maintenance at $1800 per year, of which each district would pay $450. He would spend most of his time traveling the roads and would report to the Commissioners' Court. He would have authority over the road gangs of the districts. In this way the work of the entire county would be standardized. Each district would have its supervisor and district gang of eight teams and drivers, as at present. These gangs would fill the bins with stone and gravel, and also distribute the material at the road side, for the use of the road keepers or patrol men. They would also patrol and repair 50 miles of the roads having the lightest traffic, to which no road keepers are assigned.

Road Patrol System Advised

These road keepers constitute an important feature of the proposed system. There would be twelve in each district, with 5 miles per man on the heavy traffic roads near the city, 8½ miles on the roads of next importance, and 12½ miles per man on the roads with light traffic. With material for patching and surfacing placed at convenient points along the road, the keeper would be on the road all the time, to keep it in good condition. He would have a team available for use with a grader or drag when necessary.

The road keeper should be identified to the traveling public. For this purpose Mr. Witt suggests that the man should wear a cap or hat of distinctive type and color. He should have also a flag or marker of the same color, to be displayed at the roadside when he

leaves the road at any time. This marker would indicate the road-keeper's location to the general superintendent when on his rounds.

One motor truck and trailer would serve the entire county and is considered essential for long hauls. This outfit would cost $5000, or $1250 for each district. It is recommended that all road building material be purchased by the Commissioners' Court, in sufficient quantity to insure good prices and on the basis of competi tive bids when possible.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

How One Engineer Feels About the Civil Service Examinations

Sir—I have gained the impression that practically all appointing officers try to evade the civil service rules and often from exactly opposite motives. At one end of the scale is the engineer of ability who resents any attempt at dictation as to the men he shall employ; at the other end, the politician who wishes to appoint friends incapable of passing the examinations. It seems as if something is fundamentally wrong with a system where such a situation exists, even though engineers at least openly defend the system and may at times find it of value as a protection against political pressure where a large number of appointments are to be made.

Personally I have always felt that a man was justified in feeling resentment at the necessity of passing a civil service examination when he considered himself a person of fair intelligence and education whose record was open and could be ascertained from outside sources by any appointing office.

I have known a number of men whose subsequent record has shown them among the best engineers who have flatly refused to consider a position when they were required to take an examination.

Boston. CIVIL ENGINEER.

Macadam Roads in War Zone

Sir—As a road official in charge of the construction and maintenance of macadam highways, I have read with great interest W. J. Weir's article on "Road Maintenance in the War Zone of France," in *Engineering News-Record* of Sept. 13, p. 488, your editorial of the same date and the letters to the Editor in subsequent issues.

One factor that seems to have been overlooked in the discussion is the "flexibility" of the macadam road—in other words, a macadam road will carry any amount of traffic that could come upon it, provided the surface has constant attention. Had the French roads been surfaced with "permanent" material before the war, I doubt that the engineers in charge could have foreseen the present demands of war traffic. The width of metal and the foundation depth may be readily increased on a macadam road without interrupting traffic.

As for the actual maintenance of a macadam road under this traffic, it has no doubt required thousands of men, but I understand that this work has been done largely by prisoners and men unfit for military service. The maintenance of a system of macadam roads in peace time would show very likely a small cost per mile for the entire system. Had France depended on a few "permanent" roads it is doubtful if the famous "taxi-cab dash to the Marne" would have been possible.

It seems to me, therefore, that the conclusion in your editorial note, Sept. 13, p. 481, that macadam lends itself to the emergencies of war best of all types of hard roads is correct, but it does not follow that macadam is the best road. War simply demands a reversion to the simpler types of construction, as for instance the corduroy and plank roads now being built by the French engineers in Flanders, which are practically identical with the first "pikes" through the swamps of this state.

R. L. LONGSHORE,
Decatur, Ind. Deputy Engineer of Adams County.

Sir—The writer was very much interested in the article "Road Maintenance in the War Zone of France," by William J. Weir, in *Engineering News-Record*, Sept. 13, p. 488. Mr. Weir seems to think that the water-bound macadam road, the prevalent type in northern France, is the only type of pavement that could be used successfully under the conditions prevailing in that section. He states:

"One is inclined to wonder what would happen to our bituminous concrete, or to our brick construction if these were subjected to the continuous pounding of traffic, such as occurs, for instance, on the Anicus Road. They would develop severe weakness, of course; no standard surface would withstand such wear. I believe that the difficulties in repairing them in kind, would be enormous owing to the absolute lack of time for necessary refinements. Modern war traffic over our standard country highways would undoubtedly bring serious problems of maintenance and repair."

Mr. Weir also makes the following statement:

"The Bar-le-Duc-Verdun road, about 50 miles in length, had carried, during the months of the attack on Verdun, a continuous chain of about 5000 motor trucks night and day. The total wear and depreciation of the surface must have been terrific."

After a careful study of Mr. Weir's article it is my conclusion that the water-bound type of highway in the war zone has to be resurfaced or renewed continually, and is not subject to what one may term strict maintenance and repair. This seems to be borne out by his further statement:

"When, and as soon as, the shifting of the point of big actions permits, *complete repair and restoration of the road must be undertaken.* In other words the surface must be worn out."

This is a logical deduction from our experience in New York State with this type of construction. Water-bound macadam, whether plain or surface-treated, is a light-traffic road at the best, and may be classed rightly as only semi-durable. Surely, the so-called permanent type used in this country, such as concrete, brick and bituminous concrete, would not be ground up and blown away as in the case of water-bound macadam. Any of

these types, which our experience has found more durable, probably would take care of the war zone traffic with ordinary maintenance and repair.

New York is having excellent results with its first-class concrete highway construction where such roads have been built outside of large cities for heavy motor and horse-drawn traffic. Highways of this type, leading from Buffalo, Syracuse and Albany, are taking care of a steadily increasing mixed traffic with no appreciable wear and a very low maintenance cost. This type has also the advantage of a low first cost, and can be maintained easily with ordinary labor without closing them to traffic.

Mr. Weir's article is excellent in that it gives the American highway engineer a very good idea of the kind and density of traffic, the methods used to repair water-bound macadam (the only type encountered), the grades, drainage, width and other details, but it does not convince one that the permanent types of road would be unsuccessful. It is certainly unfortunate that Mr. Weir could cover the field only superficially, and that he was unable to get into contact with officials who directed the road engineering, and who probably by this time have formed some ideas as to the types of roads needed in the reconstruction of the highways in France.

JOHN H. HUBER,
Resident Engineer, New York State Commission of Highways.
Syracuse, N. Y.

Concrete Floor Slabs Distribute Loads to Steel Bridge Stringers

Sir—The article in your issue of July 12, p. 65, entitled "Standard Bridge Floors of Concrete Slabs on Steel Beams," by William Snaith, assumes that the wheel loads of the roller are transmitted through the concrete slab to the steel beams below without being distributed by the slab.

Bulletin 28 of the Ohio State Highway Department, published in September, 1915, gives the results of a series of tests conducted by the writer which show that the slab does distribute concentrated loads in all directions and that the stringers below are not nearly so severely loaded as is assumed in Mr. Snaith's article. A synopsis of the results of these tests was published in *Engineering Record*, Nov. 6, 1915, and in *Engineering News*, Nov. 11, 1915. Other tests along the same line have been conducted by the United States Office of Public Roads.

The reduction in the amount of live load carried by a stringer and the more nearly uniform distribution of the load result in a considerable saving in the supporting steelwork and still allow an ample factor of safety.

Based on the results of these tests and others which it has conducted on bridge floors in service; the State Highway Department of Ohio uses the following assumptions in designing reinforced-concrete slab floors and their supports.

Reinforced-Concrete Slabs—For slabs without pavement or earth covering, with one or more concentrated loads on a line parallel to the main reinforcement, the slab extending in width each way from the point of application of the load a distance greater than the span, or supported at its edges by beams capable of supporting the resulting imposed weight, each foot width of slab shall be assumed to carry as concentrated loads each load divided by $(1.2d + 1.5)$, where d is the distance in feet from the load to the nearer support. In case two equal concentrated loads 6 ft. apart are on a line perpendicular to the main reinforcement and three or more feet from the nearer support, each foot width of slab shall be assumed to carry as a concentrated load the weight of one load divided by $(0.5d + 3.5)$. With pavement or earth covering or both, the above loadings per foot width of slab may be assumed as uniformly distributed loads, the distribution lengthwise of the slab to extend each way from the point of application a distance equal to the depth of earth covering plus twice the depth of pavement. Axle loads of railway cars may be considered distributed upon three ties.

Stringers for Reinforced-Concrete Floors—The greatest weight that will be upon any intermediate beam of a series of beams approximately uniformly spaced and not over 6 ft. apart, due to a concentrated load or to two concentrated loads 6 ft. apart upon a line perpendicular to and at the middle of the span, may be taken as equal to the amount of one load multiplied by one-sixth of the beam spacing in feet. If the concentrated load is at or near the stringer support, the total weight of one load shall be assumed as carried by a single beam. For intermediate postions of the load between the middle and a support the distribution shall be taken as proportional. If the arrangement of the stringers is such that a concentrated wheel load may be applied to the floor within one-half the stringer spacing of the outside stringer, it shall be proportioned to carry not less than one-half the weight of such wheel load, and in no case when a wheel load can be applied between the outside stringer and the next intermediate stringer shall the outside stringer be proportioned to carry less than an intermediate stringer.

The writer is indebted to John R. Chamberlin, Deputy Highway Commissioner in charge of the Bureau of Bridges of the Ohio State Highway Department for the above information as to its present practice.

CLYDE T. MORRIS,
Professor of Structural Engineering, Ohio State University.
Columbus, Ohio.

Automatic Flood Gates Are Patented

Sir—We see in *Engineering News-Record* of Aug. 9, 1917, p. 271, a description of automatic floodgates on the crest of the Nashua dam, Iowa, by C. W. Oliver, in which it is said that this particular type of floodgate "was imported from Switzerland by the Fargo Engineering Co." Not only in our own interest but also in the interest of your readers, we request you to state that the type of automatic floodgates described in the article mentioned is patented, and that the United States patents are controlled by our concern. The Fargo Engineering Co., Jackson, Mich., is our eastern American representative and by its intervention we furnished the detail drawings for the automatic gates at Nashua, imposing loyalty on the owners of the dam.

BARRAGES AUTOMATIQUES S. A.,
Zurich, Switzerland. BY W. O. SOMMER.

THE ENGINEER IN FIELD AND OFFICE

A DEPARTMENT DEVOTED TO DETAILS OF THE DAY'S WORK

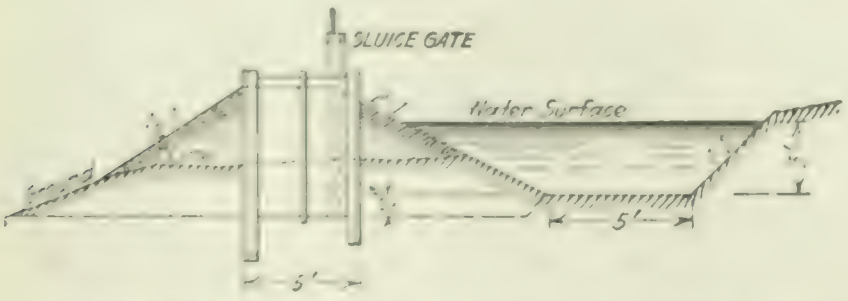
Simplified Cross-Section for Canals on Hillside Locations

BY VAUGHAN WOOD
Montgomery Creek, Calif

FOR canals that follow the contour of the hills, where the side slope is equal to one foot in ten or steeper, the Waterford Irrigation District, Stanislaus County, California, has been using a simplified cross-section. The same bottom width of canal and the same cross-section of lower levee are used as for flat-section canals. The upper side is excavated to a 1:1 slope and no levee constructed. This design effects economy in excavation and also does away with the pipe drain beneath the canal, since drainage goes directly into the canal section.

However, side spill gates are placed in the lower levee about one-half mile apart, preferably in a wash that can carry away drainage. These spill gates are built with a floor 1 ft. below the bottom of the canal, and when the irrigating season is over they are opened and allow the storm water to sluice out a large part of the accumulated sand which may be in the bottom of the canal. Besides effecting a saving in excavation and affording the advantage of being able to use the water which otherwise would be wasted under the canal sections through the drains, such practice prevents water from forming boggy places in the flat ground at the base of the hill.

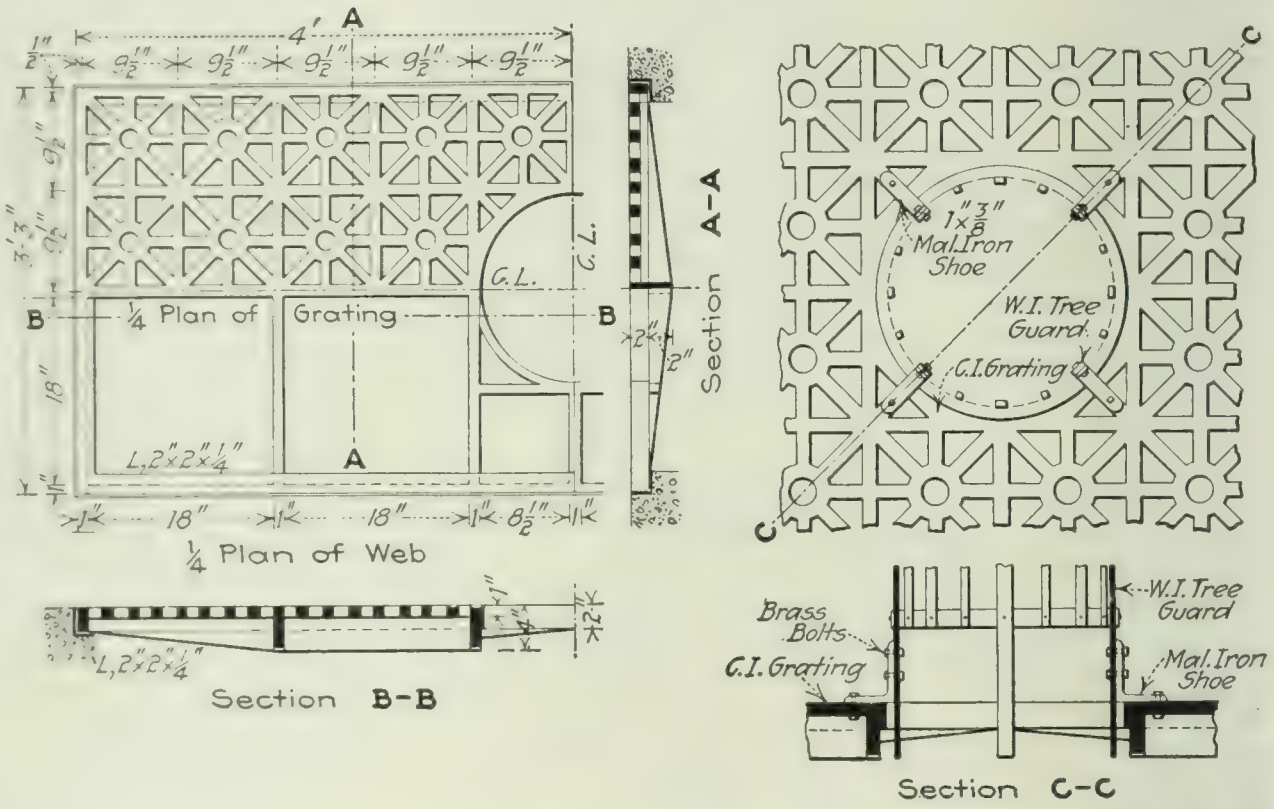
Another feature of interest in connection with these canals is the method used in locating a normal-cut canal from profile alone. The difficulty encountered in this regard was due to the fact that the normal center cut was very variable, since the side slopes varied with extreme frequency. The method devised and used was to cross-section the canal without setting cut or fill stakes; then yardage was figured and mass diagrams were plotted. By means of profile and mass diagrams together, slight changes could be made with one relocation that would approach the economical location.



ADVANTAGEOUS DESIGN FOR CANAL ON SIDE HILL

Cast-Iron Gratings Protect Tree Roots in Albany Business Street

STATE STREET, Albany, N. Y., furnishes an example of how trees may be preserved even in the business thoroughfare of a large city. In order that the roots of the tree may have plenty of air and moisture, they are surrounded by an 8 x 3¼-ft. cast-iron grating, which is flush with the surrounding sidewalk or pavement and forms a part of it, but nevertheless protects the roots. The accompanying sketch shows the details of the grating. It was designed by the Albany Bureau of Engineering, which is under F. R. Lanagan, city engineer.



ALBANY SHADE-TREE GRATING

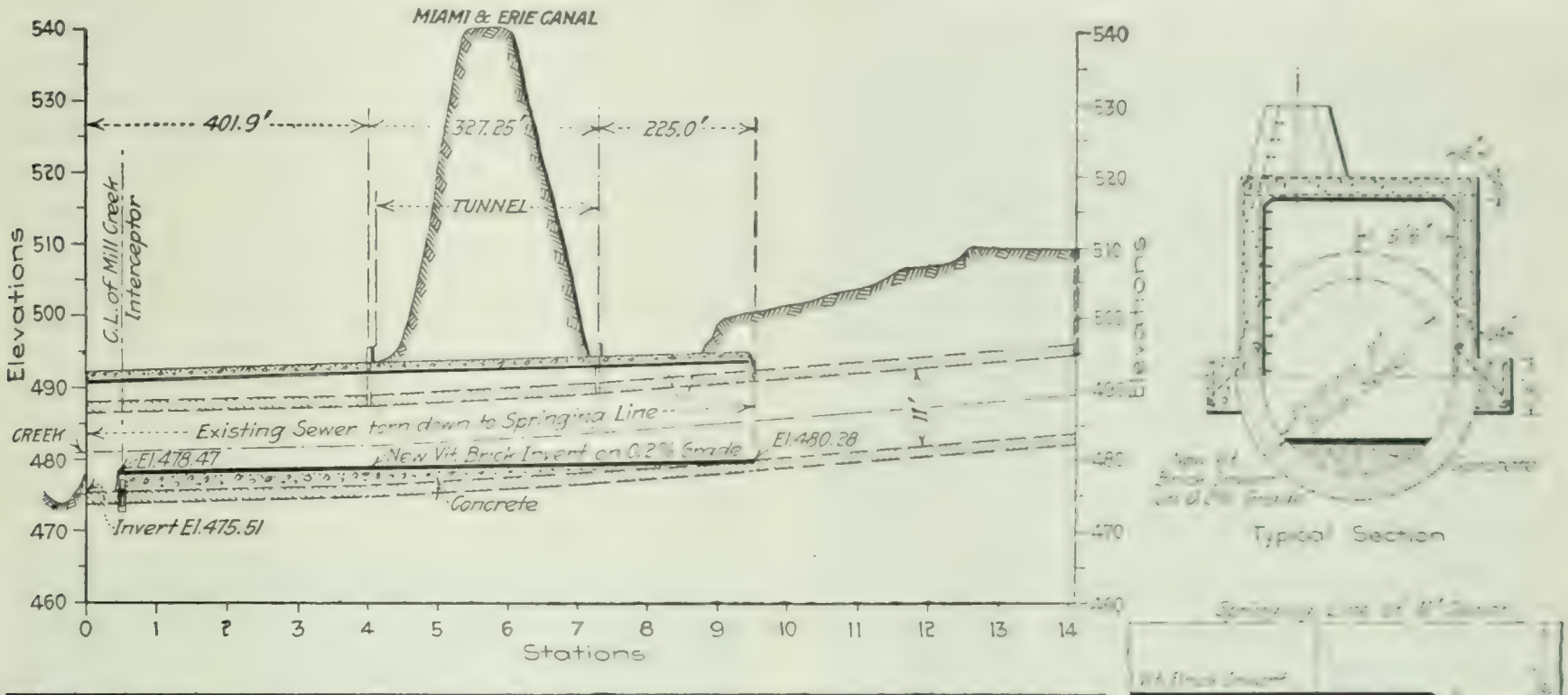
Enlarging an Old Brick Sewer

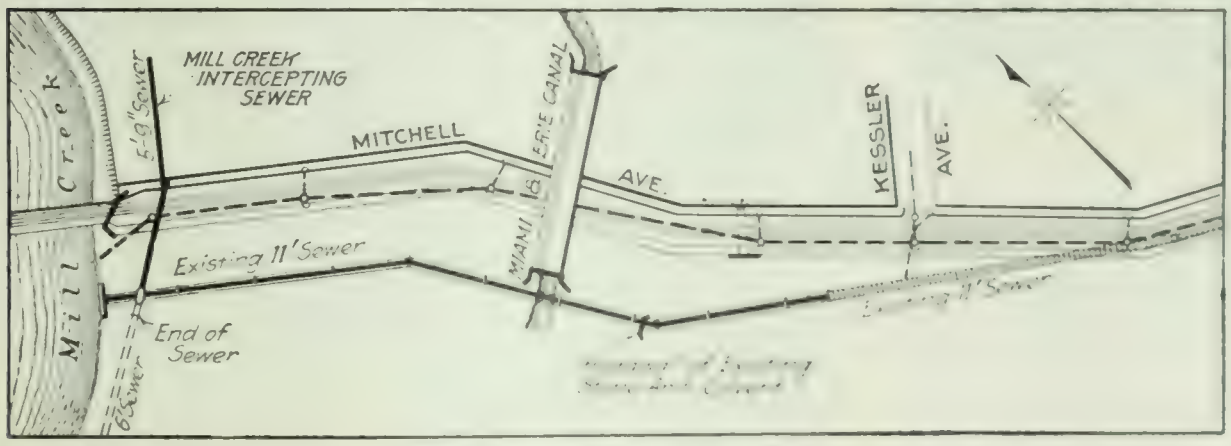
REMOVING the upper half of a four-ring 11-ft. circular brick sewer is the delicate part of a contractor's job on a sewerage improvement now in progress in Cincinnati. The removed portion of the old sewer is being replaced by a rectangular reinforced-concrete structure of the form shown by the accompanying typical section. A new invert is being placed on top of the old invert at a change of grade, in order that the flow line at the sewer outlet may be 3 ft. higher than before. The work is part of Contract 4 of the Mill Creek interceptor, and is being done by D. P. Foley, a Cincinnati contractor.

The three main reasons for the removal and reconstruction of the old 11-ft. sewer were: (1) That the

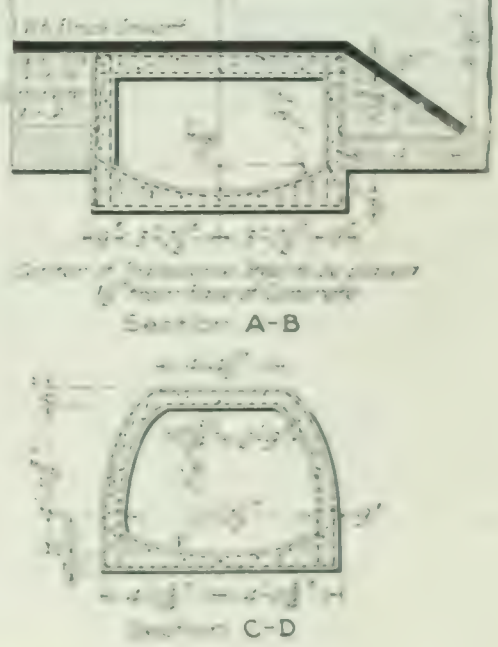
Mill Creek interceptor, which is located 50 ft. from the outlet of the trunk sewer at Mill Creek (shown in plan and elevation on the accompanying drawings), may pass under the trunk sewer without using an inverted siphon; (2) that the trunk sewer, which is the outlet for a residential area of 1700 acres, may have its capacity increased from 860 to 1800 sec.-ft. or to approximately the estimated probable run-off for this district; and (3) that the invert at the outlet end at Mill Creek may be raised to the level of the creek bed instead of being 3 ft. below the bed of the creek.

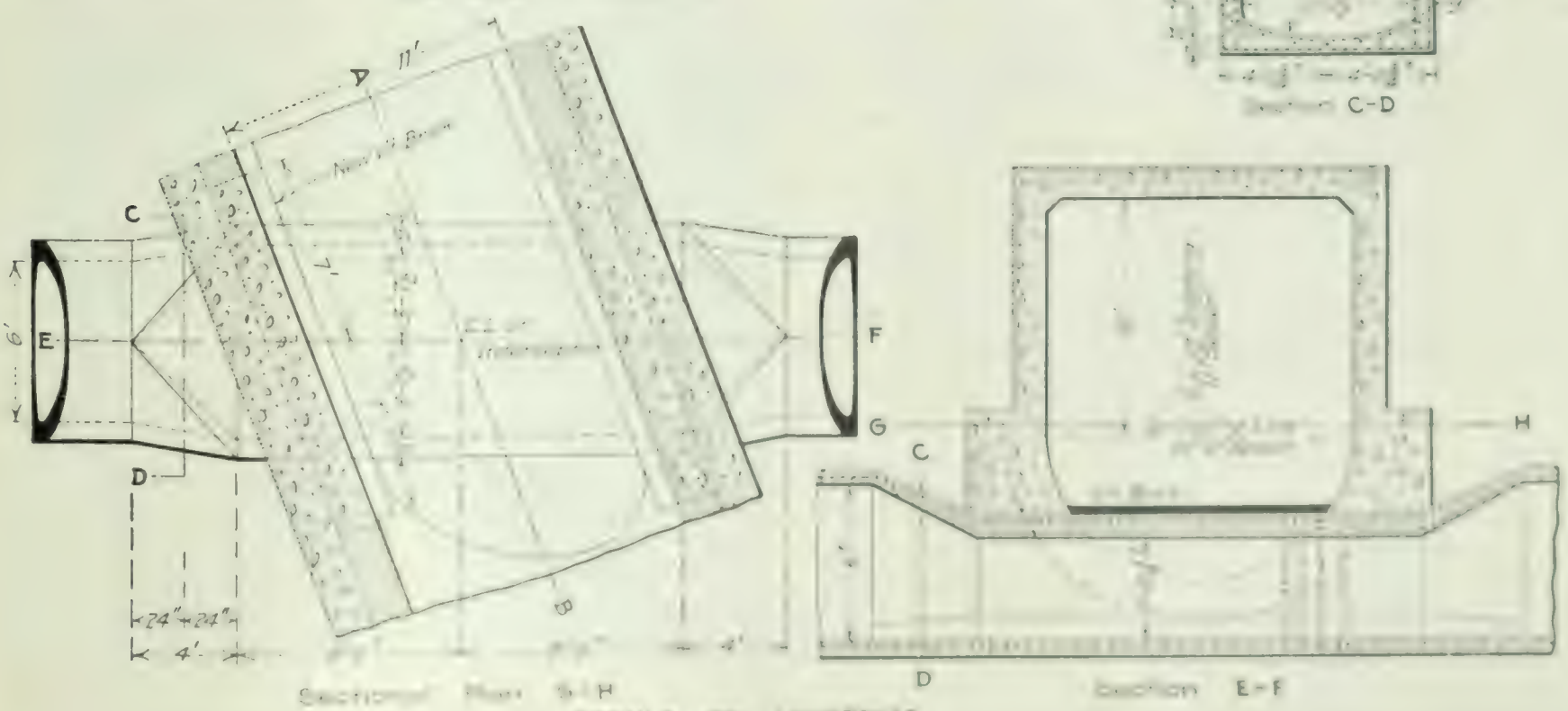
Over the old sewer was an earth filling having an average depth of about 15 ft. This was removed by a ¾-yard steam shovel. The old sewer was uncovered to a point 2 ft. below the springing line and then the concrete haunch walls shown in the typical section were placed. Next, the brick arch was removed by hand labor in two operations—first, removing the outer ring





MILL CREEK INTERCEPTOR





DETAILS OF UNDERPASS

NEW INTERCEPTOR WAS PASSED BENEATH OLD TRUNK SEWER WITHOUT INVERTED SIPHON. CAPACITY OF OLD SEWER DOUBLED AND OUTLET RAISED ABOVE CREEK BED

of brick by picks and bars, and, second, breaking the inner rings by sledging and permitting the broken material to fall on a temporary platform, from which it was removed by hand labor. Wooden forms were then set, the steel placed, and the complete concrete section above the springing line poured in one operation.

Some of the troublesome parts of the work were: (1) The fluming and caring for a dry-weather flow in old sewer of about 1,500,000 gal. of sewage per day, and in times of storm the run-off from a drainage area of about 1900 acres. As there were 26 days during June and July on which the precipitation was 0.01 in. or over, the interference was rather serious. (2) The placing of this large rectangular section in tunnel and beneath the Miami and Erie Canal which, at this point, is on an earth fill about 55 ft. above the springing line of the old sewer, and in the tunnel the removal of a stone arch culvert constructed at the time the canal was built, in addition to the removal of the arch of the old brick sewer.

The main interceptor has a 6-ft. semi-elliptical section. Its flow line and the shape of its invert underneath the trunk sewer were retained, the increased capacity in the underpass being obtained by increasing the width of the intercepting sewer.

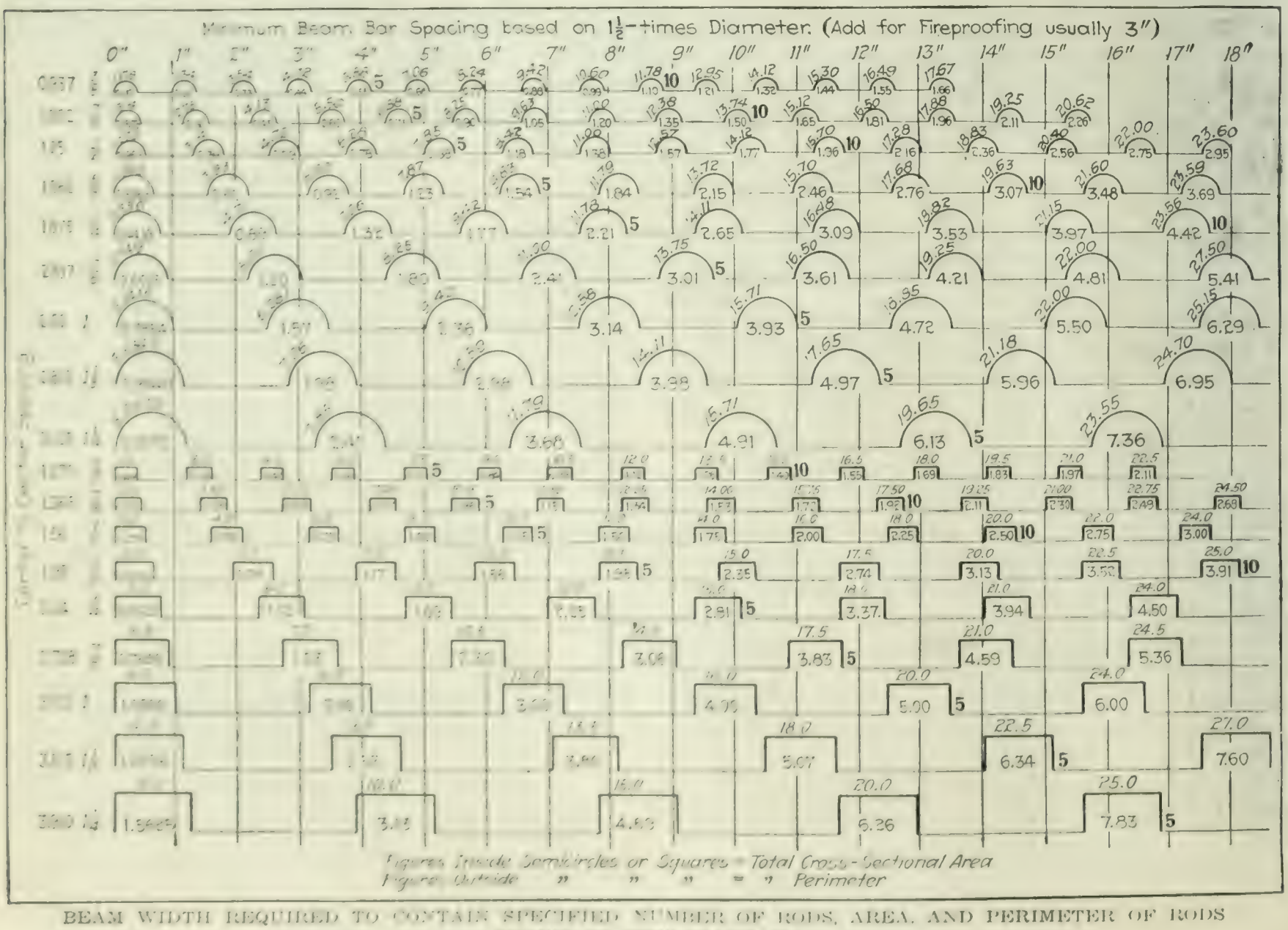
Diagram Facilitates Spacing of Reinforcing Bars

A DIAGRAM which aids a reinforced-concrete designer to select the proper number and size of rods in a beam has been devised by Ralph R. Leffler, of the Concrete Steel Products Co., Chicago. The diagram is based on the Chicago requirement of a spacing $1\frac{1}{2}$ times the rod diameter and represents to scale the disposition along a beam of square and round rods from $\frac{3}{8}$ in. to $1\frac{1}{4}$ in. diameter. The figures inside the semicircles or squares give the total cross-sectional area of the rods up to the one that is noted, while the figures outside give the total perimeter, to be used in figuring bond.

To illustrate the use of the diagram, the over-all distance of seven $\frac{3}{4}$ in. round bars (area = 3.09 sq.in.) is seen to be 12 in., to which 3 in. is usually added for fireproofing, making the required width of the beam to accommodate the bars in one layer of minimum spacing equal to 15 in. If a width of 15 in. is too great, practically the same steel cross-sectional area can be secured by using four $\frac{7}{8}$ in. square bars (area = 3.06 sq.in.) whose over-all distance equals $9\frac{1}{16}$ in., to which adding 3 in. for fireproofing gives a beam of $12\frac{1}{16}$ in. or 12 in.

Further study of the tabular diagram will show it to be very advantageous when different sized bars totaling a required area are used in a beam, when two layers are used, when bond is the controlling factor, when either squares or rounds can be used as may be more economical.

In case the requirements for the spacing of bars on any particular job or in any city vary from those of the Chicago code a similar tabular diagram conforming to those particular requirements can be constructed very easily.



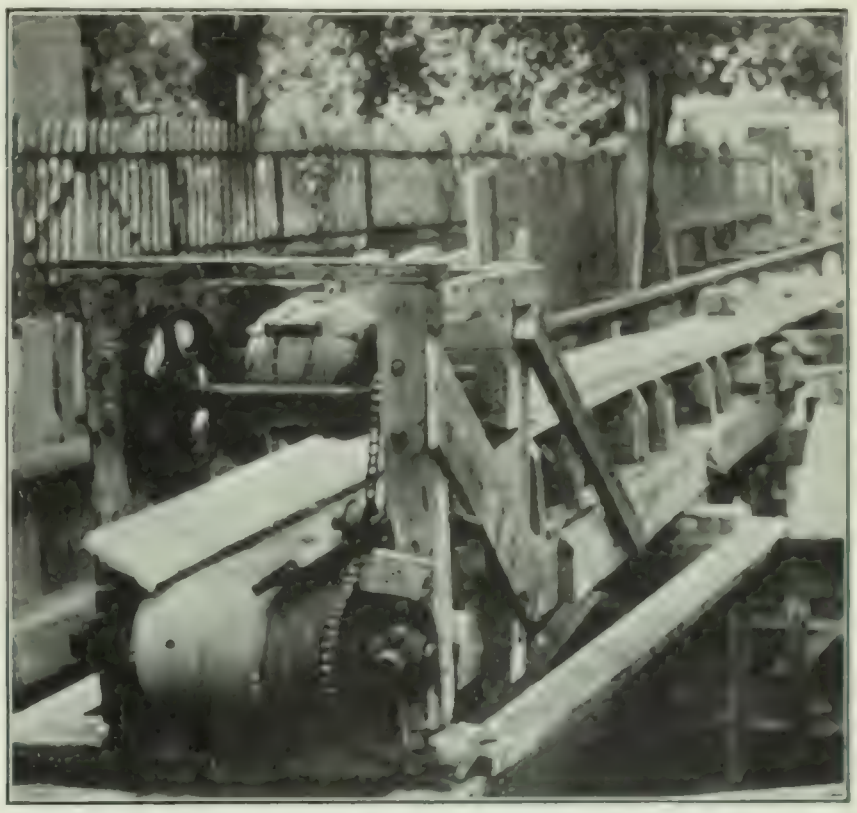
BEAM WIDTH REQUIRED TO CONTAIN SPECIFIED NUMBER OF RODS, AREA AND PERIMETER OF RODS SHOWN BY THIS DIAGRAM

HINTS FOR THE CONTRACTOR

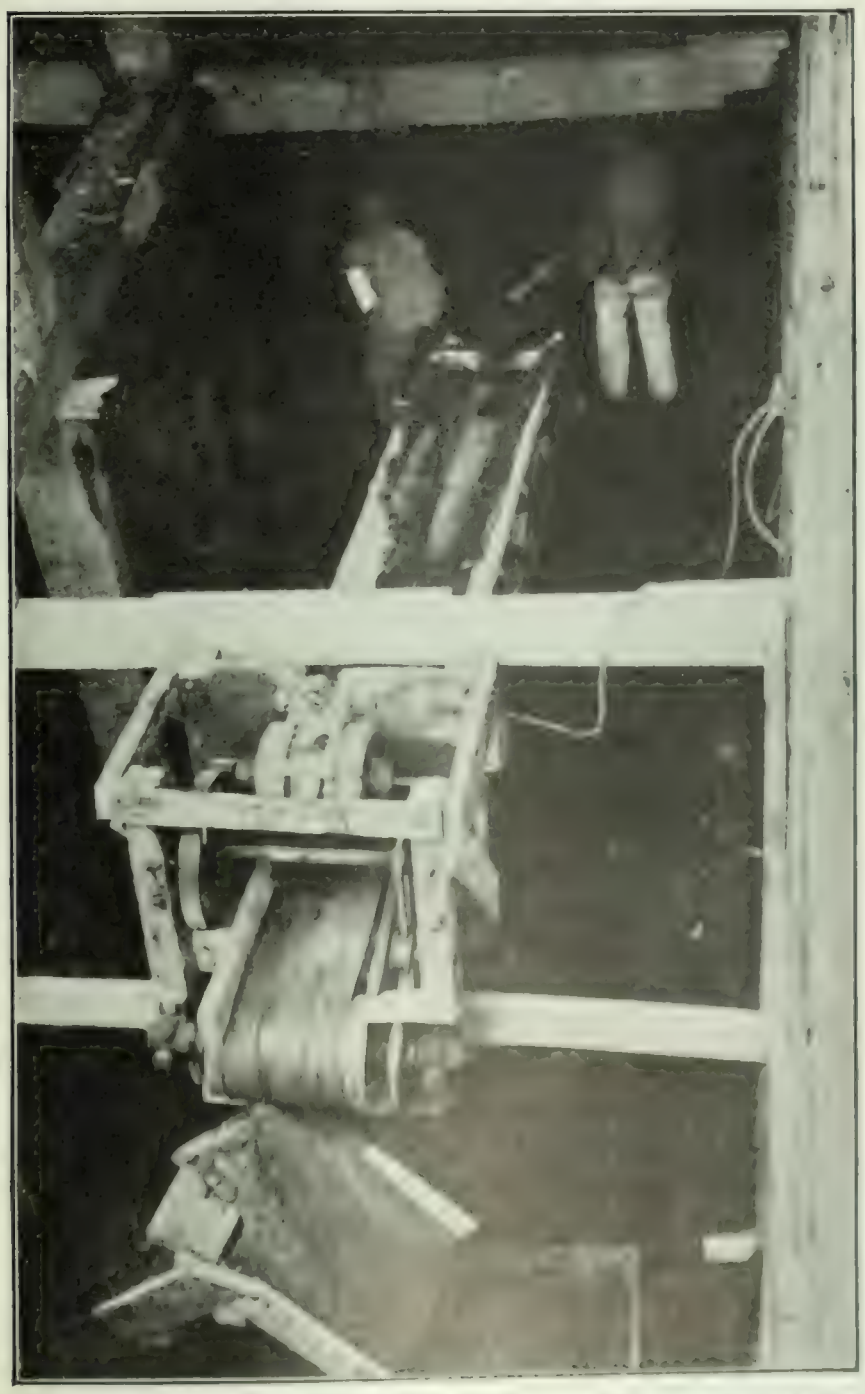
DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Portable Belt Conveyor Takes the Pitch Out of Shoveling

SHORT portable belt conveyors are used in a section of the Nostrand Avenue subway, under construction in Brooklyn, to fill cableway buckets with earth from under the street car tracks. The conveyors are made in 20-ft. sections, each with a 1-hp. General Electric or Westinghouse motor set above one end, as shown in the picture. The frame of the section consists of two 3-in. planks, with a 1-in. floor nailed on. The rollers are fastened to supports carried by this floor. The floor is made tight to prevent dirt from falling through to the wrong side of the belt and injuring it by getting next to the rollers. These sections are rather heavy for hand handling, but where the cableway is handy they are moved easily. Several men may shovel on one of these belts at the point nearest to where they are digging, and all the dirt will be taken away and dumped at the upper end of the conveyor. Here there is a pivoted chute, as seen in the picture. Swinging this slightly about its pivot, which is vertical, throws the dirt into the other bucket. By this method the cableway may set down an empty bucket alongside the full one, and the dirt stream may be shifted into it without moving it to the point where the full one was.



SPEED REDUCTION IS THROUGH THE GEAR AND CHAIN DRIVE



SMALL BELT CONVEYOR GETS EASILY INTO PLACES HARD TO REACH

These conveyors are to be employed on several sections of the work, as the two steam shovels are not able to get along as fast as desired on account of cramped quarters and inability to get rid of earth as fast as it can be loaded. On a finished section of the work they were used in large numbers, being arranged in tiers and running in the same direction as the car tracks carrying the buckets. In this way the shovelings of many men were brought together in buckets, to be taken up out of the pit at one point.

The work is being carried out by the Newman & Carey Subway Construction Company.

Planks Laid on Hill Save Breakage in Rolling Brick Pavement

BY JAMES A. CAIN

IN LAYING brick paving at Vernon, Penn., recently it was found impossible to ascend a steep grade over newly laid bricks with a road roller because the friction pulled the rows of bricks over and threw many of the bricks out of line. The roller could descend the grade without trouble, but in order to reach the top a long detour through side streets was necessary, involving great waste of time. A roadway of transverse

planks about 200 feet long and a little wider than the roller was then laid. The roller made a round trip over this planking in one position and the planking was then moved sidewise. The trips were repeated until the entire street had been rolled. The results were very satisfactory, the original alignment was retained, and only a few bricks were broken, whereas bricks were turned over and a good many cracked in the course of the attempt to roll the grade without planks. Shortly after the work at Verona was finished the same method was successfully used in rolling hills on brick paving at Belle Vernon, Penn.

On both paving jobs J. I. Dick, general contractor, Scottdale, Penn., did the work, and Douglas & McKnight, engineers of Pittsburgh, supervised the construction. The writer represented the engineers on the Belle Vernon work.

Concrete Plant Places Backfill

A CONCRETE-MIXER car used in building retaining walls is used also for backfilling behind the walls, on sections of the Brighton Beach Rapid Transit lines in Brooklyn.

The plan, devised by N. L. Kennedy, superintendent for the Intercontinental Construction Company, makes use of a track mixing plant. Dump cars loaded by the steam shovel, or by motor trucks dumping over the completed wall, are run to the concreting car, which has a Lakewood mixer equipment. The earth is shoveled into the charging hopper. This delivers it to the drum, where water is added. The wet material is discharged into the elevator bucket, which in turn dumps it into a chute extending over the retaining wall. The material is wet enough to flow for a distance of 30 to 45 ft. along the back of the wall.

This plant has averaged 100 cu.yd. of fill in 10 hours, with a crew of two hoisters and six laborers. The cost is about 25c. per yard. This method of filling is used at points which are inaccessible by road, and the work is done at odd times when the mixer is not used in building the concrete walls.

Ropes Simply Stretched Catch Form Panels in Stripping Floor

By Samuel Warren
New York City

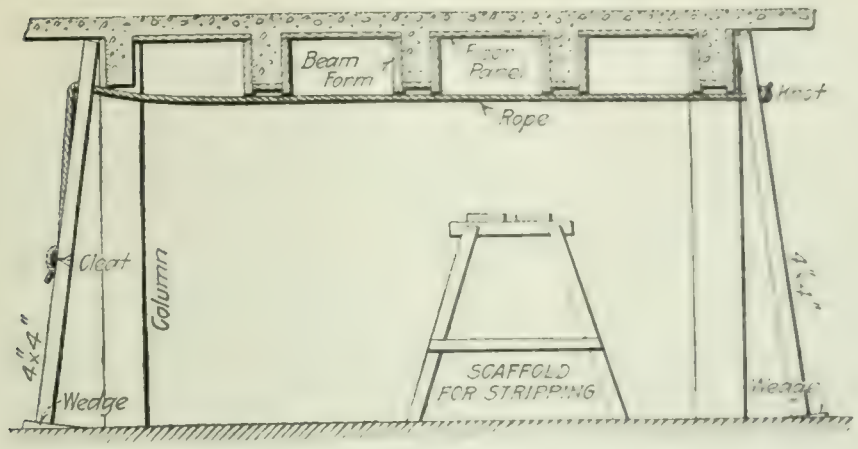
A SIMPLE RIG for catching floor forms in stripping, and one which insures the minimum of damage, is illustrated in the sketch.

The rig consists of pairs of posts, each made up of two pieces of 4 x 4 cut slightly longer than the clearance between the floor and the ceiling. About a foot below the top of each post a hole is bored. An inch rope is passed through the holes and knotted against one of the posts. The posts are then set as shown in the sketch, and are held tightly in place by a wedge at the bottom of each. The loose end of the rope is then pulled taut and held by means of a cleat.

After the shores are removed and the floor joists for the floor panels are knocked out, a scaffold consisting of planks on horses is placed underneath. From this the men work to loosen the beam and girder forms and floor panels. These fall but a small distance, being caught by the ropes. In case a form breaks loose, the workman can prevent injury to himself by ducking below the level of the ropes.



CONCRETE PLANT PLACES 100 YARDS OF BACKFILL A DAY

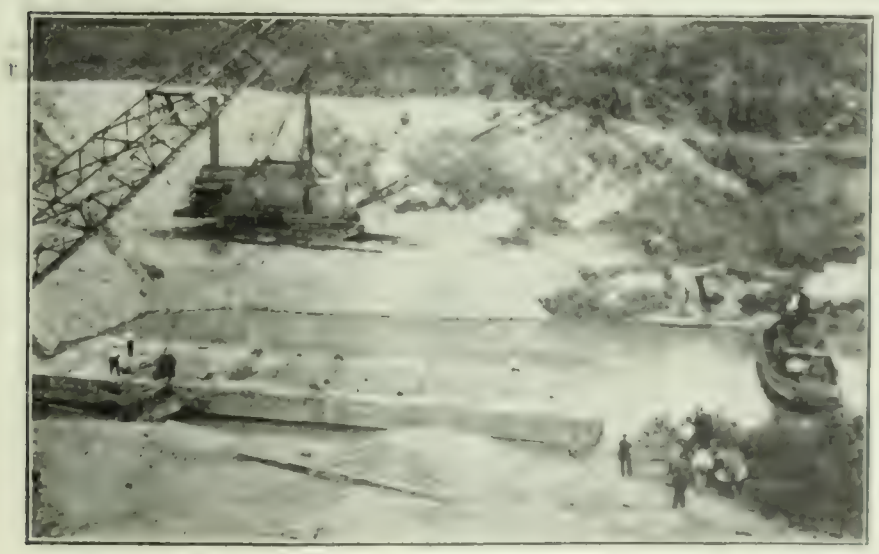


ALL THE FORMS IN A BAY LOWERED TO FLOOR AT ONCE BY SLACKING ROPES

As soon as all the forms have been stripped they are lowered to the floor by loosening the ropes simultaneously at each cleat. The same apparatus can be used for stripping flat slab panels by leaning the opposite posts away from each other. A strain on the rope only serves to hold the posts more firmly, because they are slightly longer than the distance from the floor to the ceiling.

Canal Is Excavated to Accommodate Spoil from Dump Scows

EXCAVATION of a dumping site for dump scows was made necessary by the absence of available dumping grounds, in part of the canalization of the Hudson River for the Champlain Canal. To provide for this need, the contractor excavated a canal parallel with and a few hundred feet from the river bank. It is 60 ft. wide and 12 ft. deep, and about 3000 ft. long. Two dragline excavators with 105-ft. booms and 3½-yd.



EXCAVATED MATERIAL IS DUMPED BY BARGES INTO CANAL AND THEN HANDLED BY DRAGLINE MACHINES

buckets worked on opposite sides of the cut, and deposited the spoil as far away as possible, leaving wide berms on which the machines could return.

Tugs bring the 200-yd. steel barges to the end of the canal where they are dumped. The dragline machines then pick up the dumped material and place it between the spoil banks, making a pile about 50 ft. high and 250 ft. wide. As the machines work backward along the berms they gradually fill the canal and the space between the spoil banks. The work is shown in the accompanying view, which shows the canal partly filled and a barge in position for dumping. At the right is the Hudson River.

This work is being done near Waterford, N. Y. The Dunbar & Sullivan Dredging Co., of Detroit, has the contract and Richard Goode is its superintendent. The construction is under the supervision of Geo. D. Williams, division engineer, Department of the State Engineer and Surveyor. John McBride, senior assistant engineer, has direct charge.

Road Machine Does Heavy Side-Hill Grading at Rapid Rate

AN AUSTIN "Mammoth grader" has been used effectively in Logan County, Arkansas, in making side-hill cuts at a rapid rate. An interesting example of this work was the widening of a mountain trail between Boonville and Sugar Grove into a wagon road with



OUTFIT DOES MILE OF HEAVY GRADING IN FIFTEEN HOURS

no other earthwork than could be performed by the use of this machine. As the illustrations show, the extended axle permitted the cutting blade to dig into the side-hill bank, the cutting effect being further facilitated by the offset hitch attaching the traction engine to the grader. On this work the grader blade dislodged rocks weighing up to 400 or 500 lb. apiece. The road was graded wide enough to admit the passing of two motor cars or loaded wagons at any point. The first mile of the road, graded under unusually severe conditions, was completed in 15 hours of actual working time.

Cantonment Road Building in Record Time

A record-breaking piece of road building was completed last week in connection with the army cantonment near Louisville. This is one of the few military establishments that have built permanent roads. In 67 working days the contractor completed 42,360 sq.yd. of Trinidad asphaltic concrete highway laid on a concrete base, or about 6 miles of road 18 ft. wide. A mile of the road was over a 3-ft. fill, and immediately upon its completion a traffic count showed that 1000 vehicles passed over it within the first hour. Most of these vehicles were motor trucks and wagons carrying loads of troops one to five tons. The record made by the Bickel Asphalt Paving Co., the contractor, is all the more remarkable in view of the fact that it was necessary to haul and crush all the stone used on the work.

NEWS OF THE WEEK

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

3000 Applicants for Road-Building Regiment

Men from 37 States, Panama and Alaska Accepted as Result of Engineering News-Record's Recruiting Campaign

More than 3000 applications have so far been received for enlistment in the new 23rd Regiment of Engineers which is to go to France immediately and build and rebuild roads "over there."

This information was furnished to the Washington correspondent of *Engineering News-Record* this week by Col. E. N. Johnston, U. S. A., the commanding officer of the new, big unit, in behalf of which this journal has been waging a recruiting campaign which was inaugurated in the Oct. 4 issue. The applications for service in this remarkable unit of the new army, Colonel Johnston states, are now pouring in at an unprecedented rate, so far as the system of military enlistment is concerned. The commanding officer hopes that he will be able to take care of all of those who apply.

The regiment is being mobilized at Camp Meade, Admiral, Md. Colonel Johnston has his office and his adjutants and assistants at 1419 F St., Northwest, Washington, D. C., where all applications for enlistment in the regiment should be addressed, but out at Camp Meade, just outside of Washington, there have already assembled for training about 850 men who have been accepted for the new "crack corps" among the engineers of the army, and these are being added to in big lots every day.

"We have applications from and we have accepted men from 37 states in the Union, the District of Columbia, Panama and Alaska," Colonel Johnston said. "We had a few from Canada, too. We have men from Harvard, Princeton, Yale, Cornell, Pennsylvania and state universities including Michigan, Virginia, Wisconsin, etc. We have men from Massachusetts Institute of Technology, Stevens and other institutions."

Colonel Johnston went on to explain that it is not only the college man who has a great opportunity in the big, new regiment, but that opportunities are offered to many other classes of men who are road builders and highway men.

"While in certain cases people especially qualified may be given definite promises of positions," Colonel Johnston said, "no more commissions will be granted for the present, although everyone will have a chance to earn a commission, in actual service. We are not hearing enough from the road-roller men, the stone-crusher men, the quarry men, the drill runners, the bridge carpenters, the blacksmiths, the machinists and the general mechanics.

"These men are just as much desired by the regiment as college engineers. The opportunities for advancement for these men are just as great as they are for college engineers. Lack of a college education will be no handicap whatever to advancement in the regiment. We want to hear from some men who are not only proficient in some of the positions specified, but who, in addition, can play some musical instrument. We want some snare drummers and fifers."

Colonel Johnston made it clear that the men who go to France with this outfit are going to get an education in highway engineering that they could not get in any college in the world. He said that when these men come back from France they will be worth twice as much to employers in the United States as before. It was said in Washington that the men of the 23rd Engineers will be sought by employers all over the country on their return.

It was pointed out that the traffic on many roads in France with which the 23rd will have to do will require more maintenance work in a month than would a similar road in the United States in a year. The men of the 23rd will work under conditions such as they have never met before; conditions which will inspire their professional interest, their sporting interest and their patriotism.

Applications for enlistment may be made on the form on page 816-a of this issue.

St. Joseph, Mo., Grants Restricted Garbage Franchise

The City Council of St. Joseph, Mo., has passed an ordinance granting a franchise to the Hockenberry-Boyer Co., under which that company is given the privilege of collecting garbage, trash, ashes and manure under certain restrictions. The details of the ordinance provide for the collection of wet garbage for 60 cents a month the first year, 50 cents a month the second year, 40 cents the third and fourth years, and free service the fifth year to all householders who have used the service for the first four years. Al trash, ashes and manure will be removed for $1 a cubic yard.

The company expects to use motor trucks and tightly covered tin cans, and will feed the wet garbage to hogs outside the city limits. The life of the contract is to be five years, and the city retains the option of providing universal free service to the householders after three years by paying $1250 a month to the contractors.

New West Side Improvement Plan Offered

Scheme for New York's Freight Problem Offers New York Central 25-Year Lease

General features have been announced regarding a new solution for the West Side problem of the New York Central R.R. in New York City, involving the freight line from Spuyten Duyvil to St. John's Park. The plan was developed by the joint committee of the Board of Estimate and the Public Service Commission, acting in accordance with the law passed last spring. The most radical feature of the new proposals is the retention by the city of the waterfront, the railroad to pay rental therefor and the city to be empowered to terminate the agreement after 25 years. A public hearing took place Oct. 18, and little opposition to the plan was offered. The New York Central was not represented, however, and a few days before the hearing the company announced its flat rejection of the scheme.

These are the principal new financial and operating features of the plan:

Rental to be paid by the railroad, readjusted every 25 years—city waterfront and other property to be leased and not sold to the company.

The railroad to be wholly upon city streets or public property.

The railroad's rights to be subject to recapture by the city, and to be terminable at the end of 25 years without compensation therefor.

The use by other railroads of the structures under reasonable terms.

New engineering features include:

Connection with Grand Central Station for passenger service.

Partial depression under a roof of the tracks on the present right-of-way along Riverside Park.

Entire removal of waterfront yards and terminals in Manhattan Valley, these instead to be located east of Riverside viaduct.

The law fixes Dec. 1 as the latest date for the Board of Estimate and the Public Service Commission to effect an agreement with the New York Central. Failing in that, the Board of Estimate loses all jurisdiction. The plan as set forth is not accompanied by any new maps or estimates, and railroad officials point to the shortness of the time available for the completion of such plans. In any event, however, the company holds that its title to its present right-of-way has been fully established, and it declines to consider any substitution of a terminable leasehold for that title, whereby an unfriendly administration might destroy its entire terminal.

Toledo Plans Extensive Sewer Improvements

A bond issue of $2,800,000 for intercepting sewers, pumping plants and sewage works is to be submitted to popular vote Nov. 6. If the bonds carry, as is expected, the City Council will be asked to issue $700,000 of the bonds at once to build the Ten-Mile Creek interceptor and Bay View Park pumping plant. This interceptor will include three miles of 72-in. sewer in tunnel and three miles of 42- to 72-in. sewer, with at least two inverted siphons. The ultimate capacity of the pumping plant will be 50,000,000 gal. It is hoped that the contracts for this work can be let early in 1918. Three other intercepting sewers, a smaller pumping plant and a large sewage-treatment plant will be constructed later. H. C. McClure is city engineer and W. G. Harmon, sanitary engineer.

Interstate Commerce Commission Divides Its Duties

To facilitate the disposal of its docket the enlarged Interstate Commerce Commission, under authority granted by Congress in the act enlarging the commission, has divided itself into three sections. Commissioners McChord, Meyer and Aitchison will handle valuation matters, Commissioners Clark, Daniels and Woolley will deal with certain rate applications and requests for suspension and with the transportation of dangerous materials, while Commissioners Harlan, Hall and Anderson will have the disposition of all board of review cases which have been submitted "and those not hereafter orally argued before the commission or any division thereof."

The three divisions will alternate in hearing cases set for argument, each division sitting for one month.

Russian Society of Engineers Gets Recognition

Official recognition by the Russian Mission to the United States has been accorded the Russian Society of Engineers of Chicago. Through this source the society has been able to formally tender its services to the Russian Government in all matters pertaining to engineering. It has offered not only the personal services of its members, many of whom are of high standing in the profession, but it also will act in an advisory capacity in procuring American engineering skill and in introducing American machinery and materials. M. C. Winokur, 1248 North Kedzie Ave., Chicago, is secretary.

Rivers and Harbors Congress Will Be Held in Washington

It has been announced that the fourteenth annual convention of the National River and Harbors Congress will be held in Washington, D. C., on Dec. 5 to 7 of this year. Addresses will be made by Secretaries Baker, Lane and Redfield, General Black and others.

Public Health Association Had War Program

Army and Civil Population Problems Considered—Sanitary Engineering Section Profitable

HEALTH problems of the war and many others growing out of it occupied a large place on the program of the forty-fifth annual meeting of the American Public Health Association at Washington last week. In fact "War Program" appeared at the head of the official schedule for the meetings. Besides the general sessions, the convention met in sections—sanitary engineering, laboratory, industrial, hygienic, public health administration, vital statistics, sociological, and food and drugs.

The General Sessions

The presidential address of Dr. W. A. Evans, Chicago, Ill., dealt chiefly with the health of troops in army cantonments. Water-borne diseases are so well in hand that these received only passing mention in the address. Concern was expressed as to lack of air space and ventilation in the camps of which the speaker had knowledge. Civil authorities adjacent to camps should make their communities safe from communicable diseases to which soldiers and sailors are subject. After the war, soldiers, sailors and members of the medical staffs will be a great potential health force in the communities to which they return. The doctors will be available as health officers and the engineers and bacteriologists will also be available for public-health work. This, with health insurance, should give a new impetus to health work after the war.

In similar vein Dr. W. C. Gorgas, surgeon general, U. S. A., urged the increased importance of public-health work in war time. With 1,500,000 men in camps the danger from infection from without is great. Infection from within can be controlled. In behalf of the army, General Gorgas expressed the hope that the American Public Health Association will keep up its health activities. Dr. W. C. Braisted, surgeon general, U. S. N., said that this country now leads the world in naval hygiene. The death rate in the navy last year was 4.4 per 1000, or corrected for age, about 8.

Work of the United States Public Health Service

Dr. John W. Trask, assistant surgeon general, United States Public Health Service, outlined the work being done by this branch of the Government to protect the troops in camp by caring for the health of the extra-cantonment zones. State and local authorities have conferred their powers on the United States Public Health Service and are cooperating in this work. Sanitary surveys of these areas were made at once 33 sites were selected and house-to-house inspections are being continued, with special reference to water-supply and the detection of communicable diseases.

A large and enthusiastic audience listened to an inspiring address by Herbert C. Hoover, food administrator.

Resolutions were adopted by the convention urging President Wilson to add to his economic and other war-need programs one for the conservation of the health of our civilian populations; advocating the provision of ample funds for the work of the United States Public Health Service; and urging measures for greater coöperation between local, state and provincial health authorities and the general governments of the countries included in the membership of the American Public Health Association—the United States, Canada, Cuba and Mexico.

Sanitary Engineering Section

Although scheduled for a single session, the number and interest of the papers and committee reports presented to the Sanitary Engineering Section was such as to require three sessions. T. C. Hatton, Milwaukee, presented a notable summary of activated-sludge conclusions, which will be abstracted in a coming issue. Langdon Pearse, Chicago, sent a closely related paper, dealing with the treatment of packing-house wastes for the activated-sludge process. This is abstracted on page 777.

The work of the Essex County Mosquito Extermination Commision of Essex County, New Jersey, which has included 1,800,000 ft. of ditching, was described in a paper by Dr. Ralph Hunt. W. J. Mauer, engineer of the Chicago Ventilation Commission, sent a paper on army barracks ventilation. Some of the members appeared to think that Mr. Mauer was urging a counsel of perfection in advocating such things as a separate building for each eight men.

Notable Committee Reports

Two epoch-marking committee reports were adopted, each having been presented a year ago at the Cincinnati meeting and held open for criticism and revision. For the Committee on Sanitary Control of Waterways, H. P. Eddy, chairman, Boston, Mass., reported that no criticisms of the proposed fundamental principles and code for the sanitary control of waterways had been received and that no changes were recommended, so the 1916 report of the committee was adopted. This report in full was printed in the *Journal* of the American Public Health Association for April, 1917; the code appeared in *Engineering News*, Nov. 9, 1916, p. 870, and in the *Engineering Record*, Nov. 11, 1916, p. 487.

The Committee on Sewerage and Sewage Disposal, through George E. Wilcox, chairman, Philadelphia, presented in revised form the definitions of sewerage and sewage-disposal terms submitted a year ago. The revised terms were adopted. Some of the original definitions were printed in *Engi-*

neering News, Nov. 2, 1916, p. 858. The revised terms were published in full in the *Journal* of the American Public Health Association for October, 1917.

STATE CONTROL OF SEWAGE WORKS

For the Committee on Sewage Works Operation and Analytical Methods, W. L. Stevenson, chairman, Philadelphia, acting on a request made at the Cincinnati meeting, amplified the ideas of state control of sewage works expressed in 1916. In part, the 1917 report said:

"Generally the degree of such control should vary inversely with the quality of maintenance provided by the municipality or other owner of the works and directly with the possible danger caused by falling off of efficiency in operation.

"It is not a proper function of the state, excepting in cases of emergency, to do more than keep watch over the local authorities or to prod them to greater efforts. The ideal condition would be for each municipality or owner to so operate its sewage-treatment works through its own agents—either trained employees constantly on the payroll or special consultants regularly engaged—that the work of the state would be resolved simply into the study and checking of the results accomplished by the works, but this ideal condition has not yet been obtained except in isolated instances.

"The most desirable plan of state control comprises routine inspection, advice when deemed necessary, general supervision, adequate police power to enforce proper operation, and authority to require regular tests and records.

"The desideratum in the operation of sewage-treatment works under state control may well be likened to the conditions existing in our national banks. The examiner checks the accounts and methods of business and, when found to be in accordance with law and the safety of the public, does not interfere; but if the bank is in an unsound condition the central governing power steps in and requires changes to safeguard the public, and, if the emergency is extreme, actually assumes temporary control."

As in its reports for 1914, 1915 and 1916, the committee again urged that owners of sewage works should employ competent trained employees for operation and should also engage experts for periodical inspection and general supervision of the works.

REFUSE COLLECTION AND DISPOSAL

The Committee on Refuse Collection and Disposal, through S. A. Greeley, chairman, Chicago, Ill., reported that the war had caused a slackening in the construction of new disposal works and a falling off in collections estimated at 30%. The two notable installations of the year have been the Cobwell reduction works for New York City and the Stirling incinerators at Toronto. In a paper dealing with the relation of the war to garbage collection and disposal, I. S. Osborn brought some striking facts and figures which are presented on page 778.

Shandaken Tunnel Contract Has Not Yet Been Awarded

The statement in *Engineering News-Record* of Sept. 27, to the effect that the New York Board of Water-Supply had awarded to the Degnon Contracting Co. the contract for the 18-mile Shandaken tunnel, was incorrect. The Degnon company was low bidder, but the Board of Water-Supply has taken no official action in awarding the contract.

Bingham Succeeds Abbot in New York Office

Brig. Gen. Theodore A. Bingham has been returned to active military duty and will assume the duties as division engineer of the Northeast Division, Corps of Engineers, U. S. Army, with headquarters in New York City, succeeding Col. Frederick B. Abbot, who has been assigned to the work of organizing and training troops for the engineering branches of the army. General Bingham was police commissioner of New York City from 1906 to 1909, and in 1911 served for a short time as chief engineer of the Department of Highways, New York State. From 1911 to 1915 he was consulting engineer for the Department of Bridges. General Bingham has been on the retired list of the army since 1904, following an accident at the Buffalo Exposition.

Chicago Sanitary District Asks U. S. for Bridge Steel

Inability to obtain structural steel owing to the action of the United States Government in commandeering the steel supply is holding up the contractor for railroad bridges across the Calumet-Sag drainage canal of the sanitary district of Chicago. The bridges are on the last two sections of the work which cannot be completed until the bridges are constructed. In view of the importance of the canal in preventing pollution of the public water supply, and in view of the large amount of money already invested in this work, the district considers that there is a public necessity for the construction of the bridges. It has therefore requested the United States Government to permit some steel company, or companies, to furnish the contractor the 1200 tons of steel necessary for the work. The Government has already agreed to allow the supplying of steel to the contractors for the Chicago River bridges for the City of Chicago.

Defiance, Ohio, Will Purify Its Water Supply

The City Council of Defiance, Ohio, has authorized the director of public service to enter into a contract with the W. J. Sherman Co., of Toledo, Ohio, to make a preliminary survey and investigation looking toward the purification of the city's water-supply.

Santa Barbara Wants City Manager

Under a new city charter which will take effect Jan. 1, 1918, Santa Barbara, Calif., will have a city manager. The city manager committee of the council-elect wishes applications for the position before Dec. 1, 1917. The first letter from candidates should state qualifications and salary desired and should contain references. The city has a population of about 20,000. The committee announces that the salary paid is "dependent on the man."

President Approves Selection of Nitrate Plant Site

On Oct. 16 it was announced that the President had approved the selection of a site at Sheffield, Ala., for initial ammonia and nitric acid plants to be constructed by the Government out of the $20,000,000 appropriation made by the last Congress for this purpose. This site is on the Tennessee River, just below Muscle Shoals, and near the phosphate beds of Tennessee.

In discussing the paper on state health board control of refuse disposal, by E. D. Rich, abstracted elsewhere in this issue, Theodore Horton, chief engineer of the New York State Department of Health, Guy C. Emerson, Jr., acting chief engineer of the Pennsylvania Department of Health, and M. N. Baker, of the editorial staff of *Engineering News-Record*, questioned the wisdom of state boards of health attempting control of a service having so little relation to public health.

There seemed to be dissent also to portions of the report of the Committee on Plumbing and Drainage of Buildings (C. H. Wells, chairman, Montclair, N. J.), which asserted a close relationship between plumbing and public health and argued that plumbing control should be vested in health rather than building departments. The report, which contained an outline of the general principles of good plumbing, was ordered sent to the section membership for discussion, with the understanding that a year hence the committee will submit another report, giving more detailed attention to the control of water and sewer connections—which are now in a twilight zone of little or no control, resulting in much water waste and the overtaxing of sewage works through leakage.

NEW OFFICERS ELECTED

Dr. W. A. Evans, Chicago, was re-elected as president of the association. For the Sanitary Section, George S. Webster, Philadelphia, was selected as chairman; E. A. Fisher, Rochester, N. Y., as vice chairman, and S. A. Greeley, Chicago, as secretary. The Laboratory Section will have Dr. George W. McCoy, United States Hygienic Laboratory, Washington, D. C., as chairman; R. B. Fitz Randolph, Trenton, N. J., as vice chairman, and Dr. Charles Krumwiede, Jr., New York City, as secretary. Dr. Thomas Hastings, Toronto, was chosen as chairman, and C. H. Wells, Montclair, as secretary of the section on Public Health Administration.

New Orleans Will Collect and Utilize Its Refuse

Cobwell Process for Garbage—Refuse Sorted and Sold—Tailings Incinerated

The Commission Council of New Orleans, La., has by ordinance approved a project for the municipal collection and disposal of garbage and other city wastes recommended by E. E. Lafaye, commissioner of public property. The plan includes a Cobwell garbage-reduction plant, refuse sorting and utilization and the incineration of unutilizable wastes. The estimated cost of the reduction plant alone is $750,000, of which $598,000 is for equipment to be supplied by the Cobwell Corporation, Cleveland and New York, and the remainder for buildings and site. The entire project is to be financed by the Metropolitan Life Insurance Co., New York City, on the basis of certificates issued by the city, payable in 14 annual installments. Tentative contracts have been made with each of the two companies named.

TWO-HUNDRED-TON COBWELL PLANT

The reduction plant is to have a capacity of 200 tons a day. It will include 40 reducers, various accessory tanks and conveyors and a 15-hp. boiler plant with automatic stokers. The Cobwell Corporation claims that 60,000 tons of garbage treated annually in the proposed plant will yield 1800 tons of grease worth $252,000 and 10,800 tons of tankage worth $129,600, making a yearly revenue of $361,600 or $6.03 per ton of garbage. Against this it figures operating and capital charges of $4.10 a ton, or $246,000, leaving an estimated profit of $135,600. This would not be clear profit to the city since the tentative contracts provide that 40% of the net earnings in any quarter up to $12,000 and 5% on all above that amount shall be paid to the Cobwell Corporation as royalties.

ESTIMATE OF OPERATING COST

The detailed estimate of operating cost per ton of garbage is: Coal, maximum (based on 14,000 B.t.u.) $1.10; electric power and lighting (current purchased), $0.20; solvent loss maximum, 4½ gal., $0.40; labor (average 30c. per hr.), $1; miscellaneous supplies, material and labor, $0.30; depreciation at 3% and interest at 5% on $750,000, $1; administration, $0.10; total, $4.10. It will be noted that this estimate does not take into account the fact that the certificates for financing the project must be retired in equal annual payments extending through 14 years. The tentative contract provides that the grease left in the tankage shall not exceed 3%; also that if during the last 30 days of the initial four months' operation of the plant (under the supervision of the Cobwell Corporation) the estimates just given are not fulfilled the net deficiencies, after balancing under-performance and over-performance, are to be deducted from royalties. The detailed plans for the reduction works are to be prepared jointly by engineers and architects representing the city and the contractor, but the latter will have the say as to requirements dominated by its process. Barring war delays, the contractor agrees to have the reduction works ready for operation within a year of the date of the final contract.

Engineer Employment Agency Opened by Labor Department

The United States Department of Labor has recently opened at 845 South Wabash Ave., Chicago, Ill., a division known as the Teachers and Professional Service Division, whose function it will be to aid the employer in obtaining suitable help, and professional persons in securing suitable employment. While intended to embrace all professions, attention has thus far been confined to the teaching and engineering professions. The services of the division will be absolutely free to both employer and employee, all expenses being borne by the Government. The methods which will be pursued will be quite thorough and no service will be rendered an applicant until the division has learned, from persons familiar with the applicant's record, that he is qualified as to training, experience and personal qualities.

After an applicant is recommended for a reported vacancy, the employer is given an opportunity to examine the data and the way is prepared for a personal interview. The officers of the division will provide a place where the employer may meet his prospective employee.

State Need Not Repair State Road Through Borough

The County Court of Dauphin County, Pennsylvania, has ruled that there is nothing in the Highway Act of 1911 which requires the state to make repairs on a state highway which is at the same time a borough street. The decision was given in refusing a writ of mandamus asked by Gettysburg to compel the state to repair a borough street. The court also ruled that there is nothing which allows the State Highway Commissioners to interfere with a borough highway.

Newark Shipyard to Employ 12,000 Workers

The United States Shipping Board and the Submarine Boat Corporation, which is erecting the ship plant for the emergency fleet, are coöperating to spread among the steel and iron workers of the country the news of the great need for them in the task of turning out the standardized steel ships which will be constructed at this yard. It is understood that the Newark yards are to employ 12,000 men on their first contract for building 50 vessels of 5000 tons each. This preliminary contract, which was signed last month, will be followed in all probability by another for 150 vessels.

Railway Bridge and Building Men Convene

Discuss Bridge Erection, Coatings for Steel Camp Structures and Other Subjects

The erection and protection of steel bridges and the equipment of camps for bridge and construction gangs were among the subjects discussed at the annual convention of the American Railway Bridge and Building Association. This meeting was held in Chicago Oct. 16, 17 and 18, with a large attendance of engineers and superintendents of bridges.

The placing of new plate-girder spans with the minimum interruption to traffic was dealt with in a committee report presented by Lee Jutton, division engineer of the Chicago & North Western Ry. Two general methods are practicable: Piecemeal removal of the old and construction of the new spans, or the replacing of an entire span at one operation. Mentioned in the discussion that followed was the erection of concrete slab spans alongside the old work, with ballast and track complete. In this way the track could be connected up as soon as the new span had been moved into place.

PRESERVATIVE COATINGS

Paint for steel and other structures was covered in a report presented by Charles Ettinger, Illinois Central R.R. For steelwork, he considered that the primer or first coat should be a rust-inhibitive coating with lead base. Carbon-paints may be applied over this, but should not be applied directly to the steel. The report pointed out the economy of using high-class paint for structures of this kind.

Concrete as a protective coating for steel structures was presented in a paper by E. E. R. Tratman, Western editor of *Engineering News-Record*.

The importance of good housing and feeding as a means of keeping men in the crews of the railway bridge and maintenance-of-way departments was the subject of a paper by F. E. Weise, chief clerk in the engineering department of the Chicago, Milwaukee & St. Paul Ry. There are many objections to the use of cars, which are generally old cars removed from their trucks and mounted on sills. Buildings of concrete or of stucco on wire mesh are used in a few cases. Some railways and construction companies are introducing portable sectional knock-down houses. Most of these are of wood, but sectional steel structures for similar purposes are available.

Another subject discussed in regard to labor was the introduction of differential rates of pay for employees; that is, paying higher rates to men having the greater skill or experience.

Officers for 1917-18 were elected as follows: President, E. C. Turner, Baltimore & Ohio R.R., Baltimore; secretary, C. A. Lichty, Chicago & North Western Ry., Chicago. The next meeting is to be held at New York in 1918.

ENGINEERING SOCIETIES

The Providence Engineering Society was addressed on Tuesday evening, Oct. 16, by F. A. Barbour, supervising engineer of Camp Devens, on the subject of "The Construction of the Army Cantonment at Ayer." The lecture was illustrated and constituted the October meeting of the society. Other meetings scheduled for the near future are: Oct. 29, "The Fire Hazard of the Automobile," by A. P. Vigneron, of the Automobile Mutual Fire Insurance Co. of America; Nov. 15, "Notes on Municipal Engineering," an illustrated talk by Milton H. Bronsdon, city engineer, Providence, R. I.; Nov. 14, "Steel and Iron Pipe," by Harold T. Miller, of the National Tube Works; Nov. 9, "Handling and Moving Materials, Including Incoming and Outgoing Materials, Arrangement of Materials, Control of Materials, Shop Classification, Etc.," by Chester T. Morey, of the Rhode Island Tool Co.; Nov. 13, "Some Steels Used in Machine Construction, Their Composition, Physical Properties, Treatment and Metallography," by Chester B. Sadler, of the Rhode Island Tool Co.; Nov. 1, "The Engineering of a Telephone Plant," by John T. Frankenburg, superintendent of the Providence Telephone Company.

The Harvard Engineering Society of New York will hold its first regular meeting at the Harvard Club Wednesday evening, Oct. 31, at 8:30 o'clock. Prof. Douglas W. Johnson, of the Department of Physiography of Columbia University, will give an illustrated talk on the European War, showing the intimate relation between the movement of troops and the topography of the country.

PERSONAL NOTES

CLIFFORD OLDEN, bridge engineer of the highway division of the Illinois State Department of Public Works and Buildings, has been appointed acting chief highway engineer until the position made vacant by the death of William W. Marr is filled by regular appointment.

GERALD J. WAGNER, construction engineer for the Michigan Railway Co., has been appointed city engineer of Grand Rapids, Mich., vice W. S. Moore, who is now chief engineer of the highway department of Indiana.

O. L. DILLON, JR., formerly superintendent for the Canal Construction Co., Chicago, and the Hoosier Land and Investment Co., Sikeston, Mo., is now chief engineer and superintendent for the Johnston-Porter Clay Co., McKenzie, Tennessee.

H. H. ESSELSTYN has formed a partnership with I. [illegible] MURPHY and R. G. HANFORD, and will engage in general engineering and architectural business. Mr. Esselstyn was for 15 years connected with the Westinghouse-Church-Kerr Co. in various positions. Mr. Murphy was previously associated with J. G. White & Co. and in other public-utility organizations, and Mr. Hanford has been associated with F. L. Packard, Columbus, Ohio, for the past six years.

H. C. DREHER, C. A. BARKER and F. R. PATTERSON have formed the Dreher Construction Co., general contractors, Chicago, and will carry on a general contracting business, specializing in reinforced-concrete construction.

MAJ. C. T. WARING, who was engaged in various capacities on the Panama Canal from 1905 till 1909, then becoming assistant engineer on the Cape Cod Canal, and later holding the position as resident engineer and superintendent on the same work, now has charge of the construction of six aviation schools in northern Texas.

D. D. CLARK, chief engineer of the Bureau of Water-Works, Portland, Ore., and builder of Portland's water system, has resigned on account of ill health, his resignation taking effect Oct. 1. Mr. Clark is recognized as an authority on hydraulic engineering and has been employed by the City of Portland since 1893, for the past 20 years being chief engineer of the Water Bureau. During Mr. Clark's tenure the slides which threatened the complete destruction of the two city reservoirs in 1903 and 1904 were stopped through the construction of a tunnel drainage system.

W. F. COLLAR, for the past two and one-half years in complete charge of construction of the east approach of the Municipal Free Bridge for the City of St. Louis, has resumed his connection with the Foundation Co., New York. His present position is that of assistant to the Western manager, F. W. ADGATE, with headquarters in Chicago.

ERNEST MCCULLOH, formerly with the city engineer's office of Los Angeles and who was for 10 years connected with the United States Reclamation Service on the design and construction of the Tieton and Sunnyside projects in Washington, is now associated with the Charles L. Pillsbury Co., engineers, Minneapolis and St. Paul, having charge of the recently organized department of civil engineering of that company.

MAJ. PHILIPPE BUNAU-VARILLA, at one time general manager of the old French Panama Canal Co., and who is now serving as major of engineers in the French Army, has been commended by General Petain for his services in the reorganization of French positions during the recent Verdun attack.

PROF. E. J. BABCOCK, dean of the College of Engineering, University of North Dakota, has been made acting president owing to the resignation of DR. FRANK L. MCDEY, who has accepted the position of president of the University of Kentucky.

A. L. LUEDKE has recently been promoted to be assistant to the Director of the United States Office of Public Roads and Rural Engineering, with headquarters at Washington.

MANUEL L. VICENTE has been appointed professor of civil engineering, University of Porto Rico. Professor Vicente has been connected with the civil engineering department of this university for the last three years, his most important work having been the remodeling of the courses of study in civil engineering to agree with those given in American universities.

HOMER HAMLIN, formerly city engineer of Los Angeles, Calif., has opened an office as consulting engineer and geologist in the Central Building, Los Angeles, Calif. Mr. Hamlin will specialize in surface and underground water-supply, sewerage, sewage-disposal, irrigation, land drainage and municipal and civil-engineering problems.

SOL PINCUS, assistant sanitary engineer, United States Public Health Service, has been assigned to duty in connection with the sanitary engineering problems of the new army camps. He is now engaged in the extra-cantonment zone of Camp McClellan.

R. H. THOMSON, consulting engineer, Seattle, has been engaged to investigate and make a report to the Spokane County Commissioners on the alleged failure of certain permanent highways in Spokane County, Washington.

MAJ. WILLIAM D. WRIGHTSON, formerly with the United States Public Health Service, is at present in charge of the Sanitary Corps, National Army.

F. R. GOODMAN, formerly state division engineer, is now engineer of Coconino County, Arizona, with headquarters at Flagstaff.

OBITUARY

GEORGE W. WESLEY, an engineer in the employ of the Lackawanna R.R., died at his home in East Orange, N. J., Sept. 27.

HARRY M. GOULD, president of the Gould Contracting Co., Nashville, Tenn., died Sept. 30. A graduate of Rensselaer Polytechnic Institute, for a year or two he was connected with the engineering department of the Louisville & Nashville R.R., then becoming associated with his father, JOHN E. GOULD, in the Gould Construction Co., Louisville, Ky. In 1907, when this company was merged with Foster & Creighton to form the Foster, Creighton, Gould Co., Mr. Gould was made vice president and general manager, and as such erected the Sparkman St. and Jefferson St. bridges over the Cum-

berland River at Nashville, and the substructure of the Kentucky & Indiana Terminal Railroad Co. bridge over the Ohio at Louisville, Ky.; the superstructure of the Fort Smith and Van Buren St. bridge over the Arkansas River at Fort Smith, Ark., and many other steel structures for the Louisville & Nashville R.R. In 1915 he formed the Gould Contracting Co., which has much railroad bridge work and hydro-electrical development work under way.

BUSINESS NEWS

Federal Export Corporation Buys New Mexico Central Railroad

The New Mexico Central R.R. has been purchased by the Federal Export Corporation, of 115 Broadway, New York. This property lies in a section of New Mexico that has recently been opened to oil developments. The line has a length of 120 miles, extending from the City of Santa Fé, where it joins the main line of the Atchison, Topeka & Santa Fé R.R., south and southeast to Willard, where it crosses the southern branch of the Santa Fé road, and thence to Torrance, where it connects with the El Paso & Southwestern.

The Federal Export Corporation has in project the electrification of the road or its reëquipment with internal-combustion locomotives. Its engineers are at present examining the property with the object of ascertaining the most available means of placing the road on a more productive basis.

American Machinery Needed in Scotland After the War

United State Consul Rufus Fleming, at Edinburgh, Scotland, reports:

"Notwithstanding taxation will rest heavily upon every community in consequence of war expenditures, soon after the return of peace large projects must be undertaken in this part of Scotland.

"Streets and highways have been badly worn by increased traffic and repairs have been deferred; harbor construction and improvements, for which full arrangements were made several years ago, are in abeyance owing to financial and labor problems; and tramway extensions, important housing schemes, sewerage works, industrial plants, land clearing and drainage enterprises, and the development of mines and quarries are among the other works, public and private, which must receive attention when conditions will permit.

"American manufacturers and exporters of machines for excavating, contractors in the various lines indicated could probably cover this market in the most satisfactory way from general agencies in English commercial and industrial centers to which the engineering and building concerns throughout the country are in the habit of sending orders for heavy machines of all kinds."

Westinghouse Electric Company Announces Wage Increase

Another increase in wages for shop employees aggregating nearly $2,000,000 a year has just been announced by the Westinghouse Electric and Manufacturing Co. Effective Oct. 16, all employees observing shop hours, except munition workers, receive an additional bonus of 10% if they are on a salary or time-rate basis, and of 7% if they are on a piece, premium or task basis.

The 20,000 shop employees of the Westinghouse company form one of the most highly skilled organizations in the country. They are one of the best-paid bodies as well, increases granted since the outbreak of the European War now amounting to about 60% of the former average compensation.

Notes from

MAKERS OF PLANT AND EQUIPMENT

Page Woven Wire Fence Co. announces the change of its corporate name to Page Steel and Wire Co. A Pittsburgh office at 644 Union Arcade was opened Oct. 22 with E. C. Sattley as general manager.

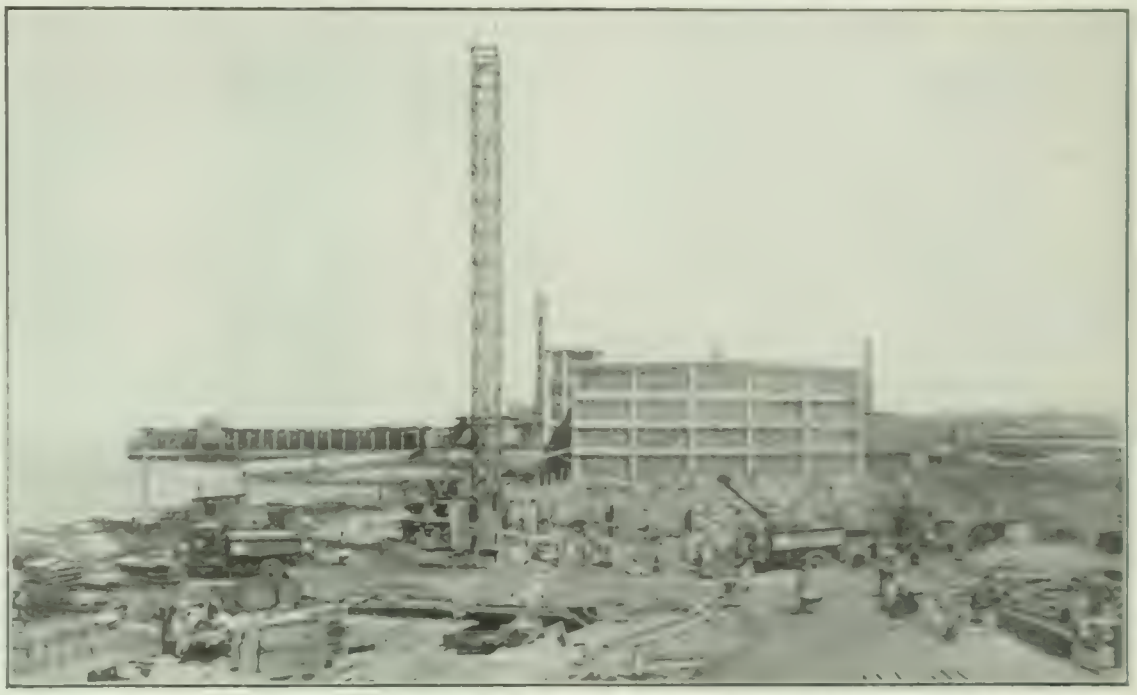
American Pulverizer Co. has moved its general and sales offices, factory and new experimental laboratory to 18th and Austin Sts., St. Louis, Mo.

Charles C. Cheyney, manager of the Chicago office and store of the Buffalo Forge Co., has a commission in the Naval Aeronautic Corps and is beach engineer at Pensacola, Fla., in charge of airplane engines.

C. F. Goodrich, assistant manager of the Buffalo Forge Co.'s Boston office, has left for active duty as first lieutenant in the Ordnance Department, and is stationed at the Watervliet Arsenal.

Don R. Marsh, production manager with the Buffalo Forge Co., has given up his work to assume similar duties at Washington in the production of ammunition. Mr. Marsh will receive a captain's commission.

Plymouth Cordage Co., North Plymouth, Mass., is putting up new buildings with capacity sufficient for the storage of 200,000 bales of fiber and 50,000,000 lb. of rope and twine. The warehouse shown in the accompanying illustration is 100 ft. wide, 302 ft. long and seven stories high. A second warehouse now under construction is 82 ft. wide, 202 ft. long and three stories high. The uncertainty of the transportation situation, the Plymouth company has found, has made it absolutely necessary to carry in stock at all times sufficient fiber to keep the mills running for long periods, while the hundreds of sizes and kinds of rope manufactured make necessary large stocks for immediate shipment upon a distributors' order.



PLYMOUTH CORDAGE CO.'S NEW WAREHOUSE CONSTRUCTION

R. M. Elder, branch manager at Des Moines, Iowa, for John Baker, Jr., asphalt and bituminous products, is now manager of the railroad division of the same firm, with headquarters at Chicago. Mr. Elder was formerly superintendent of construction on fortifications of the Panama Canal.

H. F. Bardwell has been appointed New York district manager for the Vanadium-Alloys Steel Co. of Pittsburgh and Latrobe, Penn., with offices at 30 Church St., New York.

TRADE PUBLICATIONS

"A Quarter Century of Success" is the title of a new catalog of the Neptune Meter Co., 50 E. 42nd St., New York, which deals with the development of the Trident water meters.

The Hall Engine Co., Erie, Penn., is distributing a new bulletin containing

specifications of Type B steam shovel, also special features of design and details of construction which ought to be of use to those interested.

The Sullivan Machinery Co., 122 South Michigan Ave., Chicago, Ill., is distributing Bulletin 75C describing angle-compound power-driven air compressors and Bulletin W75F on Tandem Compound Corliss Air Compressors.

Journal-box packings are described in a new pamphlet of the Franklin Manufacturing Co., Franklin, Penn., which is said to be the first write-up on the subject and should be of value to those having to do with railway journal lubrication.

The Dean control system, for use with steam, water and gas valves is described in a leaflet issued by the Cutler-Hammer Mfg. Co. A feature of the apparatus is that motor, gearing, limit switch, clutch and lost motion device are incorporated in one casing attached to the valve yoke, instead of being separate.

Taylor Instrument Co., Rochester, N. Y., has just issued a catalog on temperature regulators.

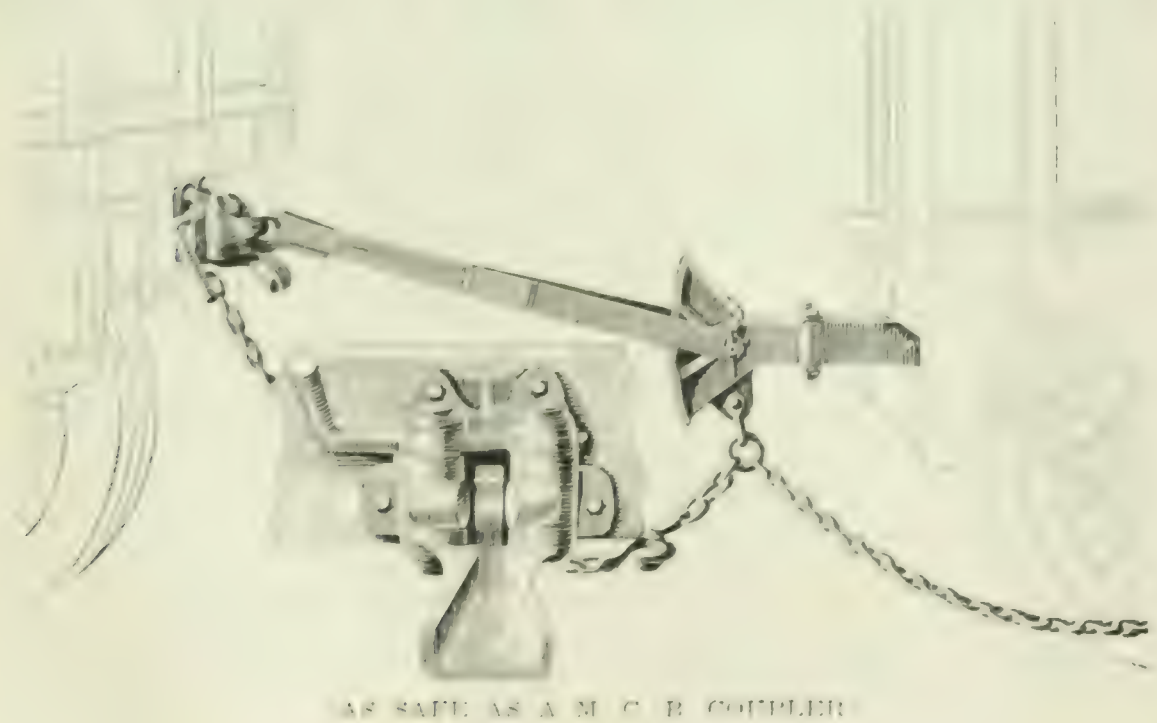
The Steelite Co., Guardian Building, Cleveland, Ohio, has issued a new loose-leaf catalog containing colored reproductions of standard designs of Steelite elevator cabs and inclosures.

APPLIANCES AND MATERIALS

Automatic Truck-Trailer Hitch

To connect trucks and trailers, the Troy Wagon Works Co., of Troy, Ohio, is placing upon the market the automatic truck hitch illustrated herewith. The main casting is of malleable iron and the two jaws of steel. In making a connection all the operator has to do is to raise the hand lever and part the jaws, then steer the connecting bar into the apron of the hitch, which will guide it into the jaws and trip the lock, so that the coupling is made like that of the ordinary railroad car. This arrangement permits the coupling to be made without the operator going between the truck and trailer, for he can stand to the side and guide the connecting bar into the apron of the hitch by means of a stick, and from anv angle, thereby avoiding the possibility of accident.

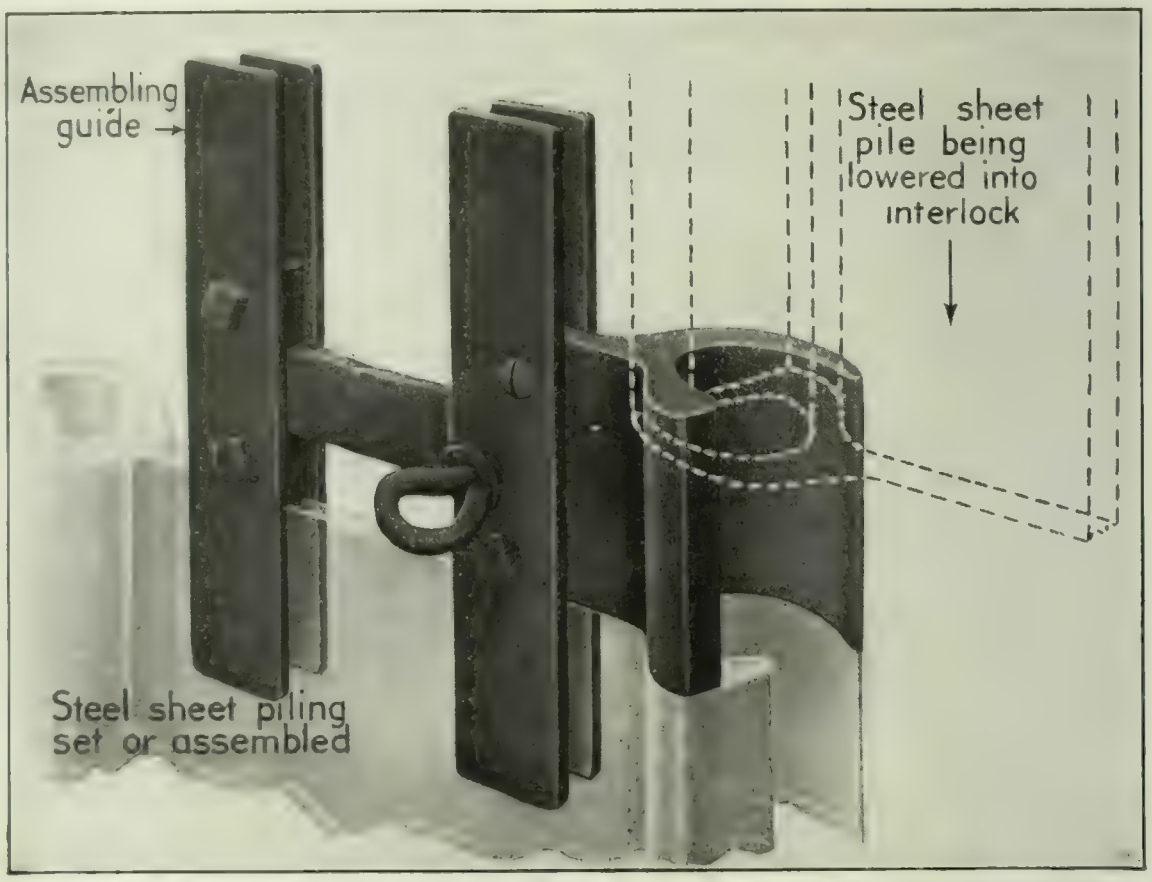
When the coupling is made, as the jaws close in front they open in the rear, which allows the hand lever to drop and throw a lug between them, so there is no possible way for the jaws to open and release the connecting bar until the hand lever is raised by the operator. To uncouple, the operator simply raises the lever and the truck pulls away. One change has been made in the hitch as shown by the illustration. Instead of having to drill the truck frame, the Troy company made the large casting longer and bored three holes at the bottom so that the bolts straddle the frame. This makes the hitch adjustable to any width frame and can be changed from one truck to another very quickly.



AS SAFE AS A M. C. B. COUPLER

Special Device Helps in Handling Lackawanna Sheet Piling

On windy days or when the handling line is swung from a barge affected by swells or wave motion, the sway of the steel sheet-piling sections has made trouble in steering the interlock of the free piling sections into entrance and sliding contact with the interlock of the last piling section placed. This is particularly true where the tops of those piling sections, which have been assembled or placed, remain at a considerable distance from the ground or water level.



GUIDE IS SECTION OF PILING WITH PART OF THUMB OF INTERLOCK CUT AWAY

To save time and labor and make the attendant's work safer in this operation, the assembling guide shown in the illustration was developed by F. E. Cudworth and successfully used in placing the 50- to 70-ft. Lackawanna sheet-piling sections used in the 46th St. pier cofferdam, New York City. The construction of this special guide is shown very clearly in the illustration. It is reversible to handle either position of interlock, and is provided with a swivel eye and safety line that prevents the guide from falling out of reach or getting lost in the water.

In using this device the workman draws the free piling section sidewise into and against the guide as the piling section descends, and as the interlocks are in this way aligned perfectly, they slide together on the first trial. On the work above mentioned it was found that an operator skilled in handling a lighter could easily lower a sheet-piling section within the range of the guide, and that the guide then enabled the section to be placed with a minimum of labor.

We repeat the following notice for the benefit of our readers who may have missed it in the October 4th issue.

Experienced Highway Construction Men

Needed for Service in France

[This Statement Is Authorized by Colonel Johnston, Commanding the 23rd Engineers.]

Men who have had experience in any branch of road construction are offered an opportunity to see early service in France in special road-building battalions of the United States Army by recruiting plans here announced. These battalions will be required to repair and maintain the highways near the fighting front, over which tremendous traffic is operated continuously. They will also build new strategic highways in the war zone. Consequently, these troops, all volunteers, will be in the thick of the greatest activities.

The new battalions are constituted as regular military units and as a part of the regular army organization. They are fully armed and will be required in emergencies to fight along with other troops. Generally, however, they will be ocupied with road work.

The battalions will form a part of the 23rd Regiment of Engineers of the new National Army. This regiment will eventually have a strength of about 10,500 men—more than an ordinary brigade—and will, so far as is at present known, be the largest in the army. It will be commanded by Col. E. N. Johnston, of the Corps of Engineers, U. S. A.

Many Worth-While Jobs

There will be more highly-paid and high-ranking non-commissioned officers in the regiment, it is believed, than in any other. There will, therefore, be more openings for men of education and practical experience than is usually the case.

The organization of the battalions is as nearly the same as that of large contracting forces as is feasible. Modern road-building machinery has been fully provided, including rock-crushing plants, steam shovels, road rollers, tractors, graders, motor trucks and pumps. A full line of dump wagons, wheel and drag scrapers and similar dirt-moving equipment also will be available. Shops for the repair and maintenance of all the plant and equipment will be operated close to the front.

Much of the plant used on road work in America is new to European engineers, while the methods also are quite different from those used tbroad. A great opportunity is thus offered to demonstrate what skilled Americans can do with modern equipment, and the regiment which is now being recruited must include men to operate the necessary construction plant, to man the shops and, as non-commissioned officers, to handle the forces.

Who Can Qualify

For the non-commissioned officer positions men are required who can qualify in private life in the following lines: Superintendents and assistant superintendents of highway, bridge and quarry work, of mechanical plant and of transportation; chief clerks, material men, stock men, timekeepers; foremen for concrete, road, bridge and quarry work; powder men, riggers, carpenters, iron workers, surveyors and draftsmen.

For the enlisted personnel it is desired to secure men skilled and experienced in one or more of the following occupations: Surveyors, draftsmen, clerks, stenographers, axmen, blacksmiths, blacksmiths' helpers, machinists, gas-engine operators and repairers, crusher operators, hand driller, drill runner (air drills), quarrymen, powdermen, masons, teamsters, pile-driver operators, concrete, form, road and bridge men; tractor operators (gasoline), grader operators (blading and elevating graders), bridge carpenters, motor-truck drivers, chauffeurs, cooks, motor-truck and automobile repair men, pipe fitters, electricians, horseshoers, tailors, shoemakers, musicians (bugle, fife or drum), mechanics, telephone operators, steamfitters, tool sharpeners, ditchers, boatmen (builders and caulkers), shovel runners (gasoline), barbers, veterinarians, French interpreters, bituminous road men, iron workers, riggers, general utility men capable of driving automobiles, motor trucks and all types of gasoline-driven machinery.

Any male American citizen between 18 and 40 years of age, and who has not actually been called by a local board in the draft, is eligible for enlistment in these special battalions, if acceptable physically. All men must first enlist as privates, the rate of pay being $33 per month and expenses. Men with the necessary experience may be assigned to special duties and given non-commissioned rank at rates of pay ranging from $40.20 to $96.00 per month and expenses. The latter include, for both privates and non-commissioned officers, food, clothing, medical attendance and transportation. Those who enlist will be eligible immediately for promotion, acording to their ability and as openings occur. Men who are specially well qualified and recommended will be given definite promise of advancement to higher grades when their enlistment is authorized.

Officers are Specialists

Colonel Johnston, who will command the regiment, was graduated from the United States Military Academy at West Point at the head of the class of 1901. After service on road and bridge work in the Philippine Islands and river and harbor work in the United States, he served as an instructor at West Point and as an assistant to the Chief of Engineers at Washington.

The first two battalions are commanded by Majors I. C. Moller and Henry H. Stickney. Major Moller received his engineering education in France. He has been engaged exclusively in highway work for the last ten years, and for three years has been chief engineer for an American company doing road work in all parts of the world. In this capacity he has been called upon to act as consulting engineer for the governments of almost every Central and South American republic.

Major Stickney was educated at Clarkson College of Technology, Potsdam, N. Y. Since 1906 he has been engaged on state highway work in New York and on the New York State Barge Canal. He has also had considerable experience as consulting engineer in road and water-supply construction. He is a graduate of the Engineer Officers' Training School at Fort Leavenworth and a member of the New York State National Guard.

Captain F. S. Skinner, regimental adjutant, is a graduate of the United State Military Academy. Thus the regiment will be under the direction of those who have fully demonstrated their ability in highway and construction work.

Full information regarding steps that must be taken to enlist in this regiment may be secured from the Commanding Officer, 23d Engineers, National Army, 1419 F St., Washington, D. C., by mailing the following information to him.

Fill in This Form, by Typewriter, if possible, and Mail Today, to

COMMANDING OFFICER, 23rd ENGINEERS, NATIONAL ARMY,
1419 F Street, Washington, D. C.

(1) Name ..... (2) Address .....

(3) Age ..... (4) Nationality .....

(5) Married or single ..... (6) Have you been called in the draft?

(7) Will you enlist for period of the War? ..... (8) State briefly your road-building or other construction experience .....

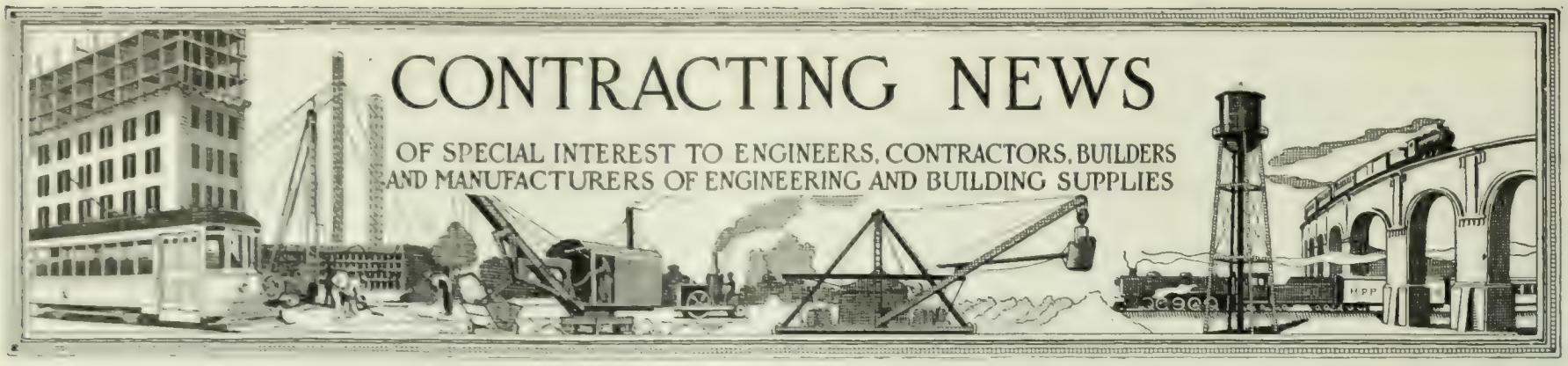
.....

(9) What machinery can you operate? .....

(10) Your present or a former employer must certify to your qualifications by signing here

.....
SIGNATURE OF EMPLOYER

EMPLOYER'S ADDRESS FOR TELEGRAMS



Proposals

For Proposals Advertised See Pages 43 to 45 Inclusive

WATER-WORKS

Bids Close			See Eng. News-Record
Oct. 29.	Portland, Ore.		Oct. 11
Oct. 29.	Langdon, N. D.		Oct. 25
Oct. 31.	Hoskin, Neb.		Oct. 25
Nov. 1.	Galveston, Tex.		Oct. 25
Nov. 7	Tonawanda, N. Y.		Oct. 18

SEWERS

Oct. 29.	Glendale, Ariz.		Oct. 18
Oct. 31.	Seguin, Tex.		Oct. 25
Nov. 1	Newark, N. J.		Oct. 25
Nov. 1.	Grand Mound, Ia.		Oct. 25
Nov. 1.	New York, N. Y.		Oct. 25
Nov. 2.	Appleton, Wis.		Oct. 25
Nov. 3.	Altamont, N. Y.		Oct. 25
	Adv. Oct. 25.		
Nov. 5.	Cheyenne, Wyo.		Oct. 25

BRIDGES

Nov. 2.	Richmond, Va.		Oct. 18
	Adv. Oct. 18 and 25.		
Nov. 6.	Oswego, Kan.		Oct. 18
	Adv. Oct. 18 and 25.		
Nov. 6.	Dallas, Tex.		Oct. 11
	Adv. Oct. 11 and 18.		
Nov. 6.	Little Falls, Minn.		Oct. 18
Nov. 12.	Minneapolis, Minn.		Oct. 25

STREETS AND ROADS

Oct. 29.	Indiana		Oct. 11
Oct. 29.	Highland Park, N. J. (New Brunswick P. O.)		Oct. 18
Oct. 29.	Spartanburg, S. C.		Oct. 25
Oct. 29.	Arkansas		Oct. 25
Oct. 29.	St. Paul, Minn.		Oct. 25
Oct. 29.	Lisbon, O.		Oct. 25
Oct. 29.	Brooklyn, N. Y.		Oct. 25
Oct. 30.	Jersey City, N. J.		Oct. 25
Nov. 1.	Columbus, O.		Oct. 25
Nov. 1.	Raymond, Miss.		Oct. 25
Nov. 1.	Steubenville, O.		Oct. 25
Nov. 5.	California		Oct. 25
Nov. 5	Bloomfield, N. J.		Oct. 25
Nov. 5.	Pikeville, Ky.		Sept. 27
Nov. 5	Kansas City, Kan.		Oct. 18
Nov. 5.	Collinsville, Miss.		Oct. 18
	Adv. Oct. 18 and 25.		
Nov. 5.	Fayetteville, W. Va.		Oct. 18
Nov. 6.	Ft. Pierce, Fla.		Oct. 25
Nov. 6.	Goldendale, Wash.		Oct. 25
Nov. 6	West Orange, N. J.		Oct. 18
Nov. 6.	Indiana		Oct. 11
Nov. 6	Morgantown, W. Va.		Oct. 11
	Adv. Oct. 11		
Nov. 6	Tallahassee, Fla.		Oct. 25
Nov. 6	San Diego, Cal.		Oct. 25
Nov. 6	Waterville, Wash.		Oct. 25
Nov. 7	Jefferson City, Mo.		Oct. 25
Nov. 8	Pennsylvania		Oct. 18
	Adv. Oct. 18 and 25.		
Nov. 8	Morristown, Pa.		Oct. 25
	Adv. Oct. 25		
Nov. 13	Prestonsburg, Ky.		Oct. 25
Nov. 14	Minnesota		Oct. 25
Nov. 19	Seattle, Wash.		Oct. 25
Nov. 22	Hindman, Ky.		Oct. 25
Nov. 24	Kendallville, Ind.		Oct. 25

Bids Close			See Eng. News-Record

EXCAVATION AND DREDGING

Oct. 29.	Duluth, Minn.		Oct. 18
Oct. 30.	Mankato, Minn.		Oct. 25
Nov. 1.	Papillion, Neb.		Oct. 16
Nov. 2.	Albany, N. Y.		Oct. 11
	Adv. Oct. 11 to 25.		
Nov. 2.	Redwood Falls, Minn.		Oct. 25
Nov. 2.	Algona, Ia.		Oct. 25
Nov. 2.	Sibley, Ia.		Oct. 11
Nov. 3.	Winamac, Ind.		Oct. 25
Nov. 7.	Lincoln, Neb.		Oct. 25
Nov. 8.	Harrisonville, Mo.		Oct. 25
Nov. 9.	St. Cloud, Minn.		Sept. 27

BUILDINGS

Oct. 29.	Trenton, N. J.		Oct. 25
Oct. 30.	Columbia, S. C.		Oct. 18
Oct. 31.	Davenport, Ia.		Oct. 18
Nov. 1.	Lawrence, Kan.		Oct. 18
Nov. 1.	Cleveland Heights, O. (Warrensville P. O.)		Oct. 25
Nov. 1.	Charleston, W. Va.		Oct. 25
Nov. 1.	Detroit, Mich.		Oct. 25
Nov. 2.	Lakefield, Minn.		Oct. 18
Nov. 15.	Northampton, Mass.		Oct. 25
Nov. 25.	Middletown, Mass.		Oct. 4
Dec. 1.	Norfolk, Va.		Sept. 13

FEDERAL GOVERNMENT WORK

Oct. 28.	Post Office — Waterloo, N. Y.		Sept. 20
Oct. 29.	Buildings—El Cayey, P. R.		Oct. 11
Oct. 29.	Buildings—Grand Isle, La.		Oct. 11
	Adv. Oct. 11.		
Oct. 29.	Distributing System — Charleston, W. Va.		Oct. 25
Oct. 30.	Metal Work, etc. — Key West, Fla.		Sept. 6
	Adv. Sept. 6 and 13.		
Oct. 30.	Post Office—Farmville, Va.		Sept. 27
Oct. 31.	Power House — Brooklyn, N. Y.		Oct. 4
Oct. 31.	Post Office—Hollidaysburg, Pa.		Oct. 4
	Adv. Oct. 4.		
Oct. 31.	Levee Work — St. Louis, Mo.		Oct. 18
Nov. 1.	Lookout—Omaha, Neb.		Oct. 11
	Adv. Oct. 11.		
Nov. 1.	Post Office—Kenton, O.		Sept. 27
Nov. 1.	Construction Materials — Detroit, Mich.		Oct. 4
	Adv. Oct. 4.		
Nov. 2.	Maneuver Boats — Cincinnati, O.		Oct. 4
	Adv. Oct. 4 to 25.		
Nov. 2.	Post Office — Valparaiso, Ind.		Oct. 4
Nov. 3.	Dredging—San Diego, Cal.		Oct. 25
	Adv. Oct. 25.		
Nov. 5.	Post Office — Burlington, N. C.		Oct. 4
Nov. 5.	Tank and Tower—Philadelphia, Pa.		Oct. 25
Nov. 5.	Steel Tower — Charleston, S. C.		Oct. 25
Nov. 5.	Steel Tower—Norfolk, Va.		Oct. 25
Nov. 6.	Bridge—Towaoc, Colo.		Oct. 18
Nov. 7	Buildings — Elbowoods, N. D.		Oct. 18
Nov. 8.	Levee Work — Vicksburg, Miss.		Oct. 18
	Adv. Oct. 18 and 25.		
Nov. 8.	Piers, etc.—Detroit, Mich.		Oct. 11
	Adv. Oct. 11 to 25		
Nov. 9.	Post Office—Forsyth, Ga.		Oct. 11
Nov. 13.	Post Office—Harrisonville, Mo.		Oct. 11
Nov. 14.	Post Office—Austin, Tex.		Oct. 11
Nov. 15.	Canals—El Paso, Tex.		Oct. 18
	Adv. Oct. 18.		
Nov. 16.	Maneuver Boats — Wheeling, W. Va.		Oct. 18
	Adv. Oct. 18.		

Bids Close			See Eng. News-Record
Nov. 19.	Fitting out Cranes—Washington, D. C.		Oct. 18
Nov. 19.	Shipbuilding Ways — Brooklyn, N. Y.		Oct. 25
Nov. 20.	Post Office—Caribou, Me.		Oct. 18
Nov. 22.	Post Office—Basin, Wyo.		Oct. 25
Nov. 23.	Post Office — Woodbury, N. J.		Oct. 25
Nov. 26.	Dry Dock Crane, Wash., D. C.		Oct. 25
Nov. 27.	Post Office—Chapel Hill, N. C.		Oct. 25
Nov. 28.	Post Office — Bellefourche, S. D.		Oct. 11

MISCELLANEOUS

Oct. 30.	Piers—Buffalo, N. Y.		Oct. 25
Oct. 30.	Elevated Railway—Philadelphia, Pa.		Oct. 18
	Adv. Oct. 18.		
Oct. 30.	Fire Escapes — Dover, N. J.		Oct. 18
	Adv. Oct. 18.		
Nov. 7.	Duct Line, New York, N. Y.		Oct. 25
Nov. 13.	Channel Improvements — Columbus, O.		Oct. 25
	Adv. Oct. 25.		
Nov. 15.	Pumping Machinery — Brockton, Mass.		Oct. 25
	Adv. Oct. 25.		
Nov. 15.	Flood Control—Dayton, O.		Sept. 13
	Adv. Sept. 13 to Oct. 18.		

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official.

WATER-WORKS

Proposed Work

Mass., Boston — City plans to improve water-works system in Franklin Park. About $30,000. E. F. Murphy, comr. pub. wks.

N. J., Wrightstown—Wrightstown Utilities Corp., incorporated with $150,000 capital stock plans to build water and electric systems here. Runyon & Carey, 843 Broad St., Newark, engrs.

Va., Danville—See "Industrial Works."

Va., Portsmouth—City having plans prepared by Schofield Eng. Co., engrs., Commercial Trust Bldg., Phila., improving water-works system.

N. C., Hickory — City to issue $15,000 bonds to build water-works system.

S. C., Fountain Inn—See "Sewers."

O., Ironton—City plans to issue $30,000 additional bonds to build water-works system. Cost of entire work, about $405,000. R. G. Howell, city engr.

O., Mt. Vernon — City to sell $15,000 bonds Nov. 1 to improve water-works system. R. S. Blum, city engr.

Ill., Grosse Point—(Official)—Village rejected bids for c.i. water pipe, etc. Noted Oct. 4.

Minn., Fergus Falls—City plans to sell $30,000 bonds to lay water and gas mains. H. Blegen, city engr.

Minn., Morris—City election soon to vote on bond issue to build water-works system.

A Consolidation of Engineering News and Engineering Record — Published by McGraw-Hill Publishing Company, Inc.

ENGINEERING NEWS-RECORD

A WEEKLY JOURNAL
DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

Volume 79 — NEW YORK, THURSDAY, NOVEMBER 1, 1917 — Number 18

A Last Word for James Peter Beck

IN THE portland cement industry Richard Hardy is known as the man who can not only generalize and summarize, grasp the bigness of problems and state them so all can understand, but also touch the heart strings, show forth the beauties of a man's life and point out its inspiration. Never did he any task better than the eulogy he delivered on James Peter Beck at the recent meeting of the Portland Cement Association. Because of its lofty sentiment and the interest it will have for Mr. Beck's many friends, it is printed in part in the news section of this issue. Would that all of us when we have passed beyond might have it said of us as Mr. Hardy says of Beck: "It has been good to have met Peter Beck on the way; good to have journeyed with him for an hour or two when life was still kind. We are all the better for having known him. . . . We shall often in the coming years turn to the page in our book of memories upon which his name is written." These sentiments will surely be re-echoed by everyone who knew Beck, who felt the force of his personality. It was indeed good to have met him on the way.

Clearing House Summary on Activated Sludge

FOR THREE YEARS the attention of all concerned with sewage treatment has turned with hope to the activated-sludge process. Like so many other innovations in sewage treatment, this one had its inception at the Lawrence Experiment Station, was seized upon and carried forward in England and later on taken up for intensive and extensive study in this country. The initial work at Lawrence and its elaboration by Dr. Gilbert J. Fowler and his followers in England should never be lost sight of by those who desire to give credit where credit is due. In America the activated-sludge process in its developmental stage has nowhere received more thorough study than at Milwaukee under T. C. Hatton and his able corps of assistants. In a large sense, Milwaukee has been a clearing house for activated-sludge data and opinion, for nearly everyone interested in the process has visited the Milwaukee testing station or at least has corresponded with Mr. Hatton. Among the services rendered by Mr. Hatton, not the least has been many papers he has written on activated sludge. The latest and ripest of these was presented before the Sanitary Section of the American Public Health Association at Washington on Oct. 18. It is so complete a review and summary that we take particular pleasure in presenting an extended abstract, containing substantially all its more essential features, beginning on page 840 of this issue. Lack of funds and space render uncertain the publication of American Public Health Association papers in its *Journal*. On this account, it is all the more important that a paper which will be read eagerly by hundreds of engineers and sanitarians all over the world be made immediately available.

The Twenty-Third Engineers—Supermen

FOR OBVIOUS reasons this journal's readers have an especial interest in the Twenty-third Engineers, the highway regiment now forming at Camp Meade. A month ago in need of recruits, with only 300 men enrolled, this journal was privileged to fire the first publicity gun in a recruiting drive, the ammunition being printers' ink. Last Saturday, three weeks after the first announcement was made in these pages, 1012 picked men swung into company front and passed in review before their commanding officer with an assurance of formation that only months of drill ordinarily give. The reason was not hard to find as one of the editors of the *Engineering News-Record* passed with the reviewing party along the long lines. The faces were those of strong men, men accustomed to direct others, men whose bearing betokened an ease that comes only with the habit of success, with accomplishment. The regimental records bore out the testimony of the faces—foremen, superintendents, mechanics, specialists in every branch of road making and its accessory arts—and all of them volunteers. In sum, the Twenty-third is gathering to it a superior type of men, the sort that give promise of making a great record on the lines of communication. And the letters of application pouring in daily are fully up to the standard already set. We have no hesitancy in saying that construction men who contemplate enlistment and have experience useful in the road-building art will not be disappointed in joining the Twenty-third.

Lack of Rolling Stock Forces Road-Material Embargo

THE ACTION of the Priority Board in issuing its second order, which forbids the transportation of road materials in open-top cars, brings home to the engineering profession in concrete terms the serious position of the country's transportation system in the matter of equipment. It is explained that, while the Priority Board recognizes the vital need for all the new road construction possible as a supplement to our overworked railroads, yet because there are not enough

coal cars in the country to supply the Navy, the merchant marine, our Allies, domestic munitions plants and public utilities with coal during the winter, to say nothing of the civil population of our own country, it is now necessary to eke out this supply by depleting the already inadequate supply of gondola cars to an extent which will shut off road construction during the winter. It is sincerely hoped by all parties to the promulgation of the order that it can be rescinded with the coming of warm weather at the very latest. There is no doubt that at the present moment we need the coal in the prosecution of the war far more urgently than we need the roads, and every highway official, engineer and contractor affected will cheerfully assist in enforcing the order and in using substitute transportation of some sort wherever feasible to keep important roadwork going. Neither is there any doubt that our rail transportation system is inadequate and in need of immediate financial help from the Government. If we would win the war, the railroads must not be allowed to rattle to pieces with antiquated equipment, run over properties which are depreciating because there is no money to keep them up. On the contrary, the facilities of the railroads must be increased to carry a traffic such as they have never borne before, and the property and equipment must be kept in first-class working order. If the Interstate Commerce Commission cannot afford the necessary relief at once, the Government must, by investing in their securities or otherwise, put its credit behind the railroads before another month has passed. The embargo on highway materials should spur every engineer whose opinion has weight with the Government to do his best to convince every official with whom he comes in contact that assistance to the railroads is prerequisite to the conduct of an offensive that will have military value.

Revival of River Traffic

THERE IS SUGGESTION of great future development in the step taken by the Government to revive freight-shipping on the upper Mississippi, noted on the news pages of this week's issue. If the barge line that will start next spring is a success, it will stimulate widespread public interest and enthusiasm, which are indispensable to the upbuilding of river and canal transportation.

Essentially a bulk-freight enterprise, the upper Mississippi project does not depend on the coöperation and support of many individual shippers. It can be maintained by a few large shippers and receivers, and does not depend vitally on general public interest. But conditions are otherwise for most other cases of waterway transportation, which, depending on package freight, must get their business from many individuals and must serve them adequately at collection and distribution points. It is this that makes so difficult the development of business on the almost completed New York State Barge Canal. Well-established public faith in the waterway service in all cases is, however, prerequisite to success; without it the business cannot be obtained nor proper terminal facilities planned and financed. Such public faith does not exist now. Success of the Mississippi barges would bring it.

If present indications are a gage of the true situation, the Mississippi enterprise will not have at the start the help of an active public interest. Such also is the situation in New York State. Thoroughly ingrained skepticism prevails over enthusiastic faith on the part of a few. This is but natural, in view of the long years of river idleness. The boats and barges of former times have gone to pieces and the old-time pilots have abandoned their calling. The public is waiting to be "shown." Success will convince it, even after the long history of river-traffic decay, the failure of a transportation project a year or two ago, and the indifferent success of an experimental barge trip between St. Louis and St. Paul, just made.

One important fact is clear even now, however: The railways stand ready to help the river enterprise throughout; as they have helped already the experimental trip. This new element in the situation must be reckoned as one of the great gains from our war emergency; it is another instance of the new coöperative spirit that is guiding all the country. Assured of railway support, river transportation has unhindered opportunity for development. It can succeed on its merits. It may prove its economy and capacity.

The problem is one of many complications, of which two only will be mentioned; one, the possible conflict between the demands of agriculture and of transportation, the other, the responsibilities of the municipalities in providing terminals.

The former issue was put squarely last month at St. Paul and for the time, at least, agriculture seems to have won over transportation. On the upper Mississippi the Federal Government maintains large storage reservoirs designed to control for navigation purposes the level of the river at St. Paul. Navigation there has been slight, so slight in fact that thousands of acres of land within the flowage lines of the reservoirs and connecting streams have been left dry, and neighboring farmers have taken advantage of the fertile ground to raise hay. This hay was growing nicely or was cut and stacked early this September when the Federal Government sent down the river the fleet of ore-laden barges which had previously delivered coal from the St. Louis district to the northern market. The barges met an extremely low stage of water, which could have been remedied by early filling of the control reservoirs and proper regulation, had not such control and regulation been forestalled by the importunities of the farmers whose hay crop would have been destroyed. Consequently, the fleet had to worry through an almost impassable stage of the river and the war-driven efforts of the Government to promote national efficiency by decreasing transportation costs were impeded by the war-driven efforts of the same Government to increase the food products of the nation. In regard to terminals the various municipal public-works men have an obvious duty. Immediate and adequate terminals must be built. Toward solving this essential part of the river transportation problem the Federal Government will contribute nothing—except possibly advice. If the river cities are, then, to realize on their geographical position they must overcome corporately their separate apathy and begin now to plan the connections and terminals without which all the government-owned barges in the world could not succeed as river carriers.

The Times Square Tangle

IT WILL BE INTERESTING to hear what the press of New York City has to say when the new dual subway system is put in operation, and those who use the New York Municipal Railway's new Broadway line discover what has been saddled on the public as an excuse for a station at Broadway and 42nd St., the main express stop of that line in Manhattan. As explained in *Engineering Record* for March 24, p. 452, this old layout was made long before experience demonstrated the density which traffic at such centers might reach, and was also made under the necessity of keeping the present subway across town at 42d St. in operation until the last moment—a necessity since removed.

Under this old plan, passengers can enter and leave the 500-ft. island express platforms only at the ends. These express platforms are more than two stories below the street. The exit stairs provided will also be used by incoming passengers—an inexcusable blunder of design in any circumstances—and are only 5 ft. wide between walls. Four of these stairs are to take care of half the total traffic at this station, which may well become the busiest of the entire dual system.

Although, after the publication of the article mentioned, and after agitation by interested associations in favor of changing this plan, it was announced that a new layout had been agreed upon which would greatly relieve the situation, it develops now that this new layout is not to be built. In fact, the structure as originally designed is already virtually completed and 30 ft. of backfill is being dumped on it at this moment.

There are commissioners and engineers in the pay of New York State on the force of the Public Service Commission for the First District whose plain duty it was to remedy this fault. They were fully cognizant of it, as is evidenced by their expressed intention to remedy it. They failed to do so, and, no matter what the circumstances, they must shoulder the blame.

Moreover, the circumstances are such as to reflect still further upon the conduct of these men. The changed plan, it will be remembered, included a mezzanine over the Broadway station from building line to building line. The contractor for the section including this station submitted a proposal to construct this mezzanine, including a price for cast-iron columns which the manufacturers warned was good for only one week. For more than a month, however, agents of the commission held up this plan, and finally attempted, on what was asserted to be too brief notice for action by the numerous interested estates, to make the owners of property adjoining this station contribute $60,000 toward the cost of the improvement. This in spite of the fact that the improvement was a necessary part of a city-wide rapid-transit system whose financing had already been provided for, and which is to be used by the entire public. Failing in this, the engineering force of the commission was directed to redesign this mezzanine, narrowing it between the curb lines and restoring certain ventilator structures (which have been rendered unnecessary by the installation of a mechanical system at this station), so that it will be physically impossible for the offending property owners ever to get any connection with the mezzanine. This redesign reduced the number of cast-iron columns by one-fourth, and made it necessary to place waterproofing in a narrow slot between the outside walls of the mezzanine and the ventilator structures mentioned, where the work would be very expensive. The contractor furnished a prompt estimate on this second proposal also, explaining to the commission that the waterproofing would cost more, and also explaining to the satisfaction of its engineering force that the price of cast-iron columns had increased greatly, and that the manufacturers would no longer furnish them at the first figure quoted. The entire matter, it is asserted, was agreed to, orally, and only the signing of the formal contract was necessary to initiate work on the change.

When this formal contract reached the office of the contracting firm it was noted that the price of the cast-iron columns had been reduced to the figure bid for the original change proposed, and that the price for waterproofing had been reduced to the price bid more than two years ago, when the general contract for the section was let. Thinking this a mistake, the contractor communicated with the commission before signing the document. He was informed, however, that the changes were not in error, having been made by one of the commissioners in person.

The amount involved is said to have been less than $1800. Although the contractor denies any intention of holding up the work on account of it, the entire handling of the affair is said to have been so offensive that it soon became evident to the contractor and his legal advisers that there was no use in pursuing the subject further while the commission looked at it in that light. The commission was notified that, as it would not adjust these items or even discuss the matter further, the contractor would not sign the agreement.

Of course, it is always possible for the engineers concerned to advance the argument that the contractor, by selfishly grasping after a paltry $1800, held up this needed improvement in the new transit system. It is also possible to assert, as has been done on the part of the commission, that this and other changes were proposed by the contracting firm to recoup heavy losses faced on the original contract because of changed conditions since it was let. Even if proved, this charge is not of a criminal nature. On private projects it is considered poor financial policy for an owner to compel the execution of a contract under such conditions.

Furthermore, neither of these arguments would hold water even if the contracting firm concerned were seven times the essence of greed. It is hardly the business of the contracting firm under circumstances such as those related to see that the design of the structure it builds is suited to the needs of the owner. It is most emphatically the duty of the Public Service Commission and of its engineering staff to see to this point, and no action by third parties can possibly relieve them of this obligation to New York City.

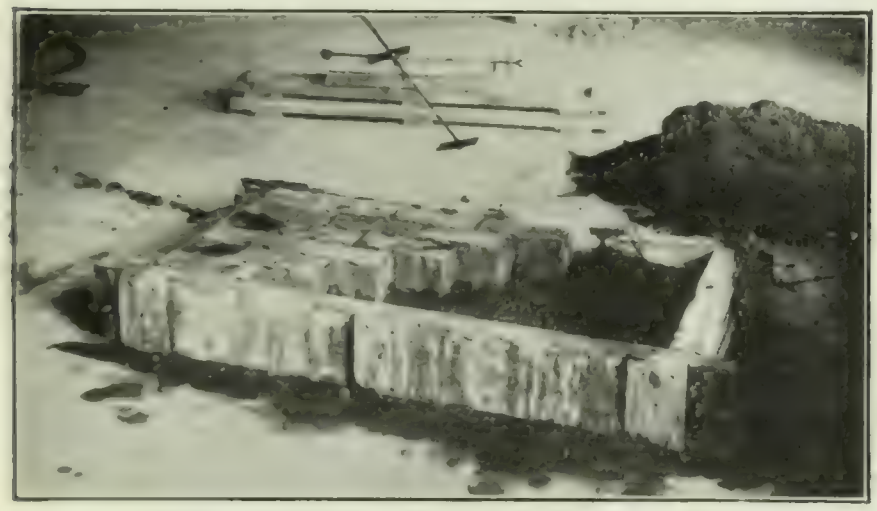
The damage done to the city, while serious, is temporary, and of a pecuniary nature. It will not be long after the line is in operation before public protest will force the city to dig up this station and reconstruct it in a proper manner—at greatly increased expense. The damage done to the standing of the engineer is not quite so tangible, but its effects are liable to persist for a longer time.

Tests Show Advantages of Laying Brick Directly on Concrete Base

Comprehensive Research Completed at the University of Illinois Justifies the Assumption That the Strength of Such a Slab Is the Same as That of an Equal Thickness of Concrete

By C. C. Wiley
Instructor in Highway Engineering, University of Illinois

AFTER A SHORT series of tests on the monolithic type of brick pavement construction, which tests were described in *Engineering Record*, Jan. 15, 1916, p. 86, the University of Illinois undertook a longer series of tests with the intent of confirming more fully the points brought out by the preliminary tests and of furnishing, if possible, reliable data upon which the design of a brick pavement could be based. The test series laid out by the Department of Highway Engineering was carried through by H. H. Edwards and R. P. Brown, highway engineering students of



ALL SPECIMENS WERE 23 x 45 IN., BEING FABRICATED IN SPECIAL FORM

the class of 1917, and has demonstrated rather conclusively that the monolithic type which dispenses with the dry mortar beds is superior in many ways, and that the strengths developed in cross-breaking are at least equal to those exhibited by a concrete slab of the same thickness and having the same composition as the base of such a composite slab.

The present and more extended series comprised 66 slabs of four general types, as follows:

1. Plain concrete slabs indented to represent ordinary concrete roads, and the concrete base used in other kinds of pavement.

2. Monolithic brick slabs of the type first constructed in Paris, Ill., and adopted by the Illinois State Highway Department. This type is referred to in this paper as the "dry-layer" type, since a thin layer of mortar is used to smooth the surface of the concrete.

3. Monolithic brick slabs of the kind used on the bond-issue roads of Vermilion County, Illinois, in which the bricks are laid directly on the green concrete. This type called here the "direct-contact" type, was described in *Engineering Record*, Sept. 30, 1916, p. 400.

4. Monolithic slabs consisting of grouted brick only.

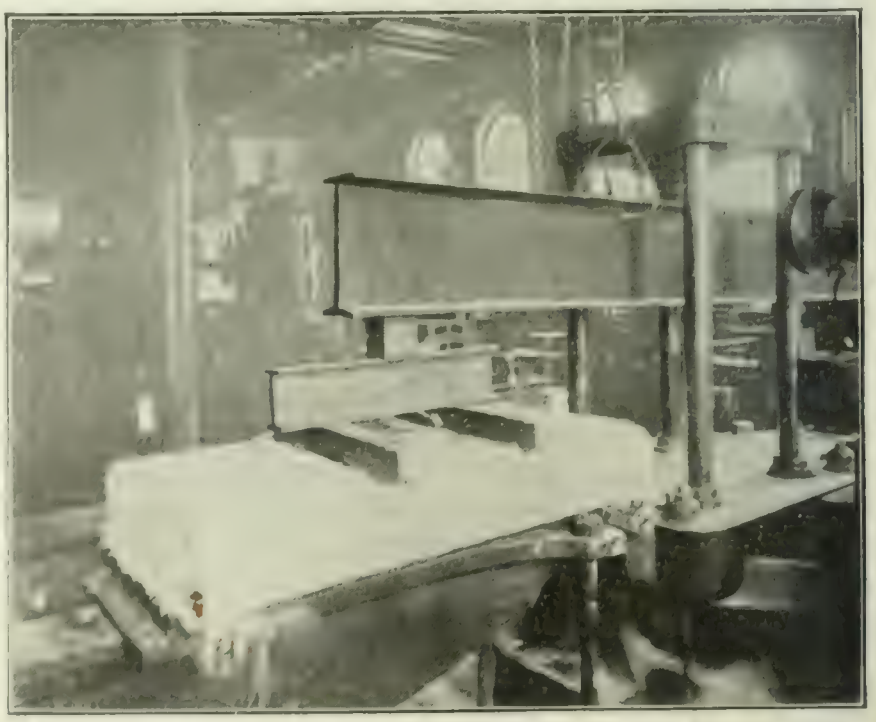
Each of these four types is represented by several groups which differ in details. Each group consists of three specimens.

The aggregates used in the concrete were washed gravel and sand of well-known excellence obtained from glacial deposits along the Wabash River near Covington, Ind. The gravel was well graded from 1 in. down to ¼ in., except for the slabs with very thin bases, where a roofing gravel ranging from ½ to ¼ in. was used. The sand for the concrete was well graded from ¼ in. down, while that used in the dry mix would pass a ⅛ in. screen.

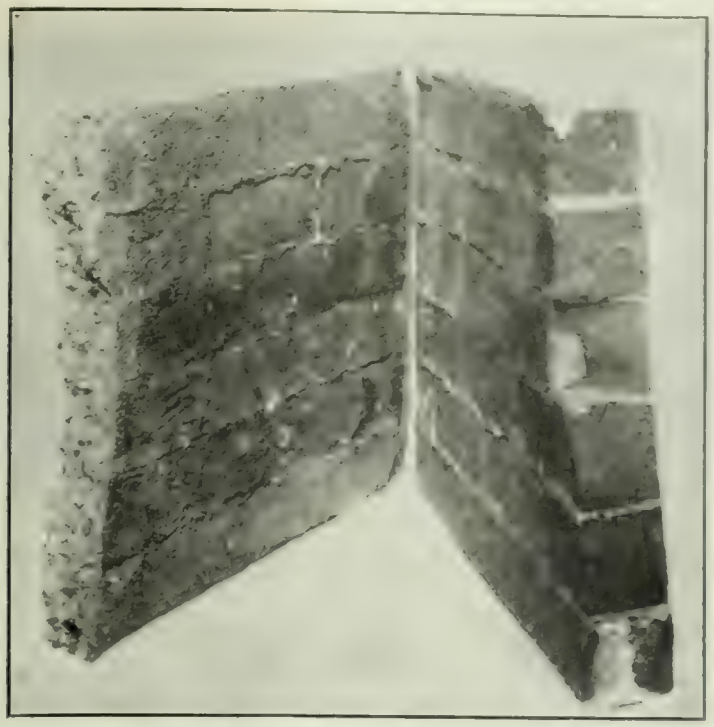
At first the same sand as that employed in the dry mix was used in the grout filler, but later this was replaced by a fine, hard, silicious sand from Lincoln, Ill., all of which would pass a $\frac{1}{16}$ in. mesh. A standard brand of portland cement was used and a quantity sufficient for the entire series was purchased at one time on the open market.

The bricks were "Danville Block," furnished through the courtesy of Harvey C. Adams, president of the Danville Brick Co., Danville, Ill. Wire-cut-lug bricks were used in virtually all slabs. A few semi-repressed blocks having a bar-shaped spacing lug entirely across one face, and a few 2-in. plain wire-cut bricks were used in some slabs.

Every precaution was taken to maintain strict uniformity in all test conditions. Tests were made of all materials, to insure uniform quality. The materials were stored indoors so as to be always air-dry and in addition the aggregates were oven-dried at a low temperature shortly before using, to insure a uniform water content. The materials for each batch of concrete were measured separately and every operation of mixing the concrete, molding and grouting the slabs, and then



SPECIAL TESTING RIG APPLIED LOAD AT THIRD-POINTS



MORTAR ADHERES TO BASE IN DRY-LAYER TYPE, SHOWING LOW BOND TO BRICK

curing and testing them, was strictly standardized. The results are therefore believed to be comparable and free from undue variations.

The concrete was proportioned by volume—a sack of cement being considered as 1 cu.ft.—and was mixed in a small, power-driven, batch mixer. In the first tests the grout was mixed by hand, but later it was mixed in the same machine.

The slabs measured 23 x 45 in., as these dimensions accommodate six courses of five bricks each. Wooden forms were used, and the slabs were fabricated on a concrete floor, using building paper as a separator. After the concrete was deposited in the form it was struck off to the desired depth by means of a template. If the slab were of the "dry-layer" type the dry mix was spread and smoothed off with a second template so set as to form a layer of the dry mix about $\frac{3}{16}$ in. in thickness. If it were of the "direct-contact" type the same template was used for cutting the concrete and for tamping the surface to a slightly puddled condition to receive the brick. In either case, the bricks were laid and tamped lightly to an even surface and then sprinkled and grouted, a rubber-edged squeegee being used to finish the surface.

When two days old the slabs were covered with about 2 in. of sand, which was kept moist until the 26th day, when it was removed and the slabs were transported to the testing laboratory, where they were permitted to dry in air until tested.

All slabs were broken at the age of 28 days in an Olsen testing machine of 200,000 lb. capacity. Because the slabs were too wide to go between the screws of the machine, they were placed on the table extension and the load was transferred from the head of the machine through a needle beam, as is shown in the illustration. The load was transmitted from the needle beam to the slabs through a loading rig of small I-beams so spaced as to concentrate the load equally on the third-points of the span. The slabs were supported on bearing plates resting on rollers spaced 42 in. between centers. Plaster-paris was used to bed all bearing plates on the slabs.

The fractured specimens were placed out of doors with the broken edges uppermost and exposed directly to the weather, for the purpose of observing the effect of the elements. Some of the slabs have been exposed for more than a year, but all of them have not been outside a sufficient time to give reliable indications.

Since the slabs were broken on their smaller dimension, it follows that those slabs having longitudinal courses were broken across the courses, corresponding to a longitudinal crack in the pavement; while those with transverse courses were broken along a grouted joint, corresponding to a transverse crack.

Comparison of the results given in the accompanying tabulation will show that when the concrete side of the slab is in tension the direction of the brick courses has little effect on the strength, and that the modulous of rupture is approximately that of plain concrete of the same quality. This is true when the concrete forms roughly one-half of the thickness of the slab. With the very thin bases, the brick makes up a sufficient part of the total slab to govern its behavior.

When the brick are in tension there is a marked difference in strength with the direction of the courses of brick, as would be expected. Here the slabs with longitudinal courses show high strength, in most instances greater than that of 1:2:3 concrete. This is doubtless due to the fact that the bricks lap in such a way that a shearing stress is set up between the bricks and the grout, and the bond in this direction is sufficient to develop high beam strength. The slabs with transverse joints are very much weaker, since in this case the stress is direct tension on the bond between the brick and the grout. The beams with diagonal courses show a strength intermediate between these two.

At first thought, it would appear that with this wide difference in strength in the two directions the pavement would fail when subjected to the load that would suffice to set up the necessary stress in the weakest plane. Such, however, is not the case. With a load concentrated at a given point the tendency to deflect is the same in all directions, and as fracture cannot occur until a certain amount of deflection takes place, it follows that the slab will not fail along this weakest section sooner than elsewhere, unless the con-



SAND DISSOLVED BY RAIN FROM MORTAR NOT COVERED WITH CEMENT—MANY GRAINS DISLODGED

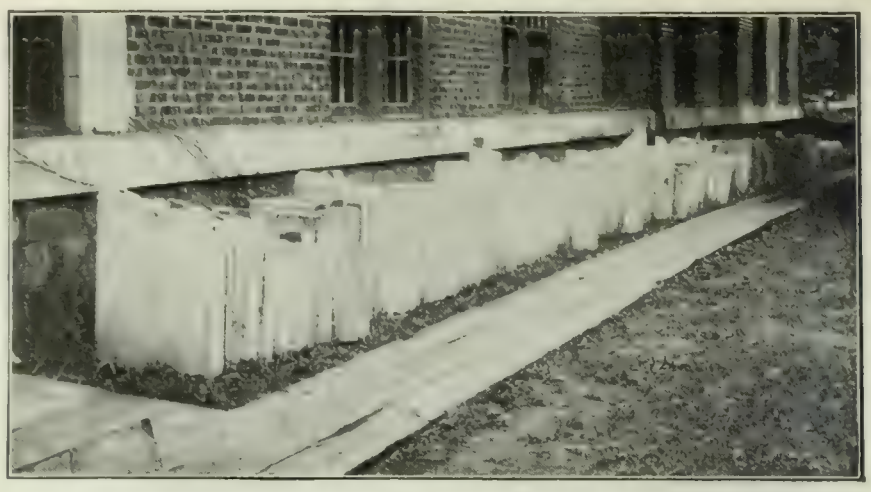
ditions of loading are such that the greatest tendency to deflect is along this plane. As the only condition of loading which would cause such deflection is that of a simple beam, and as such a condition is highly improbable in a pavement, it follows that the weakest section does not govern of necessity the strength of the road.

Little difference in strength is noted between the "dry-layer" type and the "direct-contact" type of construction, and what difference exists is probably due to a difference in the grout. The "dry-layer" slabs used a grout of ⅛-in. sand, which a few tensile tests showed to yield a stronger grout than the $\frac{1}{16}$-in. sand used in the "direct-contact" specimens. It is worth noting, however, that the grout of ⅛-in. sand was decidedly more difficult to mix properly and showed more tendency to segregate than did the other—a point worth considering in actual construction.

In the "dry-layer" type of construction the bricks show the greater tendency to separate from the concrete. The materials in a dry mix are never associated as intimately as those in a wet mix, and consequently the cement does not come into as thorough contact with either the sand grains or the brick. The "dry-layer" is, therefore, weaker than the underlying concrete, and

MODULI OF RUPTURE OF SLABS

Description of Slab	Group	Slab Nos.	Thickness, Inches: Concrete	Brick	Total	Material in Tension	Averages: Total Load, Lb.	Modulus of Rupture, Lb. per Sq. In.
1 2 3—Plain concrete	A	A7, A8, A9	6	0	6	Concrete	9,512	480
	B	A10, A11, A12	7	0	7	Concrete	12,815	478
4 5 6—[illegible]	C	B37, B38, B39	7	0	7	Concrete	11,735	437
"Dry-layer" Type 7 8 9—Concrete base, 1:3:5 [illegible]	D	A13, A15, A19	2	4	6	Concrete	9,888	502
	F	A14, A17, A18	2	4	6	Brick	10,258	523
	E	A1, A2, A6	3	4	7	Brick	12,505	466
	G	A3, A4, A5	3	4	7	Concrete	14,293	532
Same, except that bricks are set on edge at 45° to axis of slab	H	A20, A22, A23	3	4	7	Concrete	11,485	428
	I	A21, A24, A25	3	4	7	Brick	7,052	263
Same, except [illegible]	K	A30, A36, A37	3	4	7	Concrete	12,207	455
	L	A32, A33, A34	3	4	7	Brick	4,357	163
10 11 12—Concrete base, 1:3:5 [illegible]	M	A26, A27, A28	1	4	5	Concrete	5,162	377
"Direct-contact" Type 13 14 15—Concrete base, 1:3:5 [illegible]	N	B1, B2, B3	1	4	5	Concrete	7,400	540
	O	B4, B5, B6	1	4	5	Brick	7,478	546
Same, except [illegible]	P	B28, B29, B31	3	4	7	Concrete	12,820	478
	Q	B30, B32, B35	3	4	7	Brick	11,730	437
Same as other, except [illegible]	R	B34, B35, B36	3	4	7	Concrete	12,287	470
Original type, 16 17 18—Concrete base, 1:3:5 [illegible]	S	B7, B8, B9	0	4	4	Brick	4,988	569
Same, except [illegible]	T	B10, B11, B12	0	4	4	Brick	1,325	151
Same, except [illegible]	U	B22, B23, B24	0	4	4	Brick	5,122	585
Same, except [illegible]	V	B25, B26, B27	0	4	4	Brick	4,732	540



ALL SPECIMENS WERE EXPOSED TO WEATHER AFTER TEST

the bond to the brick is not great. Further, any water falling on the dry mix will wash the cement from the exposed grains and frequently the wind blows so much of it away that the bricks are actually in contact with a layer of sand instead of mortar. In addition, it is not improbable that moisture collects in the porous dry layer and may later cause separation by freezing.

On the other hand, the "direct-contact" type furnishes a bed of thoroughly mixed wet mortar favorable to a close contact of brick and cement. Some incomplete tests indicate that the direct tensile bond of the brick to the concrete is several times greater in the "direct-contact" type than in the "dry-layer" type. Incidentally, none of the "direct-contact" slabs exposed to the weather has shown signs of separating, while several of the "dry-layer" type have given such signs.

Tests of slabs composed of brick only show clearly that the grouted slab possesses considerable strength of its own—a fact apparently overlooked in the design of the sand-cushion type of pavement. Evidently, the base was expected to furnish the strength and the brick to serve only as a wearing surface. But after all, the brick portion is a rigid slab on a more or less compressible foundation, and it is necessary for it to carry the load first.

The monolithic type of construction combines the strength of the brick slab with that of the concrete base in such a manner as to develop the maximum in both, and these tests show that such a compound slab is fully equal in strength to a concrete road slab of the same thickness. It appears therefore that in the monolithic brick road the brick and the concrete should not be considered as separate units of a pavement, but rather as integral parts of a single structure. In other words, a monolithic brick slab 7 in. thick should not be viewed as 4 in. of brick on 3 in. of concrete, but should be treated as a 7-in. concrete slab. The bricks are essentially aggregate of high wear-resisting qualities. This may be expressed in another way—if a 7-in. slab of concrete is sufficient to carry the load, so is a 7-in. monolithic brick slab—with the added factor of high resistance to the wear and tear of traffic. With this type of construction it seems therefore entirely logical to reduce the total thickness of the slab, either by reducing the thickness of the base or by using thinner bricks, provided a sufficient gross thickness is retained to furnish strength enough to carry the probable loads, and this necessary gross thickness can be determined on the same basis as the thickness of a concrete road.

Unsanding Two Deep Wells

Special Expedients Necessary to Remedy Faults That Were Introduced by Drilling Without Engineering Supervision

By W. C. Hammatt
Consulting Engineer, San Francisco

IT IS a frequent occurrence that deep wells, bored by well-drillers without engineering supervision, fail to give the expected quantity of water; or if the expected quantity of water is produced, it is frequently accompanied by so much sand as to make impracticable the maintenance of the ordinary type of deep well pump. Recently the conditions in two such wells were referred to the writer to diagnose and put in operating condition.

The first of these wells is shown in Fig. 1, accompanied by the log as furnished by the well-borer. Since this well was bored without engineering supervision, it was impossible to identify the materials corresponding to the nomenclature furnished by the well-borer and, therefore, impossible to determine from just which stratum appeared the sand which was being pumped.

This well is 12 in. in diameter and 243½ ft. in depth —the casing being perforated for 100 ft. from the bottom. A test of this well with an airlift showed a capacity of 116 gal per min. over a period of three days, with a drop of the water level of less than 40 ft. below its static condition. A pump was installed with a capacity of 100 gal. per minute, but very soon the pump began handling such a quantity of sand as to make it impossible to operate for more than two or three days without changing leathers. This sand was yellow in color and 80% passed a 40-mesh sieve. Since no samples were taken of the various strata during the boring of the well, there was no certainty that the sand entering the well during operation came from any particular stratum.

Presumably the greater quantity of the water came from the blue and gray water sand near the bottom of well, with perhaps a fair quantity from the gravel stratum between the 171-ft. level and the 180-ft. level. Since there was some doubt, however, in regard to the well-borer's method of taking measurements, the writer did not consider it safe to attempt to make use of the upper stratum, but decided to case out practically all water except that from the blue and gray water sand. The method of doing this was as follows:

An 8-in. inner casing was installed and centered with the outer casing by means of metal straps. The bottom 18 ft. were perforated with slits $\frac{1}{32}$ in. wide, providing an aggregate area of about 200 sq.in. The 8 in. casing was extended upward for a distance of 100 ft. above the bottom of the well, where a taper section increased the diameter to 9 in.

The bottom 18 ft. between the two lines of casing was then filled with gravel accurately screened by hand to pass through a 2-mesh sieve and be retained by a 4-mesh sieve. The next 2 ft. were filled with gravel accurately screened to pass through a 4-mesh sieve and be retained by a 10-mesh sieve. The next 2 ft. were filled with hand-screened gravel, 10- to 20-mesh; the next 2 ft., 20- to 40-mesh; and the next 2 ft., 40- to 80-mesh. From this point upward the whole space between the two casings was filled with ordinary sand running from about 10-mesh to 80-mesh, but not accurately segregated.

This segregation makes it impossible for sand of one size to pass through the sand of the next larger size below. Thus the advantage of filtration through the smallest size is obtained without danger of pulling any

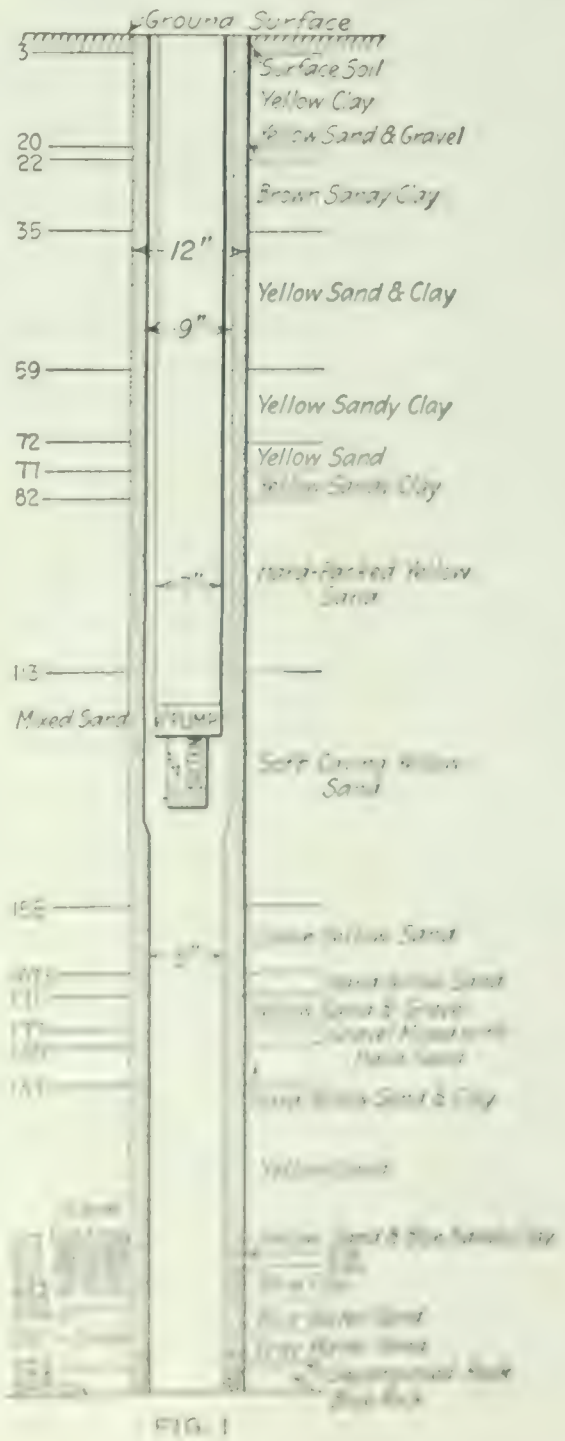


FIG. 1

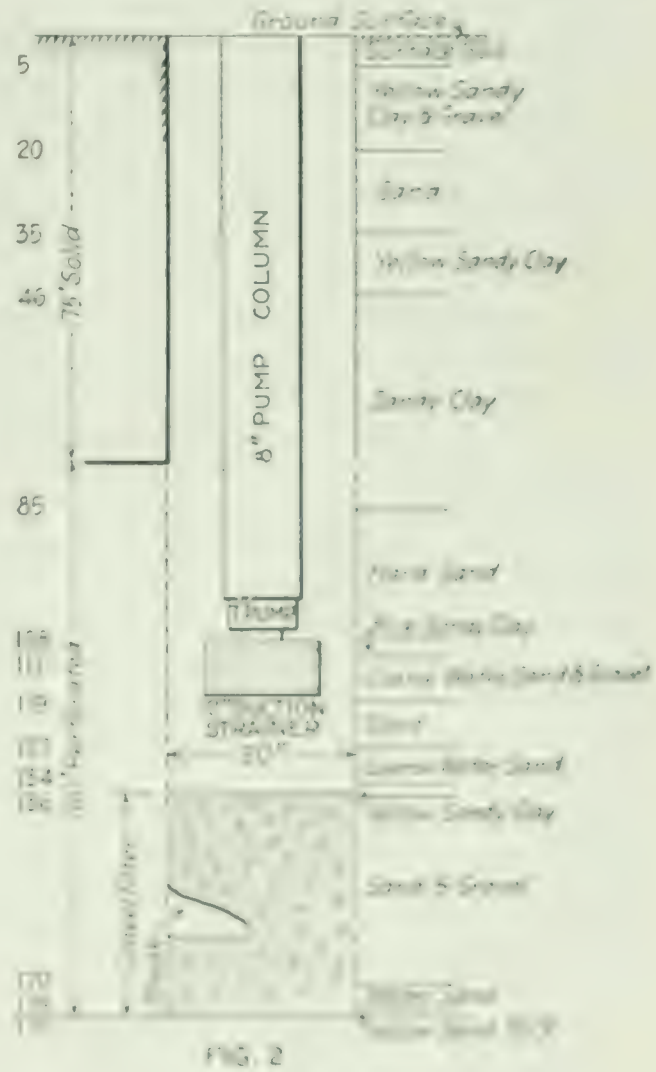


FIG. 2

of it through the perforations. While this method does not actually shut off the water from the yellow sand, it requires it to be filtered through the sand betwen two casings before it comes through the perforations at the bottom of the inner casing, and keeps any of the yellow sand from being drawn into the bore of the well.

On the completion of this installation the pump was overhauled and again put in commission. It was found that the capacity had diminished to about 83 gal. per min., though the difference in capacity probably was due only partly to the partial shutting off of the water derived from the yellow sand, since the test was made at a season of the year when the wells were delivering their minimum quantity. The pump has now been in operation for some time with a uniform discharge and virtually no sand.

Light Steel Casing

The second well was bored in 1908 at a time when materials were hard to obtain, and it was therefore cased with very light, black steel casing, perforated with slots about $\frac{1}{16}$ in. in width for the lower 100 ft. The well was 20 in. in diameter and 175 ft. deep, the log being as shown in Fig. 2.

The winter had been one of extreme drought, and with the beginning of the summer season a larger quantity of water than usual was needed. The wells were all cleaned for the purpose of increasing their supply. Shortly after the pump in this particular well was reinstalled, it stalled suddenly. On pulling the pump column it was found to be filled for a height of 45 ft. with sand and gravel. The well itself also was found to be filled for over 20 ft. with sand mixed with gravel, some pieces being as much as 4 in. in diameter. It was therefore clear that the casing had caved, and an attempt to clean the well showed the cave-in to be about 18 ft. above the bottom, where the casing had bulged nearly to the center of the well. While there was a possibility of forcing the casing back to its original section by means of a specially designed bulger, this procedure was considered to be so costly and precarious as not to warrant the attempt. A new well to replace the old would not only be expensive, but the boring would require time. Repairs to the existing well were carried out in the following manner:

The sand and gravel were completely removed from the bore of the well by means of a sand pump small enough to pass the bulge in the casing. The bore of the well was then filled to a depth of 40 ft. from the bottom with coarse gravel which would pass through a 1-in. mesh and be rejected by a ½-mesh. This is well above the stratum where the break occurred.

Gravel Prevents Further Caving

This gravel was intended merely to hold the weight of the caved material and prevent it from entering the bore of the well or forcing in the casing any further. The stratum from which the water is produced consists of very coarse gravel with some fine sand, and the drawing out of this sand from the gravel, over a period of years, probably caused the ultimate movement of the remaining gravel. It is probable that very little more sand will be drawn from this stratum, as the period of pumping has been so great that the sand has probably all been removed for some little distance from the well. On this probability reliance was placed. If much more sand were to be drawn from this stratum, it would ultimately fill the voids in the gravel in the bore of the well and would cut down the production to a considerable extent. This will take a long time and meanwhile the well can be kept in use, thus avoiding the expense of boring a new one.

Since this well was restored it has produced 67 gal. per min. against 42 gal. per min. which it was producing prior to the cave. It is thus evident that the cave which broke the casing opened up the water stratum and somewhat facilitated the production of water therefrom.

Professional Questions

Engineers are urged to send to the Editor comment on cases presented in this section or statements of their own experiences in matters of professional ethics.

Communications must be signed, but names will be withheld from publication, if the writer so desires.

Employees with Better Jobs in Sight

Referring to the editorial in *Engineering News-Record* of Aug. 30, p. 386, "Professional Questions Call for Study," two highway engineers have written to this journal urging discussion of the practice of some employers (1) declining to consent to their employees being offered more remunerative positions by others, when their consent is asked in advance; or (2) declining to recommend employees who have been approached by prospective employers who offer greater remuneration.

Charges for Professional Services

An engineer makes the following inquiries as to charges for professional services:

"I will greatly appreciate an opinion on the matter of professional charges from both the architect's and engineer's point of view in the following cases:

(1) A new corporation is to build approximately $67,000 worth of new mill buildings for automobile construction and wants me to furnish a complete set of plans, all details, have charge of all contracts, furnish complete supervision and hire men for inspection during the construction. Is 6% of the above price all right?

"(2) A corporation engages an engineer to make preliminary studies for railroad trestles, coaling stations, industrial railways, steam railroad connections, concrete bridge abutments, steel plate girders, preparation of contracts, right-of-way maps, full charge of construction, hiring of inspectors, and to assume full charge of the entire work. What is a fair price for this engineering? If the work were divided into three parts, what should be charged for (1) the preliminary conference; (2) surveys and maps, plans of bridges, cross-

section and final estimate; (3) entire engineering services?"

What is the opinion of *Engineering News-Record* readers as to the amounts of the fees which should be charged in the cases cited?

Questionable Practices in Engineering Work

THE LETTER by S. Whinery in *Engineering News-Record* of Oct. 4, p. 657, raises a question about which more should be written, according to D. R. Shearer, of Johnson City, Tenn., who submits the following comment: Of course, the average engineer has a general idea of the ethics of his profession, but this idea is not always clearly defined in his mind. To follow any line of conduct it is necessary to have a very definite knowledge of the tenets embodied and to feel that the line of demarcation between the good and the evil of a certain creed is plainly evident to all concerned.

It seems to the writer that the engineering societies should give greater publicity to their respective codes of ethics, and that the engineering journals should publish such a code as is applicable generally to the profession. If this should be done and you should adhere to your purpose of commenting upon special cases as they arise, it seems that engineers acting in an unprofessional manner necessarily would absorb gradually so much knowledge of the questions involved that it would act as a deterrent of many practices now in vogue among certain classes of the profession.

Engineering is a business as well as a profession, but a true code of ethics is as applicable to a business as to any profession, so that those engaged in the essential branches of business connected with engineering are in no sense immune from an application of ethics to their own work.

There is one questionable practice which seems to be growing upon the profession in recent years and about which little is heard in the journals and societies. That is, the selling on commission of certain machinery or equipment by engineers who are supposed to represent their clients in an impartial and unprejudiced manner. Of course, there are many sales engineers who often are called in as consultants, but in such cases the clients know what they are doing. The trouble comes from the engineer engaged in general practice who has surreptitiously certain agreements with manufacturers and of course recommends the products of those manufacturers without carefully weighing the advantages of equipment made by other manufacturers of similar lines.

Another practice which may not be unethical, strictly speaking, is often evidenced among engineers to their discredit, and that is the recommendation of equipment made by a certain manufacturer simply because the engineer was trained in the shops of that firm or has a better knowledge of that line. It is true that there is great difficulty in taking an absolutely unprejudiced view of any question, but that view should be the aim of every engineer engaged in general practice. It is only by looking at every question from all sides that the engineer can render the greatest service possible to his client.

Copper Town Outgrows Its Water and Sewage Systems

ENORMOUS growth in the output of the Globe-Miami copper mining district in Arizona has put an added strain on the water-works system, and made the antiquated cess pools and the private sewers to the nearest ravine a menace to the health of Globe, a city of 10,000. The payroll of the district is $1,500,000 per month, and 25,000,000 lb. of copper is produced.

Labor and I. W. W. troubles have prevented a bond issue of $500,000 from being put up for vote until this fall, although a report by the Benham Engineering Co. on the questions has been in the hands of the officials since June. From this report we learn:

Globe secures its water from a deep well and a system of shafts and galleries or tunnels about ½ mile from the southern limits of the city. The latter is a surface supply, 54, 65 and 165 ft. below ground level. In 1914 the surface supply became inadequate and a well was sunk from the bottom of the lowest shaft 910 ft. below the surface. A turbine pump of 700-gal. per minute capacity is located 100 ft. below the surface of the ground. Since its installation the well has furnished the greater portion of the supply and continuous pumping at full capacity has never lowered the surface more than 5 ft. The engineers felt that the city should not expend, until need arose, a vast amount of money in developing a more costly surface system by impounding winter and flood flow. From the top of the existing well the penetration of the Gila conglomerate, through a series of water bearing formations, indicates that a second well of similar construction will furnish all the water needed for many years. The Gila conglomerate is essentially a valley deposit at least 700 ft. deep over the Pinal Creek area surrounding Globe and extending south 4 miles and west 5 miles, running northwest toward Miami, where it narrows considerably. The formation is a firm but not hard conglomerate, varying from fine sand to boulders 8 ft. in diameter. High timbered mountains, snow covered in winter, are the source of the supply.

The daily water consumption in Globe averages 25 gal. per capita, and the 1840 water accounts, 1600 of which are metered, each yield $24.50 per year. Costs of pumping per 1000 gal., excluding depreciation, for 1913 to 1916 inclusive, have been as follows: 27.5 cents, 38.6 cents, 46.8 cents and 38.8 cents. The abnormally low consumption is due to the small amount of waste and to the fact that no industries are supplied. The engineers estimate that with a new sewer system installed the increase will be but 50 per cent, because the residences are now mostly connected with cess pools or private drains.

Wrought or galvanized iron pipe only has been used for mains, and in the engineer's opinion its life does not exceed 10 years, the present system requiring constant repairs and renewals.

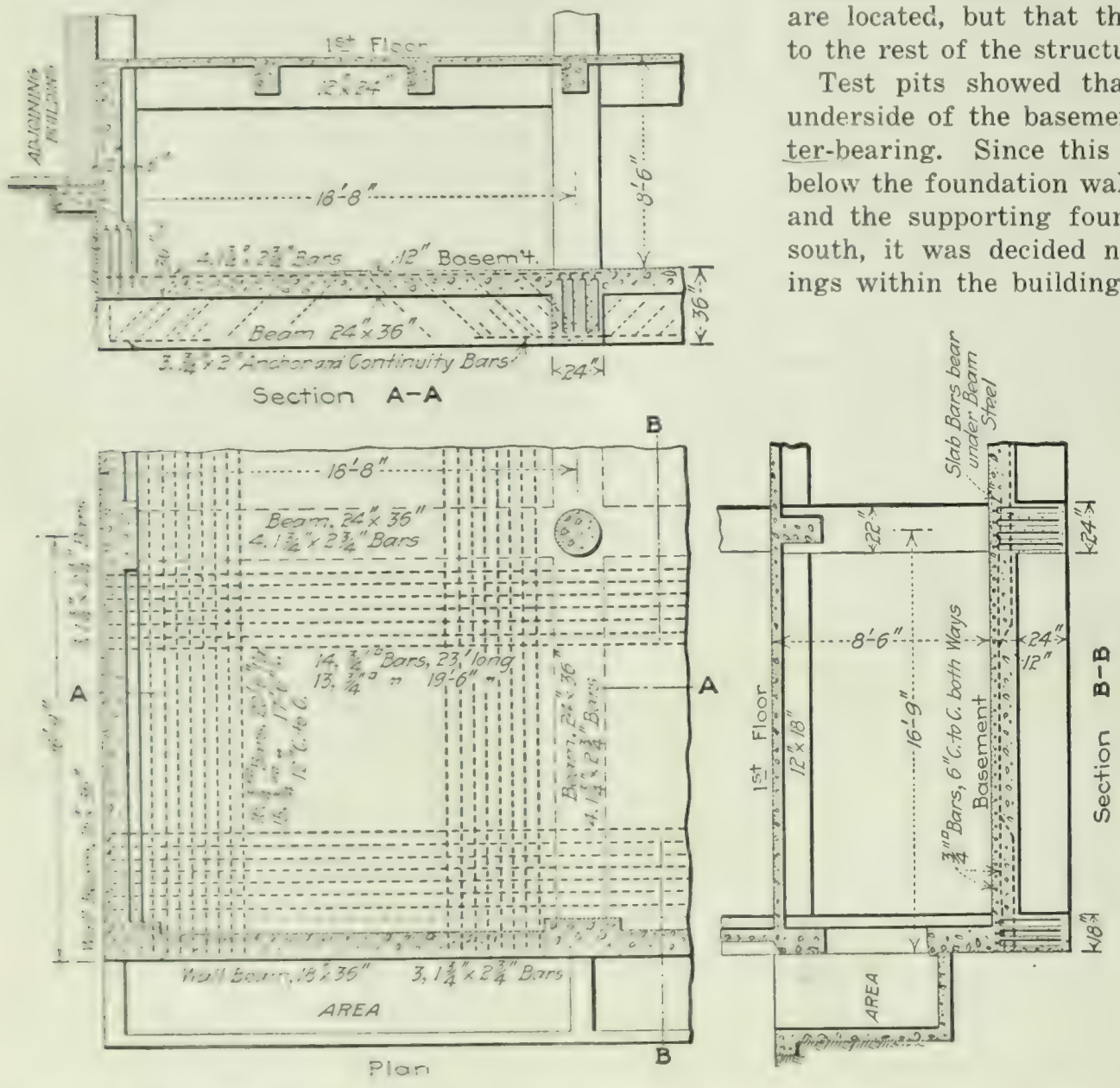
The sewer system presents no difficulties, as the grades are heavy and comparatively small pipes may be used for mains and in connect with the two Imhoff tanks below the city discharging into Pinal Creek.

Assisting the Benham Engineering Co. in making the investigation were R. A. Smith, city engineer, and George Cook, water superintendent.

Floating Foundations Carry Two Concrete Buildings

Factories in Chicago and Camden Have Inverted Floor System to Distribute Loads Over Soft Ground

THE USE of a mat foundation for spreading the weight of a heavily loaded concrete building over a soft foundation is well illustrated in two widely separated structures recently completed. One is for the Farr & Bailey Manufacturing Co. in Camden, N. J., the other for the Felt & Tarrant Manufacturing Co. in Chicago. In both buildings the foundation is an inverted reinforced-concrete beam-and-slab system distributing the concentrations of the column loads uniformly over the ground surface.



DETAILS OF CORNER OF CAMDEN BUILDING, SHOWING FLOATING FOUNDATION

It was intended originally that the Camden building should occupy only the area of the two bays of the north side of the building (which is on the left-hand in the accompanying view) and should be connected by a bridge at the fifth floor level with the large building at the south side. This first decision was made because in line with the present third and fourth bays there was a street which was a part of the driveway system of the plant, and also because a one-story building occupied the space on the south bay, and housed six sets of steam coils and blowers—equipment needed for one of the processes in the manufacture of linoleums carried on in the building. After more thorough consideration, it was decided to cover the entire area with a building five stories high, using the first floor of the south bay to house the blower equipment, and the next adjoining bay for the driveway.

Because the blower machinery rested on foundations built on the ground, and because it was impossible to shut down this equipment, it was not possible to permit any part of the foundations to occupy any of this area, so it was decided that the new building should not have a basement under the southern bay where the blowers are located, but that the basement should be limited to the rest of the structure.

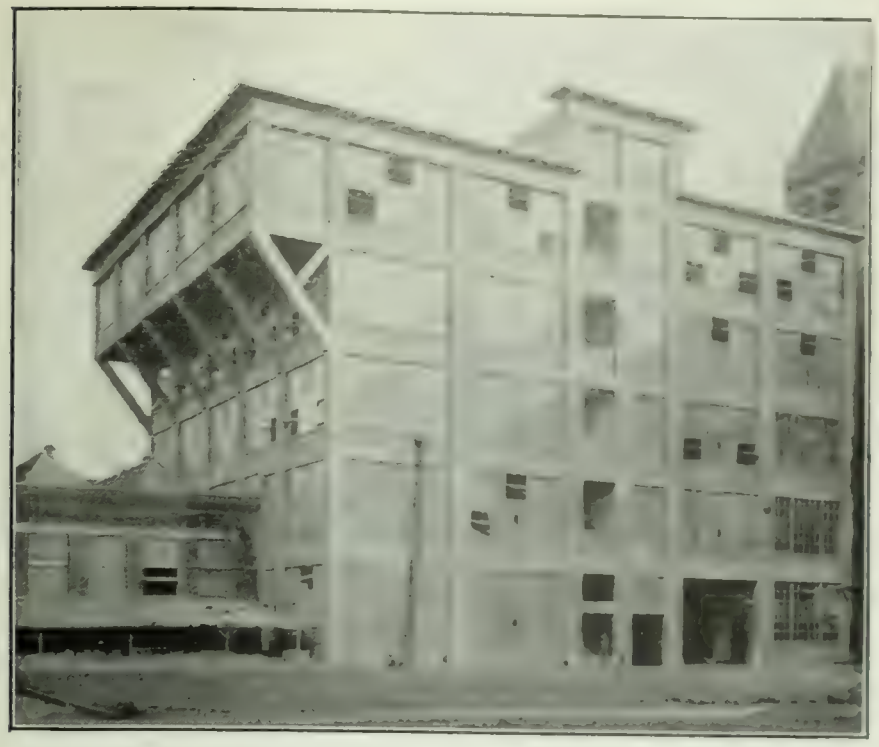
Test pits showed that the supporting soil at the underside of the basement floor was very soft and water-bearing. Since this basement extended very much below the foundation walls of the building on the north and the supporting foundation of the blowers on the south, it was decided not to construct separate footings within the building lines, but to design the basement floor as a supporting floor, with girders extending both ways from column to column, and projecting below the basement floor as detailed in one drawing shown herewith. This entire reinforced-concrete floor was designed to distribute the weight from the columns by the cross-girders and the slab over the entire area, equalizing the weight as much as possible. Therefore the reinforcing steel in both the girders and the slab had to be located near the top of the concrete, reversing the ordinary method of reinforcing a floor when the load is superimposed.

Later, on account of necessary changes, some of the girders were incorporated in the exterior walls above the basement floor slab. This was preferred to extending them below as in the case of the intermediate girders.

Because of the location of the blower machinery in the south bay, it was impossible to construct column footings or columns against the building on the south; therefore the south bay of the new building had to be carried on the brick wall of the old building, not a desirable but a necessary solution of the difficulty. Nevertheless, no cracks have appeared in either building from unequal settlement.

Plans for the structure were made by Layton F. Smith, then an engineer of Baltimore, Md., but now an officer in the United States Naval Reserve. The contractor was the Harrison C. Ray Co., of Philadelphia.

The Chicago building is a five story and basement warehouse and factory which is to be used largely for the storage of steel plates and bars. The floors are sub-



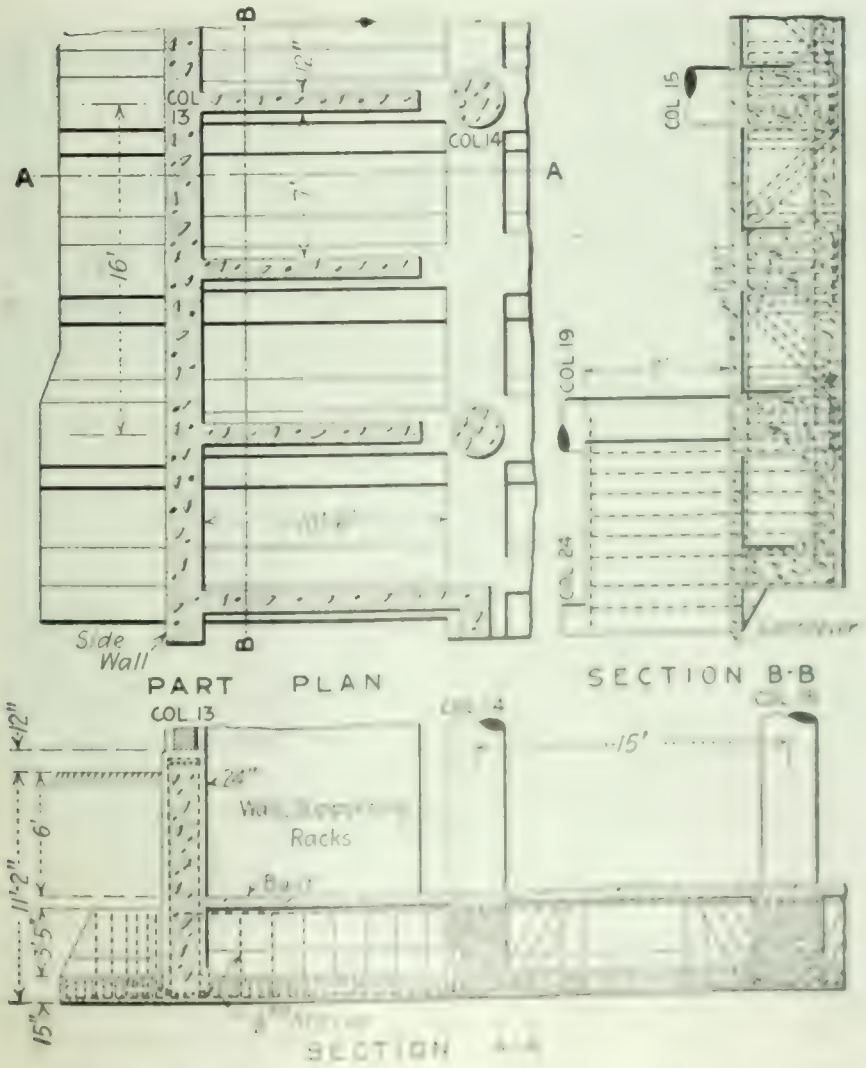
FIVE-STORY FACTORY AT CAMDEN, N. J., CARRIED ON FLOATING FOUNDATION

jected therefore to unusually heavy loadings, in some cases reaching 2000 lb. per sq.ft. and in no case being below 600 lb. per square foot.

The foundation is a cellular mat of reinforced concrete placed upon the stiff blue Chicago clay, no piles being used. It is estimated that this clay will carry safely a load of 4000 lb. per sq.ft., and the actual load at the base of the foundation will come well within this figure. The floor area is only 45 x 75 ft., but in order to increase the bearing area the foundation mat is made wider than the building. Its width over all is about 55 ft., projecting 6 ft. beyond that side of the building where the heaviest loading will be placed, and 4 ft. on the other side. This is shown by the drawing. At the corner of the building where the elevator and stair shaft are situated the mat is omitted and the columns have large spread footings. At the rear of the building, which adjoins an existing structure, some of the wall columns (in the party wall) are supported on cantilever brackets extending 2 ft. outside the foundation girder.

The mat is 4 ft. 8 in. deep, with beams and girders in both directions on a continuous bottom slab 15 in. thick. The girders are 24 to 42 in. wide. They are 41 in. high above the slab, except that the outer girders, which carry the side walls, are built up to a height of 12 ft. The cells between the girders, 41 in. deep, will be filled with cinders and covered with a 6-in. slab forming the basement.

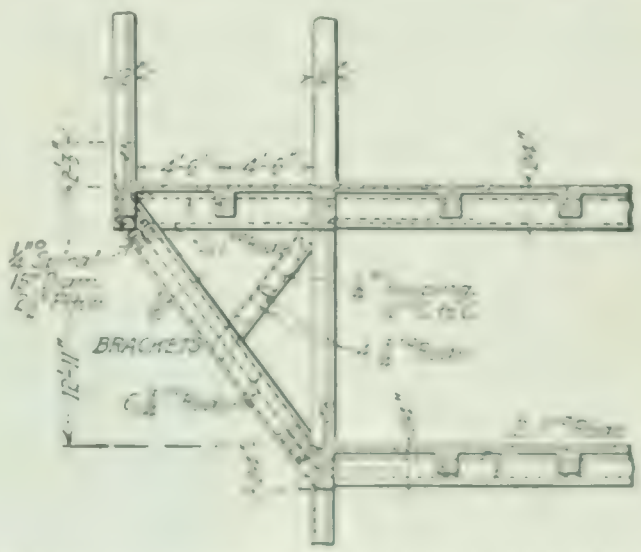
The Chicago building was designed by L. G. Hallberg & Co., architects of that city, and was built by the Mueller Construction Company.



CHICAGO BUILDING FLOORS SUPPORTED ON REINFORCED CONCRETE

Upper Floor of Concrete Building Carried on Bracket

IN THE reinforced-concrete building for the Farr & Bailey Manufacturing Co., referred to in the foregoing article, it was necessary to provide on the fifth floor a greater space, for the examination of the linoleums made by the company, than the ground area of the building permitted. This floor and the roof, just above, therefore were extended beyond the north building line 10 ft. by means of reinforced-concrete brackets, cast at the same time as were the columns and floor. The bracket construction was tied into the building proper by rods extending along and inside the girders, to beyond the second line of columns of the building, as shown in the accompanying drawing and view of the building.



HOW FLOOR BRACKET FOR BUILDING WAS DETAILED

Biggest Lumber Order in History

More than 100,000,000 ft. of Southern pine (approximately 20,000 carloads) has been purchased by the Federal Government through the Southern Pine Emergency Bureau for the war needs of the nation here and abroad, according to figures compiled by the Bureau. This is additional to about 175,000,000 ft. of timber being placed through the Bureau for the construction of 250 ships. The total makes by far the biggest lumber order in the history of the world.

Truck Heavy Submarine Sections Through New York Streets

Fifty to Sixty-Ton Pieces of Captured Mine Layer Carried on Four Wheels Without Injury to Pavements

PERHAPS THE HEAVIEST loads ever carried on four wheels through city streets in this country were handled recently in moving the German mine-laying submarine UC5 from 132nd St. and the North River, New York City, to 66th St. and Central Park West, where the boat is being reassembled and used to aid the sale of Liberty Bonds. Carried on a special steel-frame truck, itself weighing 15 tons, the three heavy sections, weighing 50, 55 and 60 tons, respectively, did remarkably little damage to various types of pavements.

As announced in the daily papers, the submarine, which was lent by the British government to the New York Liberty Loan Committee, was used to advertise the sale of Liberty Bonds during the final week of the loan. The boat, originally of 200 tons displacement on 8-ft. draft, perhaps 35 tons of which were cargo and fuel capacity, was captured in April, 1916, off the coast of England, while full of contact mines, and after an attempt to destroy her by dynamite had been made by her crew. Originally built in three sections for transportation over land to a captured Belgian port, she was readily taken apart after dangerous work in securing the contact mines, which had been displaced in her hold by the explosions. Her three sections were sent to New York in the hold of a cargo vessel. The original cradles of 12 x 12-in. timbers and the pair of 2-in. galvanized wire rope slings used in handling each section by the British Admiralty are still on the boat and were used in removing it from the ocean steamer to lighters and in transferring each section in turn to the truck at 132nd St. This work was done by the Merritt & Chapman Derrick and Wrecking Co.'s 175-ton floating crane.

The submarine is 110 ft. long and 11 ft. in diameter. With a 1-ft. timber bolster under the keel, the top of the superstructure on the two end sections rode about 17 ft. above the street, while the center section with the conning tower and periscope was several feet higher. On account of the wrecking of the interior of the boat by the attempt to destroy her, and uncertainty as to the exact original displacement of the boat without cargo, it is difficult to estimate accurately the present weight of the sections, but the back section, 45 ft. long and the first one moved, is thought to weigh at least 55 tons. The center section, entirely cylindrical and 22½ ft. long, is believed to weigh at least 50 tons; and the bow section, 42½ ft. long, and of full diameter almost to the nose of the boat, to weigh more than 60 tons.

The heavy reach truck used was set so that the bolsters registered with the cradles under the section to be hauled. These cradles and the section itself were secured against sliding or rolling by two chains to each cradle, and two chains or wire ropes to each end of the section, all tightened with turnbuckles or steamboat ratchets. The truck is of about 8 ft. gage, and as these lashings were kept under a heavy strain, being tightened as often as they worked loose, none of the loads manifested any tendency to shift or turn over.

The hauling was done by horses, one pair of wheel horses being hitched to the truck tongue, and two lines of 20 teams each being attached to a yoke in front of the tongue by two 1¼-in. wire-rope cables attaching either end of a cable to one end of the front axle of the truck.

The route followed was across the New York Central R.R. tracks at the Fort Lee Ferry and down Manhattan St. over granite block paving to 125th St.; then along 125th St. over asphalt paving to 7th Ave.; down 7th Ave., over asphalt and asphalt block paving, to 110th St.; west along 110th St. over asphalt to Central Park West; thence over asphalt paving and car tracks paved with granite block to the 66th St. entrance of Central Park. Here the loads were taken a short distance over the asphalt driveway and down a plank roadway laid on the grass, to the final location. The only difficulty experienced was with the first load at 103rd St. and Central Park West, where a washout, caused by the



STERN SECTION, FIRST TRANSPORTED, FOUND WEAK SPOT NEAR OLD WATER MAIN WASHOUT



FIFTY-TON CENTER SECTION LEFT NO MARKS ON ASPHALT

bursting of water main some months before, had left a weak spot in the pavement between car tracks, through which the left rear wheel of the truck settled several inches. The heaviest section, transported when the temperature was about 50°, made no impression on the granite-block pavement and did not leave any perceptible marks on the asphalt or asphalt-block sections. The four wheels on the big truck are alike, each with 14-in. flat tread, rounded to ¼-in. radius at each edge. They are of cast steel, 30 in. in diameter, and weigh 2 tons apiece. The wheels are set on steel axles to about 8 ft. gage. Remarkably few manhole covers were broken, one load running over a number on Manhattan and 125th Sts. without causing any damage.

The streets along the route selected are almost level, but to guard against accidents a pair of wagons were hitched to the rear of each load with chain as a hold-back, and a short sled of 10 x 12-in. timbers was hung under the rear axle. These timbers swung just below blocks on the under side of the axle, and their rear ends dragged the street. Their front ends were carried a few inches above the pavement, so that by throwing a heavy timber under the sled it would be possible to stop the truck within a very short distance. Most of the time, however, the truck was guided and checked by putting wood blocks under the wheels.

On reaching the park the first section was jacked up off the truck and lowered to timber cribbing after the truck had been removed. In bringing up the second section the teams were split on each side of the first and the truck was stopped with the sections about 20 ft. apart. The tongue and the wheel horses were then taken out, a six-part manila rope fall-rigged, and the section pulled to within 3 ft. of the first. The second section was then raised and the truck removed as before. The bow section was placed in the same way, the space between sections being left on purpose in order to make it easy for the public to gain access to the interior of the submarine.

The work was carried out by the Snare & Triest Co. under the direction of W. G. Triest. The special truck, teams and drivers were furnished by the Meade Transfer Company.

New Haven Tests Five Processes of Sewage Treatment

Activated Sludge, Imhoff Tank, Miles Acid Tank, Screening and Chlorination Studied at Experiment Station

FIVE PROCESSES of sewage treatment are being investigated at a sewage-experiment station established by the City of New Haven, Conn. The processes are: Activated sludge; Imhoff sedimentation and digestion tank; Miles acid tank for recovery of grease and fertilizing material; screening; disinfection by liquid chlorine. The following statement regarding the reasons for the experiments and description of the plant are taken from a paper by F. W. Mohlman, chemist and engineer-in-charge of the sewage experiment station, read at the recent Boston meeting of the American Chemical Society:

Reasons for Investigations

"In the summer of 1916 representatives of the United States Public Health Service, under the direction of Dr. H. S. Cumming, made an investigation of the sanitary condition of New Haven harbor. They found that it was seriously polluted by the sewage and industrial wastes of New Haven. They recommended that the taking of shellfish from the harbor be prohibited, that bathing be prohibited and that the city take steps to insure the proper disposal of the sewage. Following these recommendations the city council appropriated a sum of money for the establishment of a sewage-experiment station and a citizens' committee was appointed to take charge of the work. Prof. C. E. A. Winslow of Yale University is the chairman of this committee and the director of the experiments. During his absence in Russia with the Red Cross Commission Henry B. Sargent is chairman of the committee. The plant was designed by Prof. S. E. Barney, Yale University, assisted by R. H. Skelton. The writer is chemist and engineer-in-charge of the station, with W. S. Sturges as bacteriologist. Continuous operation started in June of this year.

"New Haven is an important manufacturing city of 150,000 inhabitants. The sewerage is on the combined system. Wastes from most of the larger factories are discharged into the East St. sewer, which has an average dryweather flow of 13,000,000 gal. per day. Since it was thought that tradewastes might interfere with the treatment of this sewage it was decided to locate the experiment station at the outfall of this sewer.

"The sewage for the testing station is pumped by a bucket-elevator, which was erected in a concrete forebay at one side of the sewer. The sewage is deflected into the forebay by a galvanized-iron deflector built out nearly to the center-line of the sewer, and flows back into the sewer at the lower end of the forebay.

It was believed that a fair sample of the sewage could be obtained in this way, including the floating solids and grease, and that the suspended solids would not be broken up to as great an extent as if a centrifugal pump were used.

"Operation of the elevator has shown that it fulfils these expectations. The elevator delivers approximately 150,000 gal. of sewage per day into a hopper-shaped receptacle from which it flows over to the station through a wooden flume. Before flowing into the weir-box, where it is measured, the sewage passes through a grit-chamber 15 ft. long, 12 in. deep at the inlet end, 4 in. deep at the outlet end and 4 in. wide, with a detention period of 0.24 minute. The velocity of the sewage is checked to 0.7 ft. per second at the inlet end, increasing to 2.1 ft. per second at the outlet end. This velocity is so high and the detention period so short that very little grit has been removed from the sewage.

"Beyond the grit-chamber there is a butterfly valve in the flume which is automatically controlled by a float in the weir-box. This butterfly valve keeps the sewage at a constant level in the weir-box, the excess sewage being deflected over weirs 4 ft. long cut in the sides of the flume. The apparatus for maintaining a constant level was constructed by Wallace & Tiernan, New York City.

"From the weir-box the sewage flows to the various tanks over adjustable weirs, small amounts of 10,000 gal. per day being measured by 60° V-notch weirs and 100,000 gal. per day by a rectangular weir 7½ in. long.

PROCESSES UNDER INVESTIGATION

"The activated-sludge experiments are on the continuous-flow basis. The aërating tank is 16 ft. long, 4 ft. wide and 8 ft. deep. At the bottom of the tank the sides slope at 45° to a trough 1 ft. wide which runs the full length of the tank. An iron frame in which are cemented 15 filtros plates is cemented into this trough. The air is admitted at the inlet end of the trough and the water which filters through the plates can be drawn off at the outlet end. Air at 3.5 lb. pressure is supplied by a Nash hydro-turbine having a capacity of 20 cu.ft. of free air per minute. It is measured by means of a venturi tube.

"The settling tank is 4 x 4 ft. in plan, and 12 ft. deep to the bottom of the hopper. The hopper slopes at 60° to a sump in which is cemented a 3-in. ell connected to the suction of a centrifugal pump. Sludge is pumped back to the aërating tank, where it is measured in an orifice box. A baffle 7½ ft. deep extends across the center of the settling tank. This baffle was first placed 3 ft. from the inlet weir and 1 ft. from the outlet weir, but the upward velocity of the effluent carried particles of sludge over the outlet weir. Since placing it in the center of the tank no sludge has been lost in this way. The theoretical upward velocity is now 2.4 in. per minute and was formerly 4.8 in. per minute. The capacity of the aërating tank is 3100 gal. and of the settling tank 1150 gal. At present, while treating 17,000 gal. of sewage per day with 50% as much sludge returned, the aëration period is 3 hr. and the settling period 1.1 hours.

"The Imhoff tank is 16 ft. long, 4½ ft. wide and 11½ deep. The flowing-through chamber extends the full length of the tank, with gas vents 8 in. wide on each side. The capacity of the tank is 840 gal., giving a detention period of 2 hours when treating 10,000 gal. of sewage per day.

"The Miles tank is 16 ft. long, 3½ ft. wide and 4 ft. deep and has a capacity of 1680 gal. When treating 10,000 gal. per day the theoretical detention period is 4 hours. Liquid sulphur dioxide in cylinders is used for acidifying the sewage, supplemented at times by gas produced by a sulphur burner.

"Screening experiments were planned with the expectation that an experimental Riensch-Wurl screen could be obtained, which was to be operated at the rate of 100,000 gal. per day. In view of the impossibility of obtaining this screen, experiments with a mechanically-operated screen had to be abandoned. Fixed screens of 30-mesh monel metal wire cloth are used in a screen chamber through which raw sewage flows at the rate of 100,000 gal. per day. The screens are removed when the loss of head reaches 2 ft., and are cleaned by hand. The operation of the screens is discontinuous, approximately 3000 gal. of sewage being screened for one experiment.

"The effluents from the Imhoff tank, activated-sludge tank, and screennng chamber run through baffled tanks, where they are treated with liquid chlorine. The periods of detention are from 2 to 5 min."

Old Brick Road Resurfaced with Thin-Base Monolithic Brick

Use of 3-Inch Block Proves Satisfactory—On Future Work the Experimental Use of a Two-Inch Paver Is Proposed

BY HARLAN H. EDWARDS
Highway Engineer, Danville, Ill.

SOME UNUSUAL details of design and construction, involving the use of an old brick pavement as the foundation for a new wearing surface, were embodied in a new monolithic brick pavement laid during the past summer near Danville, Vermilion County, Ill., under the direction of William S. Dillon, county highway superintendent. The work lay along what is locally known as the Batestown road, approximately a mile west of Danville along the Big Four Ry. The Batestown road carries very heavy traffic from coal mines and brick plants as well as the through traffic from Champaign and other points farther west. It was paved about 15 years ago with an inferior grade of brick, laid on a poor concrete foundation, and had worn rough and uneven under the heavy traffic. Since the funds for reconstruction were limited, the problem was to obtain the best and most durable surface for the money available.

After careful consideration had been given to brick, concrete, asphalt and tar as possible resurfacing materials, brick was selected as being most suitable and permanent for the heavy traffic. It was then necessary to determine the most economical method of construction. Since the monolithic type was most easily adaptable to this job, after much thought and consultation with other engineers, Mr. Dillon designed the brick pavement to be









FIG. 1. FIFTEEN-YEAR-OLD BRICK PAVEMENT, BUILT OF INFERIOR MATERIALS, WAS UNFIT FOR HEAVY TRAFFIC. FIG. 2. CONCRETE FOR THE NEW THIN BASE WAS DELIVERED FROM THE 2-FOOT MIXER BY WHEELBARROWS. FIG. 3. A WOODEN TEMPLET SHAPED THE BASE FOR THE PAVING BLOCKS. FIG. 4. WITH THE THIN BASE THE NEW BRICK SURFACE WAS UNUSUALLY SMOOTH

laid and grouted on a thin, fine-gravel concrete base, spread to a uniform surface over the old brick road. Specifications were drawn up and the contract for the construction of 10,270 sq.yd. was let to William Ray, of Danville, for a unit price of $1.65 per square yard.

Several features of this work facilitated rapid and almost continuous construction and required at the same time but a small outlay for equipment. Since the old pavement furnished a firm and unyielding foundation, no earthwork was needed. Moreover, there was no waste of materials such as is caused by piling on an earth subgrade. Again, the old pavement furnished a foundation unaffected by rain, so that operations could be resumed very shortly after a downpour. Finally, because of the thin layer of concrete used, a small mixer (2 cu.ft. capacity) operated by two or three men easily kept ahead of the brick gang, laying about 250 ft. of 16-ft. pavement in a day.

As shown in the accompanying illustrations, the method of construction consisted of placing a thin layer of pea-gravel concrete upon the cleaned surface of the old pavement, and laying and grouting the brick thereon. The sand and gravel were hauled and dumped in sufficient quantity upon the old brick pavement, while the bricks were piled along the edge of the road in regular order for laying. Most of the pavement was laid with a 4-in. Danville wire-cut-lug block, but for the western 700 ft., 3-in. Danville pavers were used, reducing the unit price of $1.65 to $1.55 per sq.yd. The concrete was a 1:4 mix, containing a fine, well-graded gravel ranging from that which will pass a ½-in. revolving screen down to fine sand.

After the surface of the old 18-ft. brick roadway was cleaned thoroughly by brooming, 5-in. wood forms were placed and braced true to line and grade 16 ft. apart, and the concrete, slightly stiff, was carried from the mixer and dumped in place by wheelbarrows. After it was spread to a virtually uniform surface, it was struck off to a 2-in. crown with a hand-drawn wooden templet, and upon this fresh surface the bricks were laid immediately.

The bricks were carried from the piles to the pavement on boards or wooden pallets, and placed in regular order so that with minimum effort they could be laid in the pavement best face up and lugs to the rear. After the necessary inspection was made and the soft, rough or broken bricks were removed or turned over, the bricks were rolled to a smooth, even surface with an 800-lb. water-ballast hand roller and grouted immediately. All work was carried on within 100 ft. of the mixer.

By the use of this thin layer or base of concrete a more smooth and even surface was obtained than is usual with the thicker base types of the monolithic brick pavement. With them, unless extreme care is taken to insure (1) a proper gradation of aggregate, (2) uniform consistency of concrete, (3) proper slushing-off of the concrete base and (4) intelligent rolling of the brick, a wavy, uneven surface is too often the result. In this case, however, although the thickness

of the concrete varied from ½ in. to 4 or 5 in., according to the depth of the holes in the old pavement, the concrete was of such consistency and composition that smoothness was obtained with little effort. This is an important item, because the universal use of the motor vehicle creates a public demand for smoothness as well permanence.

Though the use of paving brick as a resurfacing material for old, worn pavements is probably not new, this type of construction, as designed by Mr. Dillon, is a novelty and a starting point for similar work. Though here this new surface was laid on an old brick pavement, it is equally as well adapted for resurfacing concrete, macadam, asphalt, or any other similar type of worn pavement, provided a solid foundation is afforded thereby. The use of the 3-in. brick has proved a success here as well as in previous construction, and in order to reduce further the cost of such work and eliminate unnecessary use of material, the experimental use of a 2-in. paver on this sort of work is proposed for part of a resurfacing job to be undertaken next year. Though some engineers scoff at such work and predict failure, many of those well acquainted with this type of construction think that the old pavements, pounded down by years of hard usage, will provide ample foundation for a thin brick surface laid monolithically.

Standard-Type Bunk-Houses Built by Railroad

Pennsylvania's Unit System of Portable Buildings Provides Comfortable Quarters at Economical Cost

SUDDEN DEPLETION of the fixed labor supply, due to the war, forced the Pennsylvania R.R. to solve the housing problem in some adequate way, in order to hold replacements made. This condition brought to the company a large importation of alien labor, most of it men who had no homes, so A. E. Owen, chairman of the road's camp committee, told the sixth annual Conference on Housing in America held in Chicago Oct. 15, 16 and 17. The following is an abstract of Mr. Owen's address:

The first question that arose was, How should these men be housed? The matter presenting an entirely new phase of labor difficulty, it was quite natural that the utilization of every available building and freight car should be considered first, because at that time the condition was believed to be only temporary. The officials have since changed their minds on this point. The result, however, was a variety of bunk-houses, some of which meet the requirements very well while others do not. When it was realized that the new conditions were approximately permanent, a careful study was made, to determine the best kind of bunk-house to use—keeping in mind, first, comfortable quarters for the men; second, efficiency and economic construction and third, general utility. Finally, a plan was submitted, which, after many actual service trials were made, was approved. A standard plan then was adopted.

The buildings are of the portable type, constructed of the ordinary tongue-and-groove white pine. They are built in sections 10 ft. long by 20 ft. wide, with sloping roofs. It is 16 ft. from the floor to the ridge-pole, and the floors are raised about 18 in. from the ground on suitable piers. The entire exterior of the buildings is covered with a pebble-dash roofing paper. The unit method makes it quite a simple matter to increase or decrease the size of a building. The units can be stored conveniently, or they can be moved without serious difficulty. General economy and adaptability to emergency use are also points not to be forgotten. In order to conform with the fire regulations, these quarters are lighted by electricity, and each building is equipped with the proper number of fire extinguishers. Screens for the windows and doors are also provided, and the company prides itself on having waged a successful war on flies and other vermin. The camp inspectors are looking constantly after these nuisances, as well as seeing that dirt, grease or refuse of any kind is not allowed to accumulate. Instructions are given to burn or bury all such litter.

A regular standard double-deck bunk is used in these dormitories. Each bunk is supplied with two blankets, pillows, pillow cases and a sheet. The blankets, mattresses and pillows are aired frequently and sprayed with an approved insecticide. Pillow cases and sheets are sent to the laundry, and floors are scrubbed at least twice a week with a disinfectant solution, besides being mopped or swept daily. The cuspidors are cleaned daily and a disinfectant solution is added. Wherever it is possible, a separate locker containing soap and individual towel is provided for each man.

In each of these buildings stationary wash stands are provided, with hot and cold water, and where camps are large enough and drainage is available, shower baths are provivded. It is the aim of the company to provide eventually this facility at the smallest camp.

Probably the most important point in the maintenance of labor and labor camps is food. As the best that can be had is offered, the turnover is extremely heavy. The men have the opportunity to obtain credit, and are allowed the privilege of purchasing, at cost, clothing, shoes, tobacco, etc. The bunk-room and the meals are virtually donated, although it is true that the company receives a small amount in return.

In the larger camp a separate building is used for a commissary or store, where small quantities of foodstuffs are carried for general consumption. This plan is being carried out gradually in the smaller camps. The kitchens are equipped on about the same plan as are hotels. Bills of fare have been introduced, with menus of excellent variety of good, wholesome food. Good cooks are employed to prepare the food properly, and it is served by waiters. A second helping is permitted.

Gradually the camps are being enlarged to include recreation rooms, something to give the men opportunities to amuse themselves, a central point where they may gather and pass the time when not out on the tracks. Various forms of amusements are provided at this time, but no standard plans have been drawn up, because the various nationalities require different forms of amusement.

The company medical department has been enlarged to look after the general sanitation of the camps and the health of the men.

Field Tests Made on Oil Treatment of Wood Against Marine Borers

Forest Service and Fish Commission Studies of Creosote Oil Protection on Specimens Immersed Six Years Indicate Need for High Boiling Oils and for Complete Protection

BY C. H. TEESDALE AND L. F. SHACKELL
United States Forest Products Laboratory, Madison, Wis. Professor of Physiology, University of Utah, Salt Lake City

FOR a number of years the U. S. Forest Service, in an effort to overcome the destruction of timber by marine borers, has been investigating methods of treatment and efficiency of various preservatives, taking records on actual service tests. At the same time the U. S. Bureau of Fisheries has been studying the life histories of the various borers. Since 1914 these bureaus have been working jointly on the problem, and have published annual reports of progress in the *Proceedings* of the American Wood Preservers' Association for 1915 and 1916. The results of further experimental studies on various kinds of preservatives—that is, after six years' service—and the observation of certain rarely noted peculiarities of borers are the subjects of the present or third report.

For hundreds of years search has been made for an efficient protective against the attacks of marine borers. During the past 50 years the use of creosote oils, particularly those obtained from coal tar, has made great headway, until at present impregnation under pressure with coal-tar creosote may be considered a standard method of preserving piling. This method is, however, expensive, and its effectiveness by no means invariable.

For example, 12 years is about the average life obtained from piling given an 18-lb. treatment and installed at Pensacola, Fla., and it is the practice of one of the railroads in that territory to use a tile protection around creosoted piles where renewals are very expensive. The sections in one of the views were taken from a creosoted longleaf pine pile destroyed by xylotrya at Gulfport, Miss., after 11 years' service Another view shows a pile badly damaged by sphæroma at Mayport, Fla., after 12 years' service. It was in somewhat worse condition than the average pile in the structure of which it is a part.

There is an element of uncertainty in all except, perhaps, the heaviest treatments. Coal-tar creosote is a highly complex mixture of organic compounds, no two creosote oils being identical in composition; and methods of analysis are limited mainly to fractional distillations carried out under arbitrary conditions, together with determinations of a few physical constants. Furthermore, it has not been known whether the effectiveness of a creosote oil against marine borers is due to its toxic constituents, to its viscosity, to high-boiling, practically non-volatile compounds or to some combination of the foregoing. The development within recent years of a ready market for individual constituents of creosote—the phenols, naphthalene, tar bases and so forth—has led to the widespread use against marine borers of oils from which these constituents have been in part removed, so that the composition of the oils must be widely different from that of the straight distillate oils used 20 to 50 years ago, and it is uncertain how the effectiveness of the oils is impaired. It is these early oils, however, that have furnished the service data on which has been based the reputed effectiveness of creosote oils in general.

The first series of tests under the auspices of the Government bureaus was started in 1911 and 1912 with treated specimens of Southern yellow pine, each about



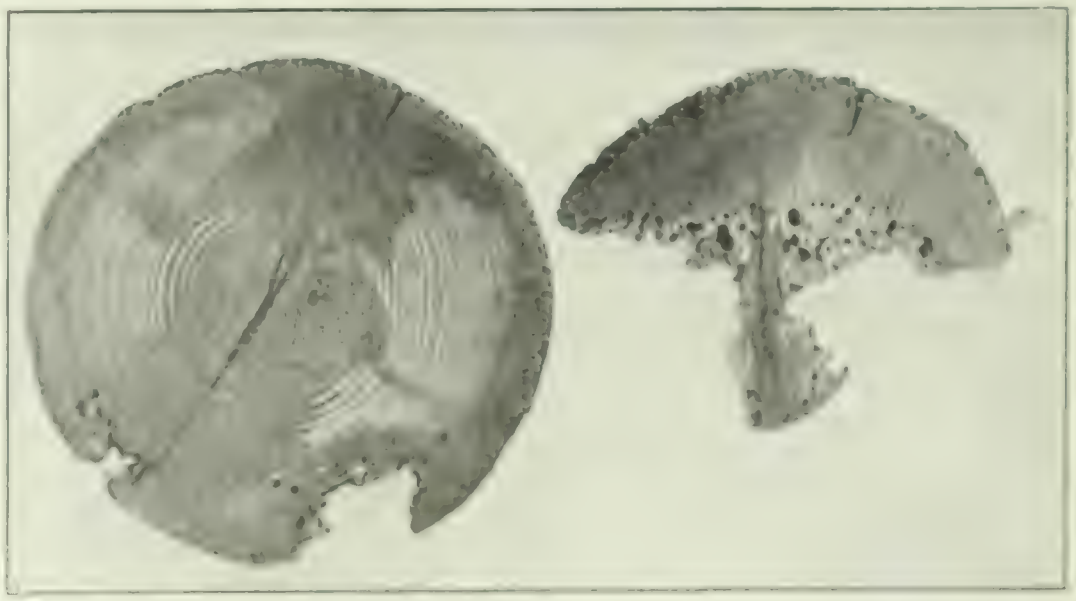


TABLE I SUMMARY OF ALL TESTS OF VARIOUS PRESERVATIVE OILS, 5 TO 6 YEARS' SERVICE

Preservative	No. of Specimens	Condition: No Attack	Very Slight Attack	Slight Attack	Medium Attack	Severe Attack	Very Severe Attack	Destroyed	Lost
Fraction I	16					8	6	2	
Fraction II	16				2	5	4	4	1
Fraction III	16			3	6	4	1	2	
Fraction IV	16		2	7	5		1		1
Fraction V	16		5	3	7			1	
Coal-tar creosote	20			5	14				1
Copperized oil	8					1		7	
Water-gas tar creosote	8			2	4	2			
Hardwood tar	8							8	
Timber asphalt	8							8	
Untreated	24							24	

6 in. in diameter and 2 ft. long. Specimens treated with coal-tar creosote fractions were installed at Pensacola, Fla., Gulfport, Miss., and San Francisco, and specimens treated with various other preservatives were installed at Gulfport and San Diego. Table I shows a summary of the results of inspections made from September, 1916, to January, 1917, after the specimens had been in service for periods varying between five and six years.

A second series of tests was started by installing additional specimens in 1914 and 1915, and the condition of these at the same inspection is shown in Table II.

The pieces treated with coal-tar creosote fractions in 1911 were given an absorption of 18 lb. per cu.ft., and the later ones an absorption of 8 lb. per cu.ft., but all are grouped together in the summary. Table III shows the physical and chemical properties of all the preservatives used in these experiments.

High Boiling Oils Seem Most Effective

Comparing the results obtained on the five fractions of creosote, it will be noted that there is a progressive increase in resistance to attack as the boiling point of the preservative is raised. Thus, all of the specimens treated with fraction I were either severely attacked or destroyed, while only one of fraction V was destroyed. Those treated with coal-tar creosote were about comparable to those treated with fraction IV. The high boiling water-gas tar creosote was almost as effective as coal-tar creosote. With the other preservatives used it will be noted that copperized oil, hardwood tar, timber asphalt and spirittine were not at all effective. Hence, it is concluded that products of petroleum and of the distillation of hard and soft woods are not effective in preventing attack by marine borers.

TABLE II CONDITION OF SPECIMENS INSTALLED AT GULFPORT AND PENSACOLA IN 1914 AND 1915 AND INSPECTED IN FEBRUARY 1917

Treated With:	Degree of Attack by Borers: Very Slight	Slight	Medium	Severe	Very Severe	Destroyed	Not Inspected
Installed at Pensacola in January 1914							
Spirittine					2	2	
Water-gas tar, 1911			1	2	1		
Water-gas tar, 1914			2		2		
Crude oil and Zn Cl					1	2	1
Creosote and ferric chloride	1	3					
Creosote and copper	1	2			1		
Crude oil and copper				1		3	
Installed at Pensacola and Gulfport in January, 1915							
75% creosote 25% naphthalene		3	1				2
50% creosote 50% naphthalene	2	4	1		1		
75% creosote 25% tar	2	3	2				1
50% creosote 50% tar	4	3	1				
Creosote	3	1					
1% crude ferric acetate						3	
5% crude ferric acetate						2	

The later experiments indicate that low boiling water-gas tar distillates are ineffective. Zinc chloride or copper salts added to crude oil were of little value, while ferric chloride or copper salts added to creosote considerably increased the resistance, especially to limnoria attack. Naphthalene added to creosote decreased its resistance to the borers, especially limnoria. While Table II indicates that additions of tar to creosote reduced the resistance to attack, this was due to the fact that the tar increased the difficulty of penetration, and with the low 8-lb. absorptions resulted in narrow, poorly penetrated strips near the surface, in which the borers obtained a start. Where the specimens were well treated the general surface conditions indicated that tar increased the resistance to attack to a considerable extent. Ferric-acetate solutions were of no value.

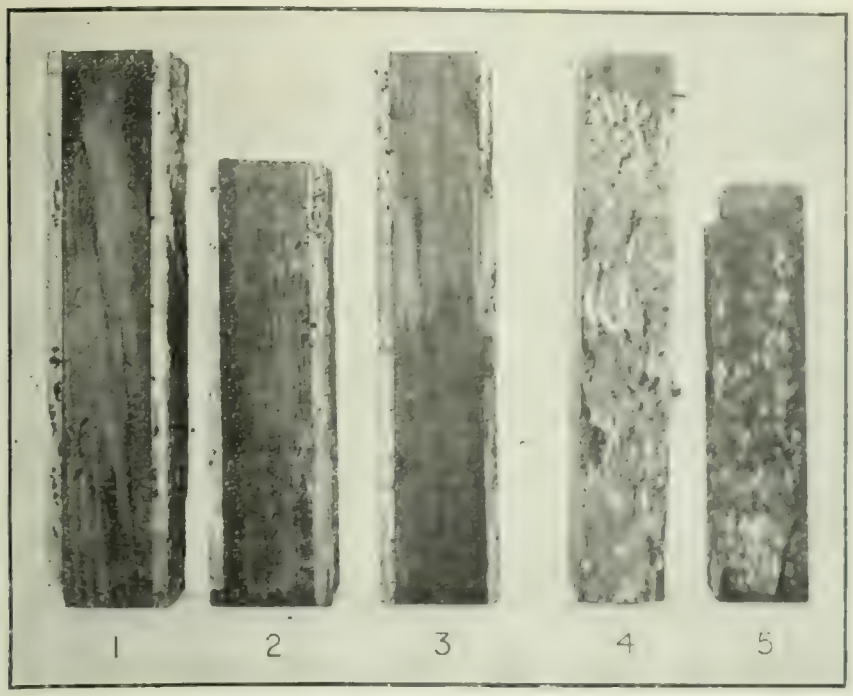
The shipworm, xylotrya (often confused with a less common relative, teredo), is perhaps the most destructive borer in American waters, and though a microscopic organism at the time of its entrance into a piece of wood, may attain a length of several feet and a diameter of an inch. Widely different from this mollusc is the tiny crustacean borer, limnoria, which rarely attains a length above $\frac{1}{8}$ in., and yet because of vast numbers is fairly destructive. In spite of the great structural differences between these two forms their reactions toward creosote poisons were strikingly similar. This was determined from the following summary which applies equally to both xylotrya and limnoria. More than 1000 specimens of xylotrya and more than 12,000 of limnoria were used.

Investigation Made of Relative Values of Oils

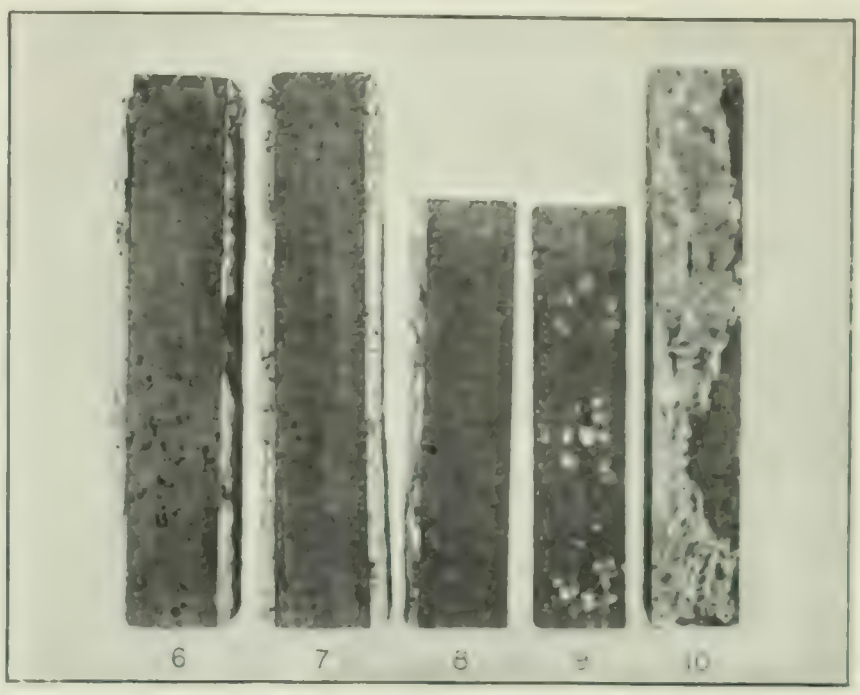
The preparations investigated consisted of the creosote and creosote fractions used in the above described service tests (see Table I), a series of creosote light oils; a series of tar acids, a series of tar bases and a series of crystalline coal-tar hydrocarbons. The light oils tested were benzol, toluol and a mixture of the isomeric xylols. The tar acids consisted of phenol, orthometa- and para-cresols and alpha- and beta-naphthols. The samples of mixed tar bases, which were furnished by S. R. Church of the Barrett Manufacturing Co., consisted of four fractions obtained by the Hempel distillation of crude bases. The temperature limits of these distillates were, respectively, 94° to 167° C., 170° to 210°, 210° to 250°, and 250° to 315°. Experiments were also made with a sample each of pure pyridine and of synthetic quinoline. The crystalline hydrocarbons studied were naphthalene, acenaphthene, phenanthrene and anthracene.

1. The toxicity of creosote fractions *decreases* as the boiling point rises; that is, the creosote and its distillates, arranged in the order of decreasing toxicities, are: Fraction I, fraction II, creosote, fraction III, fraction IV, fraction V. The high toxicity of fraction II, which was solid with naphthalene, was probably due mainly to tar acids.

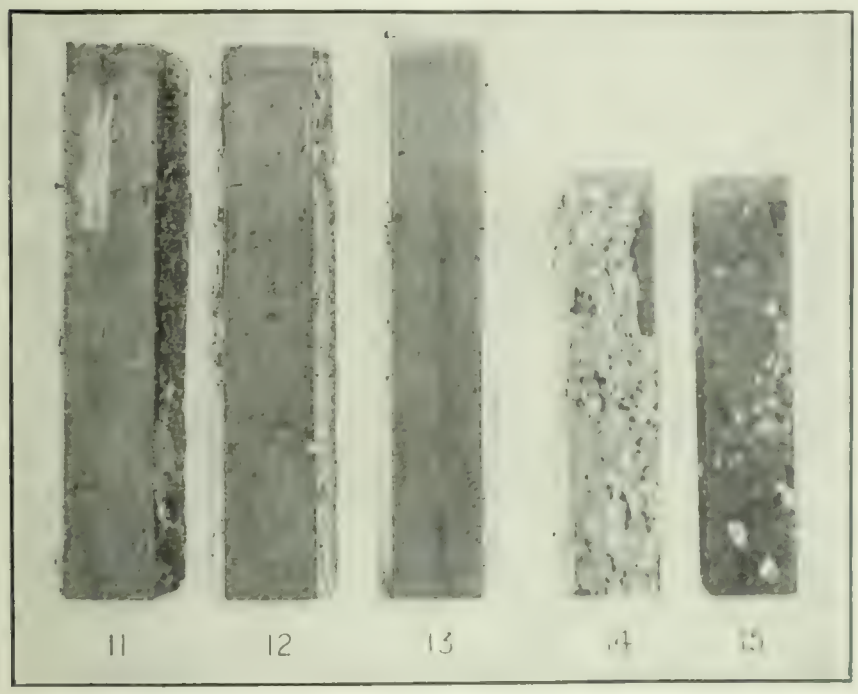
2. The creosote light oils are definitely poisonous for the borers. Benzol is the most and xylol the least toxic. The toxicity of toluol lies between these two.



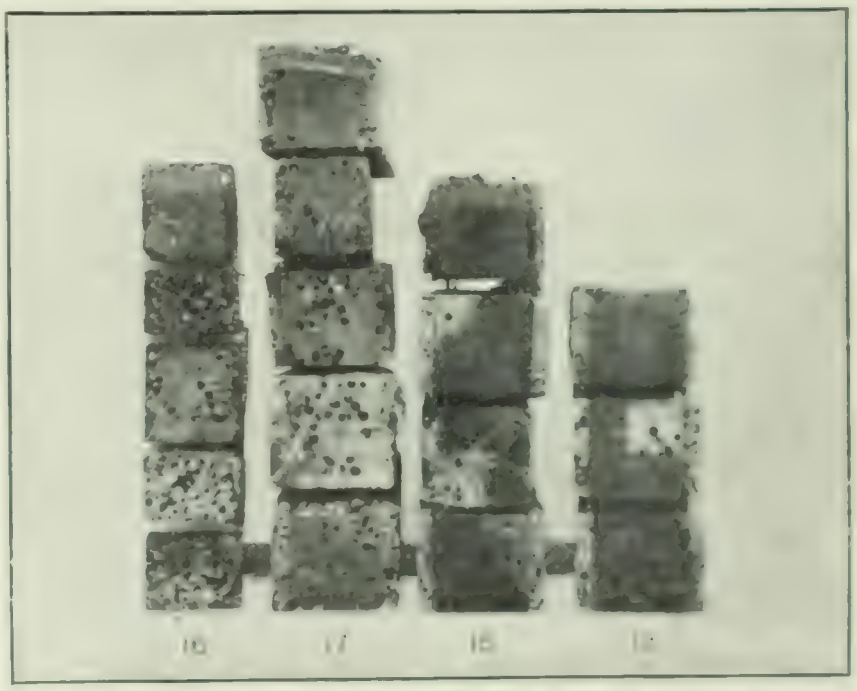
Heavy Treatments with Most Toxic Creosote Distillate—Fraction I (1) 14.0 lb. (2) 15.3 lb. (3) 13.7 lb. (4) 13.1 lb. (5) Unsheathed control, 17.4 lb. oil per cu.ft. Sheathing practically destroyed; attack on treated cores though definite is superficial. No. 4 illustrates destructive attacks of xylotrya and limnoria on untreated sheathing. Unsheathed control not attacked. Patches on No. 5 are oyster shells and barnacles



Light Treatments with Straight Creosote of Medium Toxicity (6) 5.6 lb. (7) 6.6 lb. (8) 10.8 lb. (9) Unsheathed control, 6.4 lb. (10) 4.1 lb. oil per cu.ft. Depth of borings average ¼ in. No. 9 not attacked



Light Treatments with Least Toxic Creosote Distillate—Fraction V (11) 5.4 lb. (12) 7.9 lb. (13) 7.5 lb. (14) 5.7 lb. (15) Unsheathed control, 7.8 lb. oil per cu.ft. Attack on treated cores fairly general, but for most part extremely superficial. No. 15 not attacked



Sectional View Through Middle of Typical Specimens

Reading from top in each set, preservatives used in similar quantity of 20% by vol. (1) coal-tar naphthalene, unseasoned creosol, neutral, raw oil. Unsheathed controls in nos. 16, 17, 18, 19. Fraction III creosote; fraction I (light treatment), fraction 3 (heavy treatment). Row 18; fraction II, fraction IV, fraction V. The lower three specimens, nos. 17, illustrate difficulty of treating heartwood and advantage of fact taken by borers

TESTS SHOW THAT MARINE BORERS PENETRATE UNTREATED SHEATHING IN MINUTE FORM AND WHEN THEY REACH FULL SIZE ATTACK THE TREATED WOOD BENEATH

3. The tar acids are all highly poisonous to the borers. Their toxicity steadily increases with rise in molecular weight; that is, arranged in order of increasing toxicity, they are: Phenol, the cresols and the naphthols. The three isomeric cresols, which exert practically the same degree of toxic action, are about twice as poisonous as carbolic acid; while the two naphthols, also equally toxic, are ten or more times as poisonous as phenol.

4. Tar-base fractions all show a high toxicity for the borers; and this toxicity increases with rise of boiling point of the fractions. Pure quinoline, boiling at 239° C., is several times as poisonous as pyridine, with a boiling point of 115°. The toxicities of the tar bases are fairly comparable with those of tar acids of approximately the same boiling points.

5. In comparison with the tar acids or bases or even the lighter hydrocarbon oils, the solid hydrocarbons of creosote are only very slightly toxic. Arranged in the order of decreasing effectiveness, they are: Naphthalene, phenanthrene, acenaphthene and anthracene. Naphthalene is perhaps five times as toxic as anthracene.

It has apparently been assumed that the more poisonous a creosote oil is the more effectively will it prevent attacks of marine borers. It will be noted, however, that the conclusions drawn from these direct toxicity tests, especially with reference to creosote and its fractionates, are diametrically opposed to the conclusions drawn from the service tests above; that is, the highest boiling fractions, which were the least poisonous, stood up the best in actual service. But it does not follow that some of these observations must be inaccurate, nor

TABLE III PROPERTIES OF PRESERVATIVES USED IN GOVERNMENT WOOD BORER TESTS

Preservative	Specific Gravity at 60° C.	Per Cent. Distillation (Hempel Column), Degrees Centigrade: To 170	170 to 205	205 to 255	255 to 295	295 to 320	Above 320	Highest Temperature Reached	Residue	Loss	Remarks
Coal-tar creosote I	1 048		11 0	35 9	14 8	12 4		320	25 8	0 1	
Fraction I	0 934	28 6	34 8	27 0				225	8 1	1 5	Collected between 0 and 205° C.
Fraction II	1 003	0 9	8 1	76 4	10 5			287	4 0	0 1	Collected between 205 and 250° C
Fraction III	1 045	0 2	0.5	29.2	43 8	11 3	8 8	337	5.8	0 4	Collected between 250 and 290° C.
Fraction IV	1 088			1 4	21 7	31 5	23 1	335	22.5	0 1	Collected between 290 and 320° C.
Fraction V	1 15				2 4	7 7	38 6	360	51 2	0 1	Residue above 320° C.
Water-gas tar creosote 1	0 995		6 9	39 4	29 0	5 0	11 7	350	7.6	0 4	Water-gas tar distillate.
Water-gas tar creosote 2	1 042		5.5	20 7	17 5	10 0	23 9	360	21 9	0 5	Water-gas tar distillate.
Water-gas tar creosote 3	1 058		4 9	2 9	9 3	10 5	36 9	350	35.0	0 5	High boiling water-gas tar distillate oil.
Hardwood tar	1 195	27 0	3.1	20 9	10 0			244	46 8	2 2	A tar product in distillation of hardwoods. Contained 24% water.
Timber asphalt	1 063	...	...	...	17.9	30.5	27 1	345	20.2	4 3	A residuum of petroleum.
Copperized oil	0 937	....	....	....	19.4	28 71	30 82	358	17.5	3.6	(1) To 340, contained 10% saponifiable oil removed before distillation. (2) 340 to 358, contained 0.34% copper.
Spiritine	1 006		22.1	13 2	4.4	..	...	295	56 9	3 4	A product of the distillation of Southern pine.
Creosote from which five fractions were distilled		2.0	7 0	43 0	16 0	4 5	....	315	27.6	0.9	Analysis by retort method contained 0.9% water.
Coal-tar creosote II	1 071		1 2	31 7	14 5	15 2	....	360	36 9	0.5	Contained some undistilled tar. Residue above 360 was 20.9.
75% coal-tar creosote II and 25% crude naphthalene	1.063	...	0.5	40 8	11 0	12.1	..	330	35.1	0.5	
50% coal-tar creosote II and 50% crude naphthalene	1 064	....	0 5	46 8	10 0	12 4	....	330	30.0	0.3	
75% coal-tar creosote II and 25% hypersol tar	1 108	...	2 6	24 5	12 7	12 8	....	330	46.9	0.5	
50% coal-tar creosote II and 50% hypersol tar	1 139		1 6	18 7	9 3	13.1	...	330	56.8	0.5	
		To 190	190 to 275	275 to 300		300 to 320					
Crude oil	0 873	0 0	16 5	17 0		17.0	34.8	365	....	...	
Zinc Cl solution	1 048	20°C									
Creosote, $FeCl_3$ mixture											Per cent. ferric chloride in mixture 0.88
Copperized coal-tar creosote											Per cent. copper in mixture 0.879.
Copperized crude oil											Per cent. of copper in mixture 0.654

that toxicity is not a factor in the preservative action of creosote oils. It seems worth while to consider this point in some detail, if only to show how involved is this problem of marine borers.

The data for the first six preservatives, Tables I and III, indicate that the practical efficiency of these preservatives is a function of the high boiling constituents that each contains. For example, fraction I, which was the least effective, had a residue above 225° C. of 8.1%; whereas fraction 5, the most effective, had a residue above 320° C. of 89.8%. Coal-tar creosote, with an efficiency between that of its lowest and its highest boiling fractions, had a residue above 320° C. of 25.8%. Now, it is not improbable that the high boiling, relatively non-volatile constituents tend to prevent the loss of lower boiling, poisonous substances. With such an assumption, it is easy to reconcile the apparently conflicting results of the service tests and the toxicity experiments.

Although the writers are convinced that the proportion of high boiling constituents in a creosote oil is a large factor in determining its value for marine work, they are also inclined to believe that other though more obscure factors may play an important part. It seems possible, for instance, that the tar acids and bases, which were found to be the most poisonous constituents of creosote, may be chemically combined in a creosote to form relatively non-poisonous compounds. Another and perhaps more reasonable assumption is that the high boiling acids (for example, naphthols) and bases (for example, quinolines), which are readily miscible with high boiling neutral creosote oils but only slightly soluble in sea water, will be found to have a very low coefficient of distribution between the neutral oils and the sea water in comparison with lower boiling acids (for example, phenol) and bases (for example, pyridine), which are much more soluble in sea water. The writers expect to test these assumptions experimentally in the near future.

Users of creosoted piling have been occasionally greatly puzzled on observing shipworms which were boring through heavily creosoted wood. The writers have themselves seen this; but on following the burrows back, have very frequently found that the point of beginning attack was at a spot which had received, if any only very superficial treatment. These observations furnished the basis for a series of service tests to determine whether shipworms would pass from untreated into treated wood; and, if so, whether the type of treatment would determine the extent of their attack.

Rectangular sticks of sap loblolly pine, about 3 x 3 x 36 in., finished on all sides, were treated at the Forest Products Laboratory with creosote I and the several fractions. A series of treatments was also made with special preparations as follows: (a) Benzol (90%); (b) resublimed naphthalene (25%) in gas oil (from Madison Gas & Electric Co.); (c) pure phenol (5%) in gas oil; (d) alphanaphthol (1%) in gas oil; (e) gas oil. After treatment the majority of the sticks were completely sheathed with untreated ½-in. sap pine boards secured from the same source as the treated wood. The sheathing was surfaced on the side in contact with the treated core, and was secured to the latter with brass screws. One specimen in each treatment was left unsheathed as a control. The purpose of the sheathing was merely to serve as bait for the microscopic free-swimming shipworms, and later as shelter for the borers until they should attain a size sufficient to render them easily observable. The main object of these experiments, however, was to study the reactions of the borers on reaching the treated cores.

The specimens were shipped to the U. S. Fisheries Station, Beaufort, N. C., and were installed in Beaufort Harbor in the middle of June, 1915—about five weeks after treatment. They were allowed to remain in the sea water for six months, and were then taken up and examined.

The results of these tests are illustrated in part in the accompanying group of views. The last shows that naphthalene, alphanaphthol, phenol and benzol, in the proportions in which they were present, were ineffective in these service tests. Perhaps the most striking point, however, about these tests was the fact that in each of the sheathed specimens treated with creosote or its fractionates the borers passed from the untreated sheathing into the cores; whereas the unsheathed controls shown in this group of views were unattacked.

The interpretation of these unexpected results lies in the peculiar life history of the shipworm. The latter invariably begins its attack on wood as a free-swimming larva, microscopic in size. At this time it is readily killed by traces of poisons which may slowly leach from the surface of unsheathed creosoted specimens. But when such a larva has once obtained a foothold in the wood, it undergoes a radical metamorphosis and grows with great rapidity, so that in two or three weeks it may attain a size thousands of times that of its larval state. This great increase in size is accompanied by a corresponding increase in resistance to creosote poisons; so that shipworms which by some chance have obtained a foothold may ultimately be enabled to burrow with apparent impunity through heavily treated wood.

Standard Specifications Best for Piling

The value of high boiling coal-tar creosote oils for this purpose may be considered as established, but further investigation is necessary to establish the value of specifying high boiling acids and bases in oils for marine work. A liberal content of acids and bases would do no harm, and if these results have practical significance, strongly indicate that they would increase the effectiveness of an oil.

The following specification was adopted at the 1917 convention of the American Wood Preservers' Association and provides a distillate oil containing more high boiling constituents than any previously adopted for use in pressure treating plants. While it was intended for treating paving blocks, it is also the best specification thus far adopted that could be used for piling. Such an oil need be used only in the most heavily infested waters. At least 22 lb. per cu.ft. should be injected.

The oil shall be a distillate of coal-tar or creosote oil. It shall comply with the following requirements:

1. It shall not contain more than 4% of water.
2. It shall not contain more than 0.5% of matter insoluble in benzol.
3. The specific gravity of the oil at 38° C. shall be not less than 1.06.
4. The distillate, free from water, shall be within the following limits: Up to 210° C., not more than 15 per cent.
5. The specific gravity of the fraction between 210° and 235° C. shall be not less than 1.02 at 38° C.

The specific gravity of the fraction between 235° and 355° C. shall be not less than 1.10 at 38° C.

6. The residue above 355° C., if it exceeds 10%, shall have a float-test of not more than 50 sec. at 70° Centigrade.
7. The oil shall yield not more than 2% coke residue.
8. The foregoing tests shall be made in accordance with the standard methods of the American Wood Preservers' Association.

The results of the recent studies may be summarized as follows:

1. The economic losses due to the activities of adult shipworms can never occur as long as treatments of wood for marine structures are able to prevent attack by the microscopic and apparently insignificant shipworm larvae.

2. Heavy treatments with a proper type of creosote will still prove inadequate as long as areas of superficially treated sapwood, heartwood, knots and so forth are left exposed for the lodgment of the shipworm larvae.

3. It appears that a proper creosote oil for marine work should contain a large proportion of constituents boiling above 320° C., as well as considerable amounts of high boiling tar acids and bases.

Water-Supply of Boston District Protected at Sources

The water-supply of Boston and the other cities and towns of the Metropolitan Water District is neither filtered nor chlorinated, but great care is taken to protect it from pollution.

Long before the district was established, Boston facilitated the diversion of the sewage of South Framingham and other towns from its water-supply by contributing toward the cost of sewage-treatment works located in other drainage areas. When the Metropolitan Water District built its works it constructed filter beds to treat the sewage of Clinton, preparing it for discharge into the Nashua River below Wachusett impounding dam.

State legislation provides that the Clinton works be operated by the Metropolitan Water District until the sewage of the town "shall have outgrown the normal capacity of the south branch of the Nashua River to properly dispose thereof," after which the town must take possession of the works at a price to be agreed upon mutually and operate them. The last annual report of the Metropolitan Water and Sewerage Board states that "the time is near at hand, if it has not already been reached, when this provision of the statute should become operative."

The report also states that the board is operating a number of filter beds to treat the waters of streams flowing through thickly settled sections of the various water-gathering grounds in its charge. These waters include Marlborough Brook and tributaries in Marlborough, Pegan Brook in Natick, a stream flowing through built-up parts of Sterling, as well as smaller "filter beds which receive the drainage from a few houses near Sterling Junction, the Worcester Training School at West Boylston, and from the swimming pool at Southborough." The effluent from two of the filter beds was treated with calcium hypochlorite. Hypochlorite was also applied for a few days to the overflow from the intercepting reservoir at the Pegan Brook filter beds, on account of the fact that diluted sewage overflowing from the Marlborough main sewer was thus being discharged into this reservoir.

Cast-in-Place Reinforced-Gypsum Roof Slabs on Paper-Mill Buildings

New Methods Developed for Handling and Mixing the Material, for Form Construction and for Order of Procedure—Gypsum Used Without Sand or Stone



THE GYPSUM PASTE WAS POURED INTO THE FORM AS SOON AS MIXED AND WHEN FULL THE FORM WAS SCREEDED OFF WITHOUT DELAY

A ROOF SLAB of reinforced gypsum cast in place has just been completed on a new beater house of the Scott Paper Co. at Chester, Penn. It is the second of two such roofs that the company now has. The first was constructed last winter, in cold February weather, over a paper-machine house. This is a flat roof, 47 x 180 ft., sloping ⅜ in. per ft., while the beater-house roof, 45 x 157 ft., is a ¼ pitch roof with monitor, sloping 6-in. per ft.

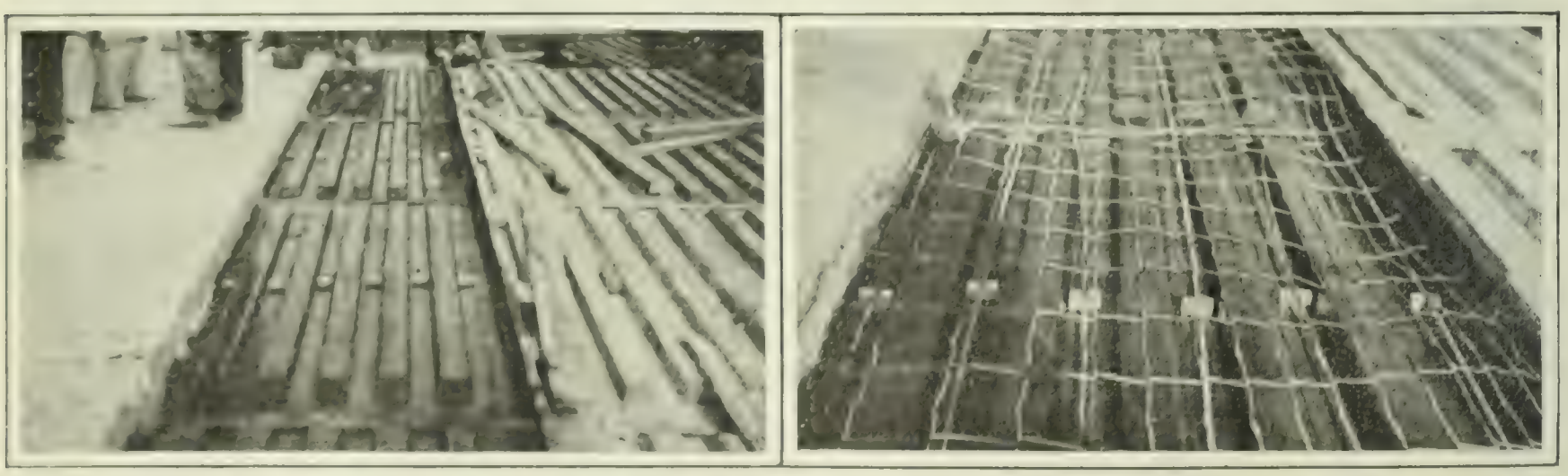
Both buildings have reinforced-concrete frame, steel roof trusses, steel purlins spaced 6 to 6½ ft., and were intended to be roofed with reinforced-concrete slabs across the purlins. But during erection the officials of the paper company began to fear trouble with condensation on the under surface of the roof slabs, and in conjunction with the architect, George F. Hardy, of New York, they looked around for a roof material likely to be free from such objection. Gypsum was finally settled on as the most desirable. The contractor, the Cummings Structural Concrete Co., of Pittsburgh, agreed to undertake cast-in-place construction instead of laying premolded gypsum blocks.

New methods had to be worked out for handling and mixing the material, for form construction, and for order of procedure. Experience elsewhere in casting gypsum blocks was drawn upon, and early trouble with forms sticking and having to be chopped out—because of using rough lumber and giving the vertical surfaces of the T-beams no draft—soon taught the need for special care.

The contract for the gypsum roof was taken at the price previously accepted for the reinforced-concrete roof. Whether or not the contractor lost money under this arrangement is not known. The design was made by ordinary reinforced-concrete beam formulas, but with lower compression—300 lb. per sq.in.—while the steel tension was held at 16,000 lb. per sq.in. The T-beam stems are a trifle over 2-in. wide and are spaced 6 in. center to center.

The procedure is briefly described below, but the accompanying photographs of the work in progress bring out most of the essential points needed for a comprehension of the process.

The gypsum was used neat—as a water paste without sand or stone. It was mixed to the consistency of a batter or thin paste. This is best illustrated by the views showing the paste being poured out of the mixing can into the form.



A 3-FOOT STRIP ACROSS THE ROOF WAS BULKHEADED OFF, THE FORMS CLEANSED AND OILED, ROD REINFORCING PLACED ON PLASTER BLOCKS IN THE T-BEAM STEMS AND WIRE MESH LAID OVER



THE MIXING IMPLEMENTS: AN ASH CAN AND A DASHER

A bag of gypsum was emptied into the can two-thirds full of water, and the dasher used quickly to make a smooth batter—no sand or stone

The mixing equipment consisted of a metal ash can and a stirrer or dasher, as illustrated. The can was filled two-thirds full of water, a bag of gypsum was poured in, and the dasher was worked quickly to get a uniform paste. Then the mixture was poured into the form and the surface screeded off without delay, for within 15 min. the gypsum set so hard that forms could be stripped if desired and men could walk on the slab.

The forms consisted of a tight floor of matched boards, and lengths of dressed 2 x 4 stock nailed on flatwise, 6 in. on centers to core out the spaces between the T-beam stems. These cores were dressed to ½-in. draft on sides and ends. The form was shellacked and sandpapered, like a foundry pattern, and before use was brushed with a clear oil (press oil), using a long-handled whitewash brush as shown in one of the views.



THE FORMS, BUILT OF PLANED LUMBER AND HEAVILY DRAFTED, WERE SHELLACKED AND RUBBED DOWN AND GOT A COAT OF OIL BEFORE EACH USE. THE OIL WAS APPLIED WITH A WHITEWASH BRUSH

The roof was placed in strips 3-ft. wide running across the building, the same direction as the T-beams. The open side of the strip was closed off by a bulkhead plank whose width was just the thickness of the slab, so that a screed moved along the bulkhead would true the gypsum to the proper surface. In each T-beam stem was laid a ¼-in. rod, supported on little precast blocks of gypsum; these rods formed the sole reinforcement of the roof. Over the tops of the T-stems was laid a 3-ft. strip of wire mesh as bonding steel to restrain the expansion of the gypsum. The form was then ready for pouring.

Pouring was done in one continuous operation for the 3-ft. strip clear across the building, about 50 ft. In smooth operation it took less than an hour to cast the strip, but during this time the first part of the strip had set hard before the last part was poured.

A sufficient number of bags of gypsum for one strip was brought up by hoist from the box-car in which it was received on the job, and the bags were set up in a



BAGS OF GYPSUM SET IN ROW ALONG STRIP OF ROOF TO BE POURED AND THEN ALL UNTIED

row along the edge of the strip about to be cast, standing on the strip finished last. They were then untied, making all ready for quick work. Mixing, pouring and screeding proceeded in regular order until the strip was completed.

It was found necessary to use the gypsum fresh. If allowed to stand some weeks before use its setting power was reduced considerably.

The machine-house roof was poured in the last week of February, 1917, in very cold weather. Snow had to be scraped off the roof at times. The low temperature did not affect the setting of the gypsum, however.

Construction of the beater-house roof, during the past month, went on in the same way as just described, except for complications introduced by the steep pitch. Stepped platforms had to be set on the roof to give a working floor, and the soft gypsum paste had to be held from flowing down. For the latter purpose, top forms were not successful; the thin paste came up like water through any crevice or hole. But by holding a bulk-



THE GYPSUM ROOF SEEN FROM BELOW

head board on top of the screeded surface of the slab just poured, and pouring the paste from a pail against the face of this board, the gypsum was held and could be spread out upward along the roof the moment it thickened enough to hold shape. Pouring a strip was begun at the gutter and proceeded up to the ridge, this being the same as was done in the case of the flat-pitch roof.

Each of the two roofs required about ten days for the gypsum work. As already stated, forms could be taken down early, and only four sets—3-ft. strips—of form were provided.

Conclusions on Activated-Sludge Process at Milwaukee

T. Chalkley Hatton Discusses Many Features of Sewage-Treatment Work—Believes That with a Large Plant Sludge Can Be Disposed of at a Profit

IN a paper presented before the annual convention of the American Public Health Association last week in Washington, T. Chalkley Hatton, chief engineer, Sewerage Commission, Milwaukee, Wis., presented a résumé of conclusions on the activated-sludge process of sewage treatment, based on investigations made at the Milwaukee sewage-testing station. The essential features of the process are the passage of sewage through aërating tanks containing a certain proportion of activated sludge and the further passage of the sewage thus treated through sedimentation tanks. The sludge removed from the latter remains for final disposal, as in various other methods, but its peculiar characteristics demand special treatment. The paper, in slightly condensed form, follows: In this as in all other methods of sewage treatment, the character of the effluent required is one of the first questions to decide, for upon it depend the size of plant and the air required to operate it.

If the removal of the matters in suspension and the production of a clear effluent are all that is required, less aërating tank capacity and less power should be provided; whereas, if the effluent must be not only clear but well nitrified, the sewage must be given a longer period of contact with the air and sludge and a greater volume of air per gallon of sewage treated must be used.

In an aërating tank having 15 ft. effective depth of liquor, 98% removal of suspended matters can be effected with 0.5 cu.ft. of air per gal. of sewage treated applied for 1 hour, but if nitrates are to be produced in the effluent the same sewage will require from 0.75 to 1.1 cu.ft. of air per gal. applied from 4 to 6 hours.

The reason is found in the fact that the agitation of the liquor by the air separates the solids and colloidal matters very rapidly, but it takes time for the bacteria contained in the activated sludge to convert the ammonias into nitrites and these in turn into nitrates.

Preliminary Processes Desirable

Should the sewage to be treated be combined with storm water, grit chambers should be installed, of such a design as effectually to exclude all grit from the aërating tanks.

The sewage from an industrial community, collected by either a separate or a combined system of sewers, should be fine-screened before passing into the aërating tanks. This positive statement is the result of the author's observation, covering two years, of the operation of the activated-sludge process under varied conditions at Milwaukee.

Grit in the aërating tanks settles to the bottom and rests upon the air diffuser plates, interfering with their efficiency. All industrial sewage carries quantities of waste, fleshlings, pieces of leather, packing-house wastes, large pieces of paper and textiles of many kinds, lime and hair. In the aërating tanks these things form masses of great specific gravity, settle upon the diffuser plates and interfere with their efficiency. If they are carried over to the sedimentation tanks they frequently stop up the sludge draw-off pipes and valves, and thus disturb the continuous operation of the plant. Besides, the decomposition of the organic matter contained in these articles requires large quantities of air, which is a more expensive medium than is required in other forms of sludge reduction. We found at Milwaukee that we could save from 15% to 20% of air when treating sewage passing a 20-mesh screen, as compared with the same sewage passing a 1-in. grid screen.

Where a purely domestic sewage is to be treated by the activated-sludge process, the author is not so sure that fine screening is necessary. He believes that a $\frac{3}{16}$-in. slotted screen is fine enough for any sewage.

Preliminary sedimentation, in lieu of fine screening, is not applicable to the activated-sludge process if the sludge is to be disposed of finally as fertilizer. The sludge from such a tank contains very little ammonia, is hard to handle and mix with activated sludge, and when mixed adds to its weight without adding correspondingly to its value; whereas, fine screenings contain almost as much available ammonia as the activated sludge, can be easily mixed with it in the dryer, and increase the value of the mixture to a proportionate extent.

Type of Aërating Tank

After the period of retention in the aërating tank and the volume of liquor to be treated are decided, the tank should be so proportioned as to give the greatest length of flow possible without wasteful use of piping and concrete. Our tanks in Milwaukee are to be 350 ft. long and 22 ft. wide, the liquor being admitted at one end and removed from the other.

As the piping system of the activated-sludge process is an expensive feature, due attention should be paid to it in the design. All valves should be so placed as to be easily reached, and all air piping should be of such type as to preclude inside corrosion. Iron rust gets into the pores of the air diffusers and reduces their efficiency. Therefore, cast-, galvanized-, or Sherardized-iron pipe, or lead, should be used to carry air.

In cold climates all air pipes must be made frost-

proof to prevent hoarfrost from accumulating on the inside and increasing the frictional resistance to the air. Frost-proofing can be effected by placing the air pipes a few feet under the surface of the liquor in the aërating tanks.

The bottom of aërating tanks should be of saw-tooth, or similar form, with slopes from 1 to 1 to 1 to 1.5, with the air diffusers placed in the gutters. The object is to allow upon the bottom no flat places upon which sludge could rest and become septic.

The air diffusers may be placed in cast-iron or concrete containers—preferably the latter, because they cost less and do not corrode. If cast-iron containers are used, they should receive a good coat of pitch while hot, care being taken to place the diffusers in the containers in such manner as to secure air-tight joints and permit removal and replacement without damage.

Milwaukee Conclusions on Sedmentation

Sedimentation has received greater study at the Milwaukee testing station than any other feature of the process. It will perhaps be sufficient to state the general conclusions borne out by these experiments.

The running-through velocity should not exceed 3 ft horizontal per minute.

The detention period may be from 30 to 50 min., according to character of sewage treated.

Vertical-horizontal flow is more efficient than vertical or horizontal.

The effluent must be removed with the least velocity possible and over continuous rather than V-shaped weirs. The latter create cross-currents just where they are most objectionable. Cross-currents must be avoided so far as possible.

Baffled Cross Flow Required

The influent must be introduced back of a baffle at least 4 ft. below surface of liquor in tank.

The flow should be across the narrow section of the tank. Too long a path of flow tends to pick up the lighter particles of sludge and carry them over with the effluent.

A baffle should be placed back of the effluent weir and extend a few inches below the liquor surface. This is to prevent the fats, match sticks and other light substances, which float upon the surface of the liquor, from passing out with the effluent.

The depth of the tank is not important, except that it shall be sufficient to allow capacity for the settled sludge to be drawn off without abnormally increasing the under-currents near the level of the bottom of the influent baffle due to the suction of sludge passing from the tank.

An area of 1 sq.ft. for each 1600 gal. of well aërated sewage should be provided. The less the aëration the greater the area required.

The tanks may be either hopper or flat bottom, as desired, and the sewage may be removed by air lifts or hydrostatic pressure. If hopper bottoms are used the slopes must be from 1 to 2 to 1 to 3 to keep the sludge moving toward the draw-off pipe. If the flat bottom is used some apparatus must be provided to remove to a draw-off pipe the sludge settling on the bottom. This may be done by a Dorr thickener or similar device, or by a squeegee mechanically operated from the top of the tank. In the Milwaukee Station the last two mentioned devices have been tried out with satisfactory results. They insure a clean tank, thicker sludge and less tank depth. Returning thicker sludge to the aërating tanks means reduction of air. In localities where deep tanks would add greatly to expense of construction the mechanical devices above mentioned probably would be advisable.

Several types of air diffusers have been tried at Milwaukee.

Tile are not sufficiently uniform in porosity.

Basswood blocks cut cross-grain ½ in. thick, 2 to 3 in. wide and 4 to 6 in. long, give excellent diffusion when first operated. If not treated with a preservative the surface exposed to the sewage deteriorates within a short time through fungous growths. If treated, the diffusion efficiency is diminished. Wood must be saturated constantly in order to keep it in place. If for any reason an aërating tank should be thrown out of commission long enough to allow the wood to dry out, the blocks would pop out of place when the tank was put into operation again. Therefore wood is not applicable to the process.

Perforated pipes give good air diffusion as long as they are kept in constant service and are of such material as to preclude corrosion. The perforations necessarily must be very small and close together. When they are made through galvanized-iron pipe corrosion soon occurs, which stops up the perforations. When the air is taken off the pipes with liquor in the tank, the latter is drawn into the pipes through the perforations by back suction, and when air is returned to the pipes the solids in the liquor which have entered the pipes are forced into the perforations and stop them up. Our experience and that of most other experimenters indicates that perforated pipes as air diffusers cannot be depended upon.

Filtros plates, made by the General Filtration Co., Rochester, N. Y., are porous plates 1½ in. thick, made up of graded sand and burned in kilns under high temperatures. They can be made of any degree of porosity required, are stable in character and are, by all means, the most satisfactory air diffusers we have used at Milwaukee.

Ratio of Air Diffuser and Tank Surface

Ratios of 1 to 4 to 1 to 10 have been used in the United States and England. The latter inclines towards the greater ratios. It is the author's opinion that the economical ratio depends largely upon the type of aërating tank used and the character of effluent required.

In a short flowing-through length a ratio of 1 to 4 or 1 to 5 would prove more efficient, thus decreasing the tendency of short-circuiting the passing liquor; whereas in long flowing-through tanks a greater ratio could well be used, because the law of averages is thus better utilized.

The higher standard effluent required the smaller the ratio, for the reasons stated above. The author has determined to use a ratio of 1 to 8 in the Milwaukee plant, where the tanks are 350 ft. long and must produce a high standard effluent.

This factor depends largely upon the character of sewage to be treated and effluent to be produced.

A mixture of domestic and industrial sewage can be well clarified—that is, to contain not more than 5% of the suspended solids in the original sewage—in 1 hour's aëration by using from 0.5 to 0.9 cu.ft. of free air per gal. of sewage treated. To maintain this clarification, however, it is necessary to aërate further the sludge removed from and returned to the aërating tanks. This procedure, however, saves air, because the sludge aërated is only ⅓ to ½ of the total volume of sewage treated.

To produce from the kind of sewage described an effluent containing nitrates and 4 to 6 p.p.m. of dissolved oxygen, with a reduction of bacteria from 95 to 98% requires from 4 to 6 in. aëration. After such period of aëration there seems to be little or no advantage from re-aërating the sludge, probably because it is maintained in prime and active condition by the period of aëration above stated.

Period of Sedimentation

The period of sedimentation is connected closely with the period of aëration, assuming the sewage treated to be of similar character. A short period of aëration requires a longer period of sedimentation. Well activated or well aërated sludge flocs very rapidly and settles out of the liquor at the rate of 1 in. vertically per minute, whereas poorly aërated sludge flocs slowly; in fact, the finer particles seem incapable of floccing. The principal factor seems to be the area provided, as has already been mentioned. From 30 to 50 min. are sufficient to clarify the sewage, providing the sludge is removed from the sedimentation tank as rapidly as it settles.

Volume of Air Required

Theoretically, it would cost the same to supply an aërating tank 15 ft. deep with 1 cu.ft. of air under 6.5 lb. pressure per gal. of sewage treated as to supply a tank 10 ft. deep with 1½ cu.ft. of air under 4.34 lb. pressure.

If this ratio of air is equally effective in the depths mentioned, the air supply to the 15-ft. tank would be cheaper because the frictional losses through the diffusers and air mains would be about the same in a tank of either depth. If this theory were exended, the deeper the aërating tank the cheaper the air supply. But the less the depth of tank the better the circulation, the smaller the air bubbles and the greater the saturation. Again, it should be noted that the deeper the tanks the greater the volume of sewage treated per acre of disposal plant. This means less concrete construction, air piping, valves, fittings, influent, effluent, and sludge carriers and, last but not least, less area of tank bottom containing the air diffusers. Under average conditions, aërating tanks 15 ft. deep would prove cheaper probably than tanks 10 ft. deep.

The author believes that the Milwaukee sewage can be treated successfully to produce an effluent showing 90% removal of bacteria, 95% removal of suspended matter and 72 hour stability, by using 1.5 cu.ft. of air per gallon of fine-screened sewage in a 10-ft. deep tank, and 1.1 cu.ft. of air per gallon in a 15-ft. deep tank, using from 15 to 25% of activated sludge in the aërating tank; screens to have from ⅛- to $\frac{3}{16}$-in. slots.

About 20% of well activated sludge is all that is required for satisfactory treatment. This percentage is measured in a beaker after ½ hour's settlement, after which the settled sludge contains about 99% of moisture.

Up to 1917 our computations to determine the weight of dried sludge produced from the process had been made according to the formula suggested by George W. Fuller, "Sewage Disposal," p. 23. Finding several discrepancies, we determined to make experiments to ascertain the reduction in activated sludge. It was found that 1640 lb. of dried fertilizer, containing 10% moisture, were produced, whereas by Fuller's formula we should have obtained about 2034 pounds.

In our final plant at Milwaukee we are providing means to produce from each 1,000,000 gal. of raw sewage treated 55,565 gal. of sludge containing 99.5% moisture, 10,250 gal. containing 98% moisture, 8305 lb. of pressed sludge cake containing 76% of moisture, and 2076 lb. of dried sludge containing 10% moisture.

Removing Sludge from Sedimentation Tanks

Several methods have been tried at Milwaukee for removing the sludge from the sedimentation tanks. Where hopper-bottom sedimentation tanks have been used the air lift has been utilized principally. This method has two disadvantages—excessive cost of pumping and producing sludge of high moisture content. It has the advantage of easy control and increased aëration of sludge.

Removing the sludge by means of the hydrostatic head has the advantage of producing a much thicker sludge and a more uniform flow. This last is an important factor in that it prevents to some extent the accumulation of sludge upon the side slopes of the tank, and thus less dissolved oxygen is absorbed in the sedimentation tank. By proper arrangement of valves the sludge draw-off can be regulated satisfactorily, but care must be taken to avoid placing a valve in the draw-off pipe, as it tends to cause complete stoppage of the sludge flow. When possible, a sluice gate should be placed at the outlet of the draw-off pipe.

In every hopper-type bottom used by the author there has been more or less sludge accumulation upon the side slopes of the tank. This sludge becomes septic and absorbs the dissolved oxygen, thus producing a lower grade effluent from the sedimentation tank.

To overcome this tendency flat bottom tanks have been used and squeegees introduced to remove the sludge to a central blow-off pipe. Two types of apparatus have been used with success. The first is what is known as the Dorr thickener, and consists of two or more horizontal arms to which leather scrapers are attached and which revolve around the bottom of the tank, scraping the sludge to a central pipe. These arms are attached to a vertical shaft supported in the center of the tank and actuated by some power device located at the surface. From long continued tests we have found that the maximum allowable speed of the squeegee arms is about 12 ft. per minute. We have been able to precipitate the sludge successfully by this process at the rate of 1500 gal. of sewage per sq.ft. of tank.

Another device satisfactorily demonstrated has been a squeegee moving over the bottom of a rectangular tank. The squeegee is attached to a slotted horizontal pipe,

which is in turn attached to a vertical pipe fastened to a car running on tracks built upon the top walls of the tank. This apparatus acts in the same way as a vacuum cleaner, the air lift being used to remove the sludge and the car being run by an independent motor with compressor or otherwise, as is learned to be most convenient.

This apparatus has the advantage of removing the sludge in a denser condition than any other method we have used; 98% of moisture is about the average. In construction and operation it is more expensive than the Dorr thickener.

Either of these last two methods results in lower cost of sedimentation tanks, shallower tanks being required than in the case of tanks of the hopper-type bottom.

The denser the sludge removed from the sedimentation tanks the less area required for both aëration and sedimentation, because with dense sludge returned to the aërating tanks much less liquor has to pass through these tanks to maintain the proper percentage of sludge.

It is therefore the author's opinion that the removal of the sludge by mechanical means will reduce largely the first cost of plant, and will produce a much more satisfactory and uniform effluent.

Dewatering Sludge

The dewatering of sludge may be effected satisfactorily in several ways, depending upon its final disposition. Should the plant be small and local temperature above 50° F., the wet sludge can be dewatered to 75% moisture in a few days of good weather upon beds of stone and sand, in the same way that sludge produced from Imhoff tanks is dewatered. In colder climates, these drainage beds may be protected by glass buildings similar to hothouses. Sludge containing 75% moisture or less can be kept under cover without creating an unpleasant odor. During the proper season it can be spread over tillable ground in lieu of manure, in about the same quantity, and will have greater fertilizing value.

It can be dewatered to 75% water by means of presses of different type, after which the cake can be stored under cover and spread, as said before, upon the ground during the proper season; or it can be pressed, dried and ground to produce a low-grade fertilizer sought for in any market in this country.

The following remarks apply particularly to plants of considerable size producing sufficient sludge to warrant the expense of reducing it to a commercial fertilizer basis.

The sludge from a hopper-bottom type of sedimentation tanks contains from 99 to 99.5% of water. If this is allowed to settle in a tank for 5 or 6 hours, the water content can be reduced to 96%, and the volume to one-eighth. This resultant sludge can be dewatered, by any one of at least three kinds of press, to 75 to 80% of moisture and to one fifty-seventh of its original weight. It can be dewatered further by drying in any one of a number of standard kinds of dryers, to 10% moisture and about one two-hundred-and-twenty-third of its original weight.

After drying it must be run through a grinder, of any standard type, to reduce it to sizes applicable to an agricultural seeding machine.

Careful inquiries have been made of manufacturers and dealers in fertilizers as to the market for such a fertilizer and the probable financial return therefrom. We believe we are warranted in concluding that with a plant of the size necessary for the City of Milwaukee the sludge produced by the activated-sludge process can be reduced and disposed of at a profit.

The 6 x 9-ft. Berrigan press, made by H. R. Worthington, Harrison, N. J., can dewater 96% sludge to 76% sludge at the rate of about 7 tons of pressed cake per 24 hours.

The 60-plate 3 x 3-ft. press made by the Simplex Ejector Co., Chicago, Ill., can dewater 96% sludge to 80% sludge at the rate of 7 to 8 tons of pressed cake per day.

The 5 x 40-ft. Buckeye direct heat-dryer made by the Buckeye Dryer Co. of London, Ohio, can dewater 76% sludge to 10% sludge at the rate of 27 tons of dry material per 24 hours by using 1 lb. of combustible to 10 lb. of water evaporated.

The indirect steam dryer of the Smith type can also dewater the sludge successfully, but at what maximum rate we are unable to state, as we never ran it at its maximum.

The one important and unsolved question in the cost of pressing is the cost of the filter cloths or bags, and this cannot be solved except after a year or more of continuous operation. We are basing our estimates on the experience at Worcester, Mass., where Matthew Gault, superintendent of sewers, states in his annual report that it requires 2.2 yd. of 40-in. wide No. 3 duck per ton of dry sludge produced.

Cost and Value of Dried Sludge

The cost of pressing the sludge is $4.82 per dry ton. This cost includes interest charges at 4½%, depreciation of 2% to 6%, according to character of structure or apparatus, repairs and renewals, filter cloths at $1 per dry ton of sludge, power, labor and all other known expenses.

The cost of drying is $3.93 per dry ton, which includes all charges as above named for pressing except that 10% depreciation for dryers is estimated, $3.75 per short ton of coal, $0.00424 per kw.-hr. for power, 8 lb. of water evaporated from 1 lb. of combustible from sludge cake containing 76% moisture.

A typical analysis of dried sludge, as shown on page 49 of the third annual report of the sewerage commission of the City of Milwaukee, shows 5.1% of nitrogen as N_2H_4, 5.3% fat, 0.5 soluble phosphoric acid and 0.25 potash. In normal times the nitrogen is worth $2.50 per unit. At the present time it finds a ready market at $3.60. Basing the value of the sludge produced upon the lower price per unit, we find our sludge would be worth $12.50 per dry ton, which represents a clear profit of $3.75 per ton.

In the complete report of Pearse and Richardson to the engineering committee of the sanitary district of Chicago and the committee representing the stockyards' interests, dated Apr. 16, 1917, it is estimated that sludge screening will cost $5.75 per dry ton and drying $2.45 per dry ton, or a total of $8.20 per dry ton.

In considering these costs the present high war prices must not be overlooked. These affect also the entire

disposal plant for the City of Milwaukee, plans and estimates of which have just been submitted to the sewerage commission. The estimated cost of this plant for treating an average dry-weather flow of 85,000,000 gal. a day is $4,307,000, whereas 18 months ago the same plant could have been built for $3,000,000.

Estimating that one ton of dry sludge can be obtained from 1,000,000 gal. of raw sewage treated, and an average daily dry-weather flow of 85,000,000 gal., the net cost of disposing of Milwaukee's sewage is estimated as $9.64 per 1,000,000 gal., of which $4.89 is chargeable to overheads, and $4.75 to operation, renewals and repairs. The 85,000,000 gal. of sewage per day is expected to be produced from a population of 589,000, and the net cost of operation, including overhead charges and maintenance, is 53c. per capita.

Elimination of Odors

There is no offensive odor connected with the activated-sludge process of sewage treatment, but considerable odor may attend improper methods of sludge reduction. Partially dewatered sludge, if exposed to the sun for a few hours, gives off a highly objectionable odor of sulphuretted hydrogen. This odor lasts for a short time only, or until a dry covering is formed. Sludge placed under cover and not exposed to sun or wind gives off little odor.

When the sludge is dried through a direct heat dryer, a very offensive odor is thrown off with the hot gases of combustion. To overcome this, the gases must be run through a dust box, thence through a condenser, and the insoluble gases escaping from the latter should be discharged into a furnace immediately under the fire grate.

Flies, insects and worms do not infest the treatment plant, even during the early fall when they are so prevalent in nearly all other types of disposal plants.

Conclusion

The foregoing statements and conclusions have been made as the result of observations and studies of the operation of the sewage testing station at Milwaukee during three years; the last half of the study has been almost exclusively confined to the activated-sludge process.

The only process known to the author which can produce an effluent comparable with that from percolating filters is the activated-sludge process, which, when developed to the extent possible and very probable within the next decade, will doubtless supercede the filters. There are many advantages in this new process which must be considered, among which are small area, lower first cost, and final disposition of the troublesome sludge.

As compared with percolating filters treating a maximum rate of 3,000,000 gal. per acre under favorable climatic conditions, the activated-sludge process can treat 10,000,000 gal. per acre under the most unfavorable climatic conditions.

The first cost of construction is higher for the percolating filters than for the activated-sludge process, and little difference is expected in the cost of operation.

Metcalf and Eddy in Volume III, "American Sewerage Practice," give the following figures as to the cost of construction and operation of several important percolating filter plants: At Gloversville, N. Y., the cost was $58,455 per 1,000,000 gal., exclusive of roofing. Operating cost in 1914 was $5.92 per 1,000,000 gal. At Fitchburg, Mass., the cost was $59,650 per million with operating cost when treating about 2½ millions about $12.00 per million.

The average cost of nine of the most modern plants in the United States is given as $47,000 per million gallons. (These costs are exclusive of engineering.) E. J. Fort, of Brooklyn, estimates the cost of overheads and operation for a plant treating 30 million gal. will be $9.50 per million gal., exclusive of the final disposition of sludge. Mr. Ulrich, city engineer of Reading, Penn., gives the operating cost of the Reading plant as $9.13 per million in 1912.

The Milwaukee plant, as designed, is estimated to cost $44,000 per million, exclusive of engineering and pumping, and $4.75 per million gal. operating cost. This first cost embraces prices for labor and material which did not prevail when the percolating filters above referred to were built.

Mr. E. E. Sands, city engineer of Houston, Tex., has just completed an activated-sludge plant (exclusive of sludge disposal) to treat 12 million gal. at a cost of about $24,000 per million, and expects to install the sludge disposal features for $40,000, the balance of his appropriation.

The high nitrogen content in the sludge produced from the activated-sludge process warrants the expense necessary to reduce it to a fertilizer basis, and thus the sludge problem is solved without nuisance.

The absence of odors, flies and other insects is no small advantage. Freedom from odors frequently enables the engineer to eliminate long expensive outfall sewers. The small loss of head through the process frequently obviates pumping, as is so often required in the percolating filter process.

Throughout many discussions by engineers of this new process the cost of power has been one of the stumbling blocks. In a small plant treating less than five million gal. per day the cost of producing the power might prove too expensive, but where larger plants are under consideration power can be produced easily for less than 1c. per horsepower-hour. Such a cost will place the cost of operating the process upon an equality with that of the percolating filters.

However, local conditions can determine best which of the two processes should be installed, but the author contends that such determination should be made only after a thorough study of the merits of the two processes, and not from the point of view that one process has been operated successfully in many places, whereas the other is still more or less in an experimental stage. If this attitude were adhered to in the industrial field, very little progress indeed would be made.

Drifting Sand is a Public Nuisance

Controversies over drifting sand that has obliterated new street work in the western part of San Francisco will be stopped by an ordinance passed by the Board of Supervisors, authorizing the Board of Public Works to remove the sand and assess the cost against the property from which it was allowed to drift.

Steps in Turbine-Runner Design That Engineers Should Know

After a Few Controlling Dimensions Have Been Computed It Is Possible To Shape Up Waterwheel Runners in a General Way and Form Independent Judgment of the Builder's Design

By Walter C. Pomeroy
Ann Arbor, Mich.

THE DETAILED design of hydraulic turbines is a highly specialized engineering effort outside the daily duties even of most hydraulic engineers, but it is widely recognized that any engineer desiring to form an independent judgment of a particular turbine must have a good general knowledge of turbine construction and some intelligent conception of the type characteristics of different runners. Moreover, he must have a better knowledge of the actual steps in runner designing than most persons have realized.

It is aimed in the following paragraphs to give a general idea of the processes of laying out a turbine runner and, inferentially at least, to show how a design may be scrutinized. No attempt has been made to have the studies broad enough to be of value to a turbine designer.

To date, promoters place all reliance on Holyoke data and the turbine builder's reputation. These are only half-way measures. If, as usual, there are modifications in the larger runner over the model, the promoter has no way of checking the effect of the changes on performance. There should be someone on the promoter's staff who can form independent judgment of the turbine before it is built, installed and tested.

General Problems of Design

The problems met in the design of turbine runners are of two quite distinct classes. Solution of the one variety involves a knowledge of the laws of hydrodynamics and the scientific application of experimental test data. Solutions of the second class are almost entirely a matter of graphical construction. This article is limited to the latter. Trial methods are much in evidence, and the reader should understand thoroughly that in designing a turbine runner he may have to use his eraser quite as energetically as he does his pencil. Each step seems to depend on the one ahead of it; the design is in effect the systematic weaving together of several problems separately indeterminate.

A few generally misunderstood ideas should be mentioned: The theoretical attack does not insure a good runner. There are no definite laws governing the principal dimensions of the runner nor their exact relation to speed, capacity or efficiency. No designer can state the efficiency of a new design without previous tests of very similar models. Runners of distinctly different appearance may show similar performance and those of apparent similarity disclose quite different characteristics. This would seem to indicate that no designer has been able to unite all the good features in one design or steer clear of all the bad.

For the present studies we will state the problem thus: Required to design a runner to deliver 3 sec.-ft. and to run at 75 r.p.m. under 1-ft. head; the principal dimensions are:

$D_1 = 16$ in. (rated diameter, at center of entrance edge);
$B = 4$ in. (height of gate);
$D_2 = 16$ in. (diameter of discharge-edge rim circle); and tangent to travel circle in direction of
$\beta_1 = 90°$ (angle between bucket vane at entrance flow line).

Drawing the Flow Lines

The rim and crown surface of the runner are the two rotating surfaces at each extreme of the bucket vanes and are shown in the elevation view (Fig. 1) by the lines in which they cut the plane of the paper. Consider the space between the rim and upper crown surfaces free from any bucket vanes: This space should have no sudden change in volume, a fact which aids us in determining the exact form of the generating lines of these surfaces. By use of the proposition of Pappus we divide this space into smaller equal-volume sections. This is not accomplished by the first stroke, as the niveau lines AA', BB', CC' must be taken at right angles to the flow lines, which are as yet undetermined. However, with a careful eye these can be worked into place with the proper relation to each other very closely and then corrected exactly. For equal-volume sections we have

$$2\pi r_1 b_1 = 2\pi r_2 b_2 = 2\pi r_3 b_3 = 2\pi r_4 b_4$$

with b always measured at right angles to the flow lines.

Assuming continuity of flow, the generating lines I I, II II, III III, IV IV and V V of the boundary surfaces of these smaller volumes become stream lines, or directions of flow; the niveau lines AA', BB' and CC' are the generating lines of surfaces of constant velocity. The exactness of these lines is not of serious consequence, especially in this type of runner.

Entrance and Discharge Edges

The elevation view of the entrance and discharge edges (see Fig. 2) cannot be definitely determined at once, but must be assumed and later modified to suit conditions met in the development of the plan view. The two edges of the bucket vane do not lie in the same radial plane, and either one may not even lie in a single plane. However, we shall tentatively place our discharge edge in one radial plane, that of the paper, and revolve the entrance edge into the same plane. The discharge and entrance edges are assumed as shown in Fig. 2. The use of drawings of runners of known results is of great help at this point, although there is a very wide choice—some designers using the so-called

"short bucket" and others employing a very deep "spoon" on the discharge edge, as shown dotted in Fig. 2. Good runners have been produced in both cases.

After assuming the discharge and entrance edges, we compute the equivalent area of discharge and entrance at right angles to the flow. This discharge and entrance area of each small turbine section is $2\pi r_1 b_1$, $2\pi r_2 b_2$, etc., respectively, with no allowance made for bucket-vane thickness (see table, Fig. 2).

In drawing the velocity diagrams, which is the next step, we consider first the peripheral velocity—which

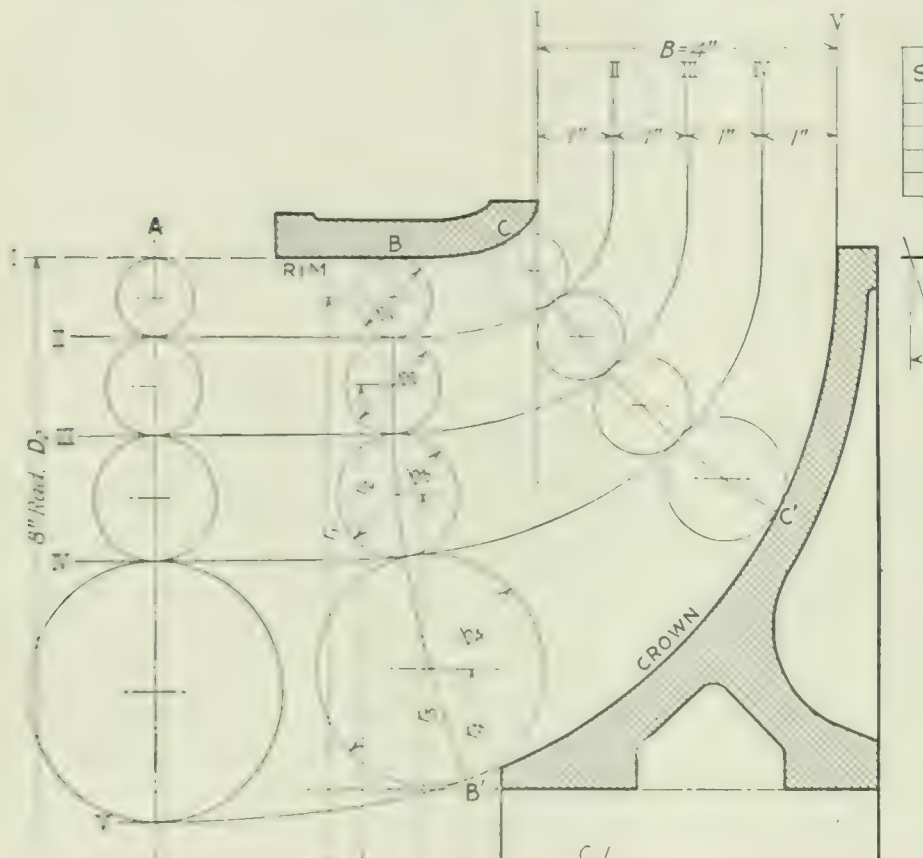


FIG. 1
DIAGRAM FOR DRAWING FLOW LINES

DISCHARGE EDGE

Sect.	Rad.	b	ft²	C_2 from Diag.	Q" c.f.s.
1	7.28"	.106"	0346	2.31/sec	0.795
2	6.03"	.126"	0346+	2.25 "	0.780
3	4.87"	1.64"	0348	2.20 "	0.765
4	3.72"	2.14"	0348	2.17 "	0.755
			1.388		3.095

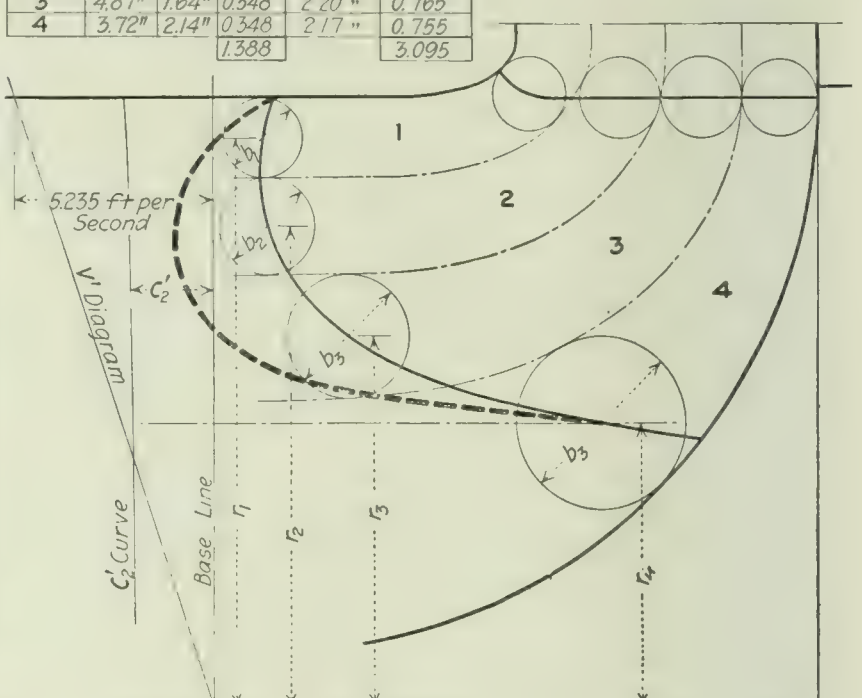


FIG. 2
ENTRANCE AND DISCHARGE EDGES FIRST ASSUMED

determines the speed of the runner. The peripheral velocity at D_1 is

$$V_1 = \frac{\pi D n}{60 \cdot 12} = \frac{\pi \cdot 16 \cdot 75}{720} = 5.235 \text{ ft. per sec.}$$

n being the number of revolutions per minute.

The peripheral velocity varies directly as the diameter, being zero at center and, as shown above, 5.235 ft. per sec. at $D_1 = 16$ in. A straight line through these points becomes our speed diagram, and we can readily measure the peripheral velocity at any point along the discharge or entrance edge.

The second group of velocity quantities comprises the discharge and entrance velocities in the plane of the flow line and at right angles to the peripheral velocity. We have the discharge given as $Q' = 3$ sec.-ft. The total free discharge area is 1.388 sq.ft. (see table, Fig. 2), but this must be corrected for vane thickness—an item depending on vane angle and type of vane (steel plate or cast iron). Here we will assume that the vane cuts off 5% of our total area; then our total effective discharge area becomes 1.32 sq.ft. The mean discharge velocity is then $C'_2 = 3/1.32 = 2.24$ ft. per second.

Experience seems to show that the actual discharge velocity is slightly greater than this mean velocity at the outer sections and slightly less at the inner sections (though this is disputed by some authorities). Our diagram for C'_2 is then practically a straight line, increasing slightly at the rim (see Fig. 2). The entrance-edge velocity, C'_1, is computed in similar manner, and for this type of runner seems to be practically constant across the bucket edge. The entrance vane angle is to be 90°, and the discharge angle β_2 will be determined by the value of C'_2 and V'_2 at the point in question (see Figs. 4 and 5).

A full discussion of relative and absolute velocities, velocity diagrams and vane angles cannot be included within the scope of this article, but the reader has only to refer to any of the many full discussions of this phase of the subject—notably the paper by Prof. S. J. Zowski, "A Rational Method of Determining the Principal Dimensions of Water Turbine Runners," in *Engineering News* of Jan. 10, 1910, and the recent book, "Hydraulic Turbines," by R. L. Daugherty.

We have determined the flow lines, the velocities at entrance and discharge in the plane of these flow lines at right angles to the tangential or peripheral velocity of the runner, and also the peripheral velocity of the runner, which in turn determine the form of the bucket vane at entrance and discharge—in the given plane of the flow line. We are now in a position to determine the intermediate surface of the vane. We are to deal with warped surfaces which cannot be determined mathematically. The objective is a smooth, eddyless flow from the first few inches of the vane at entrance to the last few inches at discharge.

There is some difference of opinion as to the exact form of the vane near the edges, some advocating an involute, others a straight line. Without discussing this point, however, which at best seems to be a matter of opinion, we will use a straight line, our vane surface to join the straight-line edges. At this point a study of vent area of the bucket is of assistance in determining the length of the straight portion of the bucket in from the edges.

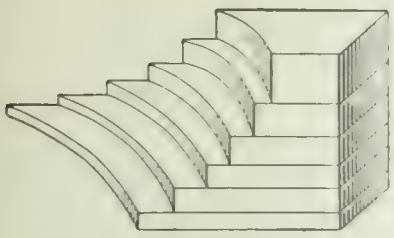


FIG. 3

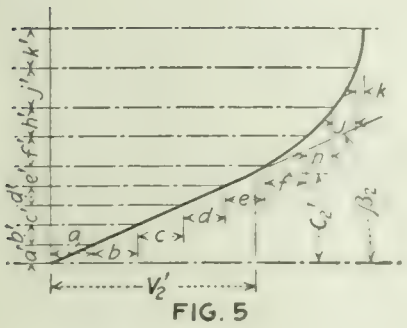


FIG. 5

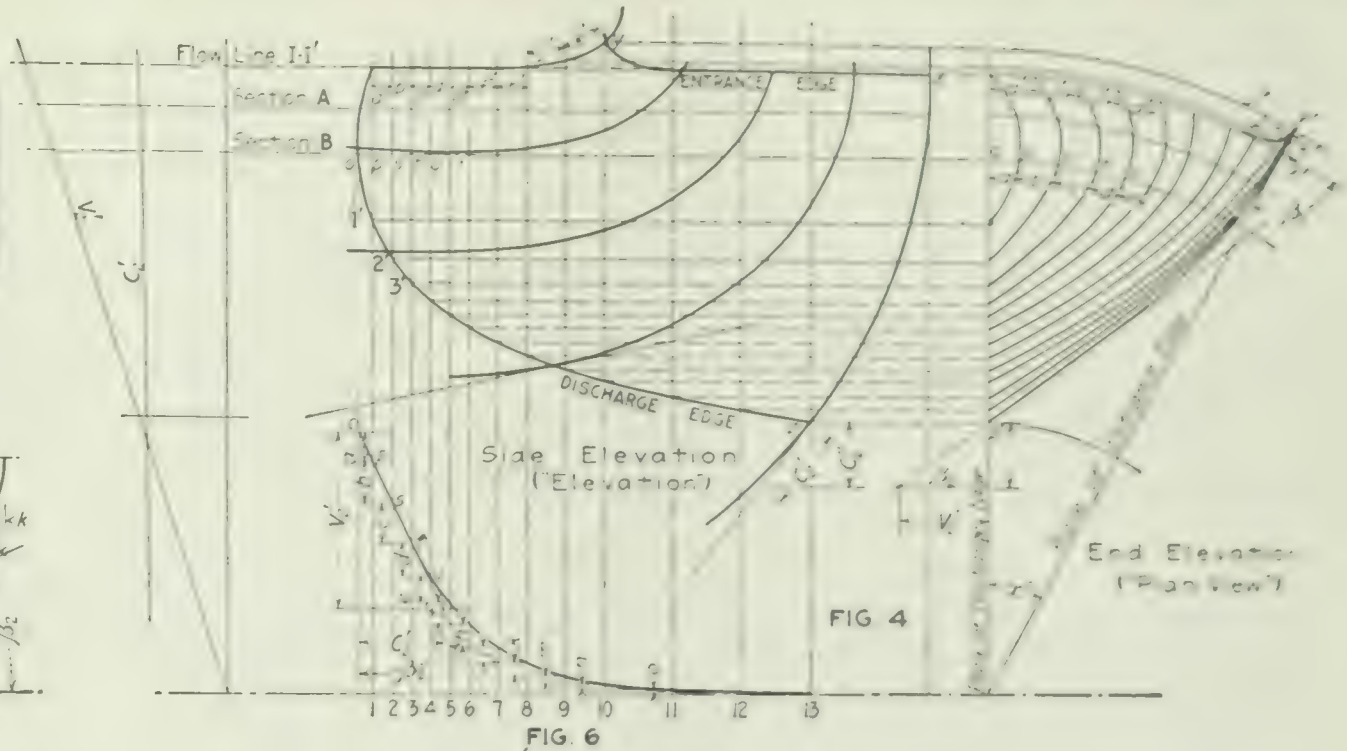


FIG. 6

THIRD STEP GIVES VELOCITY DIAGRAM AND BOARD CURVES

We will cut the runner by a series of plane surfaces perpendicular to the center line (called "board sections"). The traces of these surfaces are shown by the straight lines 1, 2, 3, 4, etc., in Fig. 4. If we determine the curves that the vane cuts in each of these surfaces (see the "plan view" in Fig. 4) and cut these curves on boards the thickness of the space between the respective surfaces, then placing each such board in its proper relation to the others we have a stepped outline of our vane surface as illustrated in Fig. 3. This is easily cut down to the smooth surface of our vane, and we have a practical working form of one side of our core box.

The discharge edge of the vane is in one radial plane and in plan appears as a straight line. The entrance edge is taken in this case in one radial plane and for the most of its length runs parallel to the center line (x, y). Each board section cuts the discharge edge at a distance 1—1′, 2—2′ (Fig. 4) from the center, and this point is shown in the plan as a point on the board curve. Our outer flow lines run parallel to the center line at the discharge, so that, if we cut the vanes by a cylindrical section, we will show the vane with its proper discharge angle in the development of such a section, as β_2 must be measured in the direction of flow lines.

The development of the cylindrical section B is shown in Fig. 6. Looking at the elevation, Fig. 4, imagine the discharge edge in the plane of the paper and the entrance edge in front α degrees. It will be seen that point p. on the vane surface, lies a certain distance in from o, point s a certain distance in front of p, and so on. The development curve, Fig. 6, determines these distances at a and b respectively; and these are in turn laid off on the trace of the cylindrical section in the plan view, which is a circle, and become points on their respective board curves.

It must be borne in mind that the full development of the bucket vane on different surfaces, the flow surface, $I—I'$, section B, or any other cylindrical or conical section cannot be attained independently of each other. The board curves 1, 2, 3, and 4 in this case will be quite definitely fixed by angle β_2. The line xz' is also fairly closely determined, although there is some latitude in the choice of angle α. With these first curves closely determined and all points on the discharge edge fixed, in the plan view, we can work in free-hand the remaining curves, then go back to our developed sections and check back and forth until we have smooth, symmetrical curves in all cases. We may find it necessary to change our assumed entrance and discharge edges to attain this, which means the checking back over considerable of our computations.

The development of many sections is advisable, using conical sections when necessary to develop E_2 in the direction of flow. The taking of several radial sections, as shown in Fig. 7, at I, II, III and IV, aids greatly in getting a perfectly smooth surface (free from pockets) throughout; these sections are used in regrinding

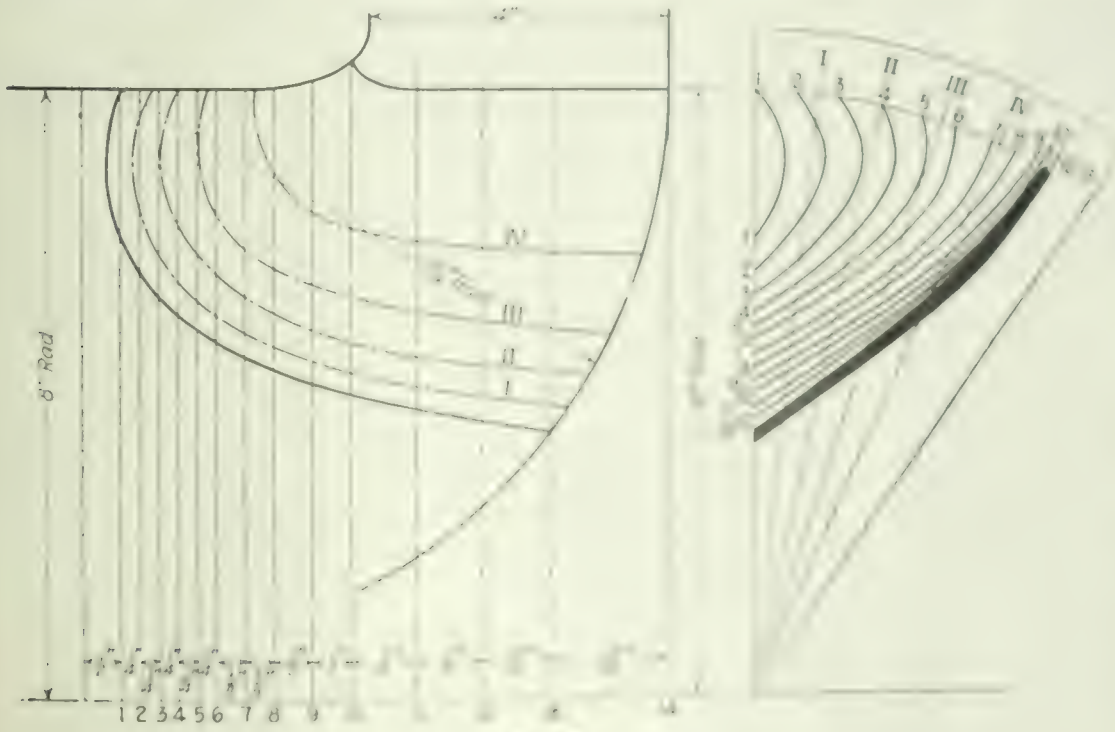


FIG. 7

SMOOTHNESS OF BUCKET SURFACE IS SECURED BY RADIAL SECTIONS

ducing the runner to other sizes. Draw a radial line through the plan view, and mark off on each respective board section the radial distance at which the board curve cuts the line. The resulting curves are shown in elevation in Fig. 7.

Floating Dock on Concrete Pontoons

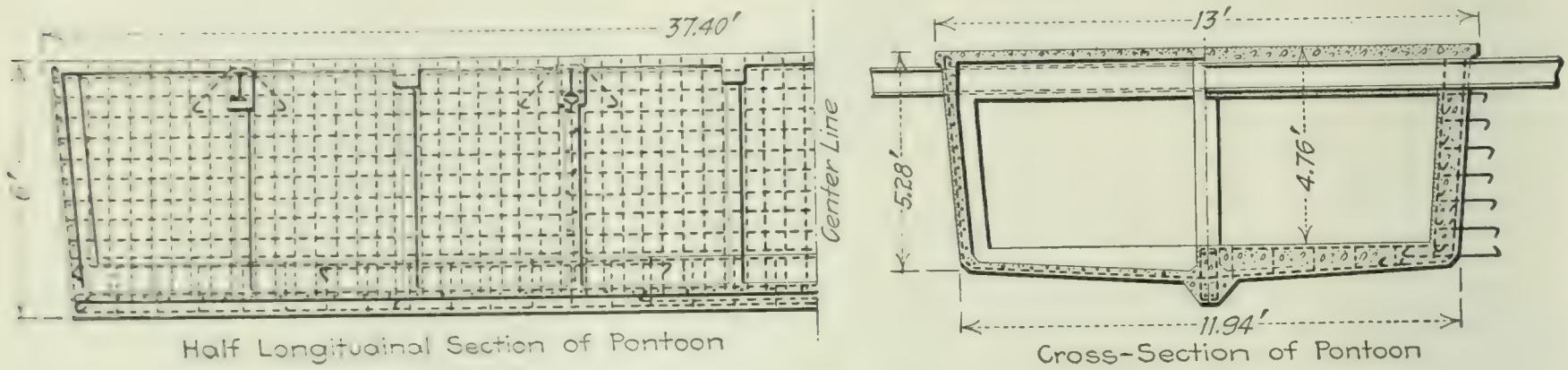
AN UNUSUAL solution was found for the problem of building a new dock and clubhouse for the Zürich Yacht Club, Zürich, Switzerland, as described in the *Schweizerische Bauzeitung* of Aug. 18. The variations of lake level, amounting to 6½ ft. maximum, made a floating structure necessary. For permanence the float was made of six reinforced-concrete pontoons covered by a continuous reinforced slab. Each pontoon is 13.1 x 37.4 ft. in plan. The drawing herewith shows the essential elements of construction.

The clubhouse, a wood-frame building, weighs 80 tons, and the live load (people, snow, stores) about 33 tons. Rigidity and stability were desired, in addition to the requisite carrying capacity. The float weighs about 200 tons. The loaded draft is 4 ft. It is anchored by five chains attached to concrete blocks of about 4 cu.yd. each, sunk at some distance from the float; the anchorage is designed more for wave attack in spring storms than for wind pressure or boat impact.

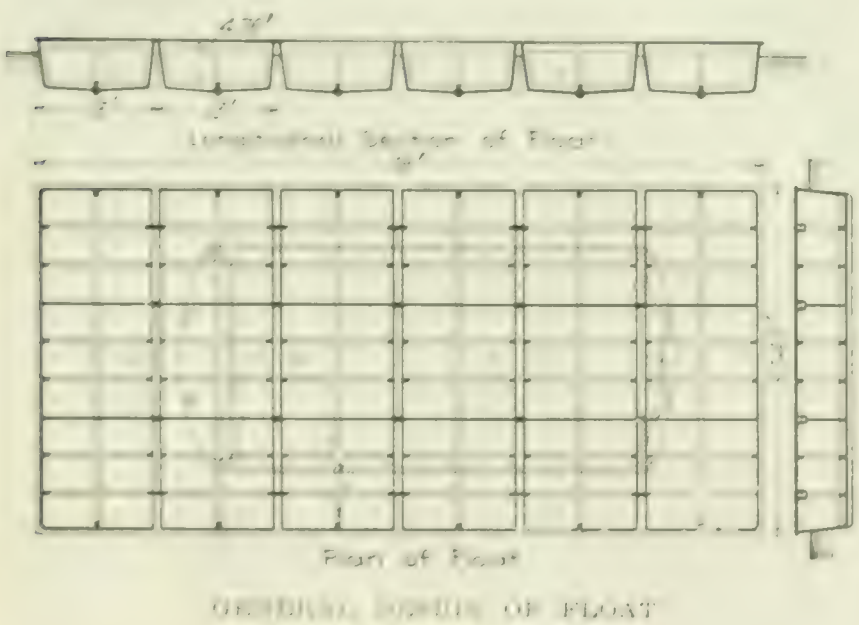
The pontoon walls are 2½ in. thick. Below the water line they were successfully treated with Ceresit, inside and outside, for watertightness.

The pontoons were constructed separately on shore, supported on two sets of skids, and the keel girder was reinforced to be adequate for carrying the dead-weight under this double-cantilever condition. Launching was done after 6 to 7 days. Four longitudinal 8-in. I-beams concreted in below deck level tie the scows together. The deck slab is 3¼ in. thick. There are also four reinforced vertical ribs between adjoining pontoons, the steel being molded in the pontoon originally and the rib being poured in a form when the pontoons were afloat and joined.

The float is supplied with water, gas, telephone and electric light by way of jointed pipes and cables under water. Sewage disposal could not be arranged for by this means, however, and therefore a small disposal plant is provided in one of the pontoons; it comprises two settling tanks, a percolating filter 40 in. square by 32 in. deep, and an ejector. Another pontoon contains gasoline supply tanks, and a third is used for bottle storage.



REINFORCED-CONCRETE PONTOON FLOAT FOR BOATHOUSE OF ZURICH YACHT CLUB



The reinforced-concrete work was designed by Zehntner & Brenneisen, engineers, of Zürich, and was constructed by Bosshard, Steiner & Co. of the same city. The structure has been in satisfactory service for 1½ years, it is stated.

To Prepare Street Code in Cleveland

Several meetings have been held by representatives of the Civic League, the Engineering Society and the Electrical League, all of Cleveland, Ohio, for the purpose of discussing a street code which will provide for proper organization of street work, including the placing of sub-structures, the preparation of permanent plans and records and an effective coördination of street functions. The great weakness of having a repair department distinct from the engineering department has been emphasized, and an attempt is being made to draft ordinances which will cover all the defects in the present system. While recognizing the difficulty in drafting a code comprehensive enough to accomplish this purpose, the paving committee of the Civic League expects to submit a report late in the fall. If such a code can be framed, it will be the first of its kind in the country.

The need for adequate cost records is another matter which the conference has taken up, so that sufficient data may be collected to determine with some accuracy the width of pavement, thickness of base, type of pavement and apportionment of cost between city and property owners. Some effort is being directed also toward improving the appearance of street fixtures by regulating their use and location and avoiding, wherever possible, the duplication of fixtures. In fact, the whole subject of street improvement is under discussion by a board of public-spirited engineer citizens.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Serial Bonds for Road Building

Sir—The article, "Serial Bonds for Road Building Save Money," by M. O. Eldridge, in *Engineering News-Record* of Aug. 30, p. 407, might convey to the casual reader the impression that a particular type of partial payment possesses an inherent mathematical superiority over all other types.

Superficial study shows that such is not the case. Unfortunately, the author draws a general conclusion from a particular example. He assumes that annual payments, including principal and interest, must be equal for sinking fund and annuity bond issues, while they may be made to vary in case of serial bonds. There is no reason why the amount set aside each year for a sinking fund or the annual payment on the principal of an annuity bond issue cannot be adjusted to make the total annual payments vary as shown for serial bonds, in the author's Fig. 4—in which case the three forms become economically identical, provided that the sinking fund yields the same rate as the bonds.

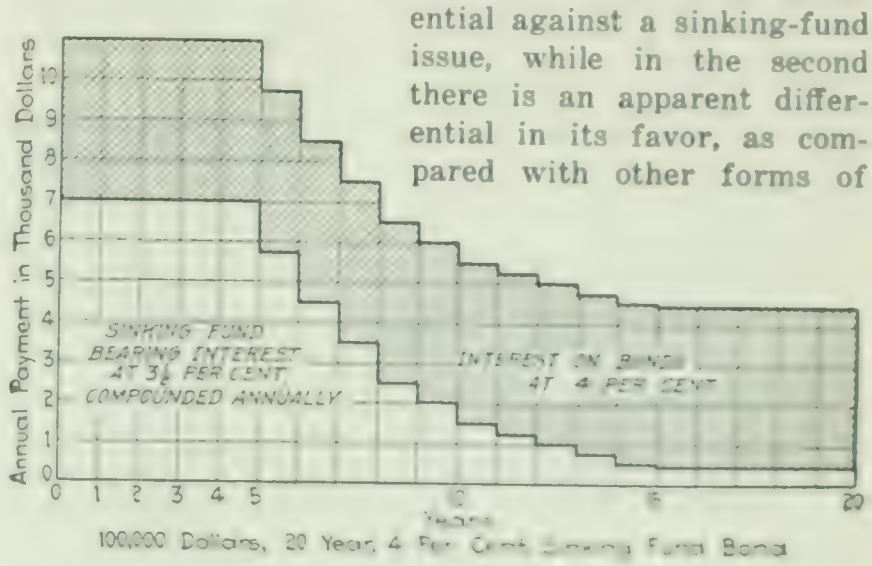
The author's Fig. 3 revised upon this basis becomes identical with his Fig. 4, the annual payments on principal being equal. His Fig. 2 revised upon this basis and assuming 4% compound interest on the sinking fund becomes identical with his Fig. 4 except as to the division line between interest and principal, which is of no importance to the taxpayer. It is, therefore, apparent that the total amount to be collected to liquidate the debt finally is dependent on the rate, or rapidity of repayment, and not on the form of the bonds.

In fact, there is presented herewith a plan of repayment for a sinking-fund issue which, in spite of an adverse interest differential, requires a smaller total payment than any plan suggested by the author. This plan, as well as the plan shown by the author in his Fig. 4, has the disadvantage of high payments the first few years, the payments being reduced toward the end of the period, while the ability of the community to make payments may run in the opposite way. If under the serial plan it is possible to make a payment of $9000 in the first year, it seems reasonable to assume that an equal or greater payment could be made in each succeeding year, under any of the plans of repayment, thus shortening the term of the bonds, and, according to the author's criterion (the total payment), making a tremendous saving.

With reference to the sinking fund examples presented, it should be said that it is admittedly poor business to borrow money at 4% to loan at 3½%. This, however, is a practical point, dependent upon circumstances in any particular case, should be introduced as such, and should not be made the basis of a general mathematical conclusion. It is possible for the sinking fund to yield more than the rate on the bonds, thus reversing the situation, and in order to make a fair mathematical comparison the rate of interest on the sinking fund should be assumed to be the same as the rate on the bonds.

In adopting as the criterion of economy the total amount to be collected from the taxpayers, Mr. Eldridge assumes that the community has a surplus of money which is less useful for other purposes than for application to the bond issue. In such a case, the annual payments should be made as large as possible, and the term of the bonds shortened—in theory the maximum economy is attained by paying cash for the improvement. If conditions are reversed and money is worth more to the community than the rate on the bonds, there will be an interest differential in favor of the issue, and it will be to the theoretical advantage of the community to make the term of payment as long as possible—again in theory, the maximum economy is attained by making the bonds perpetual.

In the first case there is an apparent interest differential against a sinking-fund issue, while in the second there is an apparent differential in its favor, as compared with other forms of



issue, but the variation in the market price of the bonds eliminates this discrepancy.

It may be argued that the examples presented by the author are typical, but they are not necessarily so, and any reform movement started should be based on correct arithmetic.

The writer is not an expert on bonds, and has no desire to recommend or condemn any particular form. It seems, however, that Mr. Eldridge's practical objections to the sinking fund bond are well taken, especially when considering small communities where the fund must be handled by continually changing officials, many of whom have had little previous banking experience.

JULIAN HINDS,
Assistant Engineer, U. S. Reclamation Service.
Denver.

Sir—Your article on highway bonds, in *Engineering News-Record* of Aug. 30, p. 407, so interested me that I sent to the Department of Agriculture for Bulletin 136 on this subject, to see whether it contained tables on amortization by equal annual payments. Table 22, I find, gives this information, based on payments being made at the end of each period. As the basis of payment provides that the annual sum plus compound interest shall equal the principal, why should not the payment be made, or deposited as safety fund in advance—thus gaining advantage of the extra interest? This would make these payments coincide with the interest payments, which are usually called for in advance.

While this procedure would, of course, be impracticable for ordinary loans (if amortization is to start at once) it could well be followed for sinking funds or mortgage reductions on a growing proposition, for example, if payments are to start, say, p years after the loan is made and it is to be paid off in n years (a usual stipulation with long-term loans), make the first payment at the start of the n year period, giving as the formula

$$S = \left(1 + \frac{1}{i}\right)^{n} - \left(1 + \frac{1}{i}\right)^{p} = 0$$

This will make the difference in a ten-year period of over $30 a thousand in the amount of annual payments, at 4%, and for other periods and percentages a proportionate saving will be made.

While this is rather a financial than an engineering problem, it is of interest to engineers in that almost all projects are financed by bonds or loans which should be amortized, and the amortization usually starts after a certain period allowed to place the project on its feet as a going proposition. To save even $750,000 on a ten-year $25,000,000 bond issue is worth considering.

R. AUSTEN MCCULLOCH.

New York City.

Macadam Roads in the War Zone

Sir—I have read the arguments following the publication of William J. Weir's article on macadam roads in the French war zone in your issue of Sept. 13. I have been trying to find out why it was necessary for several highway or material engineers to explain why waterbound macadam roads are in the discard, and to show anxiety when *Engineering News-Record* publishes such an article, and then in its editorial columns even hints that a waterbound macadam road might possibly be of some use. Mr. Weir's article dealt with facts just as he saw them, and they were certainly interesting to most highway engineers. But when he allowed a little theory to creep in, as when he wonders what would happen to the bituminous macadam, concrete and brick roads of the United States if they were subjected to the traffic that he saw on roads in France, that must have spelled history for sure.

I do not believe many highway engineers think that the modern highways of brick, concrete, etc., as they are being built in the United States, would have lasted much longer than the macadam roads in France, when pounded night and day for months and months by that terrific traffic of all kinds. Nor does any one believe that a concrete road or a brick road would withstand the blow from a Boche shell any more than a macadam road.

If France had had roads of this type would the army engineers have erected detour signs when these routes were in need of repairs, brought up cement, sand, brick, and concrete mixers, and closed the roads for several days for the material to set up? Not for one minute! They would have covered them with stone and made a macadam road and kept the traffic going.

The writer believes in concrete roads, brick roads, bituminous roads, and waterbound macadam roads, but in their places, and the macadam road has a place just as much as concrete or other types. But the waterbound macadam road has no paid promoters to tell of its good qualities and when to use it, and no association of manufacturers to see that the materials that go into it are right, or that the building is carried on according to a well-established theory worked out by high-priced research specialists. The fact remains that if a count could be taken, probably over 75% of the so-called improved roads of the world are of the waterbound macadam type, and will be for years to come, getting the people out of the mud when they would still be stuck if they had to wait for all roads to be of this so-called permanent type.

CHARLES A. CARRUTH,
Assistant Engineer, New York State Highway Commission.

Rochester, N. Y.

The Engineer in Politics

Sir—The recent action of the executive board of the Cleveland Engineering Society, declaring against the initiated rapid transit commission ordinance to be voted on at the November election in Cleveland, is a progressive answer to the archaic dictum that the engineer and the engineering society shall keep aloof from politics. It is amusing to hear some of the staid members of the profession, who ought to be more consistent and logical, preach with eloquence, while standing on one foot, that the engineer should take a prominent part in public life—then shift to the other foot and wax equally eloquent against our taking part in politics.

What is politics? It is the proper relation between citizens, as individuals or in groups, and government of city, state and nation; or the conduct of government through group relationship. Politics is a word sinister to those who fail to do their citizenship duty. If the word carries the suggestion of trickery or dishonesty in public life, that is the fault of those who stand apart, who say we shall have no hand in purifying the unclean.

Whether or not we shall contend in the political arena is not a proper subject for debate, but whether the things for which we strive are right and serve our Government. No service can be interpreted in these fast-moving times except by action. That we shall make mistakes is admitted, but with so many engineers in public life competent to sit in our councils, we should make substantial advances for the public and for our class, the engineers. Concerted action will come with class consciousness.

Of course, the best place in which to be effective in politics is where the votes are counted, in the home of the local engineering society. In national affairs there are opportunities for such a body as the Engineering Council to voice with authority the sentiments of all engineers, and then, if their voice is not heard, they can back it up with votes.

C. E. DRAYER,
Secretary, Committee on Engineering Coöperation.

Cleveland.

Use of Catskill Water in 1916

During the year 1916, according to the latest annual report of J. Waldo Smith, chief engineer of the New York Board of Water-Supply, 40,215,000,000 gallons of water were delivered by the new Catskill aqueduct to the city. This water was passed through the aqueduct to Kensico reservoir at rates as high as 365,000,000 gal. per day.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Clearance Prevents Slab Form from Getting Caught at Beams

By Samuel Warren
New York City

MANY A MAN has found it necessary, after his first attempt to build forms, to damage them considerably in removing them, because of their being embedded in the concrete at the ends. This results from not realizing that there will be a slight movement of the forms when they are filled with concrete.

A case in which such clearance is required occurs where the floor slab forms rest on the edges of the beam forms. The wrong and the right methods are shown clearly in the sketch. If the edges of the floor panels are flush with the inside edges of the beam forms, they will be found embedded in the concrete of the beam when the beam forms are removed, as the sides of the beam forms are sure to bulge when filled with concrete.

FORM AT LEFT MUST BE SPLIT TO STRIKE IT

This movement may not be more than ¼ in., but if the floor panels are embedded in the concrete even that slight amount it will be impossible to remove them without virtually destroying them.

Steel Brooms Fitted to Steam Roller Spread Stone on Road Work

IN THE construction of waterbound macadam a saving in manual labor has been effected by attaching a gang of brooms to a steam roller. The steel brooms are clamped to pipe handles which telescope into larger pipes attached to a cross frame. This arrangement permits the making of alternate long and short handles, so that the brooms overlap. The back of the cross frame has three short pieces of pipe, with bolts for securing it to the roller frame. A rope or lever, connected to the front bar of the cross frame, provides for raising the brooms when not in use.



GANG OF BROOMS ATTACHED TO ROLLER IS USED TO SPREAD STONE ON MACADAM ROAD WORK

This gang-broom arrangement was designed and made by F. J. Lees, of the highway department of Onondaga County, New York.

Length of Pipe Used To Roll Concrete Paving Transversely

ROLLER floating of concrete street paving at Binghamton, N. Y., eliminates all hand finishing. A 20-ft. length of 6-in. pipe is used, the expansion-joint spacing being reduced from 30 ft. to 20 ft., so that the forms for the expansion joint may serve as templates for the roller. As soon as the concrete has been poured the pipe is rolled over it, two or three passages being required ordinarily to press down the high spots and fill in the low spots.

This method of finishing the pavement was suggested by W. Earl Weller, city engineer. The contractor is



LONG PIPE ROLLER FLOATS CONCRETE PAVING

Frank Stento. The price on the work illustrated is $1.67 per sq.yd. for the pavement complete, plus $1.70 per 20-ft. section for additional expansion joints.

Sectional Camp Houses for 80 Laborers Moved in Day by 24 Men

ROAD CONSTRUCTION camps of timber buildings made in unit parts which can be used interchangeably are used by the highway department of Onondaga County, New York.

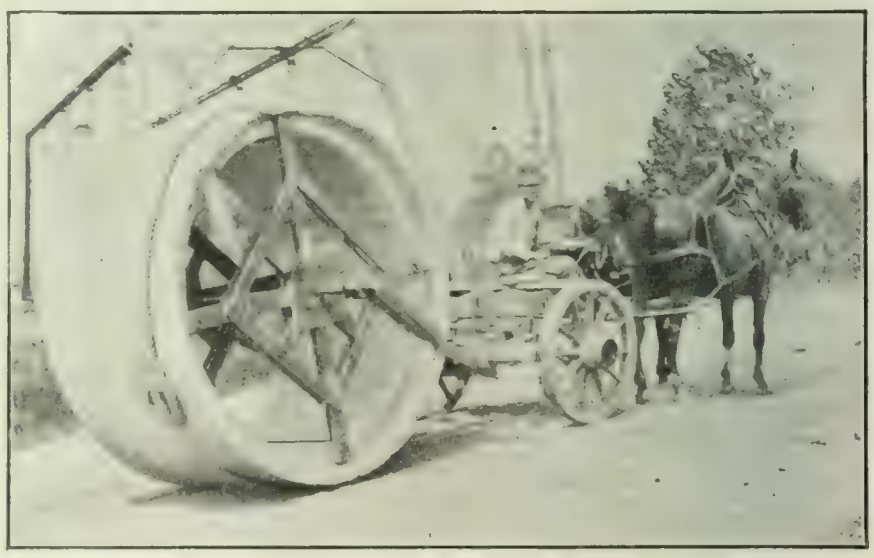
The sides are made of 18-ft. panels having tongue-and-groove sheathing on studding attached to 2 x 4-in. top and bottom plates. Each panel has two windows. The end studs have bolt holes for the attachment of side or end sections. Each end is made in two panels, the upper one closing the gable and the lower one containing the doors. The roof is carried by unit A-frames having two sides and tie, all of 2 x 6-in. plank. These are spaced 3 ft. c. to c., and rest on the side studding. Upon the frames are carried panels 3 ft. wide, a plank covering each inclined joint and a sheet-metal ridge covering the top joint. The floor is made of joists with 1-in. boards laid loose upon them.

The bunk houses accommodate ten men per 18-ft. section and can be made of any desired length. The view shows two 4-section houses for a gang of 80 men. For this gang there are also a three-section mess room, a two-section kitchen and office building combined, and a one-section mess room. The five buildings require 14 sections of 18-ft. length. Two gangs of 12 men each can take down and reërect the camp in one day. An extra cook house is used while camp is being moved.

These buildings were designed and built under the direction of F. E. Bogardus, county superintendent of highways, and F. J. Lees, who is in charge of the work.

Roll 6-Foot Concrete Pipe from Casting Yard to Trench

BY PLACING a steel spider frame with an axle inside of 4-ft. lengths of 72-in. concrete pipe, the pipes were hauled by a team 1½ mi. from the casting yard to the trench. To prevent cracking the bell end, a rope was tied around each pipe, as shown in one of the photographs. The pipes are intended for an 8100-ft. sewer



HAUL CONCRETE PIPE 1½ MILES TO TRENCH

in Indianapolis, Ind., for the Speedway Realty Company.

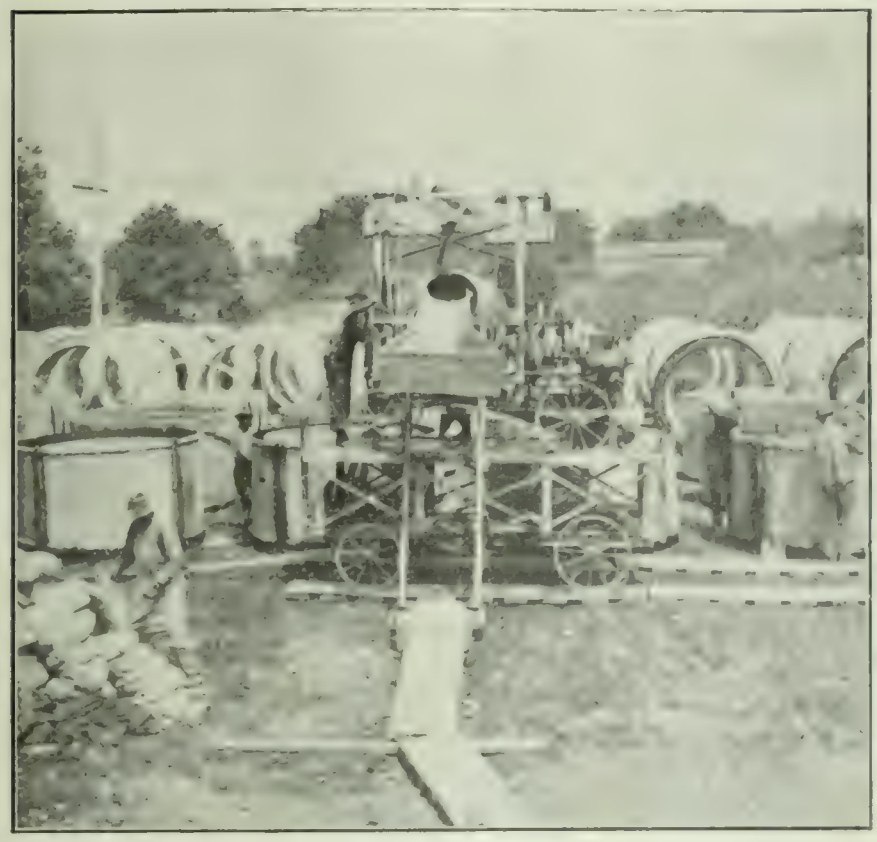
The pipes were cast in pairs in parallel rows. A one-bag mixer, mounted on an elevated platform, traveled along the rows, the charging skip being let down



SECTIONAL CAMP BUILDINGS ON COUNTY ROAD WORK EASY TO MOVE

on a track to the ground level. Usually, a gang of 14 men cast 20 pipe sections each day. Part of the gang stripped the pipes cast the previous day and turned on their sides pipes 72 hours old, while the remainder began to erect forms. By 10 a.m. six or eight forms were ready, and the mixer was started. Then concreting and form erection proceeded until 20 pipes had been cast. This work was finished in time to permit the cutting of 20 rings of reinforcing for the succeeding day's work. Pipe was cured 30 days before being hauled to the trench. The outfit included 20 sets of forms and 60 bottom rings.

In cold weather, steam curing was resorted to. The heat was retained under waterproof fabric covers, one for each group of four pipes. The steam was turned on full for an hour, and until midnight the tempera-



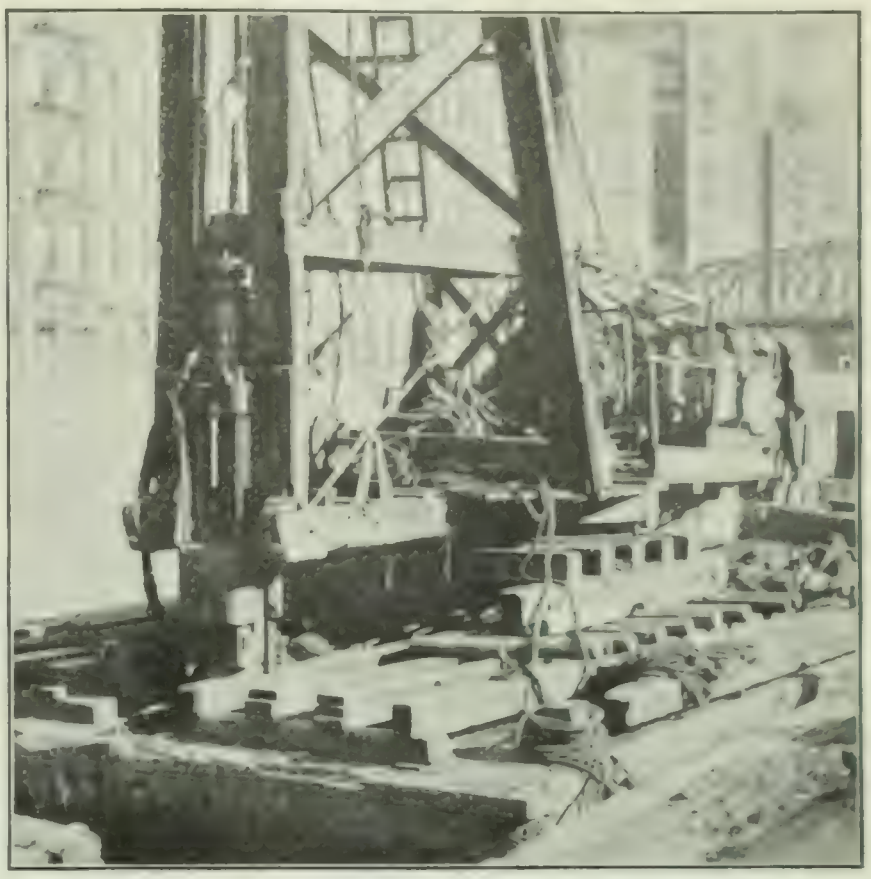
MIXER MOUNTED ON PORTABLE ELEVATED PLATFORM CASTS TWO PIPES AT EACH MOVE

ture was kept at 80° F. In the morning steam was applied again for a short time before stripping. The schedule of 20 rings per day was kept up by this means. The Wayne Sewer and Drain Co. had the contract, and H. B. Emerson was its superintendent on the work.

Turntable Driver Mounted Partly on Land, Partly on Barge

By H. H. Field
Chicago

A TURNTABLE pile driver used by the Great Lakes Dredge & Dock Co. at the new Union Station site in Chicago is made to drive piles along the shore and out into the water by rolling it onto a barge. The machine can, of course, be turned to work on either side of the scow or rolled from end to end. It is counterbalanced so that it can reach quite a distance ashore from the end of the barge. Furthermore, as shown in the photograph, skids are set on the shore level with the runways on the barge, so that the machine can be rolled right onto the land. When used in this way, movement along the bank is obtained by rolling the



TURNTABLE MACHINE MOVES BETWEEN BARGE AND SHORE

driver back onto the scow and warping the scow along the bulkhead.

This arrangement makes it possible to move the driver very rapidly with a small crew and adjust it to the work of both a land and a floating rig.

Toolbox Has Watertight Lids

A MOVABLE center lid of flashing provides watertight joints for the doors of a portable toolbox used by the highway department of Onondaga County, New York. The doors are hinged at the sides and close against the narrow top of the box, as shown. The joints are covered by the metal flashing, which is hinged so it can be raised clear of the box to permit the opening of the doors. The flashing is attached to double-jointed three-leg hinges. Each hinge is made by riveting together the adjacent legs of two strap hinges. One of the outer legs is attached to the flashing and the



HINGED FLASHING MAKES DOORS OF TOOLBOX WATERTIGHT

other to the top of the box. Thus the flashing has a longitudinal movement as it is raised or lowered.

This arrangement was devised by F. J. Lees, who is in charge of the road gang, and the toolbox was built by the gang.

NEWS OF THE WEEK

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

American Highway Association Is Disbanded

Action Taken on Ground That Organization's Mission Is Fulfilled—Annual Medal To Be Awarded

By vote of the board of directors at a meeting in Washington, D. C., Oct. 30, the American Highway Association has been dissolved. This action was taken on the grounds that the association's mission had been accomplished, inasmuch as every state now has a state highway department working closely with the United States Office of Public Roads. The organization's funds are to be employed to purchase a medal to be awarded annually for conspicuous service in the advancement of road improvement in the United States. The resolution by which the association is disbanded follows:

"Whereas, The American Highway Association was organized in 1910 as a voluntary association to aid in bringing about efficient road administration in the United States and their subdivisions and to arouse and stimulate sentiment for road improvement; and

"Whereas, Every state now has a state highway department working in close relations with the United States Department of Agriculture, and the public interest in the improvement of roads is widely manifest; and

"Whereas, It is thought that the conditions brought about by the war have made it unwise to solicit further contributions from the public for the purposes of this association; and

"Whereas, In view of the facts recited, it is considered best that this voluntary association be dissolved and disbanded; and

"Whereas, There is in the hands of said association the sum of $——, after paying all debts and liabilities which said voluntary association has incurred; now, therefore, be it

"Resolved, First, that a committee of three, namely, Fairfax Harrison, Logan Waller Page and John M. Goodell, be and the same hereby is created and appointed for the following purposes, namely:

"(a) To buy bonds with the said net sum of $—— and to deposit them with the Washington Loan and Trust Co. of the City of Washington, under such deed of trust or other agreement as said committee may deem best for the preservation of said bonds.

"(b) To appoint and legally authorize in said deed of trust or agreement the present Secretary of Agriculture, Hon. D. F. Houston, and any Secretary of Agriculture who may from time to time be incumbent of said office, to collect the interest from said bonds; and from and out of said interest the present Secretary of Agriculture, while he is incumbent of said office, and any other Secretary of Agriculture who shall from time to time be incumbent of said office, shall and he hereby is authorized and empowered to purchase a medal or such other prize or award as he may deem suitable, to be awarded and given to the person or persons under such rules and regulations as said Secretary of Agriculture, or any other Secretary of Agriculture who shall from time to time be incumbent of said office, may promulgate from time to time, the same to be awarded and given annually for conspicuous service in the advancement of road improvement in the United States, and to be known as and called the American Highway Association prize.

"Second, that said committee be and it is hereby authorized and empowered, fully and particularly, to carry into effect the purpose and intent of this resolution, and to make, execute and deliver any deeds of trust or agreements that may be necessary thereunto, and to fully provide in said agreement or deed of trust for the further investment from time to time of said fund by the said trust company or otherwise as it may deem best.

"Third, that the said voluntary association, the American Highway Association, be and the same is hereby disbanded and dissolved and any and all powers or authority which it may have is hereby invested in said committee."

It was unanimously voted to assign the copyright of the Good Roads Year Book to the D. Van Nostrand Co., of New York, N. Y., dated Oct. 15, 1917, the transfer of the copyright to become valid upon delivery to John M. Goodell of a receipt signed by the Williams & Wilkins Co., of Baltimore, for payment in full of all charges against the American Highway Association.

A review of the history of the association was ordered prepared by John M. Goodell, to whom a vote of thanks was given.

St. Paul Railway Will Rush Cascade Electrification

To utilize water power and help conserve the nation's fuel resources, the Chicago, Milwaukee & St. Paul Ry. has decided to rush the electrification of its Cascade section, from Othello, Wash., to Seattle and Tacoma. The section is 211 miles long. In order to save as much time as possible, contracts for the locomotives and power-transforming apparatus have been divided between the Westinghouse Electric and Manufacturing and the General Electric companies.

Road Builders' Regiment Has More Than 5000 Applicants

Last Week More Than 1000 Men Were in Uniform at Camp Meade—500 Applicants Received Daily

Volunteers are still applying in large numbers for admission to the Twenty-third Engineers, the road-building regiment now being organized for early service in France. Col. E. N. Johnston, commanding the new unit, told *Engineering News-Record's* representative in Washington last Saturday that more than 5000 applications for enlistment had been received since this journal called upon its readers in the Oct. 4 issue to aid in getting men with the proper construction experience to join the colors. Of these 5000 applicants 1012 were already in uniform at Camp Meade, Admiral, Md., while 300 more accepted men were en route to camp from all parts of the United States. The remaining applications are being classified as fast as possible and will furnish a large additional quota of highway construction men. At the present time enthusiasm for the road-builders' regiment has been worked up to such a pitch that 500 men are seeking admission to its ranks each day. The special need at present, according to Colonel Johnston, is for bridge carpenters and bridge foremen.

An indication of how engineers throughout the country are responding to the call of the Twenty-third Engineers is given in the following telegram received by Colonel Johnston from B. Hales, city engineer, Ray Junction, Arizona:

"C. O. 23rd Engineers.

"Yours received. My assistants all gone to army. Necessary for me to secure man to fill my position here. Will you allow me until Nov. 15 to leave here for service?"

Last week the highway unit had reached such proficiency in close order drill that they engaged in a formal review at Camp Meade.

Colonel Johnston estimates that at the rate the applications are coming in the regiment will have been recruited to full strength by Nov. 15. The regiment now needs, according to information furnished *Engineering News-Record*:

Axemen, 18; bakers, 6; barbers, 12; metal tire repairers, 6; caterers and head cooks, 12; interpreters, 12; masons, 30; pump repairers, 6; quarrymen, 72; riggers, 12; tailors, 12; telephone men, 24; rubber tire repairers, 24; tool sharpeners, 12; wagon masters, with rank of sergeant, 12; well borers, 6; wheelwrights, 12; derrick engineers, 12; and water-supply men, 6.

Part of Coast and Geodetic Survey Now in Army and Navy

In an executive order dated Sept. 24, 1917, President Wilson, acting in accordance with the authority given him for the purpose, declared a national emergency existing and directed that certain vessels, including equipment and personnel, and many engineers in the commissioned personnel of the Coast and Geodetic Survey, be transferred to the Navy Department In addition, many men now part of the commission personnel of the survey are transferred and commissioned in the Officers' Reserve Corps. The passage of the law granting this authority was noted in these columns May 31, p. 474.

Railroads of Canada Will Co-operate in War Work

An organization has been formed at the suggestion of the Canadian Government, to secure closer coöperation among the Canadian railways. It will be known as the Canadian Railway Association for National Defense, and will have authority to formulate in detail a policy for the coördinating of industrial activities in the prosecution of the war and for rendering the most efficient service to the national cause.

The executive committee comprises the following railway presidents: Lord Shaughnessy, Canadian Pacific; H. G. Kelley, Grand Trunk; Sir William Mackenzie, Canadian Northern, and A. H. Smith, New York Central. The main office of the association will be in Montreal.

Validity of the Bone Patent Not Passed Upon

In the news item noting the decision of the U. S. Circuit Court on the Bone patent, in *Engineering News-Record*, Oct. 18, p. 763, a final paragraph of the upper court decision was omitted. This paragraph reads: "With the claims restricted to a matter of location of the reinforcement (the validity of which we need not decide) there is no infringement." On account of this paragraph it is the contention of the patentee, Frank A. Bone, that the court did not decide on the validity of the patent.

It may be said that the upper court decision was in every way an affirmation of the lower court. That lower decision stated that Bone was not the first person to reinforce a retaining wall and that he was not the first person to conceive the idea of a reinforced retaining wall, which was so shaped and constructed that the weight of the earth on the heel of the wall would withstand the pressure of the dirt or the earth on the wall. Both decisions, however, concluded that it was not necessary to decide whether Bone's method or location of reinforcement evidenced patentable novelty, because if the claims of the patent were so restricted and limited the wall under controversy, that is, the wall built for Marion County, did not infringe the Bone patent.

Priority Order to Halt Road Construction

Much Work on Highways Will Be Lost Through Stoppage of All Supplies—Demand for National Road Body Growing

After an investigation understood to have been directed by Robert S. Lovett, the Priority Board of the Council of National Defense issued an order to the effect that open-top freight cars, except flat cars, may not be used after Nov. 1 for shipping:

"1. Materials and supplies, other than coal, for the construction, maintenance or repair of public or private highways, roadways, streets or sidewalks.

"2. Materials and supplies, other than coal, for the construction, maintenance or repair of theaters, or other buildings or structures to be used for amusement purposes."

May Be Lifted Before Spring

There is no official intimation of how long this drastic order will remain in effect. This journal has been informed unofficially, however, that it is hoped the embargo can be lifted long before spring road construction opens.

The immediate effect of the order is to stop from today the shipping of crushed stone, slag, sand and gravel to every highway contract in the country that depends on rail supply. Delivery of brick and cement, and possibly of barrelled asphalt, all of which have been shipped to some extent in the proscribed gondolas because of the scarcity of other cars, will also be curtailed.

Like Bolt from Blue

From reports reaching this journal, most highway work has been caught entirely unawares by the sudden promulgation of the order without a hint of warning. It was explained to the representative of this journal that the Priority Board, realizing that immediate action could not be avoided, no matter what the grounds for protesting the order, decided against hearings on the matter as calculated only to raise a storm of protest which could not in any case help the desperate situation with regard to the transportation of coal. This situation, involving the shutting down of munitions plants and coal famines adversely affecting industry in all parts of the country, is due, it is unofficially stated, to a lack of coal cars. To remedy this severe shortage, it is said, the commandeering at once of all available gondola cars could no longer be postponed.

The action taken came so unexpectedly as to catch many miles of highways graded with no prospect of securing materials to complete them before winter makes morasses of them. Next spring a great deal of work will be required to put these roads in condition for surfacing, to say nothing of the loss of money caused by having them out of service all winter.

Highway engineers have complained bitterly to the editors of *Engineering News-Record* that this condition could have been greatly mitigated if longer notice had been given to all engineers to prepare to close down their work for the winter. Contractors make the same complaint, and may of them undoubtedly face heavy losses.

Agitation for Highway Board

The fact that a matter of such vital importance (the Priority Board itself admits the urgent necessity for road construction) must be decided under the present organization in such a summary fashion by a board primarily concerned with far different duties is pointed to by leading highway officials as final proof of the urgent necessity for a national highway body as a part of the Council of National Defense. Such a body would not, they point out, result in the consideration of commercial and contracting interests of the highway field above the common good. On the other hand, it would prevent serious damage to these interests and serious delays to the development of our sorely-needed road system from action such as the present priority order. Much could have been done by such a body, these officials point out, to mitigate the bad effects of this order. That nothing was done in this direction they attribute to the fact that there is no body now in existence charged with looking specifically after the development of highways and highway transportation.

Federal-Aid Work Suffers

The order does not, of course, apply to materials for Government work. It has not yet been determined whether state roads, which are being torn to pieces by heavy traffic in the vicinity of cantonments and embarkation centers, are included, but it is thought that the Federal aid state highways will not be considered as Government work.

Neither has any loophole been found to permit the maintenance of the heavily-traveled freight roads in many states, without which important cities such as Cleveland, could not continue business under present conditions.

Montreal Finds Motor Sweepers Hard To Operate

In the report of Chief Engineer Mercier to the Board of Control of Montreal, Canada, as to the exact defects complained of in the new motor sweepers purchased by the city, it is stated that the chassis is excellent, but that the machine is difficult to operate and slow. In addition, the sweeper is so badly adjusted that on a rough street where there are holes and depressions, it leaves matter which it should have swept up. The cost for 16 days and 15 nights to operate, with the chauffeur and an extra man to help operate the machine, amounted to $317.71, the cost running daily from $17 to $23 for 24 hours.

Government To Build Barges for Mississippi

Transportation Crisis Leads Authorities to Construct Steel Barges to Carry Coal and Ore

INFORMAL announcement of the Federal Government's intention to build a fleet of steel barges for the Mississippi River was made by Secretaries Redfield and Baker in separate interviews last week, although the details of the plan have not been made public. At present the indications are that the Shipping Board will authorize the expenditure of about $3,000,000 to be devoted to the construction of a number of boats, which will be leased to private capital for service between St. Louis and St. Paul, carrying coal upstream and iron ore downstream. The fleet at present planned will consist of four specially designed power boats with 1800-hp. boilers, and 24 steel barges 50 x 310 ft. with a carrying capacity of 1200 tons each at a 3½-ft. draft, or 2500 tons at a 4½-ft. draft. Each towboat will handle three barges and the traffic will be so managed that loaded barges of coal or ore will be ready at each terminal on the arrival of a boat. It is hoped that the boats can be put in operation next spring. The lease will be held by the Mississippi Valley Iron Ore Co., of St. Louis, of which E. D. Goltra is president.

This action on the part of the Government follows the completion Oct. 20 of the experimental trip of the steamer "Nokomis." That the subsidy of river boats will be undertaken is, however, due to more fundamental causes than one round trip of a fleet of barges, particularly as that trip was not too successful. War conditions with its resulting disarrangement of old traffic routes and methods, the fact that the Northwest region requires millions of tons of coal and that Southern manufacturers are suffering lack of pig iron, are the primal causes which required this unusual participation of the Government in the revival of river traffic on the upper Mississippi.

No more interesting history of this "revival" will be written than the log of the steamer "Nokomis." A Government snag boat on the lower Mississippi, it was impressed into this service together with six barges to enable an enterprising business man in St. Louis who furnished the cargo to make an experimental trip. The tow left St. Louis July 31 and arrived in St. Paul Aug. 13—675 miles in 14 days. The barges drew 4½ ft. The water stage was favorable and the boats arrived safely, the most serious difficulty being the finding of piles. At Rock Island Rapids there was a forced wait of two days to find a pilot who would undertake this unusual tow over the rapids. Piloting a steamboat—a pleasure in fact—is the only thing about on the Mississippi River in these later days, and piloting a tow of coal barges with its nose poking upstream 600 ft. ahead of the boat, are two different propositions.

On the day the coal barges arrived in St. Paul the daily papers were announcing a coal shortage in the Northwest. This coal was offered for sale but there were no buyers. After three days' waiting, the City of St. Paul purchased the entire cargo to help out the project, the coal being delivered to the School Department at $6.50 per ton delivered, or 80c. less a ton than the market price. The coal was somewhat broken up by handling, about the same as coal delivered by boats at Duluth. At Duluth they are equipped with screens at the docks and buyers can purchase lump coal or screenings, as they wish. At St. Paul there was no such provision, which furnished some excuses for refusal to purchase, but a general apathy, the immobility of business interests, had more to do with it. The barges loaded with iron ore left St. Paul Aug. 28. They reached St. Louis Oct. 20, having been 53 days making the down river journey, due to low water and overloaded barges.

No use whatever was made of the Government storage reservoirs at the head of the Mississippi River at the time the "Nokomis" left St. Paul, to raise the stage of the river between St. Paul and Lake Peppin.

The ore-loading equipment provided this year by the City of St. Paul will be ample to handle all traffic next year, but the coal-handling equipment and storage yard will have to be augmented by the purchase of two locomotive cranes for quickly unloading the coal from the barges, and adding to the storage ground.

Commissioner of Public Utilities O. E. Keller has asked the council of St. Paul for $200,000 in the 1918 budget for improvement of river terminals. This has been cut to $50,000. Mr. Keller has announced that this amount will be sufficient to provide temporary equipment for handling next year's cargoes but that he will go before the people next fall and ask for a large bond issue for the building of permanent terminals equipped with modern coal- and ore-handling machinery, and that he believes that the people will vote these bonds after the object lesson presented to them by next year's traffic.

The railroad companies in the Northwest seem to be perfectly willing to furnish the iron ore, especially the Northern Pacific, from the Cuyuna Range. Railroad officials there say that they are in no way opposed to the revival of river traffic but they always add: "But we don't think it will amount to anything."

Legal Obstacles to St. Louis Street Widening Removed

The St. Louis Circuit Court has removed all legal obstacles to the widening of Washington Ave. from Jefferson to Grand Aves., which was provided for under an ordinance passed in 1912. The proposed improvements have been held up since that time by the filing of exceptions by a number of property owners to the appraisal figures agreed upon by the special commission.

The city's share of the cost will be $60,000, and it is expected that work will start by spring of 1918. The plans call for a widening from 60 to 80 ft., terminating at Grand Ave. in a broad plaza, which will do much to relieve the traffic congestion at that point. The cost at first was estimated at $700,000, but it has since been reduced by $200,000 by allowing certain buildings which project less than 12 in. beyond the new building line to remain until they have been altered or rebuilt.

Arkansas-Louisiana Road Measure Is Upheld by Court

The validity of the Arkansas-Louisiana road-improvement district, said to be the largest in the world, has been upheld by the Arkansas Supreme Court and the bonds will be offered for sale within 20 days. The district will build 178 miles of road through Lincoln, Drew, Desha, Ashley and Chicot Counties, Ark. In Desha and Chicot Counties a total of 122 miles of road, consisting of a concrete base 14 ft. wide covered with 2½ in. of asphalt, will be constructed. This system will cost $3,500,000.

Ordnance Corps Needs Men

A call for volunteers to join the enlisted personnel of the Ordnance Corps of the National Army has been sent to *Engineering News-Record* by Capt. F. A. Rogers, U. S. R., by direction of the Chief of Ordnance. The corps is charged with the supply, maintenance and repair of all cannon and artillery vehicles and equipment; all machines for the service and maneuver of artillery; all small arms, ammunition, harness, motor trucks, motorcycles, tractors and railroad cars. In fact, it is often referred to as the "Army behind the Army."

This journal is authorized to say that there is a place for practically every man who knows a trade in the Enlisted Ordnance Corps. Machinists, mechanics, plumbers, painters, carpenters, canvas workers, auto mechanics, saddlers, blacksmiths and wheelrights are especially needed at this time. Applicants must be between 18 and 40 years, citizens or declarants, and be able to speak, read and write the English language. They should have no absolute dependents and must be able to pass a physical examination conforming to that prescribed for the regular army.

Men of draft age who have not been called by their local boards are eligible for enlistment in the Ordnance Corps.

These instructions are issued to men who wish to enlist: Get application blank by writing to Chief of Ordnance, Enlisted Personnel Division, Washington, D. C. Fill it out, return to Chief of Ordnance, and if there is an opening for you at the time, authorization will be sent you to enlist at the nearest recruiting station.

San Francisco Engineers Study Civil Service

An Endeavor To Improve Conditions Under Which Cities Employ Engineers

Among engineers of the San Francisco Bay region there has been discussion of the improvements needed in civil service regulations if public positions are to be attractive to engineers. It was felt that the civil service system should close public offices calling for engineering ability to men not duly qualified, at the same time that it should prevent an employee who is given a position of trust and responsibility from being continued on the title and salary of a lower rank.

The failure of existing regulations to accomplish this was believed to be responsible for the unpopularity of civil-service positions with engineers. It was pointed out that 30% of the engineers eligible for membership in the San Francisco Association of the American Society of Civil Engineers were affected by civil-service regulations, and the association appointed a committee to study the entire matter.

The committee was instructed to go over and compare Federal, state and municipal civil-service laws and having the advantageous details of all in mind, to recommend such changes in municipal civil-service codes as would enable cities to attract the best type of engineers to public service. It was hoped that the activity of the committee might also interest the parent society in giving attention to the same work on a broader scale.

The committee consisted of Jerome Newman, L. S. Griswold, S. G. Hindes, Franklin Riffle and R. A. Thompson. After consideration of Federal, state and such municipal codes as could be obtained, a report was made giving an outline of the methods followed in the several systems, noting particularly important points of difference and giving a list of salaries accompanying various engineering positions under civil-service regulations of the United States, California, San Francisco and Oakland. An extract of the report has been printed by the San Francisco Association.

Canadian Government Establishes Research Scholarships

The Canadian Government has adopted the suggestion of the Council for Scientific and Industrial Research and established 20 studentships and five fellowships for the promotion of practical researches to aid the development of Canadian industry. The fellowships will be for the more advanced students who have completed their scientific training and shown special ability. A number of appointments to these positions have already been made, those obtaining fellowships being A. D. Hone, A. J. Walker and George H. Henderson. In order to get in touch with the conditions and needs of the industries of the Pacific Coast, the Advisory Council has decided to appoint an associate committee comprising representatives of the leading British Columbia industries, to advise with them on matters specially concerning that province.

No Railroad Traffic Over St. Louis Free Bridge Yet

The new municipal free bridge at St. Louis over the Mississippi River is finally completed and is carrying a large vehicle traffic, but as yet there are no railroad connections at either approach. Since most of the railroads entering St. Louis own stock in either the Merchants Terminal bridge or the Eads bridge, they can see no advantage in using the bridge provided for them by the city. Mayor Kiel has proposed a conference with the railroads to be held next month, at which time he will make an effort to determine upon what terms the roads are willing to use the bridge.

Road Convention Urges Engineer as Cabinet Member

At a recent convention of the Southern Appalachian Good Roads Association, the following paragraph was included in the general resolutions adopted:

"The development of this country's resources is based upon transportation and the solution of the transportation problems are engineering subjects. Therefore, feeling that engineering subjects should be handled by engineers directed by a trained engineer, we indorse the establishment of a Federal department of highways and transportation, the head of which shall be a member of the President's Cabinet, who shall be a trained engineer who has demonstrated his ability as an executive, and who has had actual practical engineering experience covering a period of not less than ten years in the class of engineering embraced in the department controlled."

Prices Stationary and Work Slackening

Scrap Declines on Fixing of Steel Prices—If People Save, Construction Will Feel Less Effect from War Financing

After showing steady advances for month after month over a long period, the price list of engineering materials has remained almost stationary during October. With the exception of gravel, explosives and manila rope, no price advances of a national character are noted. The effect of price fixing for steel products is shown in the scrap-metal market, where prices have very generally receded. In the prices of steel products no changes, of course, are noted; but the question of obtaining material is not one of price but of priority.

While construction work for the Federal Government is of enormous proportions (the Bureau of Yards and Docks of the Navy Department alone is said to have well over $100,000,000 worth of construction under way), private and public work not of a war character is showing more than a seasonal decline. Judging from the number of notices of contract awards reaching this journal, new construction work is less in volume than at any time since 1914. This decrease in ordinary private and public work is naturally attributed to the financing of the national war loans, which would naturally make it increasingly difficult to obtain funds for private enterprises. However, the contractor is not suffering from this cause to the extent that many other businesses must. The enormous amount of Federal construction work under way and direct employment by the Government of many engineers has, to a great extent, taken up the slack created by the lessening of private business. Some even consider that this factor should be given equal weight with the uncertainty of the labor and material markets in accounting for the small number of bidders at such large lettings as have been offered of late. The bidding for the work of the Miami conservancy district will be an interesting index to this situation, as it is understood that unusual efforts are being made to induce a large number of contractors to participate.

As to whether prices will continue to mount because of the growing scarcity of labor, and capital will become increasingly difficult to secure for any private enterprise during the next construction season, much is thought to depend on the way in which the general public assimilates the Liberty Loans. Should workmen and clerks, minor executives and professional men—the sort of people who in ordinary times seldom save anything except insurance, or money to provide for the education of their children—take the war seriously to heart in the early stages of this country's participation, and begin to save in earnest, no ill effects need be feared from the expiration of credit. It is estimated that normally the total new savings invested scarcely amount to $6,000,000,000 a year. If this money were all saved and all invested in Government bonds, and the war revenue bill should yield $3,000,000,000 in taxes, there would still remain more than $9,000,000,000 to be provided for the expenses of the first year of the war. If the Government securities must be taken largely by the banks, currency and credit can scarcely escape inflation which would force prices up. Besides this, credit for every private purpose would have to be greatly restricted. If the general public saves this money, which amounts to but $180 per wage earner out of its yearly earnings, it is held that there is a good chance for a decline in prices and it is certain that conditions would be far better with respect to financing of work apart from the war.

Gas and Flame Regiment Needs Volunteers

Maj. E. J. Atkisson, Corps of Engineers, U. S. Army, is organizing the first battalion of a "gas and flame" regiment, the 30th Engineers, at Camp American University, D. C. The new unit, which will be under the command of Col. A. A. Fries, who is now in France as chief of the gas service, needs chemists, chemical workers, machinists, men experienced in gas manufacture, pipe fitters, boilermakers, automobile repair men, electricians, etc.

Men with the proper qualifications, between the ages of 18 and 40, who have not been actually called by a local board in the draft, are urged to enlist. They should go to the nearest recruiting station, state fully their qualifications, and request to be enlisted in the 30th Regiment of Engineers.

The 30th is the pioneer regiment in the gas and flame service. Major Atkisson points out that this organization will require a large proportion of men able to assume responsibility and to act upon their own initiative and individual judgment. There will, he states, be opportunities to advance to the higher non-commissioned grades. There will also be opportunities for commissions.

All men must first enlist as privates, the rate of pay being $33 per month and expenses. Men with the necessary experience may be assigned to special duties and given non-commissioned rank at rates of pay ranging from $40.20 to $96 per month and expenses.

Railroads Must Pay Their Share of New Jersey Highways

It is believed that the decision of Chief Justice Gummere, refusing the railroads a writ of review of the road legislation, has removed the last remaining doubt as to whether the railroads will be required to pay their full share of the $15,000,000 road tax provided for by the last winter's session of the legislature of New Jersey. The decision pointed out that irrespective of the construction placed upon the original act it was clear that the supplement passed later in the session made provision by which railroad properties should bear a proportionate share of the tax burden.

Iowa Water-Works Officials Meet at Council Bluffs

Inspection of the water-works plants at Council Bluffs and Omaha occupied much of the attention of the members and guests of the Iowa Section of the American Water-Works Association at the former city, Oct. 10, 11 and 12. At Florence Station of the Omaha plant the party saw alum-cake for filters in process of manufacture.

Papers read included the following: "Recovering a Pump Lost in a Deep Well," by W. S. Judd, Mason City; "American Water-Works Laboratories," by Jack J. Hinman; "The Presumptive Test for B. Coli," by Prof. Max Leslie; "Early Experience in Water-Works Construction in Iowa," by Charles P. Chase, and "Metalium, a Substitute for Lead as a Joint Material," by H. V. Knouse.

The 1918 meeting and hereafter all alternate meetings are to be held at Iowa City and devoted entirely to discussion and business.

The officers elected for the coming year are: S. L. Etnyre, chairman; W. A. Judd, vice chairman; G. E. Shoemaker and B. T. Stedman, directors; Jack J. Hinman, Jr., Iowa City, secretary-treasurer.

Tennessee Highway Department Will Hold Examination

In compliance with a recent law, the Tennessee State Highway Department will hold an examination for assistant highway engineer in the Capitol Building at Nashville, Tenn., on Nov. 19. This examination will qualify engineers for appointment in connection with highway work on Federal and state-aid projects. About ten or twelve engineers are needed immediately, though later there will be other positions open, such as instrument men, rodmen and chainmen. For these last positions no examinations are required. The applicant must submit a statement of his qualifications, which will show his fitness for the position for which he applies. All information desired on various details of the examination or positions open may be obtained by addressing A. M. Nelson, state highway engineer, Nashville, Tenn.

Quartermaster Corps Sends Out Call for Men

The Quartermaster Enlisted Reserve Corps, with recruiting headquarters at 357 Broadway, New York City, has received a new authorization to enlist men to follow their civilian trades in the army, for duty in this country and abroad.

The men particularly needed at this time are: Electricians, tinsmiths, iron workers, carpenters, plumbers, mechanics—auto, mechanics—general, masons, bricklayers, farriers, horseshoers, saddlers, blacksmiths, teamsters, cooks, chauffeurs, stenographers, wagonmasters.

Enlistment is open to citizens of the United States, or to those men who have declared their intentions of becoming citizens.

Kansas Highway Commission Issues Its Own Magazine

The secretary of the Kansas State Highway Commission has been intrusted with the work of issuing a magazine which will be supported from funds of the Commission. The first issue is off the press now, and contains, besides an article by the governor of the State on the commission and its work, an article by W. S. Gearhart, state engineer, entitled, "Types of Roads in Kansas," and Logan Waller Page, on "Central Control in Roadbuilding."

Pittsburgh Bridge Raising Pushed by War Department

The War Department has recently given the Pittsburgh authorities a hint that it would like to know just what steps are being taken to raise the Allegheny River bridges as ordered by Secretary Baker on Mar. 23, 1917, when he declared them to be "unreasonable obstructions to navigation." His order provided for the beginning and completion of work on the seven bridges as follows:

Bridge	Commence Work	Complete Work
Penna. R.R.	Immediately	1 year
Sixteenth St.	Immediately	2½ years
Forty-third St.	Immediately	2½ years
Ninth St.	1½ years	3½ years
Seventh St.	1½ years	3½ years
Sixth St.	2½ years	4½ years
Thirtieth St.	3 years	5 years

The Pennsylvania Lines west, as soon as the order was received, made plans for jacking up its important main-line bridge to the required elevation and that work is well under way. Although a very difficult and slow operation, as it must be done without any interruption to the extremely heavy traffic, General Manager D. F. Crawford has announced that it will be completed within the time limit prescribed. The other structures, all of which are highway bridges, are owned by Allegheny County, which bought them from private owners a few years ago, after three secretaries of war had decided that they need not be raised. As Secretary Baker's decision to the contrary came at about the time when the United States was entering the war, the local officials felt confident that the Government would not press matters until after the war, and have done nothing toward elevating the spans, despite a penalty of $5000 provided by the law for every month's delay after the time limit expires. The U. S. engineer officer in the Pittsburgh district felt that this tardiness in starting the work was prompted by the hope that if delayed until the end of the present administration a revocation of the order might be obtained.

Terminates a Long Fight

After the successful termination of the long fight for higher bridges, started by Capt. W. L. Sibert, now Major-General Sibert, the officers of the corps of engineers appear to be interested in seeing an actual start made in the work before there is any change in secretaries of war. Senator P. C. Knox, on behalf of the citizens of the Pittsburgh district, has represented to the President that to carry on the work during the war would interfere with the production of iron and steel products and war materials in the district, and could not be completed in time to be of any assistance during the war. Also he showed that the work would have to be contracted for at war prices. Secretary Baker replied that "the benefits which will result from alteration far outweigh any local or national inconvenience" and recommended that the petition for suspension be denied. He was upheld by President Wilson.

James Peter Beck

Within a few days after the death of James Peter Beck, late general manager of the Portland Cement Association, the association held a meeting at Chicago. At one of the sessions, set aside for memorial addresses, Richard Hardy, president of the Dixie Portland Cement Co., delivered a eulogy, which because of its sentiment and the interest it holds for Beck's friends is here reproduced in part:

"'In the midst of life we are in death.'

"How strangely true these words strike upon our hearts this morning as we gather here to pay to the memory of our vanished friend our tributes of respect and love. It is most appropriate that we, his associates of a life ended all too soon, should for an hour lay aside all thoughts of the activity that has brought us here, to consider reverently the meaning of the life that was given almost wholly to the work in which we are commonly engaged.

"When the word was flashed to us on Saturday last that Peter Beck had passed into the shadows there came to each of us a sense of deepest loss. Only a few had known that he had been stricken, and these few felt that his rugged strength would withstand the attack of the dread disease that had seized him. They felt there was no need for immediate concern, and within a fortnight it was believed that he would again be at his post of duty. But once more the psalmist's words strike upon our hearts—'In the midst of life we are in death.'

"He commanded our respect and our admiration because of his ability, his clearsightedness, his unusual powers of comprehension and his indomitable industry. He had few idle hours. His thoughts were ever for the advancement of our work and unreservedly he gave of his strength to the promotion of our common welfare. Those who were privileged to know him well found him a most companionable man, and their loss is not easily measured. We have all felt the compelling force of his personality, his ability, his industry and his tireless energy; some there are who have known him as a close and dependable friend; theirs is the greater loss.

"The highest privilege of life is toil, and the privilege of toil is rest. There is a serenity, a holiness, aye, almost a beauty to the ending of some lives. When the relentless years have taken their full toll of strength of mind and body, there is none so unkind as to wish long pain-racked years to him who has served usefully and unselfishly. When the wages are taken and the long day done, there is indeed beauty in the thought that the weary traveler is taken again in the arms of the dear old Earth Mother and softly sung to his rest.

"It is not easy to reconcile ourselves to the passing of a life that held so much of promise as did this life of our departed friend. There seemed so much yet for him to do; so much that he could and would have done; there were still so many avenues of usefulness open to this young life. Yet at the full tide of his usefulness it came to him to join the innumerable caravan.

"It has been good to have met Peter Beck on the way; good to have journeyed with him for an hour or two when life was still kind. We are all the better for having known him, and let us hope that he, too, found something of helpfulness in his associations with us.

"To those who are bound to him by the ties of kinship, we can offer but little. At such a time we realize of how little worth are the words of sympathy that we so freely give—yet it is all we have to give, and to them, we, his associates and friends, send our hearts' sympathy in its fullness. With them we shall often in the coming years turn to the page in our book of memories upon which his name is written.

"To you, Peter Beck, friend, associate, good companion on the way, we bid you: Hail and farewell."

Quartermaster's Supply Depot at Port Newark Terminal

Work on the supply depot for the Quartermaster's Department at Port Newark terminal was begun on Oct. 22. The plans call for 12 frame warehouses, 1100 ft. x 161 ft., at a cost between $5,000,000 and $7,000,000. The site adjoins property leased by the Submarine Boat Corp. for shipyards, which work was mentioned in our columns, Sept. 13, p. 523. The grant to the Government carries with it the right to use 1900 ft. of docking. Direct communication with the Pennsylvania and New Jersey Central railroads is available at this site.

Suggests American Contractors Tackle Channel Tunnel

It has been learned from a reliable source, according to the press of New York City, that the present British ministry has taken up the question of immediately constructing the channel tunnel, described on page 645 of the *Engineering-Record* for Nov. 25, 1916, where it was left off on the retirement of the Asquith ministry. The conclusion reached according to these reports is that the $80,000,000 required for construction cannot well be spared at present; that the skilled labor and engineering talent required are too badly needed at the front; and that there is a lack of adequate construction equipment and of time to perfect and build such equipment. The interesting suggestion made is that this country furnish, privately or publicly, the capital required, and send over our subway contractors en masse, with plant, tools and men.

So far as the New York quota of this hypothetical contingent is concerned, the suggestion may appear in the light of a joke, in view of the serious difficulties reported in summoning enough resources of men and materials to complete the New York subway system.

Illinois Road Engineers Begin Study for New Program

Careful preparation for the expenditure of $60,000,000 in building roads in Illinois is already under way, although the vote on the bonds will not take place until next fall, and construction in any large way is not expected until 1920.

Oct. 19 the heads of departments, division and assistant engineers spent the entire day in Chicago learning the latest word in regard to concrete. The party assembled at the structural research laboratory at Lewis Institute, which is maintained under the direction of Prof. Duff A. Abrams by a coöperative arrangement between the institute and the Portland Cement Association.

For the first time the revolutionary results of the extensive examination of aggregates which has given rise to the function known as "The fineness modulus of the aggregate" were translated into an everyday, usable tool by which the engineer can obtain the greatest strength from a given aggregate. The preliminary results were reported on in an academic way by Prof. Abrams at the last meeting of the American Concrete Institute but have now been confirmed by such an enormous number of tests that there seems no doubt of their value. Practical examples and demonstrations of the use of this method were explained in the laboratory and then the engineers were assembled in a classroom for an exposition of the derivation. Other features explained in detail were the new colorimetric test for organic impurities in sands, wear tests of concrete, effect of rolling on the transverse strength of concrete and the effect of consistency.

Rolling was further studied on the job on the Sheridan Road work in Winnetka. In the evening a round table discussion of the day's events was held.

American Water-Works Association Helps Recruit Engineers

The Twenty-Sixth Engineers, a specialized organization destined for war water-supply service and to operate storehouses and repair shops in France, is having difficulty in getting properly skilled men to fill its ranks. The American Water-Works Association has been asked to assist in this work, and is giving the matter publicity, having announced that six companies, each having a personnel of 250 men, 166 of whom should be skilled artisans, are needed.

The following types of skilled men are particularly lacking: draftsmen and letterers, photographers and blueprinters, blasters and powder men, skilled mechanics for auto repairs, steam and gasoline engines, pipe culverts and bridge men, masons and concrete workers, experienced well drillers, machinists, pipe fitters, mappers and surveyors, electricians, riggers and laboratory assistants.

Anyone able to assist in procuring men should communicate with Col. E. J. Dent, Camp Dix, N. J.

PERSONAL NOTES

A. F. STOTLER, supervisor of bridges and buildings, Northern Pacific Ry., has been appointed division engineer of the line west of Ellensburg, Wash., vice B. L. CROSBY, who has been granted an indefinite leave of absence on account of illness. Mr. Stotler's headquarters will be at Tacoma, Washington.

L. L. ADAMS, formerly assistant engineer, Louisville & Nashville R.R., has been commissioned first lieutenant in the Engineer Officers' Reserve Corps, being succeeded by G. C. WENDING. W. E. BAKER has been appointed assistant engineer, with headquarters at Jackson, Ky. succeeding F. M. CATES, resigned. G. R. SMILEY has been appointed assistant engineer, with headquarters at Louisville, Ky., succeeding L. L. MORTON, who has received a commission as captain in the Engineer Officers' Reserve Corps.

ROBERT H. BROWN has resigned as lecturer in sanitary engineering at Columbia University, to accept a commission as captain in the Sanitary Corps, United States National Army.

J. F. MANGOLD, for the past five years assistant professor of engineering at Grinnell College, and city engineer of Grinnell, Iowa, has been appointed professor of civil engineering in the South Dakota State School of Mines, Rapid City, South Dakota.

R. Z. KIRKPATRICK, formerly draftsman and checker on power plants and fuel-oil systems, Bureau of Yards and Docks, Navy Department, Washington, D. C., has been made chief hydrographer, Panama Canal, with headquarters at Balboa Heights.

C. W. E. CLARKE, of Stone & Webster, Boston, has been detailed to France on Government work in connection with the prosecution of the war.

ALEXANDER M. PARKER, who has been connected with the Pennsylvania R.R. in various engineering positions since 1888, has been appointed superintendent of the Camden Terminal Division of the West Jersey & Seashore R.R., with headquarters at Camden, New Jersey.

ANDREW J. WHITNEY has been appointed general superintendent of the northern division of the Pennsylvania R.R., with headquarters at Buffalo, New York.

CAPT. W. J. COWELL, Engineer Officers' Reserve Corps, for the past seven years assistant city engineer of Dallas, Tex., has been ordered to active duty at the Engineer Officers' Training School, Fort Leavenworth, Kansas.

W. K. ADAMS was graduated from the Engineer Officers' Training Camp Aug. 15 and has been commissioned as captain in the Engineer Officers' Reserve Corps. He has been assigned to duty with the 21st Railway Regiment at Rockford, Illinois.

MAX J. WELCH has returned from Peru, S. A., and has accepted the position of chief draftsman during the construction of the Traylor shipbuilding plant at Cornwells, Pennsylvania.

N. S. MULLICAN, city manager of the City of Thomasville, N. C., has resigned the position to accept that of chief highway engineer of Davidson County, North Carolina. Mr. Mullican has been retained by the City of Thomasville as consulting engineer.

H. E. HOLLISTER has resigned as chief engineer of the Kalbperry Corporation and of the Kalbfleisch Corporation to devote his time to the perfection of a new process for the conversion of nitercake into saltcake and sulphuric acid.

J. R. WATKINS has resigned as engineer-draftsman in the chief engineer's office of the Chesapeake & Ohio Ry. to accept a research fellowship in theoretical and applied mechanics at the University of Illinois.

S. J. STONE is at present in charge of the erection of a plant at Garden City, N. Y., for the Curtis Engineering Co. Mr. Stone is representative of the John W. Cowper Co., engineers and contractors, Buffalo, New York.

P. B. JEFFRIES, for the past seven years assistant engineer in the Vicksburg, Miss., office of the Alabama & Vicksburg and Vicksburg, Shreveport & Pacific Ry., has been promoted to the position of assistant engineer in the office of the assistant to the president of the above-named road, with headquarters in New Orleans.

SYDNEY D. KENDALL will leave shortly for France in connection with certain contracts for rebuilding those parts of France, Belgium and Russia which have been destroyed by the war.

CHARLES E. HEWETT, irrigation engineer, of North Yakima, Wash., has been engaged by the farmers' committee in charge of the irrigation project which contemplates the irrigation of Ford Prairie and Waunch's Prairie at Centralia, Washington.

N. G. JACOBSON, of the Portland, Ore., Forestry Service Office, has been appointed supervisor of the Des Chutes National Forest, to replace W. G. HASTINGS, who has taken charge of the Vermont State forests.

E. I. CORNELL, E. C. CORNELL, EDWARD SIMPSON and A. S. ALBERTSON, of Tacoma, Wash., have formed the Construction Company of Tacoma. They were associated in the construction of the cantonment buildings at Camp Lewis, American Lake.

MORELL & NICHOLS have been retained by the City Council of Great Falls, Mont., to make plans for the city development expected in the next 30 years.

L. R. WALKER, formerly designing engineer on concrete structures and assistant city engineer of Tucson, Ariz., has been transferred by the Trussed Concrete Steel Co. from its El Paso, Tex., office to its Youngstown, Ohio, office.

R. G. CARRAWAY has been commissioned first lieutenant in the Engineer Officers' Reserve Corps. He has been ordered to report for active service at Fort Leavenworth.

ELISHA LEE has been assigned to the duties previously administrated by W. W. ATTERBURY as vice president of the Pennsylvania Railroad Co. Mr. Atterbury's commission as brigadier general was predicted in our columns Oct. 18. Mr. Lee has been in the service of the Pennsylvania Railroad Co. since 1892, and was chairman of the Eastern Railroads' Conference Committee from 1912 to 1914, having in charge the negotiations with labor organizations. In May, 1916, in connection with the enlargement of the organization of the operating department of the lines east of Pittsburgh, Mr. Lee was promoted to the newly created office of assistant general manager, and on Apr. 1, 1917, he was made general manager.

OBITUARY

DR. E. F. ROEBER, editor of *Metallurgical and Chemical Engineering*, died at his residence in East Orange, N. J., Wednesday, Oct. 17, after an illness of several months. Dr. Roeber was widely known in the electrical-chemical industry of the United States, having been one of the founders of the Electro-Chemical Society in 1902, a member of its Board of Directors from 1902 to 1913, and president in 1913 and 1914. He also wielded a large influence in this field as editor and founder of *Electro-Chemical Industry* in 1902, and of its successor, *Metallurgical and Chemical Engineering*. Born in Torgau, Germany, Oct. 7, 1867, he was educated at the University of Jena, Halle, and Berlin, receiving the degree of Doctor of Philosophy from the latter institution in 1892. He came to the United States in 1894, and became associated with Dr. Carl Hering in Philadelphia in electrical engineering work.

BUSINESS NEWS

Industrial Census Planned for France After the War

Commercial Attache Veditz at Paris reports:

Among the important measures proposed by the French Government in the preparation for industrial reorganization after the war is an industrial census, which it is proposed to make obli-

gatory and very detailed and comprehensive.

The details of the project are likely to be worked out by the newly created economic committee of the Government recently established by decree, and comprising Paul Domeur, minister without portfolio, the minister of commerce, the minister of agriculture, the minister of colonies, the minister of transport, the minister of munitions, and the minister of provisionment. The minister of commerce will take part in the deliberations of this committee whenever they affect his department.

The purpose of the industrial census is to determine the nature and number of industrial machines, the extent and character of industrial equipment and available supplies of industrial materials. There has, however, been considerable opposition to the proposed census, coming chiefly from chambers of commerce and manufacturers' associations. Objection is particularly raised to the obligatory feature of the project, on the ground that article 55 of the new income-tax law specifically authorizes the tax officials to make use of information obtained by any branch of the public service under existing laws.

Motor Truck Contracts for Heavy War Service Placed

The following statement is authorized by the automotive products section of the Council of National Defense:

All contracts for the new heavy-duty war truck will have been placed by Nov. 1, according to present plans of the Quartermaster Department. Axles, motors, transmission and steering gears have already been ordered for the first 10,000 class B trucks and the remaining contracts will be placed shortly.

The trucks are being purchased by the Quartermaster Department, which works coöperatively with the war industries board of the Council of National Defense. The director of the military truck production section arranges with all of the makers of each part for a specified date when they shall visit him at headquarters to discuss the form of contract and secure specifications and necessary information. The section in turn hands over all available data to Brig. Gen. Chauncey B. Baker, of the Quartermaster Corps, who places the actual contracts following submission of bids by the makers.

Commends Parts Makers' Patriotism

"The parts makers," according to Gen. Baker, "have been willing to sell the Government at the same terms on a single order as they secure from large companies purchasing on long-time contracts, and if the patriotism of the industry is to be judged by the attitude of the parts makers in this particular situation it would be 100 per cent."

It is to be expected that the first delivery of trucks will take place in January and that the 10,000 will be completed by the latter part of June. Following the completion of the contract distributions the military truck production section will turn its efforts chiefly toward actual truck production.

A Year's Work by Turner Company

The Turner Construction Co., of New York City, has had prepared an artist's drawing, made to scale from photographs or blueprints, showing the reinforced-concrete industrial buildings erected by its forces during 1916. In all, 70 buildings valued at about $9,000,000 constituted the year's work. There were used 360,000 bbl. of cement, 25,000,000 lb. of reinforcing steel and 8,615,000 ft., board measure, of lumber for forms and falsework. The maximum number of men employed at any one time was 4190 and on one building 450.

The speed record was made on building 27, for the Belleville Warehouse Corporation, of New Bedford, Mass. This structure in two sections each 500 x 100 ft. in place, and eight stories high, was completed in 80 working days.



PHOTOGRAPH OF ARTIST'S DRAWING SHOWING THE SEVENTY REINFORCED-CONCRETE INDUSTRIAL BUILDINGS ERECTED BY THE TURNER CONSTRUCTION CO. LAST YEAR

Notes from

MAKERS OF PLANT AND EQUIPMENT

General Iron Works Co. is the new name which has been substituted for the Potthoff Construction Co. The change of name does not indicate any change in the active management of the business.

Davis-Bournonville Co., with general offices and factory at Jersey City, has taken over the plant and factory of the Davis Acetylene Co. at Elkhart, Ind. The Davis company has been dissolved and the manufacture of acetylene lighting generators and accessories discontinued. The plant will hereafter be operated under management from Jersey City for the manufacture of acetylene pressure generators for the oxy-acetylene process, and for special products. The Canadian factory at Niagara Falls, Ontario, which has been jointly occupied by the two companies, has also been taken over, and will be operated exclusively for the manufacture of oxy-acetylene apparatus for the Canadian trade. The Davis-Bournonville Co. has also purchased the H. G. Kotten Co. factory and grounds opposite its Jersey City property. The Kotten factory will be used for manufacturing electrolytic oxygen apparatus and accessories, releasing considerable space in the company's new factory building for increased output of oxy-acetylene welding and cutting apparatus.

E. P. Reichhelm & Co., Inc., dealers in metal workers' supplies, has purchased the six-story structure at 26 John St., New York City. A feature of the transaction was that a large part of the payment was made in Liberty Bonds. The American Gas Furnace Co. and the American Swiss File and Tool Co., for which the Reichhelm company is the selling agent, are located in this building.

Roberts Filter Manufacturing Co., of Darby, Penn., has been awarded the contract for the erection of a filter plant at Hog Island for the American International Shipbuilding Corporation in connection with the new shipyards where a large portion of the mercantile marine fleet will be built. This yard is one that has been authorized recently by the United States Shipping Board. The company also has completed a 2,000,000-gal. filter plant at Camp Meade, Admiral, Md., and is building an 8,000,000-gal. plant for the Newport News Water and Light Co., at Newport News, Virginia.

Walter A. Zelnicker Supply Co. has recently secured the services of W. H.

Bramman, who is acting as assistant to the president. Mr. Bramman was formerly with the American Carbon & Battery Co.

Ransome Concrete Machinery Co. held its annual meeting at the plant in Dunellen, N. J., and at the Queen City Hotel, Plainfield, N. J., Oct. 12 to 14.

Roughen Adjustable Paving Gauge Co., Fond du Lac, Wis., announces that the J. M. Kelly Contracting Co., of Camden, N. J., is averaging 580 sq.yd. of 7-in. reinforced-concrete road with 18 men working 7½ hours daily.

Nye Odorless Crematory Co., of Macon, Ga., has constructed garbage incinerator plants at the following army cantonments: Ayer, Mass., where a plant with a capactity of handling 15 tons of material daily has been built; Wrightstown, N. J., 15 tons; Louisville, Ky., 15 tons; Admiral, Md., 15 tons; Yaphank, N. Y., 25 tons; Petersburg, Va., 25 tons; Columbia, S. C., 25 tons; Atlanta, Ga., 25 tons; San Antonio, Tex., 50 tons. These incinerators, according to A. B. Felton, Jr., president of the Nye company, are to be used for burning material that has no salable value. Other waste matter, from which byproducts may be recovered, is being utilized as outlined in *Engineering News-Record*, Oct. 18, p. 731.

APPLIANCES AND MATERIALS

Sheaves in New Grab Buckets Easy To Change

A new grab-bucket of the type closed by a vertical set of falls and from which the sheaves and entire lower block may be removed without taking out the main shaft, is being put on the market by the Advance Engineering Co., Cleveland, Ohio. The bucket, known as the "Aden," is closed with eight parts of line and handled on a trip line of two parts. The upper part of the bucket, connecting the arms and supporting the lifting sheave and the upper closing block, is in three sections to make repairs easy and inexpensive.



REMOVED TO SHOW ARMS TO DIGGING POWER OF NEW BUCKET

The guide-block for the closing line may be set on either side of the upper block between any pair of plates in this block. This makes it possible to adjust the bucket, after a boom has become warped, so that the lines will still run true, or to adjust the bucket for a boom with sheaves in tandem.

When open as far as the construction of the bucket will permit, the lips must bite in several inches before the counterweight of the lower block can touch the ground. This feature is claimed to be an improvement over previous designs, in that the closing motion begins as soon as a strain is taken, instead of having to wait until the counterweight is lifted from the ground before any appreciable digging effect is produced. The lower closing block, instead of being secured to the main shaft of the bucket, which may readily become slightly bent and difficult to remove, is held by a transverse pin through the counterweight. The bolts at the sides of the lower block plates are but slightly above the center pin, so that the bucket has to be set on a very steep slope before the lines can cut the bushings on these bolts. The design makes use of 12-in. sheaves, insuring long life for the closing line.

The photograph shows a load of dry clay containing gravel dug from a sewer trench in Cleveland, where five men, who had been employed to loosen the material with picks, were found unnecessary after the "Aden" bucket was installed. Light and heavy buckets in the ½ and ¾-yd. sizes for handling dry materials and for difficult digging are made, while heavy 1-yd. and 1¼-yd. buckets are also manufactured, following the same design.

Clear Plugged Hole of Hollow Drill Steel

Even though it is realized that plugged steels wholly or in part prevent proper functioning of the drill, considerable carelessness is met with in the matter of keeping the hole in the drill steel properly open. As a result, drilling speed is retarded, water tubes are bent or broken and time is lost tinkering or, as often happens, the drilling gang is idle while someone makes a trip to the shop after another drill steel or water tube.

To relieve this condition a compact and simply constructed machine has been put on the market by the Ingersoll-Rand Co., known as the Leyner Shank and Bit Punch, which is used as an auxiliary of the Leyner sharpener. The drill steel is clamped by two jaws brought together by the movement of a pinion, and when in this position a specially heat-treated steel punching pin, which is attached to the piston of the punch-operating cylinder, is forced by pressure into the clogged hole. On the extreme reverse stroke air is exhausted against the heated pin, effectually cooling it. The maximum stroke of the punch is 6 in., and an adjustable stop for the drill steel is provided which regulates the distance which the pin will penetrate. The standard punching pin is ⅞ in. in diameter for a distance of 2 in. from the end, and ⅜ in. for the remainder.

The operation is controlled by a single lever, a downward movement of which clamps the steel and a further side movement operates the punch. The operation is interlocking in a way which prevents the advancement of the punch until the steel is locked, and in like manner the punching device must be in neutral position before the clamp jaws can be opened.



CLAMPING AND PUNCHING OPERATIONS ARE INTERLOCKED

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Strikes Discouraged by Executive Order

POSSIBLY the first instance in which the Government has lent its support to a plan whereby labor will be penalized financially for striking in violation of its agreement with employers is that involved in the raising of the price of soft coal announced by the fuel commissioner week before last. The increase was made in order that the wages of miners in the bituminous field might be increased, but it is specifically provided that the increase in prices shall not apply unless in the given district the miners and operators shall have made a contract providing for the collection automatically of fines for quitting work in violation of the agreement. The object in setting the fines is to secure full operation of the mines. While there are certain interesting labor phases connected with the matter, these are of little interest here. The main point is that the Government by executive order has resorted for the first time to the coercion of labor by supporting a money penalty. It is but another evidence of the extent to which previous policies are being upset by war emergency. Even labor, recently most carefully nursed by the Government, must feel the strong executive arm when the nation's life is in peril.

Full Information for Bidders

IN HIS letter on page 895 of this issue, Mr. Adams argues soundly when he makes a plea for contract advertisements which give full information to intending bidders. Executives with work to let will do well to follow the suggestion made. In advertising for bids on proposed contracts these officials often fail to put themselves in the position of the man who depends upon a brief printed statement in making the decision as to whether or not the work is suitable or profitable for him to undertake. The point is that the municipality, state or other public or private organization with work to be done must adopt, in a measure, the methods of a salesman. It must "sell" its contract. This result can never be achieved while there remains doubt as to the size or general character of the job, for no contractor, unless he is starved for work, will take the trouble to investigate construction proposals unless it is made reasonably clear to him just what he is expected to do, how much of an organization and what quantity of plant will be required to put the job through and return a profit to him. The preparation of advertisements for contracts should not be placed in the hands of some clerk with no appreciation of the engineering and construction features involved. These advertisements should be carefully written by an engineer who should ask himself the question, "What information would I require before deciding to put in a bid on this job?" The writer of the advertisement should then proceed to answer this question in the writing of his proposal. The object of advertising such proposals is to induce as large a number of contractors as possible to bid upon the work. The advertisement which gives a contractor the information he really wants will bring inquiries from the right kind of men and will be a big factor in getting rock-bottom prices.

Board Reports on British Road Conditions

IN THE report of the British Road Board for the year ending Mar. 31, 1917, reprinted on page 873 of this issue, American engineers will find data upon which to base an interpretation of what three years of war has meant to British highways. The usual funds for new construction and for maintenance have been greatly curtailed, while the necessary amount of labor has not been available for new work or repairs. These two factors, lack of funds and lack of men, are combined with another—great increase of heavy motor traffic connected directly or indirectly with military operations. This combination of influences, it can readily be appreciated, has been a trying one for the British roads. Practically no new construction or much-needed reconstruction has been undertaken, and maintenance has been very largely reduced. In the light of these conditions it is significant to learn from the Road Board that "experience has shown that it is less costly to highway authorities, in the long run, to construct roads of a suitable type for the traffic rather than to continue the use of methods and materials which have become antiquated." Of course, one outcome of the English conditions is that huge volumes of deferred maintenance and construction work are piling up day by day. This means a vast road-building program after the war, if the necessary money for financing the work can be secured.

An Opportunity for Road-Building Leadership

THE disbanding of the American Highway Association, noted in the news section last week, and in the historical sketch by Mr. Goodell on page 870 of this issue, presents to the American Road-Builders' Association an opportunity for uncontested leadership of national scope. The existence of two national associations in the highway field in the past resulted in a nerv-

or less divided allegiance of United States road-builders. With their two annual conventions, two road-building exhibits, and a certain amount of natural jealousy thus engendered, the full force of united effort was not realized. Today the situation is altered. There is but one national road-building association. Its field for constructive effort, for leadership in work which is, day by day, assuming tremendously increased importance, is practically unlimited. The affairs of the organization must be directed by strong men, by men of broad vision, by men who have no ax of their own to grind in the handling of the association's affairs. Only with such men occupying each of the administrative posts in the American Road-Builders' Association can real progress be made. The association, last week, made an auspicious start by electing to its presidency H. E. Breed, first deputy commissioner of the New York State Highway Commission. But the work to be done is not a one-man job. It will require the best thought of the best men in the field of highway engineering and road construction. Times are changing. Conditions under which road-building is carried on have given birth to new and perplexing problems. Unstable and rising markets in labor and materials have saddled enormous loads upon highway contractors. Federal participation in state-road construction on a large scale is in effect, with a consequent expansion of the responsibilities of all those engaged in this work. And now, with all of these weighty matters on hand, comes the embargo of the Priority Board on open cars for the transportation of "materials and supplies, other than coal, for the construction, maintenance, or repair of public or private highways, roadways, streets, or sidewalks." Surely never in the history of American road-building did conditions call more clearly for prompt, united effort and sound constructive thought. Upon the American Road-Builders' Association now devolves a serious duty and a great opportunity.

Advice to Turbine Purchasers

HYDRAULIC-POWER promoters have made some serious mistakes as the result of their inadequate knowledge of the heart of their project—the turbine. Common practice in selecting turbines for a given place neglects expert advice until a mistake is evident. "Expert" here does not apply to the advice of an engineer capable merely of making an analysis of Holyoke model-test data; he must have an understanding also of the actual processes of runner design, and knowledge of what data he must secure from the builder to scrutinize the parts.

The strength of a turbine builder's sales department often goes farther to establish him in a locality than the ability of its designer. Flume tests are made much of; but such tests, unless made of the particular runner offered, will not protect the promoter unless he can fully consider the effect of changed conditions between test setting and actual setting.

Three coördinate lines of search are required to meet the engineer's needs: One is the study of Holyoke tests on homologous model runners; another requires check computation of the principal dimensions fixed by hydraulic theory; and the third is a scrutiny of the little-appreciated but very important art of getting smooth eddyless flow along fair curved surfaces inside the turbine runner. How this last scrutiny can be made may be inferred from the steps in runner layout so interestingly set out in elementary form by an experienced turbine designer on page 845 of last week's issue.

But such an article—even plus the after studies some engineers will be led to pursue—cannot qualify everyone to pass judgment on an important turbine design. It will be advisable to employ someone as a consulting expert—just as one would for other highly specialized and complex apparatus.

Shall Engineering Courses Be Made Shorter?

AS AN OFFSET to the attractiveness of industry under present conditions, Princeton University's civil engineering course has been shortened from four to three years, students taking the three-year course covering about 93% of the actual number of credit-hours of the regular four-year course. The number of hours of work a week will remain about the same, but the candidates for a degree in the shorter course will be required to put in two summer terms of nine weeks each at the close of their freshman and sophomore years, this extra time being occupied in much the same way as similar hours during the regular terms except that a larger proportion will be spent in field work and drawing.

While the announced intention is to discontinue this abridged course at the close of the war, the possibilities of time-saving opened up by this experiment may throw a new light on the whole question of the requirements of technical education. In contra-distinction to this shortened course, some of the coöperative courses and engineering courses in schools requiring a year or more of work toward an A. B. degree call for more than the standard four years' work preliminary to even a B. S. degree. The quality of graduates turned out by schools following one or another of these schemes is something that is not easily determined—in fact it may be said that the question is actually indeterminate, for as yet we have no method of standardizing men and no way of measuring with any degree of precision the efficiency of a definite type of training or even the efficiency of personal effort.

But this fact remains: Study, as such, is not a process that can be carried on continually. Education is not work in the sense that the word "work" is used in the business world. There is no day-to-day repetition of the same task modified only by different circumstances, but there is a perpetual absorption of new and always more complex ideas which, to be of use, must be articulated with what has been learned before. This requires more frequent and longer periods of leisure, and makes "cramming" not only of very little actual permanent value, but usually a detriment when the final results are measured.

The experiment will be watched with extreme interest. No doubt there are many who would be better served by a course of three years even though it did not lead to a degree, for there are branches of engineering and industrial applications of engineering where the full training of an engineer is not demanded. It is possible to conceive that the ultimate form of

technical training, considered nationally, may call more rationally for courses ranging from two to as many as six years, rather than a standardized course of four years leading to a uniform degree, and it is under just such critical conditions as are forced by war that these experiments will be undertaken and the advantages or limitations of technical educational systems developed.

On Germany's Footing

GERMANY today is the best example of a whole nation at war. England and France's military machines may be equal to or greater than Germany's. The people at large, however, have not been asked to make the sacrifices that are the lot of those of the chief Teutonic nation. There every thought is of war. Every energy is bent toward its winning.

Today we are still far from the conflict. Our boys are in touch with the enemy, but there has been no serious engagement. The war imposts have only now gone into effect, and the big taxes will not be collected until the spring. Food is high, but there is no serious shortage. The Liberty Bond, food conservation and Red Cross campaigns more nearly indicate the seriousness of the conflict than any other war incidents. The congressional appropriations so baffle the imagination as to make but little impression. Moreover, the individual fails to translate them into terms indicating his personal liability.

We have so long been a peaceful nation that it is difficult for us to change our lives quickly to conform with military needs. The making of the change is an educational process, in which the engineer and the contractor, as centers of influence, can play a very important part.

With the utmost expedition we must get on a war footing similar to Germany's. We need not endure the same food privation, but war must be uppermost in our thoughts, so that we may voluntarily deny ourselves so far as needed, or submit in a thoroughly coöperative way to imposed food restrictions. What applies to food, applies also to fuel, taxes and other war regulations or measures.

We advocate quick change to Germany's base, not because of any doubt about the ultimate result of the conflict. *We will win*—that is certain. But every day we shorten the conflict will bring back to us unhurt those clear-eyed, virile young men whose faces are turned toward France or who are already there. If we could save one of these lads, nothing would stop us. Yet, we can save not one but many by shortening the war.

In our organizations we can see to it that our men realize the necessity for food saving, for stopping all unnecessary purchases (for they take labor from war industries), for investment in Liberty Bonds. Our associations and clubs have no right to proceed with ordinary business until they have secured the pledges of their members to every measure of conservation and national aid.

So shall we, enginers and contractors, be doing our part in bringing home to the people of the land the need for getting on Germany's footing. The reward for our support will be lives—precious lives, lives of brave young Americans, possibly of our own sons or brothers.

A Highway War Board and Priority Order No. 2

PRIORITY Order No. 2 leaped into extraordinary notoriety in the last week. It came unexpectedly. Road officials and road builders had been looking on their work as a real war emergency. All the more violent was the shock, therefore, when at five days' notice that work was forced to a standstill.

Drastic as the order may seem, we must accept it as part of the penalty of the world war. While full information as to the character of the investigation made before the promulgation of the order is not forthcoming, it is stated in general terms that the whole subject had most earnest consideration, the claims of various lines of work being carefully weighed.

Two thoughts stand out very clearly in a consideration of the situation: (1) That there is hope for the amendment of the order by the introduction of some measure of flexibility; and (2) that we need at once a highway war board, which will consider from the war angle in all aspects highway transportation and its allied problems of highway construction and maintenance.

We base the statement that there is hope for the introduction of some degree of flexibility into the order only on general grounds. We have no authority or even "unofficial" suggestion that such modification is in contemplation. On the contrary we gather the rather plain implication that the board expects the order to stand for the winter, though it is intimated that it will be rescinded early enough in the spring to allow highway work to proceed. Nevertheless, looking at other government war measures, and realizing the urgency of many highway situations, we feel that the board will before long see the necessity of allowing certain road projects to go forward. Secretary Redfield, in explaining the Trading with the Enemy Act to the Editorial Conference of the Associated Business Papers, said that the principle underlying it was the erection of a tight wall absolutely prohibiting commercial intercourse with the enemy, but that in this wall were many gates, which might be opened as conditions dictated. So, too, we conceive Priority Order No. 2. It stops all road-materials transportation in open cars. Will there not soon be gates in the order for needed shipments.

The other outstanding thought is that we need at once a highway war board, along the lines advocated in the *Engineering News-Record* of Sept. 27. We do not need here to repeat the arguments for it or to point out its scope. The seriousness of the railroad situation is generally appreciated. We must know all our resources and have them in usable shape to meet emergencies. Therefore, we must know how the highways can relieve railroad congestion, and have them ready to render service when the crisis comes. We are reliably informed that the Council of National Defense is considering the appointment of such a board. Its favorable decision can come none too soon. Winter is approaching and with it an avalanche of traffic such as our carriers have never experienced.

Moreover, such a board, ably constituted and vigorous in management, would place before the Priority Board and other branches of the Council of National Defense a true picture of the place of the highway in the war scheme. No other agency or plan can do it.



TUG AT RIGHT TOWING BARGE LOAD OF REINFORCED-CONCRETE PIPE OUT OF MOUTH OF ROCKY RIVER TO SITE OF OUTFALL SEWER, JUST AROUND THE STRIP OF LAND WHERE DREDGE IS DIGGING TRENCH

Flexible-Joint Precast Concrete Pipe Laid Below Water in Lake Erie

At Lakewood, Ohio, Flexible Joints Are Iron Castings and Sections Comprise Five Concrete Pipes—At Cleveland Single Pipe with Concrete Ball-and-Socket Ends Were Substituted

AT BOTH Lakewood, Ohio, and Cleveland there are now being laid outfall sewers, extending into Lake Erie, in which a new design of flexible joint has been applied to precast reinforced-concrete pipe. In both places the pipe are cast on shore, floated out on barges and sunk in previously made trenches. There they are set in place by a diver in sections so jointed as to permit movement due to foundation settlement.

The trench bottoms are situated in ground sufficiently solid to permit putting in the outfall pipe without the interposition of piles, but the irregular bottom made some flexibility of joint indispensable. For the earlier of the two jobs, that at Lakewood, alternative steel and concrete pipe-line designs were made; but the prohibitive cost of metal led the engineers to accept the bid on the concrete pipe, the novel details of which were worked out for this job by the Lock Joint Pipe Co. of Ampere, N. J. The Cleveland sewer was designed after the success of that at Lakewood was assured, and a concrete pipe line of somewhat similar but improved type, devised by the same company, was accepted without competition by steel or cast-iron pipe, the cost of which was then almost prohibitive. In this later design, however, even the metal spigots and bells of the Lakewood type were avoided, and the joint was made in concrete cast to the proper shape.

The first of the two lines is an outfall from the sewage disposal plant of Lakewood, a suburb of Cleveland. This line is 1500 ft. long, connecting just inside the shore line with a 36-in. reinforced-concrete sewer some 10 ft. below ground, and running in trench cut in the shale bottom of the lake to a maximum water depth of



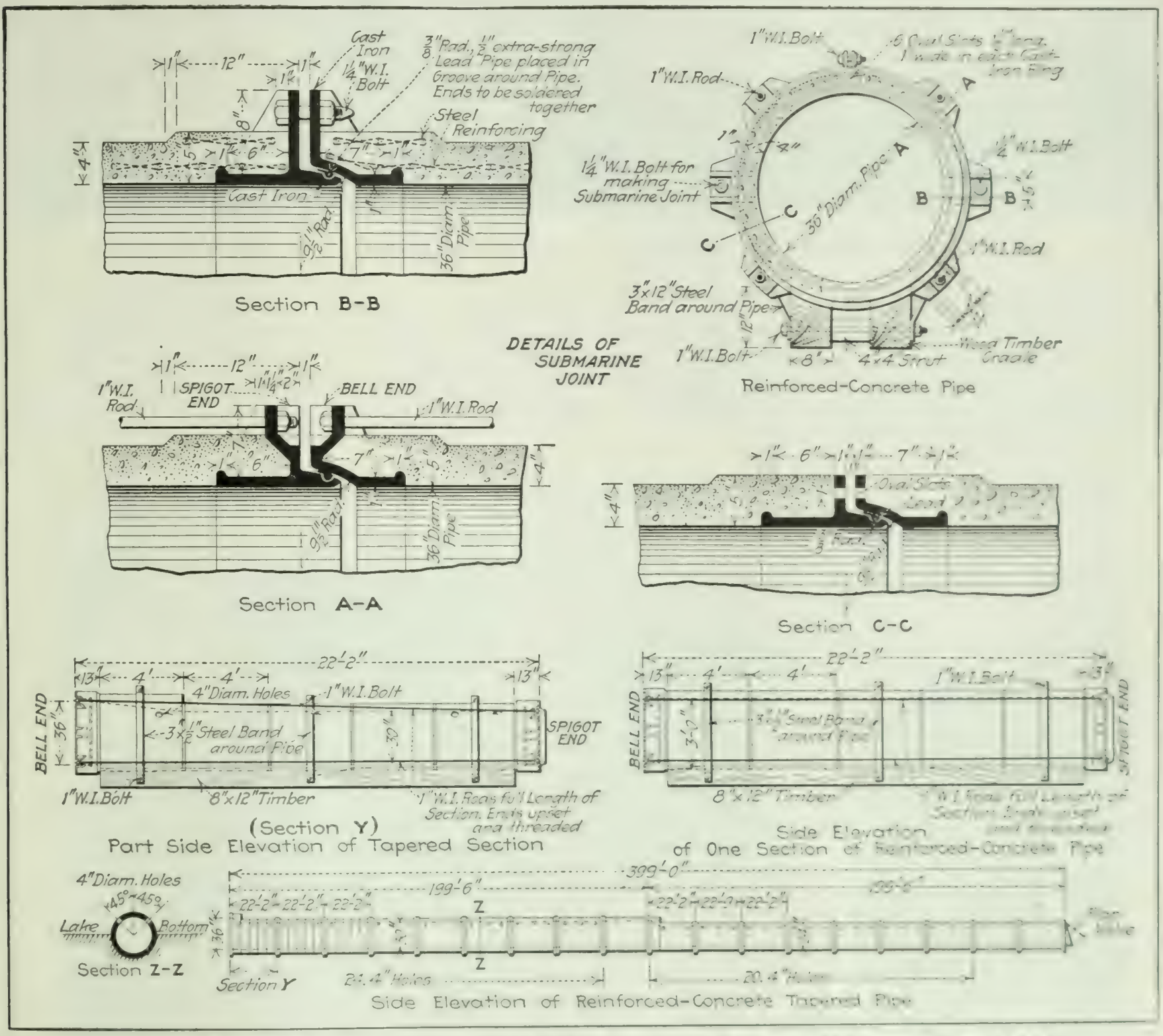
BELL END OF ONE OF THE COMPLETE LAKEWOOD SECTIONS



SPIGOT END SECTION OF 36-INCH PIPE

about 20 ft. The first 1100 ft. of the pipe is 36 in. inside diameter, and the last 400 ft. decreases to 24 in. The end is provided with a flap valve, and the whole 400-ft. section has 4-in. perforated holes to disperse the effluent.

The pipe units are each 22 ft. 2 in. long, made up of three 4-ft. lengths of ordinary "Lock Joint" reinforced-concrete pipe, with the regular poured joint, and two end sections, one having a cast-iron bell and the other



FLEXIBLE-JOINT REINFORCED-CONCRETE PIPE DESIGNED FOR OUTFALL SEWER INTO LAKE ERIE AT LAKEWOOD

a cast-iron spigot. These castings are placed in the bottom of the form in making the pipe, and are tied in to the reinforcement of the shell. They also are provided with offsets reaching up into the concrete to insure a tight connection between the concrete and the casting. Each bell and spigot casting has four lugs, through which 1-in. rods tie together the five pipes into one unit. Each casting has also two diametrically opposed lugs through which short 1¼-in. bolts are passed after the pipe is lowered into the water to make a connection with the adjacent pipe. The bell and spigot castings have opposing spherical surfaces which come in contact with each other when the short tie bolts are drawn up and form the joint which permits movement of the pipe around the tie-bolt diameter in case of any settlement in the foundations. The joint is made tight further by a ½-in. lead pipe gasket which is sweated around the spigot casting in a groove provided for it.

The separate small pieces of pipe are all cast at a plant at the mouth of the Rocky River, just adjacent to the outfall site. The five separate pieces for each section are then assembled on a cradle of two 8-in. timbers which are strutted and tied together at the proper spacing, and which have upper faces adzed off to the curve of the pipe. The joints in the intermediate pipes are then poured and wrought-iron bands bolted through the timbers are tightened around the tops of the pipes to hold them fast to the cradle. The longitudinal tie-rods are then inserted and brought to bearing and the section is ready to be placed. Assembled pipe sections are shown in the accompanying views.

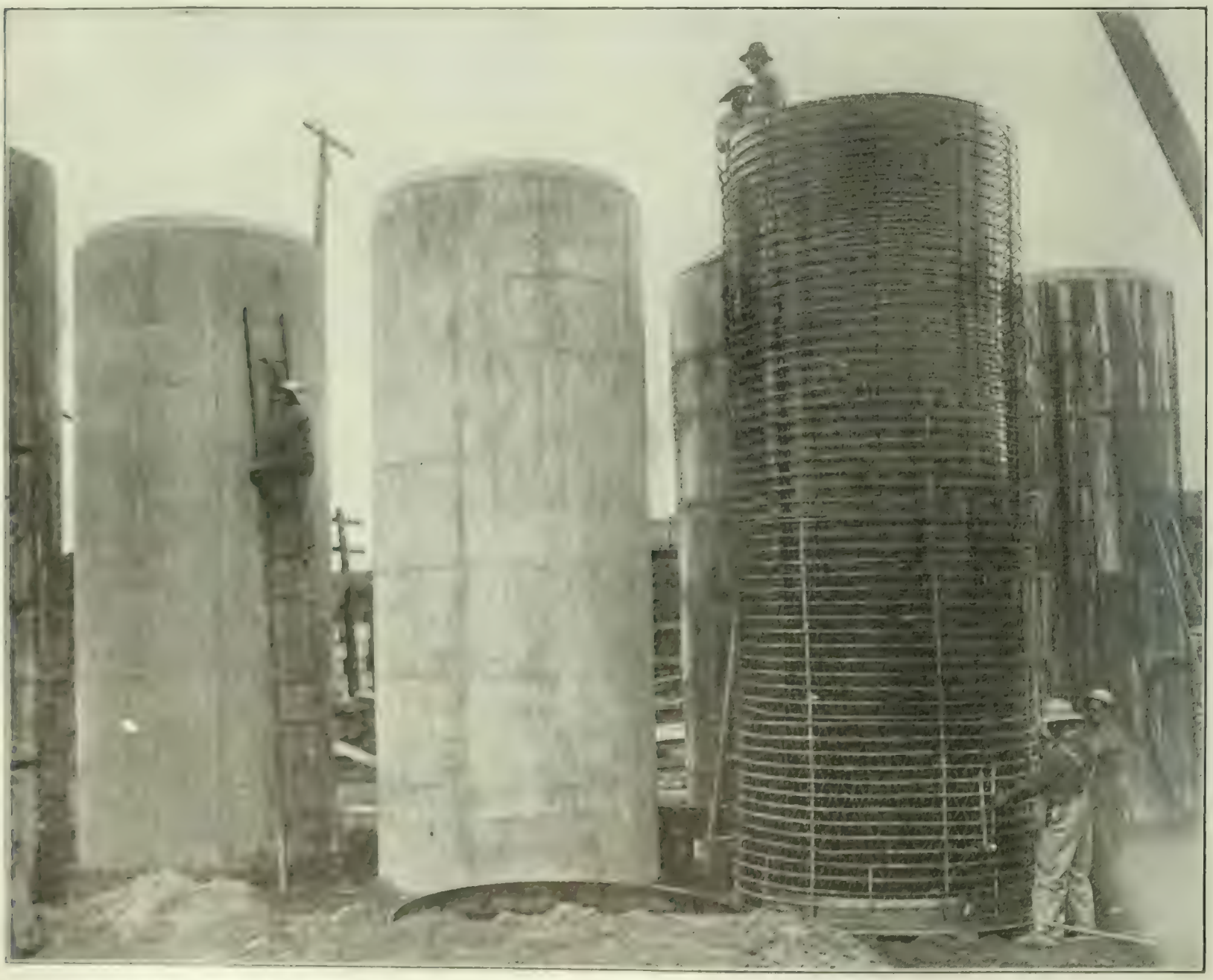
The 400-ft. tapered portion of the pipe is in two sections, the first 30 in. in diameter, and the last 24



REINFORCED-CONCRETE PIPE SECTIONS READY TO BE FLOATED OUT TO PLACE

in. in diameter. The step is made at the initial pipe of each section, and all the remaining pipes in that section are standard 30-in. or 24-in. pipe, as may be required. Except for this change, and for the 4-in. holes to let the sewage out, the details of the tapered section are the same as for the full section.

The work of setting the pipe was begun during the past summer and has progressed very favorably. As shown in the general view herewith, the pipes are kept on the strip of land between the mouth of the Rocky River and the lake. They are loaded on a derrick barge and towed to place at the outfall, where they are



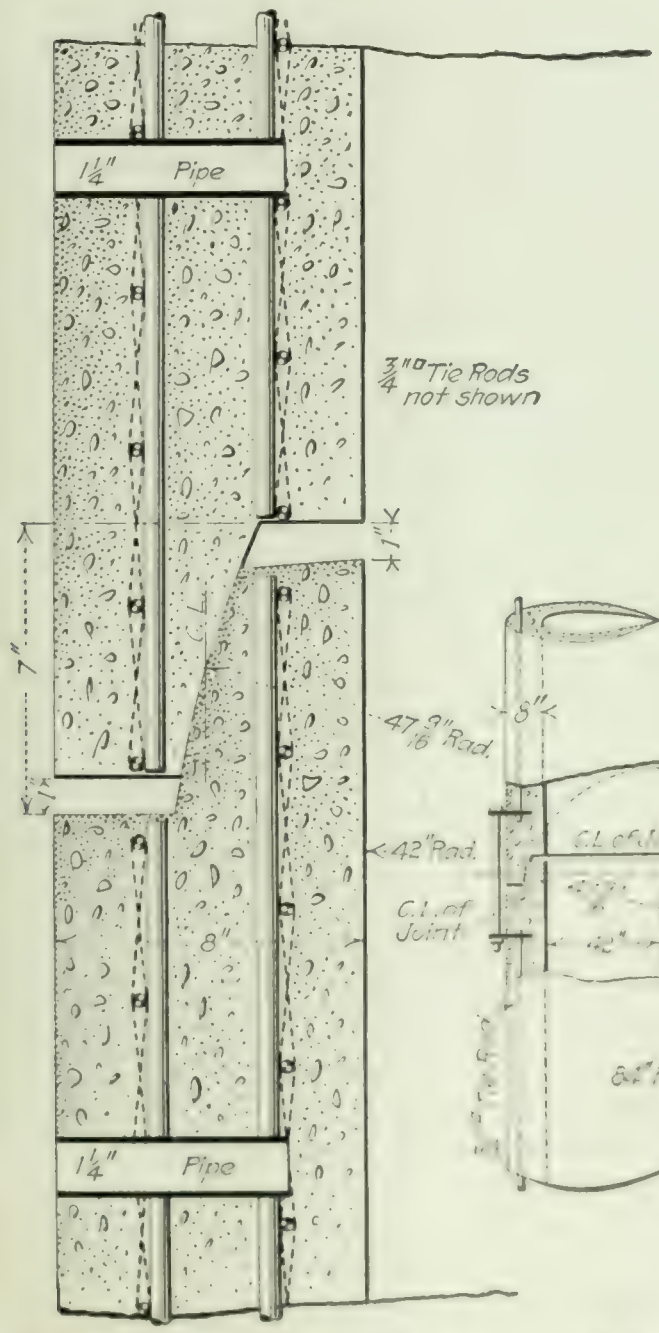
CONCRETE SIDE SEWER FEET IN DIAMETER AND TWENTY FEET LONG TO BE USED FOR SUBAQUEOUS SEWER IN CLEVELAND

lowered into place from the derrick, being suspended by a two-way line. A diver working below sets the bell and spigot together and brings the tie-bolts, which are in the horizontal axis of the pipe, to a tight bearing. Inspection of the pipe so set has shown that the lead pipes were squeezed practically tight by the action of the bolts. The 22-ft. lengths of concrete pipe are very rigid and show no appreciable deflection when being hung from the two-way line. The diver is able to set from four to six pipes a day, working in 15 to 20 ft. of water.

The Lakewood outfall work is under the direction of E. A. Fisher, city engineer, and R. Winthrop Pratt, consulting engineer. The work is being done by the American Construction Co., of Cleveland, and the pipes were designed and cast by the Lock Joint Pipe Co., of Ampere, New Jersey.

Cleveland Outlet Has Concrete Joints

The Cleveland outlet sewer is being built by the city at the foot of East 140th St. Here the pipes are very much larger than at Lakewood, being 84 in. in diameter. On account of this large diameter, it was felt that they could be cast safely for their full length in one operation, so the intermediate joints have been dispensed with. Each pipe is 20 ft. in length and is cast on end near the site.



CLEVELAND OUTFALL SEWER PIPE HAS CONCRETE BELL AND SPIGOT CAST TO HEMISPHERICAL CURVE

It was also found in the Cleveland work, which has just been begun, that the cost of castings was so high as to require some other device for the bell and spigot joints. The one shown in one of the drawings herewith was adopted. In this it will be seen that the hemispherical contact surfaces of the Lakewood joint are obtained but that they are of concrete. To make this joint it was necessary to have forms of cast-iron specially machined true to line and surface. These were placed in the bottom of the pipe forms and the concrete of the pipe shell poured upon them.

The tie between adjacent pipes is also somewhat different in the Cleveland pipe. A 1¼-in. iron pipe is set in the shell of the concrete pipe to a depth of about 6 in., and about 8 in. from the end of the pipe. In these pipe threads are tapped and eye-bolts screwed in and through the eyes of these latter bolts 1¼-in. tie-bolts are passed. In order to take up the reaction of these tie-bolts, however, the vertical iron pipes carrying the eye-bolts are held together through the 20-ft. length of the pipe by one ¾-in. rod hooked around the pipe insert and imbedded in the shell of the concrete pipe. It is intended to put a heavy asphalt paint on the hemispherical faces of the joints, so when they are brought to bearing there will be a certain amount of the asphalt squeezed out to form a tight joint.

This pipe line is 3400 ft. long, 2400 ft. of which is to be 84 in. diameter and the last 1000 ft. to be tapered down in the same manner as is the Lakewood pipe, to a minimum of 48 in. The pipes are now being cast but none of them has been set.

The work is under the direction of Robert Hoffman, chief engineer of the City of Cleveland, the Lock-Joint Pipe Co. being the designers and makers of the pipe.

Draining Country Roads with Dynamite

The Missouri State Highway Department issued recently a bulletin pointing out the advantages under certain conditions of using dynamite to improve the drainage of wet places on country roads. The department protests against throwing rocks into soft mud holes, because the result of doing this is usually the production of a mud hole at each end of the place where the rock is dumped. If water is in a roadbed it must be drained away; dumping rock into the mud increases the area which is wet by the water in the soil.

The department points out that in many cases the water is retained by a bed of clay or hardpan resting on a stratum of gravel or other material through which the water can trickle away readily. All that it is necessary to do to draw away the water from the roadbed is to give it an opportunity of passing through the impervious layer into the gravel below. It is recommended therefore that holes be dug in the clay and a charge of dynamite placed in the bottom of each. By exploding this dynamite a well will be formed at each hole through which the water in the roadbed will be drained into the gravel. This work should be done carefully so that it is certain the dynamite will clear away a hole reaching down into the stratum through which the water will pass away. After the hole has been completed it should be filled with coarse stone or gravel or some similar material, so that the dirt will not seal it and destroy its usefulness in a few months.

The American Highway Association and the Mission It Fulfilled

Intelligent Interest in Road Improvement in United States Due Largely to Efforts of Body Disbanded Last Week

By John M. Goodell
Executive Assistant, American Highway Association, Washington, D. C.

THE RAPID development of an intelligent interest in road improvements in this country has been due in a considerable degree to the work of the American Highway Association, which was dissolved on Oct. 30 by its board of directors, the purposes for which it was founded having been attained. Few of those now interested in the wise administration of public funds for road betterments realize the very unsatisfactory conditions existing when this association was organized and the full measure of the services it has rendered to the country and the several states.

The manner in which the association came into existence affords a good idea of road-building conditions in 1900. The director of the United States Office of Public Roads, Logan Waller Page, and B. F. Yoakum, head of the Frisco Railway System, were returning together from a road convention in Oklahoma. It had been characteristic of many of the road meetings of that date, of no real constructive value. There were then a few persons who were making considerable sums by organizing so-called national road congresses and keeping the contributions received from cities where the meetings were held and from commercial interests for the use of space for exhibits. Some of these meetings were conducted properly, but others were notoriously bad. Messrs. Page and Yoakum, who realized that road improvements were in danger of falling into disrepute on account of the exploiting, by unscrupulous persons, of the public interested in such work decided that the conditions demanded an active national society with prominent men as its officers, which would of necessity be recognized as a real American highway association, and thus be able to assist all those local organizations which were striving to accomplish good work and bring to an end the activities of the undesirable promoters.

Organized in 1910

Accordingly, an invitation was issued by Mr. Page to many men interested in road improvements to meet in Washington on Nov. 23, 1910, to organize such a society. Among those present were the late W. W. Finley, president of the Southern Ry.; James S. Harlan, of the Interstate Commerce Commission; the late Alfred Noble, to whose memory as a great civil engineer a monument will shortly be erected in Washington; Hennen Jennings, the eminent mining engineer; the late Bryan Lathrop, whose public-spirited work for park improvements in Chicago gave him a deep interest in road affairs; Leonard Tufts, whose development of Pinehurst, N. C., had led him to appreciate the importance of good roads in backward sections; Joseph W. Jones, whose inventions in connection with phonographs and speedometers are widely used; and the late Lee McClung, then treasurer of the United States. At this meeting the American Highway Association was organized "to harmonize and correlate all efforts for the improvement of the public roads, to the end that adequate and efficient systems of road construction, administration and maintenance may be adopted in all of the states."

The association opened offices in Washington. It soon had the support of such prominent railway presidents as Louis W. Hill, of the Great Northern system, James McCrea of the Pennsylvania system, W. C. Brown of the New York Central system, and L. E. Johnson of the Norfolk & Western system. An early achievement was the organization of good roads trains, which were run through many of the Southern and Middle Western states with the coöperation of seven railway companies and the U. S. Office of Public Roads. These trains were provided with photographs, models and lecturers, and the dates of their arrival at the towns where stops were made were advertised in advance. The technical and economical features of road construction and maintenance were explained, and in many cases local good road associations were formed. The cooperation of railway companies in the work of the association has been a feature of its career. Fairfax Harrison, president of the Southern Ry., had been its president for several years prior to the dissolution, and L. E. Johnson, president of the Norfolk & Western Ry., was an active director for some years.

Good Roads Trains

The direct personal work with the people in many states which was carried on with the good roads trains was supplemented a little later by articles prepared for the newspapers. At the time of the dissolution of the association this work had developed so that a weekly bulletin of about 1700 words, relating to various features of road work, was being sent to newspapers and agricultural journals with a combined circulation of nearly 9,000,000 copies per issue. This service was given only to papers which requested it. The coöperation of the press with the association in this work has been very helpful in bringing home to a large number of persons, not easily reached otherwise, the value of good roads and the most satisfactory methods of obtaining them.

When the association was organized there was no satisfactory up-to-date compendium of information about the condition of roads throughout the country. The Good Roads Year Book was established to supply such information. The first volume appeared in 1912 and was received at once with marked favor. The 1917 volume was a book of 550 pages; the need of such a large annual volume no longer exists, for the U. S. Office of Public Roads has arranged to publish each year statistical information relating to roads such as formed a considerable part of the year book, and a publisher of technical books has undertaken to bring out as an independent book the portion of the year-book relating to the location, construction and maintenance of rural roads. An indication of the coöperation which road builders have given to the association is evidenced by the fact that over fifty highway engineers assisted in the compilation and revision of the technical information referred to.

An indirect work of the association which proved of decided value was the organization of an annual American Road Congress. Each congress was an independent undertaking, with its own officers and financial management. The purpose was to improve, by example, the character of the national road meetings which had been held previously and this object was accomplished. The first of these gatherings was held in Richmond, Va., in 1911, and the others in Atlantic City in 1912, Detroit in 1913 and Atlanta in 1914. In 1915 the association coöperated with the American Road Builders' Association in holding the Pan-American Road Congress in Oakland, Calif. The Atlantic City Congress was the first really successful national gathering of road builders and users in the country, and the impetus it gave to such conventions virtually made the old, irresponsible gatherings obsolete. There are other organizations which have lately demonstrated their ability to hold successful road congresses and there is, therefore, no longer any reason for the American Highway Association to continue such work.

From the outset, the association took an active part in assisting legislatures which were considering the enactment of road laws. Every year help of this sort was requested. After the passage of the Federal-aid road law in 1916, making it obligatory for a state to have a responsible highway department before it could obtain financial assistance from the national government for road improvements, the requests for such assistance became so urgent that a special report on state highway department legislation was prepared under the direction of R. Walton Moore, chairman of the association's committee on legislation. An edition of 6000 copies of this pamphlet was quickly exhausted, being distributed widely.

Highway Prize Established

With the organization of a highway department in each state, a great enlargement of the activities of the United States Office of Public Roads, and coöperative road building by the nation and the several states, the objects for which the association was founded had been virtually attained. The directors therefore decided that, rather than undertake new lines of work when the energies of every citizen are directed toward the successful prosecution of the war, the organization should be dissolved. The surplus funds have been invested in Liberty Bonds and will be employed in establishing the American Highway Association Prize, to be awarded annually by the Secretary of Agriculture for conspicuous service in the advancement of road improvement in the United States.

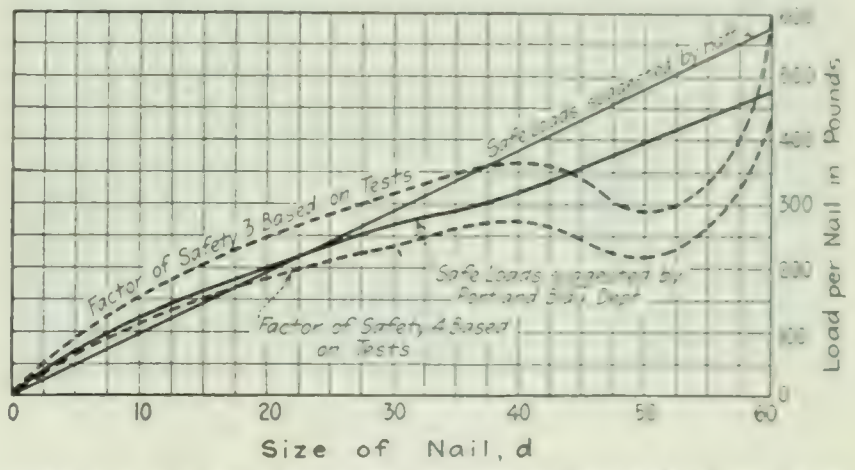
To Prevent Embankment Slips

Heavy rains last year caused considerable damage to the slopes of the north dike at the Ashokan reservoir, where the Catskill water-supply for New York City is collected. Top soil was shoveled down the slope into place to repair the damage and as a preventive measure against further slipping, 2-in. square stakes 3 ft. long were driven firmly in place, spaced 2 ft. apart in rows 5 ft. apart, parallel to the center line of the dike. One-inch boards were nailed to these stakes, the upper edge being left about 1½ in. below grade.

Tests on Nailed Joints in Fir and Hemlock Timbers

Building Bureau of Portland, Oregon, Establishes Safe Loads for Woods Commonly Used on Pacific Coast

THE FEW TESTS on the strength of nailed joints in timber which have been made public are all on varieties of timber generally found and used in the Eastern States. In order to check these figures with those for Western woods more generally used, the bureau of buildings of Portland, Ore., conducted recently a series of tests on nailed joints, using Douglas fir and western hemlock, the timbers most used on the Pacific Coast, and further inland of late, for building construction. Report has been made on these tests covering 110 joints, 87 of which were of Douglas fir and 23 of western hemlock, the tests all being designed to show the



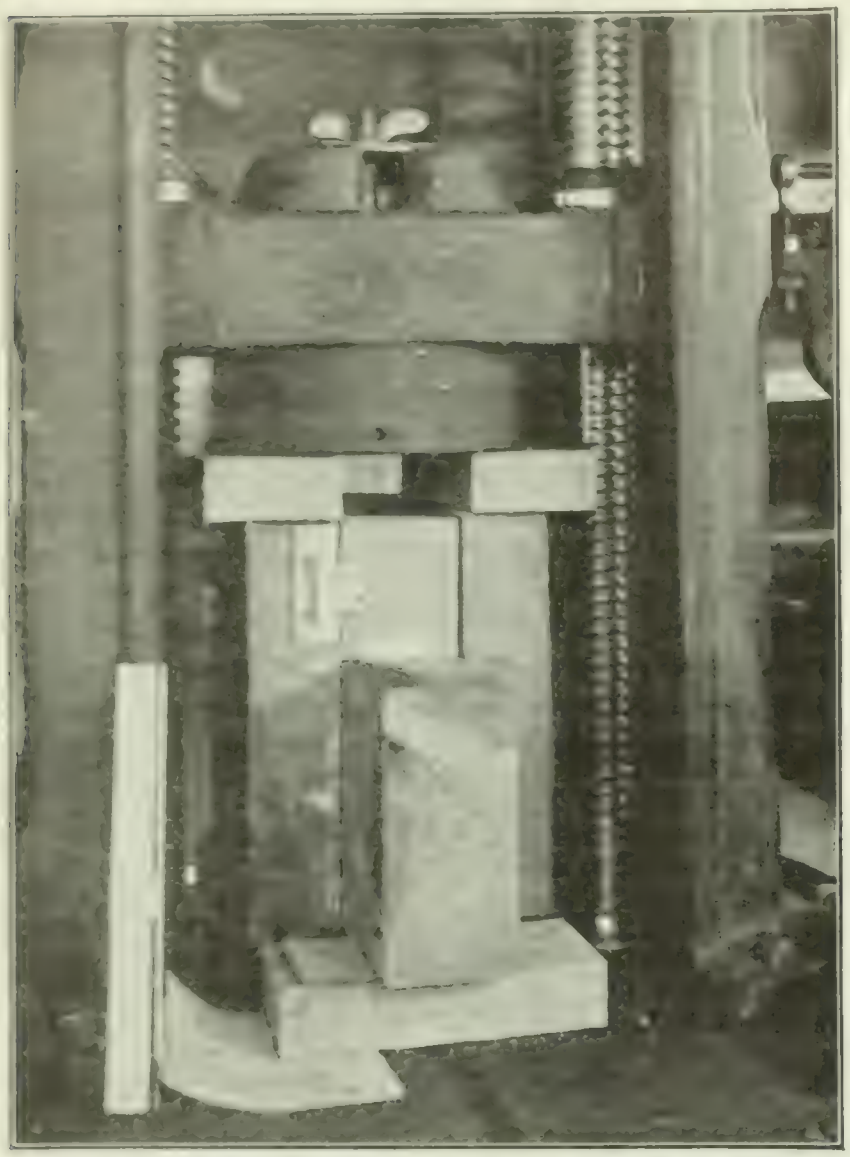
SAFE LOADS FOR NAILED JOINTS OF OREGON FIR AND WESTERN HEMLOCK

Nails driven perpendicular to grain. Load perpendicular to length of nail

strength of nailed joints with wire nails used in single shear.

The tests were divided into two series, depending on the style of the joint. In the first, two sidepieces, each with the grain of wood vertical, were nailed to a centerpiece with the grain of wood horizontal. In the second, two sidepieces, each with the grain of the wood vertical, were nailed to a centerpiece with the grain of the wood also vertical. In both series both Douglas fir and western hemlock were tested, but in the second series only Douglas fir was used. The sizes of the sidepieces varied from 1 x 6 in. to 3 x 8 in., and those of the centerpieces from 4 x 6 in. to 6 x 10 in., the dimensions indicating commercial sizes which vary from ⅛ in. to ¼ less than dimensions given. The nails were common wire nails ranging from 10d. to 60d. in size, and the number of nails used in each sidepiece varied from two to five. The sizes of the pieces were such that the nails had a penetration in the centerpiece of 30% to 80% of the length of the nail, but the nails were used in single shear, in no case passing through the centerpiece. All timbers were surfaced, so that contact in the joints was between planed surfaces only.

Tests were made, as shown in one of the accompanying views, by placing the blocks in a testing machine and forcing the sidepieces down and alongside of the centerpiece. Measurements were taken on the relative movement of the pieces by means of a scale screwed to the blocks, as shown in the view. An effort was



NAILED BLOCKS JUST BEFORE BEING TESTED IN MACHINE

made to measure the elastic limit of the joints, but this could not be determined so it was not recorded. The ultimate loads carried in the series were as follows:

RESULTS OF TESTS ON WOOD JOINTS TO DETERMINE HOLDING POWER OF NAILS

	No. of Tests	Size of Nail	Ultimate Load Carried per Nail, Lb per Sq In.
[illegible]	14	10d.	525
	9	16d.	600
	10	20d.	749
	10	30d.	922
	5	40d.	1,183
	1	60d.	1,800
[illegible]	5	10d.	407
	9	16d.	628
	12	20d.	751
	6	30d.	992
	4	40d.	1,023
	1	60d.	873
[illegible]	6	10d.	519
	4	16d.	588
	7	20d.	695
	4	30d.	979

This tabulation shows the irregularity and apparent unreliability of the single test made on the 50d. and 60d. nail joints.

On the basis of these tests the department established safe values for nails driven in perpendicularly to the grain in either Douglas fir or western hemlock, with the load perpendicular to the length of the nail, as follows:

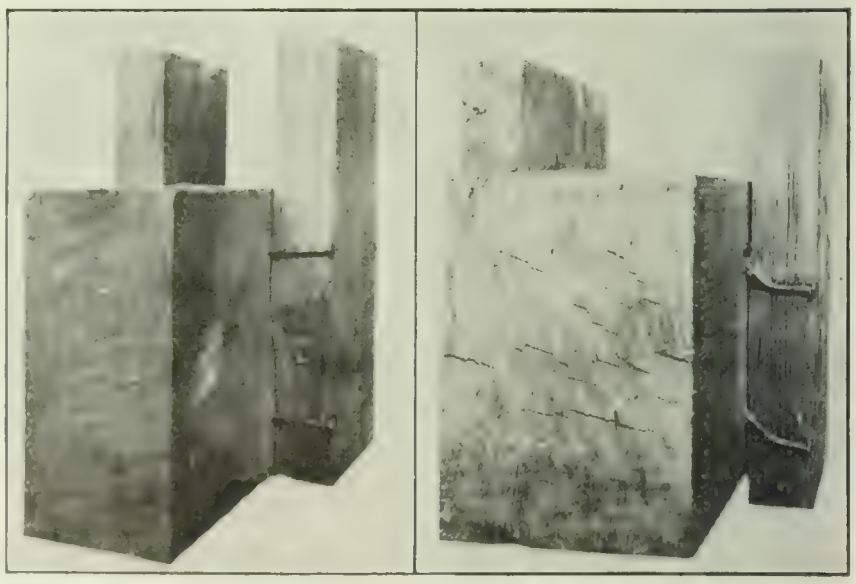
[illegible]	Load Value per Nail, Lb.
[illegible]	120
[illegible]	120
[illegible]	160
30	200
[illegible]	270
[illegible]	320
[illegible]	400
60	480

From the accompanying diagram of the loads based on two factors of safety and the suggested safe load, it will be seen that the suggested safe load is about according to the formula $W = 7d + 50$, where W is the safe working load, per nail in pounds and d is the penny designation of the nail. It is interesting to compare this value with the value suggested by previous experimenters of 9.6 d, the figure given by Prof. W. K. Hatt, of Purdue University, in a paper in the 1900 "Proceedings" of the Indiana Engineering Society.

For nails driven parallel with the grain of the wood the figures above should be reduced 25%. All of these values should be reduced if the penetration of the nail in the holding piece is less than 50% of its length.

Other conclusions in the report are that the resistance of nails driven perpendicularly in the timber with the grain of the wood parallel to the load is but little more than for nails driven similarly with the grain of the wood perpendicular to the load. It is also indicated that the standard nail heads are of proper proportions, there being no difficulty with the nail head pulling through the outside timber. The strength of the joint seems to be affected but little by the penetration of the nail in the centerpiece if that penetration is 40% or more of the length of the nail, but with less penetration the loads were reduced, and for a penetration of 30% the strength reduction amounted to about 25%. The examination showed that each nail in a joint seemed to support an equal proportion of the load.

Two principal factors involved in the strength of nail joints are the resistance of timber to crushing and the nail to bending. This is very graphically shown in the two views of the joint before and after tests. The investigator reports that the resistance of the nailed joint if depending solely on the resistance of the wood to crushing varies with the diameter of the nail, other



NAILED TIMBER JOINTS CUT TO SHOW POSITION OF NAIL BEFORE AND AFTER TEST

things being unchanged. On the other hand, the resistance of the joint if depending solely on the resistance of the nail to bending varies as the cube of the diameter of the nail. As the resistance of the joint depends on the combination of these two, various sized nails give varying degrees of resistance, but it is found that the variation of the resistance corresponds quite closely with the square of the diameter of the nail.

The data for the report were collected by Henry F. Blood, engineer of the bureau of buildings, Portland, Ore., and the report was put into final shape by H. D. Plummer, inspector of buildings of the city.

War's Influence on British Road Work Discussed in Report

Heavy Motor Traffic Has Damaged Highways—Maintenance Deferred—Much Reconstruction After the War

WAR CONDITIONS, as they have affected the construction and maintenance of roads in Great Britain during the year that ended Mar. 31, 1917, are discussed at length in the seventh annual report, just issued, of the British Road Board. Heavy motor traffic, connected directly or indirectly with military operations, has damaged many miles of highway, while maintenance work, urgently needed, has been deferred because of lack of funds and shortage of labor. The Road Board foresees a road reconstruction and repair program on a large scale after the war. Excerpts from its report, as published in *The Surveyor*, follows:

Since the outbreak of war great advantage has been derived from the improvements effected in important roads throughout the country with the assistance of grants and loans from the Road Improvement Fund. But the heavy motor traffic directly or indirectly connected with military movements and the transit of warlike stores has caused a great deal of damage to many miles of road, and, notwithstanding the expenditure of nearly £1,500,000, which represents the cost of special work on public roads paid for out of army funds and other government contributions, an extensive road mileage, used by the special traffic referred to has greatly deteriorated in condition.

Large Expenditures After War

No doubt is entertained by the board that a considerable amount of expenditure will have to be incurred on these roads after the war. Many other roads have also suffered damage by the substitution of motor traffic for horse-drawn traffic in connection with agricultural operations in some counties. Concurrently with these things, the expenditure of highway authorities on maintenance has been reduced, partly for financial reasons and partly owing to shortage of labor and materials. There will therefore be a considerable leeway to be made up after the war before roads can be restored to their pre-war condition.

Meanwhile, the policy of the board in regard to making grants and loans has been continued on the lines laid down by the treasury. During the current year the board is distributing, with treasury sanction, a sum of £200,000 out of the Road Improvement Fund, mainly in the form of assistance to expenditure on tar treatment of main county roads in Great Britain which are in a suitable condition for tar treatment, and in doing so they are endeavoring to secure that sections of road which were improved with the aid of Road Board grants prior to the war shall be preserved, as far as possible, in a condition which will prevent the benefit of improvements already made being lost.

Apart from the question of deferred maintenance expenditure and special damage caused to roads by heavy motor traffic in connection with the war the question of expenditure required in the near future for the improvement of roads has been considered by the board, and its views on this matter are set forth in a letter addressed to the secretary of the reconstruction committee.

In this communication the board states that the works of road construction and improvement which are required, and, if funds were forthcoming, might be available for execution after the war, may be divided into four classes:

(1) Works of (*a*) strengthening and resurfacing, and (*b*) drainage reconstruction, and resurfacing, which are of first importance, and should be proceeded with as soon as finance, labor, and materials can be provided.

(2) Works of road widening and new construction which have been approved, but the execution of which was postponed owing to the war, on financial considerations.

(3) Reconstruction of bridges on important roads which are unable to support heavy motor traffic, including bridges owned by railway and canal companies.

(4) Schemes for the construction of new roads and bridges, widenings in urban areas involving the purchase of buildings, and widenings and improvements of important country roads involving the purchase of property. These schemes represent desirable improvements, but their value in relation to their cost can be determined only by investigation and consideration of each scheme by the local authorities concerned in conjunction with the Road Board.

Reconstruction

The most urgent need at the present time, the board continues, is the reconstruction of important roads which are too weak to carry modern traffic. The urgency of this reconstruction is twofold—(1) To provide for the traffic of heavy motor vehicles which is expected to expand rapidly after the conclusion of the war, and if not provided for in advance will cause serious deterioration of roads and consequential damage and expenditure; and (2) experience has shown that it is less costly to highway authorities, in the long run, to construct roads of a type suitable for the traffic, rather than to continue the use of methods and materials which have become antiquated.

Conditions in England and Wales

The total mileage of roads in England and Wales is 152,000. It may be assumed that 10 per cent. of the total, or about 15,000 miles, stands in need, more or less urgent, of reconstruction or strengthening, as distinguished from resurfacing in the course of ordinary maintenance, in order to enable the roads to carry the growing motor traffic. The cost of reconstruction may be estimated at from £1000 to £4000 per mile, or at an average of £2000 per mile. The total cost of dealing with 15,000 miles may be estimated therefore at approximately £30,000,000 over and above the normal expenditure of the local authorities on current and deferred maintenance.

The annual expenditure of highway authorities in England and Wales on maintenance and improvements, including loan charges, is about £16,000,000. This sum is provided out of the local rates, with some assistance from the Exchequer Contribution Account. For prac-

tical purposes, £16,000,000 may be regarded as the maximum which highway authorities will spend on road services under existing conditions. There is no practical prospect of these authorities providing, without express statutory direction or considerable financial assistance from central funds, the capital sum which is necessary to reconstruct the more important roads of the country, even though the expenditure of that capital should be shown, not only to effect large savings in the wear and tear of vehicles, but also to arrest the increase in annual maintenance expenditure, which has been growing at a very serious rate, and which is certain, unless large capital expenditure is incurred, to continue to grow, if deterioration of roads is to be prevented.

Road Improvement Fund

Apart from the local rates and imperial subventions, the only public revenue available for road purposes is the Road Improvement Fund. The income of this fund, for the financial year ended Mar. 31, 1915, was £1,621,000. Of this sum, £898,000 was the proceeds of the motor spirit duties, £630,500 arose from carriage licenses and £92,500 from interest on investments. The revenue from the motor spirit duties and carriage licenses has since August, 1916, been diverted from the Road Improvement Fund to the exchequer. The proceeds of the motor spirit duties were the result of a tax of 1½d. per gal, on petrol used in commercial and public service vehicles. Since that date the duties and license charges on petrol used in private cars have been increased to 1s. per gal. and in commercial and public service vehicles to 3d. per gal. The proceeds of these increased duties are not known to the Road Board.

The restoration of the proceeds of the duties, either on the old or an enlarged scale, to the Road Improvement Fund would enable the Road Board to make some contribution to the £30,000,000 required, but such contribution would represent but a small proportion of the total.

Classification of Roads

In this connection it may be mentioned that shortly before the outbreak of war proposals were under consideration by the government for the classification of the roads and a revision of the exchequer grants to local authorities in respect of their expenditure on various semi-national services, including roads. The Road Board, at the request of the Local Government Board, had undertaken to classify the roads in England and Wales, as such classification was an essential preliminary not only to a sound scheme of State aid, but also to any general scheme of reconstruction. The classification was nearing completion on the outbreak of war, when the work was suspended. It will be practicable, however, to continue the work from the point at which it was broken off as soon as the board receives authority to proceed.

Although, as a class, all such works as new roads, widenings, etc., are of secondary importance, as compared with the reconstruction of the road crusts of important roads, there are some which are of considerable value, and should be carried out side by side with road crust improvements. Applications in respect of such works have been received by the board, and a number have been approved by them as suitable for assistance from the Road Improvement Fund and as works which may be carried out as soon as circumstances permit, the total estimated cost in England and Wales being £1,314,152. It must be understood, however, that this includes only such works as have been made the subject of an application to the board.

There are similar works which would be deserving of assistance as soon as the urgent works of reconstruction are completed or funds are available. The cost of works in this class which may have to be taken in hand at some time or other would probably not be less than £5,000,000.

Bridges

There are a very large number of bridges in all parts of the country which require reconstruction. The Middlesex highway authorities, for example, have made an application to the Road Board for grants toward the reconstruction or widening of twenty-two bridges, the cost of which is estimated by the councils at upward of £150,000. In every county there are a large number of bridges vested in highway authorities or owned by railway and canal companies which are scheduled as capable of carrying vehicles of only a limited tonnage, with the result that a very large mileage of roads—often important roads—are closed to traction-engine and heavy motor-car traffic, until such time as these bridges can be reconstructed.

A recent decision of the House of Lords will have the practical effect of throwing, in most cases, upon highway authorities the cost of the reconstruction of weak bridges carrying public roads over railways and canals. It may be roughly estimated that the expenditure necessary to reconstruct bridges on important roads so as to support the motor traffic legalized by Parliament will not be less than £7,000,000. This is a very conservative estimate.

Suggestions have been put forward from time to time for schemes for the construction of new roads and various improvements, but the consideration of which has not been entered upon in detail in the absence of any prospect of financing them while the more urgent work of road-crust improvement was in progress. These schemes may be grouped into the following classes:

(*a*) New approach roads to large towns.
(*b*) New bridges giving additional communication.
(*c*) New roads to connect county boroughs.
(*d*) New by-pass roads to avoid narrow villages.
(*e*) Improved communications and widenings in urban areas, involving high cost due to the purchase of buildings.
(*f*) Improvement and reconstruction of important through routes, involving the purchase of property and costly work.

These and similar schemes, the aggregate cost of which would amount to many millions, have not been examined or estimated in detail by the Road Board in conjunction with the local authorities, nor has the relative public value and cost been appraised, a work which would involve a large expenditure of time and money, for the reasons already mentioned. It may be assumed that, in almost every case, the local authorities affected

would not be prepared to accept financial responsibility for schemes of the character under discussion, and that their contributions toward them, except in the case of some urban widenings of only local importance, would represent but a very small fraction of the cost. For this reason very few of such schemes can be regarded as being within the range of practical consideration at the present time, especially while the really urgent work of road-crust improvement remains to be undertaken when funds are available.

Of a somewhat similar nature are the proposals of the recent Metropolitan Arterial Road Conferences for the construction of about 130 miles of approach roads to London, 70 miles being entirely new. The Local Government Board has requested the Road Board to examine these schemes, which, taken altogether, if their execution were proceeded with continuously, might involve an expenditure by all parties concerned of considerably over £10,000,000, and it might approach £15,000,000. The highway authorities concerned have made it clear that they are not prepared to provide any considerable proportion of the expenditure. No possible source of revenue is, therefore, in sight. The proportion of the Road Improvement Fund, as now existing, which the board can regard as available for grants toward road improvement schemes in Greater London, with the exception of a few thousand pounds, have already been pledged to works in progress, but most of which have been held up during the war. The board has pointed out to the Local Government Board that its examination of the schemes cannot be of a very practical character if it is conducted on the assumption that no money assistance is likely to be forthcoming beyond any possible grants from the Road Improvement Fund.

Scotland and Ireland

As regards Scotland, the mileage of roads requiring reconstruction and strengthening over and above the mileage that can be dealt with by the local authorities themselves out of their own resources may be taken at about 2000 miles, at an average expenditure of £1500 per mile, or a total of £3,000,000.

No estimate can be given as regards Ireland, but it may be mentioned that the special circumstances which have caused the great increase in road expenditure in England and Wales, and in some parts of Scotland, due to the large volume of motor traffic, have not hitherto pressed with any severity upon the highway authorities in Ireland.

The board has continued the special work which it undertook after the outbreak of war at the request of the Army Council, namely: (1) To supervise and arrange for the construction and maintenance of new roads, and the improvement of certain private roads in several districts for military purposes in connection with camps and otherwise, and to carry out such work, where required, by direct labor; (2) to arrange with highway authorities for improvements, mainly at the cost of the Army Council, on public roads required for military purposes, and to supervise, or to carry out by direct labor, the execution of the improvements; (3) to settle by negotiation with highway authorities the amounts payable by the Army Council in respect of damage caused by extraordinary traffic in connection with military purposes. Similar work has, with treasury approval, been undertaken for the Admiralty, Ministry of Munitions, and Timber Supply Department of the Board of Trade.

Boston Society Reports on Civil Service Engineers

A SPECIAL committee appointed by the Boston Society of Civil Engineers has been investigating for the past year the question of the classification of civil engineers in the civil service of the State of Massachusetts, with a view to suggesting such qualifications and changes as would improve the appointment and employment conditions in that service. The committee reported to the society under date of Sept. 13. It made a number of recommendations, the most important of which are noted here.

The committee recommended such modifications of the civil service rules and regulations as may be necessary to conform to a new classification, as follows: Grade A, rodmen up to $900, inclusive; grade B, rodmen whose pay is over $900 and not exceeding $1400; grade C, junior assistant engineers with pay over $1400 and not exceeding $1900; grade D, senior assistant engineers with pay over $1900; grade E, junior draftsmen with pay up to $900 inclusive, and grade F, senior draftsmen with pay over $900 and not exceeding $1600. The qualifications for these grades are as follows: Grades A and E, one year's good practical experience or the successful completion of one year's study in a school of engineering of recognized standing; Grades B and F, three years' experience or graduation plus one year's experience, or two years' study at an engineering school plus two years' experience; Grade C, five years' experience or graduation plus two years' experience; Grade D, eight years' experience or graduation plus four years' experience.

The committee places great stress on the necessity for ascertaining a candidate's experience, and says an experience sheet should be filled out in minute detail, especially in the cases of applicants for examination for higher positions. In all cases this sheet should be in such form as to determine an applicant's experience as fully as possible. The Civil Service Commission should investigate this experience and verify the tabulation, besides getting further information as to a man's ability, character, habits, and personality. To do this the committee realizes that the commission will have to have a larger force than it now has available.

The committee considers further that it is undesirable to lay so much stress as at present on the written examination. Especially for the higher grades of work, the experience of the applicant plus an oral examination should govern. It recommends, for instance, that the weight assigned to the experience and to written examinations should be changed from the present standard to one giving more weight to the experience; for the senior assistant engineer, for instance, from a weight of 75 to experience and 25 to written examination, to 80 to experience and 20 to written examination. While realizing that it is impossible to do away entirely with the written examination, the committee recommends that it be reduced as much as possible.

Twenty-Four Designs for Salem Bridge Wasted Before Commissioners Agreed

Contract Let After Three Years' Wrangling of Public Officials—Twenty-Five Designs Prepared—Prize Competition, but Prize Not Awarded—Public Loses by Delay Because of Rising Prices

EDITORIAL CORRESPONDENCE

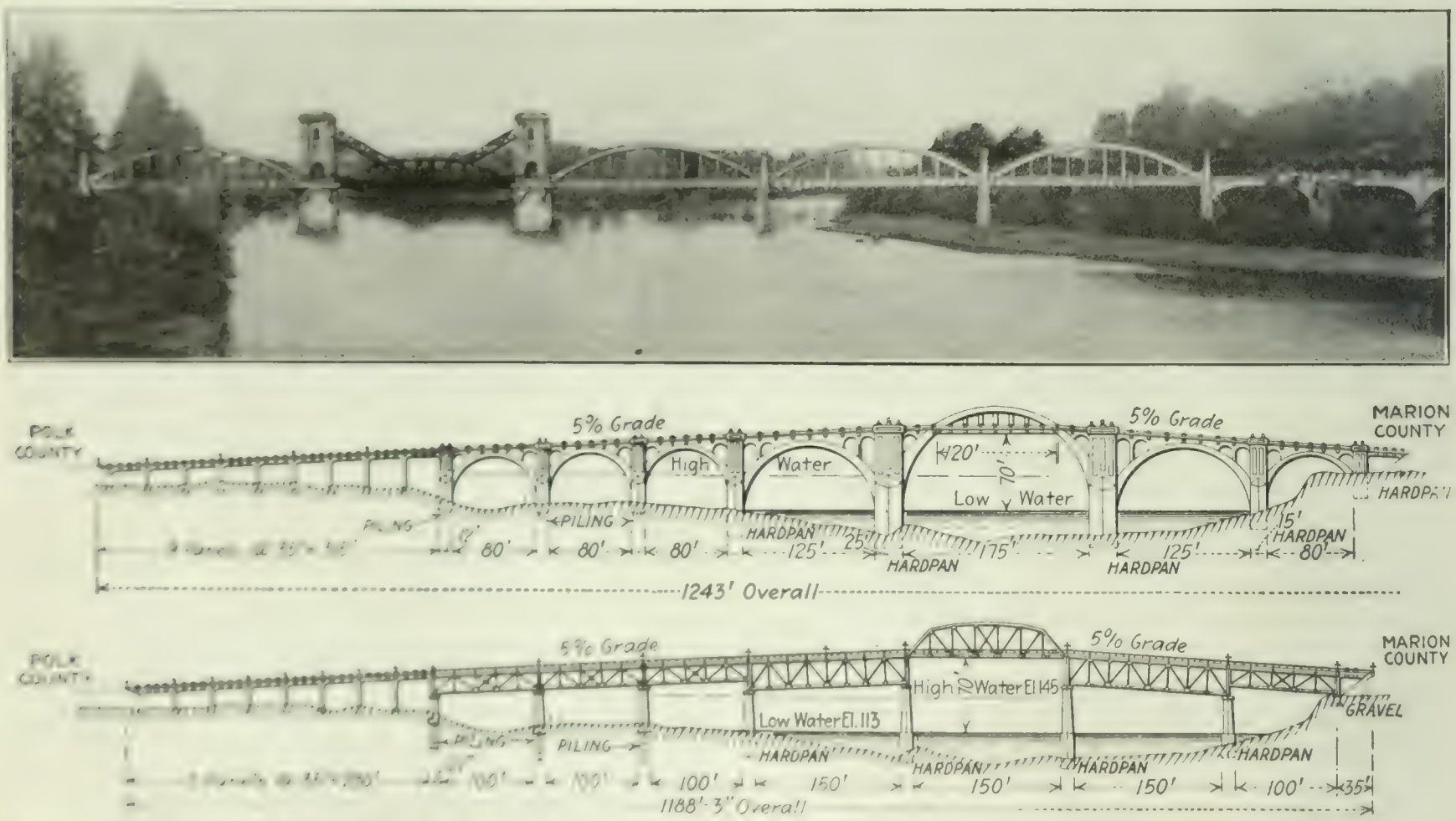
THE AWARD of the contract for the bridge across the Willamette River at Salem, Ore., brings to a close three years of indecision and controversy. While the principal loser in the whole affair is the taxpayer, the engineering profession is also involved. Engineering advice and engineering services were sought, particularly when they could be obtained without charge; but when given they met with scant consideration and discourteous treatment by public officials.

The Willamette River at Salem forms the boundary between Polk and Marion, two of the most important and wealthy counties of Oregon. Salem, in Marion County, is adjacent to the river bank, while a populous farming section adjoins the opposite side of the stream. The existing predecessor of the new Salem bridge is a typical product of the contracting bridge companies—what has been called in Kansas a "tin" bridge. While its age is much less than the ordinary life of a steel bridge, its ½-in. and $\frac{3}{8}$-in. gusset plates, its light channels, inadequate lacing and flimsy connections, needing paint to hide their nakedness, have seriously deteriorated. The old bridge had been frequently examined and as often condemned by engineers of the Oregon State Highway Department. This engineering condemnation was, hardly necessary, however, as the corrosion and the deflection and vibration of the structure betrayed its condition even to the layman's casual observation, and created public fear.

Legal difficulties in the early efforts to obtain a new bridge could have been adjusted easily, and with the bridge forming a link of a heavily traveled trunk road between counties financially able to construct a new bridge, there existed pretext but not reason for the delay in beginning an entirely adequate structure.

The first design for the Salem bridge was prepared in 1914 by the State Highway Department. While the state contributed no portion of the cost of the bridge, it was interested in having a suitable structure built upon an important road, and took this means of encouraging construction. A year later, in 1915, with a changed administration in the department that had different notions as to the best type of structure, two more sets of plans were prepared. All of these plans were furnished to the county commissioners, the interested authorities in both counties, but no definite action was taken upon them.

In December, 1915, by joint authority of Polk and Marion Counties, a prize competition was instituted, and a prize of $1000 was offered for the best plan, under certain loadings and conditions. The offer was widely



THREE DESIGNS FOR THE SALEM BRIDGE PREPARED IN 1915

Upper sketch, No. 1 of table, by H. W. Holmes, of State Highway Department. Middle and lower sketches, Nos. 6 and 7 of table, by Ralf & Cunningham, Portland



ONE OF THE 1916 DESIGNS FOR THE SALEM BRIDGE
No. 23 of table, by Joseph Weare, of State Highway Department

advertised. As it was apparently made in good faith, and the award of the prize by implication would give to the successful competitor also the commission for preparing detailed plans and superintending construction, engineering firms in the Northwest and elsewhere prepared designs. At the opening of plans Dec. 24, 1915, ten engineers were represented, with nineteen sets of plans of diverse types and styles.

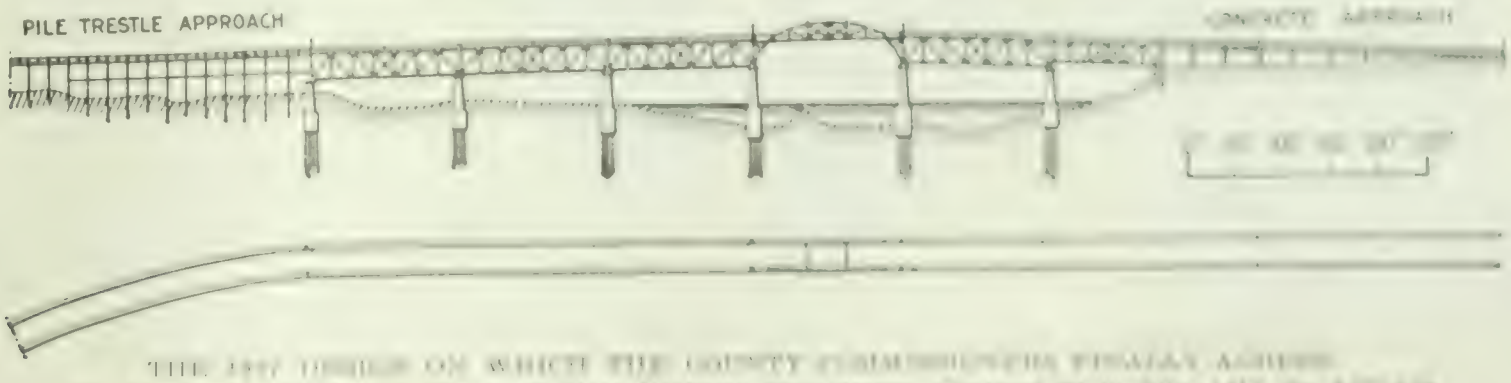
Choice of the best plan was to be made by a board of three "viewers" designated by the Marion County commissioners, with the assistance of the bridge department of the State Highway Commission. After several days of deliberation, choice was narrowed down to three designs, those of Baar & Cunningham, of Portland, Ore.; Charles Huber, of Seattle, Wash., and C. E. Fowler, also of Seattle. Beyond this point no further decision was made by the viewers. To the date of writing, no decision or award of the stipulated prize has been made, and the contestants have not been notified or communicated with in any way by those in authority. Although the nineteen sets of plans submitted represent in aggregate cost and in engineering skill a value considerably higher than the $1000 offered as a prize, the contestants have not received even the courtesy of the return of their plans with a valid and legal reason for rejection.

About a month after the competitive plans were received a new tack was taken. Marion County formally requested the State Highway Commission to prepare a set of plans. In making this request the authorities expressed their preference for a low-level steel-truss bridge with a direct-lift draw. The State Highway Department had by this time come again under a new administration, with John H. Lewis, state engineer, acting as highway engineer. Knowing the past record of delay and temporizing, Mr. Lewis refused at first to mix in the bridge matter, but later, finding that he was required by law to prepare such plans upon request, he authorized his department to go ahead with the work. Since the instructions were definite as to the preferred type of bridge, it was assumed that this design would be final, and it was worked out in considerable detail, at a cost to the state of about $1800.

Before the state plans were entirely complete, a new controversy developed. Polk County decreed that it would accept none but a concrete bridge. Marion County insisted upon having a steel structure. Polk County refused to consider the latest plan of the State Highway Department, and employed a firm of Portland engineers who agreed to design a concrete bridge upon a contingent fee basis, the plans to be paid for if the bridge was built. The deadlock betwen the adjoining counties over the type of bridge, concrete or steel, combined with an additional controversy over the exact site, resulted in a muddle which continued over the remainder of the year 1916 and effectually prevented any progress.

Early in 1917 the commissioners of Polk and Marion Counties, impelled by the increasingly dangerous condition of the old bridge and by public clamor for action, got together in a degree by making a joint request of Mr. Lewis that his department make an investigation, report upon the best site and recommend the style of bridge which should be built. Studies were accordingly made by Joseph Weare, state bridge engineer. Not being limited as previously by any instructions as to type, he recommended a type differing from that already designed—a high-level steel-truss bridge, eliminating the drawspan.

In the spring of 1917 the two counties were finally able to reconcile their differences. The high-level design of the State Highway Department was adopted, detailed plans were prepared and in July, 1917, a contract was awarded to the Unit Bridge Co., of Portland, Ore., for $237,901. Construction is now being



THE 1917 DESIGN ON WHICH THE COUNTY COMMISSIONERS FINALLY AGREED
No. 25 of table, by Joseph Weare, of State Highway Department. Contract let in July, 1917, for $237,901

CHARACTERISTICS OF TWENTY-FOUR REJECTED DESIGNS AND THE CONTRACT DESIGN FOR THE SALEM BRIDGE

No.	Date	Engineer	Type	Estimated Cost
1	1914	State Hwy. Dept. (C. H. Purcell, bridge engineer)	Low-level; steel trusses, swing draw-span, concrete approach	Not available
2	[illegible]	State Hwy. Dept. (H. W. Hayes, bridge engineer)	Low-level, concrete arches, suspended floor, bascule draw	$235,000
3	1915	State Hwy. Dept. (H. W. Hayes, bridge engineer) (alternate plan)	Low-level; steel trusses, bascule draw-span	190,000
4	Dec., 1915	Bowerman & McCloy, Seattle	Low-level; concrete arch bridge	232,000
5	[illegible]	Baar & Cunninghum, Portland	Low-level; steel trusses, concrete approach, direct-lift draw	158,112
6	[illegible]	Baar & Cunningham, Portland (alternate plan)	High-level; concrete arch bridge, concrete approach	218,269
7	[illegible]	Baar & Cunningham, Portland (alternate plan)	High-level; steel trusses, concrete approaches	126,430
8	[illegible]	W. H. Cuthrie, Portland	Low-level; steel trusses, swing draw-span, no approach shown	192,436
9	[illegible]	Chas. Evan Fowler, Seattle	Low-level; concrete arches, concrete approach	233,206
10	Dec., 1915	Chas. Evan Fowler, Seattle (alternate plan)	Same design with wooden approach	203,206
11	[illegible]	Chas. Evan Fowler, Seattle (alternate plan)	Low-level; steel arch spans, concrete approach	230,986
12	[illegible]	Chas. Evan Fowler, Seattle (alternate plan)	Same design with wooden approach	200,986
13	[illegible]	Chas. Evan Fowler, Seattle (alternate plan)	Low-level; steel bridge (24-ft. roadway), concrete approach	192,107
14	[illegible]	Chas. Evan Fowler, Seattle (alternate plan)	Same design with wooden approach	173,107
15	[illegible]	Chas. Evan Fowler, Seattle (alternate plan)	High-level; steel trusses, plank floor, wooden approach	148,180
16	[illegible]	Chas. G. Huber, Seattle	Low-level; concrete arches, Strauss bascule	294,510
17	[illegible]	Chas. G. Huber, Seattle (alternate plan)	Low-level; steel trusses, Strauss bascule	246,700
18	[illegible]	A. H. Lamm, Portland	Low-level; concrete arches, concrete approach, draw not included	171,390
19	[illegible]	Marsh Eng. Co., Des Moines, Ia.	Low-level; concrete arches	Not furnished
20	[illegible]	Portland Bridge & Bldg. Co.	Low-level; steel trusses	190,102
21	[illegible]	Scherzer Rolling Lift Bridge Co.	Steel truss bridge with rolling-lift bascule	191,153
22	[illegible]	Robt. Wakefield, Portland	Low-level; concrete arches	195,000
23	1916	State Hwy. Dept. (Jos. Weare, bridge engineer)	Low-level; steel trusses, concrete approach, direct-lift draw	198,500
24	1916	Clark & Purcell, Portland	High-level; concrete arches, concrete approach	Not available
25	1917	State Hwy. Dept. (Jos. Weare, bridge engineer)	High-level; steel trusses, wooden approaches	237,901

carried out under the supervision of C. H. Purcell, state bridge engineer.

A great loss of public money had resulted from the delay during a rising market. In 1914 and 1915, when the first designs were made, prices had begun to advance, yet the estimated cost of a high-level bridge such as was finally approved was only $126,430 in 1915, as against the 1917 contract price of $237,910. Estimates for concrete arch structures in 1915 were no higher than the cost of a steel bridge in 1917. While it may be argued that present prices of materials and labor could not be foreseen, it must be admitted that during the whole period from 1914 to 1917 contract work showed continuous advances in cost, and it was generally recognized that delay in executing proposed plans would be expensive.

But the most remarkable and deplorable feature of the case is the manner in which public officials, county commissioners, played battledore and shuttlecock with engineers and engineering services. The part played by the various state highway departments of the country in taking the legitimate commissions of private engineers has often been criticized. More subject to condemnation is a situation in which a state department is required by law to prepare expensive engineering plans, and where such plans, after superficial consideration by petty officials, are consigned to the waste basket, new plans ordered and the whole process repeated to a nonsensical limit. The Oregon Highway Department, through a succession of administrations, prepared five distinct sets of plans for the Salem bridge.

The most righteous cause for complaint, from the engineer's viewpoint, is the treatment accorded to the participants in the so-called prize contest. If there had been action in good faith and within ethical limits, it is safe to say that any firm winning the $1000 prize and the commission for subsequent work would have received the congratulations and good wishes of the other contestants. That none of the nineteen competing designs was suitable is not believable; in fact, the plan finally used resembles very closely one of those entered in the contest. The failure without color of reason to make any award whatever is unfair to all the contestants in equal measure, if not actually illegal.

Municipal Savings Bank at St. Paul Finances Local Improvements

ST. PAUL has a financial institution which is somewhat original. In a way, it is a municipal savings bank, and its purpose is to finance local improvement work. Shares of city bonds are sold to the people in $10 denominations. The city pays 4% interest on these deposits and pays it to the date when withdrawal is made, so that the holder receives interest for every day he holds the shares. One clerk in the city treasurer's office, at a salary of $1800, runs this bank. Interest payments are made twice a year and in July, 1917, amounted to $47,758. There were at that time [illegible] depositors.

The system was started in July, 1913, when the city wanted to dispose of bonds for paving work and the bond buyers appeared "finicky." The idea was conceived by the comptroller and was worked out by him and the city treasurer.

On Apr. 1, 1916, there were deposits amounting to a little less than $2,000,000 when a run, due to a grand jury attack, was started on the bank. A committee headed by a local banker asserted that the bank was unsafe and illegal. The run continued until May 2, 1916, when it stopped with $1,040,000 remaining in the bank. Every depositor who presented his certificate received his cash with interest at once. Citizens then demanded an amendment making this municipal bank a part of the city's financial system and this charter amendment was adopted at the next election.

The larger part of the deposits is from stockings and other hiding places and is money never handled by a savings bank. This form of investment appeals to those who have money lying idle for a short time, for it pays interest on a deposit of one day or more. It has proved an element of competition with the bond buyers who bid in the larger issues of the city's bonds and has been instrumental in securing large premiums in the sale of bonds or has tided the city over tight places while awaiting a more favorable bond market. The deposits on Oct. 27, 1917, were $2,569,000.

Frozen Concrete in Floor Slab Has Low Tested Strength

Piece Cut from Slab Shows Upper Half with Frost Marks and Low Strength While Lower Half Is Normal

By Sanford E. Thompson
Consulting Engineer, Boston

EXPERIENCE has taught that freezing concrete reduces its strength, but there are not many tests of actual structures in which such reduction has been measured. A recent case in the writer's practice involved an investigation of the effect of frost action on a flat-slab concrete building floor, and the specification of the necessary repairs. The case differs from most of those discussed in technical literature in that no failure resulted, only a small area on an upper floor being affected.

In the fall of 1916 the concrete of the slab in question was caught by frost during an unexpected drop in temperature. It remained frozen during the winter but was subjected to more or less thawing and freezing.

Examination of the concrete early in March showed that it still contained moisture and was so soft as to be crumbled readily by the fingers. This condition occurs frequently with concrete subjected to cold weather, sometimes when it is not actually frozen; but usually such concrete hardens satisfactorily with time or with the aid of artificial heat. A preliminary examination indicated that this ultimate hardening might occur and the use of artificial heat was advised.

In the latter part of March further examination of the slab and of samples under laboratory treatment showed that while the concrete, by the heat treatment, had attained considerably greater strength than formerly, it was not satisfactory yet and could not be depended upon to attain in the future the strength required by standard design. Consequently, computations were made and specifications prepared for thickening the granolithic finish, bonding it to the base concrete and reinforcing with steel over the column head.

The tests and examination of the concrete showed that the strength of the upper part of the slab was reduced by crystallization of water in freezing, as shown by frost marks in the interior of the concrete but that the bottom portion of the same slab, which probably retained less water and was slightly protected by forms, was of satisfactory strength and showed no crystallization. Additional reinforcement was needed therefore in the upper portion to make up for the loss of strength.

The recommendations for strengthening were made partly as a result of tests and partly from the appear ance of the interior of the concrete.

To test the concrete, it was found impossible to cut a piece out from the top, as is frequently done, because the concrete was not hard enough. Therefore a small section was cut out clear through the slab. The top was found to be much softer than the bottom; in fact, the lower 6 in. were markedly harder than the upper 4 in. Since a slab is subjected to transverse fiber stress, the top and bottom portions act separately and for this reason the sample was sawed in two equal parts horizontally and each half was tested separately.

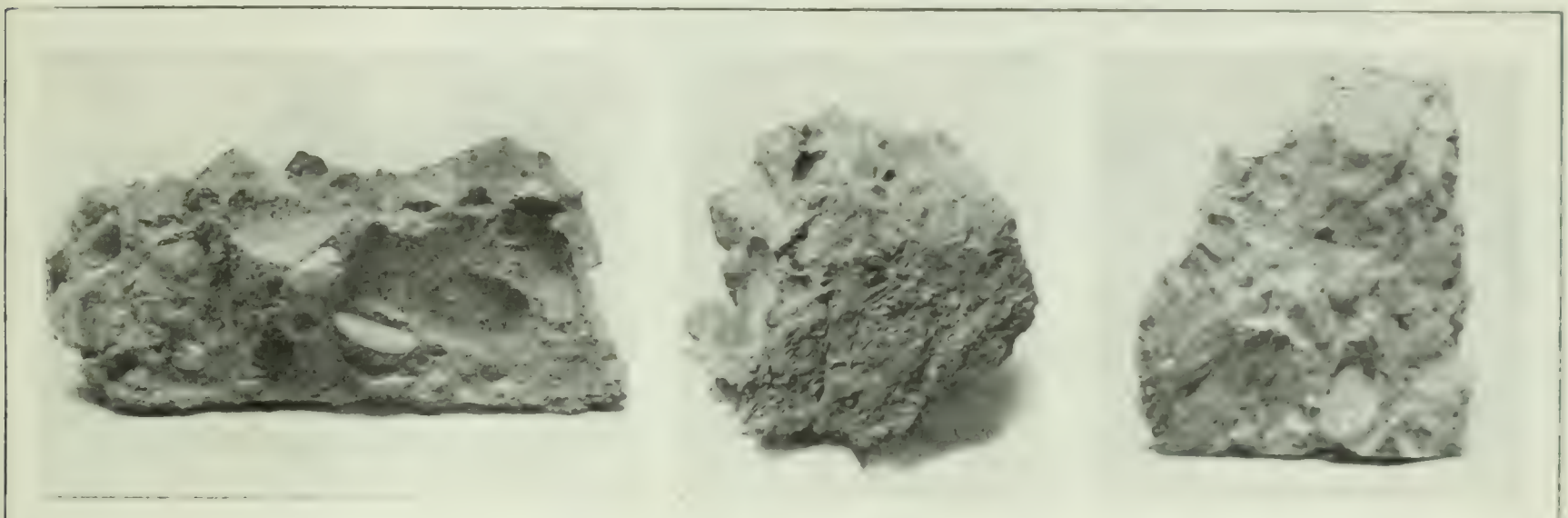


FIG. 1. FROST MARKS SHOW ON CONCRETE FROM INTERIOR OF SLAB

FIG. 2. SURFACE OF SLAB IN FOREGROUND

FIG. 3. SOLID CONCRETE AT BOTTOM OF SLAB

The results of the test, corrected in order to base them on specimens having a height of twice the least width, showed that the crushing strength of the lower part of slab was 1900 lb. per sq.in. and of the upper part, 890 lb. per square inch.

Most interesting, also, are the photographs, which indicate the cause of the low strength. Fig. 1 shows the interior of the concrete, with frost marks on all the surfaces in contact with stone. Evidently the adhesion is greatly reduced. This reduction in adhesion is further shown by the looseness of many of the stones. In fact, the photograph itself shows actual cracks around several of the stones. Fig. 2, looking down on the surface of the slab, shows the surface marks caused by water freezing on the top; also at the left of the photograph and at the top are shown portions of the interior with the same frost marks as in the preceding figures. Fig. 3 is the interior of the bottom portion of the slab, which shows higher strength. It will be seen that the frost marks are absent.

The results indicated that the limit of strength of the concrete, especially of the upper part, probably had been reached, and since concrete designs are based on a stress of 2000 lb. per square inch for 1:2:4 concrete, certain parts of the slab had only one-half the strength required by the design.

In specifying repairs the bottom of the slab at the center, made of a good grade of concrete and reinforced with steel, was considered satisfactory, especially as it was still growing in strength. The compressive strength of the upper part of the slab at the center was increased by applying a well bonded layer of granolithic. At the support the bottom of the slab was considered satisfactory. The top of the slab, however, was composed of poor concrete. In a flat slab, concrete in the top of the slab over the support is of actual value in assisting the steel to take the tensile stress; furthermore, a low compressive strength indicates a low bond strength, so that in this case the strength of the steel in bond is reduced nearly one-half. To make up for this poor concrete, reinforcement was laid in the granolithic placed on the slab over the support.

Salem (Ohio) Sewage Works Show Evils of Carelessness and Neglect

POOR FILTER material, inadequate capacity and negligent operation have resulted in bad effluent from the sewage works of Salem, Ohio, and some fifteen damage suits have been brought by riparian owners below the works.

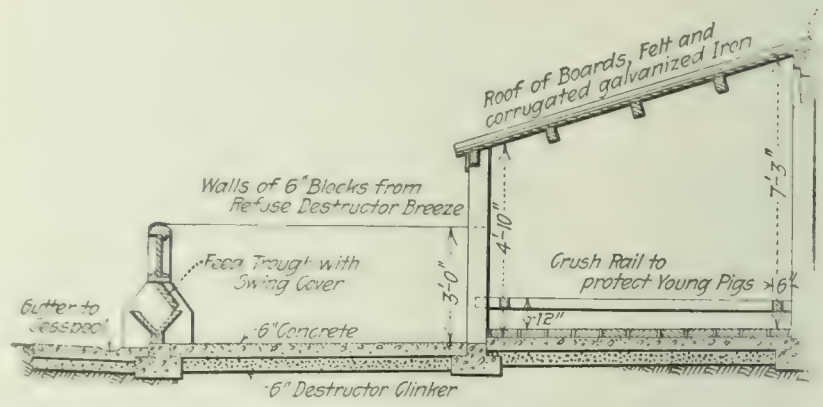
The plant was completed in 1913 under orders from the State Board of Health, requiring the city to eliminate the pollution of First Culvert Creek, a small stream which runs virtually dry in summer. The plant was designed to treat 1,000,000 gal. of sewage daily. The population at the time the plant was put in use was about 9500. Funds being limited, it was impossible to build a plant large enough to take care of future growth. Recent inspection of the plant has shown that it is greatly overtaxed, the sewage flow at times being 3,000,000 gal. a day. The city now has fifteen miles of sewers, a large part of which, constructed on the combined plan, has been in use many years. Large volumes of storm water reach the sewers and overtax the work greatly. Failure to exclude the storm water or provide otherwise against overworking has contributed largely to the failure of the plant.

One of the conditions of approval of the plans by the State Board of Health provided that samples of sand for the filter beds should be submitted to the board for approval before the material was placed. Considerable difficulty was encountered in obtaining sand of satisfactory quality at a cost which was not prohibitive. After careful inspection the board approved the use of bank sand and gave specific instructions regarding the removal of the material from the bank. Subsequent inspection of the filters showed that these instructions had not been followed, as the beds were found to contain a considerable amount of loam, making it impossible to operate them at the rates for which they were designed. To add to the difficulty, the operation of the works was neglected by the city. This neglect, combined with the poor filter material and the overworking of the plant, has made it impossible to produce an effluent which does not cause a nuisance.

The city has retained the W. J. Sherman Co., of Toledo, Ohio, to make an investigation of the condition of the sewage-works and recommend such changes as may be needed.

British Cities Build Municipal Garbage Piggeries

GARBAGE utilization by municipal piggeries and by private owners of pigs is being practised in a number of British towns under the spur of war conservation needs and at the specific request of the Government. In addition, encouragement is being given to householders and others to keep pigs on a small



A BREEDING PEN IS USED TO STOCK THE BOGNOR MUNICIPAL PIGGERY

scale. Early this year an order in council was issued advising sanitary authorities to relax local by-laws relating to pig-keeping, which in many towns have been so strict as to be prohibitive.

The municipal piggeries are located at refuse destructors, sewage farms, workhouses or elsewhere, according to local conditions. Thus far most of the operations reported have been conducted on a small scale. According to a statement by Oswald A. Bridges, surveyor to the Bognor Urban District Council, in an article in the London *Surveyor*, the accepted British practice is to boil the garbage before feeding it to hogs, skim off the grease and pick out the bones, these materials being stored for sale to the Government.

The Bognor council decided to keep 60 pigs to utilize garbage, beginning with a small number of breeding sows. The piggery is located at the refuse destructor. A cross-section of one of the breeding sties is reproduced from the *Surveyor*.

Advance in Prices of Paving Materials

Our attention has been called to errors made in figuring the percentages printed in the table of range of prices of materials (F.O.B.) and labor used in paving Cleveland streets, 1914 to 1917, in *Engineering News-Record* of Aug. 2, p. 207. The corrections will be found in the fifth and seventh columns of figures printed below:

	1914	1915	1916	Mar. 1 1917	Increase from 1914	July 16, 1917	Increase from 1914
	$1 55	$1 65	$1 90	$2 32	72%	$2 80	107%
	90 95						
	1 00	1 08	1 13	1 33	48%	1 33	48%
	1 05						
	65 70	75	88	90	38%	1 20	85%
	55	65	70	75	36%	1 15	109%
	1 42	1 55	1 65	1 65	16%	1 65	16%
	6 75	7 00	7 50	11 00	63%	15 50	130%
	16 50	16 75	19 50	21 50	30%	24 50	48%
						29 00	
	50	50	75	80	60%	80	60%
per hour	17½	.22½	.40	.45	157%	.45	157%
	1 50			1 61	7%	1 61	7%

Sea-Going Hydraulic Hopper Dredge for North Pacific Bars

"Col. P. S. Michie," Specially Designed for Heavy Work on Coast of Washington, Oregon and California, Proves Effective and Cheap in Operation

By George E. Tonney
Engineer, Port of Coquille River, Myrtle Point, Ore.



UNITED STATES DREDGE "COL. P. S. MICHIE," ONE OF THE LARGEST AND MOST POWERFUL HOPPER DREDGES AFLOAT

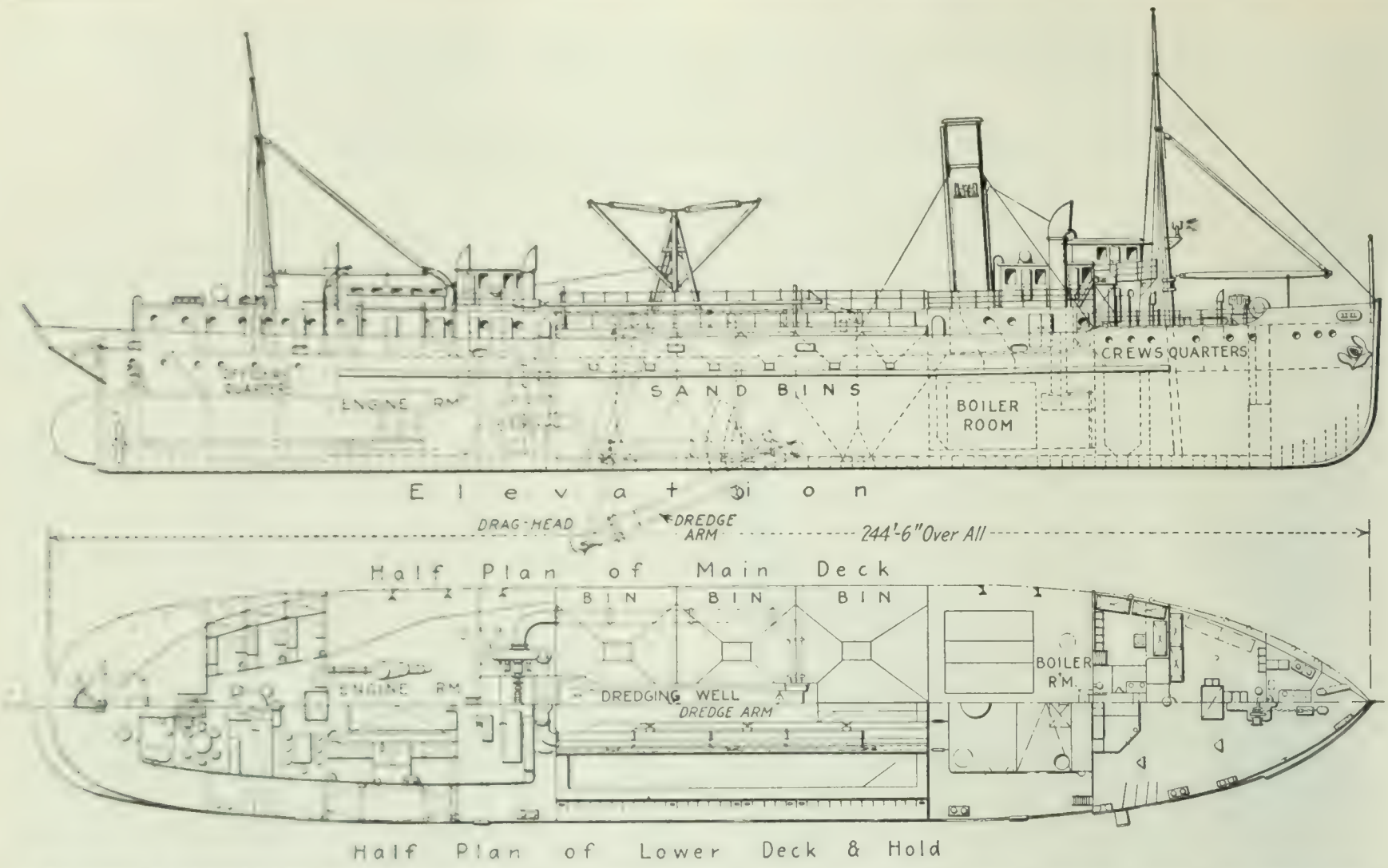
EXTREME conditions of digging and of seaway encountered on the sand bars of the river entrances on the North Pacific, particularly at Coos Bay, Oregon, led some three years ago to the construction by the Federal Government of the seagoing dredge "Col. P. S. Michie," a hydraulic hopper dredge of exceptional seaworthiness and digging capacity. This machine has now been in operation long enough to warrant a description of its design and report of its performance.

The Pacific coast of Washington, Oregon and northern California is difficult of navigation, especially during the winter months, by reason of a regular coast line, unusual depth of water and dense fogs and severe storms. The Columbia River and Coos Bay bars, on which the "Michie" operates, are regarded as among the roughest in the world, and of these the Coos Bay bar is considered the more difficult for hydraulic operations. The bar is narrow, and is exposed to the storms of the open high seas, and to heavy winds, cross currents and tidal waves. The average tide is about 6 ft.

About 9600 ft. of riprap rock jetty was finished in 1894 along the north entrance to the bay. It was subsequently rebuilt at places beaten down by the sea. Some parts of this jetty are now below low water, having been twice rebuilt to a height of 28 ft. above low water. A second jetty for the south entrance and extending into the sea a distance of 4200 ft. was proposed, but never built. This jetty was projected to act as a breakwater for heavy seas, to dispose of cross-currents, control a shifting channel, scour sand deposits and secure a minimum depth of 20 ft. over the bar at mean low water. It is probable that the original intention will be carried out on a more elaborate scale to secure a minimum depth of 30 ft., at a time in the not distant future, when appropriations become available.

The jetty is now of little avail in keeping the channel open. Sedimentary deposits brought down Coos River and other tributary fresh-water streams into the bay have little or no bearing, the formation on the bar of fine sand and silt being the direct action of the waves and tides. The channel made possible by hydraulic dredging has no permanency in either depth or position, and it is essential that dredging operations be carried on at all times to secure and maintain a channel of established dimensions. For these operations the "Michie" was built.

The "Col. P. S. Michie" was designed in the office of the chief of engineers and placed in commission in the spring of 1914. She was constructed in the yards of the Seattle Construction and Dry Dock Co. and delivered ready for service in 16 months from date of award of contract, at a cost of $378,198. The dredge is of steel construction, has a length of 244.6 ft. over-all, molded amidship width of 20 ft.; draft, light, of 11 ft., draft, loaded, of 17 ft.; displacement, light, of 1708 tons and displacement, loaded, of 3372 tons. Her speed, light, is 10 knots and loaded 8 knots, and the speed maintained while in operation is 11 knots.



SELF-PROPELLED HYDRAULIC HOPPER DREDGE "MICHIE" IS 245 FEET LONG, OF 17-FOOT DRAFT, AND HAS ENGINES OF 1780 HORSEPOWER

The boat is equipped with two inverted direct-acting compound propelling engines for twin-screw propulsion. The engines were built by the Marine Iron Works of Chicago for a working pressure of 224 lb. The cylinders are 16 x 32-in. by 24-in. stroke. The steam generating set consists of two Ballin water-tube boilers having a heating surface of 9000 sq.ft. of surface in both boilers. The fuel consumption is about 8½ bbl. of fuel oil per hour while dredging. The pumping and propelling engines develop about 1780 hp. Contrary to the general rule of marine construction, the boilers are located in the forward part of the vessel, a disposition made necessary by the location amidships of the dredging well and dredging bins. Adjacent to the boiler room is the fuel compartment holding 1100 bbl. of fuel oil.

The "Michie" is a trim vessel of pleasing appearance, with four separate dining rooms and four sets of comfortable quarters, baths and sanitary lavatories, pressure system supplying hot and cold water, and two sets of electric-lighting systems. The crew consists of 35 men, but ample space has been provided for a double crew.

The open center well, commonly known as the dredging well, is located amidships and has a length of 48 ft. and a width of 7 ft. The dredge was designed with hoppers amidships in order that the weight of the material should be carried at the place of greatest buoyance and in order that the fore and aft bulkheads and hopper sides would contribute materially to the strength of the structure. In this well operates the dredge arm, one end of which is connected rigidly to the vessel by means of heavy cast-steel trunnions. It is raised or lowered to desired positions by wire cables connecting with electrically operated winches. The material is sucked up through a 26-in. pipe in the dredge arm and delivered to two 26-in. distributing pipes to the hopper bins.

There are six bins, three on each side of the well, having a combined capacity of 1400 cu.yd. These bins are fitted with overflow weirs which dispose of all surplus water. Openings are also provided below the level of the maximum capacity to permit the dredge to operate on a lighter draft if necessity demands. A trap gate in the bottom of the bins releases the material. The bins can be filled or dumped with dredges singly, collectively or in pairs. In order to keep the vessel from listing, especially in heavy seas, it is the practice to empty partly the two forward hoppers, then to dump the four after hoppers. The dredge actually fills the hoppers in 45 min. and it is able to dump its entire load in 7 minutes.

The lower end of the dredge arm is fitted with a drag head of the usual type used by sea-going dredges. The first drag head used was made of ordinary steel and was in serviceable condition for about thirty days of actual use. A new drag made of manganese steel has seen two years of actual service and has handled as many as 27 cu.yd. of material per minute over long periods of operation. The dredge arm has been operated in 42 ft. depth of water and in this position has an angle of 30° from the vertical. All movements of the dredge arm, pumping, disposing of material, etc., are mechanically operated, the chief operator's station being located conveniently to afford a clear view of all movements.

When dredging operations began in 1914 there was 17 ft. of water on the bar. Table I is a record of the first season's work of the "Michie."

TABLE I. FIRST TEN MONTHS' OPERATION OF DREDGE "MICHIE"

Month, 1914	Cu.Yd. Dredged	Days Dredge in Commission	Parts of Days Worked	Av. Amt Dredged per Day	Max. Amt. Dredged per Day	Total Expense
January	4,719	9	2	2,?60	4,552	$3,835 30
February	10,308	28	6	1,718	4,094	3,442 44
March	14,890	31	8	1,861	4,094	2,996 91
April	48,475	30	16	3,029	4,650	3,343 28
May	65,786	29	21	3,132	4,893	3,843 48
June	Dredge rammed and sent to Portland for repairs					7,838 19
July	58,682	28	14	4,192	7,418	3,944 19
August	30,687	14	7	4,388	7,426	2,488 95
September	No work, due to lack of funds					
October	6,574	17	3	2,118	3,032	3,620 40
Total	240,121	186	77	3,118	7,426	$34,953 14

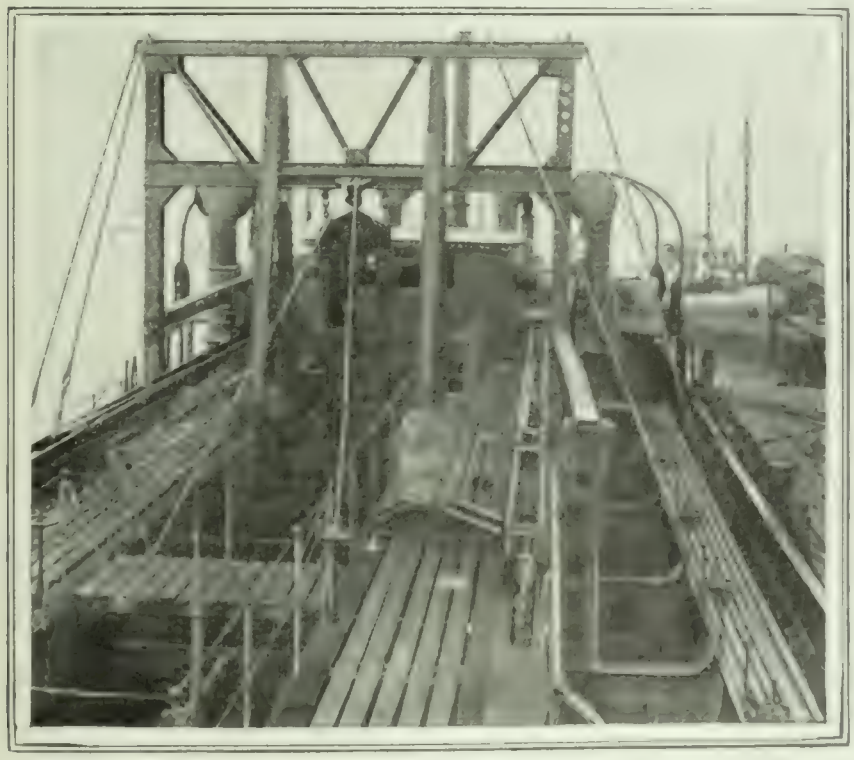
The unit cost of dredging for the season was 14.6c. per cu.yd., of which the labor cost = 6.8c. per cu.yd. and fuel oil = 3.1c. per cu.yd. The pumping average for the season was 14.5 cu.yd. per min.

Operations of work for the season of 1915 are recorded in Table II.

TABLE II. SEVEN MONTHS' OPERATION IN 1915

Month, 1915	Cu.Yd. Dredged	Days Dredge in Commission	Parts of Days Worked	Av. Amt. Dredged per Day	Max. Amt. Dredged per Day	Av. Cu.Yd. per Min.	Total Expense
May	40,520	20	9	4,502	7,170	22 8	$6,490 04
June	210,672	30	25	8,426	13,733	22.8	7,653 99
July	200,678	31	22	9,121	14,137	24.5	5,793 81
August	222,623	31	25	8,904	14,192	25.9	7,481 34
September	135,881	30	16	8,492	12,795	26.5	5,596 71
October	80,411	31	13	6,185	12,168	27.1	8,076 16
November	10,919	20	4	2,729	4,575	22.3	5,156 11
Total	901,704	193	..	.....	.....	....	$46,248 16

The unit cost of dredging for the season of 1915 was 5.13c. per cu.yd., of which the labor cost was 1.95c. per cu.yd. and fuel oil 1.6c. per cu.yd. Operations for the month of March give a record well worthy of consideration. This month the unit cost of dredging was 2.88c. per cu.yd. The costs given include all overhead expenses, including a 2% charge for Portland office expenses, but do not include the expenses incurred by the dredge while out of commission.



DREDGE WELL IN MIDDLE AND SPOIL HOPPERS AT RIGHT

All operations at all times are under the supervision of an engineer officer and during the first season's work careful inspection and study of conditions resulted in certain changes and improvements to overcome defects and increase efficiency. Operations for the year 1916 were of such a varied nature that the work accomplished could not be placed in comparison with the above tables. However, it is a noteworthy fact that the record is as worthy of consideration as that of the previous year. Maintaining a channel 30 ft. in depth above mean low water, 600 ft. in width and extending across the bar, is the object which the "Michie" has secured economically and successfully.

James H. Polhemus, Jr., junior engineer, acting under engineer officers of the army, is in charge of the operations of the dredge and to him the writer is indebted for the data used in this article.

Stringer Expansion Joints Reduce Floor-Beam Stresses

CONTINUOUS stringers without slip joints are used in the 416½-ft. truss span of the Great Northern Ry. over the Columbia River at Wenatchee, Wash., built in 1893. Extensometer measurements made recently, on both floor and truss members, showed that decided lateral bending of the floor-beams occurred under load, due to transmission of the bottom chord elongation to the floor. The stresses produced by this lateral bending are so high that it was considered necessary to eliminate them by introducing stringer expansion joints. Two such joints are now being put in.

John A. Bohland, bridge engineer of the railway, gives the design loading of the bridge as 4000 lb. per linear foot preceded by 124-ton locomotives having 34,000 lb. on each driving axle. The uniform load is virtually equal to the actual weight of present-day traffic, but the engine concentration is far below the weight of engines now in use. In consequence, the floor is taxed more severely than are the trusses. There is a double set of stringers, comprising main stringers under the rails, proportioned for the full load, and auxiliary stringers outside of these for service under derailed wheels. This extra provision of stringers leaves the floor-beams as critical points, and the lateral bending of the floor-beams is, therefore, especially objectionable.

The stress measurements were made under a test train consisting of one Mallet locomotive and a train of 100,000-lb. coal cars. The engine, one of the heaviest on the line, Great Northern Class N 1, was 93 ft. long and averaged 6710 lb. per linear foot on this length. The coal cars, whose gross weight ranged from 114,800 lb. to 143,600 lb., represented loads of 3000 to 3200 lb. per linear foot. The locomotive load exceeded the design loading by 70%, while the train load was 20% less than the design loading.

Under these conditions excessive stresses could be expected in stringers, floor-beams and floor beam hangers. The extensometer measurements showed the following stresses:

Stringer	

The low stringer stress is attributed to the presence of the auxiliary stringer system, which evidently took part of the load.

The material for the two sets of stringer slip-joints is now on the ground, and the joints will be built in before winter.

Group of Small Towns Get Together on the Water Problem

Engineering Talent Shapes the Policy of District Throughout Preliminary Stages of the Development

THE MARIN Municipal Water District, on the north side of San Francisco Bay, affords an example of the effectiveness of the engineer's influence when directed toward getting several communities to cooperate in a common cause. Although the general features of this development are similar to those of many other water-supply projects, from its inception in 1912 it has had its policy shaped as well as its procedure directed by a competent engineer.

M. M. O'Shaughnessy, city engineer of San Francisco, was formerly a resident of Mill Valley, now in the water district. Becoming interested in the local water problem, he was made one of the directors of the water district. He advocated adopting the plan of development which would be best for the entire population of 25,000 resident in the ten or twelve adjacent towns (including San Rafael, Mill Valley, Fairfax, Sausalito, Ross, San Quentin and others), and through periods of active opposition succeeded in holding the various localities together on a plan for developing a supply jointly.

Organization Difficulties

After five years of preliminaries, construction is now well under way, and because the favorable outcome of the policy is apparent opposition has disappeared. In the early stages, however, a continuous struggle was needed to keep out prejudiced influence and satisfy the customers of the private water companies that the plans proposed by the district were for the best. A typical controversy was that waged on the question of dam sites fought out early in the history of the project.

The Marin Water and Power Co., one of the several independent companies whose total capacities were insufficient for the district, had planned an additional reservoir at what was called the Tamalpais site. This would have afforded storage capacity of 3,000,000,000 gal. at a cost of $513,800. With these figures before the district, and in the face of the private company's opposition, it took a deal of education to get approval for building a dam (now under construction) at the Alpine site, where the total cost for dam and conduit was $668,500 and the storage capacity only 1,000,000,000 gallons.

The Alpine site, two miles below the other, was chosen by the district because it was found that its drainage area would supply a minimum of 5,000,000 gal. daily as compared with 3,000,000 gal. from the Tamalpais drainage area. Thus, comparing the developments on the basis of cost per million gal. per day, the Tamalpais site figured $171,267 as against $133,700 for the Alpine site.

From the standpoint of immediate return on the investment, which was naturally the private company's viewpoint, the Tamalpais site was more attractive. With a policy looking to temporary rather than permanent relief, a comparison of the two sites would not place great weight on the possibility of large future increases of capacity, which was one of the important advantages of the Alpine site. These points serve to illustrate the difference in the two viewpoints, and indicate how natural it is for the modern "town dads" to find the community obliged to take over improvements representing comparatively heavy investments which would not have been made if some one who could see clearly the broad engineering problems presented had pointed out a better way.

There were other points on which there was work to do outside the pale of the engineer's ordinary sphere. Attempts to boost the price of the drainage area which the district wished to buy had to be met. A valuation from the California Railroad Commission was secured on the land, and this had to be tested out in the courts. Finally, when such preliminaries as these were cleared away, there remained the campaign for a $3,000,000 bond issue.

This campaign, like the previous work, was directed by engineering talent. Public meetings were arranged, lectures illustrated by moving pictures were given and a systematic program was carried out to educate the people to the necessity of the project, and to convince them of the wisdom of the particular course recommended. These methods succeeded and the bond issue was approved.

Features of the Project

During the five-year formative period engineering studies went on simultaneously with the organization work. It was established that the drainage area of 10.36 sq.mi. above the Alpine dam has an average rainfall of 65 in. per year, which is very much heavier than in adjacent territory, because this area is at a high altitude on the coast line and intercepts moisture-laden trade winds. The dam decided upon is an arched masonry structure with a central siphonic spillway. The initial height will be 100 ft., but the base width is being made 88 ft. and it is planned to increase the height to 170 ft. at some later date. The radius of the arch will be 465 feet.

For the present, a 24-in. concrete conduit, 3½ miles long, will convey the supply to Phoenix Lake, which is as far as is now required. In the conduit line, which is laid in bench cut on a 0.1% grade, there is an 8700-ft. tunnel. In the consideration of the size of this tunnel, it was pointed out that the cost of a large bore would be but slightly more than that of the minimum section which it would be feasible to construct, while the larger section would afford advantages in water storage and in capacity should the conduit be paralleled later by another line.

Accordingly, an 8-ft. circular section was adopted, and is being lined with concrete throughout. A comparatively circuitous route was selected for the conduit line in preference to a shorter one in order that (1) the supply might be drawn from near the deepest point in the reservoir and (2) that building a part of the tunnel under submerged area might be avoided.

Since the district was organized, A. R. Baker has been in immediate charge of the work as resident engineer, acting under the general direction of M. M O'Shaughnessy.

Machinery and Footing Complications Control Mill Design

Three Different Kinds of Foundations—Cantilever Support for Columns—Concrete Brackets Carry Runways for Traveling Cranes

By W. Stuart Tait
Vice President and Chief Engineer, Concrete-Steel Products Co., Chicago



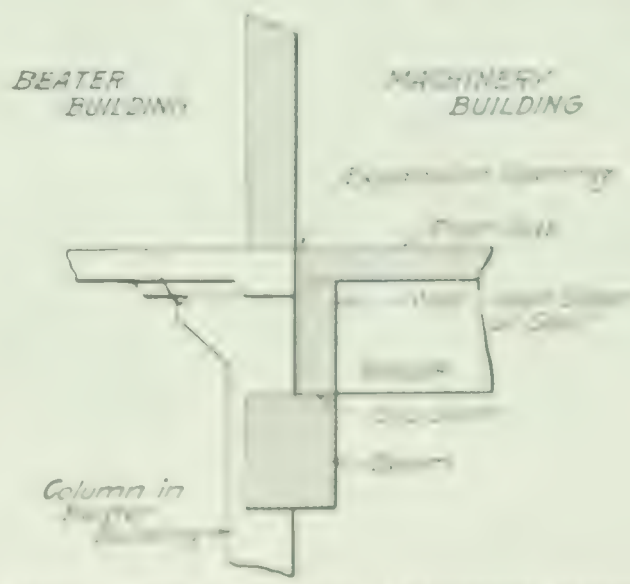
BEATER MACHINERY EXTENDS THROUGH SECOND FLOOR

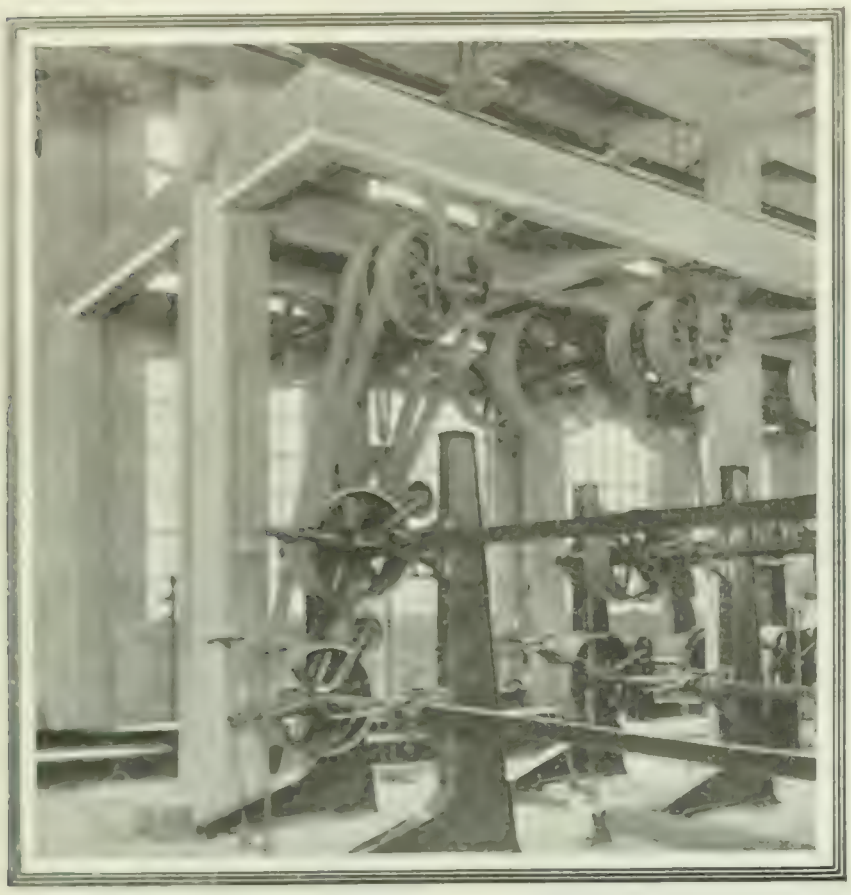
A VERY soft subsoil and a complicated machinery layout were the controlling factors in the design of the paper-manufacturing plant erected in Chicago during 1916-17 for the Chicago Mill and Lumber Co. The plant consists of a beater building, machinery building, warehouse, engine house and boiler room. The foundations under the different buildings of this one plant include concrete piers sunk to rock, concrete footings and a concrete mat. Cantilever girders and footings carry some of the columns (over soft ground, near adjacent buildings, and over a sewer), and a loading platform is carried in the same way. In one building the foundation piers are widely spaced, and alternate columns are carried by heavy girders supported upon these piers. Other notable features include the support of crane runways by brackets on the concrete columns, cantilever beams to support machinery, expansion joints between adjacent buildings, and self-supporting filter tanks formed by heavy girders between the foundation piers. Even steel structural features of special interest are included, in the shape of heavy shallow roof trusses whose bottom chords constitute runways for the cranes.

The beater building is 80 x 110 ft., with a basement and three stories. On the first floor are placed the beaters used to reduce paper and rags to pulp, and the basement is occupied by the drainers, stuff chests and tanks. The upper floors are for the storage of baled paper and rags.

The ground at the site of the building, which is adjacent to the Chicago River, is extremely soft, and it was necessary to carry the building on concrete piers built in open wells or caissons sunk to bedrock at about 60 ft. below the surface. In this building the columns are spaced 16 ft. c. to c. in one direction and 18 ft. in the other. It was found that one 4-ft. pier under every other column in the 16-ft. direction would carry the load satisfactorily.

It was also found that it would be cheaper to put in a girder between these caissons to carry the load of the intermediate columns than to sink additional caissons at these points. The basement-story column-load on the typical interior column is 392,000 lb. To carry this load on the center of a 32-ft. span, a girder 48 x 72 in. was provided, reinforced with 21 bars of 1-in. square steel,





CONCRETE CANTILEVER BEAMS CARRY SHAFTING

and stirrups, as shown. Each floor was designed for a live-load of 250 lb. per sq.ft., and one more story (to be added later) was provided for in the design.

The basement floor being considerably below the water level of the Chicago River, it was necessary to reinforce this floor to resist the upward pressure of the water. It was also necessary to take special precautions with the wall and basement-floor construction to insure an entirely waterproof construction. No waterproofing whatever was used in these floors and walls. The concrete, however, was carefully graded so that the voids were reduced to a minimum. Care was taken also to get a mixture of concrete with the correct amount of water, guarding against a very sloppy mix on one hand and a dry mix on the other.

Along the west end of this building a loading platform is provided, and as no satisfactory support could be obtained for the edge of this, owing to the poor quality of the soil, it was decided to cantilever from the foundation girders to carry the edge of this platform. This is shown in one of the foundation drawings. Both in this building and in the machinery building concrete brackets are provided on the sides of certain columns to support the crane-runway girders.

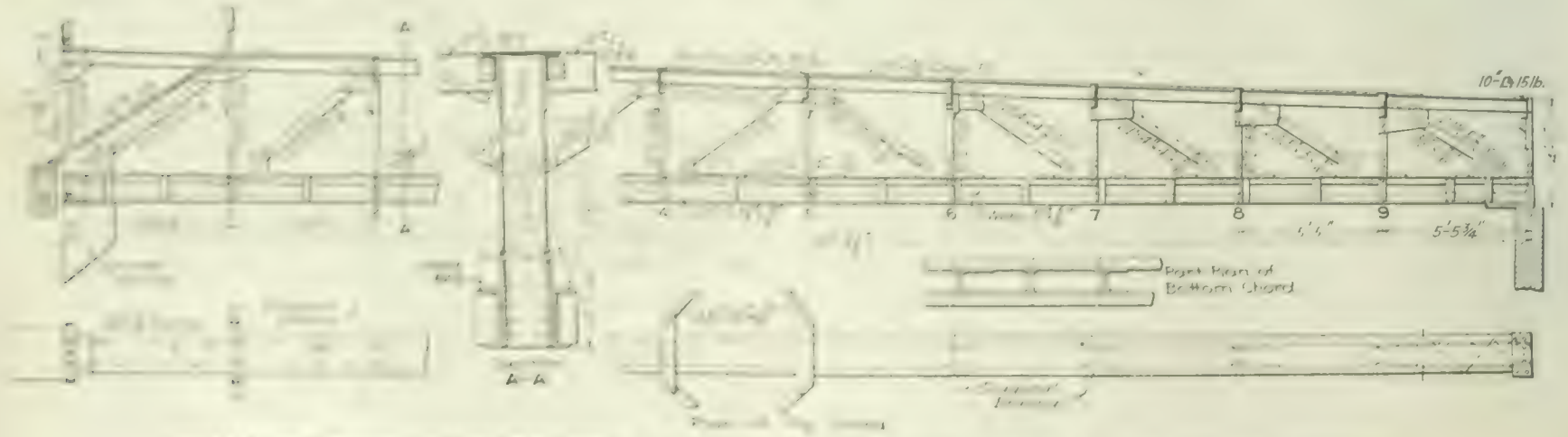
The first floor of this building, which is occupied by the beaters, is of beam-and-girder construction, and the walls of the drainers and stuff chests in the basement are in some cases used to support this slab. The upper floors are all cantilever flat-slab construction, as will be seen by the illustrations.

The machinery building is 257 x 44 ft. It has a basement and three stories and is designed for a future extension and an additional story. The basement is occupied by a filter plant and by a "save all," which is a tank to catch the pulp dripping from the paper machinery above. Here, as in the beater building, it was necessary to reinforce the basement floor against upward water pressure. The main paper machinery rests on the first floor. A portion of this extends through the second floor, which is open at this part of the room. The upper stories are used for the storage of baled paper and other raw material.

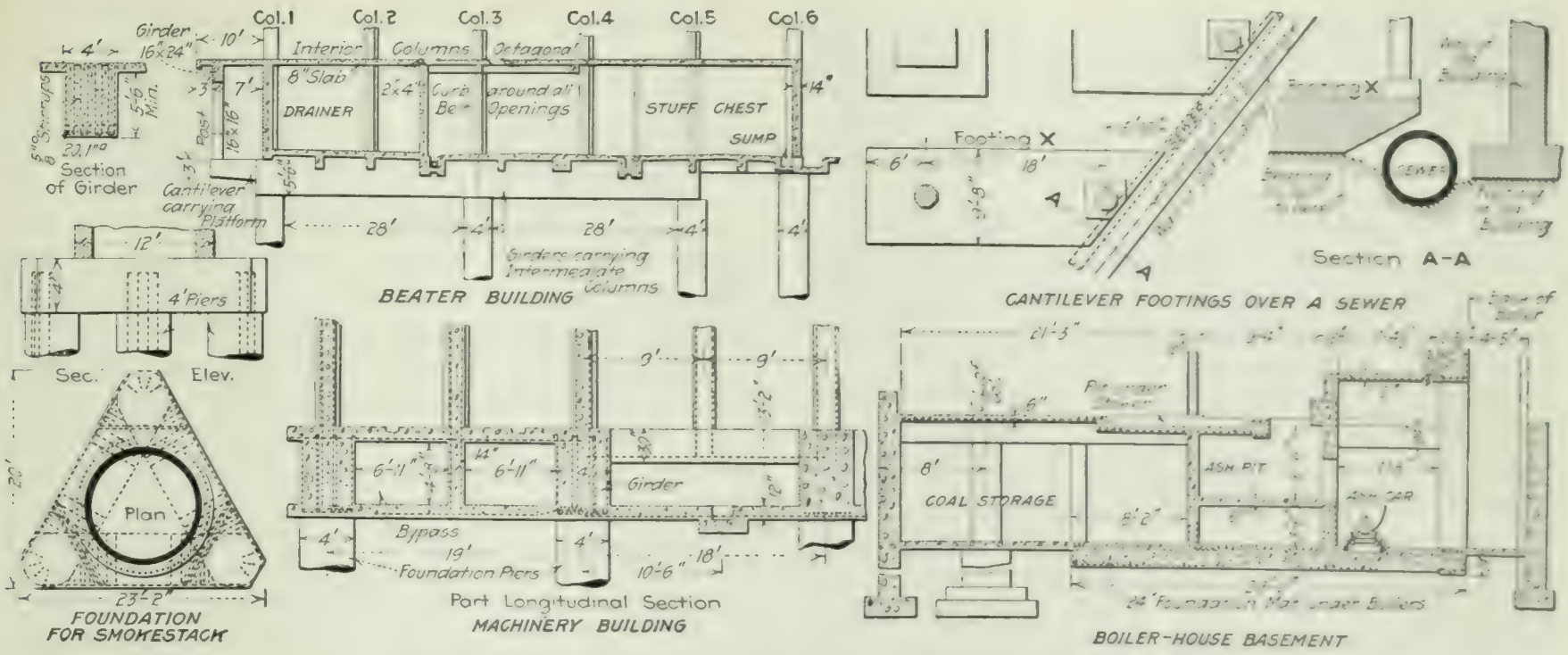
This entire structure is carried on concrete-pier foundations, and on account of the soft nature of the soil it was deemed advisable to build up the filters as self-supporting structures, not relying on the ground to carry them. Accordingly, concrete girders were placed on top of the caissons, and the walls of the filters were designed as beams to carry the load to these girders. These girders are 48 x 80 in., and those which are typical under the filters are reinforced with 25 bars 1 in. square. The filter bottoms spanning between these girders consist of 12-in. concrete slabs reinforced in one direction with $\frac{3}{4}$-in. rounds, placed 6 in. c. to c. The filter walls are 14 in. in thickness, reinforced in each side, provision being made in this way to allow of alternate filters being full and empty. The foundations for the paper machinery are carried on similar girders of about the same size.

An interesting detail is the use of cantilever beams to carry certain shafting and pulleys in this building. The upper floors of the buildings are all beam-and-girder construction, the main span being 31 ft. On account of this long span and the heavy floor load, the beams were unusually large.

The warehouse building abuts on the east end against an existing storage warehouse. The footings of the latter extend out beyond its walls, and immediately to the west of this footing a large sewer had been built. The wall of this existing warehouse had not been prepared for any future extension, so that the new structure had to be entirely independent. It was decided, therefore, to place the first of the columns approximately 4 ft. away from the face of the wall. Owing to the position of the sewer, it was impossible to obtain any bearing on the soil nearer than a point 7 ft. from the wall of the existing building.



[illegible] ROOF TRUSSES MADE HEAVY ENOUGH TO CARRY TRAVELING CRANES



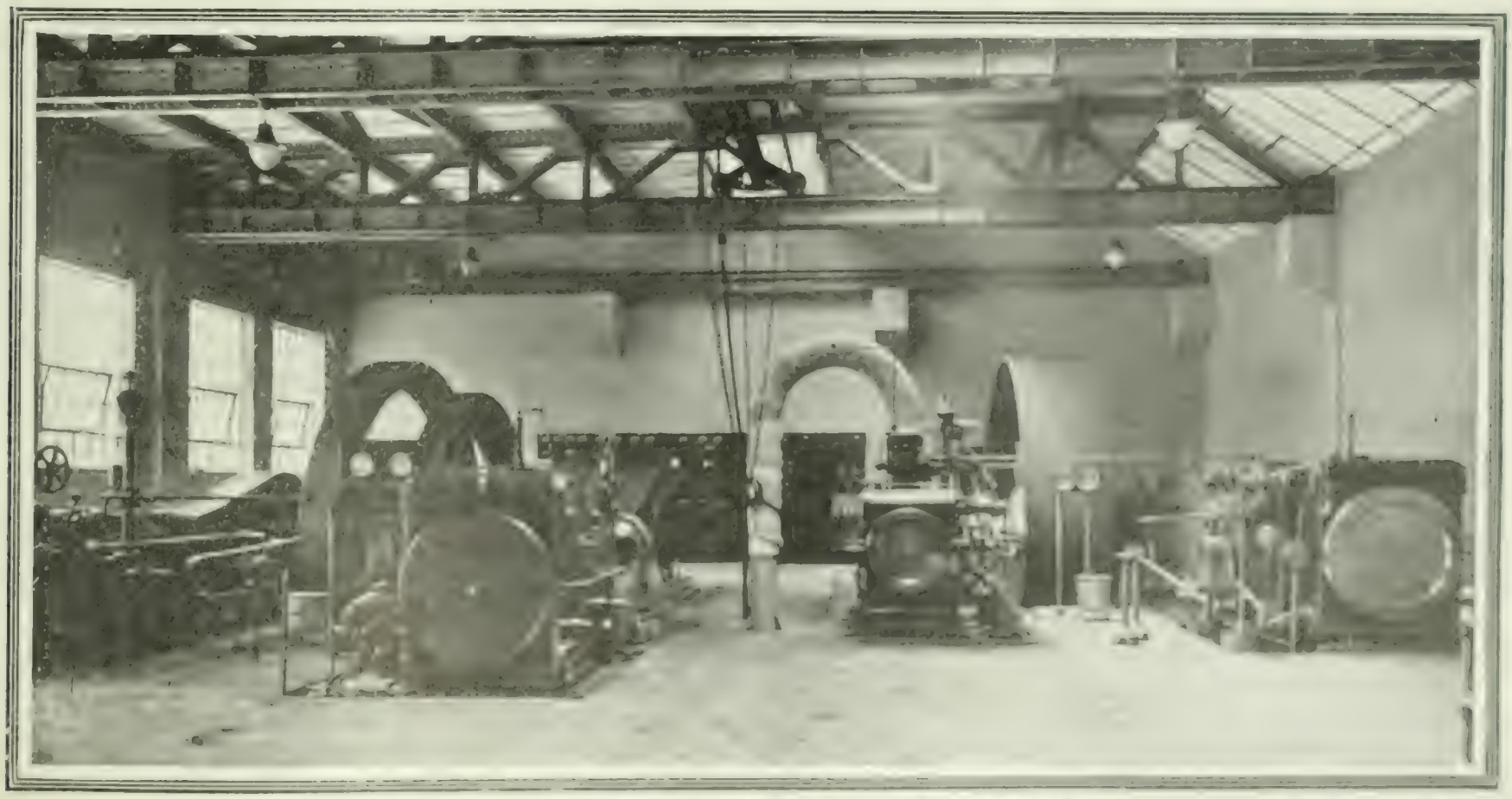
FOUNDATION DETAILS VARY IN DIFFERENT BUILDINGS

The method of construction used for these cantilever footings is shown in the illustrations. It will be noted that the columns adjacent to the old building overhang the point where the foundation bears on the ground by approximately 3½ ft. The first floor of this building is designed for a load of 400 lb. per sq.ft. and the others for 250 lb. All are of the cantilever flat-slab type.

The over-all length of this plant is approximately 450 ft. The machinery building has one end abutting against the beater building, while its other end overlaps one side of the warehouse. The adjacent beater and machinery buildings are carried on caisson foundations, while the warehouse is on spread footings. It was decided, therefore, that an expansion joint would have to be provided between the beater building and the machinery building, and another between the machinery building and the warehouse. The detail of this expansion joint on the former of the buildings is shown.

At the junction of the machinery building and the warehouse it was not possible to use an expansion joint of the type shown, as settlement would undoubtedly take place in the latter building. Accordingly, the corner of the warehouse is cantilevered out to form a connection to the machinery building in a manner similar to that used at the east end of the building where it abuts on the old warehouse, as previously described.

In order to obtain light and ventilation in the portion of the machinery building adjacent to the engine room, the height available for these roof trusses was limited to 5 ft. 9 in., while the trusses were 55 ft. in length. It was also necessary to provide for carrying 5-ton traveling cranes on the bottom chords of these trusses, and consequently it was not possible to insert any horizontal bracing at the bottom chords. The vertical members of the trusses, therefore, were designed to take bending, and knee braces were provided to resist this twist.



STEEL ROOF TRUSSES CARRY TRAVELING CRANES

These vertical members consist of 10-in., 15-lb. channels set with the web normal to the truss span. It will be seen from the drawing that the centers of the crane rails are 10 in. from the center of the truss. The reaction from the crane wheels at these points is 14,000 pounds.

All the engines are carried on massive concrete foundations resting on caissons again carried to bedrock. The roof of this building is of steel trusses carrying gypsum tiles placed between T-irons and covered with a 2-in. cork insulation.

The boilers are carried on the first floor, of reinforced-concrete construction. The basement of this building is occupied by coal storage, ashpits and an ash-disposal track. A mattress foundation of reinforced concrete, approximately 21 in. thick, was used over the entire area occupied by the boilers. Columns at the back end of the boilers and others under the stokers, and the ashpit walls, carry the weight of the boilers and other equipment to this foundation. The mattress foundation resulted in a pressure on the soil of a little over one ton per square foot and proved more economical than a caisson construction. This foundation is shown in one of the drawings.

To provide for a large increase in capacity the three main buildings were designed for one additional story. The beater building, machinery building and boiler room were also designed for extension of area.

In preparing the column designs for these structures, careful comparative cost estimates were made covering the use of 1:1:2 and 1:2:4 concrete. It was found that in spite of the high cost of cement, the richer concrete would be more economical, while its use resulted in smaller columns.

The architect was Louis Guenzel, and the mechanical equipment was designed by James L. Carey. The buildings were designed by the Concrete-Steel Products Co. and were built by the Mueller Construction Co. All these are of Chicago.

Plastic Cement Resists Locomotive Blast

PLASTIC MATERIAL to protect the undersides of bridge floors from the blasts and gases from the smokestacks of locomotives is being tested on the Atchison, Topeka & Santa Fe Ry., as a substitute for the hard and dense materials usually used for this purpose. The material is Toch Bros. self-healing bridge cement, which has been used especially for the waterproofing of bridge decks. It gets its name from the fact that if the coating is cut or torn the cut is closed or sealed automatically by the flow or creeping of the cement. It is a viscous material that does not harden. It will not flow in hot weather and retains its elasticity even at very low temperatures. A coat of this material is brushed upon the concrete or other surface for a suitable width over the center of the track. It is not affected by the heat of the exhaust, and sparks and cinders become embedded in it. When this coat is well filled, a second application is made on the rough surface, the operation being repeated until a coating about 1-in. thick has been built up.

This form of blast protection was devised by A. F. Robinson, bridge engineer of the Atchison, Topeka & Santa Fe Railway.

Road Maintenance Is Receiving Attention in Wisconsin

Local Authorities Realize That Maintenance Must Supplement Construction—Neglect Means Roads Damaged and Money Wasted

RECOGNITION of the principle that road maintenance is essential to the permanent efficiency and economy of a good-roads system is urged emphatically in the latest biennial report of the Wisconsin Highway Commission. Neglect of road maintenance by local authorities after the expenditure of considerable money in construction has been a general and costly practice in this and other states. There is a gradual change to better conditions, but the rate of progress is slow.

State Supervision of Maintenance Needed

Under the Wisconsin state-aid law roads constructed according to its provisions must be maintained by and at the expense of the counties. Originally, this applied only to roads that had been surfaced, but in 1915 the law was amended to provide that earth roads built with county and state funds must also be maintained by the counties. This change was made on account of the neglect of the latter class of roads by the county authorities, so that in many cases the state-aid earth roads were in bad condition.

Unfortunately, there is no sufficient control of this situation. The highway commission has only very indefinite authority over road maintenance, this being exercised under provisions which give it general supervision over the construction and maintenance of all roads and bridges built under the state-aid law. It is true that the commission may refuse to allot further funds to a county which does not maintain the state highways adequately. This power has not been employed, however, as in most cases it would tend to penalize towns which have no direct control over maintenance.

Bad condition of roads due to neglected maintenance has led to complaint as to material and construction. The report states that virtually all of the criticisms of the maintenance of state highways have been caused by the fact that many of the stone and gravel macadam roads have not been kept up by the counties, and have therefore deteriorated in a few years and sometimes in one season. In consequence, macadam and gravel construction has been criticised severely as unsuitable for Wisconsin roads, when, as a matter of fact, the type of construction has been in no way to blame for unsatisfactory results.

Lack of Maintenance Condemns Macadam

This dissatisfaction, however, has resulted in a demand for concrete or some other of the higher and more expensive classes of road surfacing. The commission points out that while such surfacing may be desirable and economical on certain main lines of travel, the state cannot afford to apply it to the entire system of state highways. For the greater part of this system, and for all roads of a secondary character, the surfacing must be largely of stone, gravel or other material that is available locally.

Roads of stone and gravel construction were virtually unknown in Wisconsin when the state-aid law went into operation in 1911. In the work started under this law the stone-macadam cost over $3500 and the gravel-macadam over $2500 per mile. The people of the local communities conceived the idea that roads built at such cost would be permanent and would require no maintenance.

That maintenance of roads of this type should be commenced as soon as the roads were built has been urged by the Highway Commission consistently and from the outset. It has pointed out also that in many cases the first year of the road's life is the critical time. In spite of this, the county authorities continued to build the roads and neglected to make any provision for their maintenance. The roads suffered deterioration, therefore, and the report states that some of them were almost destroyed, at least so far as the surface was concerned.

When this condition of cause and effect became evident to the communities and the local authorities, they began to heed the advice of the commission, and in 1914 maintenance with surface treatment was commenced on a small scale. In 1916, a majority of the counties took up the problem energetically, and made rapid progress with the repairs that had become necessary. The maintenance consists generally in surface treatment with tar or asphaltic oil, a cushion coat of bituminous material and sand or stone chips being placed on the old gravel or stone. This has been successful in most counties. It is estimated that as the result of the commission's continued campaign of education fully 66% of all the macadam roads built in the state within the past five years received surface treatment during 1916.

The report points out that in the matter of maintenance, as in other features of highway development, the general public as well as the county officials have had to be educated. Furthermore, the repeated efforts of the commission in such education went unheeded until it was almost too late to remedy the fault. The mischief is not undone entirely, for the public bears in mind roads that virtually went to pieces. Therefore, it has still blamed the original construction, failing to realize that the good roads they have now are of similar construction but are kept in good condition by regular maintenance. On the other hand, where the badly neglected roads have been well repaired, the people of a county appreciate at once the improved conditions and demand proper maintenance.

Maintenance methods in use in Wisconsin are still crude, says the commission, in spite of the great improvements effected. The patrol system is recommended as a further step in advance, and the report advocates its introduction in every county. Under this plan, the system of surfaced roads would be divided into sections, each with a patrolman to attend to ruts, holes, raveling, washed ditches, etc., as soon as they occur.

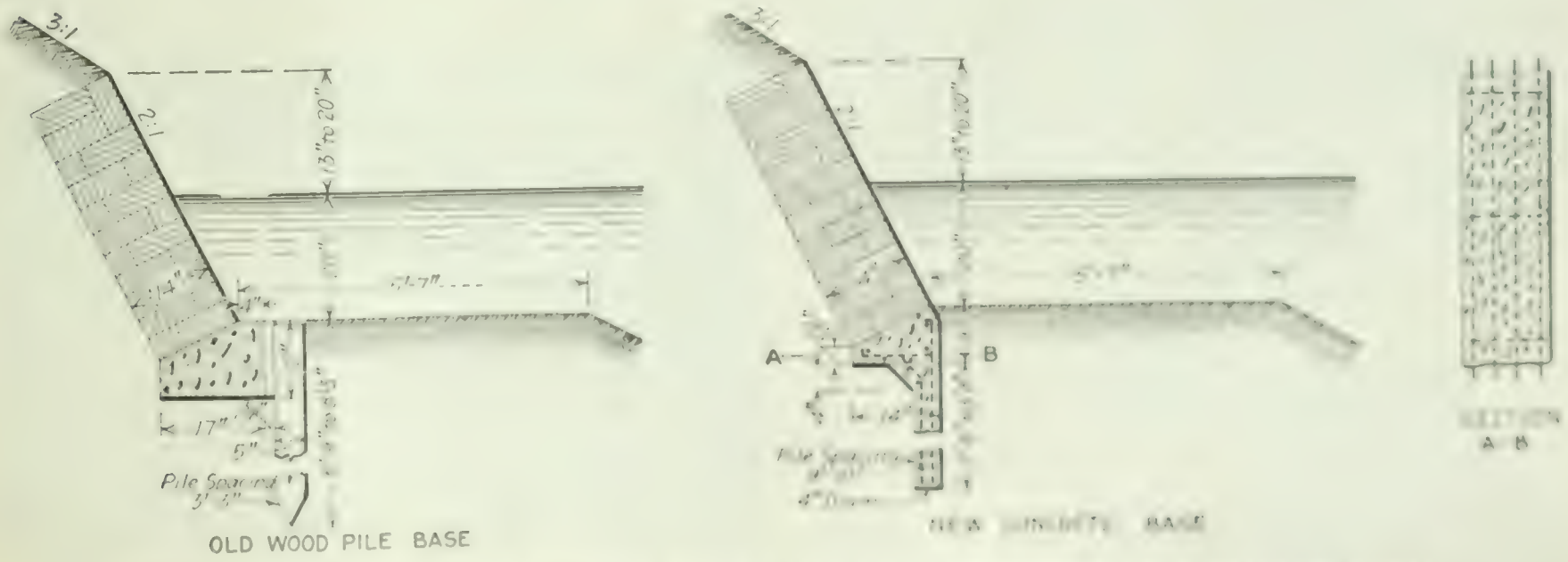
It is considered that complaint as to the macadam roads will disappear almost entirely if the following three steps are taken: Arranging for patching surface defects with bitumen and stone as soon as possible each spring; giving a surface treatment of tar and asphalt during the early part of the summer; and placing on each section a patrolman to care for the roads during the remainder of the season.

The report closes with the following sentence: "If some such system of maintenance is not adopted, and the counties continue to build stone and gravel roads and then allow them to care for themselves for years, it is absolutely true that these types are entirely unavailable for use under modern traffic conditions."

J. G. D. Mack is chief engineer of the state, and A. R. Hirst is state highway engineer.

Reinforced-Concrete Sill Foundation for Brick Bank Protection

THE old bank protection of one of the shallow French canals comprised a 14-in. brick wall set in the 1:2 slope of the bank and resting on a concrete sill. This sill was held against horizontal displacement by continuous wood planks, backing in their turn against 5-in. wooden piles spaced about 3 ft. 3 in. on center, all according to the detail shown in the left-hand drawing of the two shown. Although a considerable length of such construction had been put in, it was found to be impracticable, because the wood soon rotted out during the periods before the canal was watered or during the time when it was not in service.



OLD AND NEW METHODS OF HOLDING BRICK WALL BANK PROTECTION ON A SHALLOW CANAL

As an improvement on this detail, therefore, the engineers devised the one shown by the right-hand drawing; that is, they substituted for the combined concrete and wood sill a reinforced-concrete sill. This footing structure is made up of reinforced-concrete piles about 4 in. in diameter and from 2½ to 5½ ft. long, spaced somewhat over 9 ft., c. to c., and carrying a continuous sill which slopes on the side to the angle of the brick wall. The piles were made by boring a hole in the ground with a long-handled auger and filling this hole with concrete after the proper reinforcing rods had been placed. On top of each pile was a small rectangular head, cast at the time the pile hole was filled. After a stretch of these piles had set, the concrete sill itself was placed.

The bank protection has proved very successful and quite as cheap as the wooden ones formerly used. It is described in the May-June *Annales des Ponts et Chaussées*.

Council-Commission Government Rules Jacksonville

THE latest experiment in municipal government is being conducted at Jacksonville, Fla. One morning Jacksonville was being governed by a city council, a board of trustees for water-works and improvements bonds (which included a committee on public works, a board of health and an election commission) and a port commission. Twenty-four hours later the citizens awoke to read that on the previous day both branches of the Legislature, under suspension of the rules, had changed the city charter to provide for government by a council and a commission.

The new commission of five members has much the same function as a city manager under the commission-manager plan. It elects one of its members as chairman and he serves as mayor ex-officio. The councilmen, the commission itself and the city recorder, treasurer and judge are elected by popular vote, and all others are appointed by the commission, which also employs all laborers. The council affirms the appointment of library trustees, charity commissioners, city attorney and members of the police force, and appoints a special auditor annually. The commission frames the annual budget and its approval of all contracts and warrants is required to make them legally effective.

The present mayor and council will hold office until June, 1919. The council appointed the first commission, which took office July 3. Subsequent commissioners will be elected by popular vote for four-year terms. Each of the five commissioners will receive a salary of $5000 a year and must give a bond of $50,000. When the new plan goes into full effect there will be 18 councilmen, 11 elected one from each ward and 7 at large, each paid $240 a year.

Make Borings First

As a preliminary to the location of the Gilboa dam and the 18-mile Shandaken tunnel, for the development of the Schoharie watershed, part of the Catskill water-works for New York City, the Board of Water-Supply had made 350 borings, aggregating nearly 40,000 ft. in length. This information is from the board's annual report for 1916, just issued.

New Piggery in Topeka Utilizes Garbage

Steel Cans Are Transferred from Collecting Wagons to Motor Trucks for Delivery to Farm

OBEYING the conservation call to utilize municipal wastes, Topeka, Kan., is now turning its garbage into pork. Last spring a contractor under $5000 bond agreed to collect all garbage, including that which previously had been going to private scavengers, and to feed it to hogs outside the city limits. Daily collections are stipulated, except that from Nov. 15 to Apr. 1 bi-



GARBAGE CANS ARE WASHED EVERY DAY

weekly collections are to be made in the residential districts. There is no money consideration in the contract, but the city must prohibit private scavengers from taking the "fat" garbage from hotels and eating houses, and must enforce ordinances relating to the placing of individual cans in or near the alleys. The contractor must maintain a sanitary establishment and his collection system must not create a nuisance.

Although the operation of the piggery was begun as late as June, the collection methods have been systematized and perfected to such an extent that the complaints had been reduced to seven or eight daily from the 45,000 inhabitants when the plant was visited in August by a representative of *Engineering News-Record*. These complaints are largely from collections missed, the cans not being placed in conspicuous places.

Both the collection system and the piggery are in charge of a graduate of an agricultural school, who reformed the collection methods when he started the piggery. Definite routes for collectors, in conformance with the class of the district, have been laid out, so that a man always covers the same territory. In general, the routes are long, narrow strips starting either at the river or at Twentieth St., but ending so that they will be nearest to the existing crematory, where all loads are brought for transfer to motor trucks. By this arrangement the trucks can be operated continuously between the crematory and the piggery.

Six collectors, working from 7 a.m. to 4 p.m., are employed during the week. Their routes are charted on a map so that at any time the wagons may be located and checked up as to efficiency by the superintendent.

On Sundays two collectors cover the hotels, restaurants and drug stores, getting about 18 cans. The summer week-day collection amounts to 55 or 60 cans of 418 lb., average weight.

The 55-gal. steel can was adopted because it can be kept clean by washing, it is easily transferred from the wagons to the truck or to the loading platforms, and because the use of metal permits the exposure of only a minimum of garbage when the collections are being made. After return from the piggery the cans are washed every day at the crematory by the drivers and an extra man.

When loaded on the trucks the metal lids are removed and all the cans are covered with a canvas. This facilitates dumping at the farm and reduces the nonrunning time of the truck.

Six trips a day are made by the Smith Form-a-Truck to the piggery, which is 2½ miles from the crematory. Of this distance 1½ miles is over brick-paved streets within the city limits, and the remainder, with the exception of 300 yd., over a limestone rock-dust county road. It is planned to have the unimproved section paved before winter. Occasionally it is necessary, on account of repairs or heavy collections, to hire an additional truck to help out the 1½-ton truck on which are loaded eight or nine cans.

A herd of 800 hogs is now being fed at the piggery on a 15-acre tract, through which a railway track passes. Only grown hogs, six to nine months old, and thin, are fed. They are purchased in the open market at Kansas City. Immunization against cholera is practiced, the superintendent doing the vaccinating. Less than 10% of the usual loss has been sustained.

It is intended to fatten the hogs for market within four months. Only garbage is fed now, but the addition of corn to the ration, toward the end of the fattening period, is proposed. About 50 lb. per head of fatteners is fed, but this is considered entirely too liberal an amount. From the food-value standpoint 20 lb. are considered enough, particularly of the rich "Avenue" garbage. As the larger quantity is not all consumed, thin hogs, stockers, are turned in after the fatteners. Giving an example of the gain, the superintendent said that 85 hogs, weighing 115 lb. each, gained 75 lb. in a month, but further increase in weight is always slower. Refuse left on the feeding platforms amounts daily to two wagon loads. It is cleaned up each day, hauled to an unused part of the lot and plowed under.



WHEN GARBAGE CANS ARE FULLY LOADED, A CANVAS REPLACES THE INDIVIDUAL LIDS

At present three men are employed at the farm, one man cleaning floors, one hog man and one fence builder. Creolin is used to keep down the fly nuisance.

The concrete feeding platforms consist of two 6-in. plain concrete slabs 10 ft. wide and 190 ft. long, with a driveway 10 ft. wide between the platforms. Felt expansion joints, 1 in. wide, are placed 30 ft. apart. A 4-in. curb around the edges of the slabs prevents an excess of garbage from being pushed off to the ground. This fall a shed is to be built over the driveway and platforms, but as no breeding of hogs is intended, no elaborate pen system is planned. The seven different yards now connect directly with the platforms. The number of hogs maintained in each yard does not exceed two hundred.

Running water, from a spring at the upper end of the farm, is carried in troughs through each of the yards. To increase the capacity a well is to be drilled and a tank erected, from which water will be piped to the various pens for drinking and for washing the platforms.

Leroy L. Shoemaker is superintendent for the Mid-Continent Hog Co., of Denver, contractor for disposing of the garbage. W. L. Porter, commissioner of parks and public property, has charge of waste disposal for the city.

Incase Wood Trusses in Concrete To Resist Acid Fumes and Fire

CASING TIMBER roof trusses in cement to protect them against fire and acid fumes is a novel method employed recently in the buildings of a large oil refinery in Texas. Wood construction was adopted on account of the shortage of structural steel. After the trusses had been erected, each member was wrapped with a single layer of light waterproof building paper, placed close against the surface and fastened with carpet tacks. The object of this covering is to prevent any bond between the concrete and the wood and to protect the latter from the moisture used in applying the concrete casing.

Sheets of expanded metal with ½-in. diamond mesh were then cut and shaped to fit the members and fastened by No. 12 nails and special chairs stamped from flat-steel strips. These chairs kept the expanded metal ⅝ in. from the surface so that it would be embedded completely in the concrete.

Guide strips were tacked along the edges of the members to obtain the proper thickness of casing and to act as striking boards for the corner lines. With the work thus prepared, a 1½-in. coating of cement mortar or "guncrete" was applied with cement guns. These operated under an air pressure of 35 lb., supplied by two oil-driven compressors, each having a capacity of 250 cu.ft. per min. Before this coating had fully set, the guide strips were removed, and the surfaces left with an even finish.

The roof covering consists of a 1½-in. monolithic slab, built in place. Over the trusses and purlins was stretched a sheet of wire-mesh reinforcing secured by nails and chairs as noted above. Light wood panels

were then laid upon this and the concrete for the underside of the roof slab was shot in place by the cement gun. After about 24 hours the wood panels were removed.

The concrete surface was then cleaned with compressed air and water to secure good bonding for the top coating, which was placed in the same way. Finally a thin coating of hot asphalt paint was applied. This work was done by the Cement-Gun Construction Co., of Chicago.

SOCIETY SERVICE

A Section Dealing with the Results of Teamwork by Technical Men

New Columbus Club Gets Close to Business Men

MUTUAL STRENGTHENING of the Columbus Engineers' Club and the Chamber of Commerce, at Columbus, Ohio, resulting from an intimate relation between the two organizations, is considered by the chamber of sufficient value to justify its granting to the club the use of a small room for the club library, the occupancy of the chamber's auditorium whenever desired, and the use of a multigraph machine, an addressograph, and a folding machine with the services of an operator for these machines, together with stenographic facilities and the services of telephone operator. No payment is asked, and it is stipulated definitely that the chamber will not wish or expect to dictate the policy or any action of the club, but it intends to ask the club for advice on many questions of an engineering nature.

Other engineering societies have attempted to form close affiliations with business men's organizations, but none seems to have succeeded to so great an extent. Perhaps the objects of the Columbus club have in view more community service than have most other societies. The Columbus Society's objects are: "To advance scientific and engineering knowledge, to acquaint the public more completely with the importance and value of engineering work; to assist the officials of the city and civic organizations in public questions of an engineering or other nature as opportunity offers, and to promote acquaintance and fellowship among the technical men of Columbus and vicinity." The club represents the latest ideas in local society development; it was formed last spring after consultation with those who have been engaged most actively in promoting the "home service" idea. Its success is attested by the fact that its membership has already reached two hundred and fifty.

At the opening fall meeting, L. R. Lee, chief engineer of the E. W. Clark Co., gave an illustrated description of the process of designing the new power house of the Columbus Railway & Light Co. on Big Walnut Creek, south of the city. This introduced successfully an exchange of views on the subject among the members, who are a goodly mixture of university, city, state and corporation engineers.

C. P. Hoover gave a demonstration of water clarification and softening as practiced at the city plant. He dwelt on the probable new low typhoid record to be made this year (5 per 100,000, as against the highest rate in the country in 1908). To enable each engineer in the city to be a missionary among his laymen friends and talk intelligently of operation, he explained that when the water is clear but hard in the dry season, the treatment costs are five to ten times as high as when it is turbid and soft in flood stages. In like manner the savings effected by the use of alum pulp were explained.

City Council Fosters Engineers' Club

The Engineers' Club of Houston, Tex., is valued so highly by the city fathers that they are willing to turn over the council chamber, without charge, for the monthly meetings of the engineers. Beginning with the engineers in the city service, this organization, which is probably without counterpart in the country, has now a mailing list of 150 names. There are no dues and no constitution and no set objects. A chairman is chosen to preside for two meetings and J. C. McVea, assistant city engineer, takes upon himself the sending out of notices of meetings. At the end of a meeting the chairman appoints a committee to furnish a program for the next one. The hat is passed when more postage stamps and stationary are needed. The printing is done on the city multigraph. At the August meeting the subject of engineering education was discussed, and this led into discussion of compensation, status and other social and welfare subjects. The previous meeting had been given up to the question of joining the American Association of Engineers as a body. Differences of opinion in the matter developed, and the club concluded to continue its free, democratic existence.

Each year it is the custom to celebrate with a banquet the anniversary of some patriotic or historic occasion, such as the birth of Sam Houston or the declaration of Texas independence. The mayor acts as toastmaster, and prominent business men of the city are invited. Blueprint menus depicting historic events and characters and songs specially written help the engineers to fraternize with those who are doing things in this lively southwestern city.

The secretary of the American Association of Engineers made recently a tour of Eastern cities to learn the feasibility of an affiliation plan for local engineering clubs and societies. He reports that the officers of local organizations in Pittsburgh, Washington, Baltimore, Brooklyn, Boston, Cleveland and Detroit expressed general approval and support of such a plan. Definite written proposals were asked for. The secretary concludes that the increased demands for engineering service, due to the war, has brought a realization of a greater need than ever for engineering society activities, to handle the problems of national distribution of engineering services.

Oakland Dumps Garbage in Bay

Floating piles, chained end to end, confine the garbage of Oakland, Calif., to definite dumping areas of San Francisco Bay. Following a complaint the State Board of Health investigated the method and found no serious nuisance has been created so far, because the piles effectively prevent scattering of the garbage.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Asphalts at Louisville Cantonment

Sir—In the article on the Louisville cantonment which appeared in *Engineering News-Record* of Aug. 30, p. 412, it is stated that in the road constructed by the Bickel Asphalt Co. Bermudez and Mexican asphalts were used. This is an error. In a letter under date of Sept. 4, the Bickel Co. says: "It was this company's intention originally to use a mixture of 60% Trinidad and 40% Mexican, but after looking over the situation and seeing the enormous travel which these roadways would have to carry, we decided to use straight Trinidad."

You will observe that neither Bermudez nor Mexican was used in this work, but that it was all laid with Trinidad. A remarkable construction record was established on this work, the Bickel Co. completing 63,360 sq.yd. of pavement on concrete base in 63 working days. Considering the difficulties under which the work was done, this was a remarkable performance on the part of the contractor.

D. T. PIERCE,
Executive Assistant, Barber Asphalt Paving Co.
Philadelphia.

The Demand for Engineers

Sir—The undersigned was much interested in the letter signed "Electrical," contained in *Engineering News-Record* of Oct. 4, p. 658. He regrets that much of the letter is quite true and feels that the engineering profession as a whole is greatly responsible for the condition described. It has been the practice for large electrical manufacturing concerns to give obsolete equipment to technical schools, and by thus securing their good will obtain cheap labor for office and shop, by offering inducements to the graduate students. Although these men, through lack of practical experience, are not qualified to receive the pay of engineers, they should receive much better wages than is usually given them. Many of these young men become disgusted with the treatment accorded them, and become bitter enemies and successful competitors of their former employers.

A small proportion of the graduates thus obtained stick to the concerns but continue in most cases to draw very small salaries, as their employers know that each year will bring forth a fresh number of students to draw from. The fairly good positions are commonly filled by practical men who have had little technical training. Although in no sense engineers, they find no difficulty in hiring technical men to do engineering work at the wages of skilled labor. The great trouble with the engineering graduates is that it is often impossible for them to know the relative value of positions offered them. They are often the victims of employers who bleed them of technical information while making them believe they are virtually worthless because they lack practical experience. Although we engineers are insisting on good character, etc., the early practical experience of many students tends to discourage the growth of such qualities. There is certainly a much greater demand for technical high school students than for those having a more extensive training. The present war may provide openings for many who otherwise would have to take up other kinds of work.

The writer does not wish to minimize the importance of a first-class technical education, as it is becoming recognized that the engineers are the leaders of the world of today. He does wish, however, that the technical students should receive correct advice, fair play; and that the various publications of the large engineering societies would stop printing advertisements asking for engineers at low salaries. The general public should be educated in placing the engineer in the station which is rightfully his.

CONSULTING ENGINEER.

Rapid Stadia Survey Costs

Sir—The cost data given by L. R. Howson in his article entitled "Rapid Stadia Surveys Cover 50,000 Acres," in your issue of Sept. 27, p. 606, would, I fear, prove a snare for anyone who should contract to produce a map for the same prices. Will not Mr. Howson give us more detail in regard to his work, such as what was shown on the map from an average of less than 1½ stadia "shots" per acre—and just what is included in his total costs of 10.8, 8.07, and 17.35c. per acre?

A few years ago the writer completed a survey of about 5000 acres of rough country, partly cleared and partly wooded, including two villages and many farms, taking contours at 5-ft. intervals throughout. His total cost per acre for wages of field parties and draftsmen was 52.3c., but other expenses, properly charged, raised the total to $1.769.

In the published article, should we not have a substantial addition to the given costs for depreciation and maintenance of three automobiles, depreciation or rental of instruments, supervision by principal assistant and resident engineers, transportation and subsistence of field men, and perhaps other items?

Brookline, Mass. FRED J. WOOD.

[A copy of the letter was sent to Mr. Howson, and his reply follows.]

Sir—The costs given in my article entitled "Rapid Stadia Surveys Cover 50,000 Acres" cover field costs only. The field costs, however, include the salaries of the men in the field and the field draftsmen, a part of the salary of resident engineer, which was chargeable to the surveys, the cost of subsistence of the parties, transportation, general supplies and the maintenance of all equipment, including automobiles. The costs did not include any allowance for the general supervision of the chief engineers, which, on account of the nature of the work, was small, nor for the fixed charges on instruments or automobiles. The complete data for one of the automobiles was given on p. 518 of *Engineering News-Record* of Sept. 13.

The field draftsman prepared a map on detail paper only; this was later traced in the office and the cost not included in the tables of the article. The maps showed fence lines, culverts, buildings, roads, woods, etc.; also traverse lines and contours at 5-ft. intervals. Shots were taken at all changes in slope, and where the slope

were uniform over large areas, they were taken at 200- to 300-ft. intervals. One shot per acre is equivalent to an average spacing of readings of 208-ft.

Mr. Wood refers to his cost of 52.3c. per acre for a 5000-acre survey "of rough country, partly cleared and partly wooded, including two villages and many farms." This may not be out of line with the Columbus survey costs, for the surveys of the Delaware and Flint reservoirs, which are of adjoining areas, varied more than 100% in cost, due to topography and the size of reservoirs surveyed. The first 5000 acres of any large survey will invariably cost very much more than the average (all other factors being the same), on account of the cost of organization, the breaking in of the party, time spent in arranging transportation, sustenance, etc. The cost of the first 5000 acres surveyed for the Dublin reservoir at Columbus cost nearly double the average cost for the 18,000 acres. The cost per acre will also vary directly with the roughness of the topography, which was the principal reason for the comparison of the three surveys at Columbus along the lines set out in the weekly reports, one of which is reproduced in my article.

L. R. HOWSON.

Chicago.

Should Projection of Piles Into Concrete Be Limited?

Sir—Specifications for substructures often contain a clause similar to the following:

"The tops of the piles shall project not less than 12 in. or more than 18 in. into the concrete after all damaged wood has been cut off."

A bridge now under construction in Illinois will rest on piles driven 5 to 8 ft. through soft mud down to a hard stratum on which the piles bring up short. To give steadiness to the piles under these conditions the engineer will fix the cutoff about 6 ft. above the bottom of the abutment, so that the piles will be gripped firmly by the concrete. There is ample precedent for letting piles project far up into the concrete for obtaining a thorough anchorage effect, but under the specification clause above quoted this construction would appear to be ruled out.

The question arises whether such a clause should be qualified by excepting special cases, or whether it may be omitted without disadvantage.

CONSTRUCTOR.

Areas of Segments of Circles

Sir—Referring to the article entitled "Table Gives Areas of Segments of Circles" which appeared in the Sept. 6 issue of *Engineering News-Record*, p. 470, I beg to bring to your attention that in problems of this kind the cumbersome, exact formulas can always be transformed and simplified so as to yield expressions which are simple as to form and application and which can be made as accurate as the requirements of the work demand.

Such simplification can be effected by the use of MacLaurin's or Taylor's series. For example, in the present case the expression for the area of the segment is evidently

$$A = r^2 \sin^{-1}\frac{\sqrt{2rh - h^2}}{r} - (r - h)\sqrt{2rh - h^2}$$

in which

$$\theta = \sin^{-1}\frac{\sqrt{2rh - h^2}}{r}$$

$$Sin\ \theta = \frac{\sqrt{2rh - h^2}}{r} \text{ and } \cos\theta = \frac{r - h}{r}$$

Hence the expression becomes

$$A = r^2 \sin^{-1}\frac{\sqrt{2rh - h^2}}{r} - (r - h)\sqrt{2rh - h^2}$$

The anti-trigonometric term here is difficult to evaluate. However, this term can be expanded in terms of h and r by the use of MacLaurin's series, a discussion of which can be found in any standard textbook on the differential calculus and a brief reference to which appears on pages 1148-1149 of the American Civil Engineer's Pocket Book. (Second edition).

Briefly, MacLaurin's series is a device whereby a function may be evaluated in terms of its argument and the known value of itself and its derivatives at some given point. Its usefulness lies in the fact that by means of it any expression containing an awkward trigonometric, anti-trigonometric, logarithmic, or exponential (that is, any transcendental) term can be transformed into a new expression containing only simple algebraic terms. In general it is possible to regulate the character of the resultant expression; that is, its form can be chosen so as to be in accord with the method of computation to be used.

When it is considered how frequently in engineering, especially in water-power investigations (surge tank, penstock, etc.) complex transcendental expressions are met with the usefulness of this method will be appreciated. Many such involved expressions which, though correct, have had to be discarded in favor of less accurate but simpler expressions, because of the impossibility of making use of them in their existing cumbersome form can, by the use of MacLaurin's (or Taylor's) series, be transformed into practicable shape.

Reverting to the present case we have, letting

$$\frac{\sqrt{2rh - h^2}}{r} = x,$$

$$Sin^{-1}\frac{\sqrt{2rh - h^2}}{r} = \sin^{-1} x$$

which, expanded by MacLaurin's series, becomes

$$\sin^{-1} x = x + \frac{x^3}{6} + \frac{3x^5}{40} + \frac{5x^7}{112} + \dots$$

Substituting this value of $\sin^{-1} x$, and for x its value $\frac{\sqrt{2rh - h^2}}{r}$ in the original expression for the area of the segment, we obtain

$$A = h(2rh - h^2)^{\frac{1}{2}} + \frac{(2rh - h^2)^{\frac{3}{2}}}{6r} + \frac{3(2rh - h^2)^{\frac{5}{2}}}{40r^2} + \frac{5(2rh - h^2)^{\frac{7}{2}}}{112r^3} + \dots$$

This expression can be still further simplified by expanding the terms $(2rh - h^2)^{\frac{1}{2}}$, $(2rh - h^2)^{\frac{3}{2}}$, etc., so that we obtain finally:

$$A = r^2\left[\frac{4}{3}\left(\frac{h}{r}\right)^{\frac{3}{2}} + \frac{2}{5}\left(\frac{h}{r}\right)^{\frac{5}{2}} + \frac{2}{7}\left(\frac{h}{r}\right)^{\frac{7}{2}} + \dots \text{etc.}\right]$$

This expression is simple in form and convenient for either slide-rule or logarithmic computation. It is a simple power series of h r.

Testing this expression as to its agreement with the values of the table, we have for $h/r = \frac{1}{2}$,

$$A = r^2\left[\frac{2}{3} - \frac{1}{20} - \frac{1}{448}\right] = 0.6144r^2$$

which is only 0.03% in error.

For the extreme case of the semicircular segment, that is, $h/r = 1$, we have

$$A = r^2 \cdot 2\left[\frac{4}{3} - \frac{1}{5} - \frac{1}{56}\right] = 1.578r^2$$

which is 0.6% in error.

Closer agreement could have been obtained by adding a fourth term to the expansion, in fact any desired degree of accuracy can be arrived at in this way. All terms beyond the first two are very small as compared to the total value so that these terms can always be computed by slide-rule with a sufficient degree of accuracy. For $h/r < \frac{1}{4}$ only the first two need be used.

Mathematical handbooks, as well as engineering handbooks, give the expansions by MacLaurin's series of the more common expressions, such as sin x, log x, arc sin x, e^x, etc. In making expansions by MacLaurin's series it is of course necessary to choose such a form as will yield precise results within a few terms. The resultant expression can always be tested as to its correctness by noting its agreement with known terminal values (in this case $h/r = 0$ and $h/r = 1$).

Brooklyn. LEOPOLD PISTNER.

Give Bidders Complete Information When Advertising Contracts

Sir—On page 91 of your Searchlight Section of Sept. 6 appears an advertisement for the proposals of contractors on a bridge in Columbus, Ohio. We feel like calling attention to this advertisement. You will note that this states the length of the bridge and its width. It gives enough information about the design and the quantity of material required so that the contractor would know without sending for the plans whether or not it is within his capacity.

This is a very sharp contrast to a great majority of advertisements, particularly on Government work, which often give scarcely any idea of the magnitude of the work involved. We believe that suitable contractors are much more apt to investigate such work and become interested than would be the case where this information is not given. WILLIAM H. ADAMS,

Adams & Cummins, Consulting Engineers.

Detroit, Mich.

Objects to Extra Work Payment Clause in Miami Specifications

Sir—The "extra work" clause in the specifications of the Miami Conservancy District of Ohio, A. E. Morgan, chief engineer, is an excellently worded piece of work. There is one point to which exception can be taken, as follows: The "Conservancy District" takes for its use and benefit the following expenditures of the contractor, without pay: (1) Overhead charges, (2) general superintendence, (3) general expenses, (4) contingencies, (5) depreciation of, wear and tear upon plant, (6) maintenance of contractor's camp, except in case such camp is maintained primarily for extra work.

This discussion is based on the assumption that the 10% or 15% extra paid to the contractor is paid for the benefit derived by the owner from the use of the contractor's personal time and his business, engineering and executive abilities, knowledge and experience, to organize a construction force, to buy materials; through the use of his financial credit and capital, and his being the agency through which the desired work is constructed. The existence of a contract between the parties is conclusive evidence that these are the things which the owner or engineer desires from the contractor and for which the latter is paid. Items 1 to 6 are outside this range of activity fully as much as is the manual labor itself entering into the extra work.

Engineers who, as contractors, have made expenditures under these five items, and by accurate bookkeeping have charged to the extra work its proper expense, will realize that the small residue left of the 10% or 15% remuneration may not be an adequate payment for undertaking the extra work. Why should an engineer saddle upon a contractor the unknown and unlimited "contingencies?" Why should an engineer take and use and wear out a contractor's plant free of cost? Let him pay in an open and above-board manner for services rendered as such, and not make a contractor's pay a speculation as to whether the 10% or 15% will be an actual loss or an adequate remuneration for all the contractor's services.

The elimination of all possible uncertainty of expense to a contractor will redound to the benefit of the owner by a lowering of contract prices. Many a bid contains prices raised to cover the unknown charges which experience has taught contractors will ensue from the otherwise unpaid expense of doing extra work.

It is clauses like the one in question which cause some contractors to feel that the engineer is legitimate prey to be overcome by any and all means. It is not good business for an engineer to write a code of ethics and pose as an altruistic judge between owner and contractor, when he voluntarily becomes the owner's servant and writes into a contract a clause which throws concealed and variable charges upon the contractor.

Chicago. VICTOR WINDETT.

Macadam Roads in the War Zone

Sir—Like others, I was much interested in the article of William J. Weir on war roads, appearing in your issue of Sept. 13. Also, I have been interested in the correspondence of the concrete propagandists appearing in subsequent issues; particularly their panic at the thought that someone should be found to say a good word for macadam.

As the author has pointed out, the war road must be capable of being built quickly and possibly under the conditions of traffic, and it must be maintained under traffic; the availability of local materials is important; and, lastly, the temporary use, incident to war, favors road types of low first cost. The problem is to secure and to maintain a usable road as quickly and as cheaply as possible.

If the engineer corps were wise enough to know where a battle would be fought a year in advance, and if they

could be assured that the battle would continue and remain in one locality through a term of years, then it would be possible to lay some of the more expensive road types with assurance that the money would be well invested.

CHARLES B. BURDICK,
Of Alvord & Burdick, Engineers.
Chicago.

Sir—To the choice, by French engineers, of macadam for their network of roads, you refer in your editorial on William J. Weir's article as a "reversion" to an early type—a reversion necessitated by war conditions or necessitated when the roads were planned originally by a possibility of war. Rather than a "reversion," is it not the "persistence" of the type in its proper place?

The friends of macadam among road engineers—and from the prevalence of macadam throughout the country it seems their number is legion—will draw two conclusions from Mr. Weir's article, and the lesson should be impressed on all road builders: First, the "repairability" of macadam; it can be repaired, and well repaired, for Mr. Weir found the heaviest traveled roads "to all purposes as good as new." Second, the choice of this type made possible the comprehensive network that French engineers felt called upon to provide, and wisely did provide, in order that, wherever the clash came, not only one road would be found, but that "between two points several routes may be selected." Mr. Weir's graphic description makes the necessity for several routes very apparent.

And French engineers did choose macadam; they did not revert to it, but persisted in it, and to such an extent that "outside of villages and cities none of our so-called permanent types was encountered." How far this choice was dictated by the necessities of a probable war only the French engineers can tell, but that feature of the road problem—supplying as much mileage as possible—is presented to our engineers as well as to those of France, less for actual military operations, let us hope, than, in much greater degree, to develop the productive capacity of the land.

The actual cost of this maintenance, not in total expenditures under these abnormal conditions, but in cubic yards of materials and days of labor, would throw considerable light on costs per ton-mile, and I wish to express the hope that such figures can be obtained. Doubtless, the macadam roads of France have made good in peace times and when we learn from Mr. Weir that under the extraordinary conditions which he so ably describes they are still repairable, his conclusion that the French road system planned for just the present conditions has made good is fully warranted.

R. W. SCHERER,
Secretary, Wisconsin Crushed Stone Association.
Milwaukee.

Iron Pile Survives Long Submergence

Sir—In *Engineering News-Record* of Oct. 18, p. 759, there is a description of an iron pile that survived a quarter of a century submerged. The article said incidentally that the pile, "although neglected for years in a tropical climate, was remarkably free from corrosion when removed."

The writer has observed during many years' experience in tropical climates that iron and steel, when not in contact with the earth, remain remarkably free from corrosion. This is especially so in the Amazon Valley. On the Madeira-Mamore Railroad it was noted that the rails (probably iron), manufactured in Belgium in the early 60's of the past century, as well as machinery and locomotives, were remarkably free from corrosion even where overgrown with vines and brush after a period of more than forty years. The rails still showed the furnace scale on the web. Some rails that were lying on the rock bottom of the river, submerged half of the year, and exposed to the air the other half, showed very little corrosion.

HARVEY C. MILLER,
Chief Engineer, American International Railways Corporation.
Newark, N. J.

"Best Buy" in Pavements

Sir—Referring to the discussion in your columns as to who shall decide what materials to use in street paving: In Indiana the Board of Public Works, acting presumably, but not necessarily, under the advice of the engineer, makes choice of material, but this decision may be overturned by petition of the majority of the property owners residing on the street. This gives opportunity for fine work on the part of the gentlemanly salesmen for the various materials and personal solicitation is the order of the day (and night).

Signatures must be dated, giving also the hour and minute, and the last one "before the polls close" is the one that counts. A recent letting is typical of the way it works. A certain property owner on Apr. 8 at 8:35 p.m. signed for brick; on Apr. 12 at 1:25 p.m. he signed for asphalt; Apr. 15 at 9 a.m. for concrete and on Apr. 17 at 10:15 p.m. he obligingly got out of bed to sign again for asphalt before the close of the period.

In like manner nearly all the property owners signed from two to four petitions for different materials on this same street. As can be seen readily, this procedure secures to the citizen the privilege of changing his mind early and often, whether or not the final result is good for the street.

F. R. C.

Sir—I have read with interest both the article on page 592 of your issue of Sept. 27, and the comments by H. F. Hopkins of Pittsburgh, on page 754 of the Oct. 18 number, relating to the question of the proper method of selecting type of paving. It appears to me that there is a middle ground between the main ideas presented in these two articles, one which I have held as a personal opinion for a number of years and have seen tried in a practical way.

It is quite evident, since in a large number of our American cities the cost of the pavement is charged directly to the property owners, that they should have some voice in the selection of the material to be used. On the other hand, since in a large portion of our American cities the first cost of intersections and the whole cost of repairs and maintenance are borne by the city, there is sufficient cause for the city to be represented properly in choosing the type of pavement.

The plan which I have in mind, suggested by the writer at Beloit, Wis., sometime in 1914 or 1915, is simply this: Have the city officials, through their engineer or any competent engineering group, adopt de-

tailed plans and specifications covering a goodly number of the more standardized types of paving, and advertise for bids at one letting, on all of the types. Of course, there may be cases in which traffic conditions, value of abutting property, future development, grade of proposed improvements, etc., will eliminate for certain streets some of the paving types. However, it is my opinion that in the great majority of cases there is always a choice among several standardized types of pavements, any one of which will fill the needs if properly constructed under the right plans and specifications.

After the bids have been received on those types which, insofar as the engineering profession can predict, will prove satisfactory, the property owners should have the right to choose which type of pavement shall be used, or at least have a voice in the selection.

Such a plan as this will tend to standardize our paving specifications, will eliminate largely the opportunities for coöperative bidding on the part of the contractors, will do away with enormous expenditures on the part of paving material manufacturers, often spent in promotion, and last, but of most importance, will create real competition.

The low prices at Beloit have been explained by many as being due to various causes, but in most cases these explanations have been prompted by prejudiced viewpoints or lack of careful study of the history of this whole paving letting. The real cause of the great saving is quite evident, since it was the writer's idea in suggesting this plan to create this open competition not among the contractors bidding upon the work, but among the paving material men furnishing the prices to the contractors. The fact that this suggested plan predicted large savings—which were actually made—because of the fact that the various paving types would be brought into competition rather than the contractors bidding on these types, is strong evidence that this is the true cause of the low prices which were received at the time of the letting.

Such a plan as suggested eliminates, I believe, a great many of the questionable features of our present day practice in promoting, advertising and awarding the contracts for our modern pavements.

G. R. BASCOM,
Municipal and Sanitary Engineer.

Madison, Wis.

Mr. Bascom incloses a letter from one of the contractors in close touch with the Beloit work, A. E. Ashbrook, representing the Barrett Manufacturing Co., of Chicago. The letter says, in part: "The city council of Beloit had expected to receive bids on sheet asphalt pavement alone and were advised that the cost would range from $1.85 to $1.90 per sq.yd., which is, perhaps, a fair average for that type of construction in this state. After having followed your suggestions in receiving bids on several different types of pavement, the prices were greatly reduced, as is shown by the tabulation of the bids received, and as illustrated by the fact that bids for sheet asphalt pavement on standard specifications were received as low as $1.27 per square yard.

"From a careful study of the tabulation of the bids and the quantities as awarded, I have made the following estimate, which I believe is conservative, to represent the saving to the City of Beloit which was affected by your service."

52,650 sq.yd. sheet asphalt at 53c. reduction	$27,904
50,300 sq.yd. asphaltic concrete at 53c. reduction	26,659
25,000 sq.yd. brick, no material reduction.	
28,500 cu.yd. excavation at 10c. reduction	2,850
74,000 lineal ft. of curb and gutter at 20c. reduction	14,800
Total	$72,213

What Is a "Consulting Engineer?"

Sir—There has been considerable discussion of late, both in these columns and in the technical press in general, regarding the use of the term "consulting engineer," but so far no definite conclusions have been drawn and no ethical measures have been proposed for settling the points in contention.

It is true undoubtedly that there should be some term to differentiate the engineer who maintains an office for individual practice from the engineer who is employed regularly by some corporation or manufacturer. But the fact that an engineer has an individual practice does not mean necessarily that he is a consulting engineer in the true sense of the term. It would appear that the word "consulting" should be applied only to an engineer retained by a client to assist, advise and consult with the engineer in charge. This being the case, an engineer may be consulting on one job, designing on another and superintending on still another, or he may be consulting this month and simply directing the next month.

Surely, some other term is necessary which would be applicable to the ordinary individual practitioner, or else some descriptive name should be prefixed to the engineer who is employed regularly by one client and who is not in a position to act for other clients.

The writer feels that the engineering press and societies should take up this matter and lay down definite rules for the guidance of engineers. No doubt the majority would gladly welcome a code of this kind, and the others would come gradually to accept the recognized standards.

We can never expect to secure the recognition deserved by the engineering profession as long as such a variety of terminology is found in the press and in common usage. If engineering is merely a trade we have nothing to say, but most of us feel that it is a profession of the highest order and should rank with law and medicine, and as such it should have the same prestige, the same recognition in the courts and the same honor and respect from the layman. To secure that recognition we should work harmoniously, and if this is to be done the profession needs a code of procedure or guide of some kind. Who but engineers themselves are to blame for the very unsatisfactory state of affairs existing with regard to their professional status, and who but themselves will or can raise the standard?

Johnson City, Tenn. D. R. SHEARER.

Curb Radius at Grand Forks, N. D.

The City of Grand Forks, N. D., according to J. J. Smith, city engineer, is using curbs having a 30-ft. radius at street intersections and 10 ft. at alley intersections. This practice is followed in a district where the main thoroughfares are paved for a width of 28 ft. and the cross streets for a width of 20 feet.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Extra Length of Pipe Reduces Fitting in Mixer Supply Line

By Harlan H. Edwards
Danville, Ill.

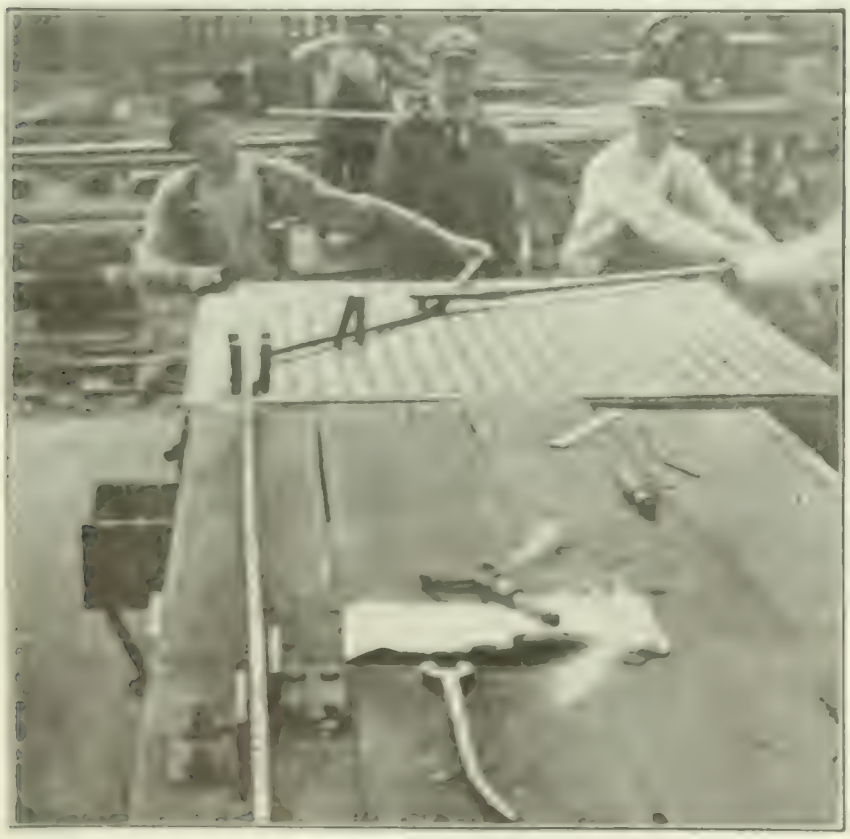
A SAVING of labor in reducing the number of times the hose has to be changed from one T in the water supply line to another, in handling a mixer on concrete road work is effected without using an unusual length of expensive hose by fitting a swing joint and one or two lengths of pipe to the T in the water line. A nipple and an L are screwed into the T in use on the water line. Into the elbow is fitted a length or two of pipe, at the end of which the hose to the mixer is attached.

If the length of hose used were such that the Ts on the main line could be spaced 160 ft. apart, by using a 20-ft. length of pipe, it would be possible to place the Ts 200 ft. apart, thus reducing by nearly ⅓ the number of changes required in moving a mile. Of course, the length of pipe is turned from the T toward the mixer, and as the latter moves down the road past the T the pipe is flopped over and laid in the other direction.

The method is used by Carl Nelson, superintendent for J. C. Poll on a road contract near Danville, Illinois.

Bar-Bender Plate and Staggered Legs on Horses Expedite Concrete Work

A PUNCHED-STEEL plate used as a working table expedites the bending of steel reinforcing bars for the Union Switch and Signal Co. building at Pittsburgh, Penn. The plate permits ready adjustment of the pins at points where the bars are to be bent. The bender is a long handle, having at one end a 6-in. pin used as a pivot, which fits into any of the holes in the plate. Adjacent to the pin is a lug which engages the bar as the handle is swung round across the plate.



REINFORCING BARS BENT ON A PERFORATED STEEL PLATE



CONSTRUCTION OF RUNWAY HORSES FACILITATES PLACING AND REMOVAL

Runways for concrete carts on the same work are supported on wooden horses which have the legs staggered and pointed, as shown in the view. This facilitates placing the horses clear of the diagonal reinforcing bars. The tapered legs make it easy to remove the horses from the concrete.

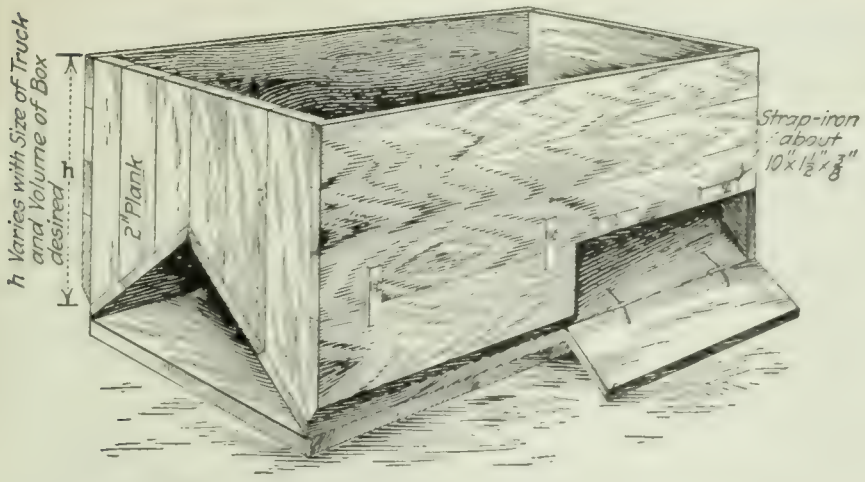
The building is being constructed by Stone & Webster, of Boston.

Hopper-Bottom Truck Bodies Used for Rapid Unloading

By Job R. Rogers
Holley, N. Y.

CONTRACTORS who contemplate the use of removable hopper-bottom truck bodies, to secure rapid unloading of loose materials and ability to employ the truck on various services, will be interested in the side-dump boxes adopted by Wing and Munger, contractors for resurfacing Part 2 of New York State Road 387.

The scheme is shown in the accompanying sketch. One of the good points of this box is the bottom-hinged side door which falls down as soon as the catch button is released, and serves as an apron to throw the material clear of the wheels. Each side has a divided door, so



HOPPER-BOTTOM BODY IS EASILY REMOVED

that quadruple control of the dumping is secured. The box ends are solid and with the inverted V-bottom make possible a rigid unit that can be easily put on and taken off the truck.

Pile Excavation on One Side of Trench So Mixer Can Spout to Forms

By L. E. Burridge
Ideal Concrete Machinery Co., Cincinnati

IN REPLACING an old brick sewer in Cincinnati with a concrete box sewer, J. J. Foley, the contractor, piled all the material excavated, to uncover the old sewer, on one side of the trench, forming an embankment high enough to enable the portable Cincinnatus paving mixer employed to spout concrete to all parts of the new sewer section.

The old brick arch is demolished down to the springing line, the old sewer lined with concrete, and the top section of the new 15-ft. box sewer constructed on top of this foundation. On account of the width of the excavation, the concrete could not have been spouted to the top of the new sewer if the spoil had not been piled on one side to as great a height as possible. The excavating was done by steam shovel. The photograph shows the mixer at work on the reconstruction of the lower part of the old sewer.



HIGH BANK ENABLES PAVING MIXER TO SPOUT INTO FORMS

Deliver Stone via Cross Streets to Industrial Cars on Subgrade

IN CARRYING out a concrete paving contract at Elizabeth, N. J., J. B. Bentley avoids driving loaded wagons over the subgrade by the simple expedient of dumping all rock, sand and cement in the cross streets. The material is unloaded in ½-yd. Koppel cars, and carried to the mixer on an industrial railway of 18-in. gage. Six cars supply the material as fast as needed. They only work part time, as the "railroad crew" also handles and places all the reinforcing.



INDUSTRIAL TRACK AVOIDS RUTTING SUBGRADE—SIX CARS SUPPLY MIXER

Advertising Engineering Education

In the September issue of "Engineering Education," the bulletin of the Society for the Promotion of Engineering Education, it is asserted that many young men would attend institutions of higher learning, and especially engineering schools, if these schools were brought to their attention in a concrete and concise way. Many young men in high schools have no opportunity of becoming familiar with the aims and objects of engineering schools, since most of their instructors, with the possible exception of those who teach manual training and physics, are graduates of colleges of liberal arts and have no conception of the engineering profession. At this time of rapid development in engineering education, it seems especially desirable that the need for engineers should be brought to the attention of the young man by means of the daily papers and the magazines with which he comes in contact.

NEWS OF THE WEEK

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

Rea, Willard and Elliott To Urge Freight Rate Advance

The entire railroad situation will be placed before the Interstate Commerce Commission by the presidents of the big carriers in the Eastern territory, beginning Nov. 5. It will be remembered that representatives of the carriers appeared before the commission several weeks ago, asking for sixty days' time in which to fully present their case, claiming then that their incomes for September and October would show a greater loss than any other month of the year. Samuel Rea, Daniel Willard and Howard Elliott, of the Railroad War Board; Alfred H. Smith, of the New York Central, James H. Hustis, of the Boston & Maine, and Frederick K. Underwood, of the Erie, will make a plea for the railroads based on the necessity of maintaining their properties and bearing the extraordinary cost of moving more traffic. Messrs. Elliott and Hustis will deal with the New England situation, and Mr. Rea, president of the Pennsylvania R.R., will make the chief argument for the trunk lines.

Among the facts which will be presented to the commission will be a statement that the net incomes of the Eastern roads for the first nine months of the year shows a decline of $57,000,000, as compared with 1915, despite the fact that the great increase in traffic produced $124,000,000 more gross revenue. Furthermore, there has been a decline in the market value of railroad stocks and bonds, since America was drawn into the war, which amounts to $3,000,000,000, accompanied by an utter vanishing of the market for new railroad stocks.

Chicago Office for Road Regiment

A Western recruiting office was opened Oct. 31 to accept enlistments in the new highway construction regiment, the Twenty-Third, specially noted in the *Engineering News-Record*, Oct. 4 and Oct. 25. Lieut. J. T. Patterson, formerly assistant engineer on valuation of the Chicago & Northwestern Ry. Co., has been detailed to the work and afforded office space at the rooms of the American Association of Engineers, 29 South La Salle Street.

Santa Fe Tries Draftswomen

The department of engineering and construction of the Atchison, Topeka & Santa Fe Ry. has selected twelve women to take a six months' intensive training. Those selected have been through college or normal school, and will receive the same training as men who are working at the same problems. The particular work is the drawing of plans for yards, which will include the location of switches, bridges and signals, and the learning of the details of track layout. S. E. Rice, who is assistant general manager of the department, says that he has always felt that women could do this type of work and now that so many young men have been drafted he is glad of the opportunity to prove that he is correct.

Viaduct Leading to Grand Central Station in New York Begun

The viaduct on Park Ave. leading to the 42nd St. entrance of the Grand Central Terminal in New York City was begun with formal ceremonies on Nov. 1. This approach is a novel structure in that it will carry vehicular traffic from the street to an upper-level roadway around the station. This roadway is a part of the station structure and is on the second-story level at 42nd St., but due to the change in street elevation reaches grade at 45th St. When the viaduct is completed a new and much-needed north and south vehicular thoroughfare will relieve congestion of mid-Manhattan and the great bulk of the station will no longer be a barrier across the city.

Army Cantonment Heating Plants Nearing Completion

The installation of heating plants at the National Army cantonments is progressing as rapidly as labor and the delivery of materials will permit. The probabilities are now that all plants will have been installed by Nov. 1. Four camps are to be steam-heated throughout with the exception of a few small units using stoves, which units constitute less than 10% of the total amount of heating required. These four cantonments are those at Ayer, Mass., Battle Creek, Mich., Rockford, Ill., and Ft. Riley, Kan. The remaining twelve cantonments have steam heat in hospitals and officers' quarters, but the barracks are heated by large hot-air furnaces, as are the mess halls.

New Freight Terminal at Chicago

A large freight terminal is to be built at Chicago by the Chicago, Burlington & Quincy R.R., as part of the extensive revision of the railway terminal system consequent upon the construction of the new Union Station. It will be located near Canal St., between Harrison and Polk Sts. Bids are now asked for the grading and for the open caissons or wells for the foundation piers. W. T. Krausch is engineer of buildings and has the matter in charge.

Skilled Men Needed by New Quarry Regiment, 28th Engineers

The Corps of Engineers, U. S. Army, according to an official communication sent to *Engineering News-Record* this week by Major O. B. Perry, Engineer Officers' Reserve Corps, has been authorized to raise by voluntary enlistment a special quarry regiment to consist of six companies of 250 men each and to be known as the 28th Engineers, National Army. This regiment is now being recruited and the first two companies are in training at Camp Meade, Maryland.

This regiment is to be made up entirely of picked men from the various quarries of the country. All trades and occupations in the quarry business will be represented. Each company will have a sufficient number of skilled men to operate a separate quarry plant and will be equipped with a complete rock-crushing and screening plant capable of producing 1000 tons of crushed rock per day. Churn and air drilling outfits will be provided and the equipment will include steam shovels, locomotive cranes, steam locomotives, cars and other standard quarrying machinery. Only men who have had experience in the handling of such equipment and those who have worked in and about quarries will be enlisted for this service.

The commanding officer will be a regular army engineer officer; the other officers of the regiment will be largely drawn from the engineers and quarry superintendents who have volunteered their services, have been given the necessary military training at the officers' training camps and are now commissioned in the Engineer Officers' Reserve Corps. The 28th Engineers offers a great opportunity for the quarrymen of this country to show their skill and courage. The success of the American army operations in France is dependent on the roads and railroads. The amount of crushed stone required is enormous. It is the duty of the quarrymen of the country to meet these requirements.

Pacific Logging Congress Held in Seattle

The ninth session of the Pacific Logging Congress convened for two days in Seattle, Oct. 18 and 19. Delegates from California, Idaho, Montana, Oregon and British Columbia were present. Among the papers presented were: "Gasoline Locomotives," by J. E. Buckingham; "Logging Railroad Construction" (committee report), James O'Hearne, chairman; "Logging Engineering and University Training."

H. E. Breed Heads American Road-Builders' Association

At its annual meeting, held at the Automobile Club, New York City, Nov. 2, the American Road-Builders' Association elected as its new president H. Eltinge Breed, first deputy commissioner of the New York State Highway Department. The afternoon session drew only a small attendance, about 30. The matter of the Priority Board's embargo on open-top cars for the transportation of road material (see *Engineering News-Record,* Nov. 1, p. 855) came up for discussion, but the decision was made to take no action. Later in the day, however, the association passed a resolution by Prof. A. H. Blanchard, endorsing the road-building resolution passed at the recent War Convention of American Business held at Atlantic City (see *Engineering New-Record,* Sept. 27, p. 62).

In the evening the association held its "get-together" dinner, at which Maj. I. C. Moller told of the work of recruiting the new road-building regiment, the Twenty-Third Engineers, in which this journal has played such an important part. Major Moller made the point that the American troops will depend largely upon powerful, up-to-date construction plant—to such an extent, in fact, that it is estimated that the 10,000 men of the American unit will be able to accomplish what 40,000 British troops have done with comparatively little road-building mechanical equipment.

"The prospect is," said Major Moller, "that the work of the Twenty-third Engineers will be the maintenance of about 2000 miles of road, in addition to such new routes as will be constructed." He explained that the present needs of the Twenty-third are roller runners, stone crushers, drill runners and traction-engine operators.

In addition to Mr. Breed, the other new officers of the association are: Lieut.-Col. W. W. Crosby, consulting engineer, Baltimore, Md., first vice president; Austin B. Fletcher, state highway engineer of California, second vice president; Arthur H. Blanchard, professor of highway engineering, Columbia University, third vice president; E. L. Powers, editor *Good Roads*, secretary and treasurer.

The following six directors were elected: Maj. H. L. Bowlby, William H. Connell, Joseph W. Hunter, Nelson P. Lewis, H. G. Shirley and William R. Smith.

Dedicate St. Louis-Belleville Road

The new concrete boulevard which has been constructed at a cost of $1,000,000 and which lies entirely inside the city limits of Belleville, Ill., but which furnishes the link connecting the city of St. Louis with that town, was formally opened to traffic on Nov. 6. The boulevard is said to be the longest stretch of concrete in any city of the United States, and has been built to relieve an abnormal condition.

Road Regiment Applicants Now Number 6000

Civil War Veteran Seeks Admission to 23rd Engineers—Lieutenant Would Give Up Commission To Join

Recruiting for the 23rd U. S. Engineers, the regiment of road builders to go to France, whose ranks *Engineering News-Record* has been assisting to fill, has been progressing at a rapid rate during the past week and more than 1200 men are now mobilized at Camp Meade, Md., with large groups joining the colors every day.

Beginning Saturday competitive company drills for prizes will begin, and Col. E. N. Johnston, U. S. A., commanding the organization, announced in Washington the past week that he has obtained the use of the rifle range at the Naval Academy, at Annapolis, for target practice for the men, and that the road-builders are about to begin learning how to shoot in the army manner under the most favorable conditions and most qualified instructors, in groups of 600 each week.

Applications to join the regiment have so far numbered about 6000. Those desiring to join should address Col. E. N. Johnston, U. S. A., 23rd U. S. Engineers, 1419 F St. Northwest, Washington, D. C.

Of the thousands of letters received at the Washington headquarters of the new road-construction regiment the following two indicate a spirit typical among the men.

"Col. E. N. Johnston, Commanding 23rd Engineers.

"Sir—I have read the statement that you are short of men and I am very anxious to go to the front. I have been foreman and superintendent of bridge work for the past 41 years, having been made a foreman by A. M. Long, master builder on the Milwaukee road in 1876; have been in active work and contracting continually since. Can calculate strains; make estimates, and have a good knowledge of planalogy. I am well used to steel, wood, and concrete work and have bridged the Mississippi three times and the Missouri four times. I am in perfect health and my father is a very active man at 96 years of age.

"My age is seventy the eighth day of last May. I served four years during the Civil War in Company F, 9th Regiment, Indiana Volunteers, and one year in Company A, 29th Regiment, Indiana Volunteers. Was wounded and captured at Chickamauga and prisoner eight months. Can furnish reference from any contractor on the coast or many Chicago firms and roads; also the Phoenix Bridge Co., Phoenixville, Penn.; the Pencoyd Bridge Co., Pencoyd, Penn.; Edgemoor Bridge Co., Wilmington, Del. I can start on the first train and pass any physical examination here or there. Height, 5 ft. 10 in.; weight, 160 lb. Never have been sick and worked on Copper River and Northwestern from Cordova to Kennecott, Alaska, during the construction of that Guggenheim line for three years. Also worked on the Harry Meggs road in Peru, 38 years ago, and on Southern Pacific line in Guatemala 31 years ago, in first instance for V. G. Bogue and second instance for Arthur Brown, superintendent B. & B. S. P. road at Oakland, Calif. Will gladly go in any capacity. My pension certificate is No. 1,157,585. Act of May 11, 1912, last increase is to $25 per month. I expect ten years of good solid work yet.

Very respectfully,

(Signed) HENRY E. ELLIOTT

Long Beach, Calif.

The second communication, from a lieutenant in the Engineer Officers' Reserve Corps, follows:

"Chief of Engineers,

"I received lieutenant's commission, Engineer Reserve, in July and have not been called. Wish to resign commission and enlist in the 23rd Engineers, National Army. Am in road-construction work at present. If this transfer is possible what procedure do I follow?

ROBERT L. RYAN

Santa Barbara, Calif.

Seattle's Water-Supply Planning To Be Completed

Although actual work on extensions to Seattle's Cedar River water system may not begin for a year on account of the condition of the bond market and the fear that an attempt to float the $3,700,000 worth of bonds might not result favorably for the city, plans and specifications for the improvement will be completed under the direction of L. B. Youngs, superintendent of the Water Department and sent to the Board of Public Works for approval. The plans in course of preparation provide for the development of Swan Lake as a storage reservoir, the construction of a water-supply tunnel which will be concrete lined from the lake to Molasses Creek, the construction of a third pipe line from the end of the tunnel to the City of Seattle, the construction of high and low-pressure reservoirs in West Seattle, and the enlargement of the reservoir.

Seattle Will Expend Large Sum on Street Improvements

The Engineering Department of the City of Seattle, Wash., A. H. Dimock, city engineer, has been called on to prepare plans and submit estimates for street improvements calling for the expenditure of considerably more than $1,000,000. In addition, the Engineering Department has been directed to make and submit a plan for separation of grades on tide lands, now developing rapidly as industrial districts. This work will require a year, and will call for the expenditure of several million dollars by railroad corporations.

Candidates Named for New England Water-Works Association

The nominating committee of the New England Water-Works Association has selected the following candidates for office during the year 1918:

For president, Carleton E. Davis, chief, Bureau of Water, Philadelphia, Pa.; for vice presidents, Samuel E. Killam, superintendent pipe lines and reservoirs, Metropolitan Water-Works, Boston, Mass.; Henry V. Macksey, superintendent of public works, Woburn, Mass.; Frank A. Barbour, consulting hydraulic and sanitary engineer, Boston; Percy R. Sanders, superintendent of water-works, Concord, N. H.; Thomas McKenzie, superintendent water-works, Westerly, R. I., and Henry R. Buck, consulting engineer, Hartford, Conn.; for secretary, Willard Kent, civil engineer, Narragansett Pier, R. I.; for editor, Henry A. Symonds, hydraulic engineer, Boston.

The committee has also chosen as candidates for the executive committee: Frank J. Gifford, superintendent of water-works, Dedham, Mass.; A. R. Hathaway, water registrar, Springfield, Mass., and H. T. Sparks, superintendent of water-works, Brewer, Me. For the finance committee, the selections are: George A. Carpenter, city engineer, Pawtucket, R. I.; Edwin L. Pride, public accountant, Boston; Bertram Brewer, superintendent sewers and water-works, Waltham, Mass.

The nominating committee, whose report has just been sent out to the membership, consisted of R. C. P. Coggeshall, chairman, George A. Stacy, W. T. Sedgewick, Frank E. Hall and F. F. Forbes.

Faculty Changes at Massachusetts Tech Are Announced

So great has been the demand by the Government and by industrial corporations for men of technical skill for the problems that are now on hand, that the Department of Electrical Engineering of the Massachusetts Institute of Technology has suffered a loss of one-third of its staff, while the mechanical and civil engineering, and the chemistry and naval architectural faculties have sustained important losses. On the other hand, the demands for instruction have not decreased, for the registration at the institute is but slightly less than normal.

Illinois Civil-Service Examination for Railroad Engineer

An unassembled original entrance examination to provide an eligible list for the position of railroad engineer for the Illinois Public Utilities Commission will be held by the Illinois State Civil Service Commission on Nov. 24. There is one position to be filled at Springfield. The salary will range from $250 to $333.33 a month and the examination is open to all male citizens of the United States over twenty-five years old. The appointee will have entire charge of the investigation of railroad accidents, examination of dangerous crossings, inspection for approval of interlocking plants and signal circuits, investigation of railroad service complaints, and preparation of orders in connection with railroads.

The requirements consist of an education equivalent to high-school graduation with a perferably higher engineering training, and there must be experience in location, construction and maintenance of railroads and other engineering works. The applicant should be competent to make a digest of testimony, analyze it and prepare orders relating to matters connected with railways. The examination will consist of the following: Training and experience, 4; special subjects covering the abovementioned duties, 6.

Applications must be on file in Springfield before 5 p.m., Nov. 22, and no application blanks will be mailed after Nov. 19. Questions covering training and experience will be mailed to all applicants on Nov. 24, together with instructions for sending their replies to the commission. Further information and application blanks may be secured by addressing the State Civil Service Commission at Springfield, Ill.

Mural Paintings Depict Engineering Themes.



ENGINEERING COLLEGE LIBRARY OF THE UNIVERSITY OF CINCINNATI DECORATED WITH SCENES ALLEGORICAL OF ENGINEERING ACHIEVEMENT

Recently there was dedicated at the College of Engineering, University of Cincinnati, a series of mural paintings which are unusual in their theme and setting. The various panels constitute both a group of landscape paintings and an allegory of engineering achievement. A suspension bridge, a large dam, a skyscraper, a wireless station and other engineering works are presented, with appropriate backgrounds. The treatment is not literal, however, nor are the technical features obtrusive. The repetition of some conventional details unifies the series and gives it a suggestion of symbolism such as one naturally associates with mural decorations.

The paintings are the work of Frances Wiley Faig, a prominent Ohio Valley artist. Mrs. Faig's preliminary studies for the library panels were shown in the annual exhibit of the American Artists' Association in the spring of 1916. They attracted much attention at this time, and the completed paintings have drawn many visitors to the engineering college. The project was planned and money for carrying it out was raised by the senior coöperative civil engineering class of 1916. The decoration of the Library is one phase of a general movement at the institution to emphasize the broader interests of the engineer.

Merchants Will Aid in New York's Snow Removal

Street Cleaning Commissioner Fetherston Receives Promise of Trucks and Men for Emergency Work

Plans have been formulated whereby the merchants of New York City will coöperate with the Department of Street Cleaning in the removal of snow from city streets this winter. The board of directors of the Merchants' Association, at its meeting Oct. 22, ordered this action after considering a report of its committee on city conditions, submitted by John C. Eames, chairman. The report follows:

"Street Cleaning Commissioner Fetherston has informed your committee that the difficulties hitherto encountered by his department in obtaining sufficient labor for prompt removal of snow will be greatly increased during the coming season by the scarcity of the labor supply. He is of the opinion, therefore, that unless effective plans for coöperation by merchants, truckmen and railroads to give aid in snow removal can be arranged, extremely serious and protracted interruption of street traffic may occur.

DETAILS OF THE PLAN

"Your committee, in conference with the Street Cleaning Commissioner and the Motor Truck Club of America, has considered a plan for the purpose named. It is proposed that immediately following a heavy snowfall, merchants agree to suspend a certain designated class of outward-bound shipments during, say, one-half of the day for a period if necessary of two or three days; that during such time of suspension they release their trucking contractors from the obligation of moving freight and thereby permit such trucking contractors to place their trucks at the disposal of the Street Cleaning Department; that merchants and shippers whose packers and porters cannot be fully employed while the movement of freight is suspended assign such packers and shippers as can be spared to the duty of loading snow from the streets in the immediate vicinity of such merchants' premises upon the trucks so released.

"Under this plan, several hundred trucks or more, together with the necessary help for loading, can be at once employed in the removal of snow from business streets designated by the commissioner, whereas several days would necessarily elapse before all of the streets in question could be freed from snow if only the force of the Department were employed.

"Your committee wishes to have made a personal canvass of a large number of the principal houses in the wholesale grocery and dry goods commission interests with a view to presenting to them the proposed plan in proper detail and obtaining their agreement to conform to such a plan.

"The committee further wishes that after such a preliminary canvass has been made, the association communicate by circular letter and otherwise to the entire business community and urge its general adoption. The purpose of the preliminary personal canvass is to obtain in advance the support of leading merchants as a means of influencing others to the acceptance of the plan.

"It is suggested that the personal canvass might readily be made in a couple of days by the solicitors of the membership bureau."

The vote on the report was unanimous with the further recommendation that, wherever possible, snow be piled in the middle of the street.

Minnesota University Welcomes Dean John R. Allen

John Robins Allen, the new dean of the College of Engineering and Architecture, University of Minnesota, was welcomed to the state and to the university in a dinner in the Hotel Radisson, Minneapolis, on Oct. 18. The dinner brought together many Minnesota engineers and architects. Fifteen societies of engineers, architects and others were represented at the dinner, and the program included addresses by representatives of the various national societies. Professor Allen spoke of some of his experiences while at Robert College, in Constantinople, and, in a more serious vein, of his ambitions for the College of Engineering of the University of Minnesota. Professor Allen went to his Minnesota post from that of professor of mechanical engineering at the University of Michigan. He was formerly president of the American Society of Heating and Ventilating Engineers, and is the author of "Coefficient of Transmission in Cast Iron Radiation," "The Effect of Painting Radiation Surfaces," "Notes on Heating and Ventilation" and (with J. A. Bursley) "Steam Engines; Steam, Gas, Steam Turbines and Their Auxiliaries."



JOHN ROBBINS ALLEN

Port of New York Will Be Under War Control

Regulation Necessary Since 80 to 90 Per Cent. of Exports Pass Through Harbor

Irving T. Bush, head of the Bush Terminal Co., has been appointed executive head of the New York Port War Board by Secretary of War Baker, and will enter upon his new duties Nov. 7. The first step of the board will be to make a survey of all the shipping and railroad facilities centered around the New York port. All information relating to pierage, storage and terminal conditions will be collected and classified, so that the board will be in a position to direct and regulate without difficulty or delay the shipment of supplies abroad.

The plan at present being considered involves bringing under centralized Federal control of all docks, piers, terminals and storage houses on the New York and New Jersey sides, whether they are owned by city, state or privately. It is not expected that the Government will seize or commandeer facilities, but rather that an effort will be made to eliminate all interferences between private entrprises which might delay the shipment of troops and supplies for the prosecution of the war.

The conditions in New York Harbor have been aggravated not so much through a lack of resources, but more by an absence of coördination between the various shipping interests in the utilization of the present facilities of the port to their maximum extent. It is realized in many quarters that the port, even at its present development, could be made to extend its facilities by at least 25%, and that to accomplish this would mean only the elimination of useless competition. Since 80 to 90% of American exports must pass through New York Harbor, and since the transportation of soldiers and food to Europe alone requires the utilization of practically the maximum energies of the port, every obstacle in the way of an interrupted flow of supplies to Europe must be removed.

California Iron Bridge Fails After Forty Years

The Santa Clara street highway and electric-railway bridge across Coyote Creek, at San Jose, Calif., which consisted of three 53-ft. pin-connected Pratt trusses 7½ ft deep, with 36-in. latticed floorbeams, collapsed Oct. 20. The members of the bridge were wrought iron. The bridge was designed forty years ago for a probable live load of 100 lb. per square foot.

Three loaded freight cars, whose gross weight was about 175 tons, had been stopped upon the bridge, and preliminary investigations have indicated that the first failure occurred in the floorbeams immediately beneath a loaded truck near the third point of the span immediately upon starting the train.

ENGINEERING SOCIETIES

New England Water-Works Association will hold its monthly meeting at the Boston City Club Wednesday, Nov. 14. Lunch will be served at 1 p.m., after which the Dexter Brackett Memorial Medal for the year 1916 will be presented by Desmond Fitzgerald. The remainder of the session will be given over to papers on water-works shop construction by A. E. Martin, superintendent of water-works, Springfield, Mass., and the construction of the earth dam on Phelps Brook, at Hartford, Conn., by J. H. Shaunessy, assistant engineer, Hartford Water Department.

The Society of Russian American Engineers held a meeting at the assembly room of the Merchants Association of New York Oct. 18. Leon Moiseef made an address. Other speakers of the evening were: Walter L. Ransom, chief counsel of the Public Service Commission for the First District, New York; Walter N. Polakov and Prof. Lomonosoff, the last a member of the Russian Extraordinary Mission.

The Cleveland Engineering Society has organized a section to be known as the "Iron and Steel Section," which will be subdivided as follows: Blast furnace, steel works, steam and electric, foundry practice, steel treating and welding. A meeting for the purpose of organizing this section was held Oct. 25 in the society rooms and resulted in the election of D. T. Croxton, president of the Cleveland Furnace Co., as chairman, and H. T. Harrison, chief engineer of Corrigan, McKinney & Co., as first vice chairman.

The Cornell Society of Civil Engineers of the City of New York elected the following officers at their annual meeting, held Oct. 16: President, Joseph C. Hilton, of Mason, Hilton & Co., contractors; vice president, J. H. Dickinson, manager Lidgerwood Manufacturing Co.; second vice president, Ira W. McConnell, assistant chief engineer, Stone & Webster; recording secretary, C. R. Harding, assistant consulting engineer for Southern Pacific Co.; and corresponding secretary and treasurer, Ernest A. Trusso, assistant engineer with the New York Central Railroad.

PERSONAL NOTES

OGDEN DUTCHER, city engineer, Nampa, Idaho, recently resigned his position, and has been succeeded by L. R. Cook of that city.

BURTON SMITH, engineer of the Oakdale Irrigation District, Calif., has resigned, effective Jan. 1.

WILLIAM B. CLOSE, formerly project manager of the Salt River Irrigation project, and IRVING C. HARRIS, operating electrical engineer and inspector on the same work, have announced the formation of a partnership with the purpose of engaging in a general engineering practice under the firm name of Cone and Harris, with offices in the Hollingsworth Building, Los Angeles, Cal.

JAMES BUCKELEW, superintendent of the Camden Terminal Division and the West Jersey & Seashore R.R., has been appointed superintendent of the Maryland Division of the Philadelphia, Baltimore & Washington Ry., with headquarters at Wilmington, Del. Mr. Buckelew has been in the service of the Pennsylvania Railroad Co. since 1885.

J. A. MCCREA has been granted an indefinite leave of absence from his position as general manager of the Long Island R.R., and his position will be filled by JOHN R. SAVAGE, chief engineer.

GEORGE M. NEEL, formerly engineer and Western representative of the Klauer Manufacturing Co., Dubuque, Iowa, is now engineer in charge of the Rio Grande drainage investigation being undertaken by the state engineer of New Mexico. The work is being done under an act passed by the State Legislature, which made appropriations for the purpose of making surveys and investigations of the valley from the New Mexico-Colorado state line to the New Mexico-Texas state line, with the purpose of determining the feasibility of reclaiming and draining lands which are now unfit for agricultural purposes.

NATHAN WOHLFELD, formerly superintendent of construction with the W. C. Hedrick Construction Co., Dallas, Tex., is at present with the 17th Regiment of Railway Engineers in France.

H. S. SLOCUM, formerly engineer in charge, St. Lawrence Transmission Co., is at present resident engineer for Vielè, Blackwell & Buck on the construction of a steam power plant for the Appalachian Power Co., at Glen Lyn, Virginia.

B. B. BURNS has been appointed assistant highway engineer of Lincoln County, West Virginia.

CAPT. R. B. H. BEGG, Engineer Officers' Reserve Corps, has been granted leave of absence from his position as professor of civil engineering at Virginia Polytechnic Institute and is now with the American Expeditionary Force in France.

R. W. TRULLINGER, for the past six years engineer specialist in the Office of Experiment Stations, United States Department of Agriculture, has been commissioned first lieutenant in the Ordnance Section, Officers' Reserve Corps.

E. V. HEILMAN, formerly mechanical and electrical engineer with the Philadelphia & Reading Ry., has been elected vice president and general manager of the Lykens Valley Fuel Co., Inc., Reading, Pennsylvania.

OBITUARY

JAMES B. SMITH, contractor, Seattle, Wash., died recently at the age of 70 years. He was born in Scotland and lived in New York and Michigan before moving to Washington.

COL. HENRY MACMULLEN, a consulting engineer in New York for many years and a veteran of the Civil War, died on Oct. 30 in Jersey City, age 81. He was associated for many years with the firm of Ford, Bacon & Davis, New York.

CAPT. A. T. RICKARDS, Royal Flying Corps, was killed in action at the French front on Sept. 13. Captain Rickards was an engineer-graduate of the School of Applied Science at McGill University.

WILLIAM MURDOCH, city engineer of St. John, New Brunswick, died recently at the age of 69.

JULIAN L. WELLS died in Santo Domingo, where he was engaged in the development of tropical timber resources. Mr. Wells was graduated from the University of Virginia, and went to Mexico where he engaged in mining at the Batoplas mine—later becoming identified with the Mexican Light and Power Co. Later he was employed in the Federal service in the Hawaiian Islands.

RODERICK MCLENNAN, of Portland, Ore., prominent in that city for many years as a contractor and builder, died recently.

JOHN EDWARD SWANKER, who died Oct. 20, was in the engineering department of the Ferguson Steel and Iron Co., Buffalo, N. Y. Mr. Swanker was a graduate in civil engineering from Union University in 1887, and was connected with several large American concerns, besides being for six years general manager of the Tees Side Bridge and Engineering Works, Ltd., of Middlesbrough, England. Before going to England to help introduce American methods there Mr. Swanker was connected with the engineering department of the Hilton Bridge Construction Co., becoming its manager and engineer upon its absorption by the American Bridge Co. He was a M. Am. Soc. C. E., and one of the charter members of the Efficiency Society. While resident abroad he was a member of the British Iron & Steel Institute. Mr. Swanker was born in Schenectady, N. Y., July 4, 1865.

WILLIAM THEODORE JACOBSON, contractor, Portland, Ore., who was identified for many years with Robert Wakefield in the Portland Bridge and Building Corporation, died in that city recently. Mr. Jacobson was a veteran of the Civil War, and constructed much of the jetty and bridge work in the Northwest.

SAMUEL T. MONROE, one of the oldest civil engineers in Southern

New York, died in Binghamton, N. Y., on Sept. 23. He had charge of the construction of the Delaware & Hudson R.R. tunnel at Sanitaria Springs, which half a century ago was considered a remarkable piece of work.

ROY D. BREEN, chief engineer for the Selden-Breck Construction Co., of St. Louis, at the Aviation Camp at Fort Sill, Okla., died as a result of an accident on Oct. 11.

JOHN C. SULLIVAN, at one time assistant superintendent of the O'Rourke Engineering Construction Co., died recently in New York. He was born in Holyoke, Mass. Mr. Sullivan had charge of the construction of one of the North River tunnels of the Pennsylvania R.R., and later built one of the sections of the Ashokan Dam. At the time of his death he had a contract from the city of New York to build a sewer in West 46th St. from 7th Ave. to the Hudson River.

LT. COL. HENRY H. ROBERT, Corps of Engineers, U. S. A., died at Vancouver Barracks on Sept. 1. He was born at Centerville, Miss., in 1882, was graduated fourth in his class at West Point in 1904, and completed the course at the Army Engineering School in 1908. He was put in charge of the Dalles-Celilo Canal work for the Government, and later became War Department engineer, Southern Department, during the recent Mexican crisis. At the time of his death he was serving as lieutenant colonel of the Fourth Regiment of Engineers.

TRADE PUBLICATIONS

The Ideal Concrete Machinery Co., Cincinnati, Ohio, has issued catalog No. 33, illustrating and describing Ideal Cincinnatus batch mixers.

Pot-valve pressure pumps are described in Bulletin W-500, just published by the Worthington Pump and Machinery Corporation, 115 Broadway, New York.

The Burt Manufacturing Co., Akron, Ohio, has prepared a new and attractive 128-page catalog describing the complete line of oil filters, exhaust heads and ventilators made by this company.

The Link-Belt Co., Chicago, Ill., is sending out Folder No. 340 on sand and gravel washery at Raritan Ridge Clay Co. and Book No. 343 on Link-Belt rope tramway system, Watson type.

Winches, derricks and cableways are briefly described in Catalog A, issued by John T. Horton Co., Inc., 242 Bradhurst Ave., New York.

Ransehousen pivot lock manhole covers are described in a pamphlet received from the East Iron and Machine Co., Lima, Ohio.

The Kettle River Co., Minneapolis, Minn., has issued a catalog describing what they designate as "The New and More Economical Creosoted Wood Block Pavement" and gives reports of tests made on such pavements.

"Mack Trucking Among the Clouds" is the title of a pamphlet issued by the International Motor Co., New York, which describes the transporting of a large mirror to the top of Mt. Wilson, Calif., for the new observatory now nearing completion.

The Appleton Manufacturing Co., Batavia, Ill., has issued a new catalog illustrating and describing windmills.

The J. Edward Ogden Co., 147-149 Cedar St., New York, has issued a catalog descriptive of mechanisms for operating heavy doors for warehouses, car barns, roundhouses, etc.

The Modern Iron Works, Quincy, Ill., has a new circular showing new and improved constructions in water-works appliances.

Autotruck bodies are illustrated and described in a new catalog issued by the Peter Barrett Manufacturing Co., Navy, Johnson and Raymond Sts., Brooklyn, N. Y.

The Walter A. Zelnicker Supply Co., St. Louis, Mo., is sending out Bulletin No. 226 on second-hand equipment.

The Jennison-Wright Co., Toledo, Ohio, has issued a new catalog describing Kreolite wood block floors.

Snow oil pumps are described in Bulletin No. S-112 issued by the Worthington Pump and Machinery Corporation, 115 Broadway, New York.

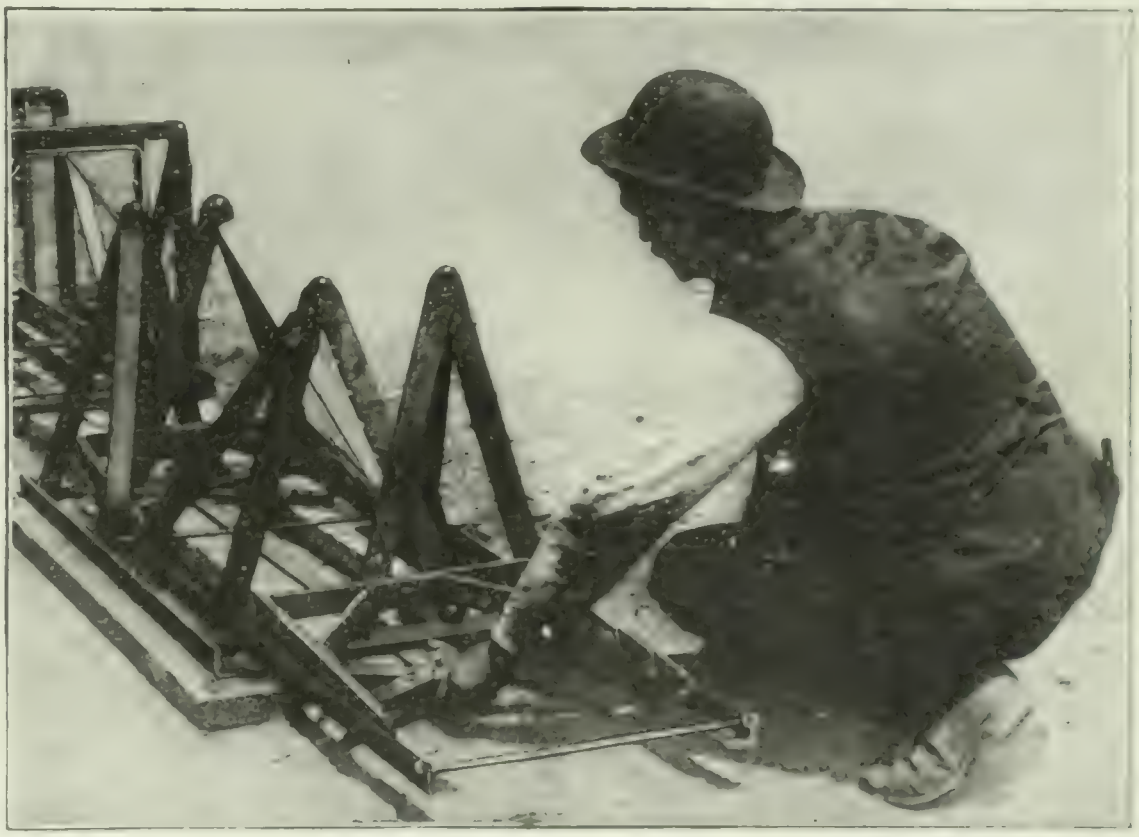
The Wright Wire Co., Worcester, Mass., has issued a bulletin giving a history of the organization and a description of its work. This contains photographs of the officers and salesmen of the different branches and views of the mechanical departments. A brief history of the wire industry is included and some of the concern's products are shown.

APPLIANCES AND MATERIALS

One-Man Collapsible Culvert Form

A collapsible steel frame for culverts which is also capable of being extended in height and width to make 39 different sizes, has recently been placed on the market. It has a frame built of angles and bars, and after erection this is covered with planks. In the photograph the supporting brace is lying flat and the operator has just pulled on the center bar which has drawn in the angle iron side sills—the bottom struts being made of two bars pivoted by a bolt at the center. If the planks fall when the side and top supports are removed, the last operation is deferred until the planks are removed; otherwise the sills are drawn in and the framework pulled out of the culvert.

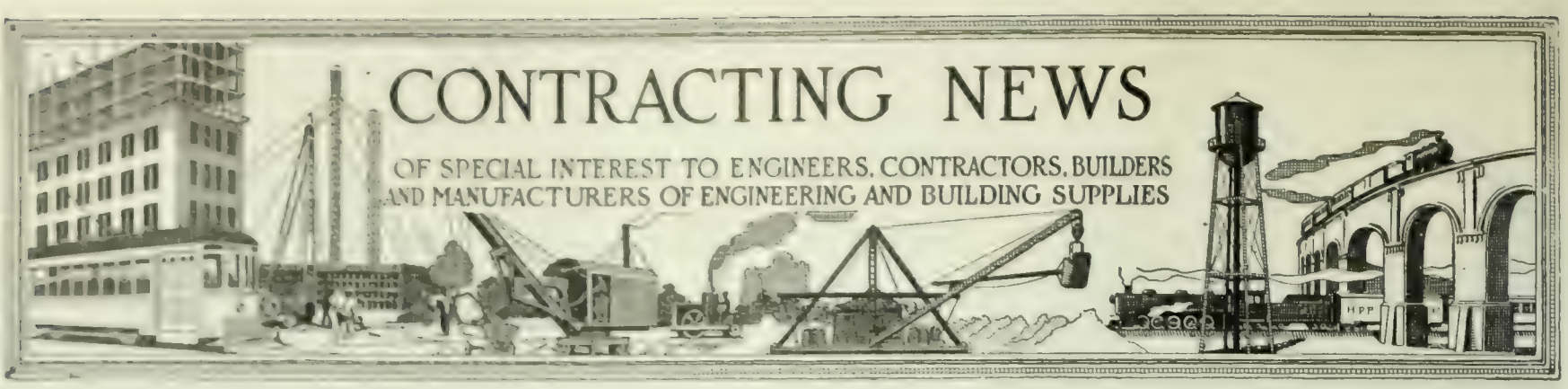
The forms are made in two sizes covering cross-sections of from 14 x 16 to 36 x 46 in. For a 30-ft. length four



PULLING CENTER ROD DRAWS IN ANGLE IRON SIDE SILLS

sections are used spaced 4 ft. apart. If a concrete bottom is desired, the concrete is mixed stiff and supporting planks are laid on the green concrete. When building culverts too small for a man to enter, wires are attached to the cross rod and center bar in order to collapse the frame and remove it from the culvert. To keep the lumber and frames clean tar paper is laid over the forms before depositing the concrete. The manufacturers claim savings in time and money of 25 to 30% over concrete culverts built with wood frames.

The frames are manufactured by the Sterns Manufacturing Co., Monadnock Building, Chicago.



Proposals

For Proposals Advertised See Pages 48 to 51 Inclusive

WATER-WORKS

Bids Close		See Eng. News-Record
Nov. 10.	Winnipeg, Man. ..... Adv. Nov. 1 and 8.	Nov. 1
Nov. 14.	Charleston, S. C.	Nov. 1
Nov. 16.	Winnipeg, Man.	Nov. 8
Nov. 19.	Wooster, O.	Nov. 8
Nov. 25.	Chicopee, Mass.	Nov. 8
Nov. 26.	Euclid, O.	Nov. 8
Nov. 26.	Winnipeg, Man.	Nov. 8
Dec. 5.	Winnipeg, Man.	Nov. 8

SEWERS

Nov. 9.	Brooklyn, N. Y.	Nov. 1
Nov. 10.	Sioux City, Ia.	Nov. 8
Nov. 12.	Pleasantville, N. J. ..... Adv. Nov. 1.	Nov. 1
Nov. 12.	Highland Park, Mich. ...	Nov. 8
Nov. 13.	Lorain, O.	Nov. 8
Nov. 14.	Niles, O.	Nov. 1
Nov. 14.	New York, N. Y.	Nov. 8
Nov. 16.	New York, N. Y.	Nov. 8
Nov. 17.	Appleton, Wis.	Nov. 8
Nov. 19.	Brainerd, Minn.	Nov. 1
Nov. 25.	Hollidaysburg, Pa.	Nov. 1
Nov. 28.	Independence, Mo.	Nov. 8

BRIDGES

Nov. 12.	Minneapolis, Minn.	Oct. 25
Nov. 17.	Charleston, S. C.	Nov. 1
Nov. 17.	Bowling Green, Mo.	Nov. 8
Nov. 19.	Charleston, S. C. ..... Adv. Nov. 8	Nov. 8
Dec. 5.	West Palm Beach, Fla. ..	Nov. 8

STREETS AND ROADS

Nov. 9.	Brooklyn, N. Y.	Nov. 1
Nov. 10.	Gibson, Ga.	Nov. 1
Nov. 10.	Colorado	Nov. 8
Nov. 11.	Princeton, Minn.	Nov. 8
Nov. 11.	California	Nov. 1
Nov. 12.	Lafayette, Ky.	Nov. 8
Nov. 12.	St. Paul, Minn.	Nov. 8
Nov. 13.	Uniontown, Pa.	Nov. 8
Nov. 13.	Pennington, N. J.	Nov. 15
Nov. 14.	Montclair	Nov. 15
Nov. 14.	Ennis, Tex.	Nov. 8
Nov. 14.	Indiana	Nov. 8
Nov. 14.	Birmingham, Ala.	Nov. 8
Nov. 15.	Clarksville, Tenn.	Nov. 1
Nov. 15.	Arcadia ..... Adv. Nov. 8	Nov. 8
Nov. 15.	Wingdale, N. Y. ..... Adv. Nov. 8	Nov. 8
Nov. 16.	Cincinnati, O.	Nov. 1
Nov. 17.	Indiana	Nov. 8
Nov. 19.	Charleston, W. Va.	Nov. 8
Nov. 19.	Seattle, Wash.	Nov. 1
Nov. 18.	Newton, Ala.	Nov. 1
Nov. 20.	Hollidaysburg, Pa.	Nov. 1
Nov. 20.	Hackensack, N. J.	Oct. 25
Nov. 23.	Connellsville, Ind.	Oct. 25
Dec. 4.	Tuscumbia, Ala.	Nov. 8

Bids Close		See Eng. News-Record
Nov. 10.	Somers, Wis.	Nov. 8
Nov. 12.	Havana, Ill.	Nov. 1
Nov. 12.	Clarion, Ia.	Nov. 8
Nov. 13.	Granite Falls, Minn.	Nov. 1
Nov. 15.	Garden Prairie, Ill.	Nov. 1
Nov. 15.	Dover Twp., Ont.	Nov. 8
Nov. 16.	Madison, Wis.	Nov. 1
Nov. 22.	Glenwood, Minn.	Nov. 8
Nov. 22.	Memphis, Mo.	Nov. 8
Dec. 6.	Marion, O. ..... Adv. Nov. 8.	Nov. 8

INDUSTRIAL WORKS

Nov. 14.	Central Islip, N. Y. ..... Adv. Nov. 8.	Nov. 8

BUILDINGS

Nov. 12.	Eldorado, Tex.	Nov. 1
Nov. 12.	Cleveland, O.	Nov. 1
Nov. 12.	Tallahassee, Fla.	Nov. 1
Nov. 12.	Sapulpa, Okla.	Nov. 8
Nov. 12.	Eldorado, Kan.	Nov. 8
Nov. 13.	Red Bank, N. J.	Nov. 8
Nov. 13.	Palo Alta, Cal.	Nov. 1
Nov. 14.	Lewiston, Me.	Nov. 8
Nov. 15.	Northampton, Mass.	Oct. 25
Nov. 20.	Pleasant Plain, Ia.	Nov. 8
Nov. 25.	Middletown, Mass.	Oct. 4
Dec. 1.	Norfolk, Va.	Sept. 13
Dec. 1.	Glenville, W. Va.	Nov. 8

FEDERAL GOVERNMENT WORK

Nov. 10.	Levee Work — New Orleans, La.	Nov. 8
Nov. 10.	Levee Work — Vicksburg, Miss.	Nov. 8
Nov. 12.	Storehouse — Washington, D. C.	Nov. 8
Nov. 12.	Emergency Camp — Gulfport, Miss.	Nov. 8
Nov. 12.	Emergency Hospital—Gulfport, Miss.	Nov. 8
Nov. 12.	Addition to Forge Shop—Washington, D. C.	Nov. 8
Nov. 12.	Heating, Plumbing and Lighting—Chelsea, Mass.	Nov. 8
Nov. 12.	Emergency Hospital—Brooklyn, N. Y.	Nov. 1
Nov. 13.	Piles, Walling and Lumber —New Orleans, La. .... Adv. Nov. 1 and 8.	Nov. 1
Nov. 13.	Post Office—Harrisonville, Mo	Oct. 11
Nov. 14.	Post Office—Austin, Tex. .	Oct. 11
Nov. 15.	Canals—El Paso, Tex. ... Adv. Oct. 18.	Oct. 18
Nov. 16.	Maneuver Boats — Wheeling, W. Va. ..... Adv. Oct. 18 to Nov. 8.	Oct. 18
Nov. 19.	Fitting out Cranes—Washington, D. C.	Oct. 18
Nov. 19.	Shipbuilding Ways — Brooklyn, N. Y.	Oct. 25
Nov. 19.	Electric Elevator—Norfolk, Va.	Nov. 1
Nov. 19.	Refrigerating Plant and Brine Circulating System—Washington, D. C.	Nov. 1
Nov. 19.	Timber Bulkheads, Boston, Mass.	Nov. 1
Nov. 19.	Filling—Key West, Fla. ..	Nov. 8
Nov. 19.	Extension—Boston, Mass.	Nov. 8
Nov. 20.	Bridge—Washington, D. C.	Nov. 1
Nov. 20.	Post Office—Caribou, Me.	Oct. 18
Nov. 22.	Post Office—Basin, Wyo. .	Oct. 25
Nov. 23.	Post Office — Woodbury, N. J.	Oct. 25

Bids Close		See Eng. News-Record
Nov. 26.	Dry Dock Crane, Wash., D. C.	Oct. 25
Nov. 26.	Steel Towers—Washington, D. C.	Nov. 1
Nov. 26.	Electric Duct System — Charleston, W. Va.	Nov. 8
Nov. 26.	Radio Building—New Orleans, La.	Nov. 8
Nov. 26.	Reservoir — Philadelphia, Pa.	Nov. 8
Nov. 26.	Electric Generating System, Ft. Stanton, N. M... Adv. Nov. 8.	Nov. 8
Nov. 27.	Post Office—Chapel Hill, N. C.	Oct. 25
Nov. 27.	Stone—New Orleans, La. . Adv. Nov. 1 and 8.	Nov. 1
Nov. 28.	Post Office — Bellefourche, S. D.	Oct. 11
Nov. 30.	Post Office—Buffalo, Wyo. Adv. Nov. 1.	Nov. 1
Nov. 30.	Machinery, etc. — Cincinnati, O. ..... Adv. Nov. 1 and 8.	Nov. 1
Dec. 5.	Post Office—Decatur, Ala.	Nov. 1
Dec. 5.	Bulkhead — New Orleans, La.	Nov. 8
Dec. 10.	Foam Fire Protection — Guantanoma, Cuba	Nov. 8
Dec. 17.	Post Office—Denton, Tex. .	Nov. 8
Dec. 18.	Laterals — Torrington, Wyo.	Nov. 1

MISCELLANEOUS

Nov. 10.	Roof Repairs — Elmira, N. Y. ..... Adv. Nov. 8.	Nov. 8
Nov. 13.	Channel Improvements — Columbus, O. ..... Adv. Oct. 25.	Oct. 25
Nov. 15.	Pumping Machinery — Brockton, Mass. ..... Adv. Oct. 25 to Nov. 8.	Oct. 25
Nov. 15.	Flood Control—Dayton, O. Adv. Sept. 13 to Oct. 18.	Sept. 13

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official.

WATER-WORKS

Proposed Work

Wis., Hartford—City plans to issue $15,000 bonds to build water-works.

Wis., Tomahawk—City having plans prepared by R. W. Richardson, engr., 476 Laurel Ave., St. Paul, Minn., for improvements to water-works system, including 20 x 25-ft. pumping station and electrically driven centrifugal pump, 300 gal. per minute capacity. About $20,000. Noted Oct. 11.

Kan., El Dorado—City sold $60,000 bonds to build water-works system. W. H. Betz, supt.

Kan., Winfield—City to issue $129,000 bonds to build new water-works system. J. M. Bradley, city engr.

S. D., Alpena—City plans bond issue to build water-works system.

S. D., Mitchell—(Official)—City defeated $125,000 bonds to improve water-works. Noted Oct. 25.

Mo., Kansas City—City plans to issue $50,000 bonds to build pumping station in East Bottoms. C. Hill, city engr.

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ENGINEERING NEWS-RECORD

A WEEKLY JOURNAL
DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

Volume 79 NEW YORK, THURSDAY, NOVEMBER 15, 1917 Number 20

The American Society Enters the Fold

THE American Society of Civil Engineers is in its new home, in the Engineering Societies' Building, 39th St., New York. The move was made official Nov. 7 by the holding there of the regular semi-monthly meeting; and that is now the address of the secretary. Thus is consummated the most important step taken by the society in its history—one that it is hoped will go far toward unifying and strengthening the engineering profession.

Road Building Recognized by Defense Council

THE country's highways have at last been placed among the instrumentalities of defense. Last week, the Council of National Defense appointed a Highways Transport Committee. Its duty will be to determine the place of the highways in the country's transportation system, particularly as influenced by the war. The need of such a body has been vigorously emphasized in this journal for some months. Highway engineers are awake to the situation and realize that the roads have saved many an industry this year and are likely to play a larger part should serious railroad congestion result from the flood of war-materials shipments that will soon start for the seaboard. The appointment of the committee was all the more urgent because priority order No. 2, forbidding the shipment of roadbuilding materials in open cars, indicated the need for expert advice within the organization of the Council of National Defense, so that if highway building must be restricted it will be done with a full knowledge of all that is entailed. The opinions of state highway officials, on page 916 of this issue, indicate how serious is the situation created by the priority order. The appointment of the committee now places highways in their proper relation to the war activities of the nation, and highway engineers and contractors may feel assured that further action on highway matters must pass the scrutiny of a body competent to estimate the needs of highways and their place in the war scheme.

American Concrete Design Well Exemplified

THE huge new cold storage plant now approaching completion in New York City, described on page 910, is a striking example of the versatility of reinforced concrete. It was not so many years ago that designers in this country would have hesitated to use the material in such a structure. The necessary separations of columns and floors to admit the insulation would have been deemed impossible in concrete, and the wide span of the special slab near the front of the building or the high columns of the railway colonnade thought beyond the safe limits of design. Today these details, while not precisely commonplaces of design, are at least quite within the accepted possibilities of the material. With this increased application of concrete to structures, American designers have passed beyond their European teachers in the matter of simplicity. The earliest French and German reinforced-concrete experts were most daring in their conceptions and applied their new material to a variety of uses not attempted in this country for many years. But their designs were complicated in execution and in appearance. The flat slab, an American conception, has contributed no little to simplification of detail, while our racial antipathy to elaboration has worked in the same direction. The Merchants' Warehouse is a good example of what American designing skill, with emphasis on simplicity of design, can do.

Common Sense About Concrete Ships

THANKS to widespread publicity, there is today a great deal of talk about the concrete ship, despite the fact that the rosy expectations are pretty far ahead of present knowledge. One highly experimental ship of large tonnage is on the ways at San Francisco, a small, motor-driven vessel has been launched at Montreal, and several small ships have been built in Scandinavian countries. These represent the efforts of thoughtful engineers and business men to solve the tremendous problem of adapting concrete to the wracking and sudden strains of a ship at sea. Quite soon they and the committees appointed to investigate the question will be able to report the progress or the hopelessness, as the case may be, of the concrete ship. Until then the future will be veiled behind theory and experiment. For some time, however, there must be an orderly development in the size of ships experimented upon. There is no more relation between a concrete rowboat or launch and the 3000-ton, 15-knot freighter demanded in the present shipping crisis than there is between a toy airplane and a giant Caproni. Step by step up through the scow, the barge and the small framed and formed hull must progress be made to the hoped-for large vessel for ocean travel. This is the normal course of all engineering design. On account of these necessary intermediate steps, it seems as though there is at the present time a

bigger field of practical work in the concrete barge for coastwise, river or canal trade. Here the gap between present knowledge and desired results is not so great and the possibility of immediate use is much nearer. If improved design and construction make such vessels seaworthy and permanent, as many of the early ones were not, some of the most serious problems of the big ship will be solved and at the same time some very necessary bottoms supplied.

Engineering Advice Should Guide Next Season's Municipal Work

TO SAVE labor and material is the duty of cities just as much as it is the duty of individuals and of business corporations. It means that cities must save. It means that municipal construction of next season must be rigidly restricted to urgent work. Construction that can be deferred should and must be deferred. The nation demands the money, the men, and the material for making war.

Do municipal officials realize this? The record of the season just closing gives no evidence of saving except that forced by high prices and absence of bids. The rigid economy which Mr. Vanderlip, Dr. Pearson, and Mr. Hoover preached early last spring has found little or no reflection in municipal practice during 1917. But next season, it is certain beyond a doubt, this economy will be secured. It will be voluntary or forced economy, as the cities themselves elect.

Maximum economy means that all moneys spent must be used with maximum efficiency. If cities are to save by omitting work that can be deferred, they must apply fullest knowledge and wisest judgment to selecting the urgent work and separating it from the non-urgent. The country requires this of them. In a more practical way, perhaps, their bankers will require it of them, when asked for money to carry on construction; or, even the government itself may undertake to supervise local expenditures. But however necessary, any such compulsion will itself be harmful to municipal interests. The cities can secure real economy—efficient economy—only by themselves planning out their program of urgent expenditures far in advance. The time for action is now.

Engineers are needed for this work. The questions at issue in separating urgent from non-urgent work are exclusively those which the public-service engineer handles. His knowledge and his trained instinct alone can discriminate correctly—and it is important to remark that the details involved in such discrimination are intricate, technical ones. But what is actually going on in our cities is that the council and other legislative authorities are themselves, by their own lights, drawing up a program for next year's work unguided by competent engineering counsel.

An engineering commission should be appointed at once, in every city, to plan the program for next season's repair and construction work. This commission, charged with eliminating from the program all deferrable work, should be instructed to undertake its task as a pure engineering problem. Sewers, streets, water-works, transit, bridges, and all other items of municipal engineering expenditure will need to be studied in impartial manner, and the results collated and measured by an economy yardstick, before the final program can be decided on.

Here is a field for work by local engineering societies. They may in cases be able to serve when the appointment of commissions cannot be secured. They are in a position to realize the facts and to foresee what next season's exigencies will demand. They, being disinterested, can awaken the city fathers and the public to a recognition of the questions at issue and of the present moment's needs. To convince the city authorities that a clean-cut engineering problem is presented by the discrimination between urgent and non-urgent work, and that this problem must be dealt with immediately, is a task of obvious difficulty; but it is a duty.

One step was taken in this direction by the engineers of Cleveland within the last few weeks. A bond issue to be voted for at the election put the problem before them early. The local engineering society gave study to the questions involved and decided that the sewer program represented necessary construction and that the bond issue should carry. Their influence, exercised through the daily press, was undoubtedly a factor in carrying the issue.

When the bonds have to be marketed or when priority must be secured for material or labor, the verdict of the engineers that a program is in the urgent class will not fail to have weight.

Industrial Unrest and War Conditions

AS A NATION we have demonstrated our willingness and ability to back this war to the limit, financially. So much for capital.

But are we individually willing and able so to coordinate our mental and physical efforts that the vast money resources we have placed at the disposal of our Government may be used to the greatest advantage and with the maximum of economy? On the decision we make in this direction, far more than on the question of bond subscriptions, will turn the measure of our success. For the cash we have loaned is no more than an outward and visible sign—the inward and spiritual grace is externalized thereby, but we cannot rest on exhibition. It is work, hard and grim, with which we are face to face; work without the stimulus of a carefully planned campaign; harder work—and in the main, a lessened return to the majority of the population for that harder work. The nation cannot waste, as war demands, and grow prosperous unless—and here is the chance of salvation—individual productiveness is increased by an amount which will offset the temporary loss of men to the army, and the irretrievable loss of materials through the wastage of war.

England, a country much like ours industrially and idealistically, has been attempting to solve this conundrum for two and a half years. The progress made is encouraging, but so far no method has been adopted which has fully persuaded labor that its interests and those of the investing classes are identical. And unless this one point be settled now, it cannot in fairness be expected to punish itself coldly to the end that the employer alone may be benefited. But barring error in understanding or an unforgivable hesitation or lethargy on the part of the English government, the plan proposed in the Whitley report of Mar. 8, which calls for

full and recognized coöperation between employers and workmen, will transform a struggling, incoherent mass into an ordered and intelligent group, driven and directed only by its common desire to bring victory to its common banner.

Let us of America profit by this example. The reports of the work of the English committees can be found in every library—and should be on every employer's desk. The basis of their recommendations is not weakly humanitarian, but broadly and generously considerate of the rights of the investor and working man alike. Nor are the proposed schemes new in theory or practice. It will take only a little more breadth of vision than is at present the rule of the American business man to make a full application of the principles and to reap the full benefit of their inevitable working.

The American Society of Civil Engineers and the Engineer in Society

A PECULIAR and not altogether explainable change in attitude can be traced in the members of the American Society of Civil Engineers as the country is traversed from the East to the extreme West. This is particularly noticeable in the reports of the various local associations of the society on the question of their relations to the parent body, which are contained in the October issue of the *Proceedings*. Here one can find the opinions and statements of the Baltimore, Cleveland, Denver and Seattle associations, and the farther west the clearer and more modern seems the basis adopted for the consideration of the question which is now before what is undoubtedly the most prominent of all engineering societies.

For a moment drop consideration of the reports of the three more eastern branches. A brief quotation from the letter of the president of the Seattle association which is appended to the report will indicate accurately the attitude which has been taken in the Northwest in attacking the question treated in the report of Messrs. Bontecou, MacDonald and Jonah. "The hope and inspiration of the proposals herein made is to strengthen the local associations and to see them become the active, energizing units of the society. We believe that they can thus be made the means of healthily expanding the membership and usefulness of the society and, among other things, of making it more capable of serving the public interests as well as the immediate interests of the membership." They feel that an organization of 7000 corporate members should have outgrown its swaddling clothes and that the voluntary assembly or "town meeting form of business meeting" now provided by the constitution should be superseded by something less archaic and more adapted to the present needs. They ask as a substitute a delegated organization which should act as the successor of the present system. They ask that the locals be considered as the basis for representation, feeling that a proper geographic distribution of representatives at business meetings would secure a wider interest in society affairs and a less formal consideration of important matters that may came up or that should properly be entrusted to such meetings. The Seattle association realizes that this would mean a radical rewriting of Art. 8 of the Constitution, but it offers no apology in forwarding any measure, however radical it may be, which may result in a more practical form of organization. They anticipate a society truly national in character and influence, and feel that in many particulars such an organization should be totally different from the present scheme, not only because of the periodic necessity of cleaning off the barnacles which the years are bound to attach to any organization, but because a fresher attitude is being forced by conditions of an age for which the engineer is responsible, and of which he must consider himself the leader.

The *Engineering News-Record* has always felt that there was much more than a superficial and honorific value attaching to membership in the American Society of Civil Engineers. Nay, it has felt that if the civil engineers in this country were in any way to achieve the ends which they desire and the place which they deserve, that they should look to that society as the one most certain and efficient method of securing what it is they may want and deserve. However, this feeling has ever been qualified by the belief that many of the society's customs are hallowed only by age, and that many of its habits have long been devoid of any value—that unless some radical operation were performed, an operation which would secure in many ways an entire new bias for the society, no vital advance could be expected. There is needed not a mere modification to compromise with present conditions, but almost a rebirth of a spirit similar to that which originally resulted in the organization of the society. For though adequate at that time, the then satisfactory method of procedure now not only proves to be a drag on needed action, but results in an irresponsiveness to modern conditions which is deplorable to say the least.

For this truth must never be lost sight of—in nearly all matters that affect the community life, men of the engineering type of mind and with the engineer's training are the predominant figures. Consider for a moment that in matters of health the engineer saves more lives through his provision of clean water, sanitary sewers and related products of his activities than does the doctor; in investments the first thought and the main reliance of the wise banker is the engineer; in rapidity and economy of manufacture, the engineer; in industrial disputes, logically the engineer. And what is there to limit the man who is provided with the tools of science and a desire for an application of his knowledge?

But to attain this place, the profession must attain first the consciousness of itself and its destiny. Its organization must be formed with an eye single to this purpose. No antiquated formula should be allowed to interpose its moribundity between the need and the fulfillment.

To this end the *Engineering News-Record* pledges its full support. It feels that in the work ahead no tradition should be spared—except only that of the high integrity which has always characterized every action of the society. Personal preferences, ideals which have outgrown their usefulness, forms that have no firm rooting in today should be ruthlessly eliminated, and in their place should be erected a structure fitted to the necessities which now confront engineers, and plastic to meet new conditions as they arise. It is only by following this ideal that the society can ever attain to its full usefulness.

Large Cold-Storage Building Introduces New Problems in Concrete Design

Complications Result from Division of Building Into Five Separate Parts by Insulation, Which Required Split Columns and Intermediate Walls—Heavy Flat Slabs and Columns Are Features



PUTTING UP AN ELEVEN-STORY CONCRETE COLD-STORAGE WAREHOUSE ON NEW YORK'S WATER FRONT

A REINFORCED-CONCRETE building of considerable size and complication in design is now being erected for use as a cold-storage warehouse by the Merchants Refrigerating Co. on the city block between 10th and 11th Aves. and West 16th and 17th Sts., New York City. In addition to being very large—it has 10 stories, with basement, mezzanine and attic, is 150 ft. high, and covers an area of 1.4 acres—the building is of novel design to take care of the separation of the various insulated portions. The insulating walls of cork composition separate the building into units, in which different degrees of temperature are maintained. It was necessary, in order to insulate thoroughly each section, to have these walls continuous, which involved the separation of the columns and floor slabs to permit the entrance of the insulating material.

The building is on the Hudson River waterfront in the Chelsea pier section of the city. It extends 184 ft. along 10th Ave. and reaches back to 11th Ave., which is 286 ft. away on West 16th St. and 357 ft. away on West 17th St. Eleventh Ave. is the marginal street fronting the transatlantic pier sheds. There are eleven usable floors, the first floor and a mezzanine between the first and second floors being devoted to office and store space, and nine floors to the refrigerated portions. Above the top floor there is a low attic, separating the roof from the insulated top floor. This attic serves mainly as an insulating air space, but has openings in it so that it can be used for certain kinds of rough storage. It is not refrigerated.

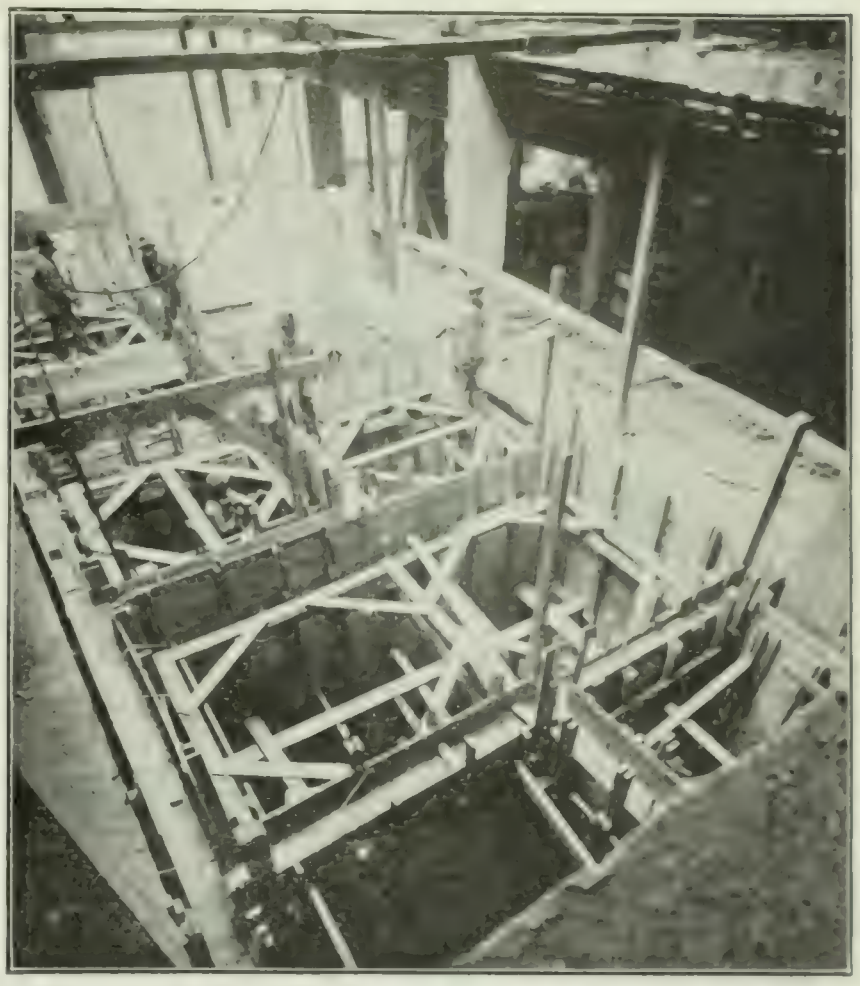
The structure is of reinforced-concrete frame throughout, with brick curtain walls carried on concealed spandrel beams placed at every other story. The lower office floors are provided with the usual windows and doors, but the storage floors have only occasional windows, and these are merely for ventilation for special occasions. They are provided on the inside with refrigerator doors which are opened only when the floor is to be cleaned or repainted and ventilated from the outside air, or on the few days in winter when outside temperature is below that required in the storage rooms.

The excavation was made in a site which at one time had been used for a gas works. Considerable trouble was encountered in removing the footings to two old

gasometers found in the northwest corner. The ground was very much more waterbearing than anticipated, and while the original design called for pedestal footings on the ground itself, a great number of piles had to be driven to bring the bearing value up to a safe one. These piles were, as a rule, concentrated under the columns, though in some few cases they were cantilever and distributed bearings carrying several columns on one general base. About 90% of the area was piled; the rest is solid earth. Pumping had to be maintained largely throughout the foundation operations, and the whole foundation wall will eventually have to be waterproofed against the ground water.

The insulated portion of the building extends from the second floor to the attic. The first floor, as previously stated, will be given over to retail commission stores and the mezzanine to offices, although a future elevated railway line, projected for the west side of Manhattan Island, will bring tracks in at the level of this mezzanine. In plan the building is separated into five transverse sections by insulated fire-walls. Each of these sections is independent and constitutes a separate insulated building from the second floor to the attic. Different degrees of temperature will be maintained in the several sections, the one at the 11th Ave. side being for cold storage—that is, having an average temperature of 20° F.—the next two being the sharp freezers where temperature as low as 15° below zero will be maintained. The two toward the 10th Ave. side are left for the time being without insulation and are to be used only for nonfreezing storage. Provision is made for future placing of insulation and brine pipes in case the two sections are turned into cold storage.

To insure complete insulation, special provisions were made at the junctures of the tenth-story columns and the attic floor and along the columns of the second story. At these locations the insulation is turned along the columns so as to increase the distance the heat would have to travel in case it passed through the floors immediately alongside the columns. The details of these increased insulating strips are shown in the drawing of the insulating layout.



LOOKING DOWN ON FORMWORK FOR ELEVATOR SHAFT

The division into sections requires that all columns at insulation above the second floor be split to permit the entrance of insulation and that floor slabs be carried only to the columns, the space between the two split portions of the column being filled not only with insulation but also in the interior section divisions with a concrete firewall and at the outside with the brick curtain wall. This separation of different parts was complicated by the presence of elevator and stair shafts, as shown on the plan. There, however, the separation was carried straight through the elevator shafts, which were built, as shown in one of the views, as entirely separate structures rising from the foundations to the roof. The insulation is then placed around the elevator shafts and refrigerator doors are provided.

The insulating material consists of cork composition board which comes in sections 2 or 3 in. thick and about 2 x 4 ft. in plan. It is plastered on to the completed concrete floors, ceilings and walls by a cement mortar and is covered on the showing face with a ½-in. cement mortar finish. Thickness of this insulation varies, with the exposure of the wall to the sun and with the degree of refrigeration required, from 5 to 8 in. Thus, the north and west walls have only 5 in. of insulation, while the south walls where the sun is strongest has 8 in.

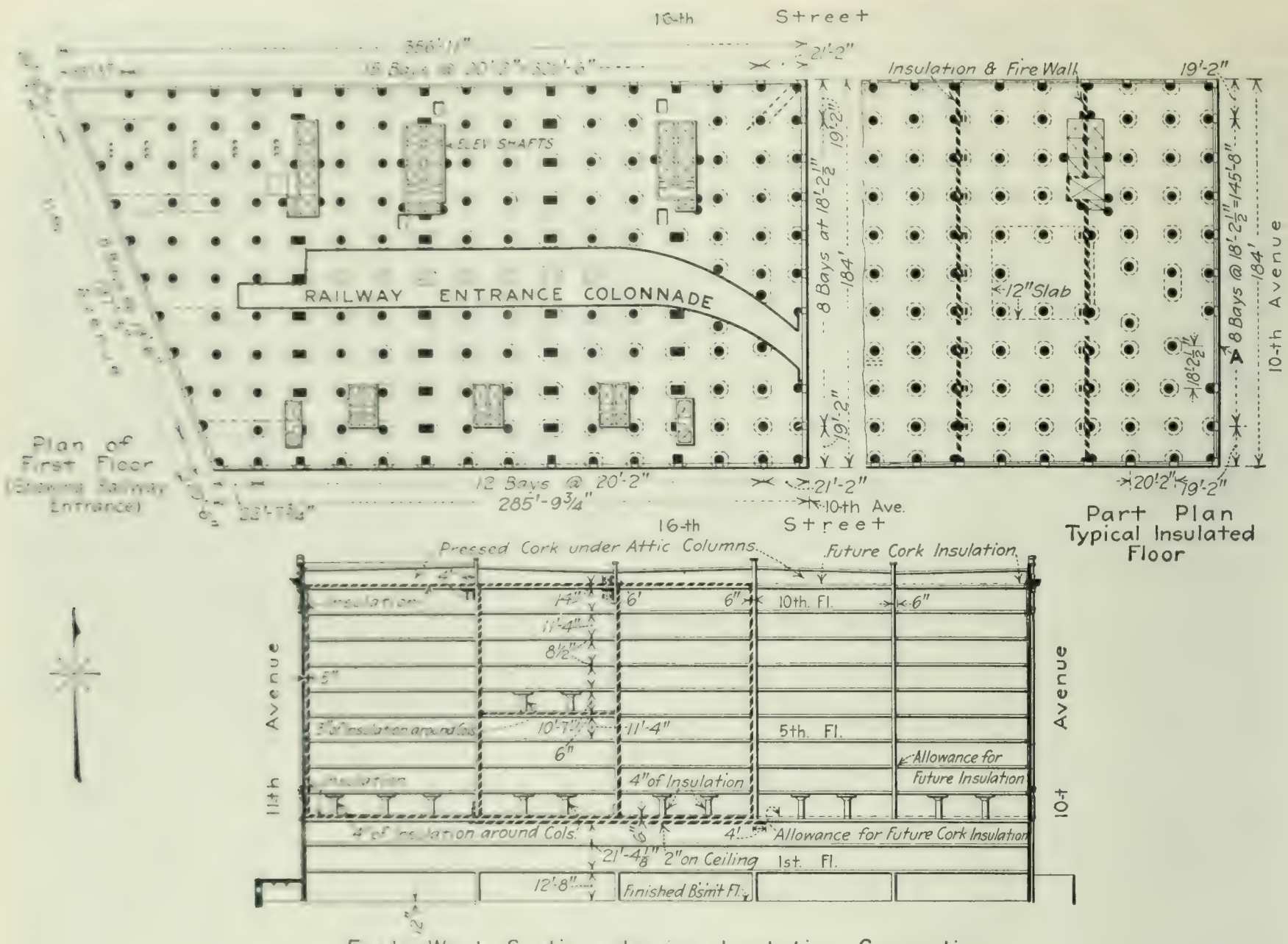


LOOKING THROUGH CORRIDOR FOR RAILWAY TRAINS



SPLIT WALL COLUMN

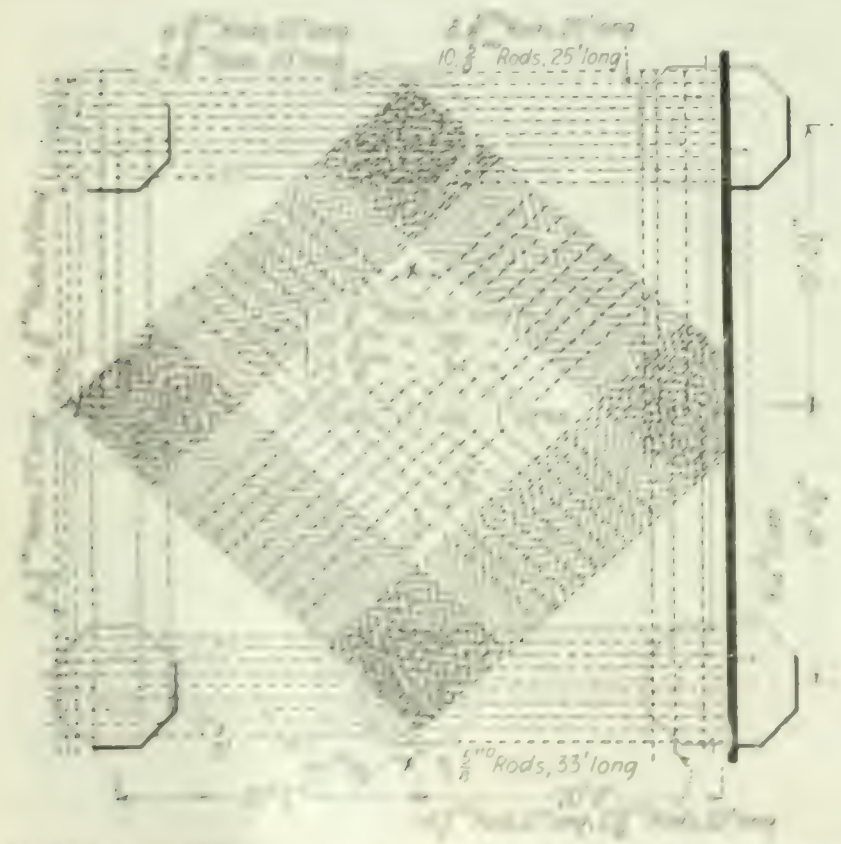
The reinforced-concrete flat slab type of construction



East - West Section showing Insulation Separation

PLAN PLANS AND INSULATING DETAILS OF COLD-STORAGE WAREHOUSE FOR MERCHANTS REFRIGERATING CO. IN NEW YORK CITY

was used throughout. A typical detail of one of these slabs and columns is shown in the drawings, and this detail varied only in a few places. The regular slab thickness of 8½ in. was increased to 9½ in. throughout the sharp freezer sections to take care of the additional load of insulation, and to 12 in. in the first and second floors as a fire stop, according to the Underwriters' regulations. The main variations from the standard panel detail were two.



SPECIAL REINFORCEMENT FOR 40-FT. PANEL OVER RAILWAY ENTRANCE

One of these is at the 11th Ave. side of the building where the square column location was prohibited by the skew, which would have brought two columns immediately alongside of each other next to the wall. In these places the column on the corner of the square nearest the wall was omitted and, owing to the length of span made thereby, the drophead was continued between the two columns as a longitudinal beam. In order, then, to take up the reaction to the cantilever action on the other side of the column, the drophead with reinforcement in the upper flange was continued back one column, as shown in the drawing.

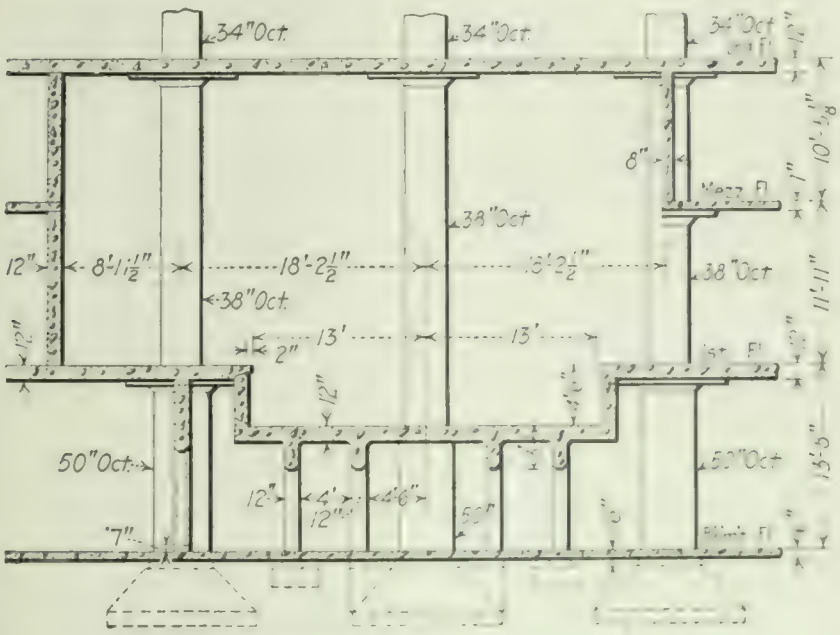
The other variation in the detailing was near the 10th Ave. entrance, where provision for a main-line railway had to be made, as described later in this article. On account of this railway entrance, one column had to be omitted and the span of the flat slab thereby increased. Leaving out this column increased the floor slab square from the 20 x 18 ft. of the typical panel to one of 40 x 36 ft. This very considerable span was taken care of by additional diagonal bands connecting the middle columns on the side, as shown in a special detail in one of the drawings. The slab was increased

to 12-in. instead of the 8¼-in. thickness of the adjacent panels, and the reinforcement designed accordingly. The slab, therefore, becomes a slightly rhomboidal area about 28 ft. in span, between the diagonal bands connecting the intermediate columns.

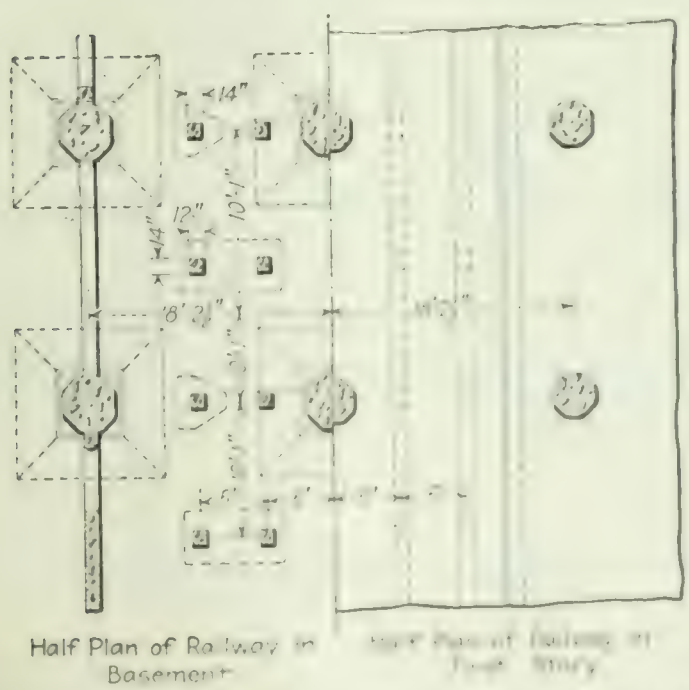
At the division walls the flat slab rests on the separated sections of the split columns, and where the division walls intersect the outer walls there are three columns, the outer one of which carries the spandrel girders and each of the inner two its respective slab.

The interior columns are octagonal in shape, spirally hooped in the lower sections, and, when the loads commence to reduce toward the top, reinforced only with straight rods and ties. They are of extremely large dimensions, particularly in the basement, some of these sections reaching as high as 84 x 36-in. In one or two places the reinforcement consists of twin spirals, one at each end of an oblong column section.

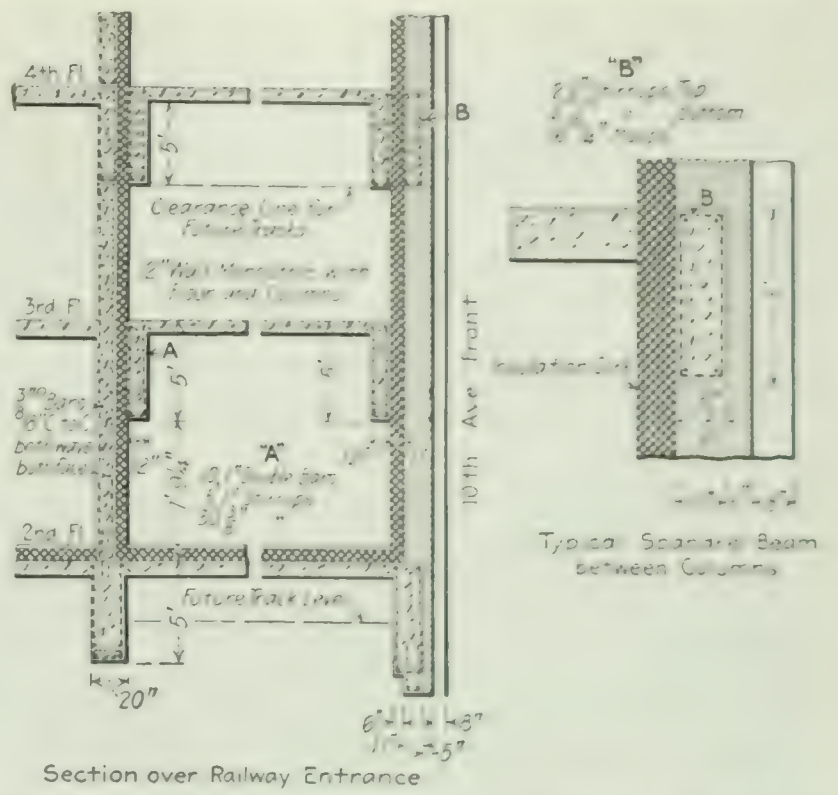
As noted before, the columns are split on the curtain walls and along the dividing walls to take care of the insulated sections. A detail of the split wall is shown in one of the drawings and a view of a wall column is also presented. In the upper part of the building; that is, above the first five stories, the wall column is braced at each floor slab by being tied to the slab column with two 1¼-in. bolts set in pipe sleeves in the interior columns. The pipe sleeve is placed there in order to



Section



DETAILS OF RAILWAY COLONNADE ENTRANCE



TWO SPANDREL GIRDERS OVER RAILWAY TRACKS OF SPECIAL DESIGN

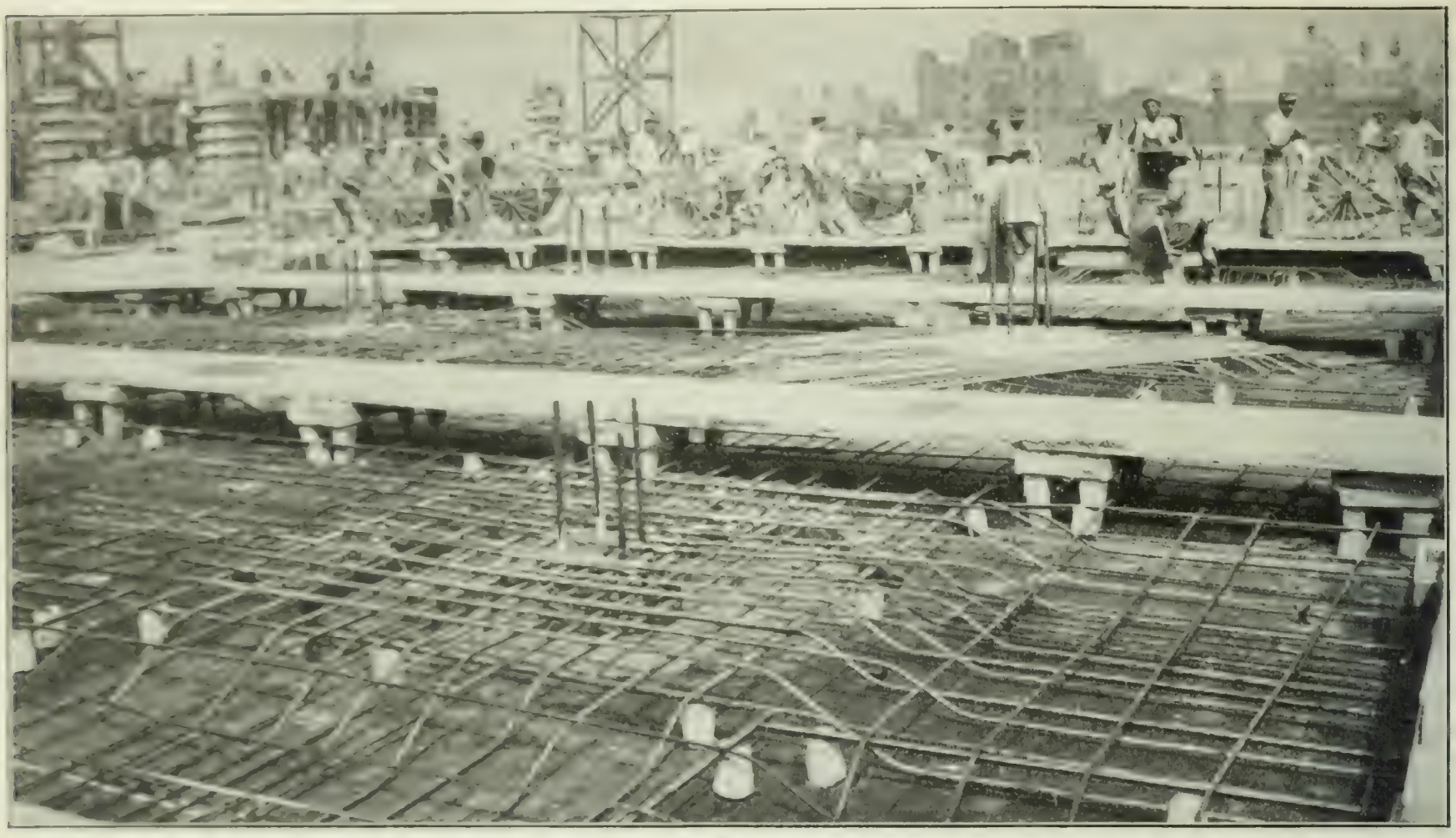
permit some vertical or horizontal movement, due to expansion of the building. Below the fifth floor, where the movement is expected to be less, the tie between the two sets of columns is merely two 1¼-in. rods set into the concrete of the two columns.

The roof columns are short stub lengths 6 to 8 ft. long, which rest on the insulating cork placed on the top of the floor. They are based on square pedestals 4 ft. each way, reinforced at the bottom with a rectangular mat of rods, as shown in one of the details. The roof, therefore, is to be carried entirely separated from the lower part of the building both as to structure and insulation.

The spandrel beams are placed at every second story and framed into the outside wall column, to carry the brick wall for two stories. In addition to the typical spandrel beams there are two other sets of beams to be noted; one spanning the railroad entrance into the building on the 10th Ave. side, shown very clearly in the view on p. 910, and the other spanning the railway into the second section of the building. These are each 5 ft. in depth at each floor, and are 36 ft. in span. They rest on the interior column and are separated from the exterior wall by the insulating cork. On account of the possibility of the railway entrance being raised to accommodate a future elevated railway entrance, it is necessary to make this bay to the first building entirely independent of the rest of the building, as will be noted from the drawing. It can be cut out at any time without affecting the remaining structure.

The railway entrance from the street-level track on 10th Ave. comes in at an angle and turns in, parallel to the side streets, about the middle of the building; it extends to the 11th Ave. side of the building. It requires an opening from the basement to the second floor, a height of about 26 ft., in which there is no cross-bracing. A view down this alleyway, during the construction of the building, is shown in one of the pictures.

In some of the lower columns the reinforcement is very slight, because at the present price of steel it was found cheaper to use a concrete section, where space



POURING ONE OF THE FLAT SLAB FLOORS IN MERCHANTS REFRIGERATING CO. COLD-STORAGE BUILDING

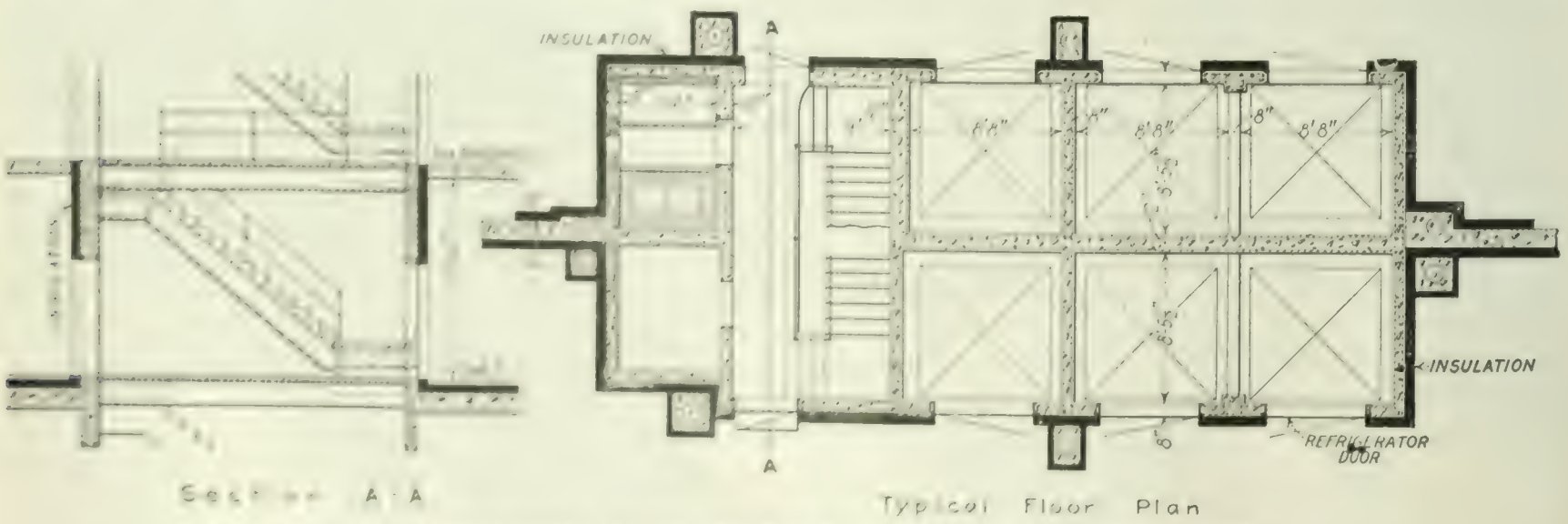
occupancy was not of importance, than to reinforce to reduce section. The railway itself is carried on short stub columns footing on piles and carrying longitudinal stringers, directly over which the tracks run, with an intermediate continuous floor. The rails are laid on short ties, a separate one to each rail.

The building is designed for live loads of 250 lb. per sq.ft. on all floors except the mezzanine, where 150 lb. are used. The railway entrance was designed for an E-50 loading.

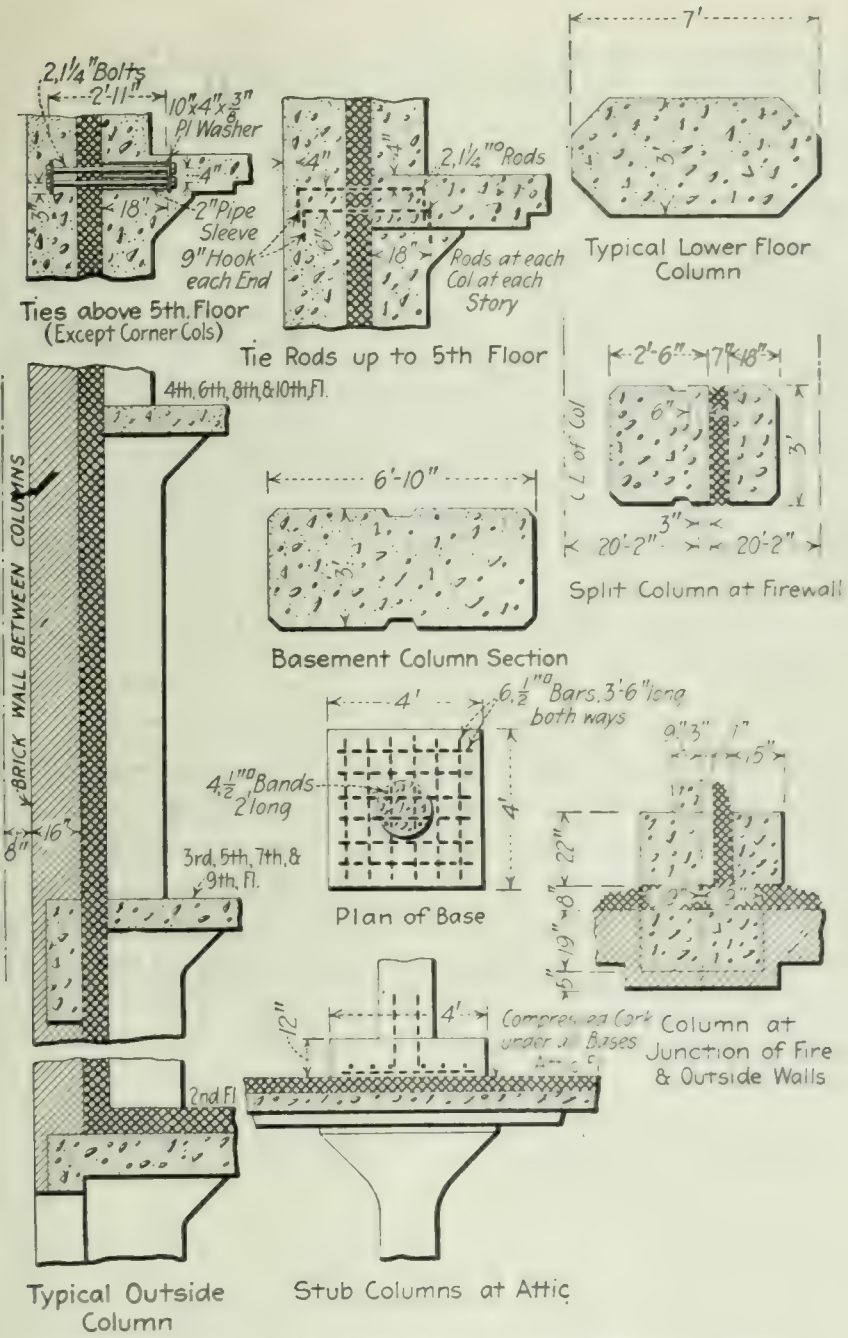
The ceilings had to be provided with inserts to carry the banks of brine pipes, which are bunched near the upper part of each story, and the dry-pipe sprinkler system, which was used in preference to the wet pipe on account of the freezing temperature. Refrigerating machinery is all concentrated in the basement on the 11th Ave. side. It is not of the size and complication common to cold-storage buildings because all of the power is purchased from the local electric company, thus doing away with all but the refrigerating units.

The construction work has been going on during the past summer. Excavation was made with steam shovels, and proceeded without difficulty. The rest of the building has been carried on with rapid progress. The material for the concrete was brought in to bins located in the basement alongside of the railway entrance. The sand and stone are being delivered by motor trucks along the runway in the railway colonnade, and dumped on grids over the bins. Cement is brought to the side street and delivered on rollers to storage alongside of the bin. Here two concrete mixers feed into elevators, which deliver onto each floor as the building is carried up. A view shows the floor under construction, with the numerous hand-pushed buggies pouring concrete on the flat-slab floor. The flat-slab layout is also shown in the same view. It will be noted that small concrete blocks are used to carry the reinforcement to proper height above the forms. The blocks are allowed to remain in the concrete.

The forms are of normal construction, except those



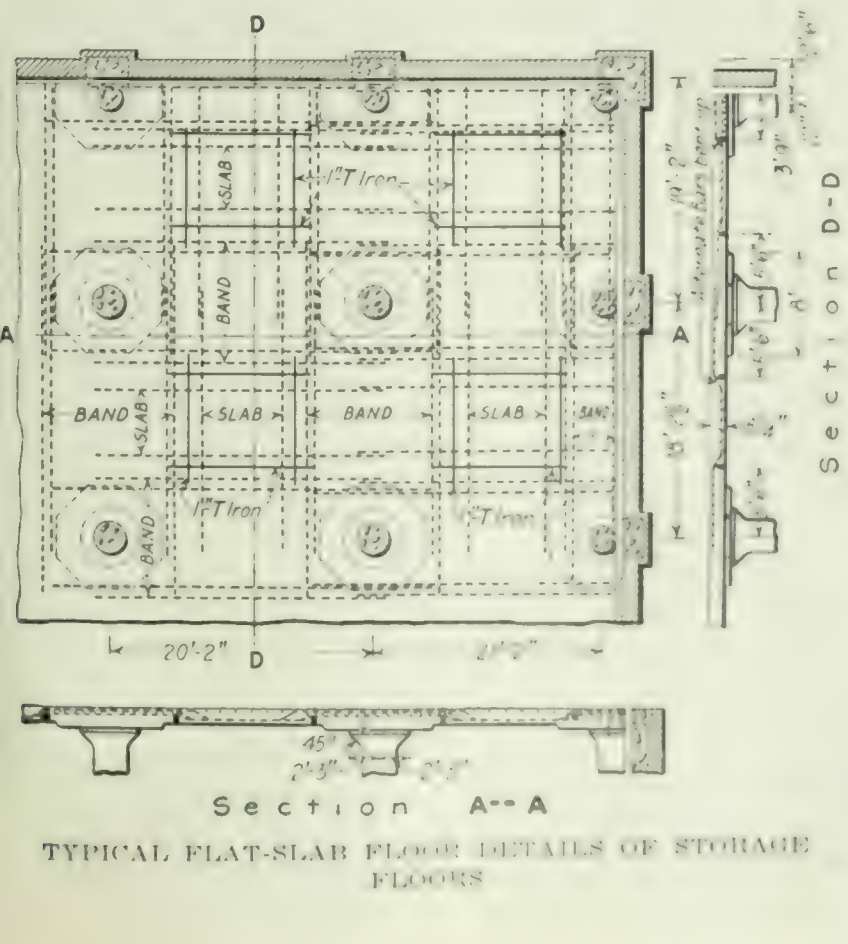
CUT COMPLETELY INSULATED FROM REMAINDER OF BUILDING



COLUMN DETAILS OF COLD STORAGE BUILDING

for the split columns, which are somewhat involved in design. As shown in the cover picture in this issue, the forms for the split column are in one part, the three separate sections being blocked apart, and the whole bound with tie-rods and wooden braces. It is set up in one-story heights, and lifted to place, braced back to the floor forms, according to the regular practice for wall columns. At the bottom of the cover picture there will also be seen lying on the floor one of the octagonal interior columns. These forms are of wood. Some of the vertical ribs are of constant size, and others are of diminishing size to fit the reduction in sections of the columns as they go up. They are used over and over again by replacing the variable strip by one smaller in width. It will be noted also that these octagonal columns are held in place by chains.

The Merchants' Refrigerating Co. building was designed by John B. Snook Sons, architects, New York City, and is being built by the Turner Construction Co., also of New York City. The architect is responsible for the general layout of the building, the Turner Construction Co. for the structural design throughout. The original design called for a steel frame with concrete protection, but the building as erected in concrete is the design submitted by the contractor. All of the refrigerating details were designed by George Horne, of the Merchants Refrigerating Company.



TYPICAL FLAT-SLAB FLOOR DETAILS OF STORAGE FLOORS

Minnesota Health Board Controls Plans

UNDER a regulation recently adopted by the Minnesota State Board of Health, all plans and specifications for water-supply, sewerage and refuse-disposal systems for public use in that state must be submitted to and approved by the board before the proposed work can be carried out. The regulation, which has the force of law, is as follows:

"No system of water-supply, sewerage, or refuse disposal for public use, which affects or tends to affect public health, shall be installed, nor shall any such existing system be materially altered or extended, until complete plans and specifications for the installation, alteration or extension, together with such information as the State Board of Health may require, have been submitted in duplicate and approved by the board so far as relates to their sanitary features. All construction shall take place in accordance with the plans as approved, whether with or without modification. Whenever any governing body of any municipality having charge thereof shall determine that there shall be any material change in the plans, construction, or operation of any such system, such governing body shall submit to the State Board of Health, in duplicate, a detailed statement of such action of such contemplated changes before it shall enter upon the making of such changes or enter into any contract therefor or any part thereof, and then such changes shall only be made after approval as to all matters liable to affect public health, by the State Board of Health."

Dr. H. M. Bracken, St. Paul, is executive officer of the Minnesota State Board of Health.

Civic League's Paving Plans

The work of the Civic League of Cleveland, Ohio, according to its latest bulletin, has not extended beyond the inspection of work already under construction, but it is intended in another year to widen its activities by making its influence felt in the selection of types of pavement for different kinds of streets, and in the drafting of specifications.

How Road Material Embargo Will Affect Construction

At "Engineering News-Record's" Request State Highway Officials Give Views on Local Effect of Priority Board's Order No. 2

IN ORDER to learn the effect on road-building in various sections of the United States of order No. 2 of the Priority Board of the Council of National Defense, which, effective Nov. 1, prohibited the use of open-top freight cars for the shipment of "materials and supplies, other than coal, for the construction, maintenance or repair of public or private highways, roadways, streets or sidewalks," *Engineering News-Record* has asked a number of state highway officials for a brief statement of the local situation. (For Priority Board's order No. 2 see *Engineering News-Record*, Nov. 1, page 855.) The following replies, by telegraph, have been received:

The department not seriously hampered by Priority Board embargo. Content to leave matter with the Priority Board.

CHARLES J. BENNETT,
State Highway Commissioner of Connecticut.
Hartford, Conn.

Priority Board embargo on road material has practically closed down all contract work for roads in the State of Maryland, cutting off supplies at many points for maintenance. There is no available material for maintenance on the eastern shore; all must be shipped in. The ruling of the board has eliminated many materials for this purpose. If order cannot be modified, very little, if any, new work will be undertaken and roads on eastern shore, where there is no local material for hundred miles or so, will practically go to pieces for want of repairs. Commission has given all contractors permission to close down their work which, in many instances, has been left in very bad condition, since no notice was given that such an order would be passed. Contractors were not prepared to close down and their loss will be great due to this order.

H. G. SHIRLEY,
Chief Engineer,
State Roads Commission of Maryland.
Baltimore, Md.

Order No. 2 of the Priority Board has had the effect of closing down a great deal of the construction and maintenance work of this department, and with the failure of the Priority Board to give sufficient notice—which, we understand they were in a position to do—will mean that this work will have to go over the winter in its uncompleted state. This will cause not only serious inconvenience to the citizens of the country but a considerable loss to the state. We recognize that the successful prosecution of the war is the matter of first importance confronting the nation at this time, and this department and the state as a whole are not only willing but anxious to give all possible assistance under existing conditions, but we are of the opinion that the Priority Board was at serious fault in not giving the highway officials time to adjust their work and prevent unnecessary losses.

While we believe that a serious error has been committed by the Priority Board in the manner in which the order was issued, we are accepting its ruling as final until amended and are endeavoring to adjust ourselves to the conditions as loyal American citizens. At the same time we are making our plans to carry forward our important construction and maintenance work as soon as the embargo is lifted and weather conditions will permit.

GEORGE P. COLEMAN,
State Highway Commissioner of Virginia.
Richmond, Va.

No existing contracts in Alabama under direction of State Highway Department are affected by priority order No. 2. Advertisements now running asking for bids on work requiring 66,000 tons of surfacing material, 52,000 tons of which are for Federal-aid projects, will be affected. Lettings will either have to be postponed or contracts awarded conditional on nullification of the order within a reasonable length of time.

W. S. KELLER,
State Highway Engineer of Alabama.
Montgomery, Ala.

Priority order No. 2 will affect only such state highway work as is done with imported materials, chiefly sand and stone. Concrete work is affected to greater extent than macadam. This year's concrete road work is completed and macadam work nearly finished. If in effect next year, the order will reduce concrete paving very largely, macadam to a less extent, but we will be able nevertheless to work to advantage in most counties on grading and surfacing with local materials, provided we can secure labor. We are anxious to improve our roads as rapidly as our facilities permit and yield to none in our appreciation of their importance, but realize the necessity in these times for curtailment in activities not absolutely essential. This year, in coöperation with the state and county councils of defense, we voluntarily gave a considerable percentage of our forces to the farmers at harvest time, but certain roads are essential and every facility should be given to permit their construction. Therefore we hope and believe that priority order No. 2 will be rescinded before spring. If not, we must accept it and refrain from acts which might tend to make more difficult the proper administration of railways in contributing to the national defense.

A. R. HIRST,
State Highway Engineer of Wisconsin.
Madison, Wis.

Due to issuance of priority order No. 2, all work of construction and maintenance where same required materials to be shipped by rail has been discontinued, work being done only where local materials are readily available. Unless this order is either rescinded or modified,

little, if any, work can be undertaken, and then only in such locations where local materials are available. Serious loss will be suffered if material cannot be obtained at least to properly maintain the main arteries of travel. Action with regard to existing contracts will depend entirely on conditions surrounding each individual case, proper allowance being made for conditions over which the contractor has no control. If national conditions will not permit of the rescinding of priority order No. 2 in its entirety, would suggest the modification of same to permit of the maintenance and reconstruction of main roads which may be determined by the United States Government authorities to be of national importance.

W. D. UHLER,
Chief Engineer,
State Highway Department of Pennsylvania.
Harrisburg, Penn.

Priority Board's embargo on road materials will doubtless entail closing down of a number of road contracts in California, both in state and county work, but on state work conditions might be worse, since many of the contracts had not advanced far enough to be affected much. The state contracts began late this year because new bond issue money was not available until Aug. 1, and many contracts are still at the grading stage, thus needing relatively little material requiring railroad transportation. Before order became effective many cars of gondola type belonging on Pacific coast were already in East or on the way and flat cars and many box cars have been withdrawn recently from highway use so prospects are very gloomy for paved roads until embargo is lifted. On mountain laterals, however, where work consists chiefly of grading, construction will probably advance more rapidly than contemplated heretofore. The commission will continue to let new contracts and carry on those existing wherever possible, even hauling some materials by motor truck, and do all else possible to assist contractors and lessen their losses, but of course the needs of the nation in the present emergency are paramount and the state will do nothing to embarrass the Government by attempting to upset the priority order.

A. B. FLETCHER,
State Highway Engineer of California.
Sacramento, Calif.

Enforcement of priority order No. 2 has left some counties in Kentucky in unsatisfactory condition. This applies particularly to mountain section where there are no limestone deposits. Several counties are building roads, using sandstone base limestone surfacing. Base course has been placed for considerable distance and unless covered with limestone previous work will be practically lost. In majority of counties material can be gotten locally, though sometimes of inferior grade. Such counties not seriously affected by order. Contractors in some instances have been affected, because order was passed on such short notice. Where only small amount of work remains uncompleted it is probable that counties will release contractors from completion of work. Of opinion roads are necessity instead of luxury. Know positively if we could have few more connecting roads, especially in eastern Kentucky, great deal of foodstuffs could be marketed which now are going to waste. Also, coal conditions would be helped, because coal could be hauled to railroad stations by wagons and loaded in cars. Such is being done where we have built roads. Our aim is to coöperate with Government in enforcement of all orders in this war. If officials feel order must stand will do best possible under circumstances

R. WILEY,
Commissioner of Public Roads of Kentucky.
Frankfort, Ky.

Regarding the effect of Priority Board embargo on road materials, permit me to say that the present indications point to the necessity of closing down road work for the season. Just how soon I am not at present able to state, as we may be able to substitute truck hauls for car delivery.

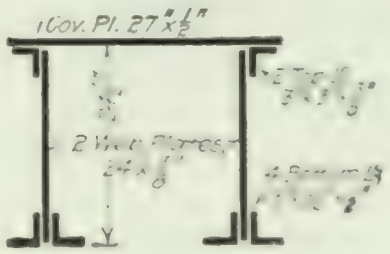
CLINTON COWEN,
State Highway Commissioner of Ohio.
Columbus, Ohio.

Priority order affects ten sections uncompleted road, for several of which materials are being shipped in box or flat cars. One section bituminous macadam, base course materials having been distributed, base course will be finished as waterbound macadam, substituting local gravel for screenings. No attempt to undertake new work or to carry on uncompleted work except to finish short stretches. Surveys and plans for $4,500,000 worth of road work will be made this winter and contracts awarded spring of 1918 if conditions warrant.

C. OLDER,
Chief Highway Engineer of Illinois.
Springfield, Ill.

Moment of Inertia Computing Simplified

THE usual method of computing the moment of inertia of a built-up structural section is to tabulate first the separate multiplications of area by distance from some axis to find the center of gravity, and then to make a separate tabulation of moments in which the area of each part is multiplied by the square of the distance of that part from the center of gravity. C. R. Harding, assistant consulting engineer, Southern Pacific Co., New York City, has found it simpler in his office to determine the moment of inertia first around the bottom of the section and then to transfer it to the center of gravity. The tabulation can then be made in one operation, as shown in the following typical example; as only one set of dimensions, d has to be determined, they can be used as multipliers twice, which is especially convenient when using a computing machine.



Tests Show Tightness of Flexible Joint Pipe Crossing New York Harbor

HYDROSTATIC tests conducted last year by the New York Board of Water-Supply on the 10,300 ft. of 36-in. pipe forming the Narrows siphon of the Catskill aqueduct showed a leakage of 5.6 gal. per minute at a pressure of 130 lb. and only 1.5 gal. per minute at 100 lb. The following details of the tests are given in the 1916 annual report of the Board of Water-Supply, J. Waldo Smith, chief engineer:

After the completion of the pipe laying on July 10, 1916, a hydrostatic test was made on the pipe between the 36-in. gate on the Brooklyn shore and the 36-in. gate on the Staten Island shore, a total length of over 10,300 lin.ft. of 36-in. pipe, of which 9740 ft. were of the submarine type. The presence of air trapped in the pipe, which was estimated from data secured during the test as amounting to as much as 20,000 cu.ft., made the measurement of leakage somewhat difficult, but by repeated tests a satisfactory result was obtained. The leakages at the pressures recorded in the first paragraph are said to be considerably less than is allowable for land lines of similar size. Further proof of the remarkable tightness of this line was furnished between Oct. 21 and Dec. 1, when the pipe was subjected continuously to the service pressures in the Staten Island mains, varying from 100 to 110 lb. per sq.in. The water supplied from this service was measured through a small meter placed on a by-pass around a 36-in. line valve. The total average leakage recorded for a period of 40 days, from the 10,300 ft. of pipe under test, was only 0.78 gal. per minute.

In August, the line was flushed out with water from the Brooklyn supply through the blow-off in Staten Island to remove salt water and dirt from the submarine line. Before the flushing, 200 lb. of hypochlorite of lime were put in the pipe on the Brooklyn side. Samples of water were taken and the pipe was found to have been satisfactorily flushed out. Measurements were also taken to determine the flow of the corresponding loss of head. While no very accurate figures could be obtained, an approximate flow of about 19,000,000 gal. per day with a loss of head of about 20 ft. was measured. This corresponds roughly to a coefficient of 110 in the Chezy formula. The line was again flushed out, using for a short time a flow of about 22,000,000 gal. per day.

The Narrows siphon was used by the Department of Water-Supply, Gas and Electricity during November and December, 1916, for the delivery of water from one of the Brooklyn high-pressure fire stations to Staten Island, and was of inestimable service in preventing a serious shortage in the Borough of Richmond.

State-Aid Hard Roads for Indiana

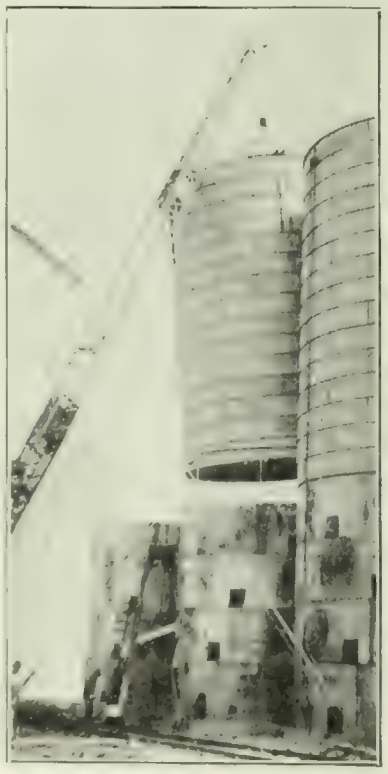
FIVE ROUTES of main "market highways" have been designated by the Indiana State Highway Commission. All of these will be hard-surface roads, but the kind of pavement has not yet been selected. No contracts will be awarded this fall, but plans and specifications are now being prepared for next year's work, and it is hoped that about 200 miles of hard-surfaced roads will be built in 1918. The Indiana law provides that the state may pay 50% of the cost and the counties must pay at least 50 per cent. The Commission intends to place all Federal-aid and state-aid money in one fund to pay half the cost of the improvements, the remainder to be paid by the counties.

The five routes mentioned are approximately as follows: (1) From the Michigan line through South Bend and Indianapolis to Jeffersonville, on the Ohio River; (2) east from the Illinois line through Dyer, Elkhart and Fort Wayne to the Ohio line, by way of the Lincon Highway; (3) the old National Road east from the Illinois line through Terre Haute, Indianapolis and Richmond to the Ohio line; (4) east from Evansville through Newburgh, Jasper, West Baden and Aurora to the Ohio line; (5) east from the Illinois line through Vincennes to Mitchell.

L. H. Wright is chairman of the commission and William S. Moore is state highway engineer, with offices at Indianapolis.

New Bottoms for Old Grain Bins

TO ENLARGE circular steel grain bins at an elevator plant it was proposed to add new sections on the top, but investigation showed that the old bins were not strong enough to carry the additional weight. It was then decided to shift the old bins, build the new sections on the old foundation and replace the old bins on top of the new sections. The view shows one of the old sections being placed. At the right is a complete bin, and at the left is one of the new bottom sections ready to have the old section set upon it.



OLD GRAIN BINS ARE SET ON NEW BOTTOMS

There are six bins in all, having a diameter of 19 ft. The old sections are 30 ft. high and the new bottom sections 20 ft. high. The difference in size of the plate rings is very evident. The sections are connected by a riveted ring joint, reinforced by vertical bars on the inside. When the bins were completed they were surmounted by a new roof and conveyor gallery. This work was done by the Minneapolis Steel and Machinery Co., for the Spaulding Grain Elevator Co., of Warren, Minnesota.

Good Roads Return Actual Dividends

Definite cash returns come to Colorado through increased tourist traffic because of its good-roads system, according to T. J. Ehrhart, commissioner of the State Highway Department. At least 40,000 automobiles, carrying 180,000 persons, visited the state this season. Each person is estimated to have remained in the state 25 days and to have spent $3.20 per day, or $15,600,000. Mr. Ehrhart estimates a 20% profit, or $3,120,000, for Colorado business men. The 1918 season is expected to bring 60,000 cars. This business promises soon to be the greatest single resource of the state.

Low Movable Dam Has Sloping Ends with Triangular Gates

Shutter Barrier in Philippines with Concrete Sill Following Bank Slope Has Reduced Flood Losses

BY C. G. WRENTMORE
Consulting Engineer, Manila, P. I.

CARRYING of the sills of a shutter dam up the bank slopes of the stream so as to reduce waterway obstruction is the principal feature in the design of two small irrigation dams built by the writer. This arrangenot only causes a minimum contraction of waterway and removes the danger of eddies common at the shoulders of shutter dams, but also is cheaper than the ordinary dam of this sort, with no loss of stability or durability. Two such dams were built for small irrigation systems in the Philippines, but as they are similar in detail one only will be described here.

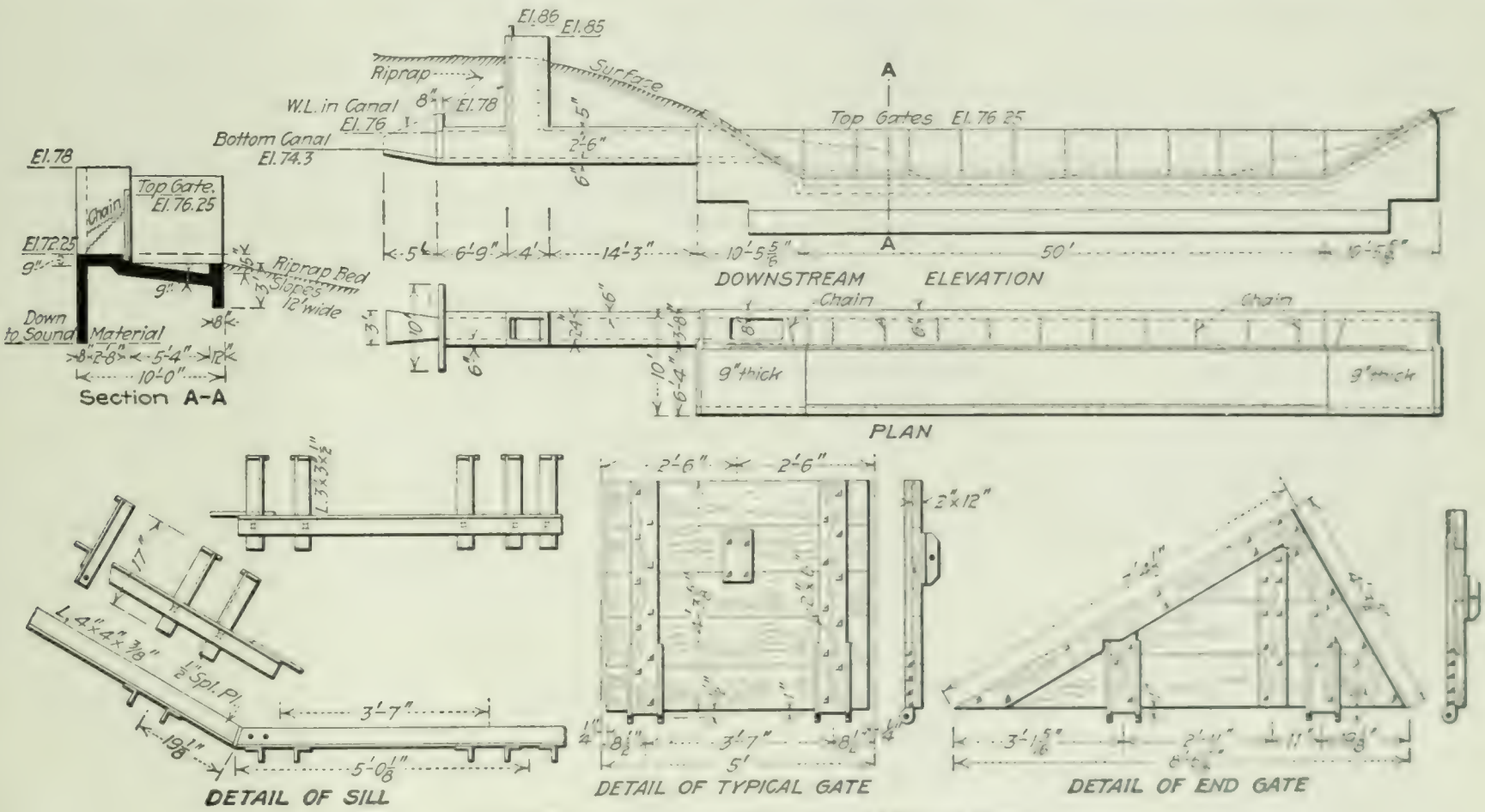
The stream at the point of diversion has a well defined channel, with banks which rise from the stream bed on a slope of about seven on twelve to near the level of the adjacent land, which runs back from the stream very evenly and almost horizontally. Ordinary floods are contained within the banks, but extraordinary inundations may frequently overtop them.

It was evident that a dam thrown across this stream in such a manner as to contract the cross-section by any considerable amount would, first, cause an ordinary flood to rise over the banks, and second, would tend to cause scour in the channel and expense in protection works. While the material is light and easily moved, the present banks below the site of the dam are well protected by tropical vegetation, and there is reason to hope that if no disturbance of the existing conditions is introduced the channel will hold its present position for many years.

In view of these conditions, a low lift was adopted for the dam, and the dam itself was designed in such a manner as not to contract the waterway at all and to change the form of cross-section as little as possible. The dam consists of a sill on the level of the stream bed supporting hinged gates or shutters, the lift of the water being entirely secured by the shutters. The sill is carried horizontally across the full width of the stream bed and at each bank is turned up on an angle to fit the slope of the bank. This sill is of concrete, with a curtain wall at the upstream edge carried down to impervious material, and having the downstream edge protected from scour by an apron of riprap sloped well down below the normal level of the stream bed.

On the concrete sill a sill of angle iron anchored into the concrete is carried across the bed and up on each sloping shoulder to an elevation slightly above the top of the gates. The latter are hinged to this steel sill with slotted hinge sockets to assure seating. The gates are held up against the water pressure by anchor chains and are released in case of flood by the shearing of a small wooden plug. When the gate falls it is cushioned by a pocket of water, thus protecting the concrete from the blow. The gates standing on the horizontal portion of the sill are rectangular, and rotate about a horizontal axis; those on the sloping portion are triangular, the axis of the hinge lying in the slope of the sill so that the gate swings somewhat back toward the bank as it falls.

A weak point in this plan is the device for tripping the gates. The writer has designed a number of tripping devices and has examined many others, but has seen none that comes near perfection and each has one or more features that are very undesirable. The one adopted is so low in first cost and so free from undesirable features, except the variation in load required to trip, that it has been adopted as the most desirable for this project.



SHUTTER DAM SILL RUNS UP BANK SLOPE

Speedy Road Condition Survey by Auto Cost Only $1.20 per Mile

Wisconsin Highway Commission Collects Data on 7500 Miles of Road as Basis for New Trunk Route System

BY THE use of automobiles, special blank forms and a code system in which numbers were employed to describe conditions observed, a survey of the condition of 7500 miles of road was made in less than three months by the Wisconsin Highway Commission at a cost of only $1.20 per mile. The survey will be used as a basis for selecting a 5000-mile trunk-line system to be constructed with Federal aid. The results of the survey, according to A. R. Hirst, state highway engineer, under whose direction the work was performed, are very satisfactory for the purpose intended and it is doubted if any more complete information could have been obtained in any other way except at greatly increased costs.

The statute enacted by the Wisconsin Legislature of 1917, providing for the coöperation of the state with the Federal Government in the construction of Federal-aid roads, requires that the State Highway Commission shall select a system of state trunk highways to which the Federal-aid construction shall be confined. The system is required to connect all county seats, and all cities with a population of 5000 or more. After May 1, 1918, the counties are required to maintain the entire system, the unimproved portions as well as the portions which have previously been improved under the state highway law or otherwise. The cost of construction and maintenance is to be paid from the proceeds of automobile licences. All construction will be administered by the State Highway Commission direct. The maintenance will be administered by the counties under the direction of the State Highway Commission and paid for by the state. Effective control is guaranteed by a provision in the law authorizing the State Highway Commision to withhold payment for work improperly done.

The law required that this system should be selected prior to Nov. 1, 1917. As the law did not become effective until July 11, any ordinary methods of surveying these routes could not possibly have covered the ground within the required time. A system was devised which, it is believed, gives the required information with a minimum of expense and a maximum of speed. The information desired is such as will enable intelligent estimates of the cost of future construction and maintenance and proper comparisons between alternate or competing routes to be made. The surveys are, in effect, reconnoissances; all future construction will be based on proper instrument surveys.

WISCONSIN HIGHWAY COMMISSION

Condition Survey Report on State Trunk Highway—Mile No. 10, Div. Survey No. 173, between City of Baraboo and City of Reedsburg, Known as the Baraboo-Elroy Road, Sauk County

Location of Miles	1	2	3	4	5	6	7	8	9	10	
[illegible]	*4-1					*1--2*1-3				*4-3	1
[illegible]	2-1										2
[illegible]											3
[illegible]	24-15		*20 9			*18					4
[illegible]	28-50										5
[illegible]		B-3									6
[illegible]											7
[illegible]								B-1			8
[illegible]			C-1								9
[illegible]											11
[illegible]		1 90 14						1-62-16			11
[illegible]		3-3-20						1-1-29			12
[illegible]		2-1						2-1			13
[illegible]						3-1 3					14
[illegible]		90-2		90-1		90-2			3-1 80-2 90-1		15
[illegible]	2-2	1-1		3-3+		1 1			1-2 2-3 2-2		16
[illegible]											17

Profile Datum Vert. Spaces = 20 ft.

[illegible]										18
[illegible] Crossings			1-1-3					1-1-3		
[illegible]										19
[illegible]										20
[illegible]										21
[illegible]		Red Trail				R-1				22
[illegible]										23
[illegible]										24
[illegible]						R-1				25
[illegible]										26
[illegible]						Mr Black				27
[illegible]			Gravel pit .... County pit							28

* NOTE—Wherever road is such as will require extra outlay, and insert required estimates of Maintenance and Construction Give estimate on Grading and Culvert. Use only where necessary and be conservative. Investigate to secure permanence at a reasonable cost.

Estimated Maintenance per Mile $[illegible] Estimated Grading and Culvert Cost on Imperative Construction $

Remarks: Crosses [illegible] in this section Good [illegible] country, very crooked road

Date 7-15-1917 Observer [illegible] Recorder H. G. [illegible]

SUMMARY (Do Not Fill Out)

| Roads and Streets | | | | | | | | | | |

All mileage measurements are made by automobile speedometer. The survey force consists of two men, an observer who also drives the car, and a recorder. The notes are taken on a specially devised blank, and are recorded by means of a code system.

Prior to beginning the survey, all speedometers to be used were carefully checked against a measured distance. The variations ranged from a few feet to more than 200 ft. per mile. It was found that these errors were caused by slight variations in the sizes of the tires of the car, and they were corrected by the use of tires of exact diameter.

Record Sheet and Code

A specimen of the record sheet and the code are shown. The record sheet is ruled horizontally into 28 spaces, one for each subject on which information is desired, and vertically into 10 spaces, each representing 0.1 mile. The subjects are arranged so that related subjects occur together, thus making the record come in a logical order, facilitating both the record and reading of the notes. The record is made almost entirely by numbers, it having been found that figures can be recorded more rapidly than letters. The record is made while the car is in motion, except for stops which are made to measure culverts or bridges and stops at the end of each mile to fill in the title blanks at the top of the sheet and make estimates of maintenance and imperative construction. All widths of right-of-way, distances between ditches, widths of traveled way and surfacing are estimated.

The title of the specimen sheet shows the location of the road and mile under survey. The mile begins with a gravel road in good condition which continues to the end of the fifth one-tenth, where there is an earth road in medium condition which continues for 0.1 mile, where it becomes poor and continues so to the end of the ninth one-tenth, where a gravel road in poor condition begins and continues to the end of the mile. The soil for the entire mile is a light clay. Drainage is good. The road follows the surface of the ground all the way. The width of traveled way at the beginning is 24 ft., the surfacing is 15 ft. This continues to the center of the second one-tenth, where the traveled way and surfacing narrow to 20 ft. and 9 ft. respectively, and so continuing to the end of the fifth one-tenth. The last five-tenths have a traveled way of 18 feet.

In the second one-tenth there is a wooden bridge consisting of a single span of 90 ft., 14-ft. roadway. The floor is of planks in poor condition; distance from grade to stream bed, 20 ft. The foundations are of stone in good condition. In the third one-tenth there is a concrete culvert in good condition, size 2 x 2 ft., and 24 ft. long. In the eighth one-tenth is a steel bridge in good condition, a single span of 62 ft., 16-ft. roadway. The floor is reinforced concrete in good condition; distance from grade to stream bed, 29 ft. The foundations are stone in good condition.

A town road, carrying light traffic, turns off to the right in the sixth one-tenth. This mile is crooked at the beginning. A tortuous curve, medium vision, reasonably safe, is shown in the first one-tenth. In the second one-tenth there is a 90-deg. turn to the left, good vision; in the fourth one-tenth a 90-deg. turn to the right, poor view, exceedingly dangerous; and in the sixth one-tenth another 90-deg. turn, this time to the

SYMBOLS TO BE USED ON CONDITION SURVEY OF STATE TRUNK HIGHWAYS

1. A—Type
   1—Earth
   2—Sand-Clay
   3—Shale
   4—Gravel
   5—Gravel-Surface treated
   6—Stone Macadam
   7—Stone Macadam - Surface treated
   8—Bit Macadam
   9—Concrete
   10—Bit Concrete
   11—Asphalt
   12—Brick
   13—Other—give name
1. B—Condition
   1—Good; 2—Fair; 3—Poor
   4—Rebuild immediately
2. A—Soil
   1—Heavy Clay; 2—Light Clay or Loam; 3—Sand; 4—Marsh
2. B—Drainage
   1—Good; 2—Fair; 3—Poor
   4—None whatever; 5—Center lower than ditch line
3. Special Conditions
   1—Mud hole; 2—Rock outcrop; 3—Present cut; 4—Present fill
   5—Side hill; 6—Dangerous ditch
4. Travelled Way-Surfacing
   Insert in order estimated width of travelled way and surfacing as 18 ft., 9 ft.
5. Between ditches—fences
   Insert in order, estimated width between ditches and between fences as 24 ft. —28 ft.
6. Wooden Bridge-Culvert
   1—Good. 2—Fair; 3—Poor; 4—Rebuild immediately
7. Stone Bridge-Culvert
   1—Good; 2—Fair; 3—Poor; 4—Rebuild immediately
8. Steel Bridge-Culvert
   1—Good 2—Fair; 3—Poor; 4—Rebuild immediately
9. Concrete Bridge-Culvert
   1—Good. 2—Fair. 3—Poor; 4—Rebuild immediately
10. Additional Bridge-Culvert
11. No Spans—Opening—Clr Rdwy
    Give number of spans, size of opening, and width of clear roadway
12. Floor—Floor to Stream Bed
    1—Concrete
    2—Creosote Blks
    3—Plank
    1—Good
    2—Fair
    3—Poor
    4—Rebuild immediately
    Give distance from floor to stream bed.
13. Foundations
    1—Wooden Piles
    2—Stone Masonry
    3—Steel Tubes
    4—Concrete
    1—Good
    2—Fair
    3—Poor
    4—Rebuild immediately
14. A. Intersecting Roads
    1—State trunk
    2—State aid sys
    3—Town road
    1—Right
    2—Left
    4—Four corners
    5—Five corners
14. B. Traffic
    1—Heavy; 2—Medium; 3—Light
15. Turn-Angle (in degrees right and left from foresight)
    1—Right
    2—Left
16. Vision—Danger
    1—Good
    2—Fair
    3—Poor
    1—Safe
    2—Medium
    3—Dangerous
17. Possible relocations
    1—Right
    2—Left
    Show limits of and estimate distance increased or diminished.
18. Ry & St. Ry. Crossings
    Locate thus with angle
    1—Grade
    2—Overhead
    3—Undergrade
    1—Good
    2—Fair
    3—Poor
    4—Reb. Immed
    1—Safe
    2—Medium
    3—Dangerous
19. Railways and Street Railways
    Within Right-of-Way
    Locate thus....
    1—Right
    2—Left
    3—Center
    1—Safe
    2—Medium
    3—Dangerous
20. Government limits
    Locate town, village, city and county lines. Name nearest point in village or city. Also attach print or map showing course of Trunk System.
21. City Construction Limit
    Locate limits where in your judgment construction should stop and begin.
22. R. F. D. Routes—Trail
    1—Right; 2—Left
    Note trail followed, if any.
23. School Houses—Town Hall
    S—School House
    H—Town Hall
    1—Right
    2—Left
24. Churches—Factories
    C—Church
    F—Factory
    1—Right
    2—Left
25. Farm Res.—Cemeteries
    Cem—Cemetery
    R—Farm House
    1—Right
    2—Left
    Write name of farm in small hole.
26. 1917 State Aid Work
    Locate on base map sections to be constructed for 1918. Check on map sections completed.
27. Miscellaneous
28. Location of Materials
    Show location of local materials available for construction and maintenance.
29. Remarks
    Describe here difficult construction locations, unusually dangerous points, etc., not otherwise covered.

left, good view, safe. In the ninth one-tenth there are three turns; 3 deg. to the right, good view, medium safe; 80 deg. to the left, medium view, dangerous; and 90 deg. to the right, medium view, medium safe. An advantageous relocation of the entire mile is possible.

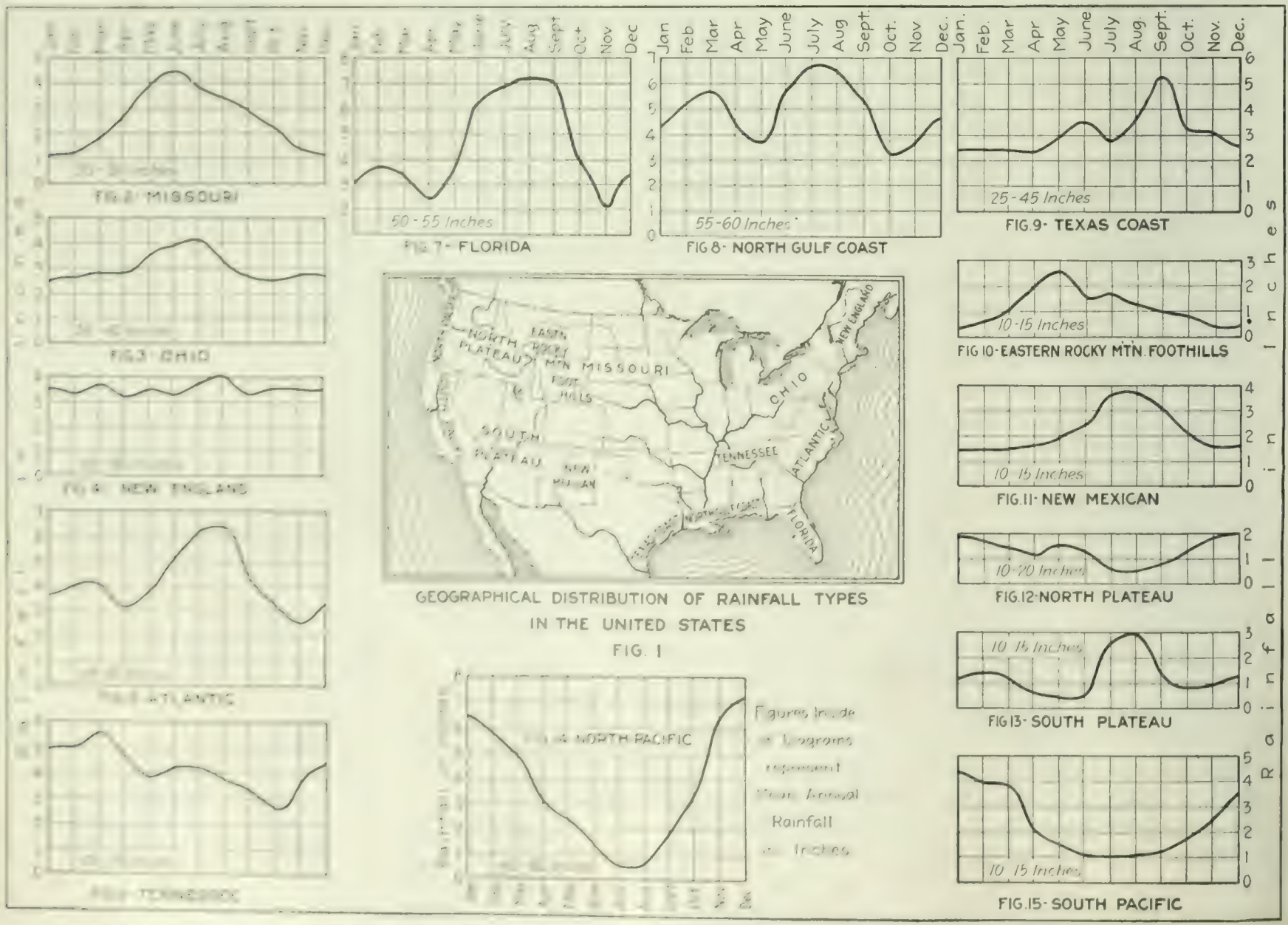
In the fourth one-tenth there is a dangerous grade crossing with the C. & N. W. Ry. The physical condition of the crossing is good. The same thing occurs again in the eighth one-tenth. Evidently the purpose of the suggested relocation is to avoid these two crossings. In the seventh one-tenth a mail box belonging to Mr. Black, whose residence is on the right hand side of the road, is noted. This indicates that the road is a mail route and thus eligible to Federal aid.

It is estimated that this mile can be maintained in reasonably good condition in 1918 for $250, without any additional grading or culvert construction

After the survey is complete, a summation of the total number of miles is made on a blank form, as shown. To insure uniformity, estimates of maintenance costs are made from a schedule of estimated maintenance costs for each type and condition of road. These range from $35 per mill for 18-ft. concrete roads in first-class condition, $150 per mile for earth roads in third-class condition to $470 per mile for 9-ft. macadam surfacing in third-class condition. The profile shown is intended to indicate only in a very approximate way the true ground level, and is plotted from observations of rise and fall made by the observer, assisted by a gradiometer attached to the body of the car. The elevation is taken as zero at the beginning of each mile. No attention is given to light grades of 1% or 2% or to the very short grades of anything less than 6%. The profile indicates whether the road is smooth, rolling or rough. The information noted is supplemented by photographs. Each party carries a camera and has instructions to photograph sections of road typical of the mile traversed, also any particularly dangerous situation. These photographs are attached to the mile sheet on which they occur.

Fifteen Monthly Rainfall Types of the United States

FIFTEEN typical rainfall types for the United States are presented by Prof. Robert DeC. Ward, Harvard University, in *The Geographical Review* for August. They are based on plotted monthly rainfall amounts for selected stations in all parts of the country. The curves and a key map outlining the corresponding geographical districts are reproduced herewith. As Professor Ward points out, neither the rainfall for any given station within a district nor the district overall for any single year should be expected to agree with the typical curve, which is a composite both of stations and years. The original article fills nearly a dozen pages of *The Geographical Review*. All the curves there given are reproduced here. The text, which occupies most of the space, is mainly a series of comments on each curve and on district variations from the type.



GEOGRAPHICAL DISTRIBUTION OF RAINFALL TYPES IN THE UNITED STATES

FIG. 1

THE RAINFALL OF THE UNITED STATES IS PRESENTED GRAPHICALLY FOR FIFTEEN TYPICAL DISTRICTS

Hard Pavements Are Replacing Dusty Adobe Roads in Western Texas

New Towns Are Born and Land Values Increase Along El Paso County's 50-Mile System—Bituminous Type Favored—Concrete Roads Laid Under 5-Year Guarantee—Gravel Used for Secondary Roads

EDITORIAL CORRESPONDENCE

ROAD CONDITIONS in El Paso County, Texas, where $550,000 has recently been spent in building 50 miles of hard pavement, will surprise agreeably the average Easterner who gages Western roads by the major mileage of the northern middle-western states. On the latter, mud after rains or dust after summer droughts presents difficulties of nearly equal importance to motor or horse-vehicle traffic. In the dry climate of west Texas, however, the adobe and silt soils powder to so great an extent as to impede traffic materially. Although the Rio Grande valley has been settled for 230 years, it has had even fair roads only within recent years, but now the certainty of crops insured by the Reclamation Service dam at Elephant Butte has put new life into the old communities, to which water is now supplied when it is most needed.

The old, indifferently farmed ranches of the Mexicans are being transformed slowly by the modern methods of irrigation. Better farming results in increased tonnage to be transported to market. Alfalfa, baled as soon as cut, makes possible loads of two or three tons if roads are available over which to transport it. Wheat, grains, fruit, all in quantities far greater than formerly, demand roads with less tractive resistance. Railroads are not essential to the numerous small villages which spring up overnight at geographically convenient crossroads, for goods can be supplied readily from El Paso by motor truck. Another factor in the extension of the system is the fact that the ownership of many ranches has passed recently to men who live in town and motor back and forth frequently. No wonder, then, that a recent $350,000 bond issue carried easily, but not until the people learned just when the roads were to be built and what they were to be. A former proposed issue of $750,000 was defeated, it is asserted, solely because there was no definite plan for its expenditure.

A constriction of the valley at El Paso, due to a limestone outcropping, practically cuts the width of the tillable area to nothing, but below and above town the valley spreads out to 4- or 5-mile width between the foothills and the river. Plans to serve adequately these strips by through routes were easy to evolve. On the south side is Mexico. Traffic, therefore, is confined largely to a single main road to the east and west. Auxiliary parallel roads, the north and south loops, in the lower valley, are mainly for local use. For any long haul the short transverse distance to the main road is not a factor.

The 50 miles of newly constructed roads and much of the secondary system were inspected in September by a representative of *Engineering News-Record*, accompanied by L. A. White, county road engineer. Some of the pavements had been in use long enough to indicate the service rendered, and along all of them conditions of increased property improvement were noted.

Leaving El Paso for the lower valley, one encounters first 1½ miles of bitulithic pavement on Alameda Ave., which the county helped the city to build last year. It is a 90-ft. street, with double car tracks moved at the time of paving to the center, leaving two 27-ft. roadways with curbs at the edge of an unpaved 20-ft. strip for the car tracks. This type of pavement has been laid in the city for many years at a non-fluctuating price of $1.77½ per sq.yd. Its success in the city has been such, according to local opinion, that no other type has been able to get a foothold. Most of it is laid on a 6-in. bituminous base, but within the past six months fifteen blocks on Myrtle Ave. and eight on Bliss St. were laid on a 4-in. 1:4:7 concrete base. The bitulithic mixture is only 1½-in. thick. On Myrtle Ave. two rows of wood blocks are laid along the rails of the car track.

For 9 miles east to Ysleta, the oldest town in the valley, the road narrows to a 16-ft. poured macadam, which has been in service eight years. As originally constructed this pavement has a base of crushed rock, graded in size from 3½ in. down to ½ in., with coarser rock laid on the bottom. This was placed in rolled layers to a total thickness of 6 in. Hot asphalt was poured by hand over the top in the proportion of 14 lb. of asphalt per square yard of pavement. A covering of screenings, ½ in. to dust, was then spread and rolled. California and Texaco asphalts were used on about equal lengths of the road. There is no appreciable difference in the behavior of the two different asphalts. After three years' service the road began to show signs of wear and raveling, and was treated with a surfacing of one part sand to two parts of stone screenings mixed with 9% of asphalt.

At present the unprotected edges of the road to Ysleta are badly scalloped to a 14-ft. width and the surface shows raveled holes, unevenness and other signs of impending disintegration. Four years ago, when the writer inspected the road in company with Capt. Herbert Nunn, city engineer, now state highway engineer of Oregon, the poured macadam was in almost perfect condition and was believed to be good for ten years. Motor trucks of large capacity were few then, and no doubt a factor of safety of more than 1 did exist. The old poured macadam was laid to Fabens, 20 miles from Ysleta, in a 9-ft. strip. It has been replaced recently by a 14-ft. width of bitulithic, except for a distance of 4000 ft. in Ysleta, where it has been widened to 24 ft. The poured macadam was scarified, graded and rolled before adding the 4-in. of new asphaltic mixture. The price of this road was $1.25 per yard.

The county expects to repave the remainder of the poured macadam next season. In the meanwhile, re-

pairs on the holes will be made by picking out and replacing with a base of concrete covered with asphaltic mastic. (Since the above was written Mr. White writes that all the bad holes between El Paso and Ysleta have been filled with mastic, and the holes in the shoulders have been filled with earth.)

For 22 miles beyond Fabens to the county line is a gravel road that has been nearly ruined by the operations of motor truck trains which supplied Gen. Pershing's army in Mexico and in the "big bend" country to the southeast. An outfit of 22 men, 18 mules, one Russell grader and two horse-drawn rollers is now at work on this section. One of the rollers was made on the ground from three 1½-ft. sections of 72-in. Armco culvert pipe filled with concrete. This obviated a wait of two months for delivery of a roller from the manufacturers. Gravel is obtained from the foothills, the



EIGHT-YEAR-OLD POURED MACADAM NEARS END OF ITS LIFE

maximum haul being 6 miles, through sand. No effective rolling can be accomplished in dry weather, but a heavy storm in September permitted some work. Water for sprinkling from irrigating ditches is not available beyond 6 miles below Fabens.

After a rain the grader is run over the road, then a drag and finally a roller. Men precede the roller, picking out by hand the few stones above 2 in. The foothill gravel runs small and is well graded, so that screening is unnecessary. This gravel road is built on top of the graded earth, not in an excavated trench. With adobe as a binder the gravel makes an excellent road surface. Although the thickness of the gravel layer is 6 in., sufficient earth comes up to bind the gravel.

The North Loop auxiliary road starts 3 miles above Ysleta and joins the main road at Fabens. Of this 22-mile route 17 miles consist of a 9-ft. strip of machine-mixed asphalt macadam laid on a 3- to 4-in. base of gravel, crushed rock or slag, put down 5 years ago. The remainder is gravel placed 3 years ago. The latter is in good condition, and the macadam for the 10 miles farthest down the valley, where traffic is lightest, is in fair condition, but it was patched last fall. In many places nearly one-half of the area appears to be covered with the mastic used. The remaining 7-mile stretch was considered too far gone for patching and the operations of a grader and drag on the sides this spring made a smooth road for the traffic. It is proposed to scarify the macadam, regrade and add gravel, a 100-ft. length picked up by hand indicating that the asphalt still remaining in the old macadam will be an efficient binder for the gravel.

The man who was county surveyor at the time the road was built is of the opinion that the failure was due to improper proportioning. Mr. White believes that this is true to a certain extent, but that the main causes are the increased weight and speed of vehicles.

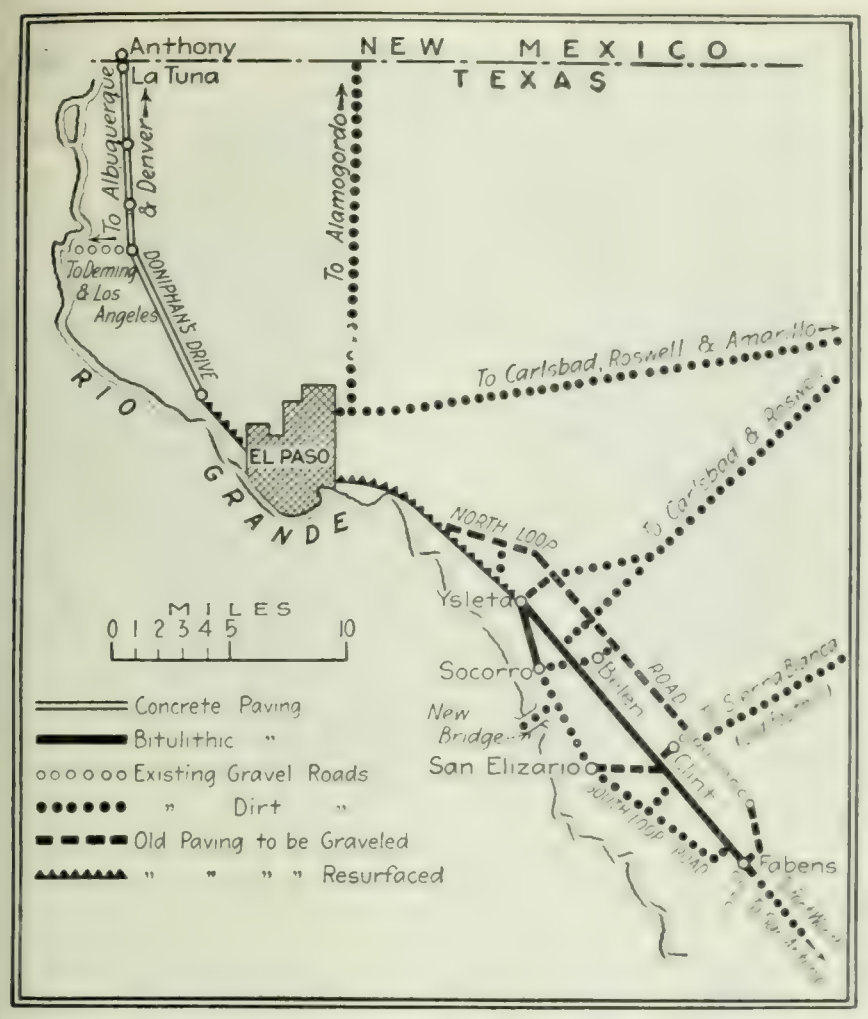
The North Loop road was built on a new right of way, the land being acquired mostly by donation. It shows remarkably little settlement, although virtually the whole length is graded up from 2 to 3 ft. above the extremely level surface of the valley. Development of the land near the foothills has followed the road, as there is now sufficient irrigation water to cover this area. The residents hold that the pavement was a good investment, considering that it raised the price of the land $30 to $50 per acre.

The South Loop road skirts the river and is simply a graded earth road on which gravel will be hauled when the county funds become available. As the haul from the foothills will be too great, the engineer proposes to load gravel onto cars up the valley, ship by rail to convenient stations and distribute with motor trucks and trailers. Much work of widening and maintaining shoulders on the main road must also be done with gravel. This work will keep the trucks busy hauling in wet weather over existing pavements.

A connection to the South Loop road from an island in the river at San Elizario, by a bridge having five 50-ft. spans, is being made. This will permit the owners of 30,000 acres of wheat land to get to El Paso without going 8 miles south to the Fabens bridge and back again. Sixty-foot piles are required, as scouring to depths of 35 ft. washes out shorter lengths. Materials encountered are silt and quicksand, except a thin layer of bowlders at a depth of 30 ft. The piles are creosoted by the Long-Bell Lumber Co., and are driven from suspended leads 52 ft. ahead of the derrick, which has an extended base counterweighted at the back end. The boom is 85 ft. long and the leads are built in sections bolted together, permitting the lead length to be extended as desired. The silt near the river makes poor road material, but a layer of yellow clay, from which a desirable top dressing was applied to the silt, was found in a borrow pit.

Doniphan's Drive on the Borderland Route, the highway to the north and west, is paved for 15 miles with concrete, the first laid in this section of the state. It is 18 ft. wide, 5 in. thick on the sides, 7 in. in the center and has a level base. Expansion joints of ⅜-in. Elastite are placed every 30 ft. The concrete was cured under water for 2 weeks. At first an earth cover of only 1 in. was placed, but it was found that the hose used in turning in the water washed off the earth unless a 2-in. depth was put on.

Maintenance for five years is guaranteed by the Southwestern Cement Co., as this is the guarantee exacted from the bitulithic contractors. The work was completed last fall under two contracts on a strictly unit basis for scarifying the old poured macadam, for grading, for rolling, for the culverts and for the slabs. The price for the slab only was 90 and 97c. for the 7- and 8-mile contracts respectively, based on $1.40 cement.



EL PASO COUNTY'S GOOD ROADS SERVE THE IRRIGATED AREAS

No cracking is in evidence beyond longitudinal cracks near the middle of the slab on a section of about 500 ft., where the old narrow strip of macadam probably was not scarified deeply enough to get the pressures equalized. These have opened less than ¼-in. and are to be filled with mastic this fall.

Two batteries of heavy artillery returning from a practice "hike" ran over a day's work 18 hours old. Though the weight of the eight 4.7-in. guns is 2½ tons, little damage was done beyond pushing a few large stones in the earth cover into the concrete and leaving wheel tracks less than ½ in. deep. The holes and marks were filled with mastic after the concrete had set and can barely be located now. On another occasion the captain of a train of 26 trucks coming from Columbus, N. M., insisted on plowing through concrete 16 hours old and a small stretch just laid. The older concrete was not injured and the latter had not yet set.

At the end of the concrete road the highway is graveled for 22 miles to Las Cruces, N. M. The work was done in 1912 and the road needs repair now, many raveled holes and uneven places being in evidence.

Sources of revenue for maintenance and construction in the county are a 15c. tax on every $100 valuation and automobile license, money, amounting altogether to $95,000 a year. For the 50 miles of hard road the county issued $350,000 of 4% bonds and about $200,000 of 6% scrip payable in seven years. No other bond issues are contemplated but some may be needed for a drainage project to keep water from the mountains from flooding the city and washing out many streets in county areas adjacent to El Paso. Damage to roads has been heavy during the past season and the road engineer proposes that a series of small dams be built in the canyons above the city similar to those proposed by the Los Angeles Flood Commission.

Run-Off Records for Two Sewerage Areas Show Contrasts

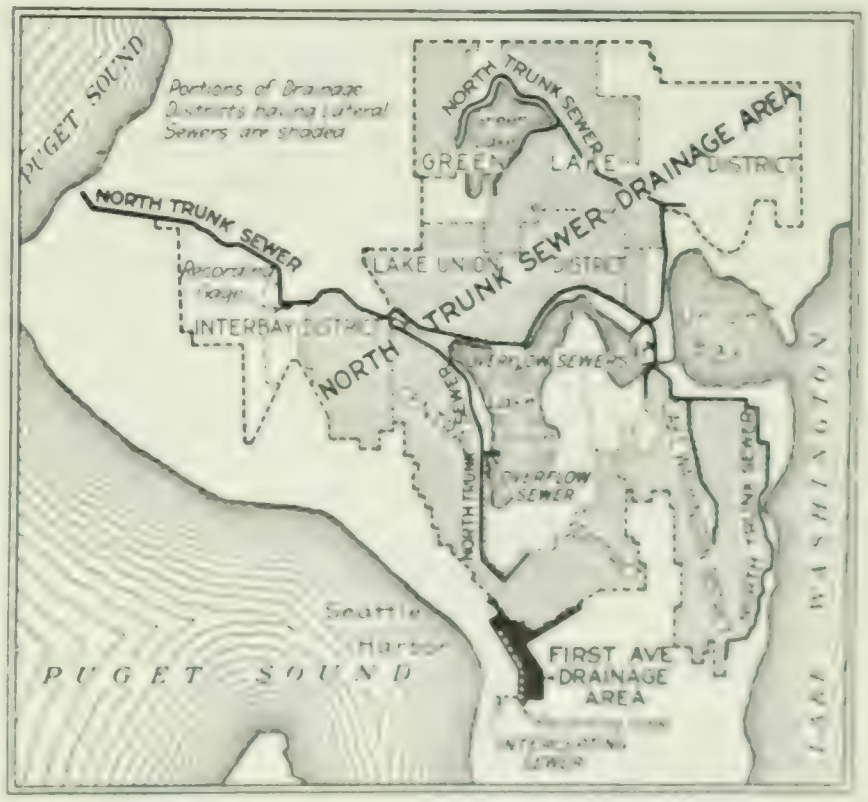
Heavy Rainfall at Seattle Followed by Running Time of 20 Minutes in One Area and 160 Minutes in Another

By H. D. Silliman
Assistant Engineer in Charge of Sewer Design, Seattle, Wash.

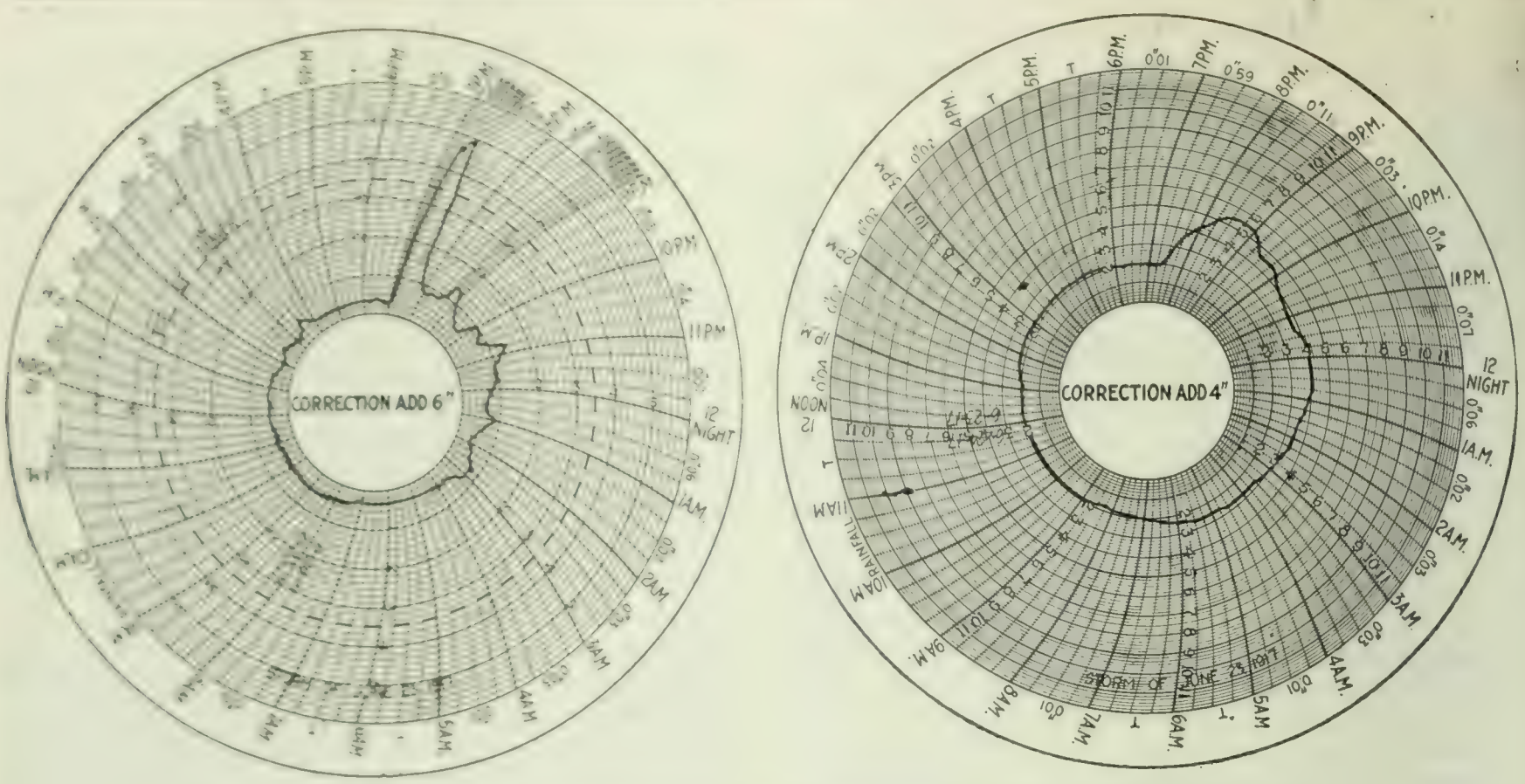
THERE occurred at Seattle, Wash., on June 23, 1917, the greatest intensity of rainfall ever recorded by the local U. S. Weather Bureau Station. The rainfall for five minutes, 7:10 to 7:15 p.m., was 0.23 in. and for 25 min., 7:05 to 7:30 p.m., it was 0.59 in.

The run-off from two drainage areas affords an interesting study. One area is small and highly developed; the other area is large, with a widely varying development, from paved districts, well built up, to sparsely settled urban districts. The charts from the recording gages show the depth of flow in the trunk sewers, the rates of rainfall in five-minute intervals for the period of greatest intensity of rainfall and in hour intervals for the entire day; and also the diameters and rates of grade of the trunk sewers.

The run-off from the First Ave. drainage area is remarkably quick. This area is 85% impervious. The running time in the sewers from the recording gage to the farthest removed storm-water inlet is 20 min. Complete details as to the sewerage of this district were shown on a map published in *Engineering News*, Oct. 28, 1915, p. 832. The maximum run-off, calculated from the hydraulic gradient at the time of greatest discharge from the trunk sewer, is approximately 98 cu.ft.



THE SMALL DRAINAGE DISTRICT IS CLASSED ROUGH AND THE LARGE ONE BUT FAIRLY BUILT UP



FLOW IN TWO SEATTLE TRUNK SEWERS WAS DIFFERENT AFTER HEAVY RAINFALL

per second. This amount is 37% of the average rainfall over the area of 156.4 acres for the time from 7:05 to 7:15 p.m.

The run-off from the drainage area of the North trunk sewer is not easy to analyze, because of its topographic features and the varying development in the five subdivisions or districts tributary to the trunk sewer. Some idea of the impervious area of each of the five districts may be obtained by a comparison of the area having lateral sewers with the miles of paved streets. This is shown in the following tabulation:

District	Area Having Lateral Sewers Acres	Paved Streets Miles
[illegible]	1,650	10
[illegible]	1,120	10
[illegible]	1,150	12
[illegible]	1,450	38
[illegible]	700	7

The running time in the sewers from the recording gage to the farthest removed storm-water inlets is about 2 hours 40 minutes.

The period of greatest intensity of the storm was only 25 minutes. The storm came from the north with an average wind velocity of 11 miles per hour. The drainage area is 6 miles from north to south, so the storm was not of sufficient duration to fill the sewers, as is shown clearly by the run-off recorded.

Branch Road Office at Florida University

The State Road Department of Florida has established a branch office at the College of Engineering, University of Florida. Besides serving as headquarters for the work of the department throughout eastern and southern Florida, this branch office will have charge of all the testing of road material for the department. The testing equipment belonging to the College of Engineering will be used, and for the further development of this laboratory the State Road Department and College of Engineering will combine their efforts.

Helps Oil-Distributing Truck Driver to Gage Correct Amount

By E. Earl Glass
Los Angeles County, California, Road Department

IN APPLYING road oil it is most difficult for the driver of a distributing truck to know whether or not he is obtaining the correct gallonage per sq.yd. unless distance stakes have been set out by the surveyor. If, however, a copy of the accompanying chart is put under glass where the driver can see it as easily as he can the trip indicator of the odometer, which has been marked to hundredths, a ready means is furnished to him for checking up the rate of distribution.

As an example: 1080 gal., or one load, of asphaltic oil is to be applied at the rate of ⅜ gal. per sq.yd. on a concrete pavement in an 8-ft. strip. By referring to

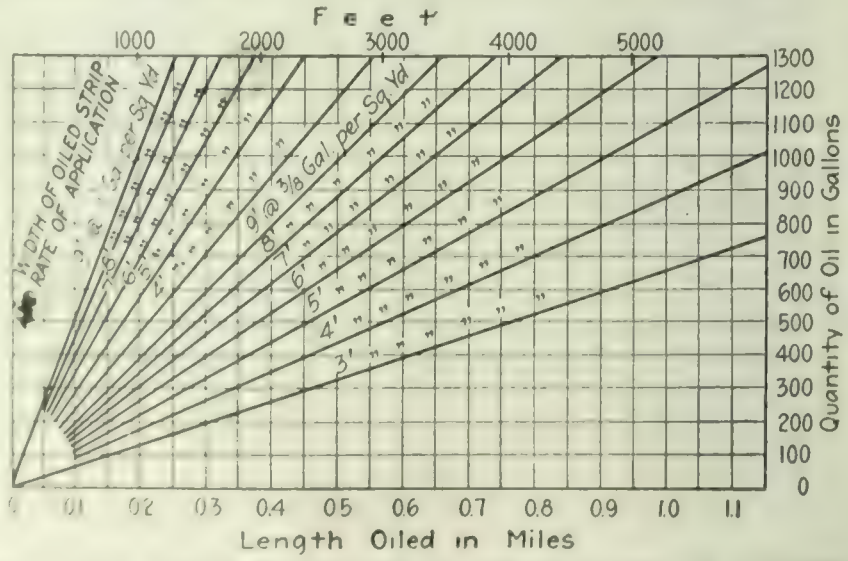


CHART IS MOUNTED UNDER GLASS IN SIGHT OF DRIVER

the chart it will be seen that 1080 gal. will oil an 8-ft. strip for a distance of 0.615 mile. If the trip meter reads 71.24 at the start, it should read 71.855 when the tank is empty.

It should be noted, however, that if the front tires are worn badly the indications will show the metered distance longer than it actually is.

St. Paul Concrete Reservoir Has Unique Side-Wall Design

Hollow Gravity Wall Section Similar to That Used in Dam—Specifications Control Construction Features—Twisted Steel Reinforcement Barred

By W. N. Jones

Formerly Designing Engineer, Bureau of Water, St. Paul; now Engineer of Design and Construction, Filter Plant, Minneapolis

As part of the enlargement of the water-supply of the City of St. Paul, Minn., work has recently been started on a new high-service reservoir in which some novelties in the use of reinforced concrete have been applied. The main new feature of the design is the use of the inclined deck wall for the side walls, and the novelties in construction are mostly found in certain restrictions as to methods of work decided upon after consideration of some recent discussions of concrete construction in technical societies and press.

The structure surrounds an approximately square area alongside of the present high-service reservoir and is so located as to permit an extension of equal size to be made when required in the future. It is 452 x 425 ft. in plan and will hold water to a depth of 24 ft., having a capacity of 30,000,000 gal. The structural elements are a groined-arch floor, columns carrying a groined-arch roof, and the hollow wall surrounding three sides and an intermediate wall where the future extension is to be. The material is reinforced concrete, and the walls are to be backed on the outside with earth embankment.

All walls were designed to withstand any and all stress to which they might be subjected under the maximum working conditions with the reservoir full and empty, no reliance whatsoever being placed upon the earth embankments. Sufficient steel was placed on the inside face of the walls to withstand a hydrostatic pressure on the outside equal to that caused by a head of water of a depth equal to that of the point in question below the flow line. It was assumed that some leakage might take place; and as a clayey material is specified to be used for embankments which would more than likely hold back the water, this condition would hold true and would give the maximum stresses that could obtain upon the section being considered, especially when the reservoir was emptied.

In designing the outside walls a great many types, especially of the gravity and buttress and counterfoot types, were investigated, both as to stability of the structure and as to cost of construction. At first it appeared, on account of the heavy thrust of the arches and the water combined, that only a gravity type of wall would answer the purpose, but further investigations led to the type finally adopted and illustrated. This type, when full, depends partially upon the weight of the water upon it for stability, while the large heavy concrete beam at the top transfers the arch thrust into the buttresses and thence into the footings, where, by means of a concrete slab heavily reinforced, the load is distributed over the ground surface in such a manner as to prevent any overloading of the earth below.

Care was taken to prevent sliding of the walls on the clay by reinforced beams dropped well below the lower surface of the concrete slab; and to prevent sliding of the buttresses and walls upon the concrete base slab, the latter was designed with notches or depressions at frequent intervals so that, before sliding could occur, the tongues of the buttresses and wall slabs would have to shear off. No dependence was placed upon the resistance offered by the earthen embankments to the sliding.

A design was made of the center dividing wall with the same general features embodied therein as the outside walls, but with this difference, the buttresses had a concrete slab of equal strength on both sides. The design seemed to answer the purpose very well as far as strength and stability were concerned, but upon estimating the cost of the wall it was considered much too expensive. Further studies were then made; and a cantilever gravity wall, as shown in the drawings, was found to fulfill all conditions satisfactorily and to be much cheaper to construct. As in the outside walls, this wall depends also upon the weight of water directly over it for a portion of its stability. Provisions against sliding were also made by dropping a tongue below the bottom plane of the base, and the top was enlarged and well reinforced to care for all arch thrust whenever the earthen embankments were removed.

Clay Blanket Under Floor

As test pits showed the ground at the elevation of the proposed foundations to be largely composed of sand and gravel and very pervious, it was deemed advisable to excavate below grade and backfill to the desired elevation with some impervious material. A poor grade of concrete as a double bottom was at first considered, but was abandoned on account of its cost. Experiments were then conducted on clay containing about 50% of sand and gravel by making vessels of the same, allowing them to partially dry out and then filling with water and allowing to stand protected from the heat for a number of days. This clayey material with more or less sand and gravel seemed to answer the purpose; and as there were large quantities available, it was decided to form a blanket underneath the foundations of this material by placing it in 6-in. layers and then sprinkling and rolling the same into a compact and homogeneous mass with a heavy roller. The estimated cost of doing this was very much less than if a lean mixture of concrete of about one-quarter the thickness had been used. As a further precaution against leakage, wooden strips were designed to be placed between all construction joints in the foundations, and a special copper and asphalt joint was designed for use in the sloping walls of the basin.

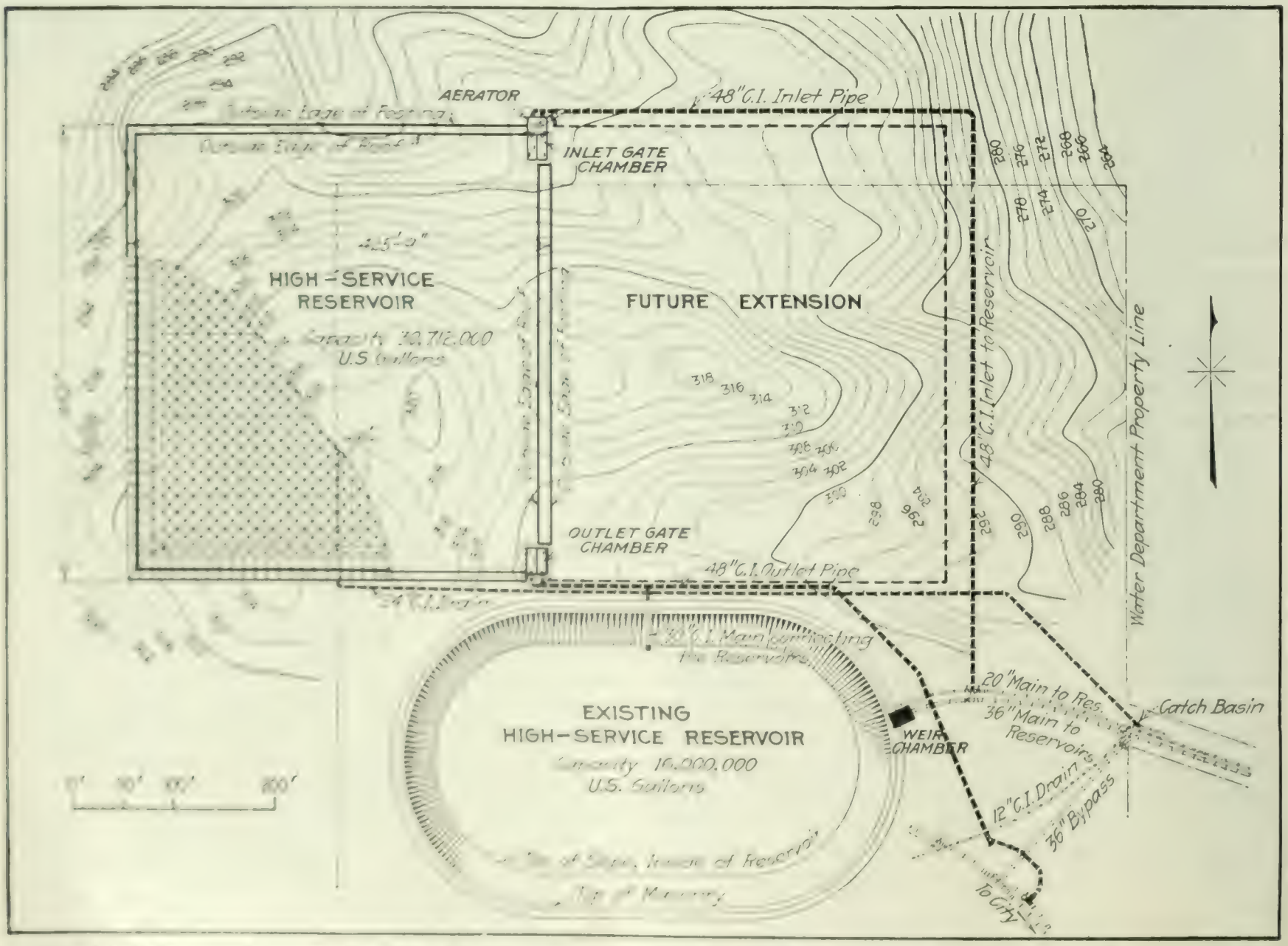
Inverted groined arches are to be placed for the column footings, and groined arches with depressions in the top are to form the roof of the structure. These

were adopted on account of the freedom from air pockets, ease of construction and low estimated costs based upon extended experience upon similar structures. All depressions in the tops of the groined-arch vaulting are to be filled with a clayey earth which is also to cover the entire roof to a depth of 21 in. above the crown of the arches, and upon this is to be spread a 3-in. layer of loam suitable for the growth of grass and shrubbery. It is expected that the clayey covering will act to prevent the rain water from finding its way down between the cracks and openings in the concrete arches into the reservoir and that the slopes as shown will carry off all water satisfactorily. The covering will also act to prevent excessive freezing of the water below, but 24 in. of earth is not sufficient to keep the reservoir entirely free from ice during long periods of extreme cold, as past experience in this vicinity with this amount of covering has demonstrated that one may expect about ¾ in. of ice to form on the surface of the water during certain times of the winter.

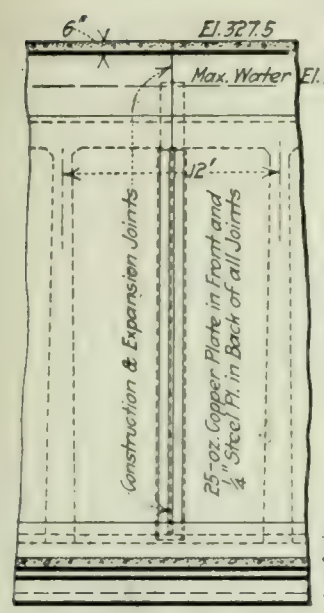
The clay embankments were therefore designed to act not only as a dam for preventing any leakage getting away wherever the same might occur, but also for protecting the structure from the extreme and sudden changes in temperature which occur in this district, to prevent freezing of the water during the cold of winter and to act as the support for a roadway around the top of the reservoir. The top covering, besides serving for protection, is intended to be composed of such materials as are suitable for the growth of vegetation so that the top of the structure will resemble a lawn, once it is well planted and taken care of.

All steel rods must be deformed, but not square twisted, the square twisted rods being thrown out on account of the results obtained in a series of tests carried on under the direction of Prof. A. N. Talbot at the Engineering Experimental Station, University of Illinois, a number of years ago, the results of which were considered of sufficient importance to condemn this type of bar for use in this structure. Plain rods were not considered, although cheaper on account of the manner in which this work might be done. St. Paul does most of its large construction work by contract, and the city charter compels the contract to be let to the lowest responsible bidder, with no provision of just how the contractor's responsibility is to be determined. Thus there is no assurance that a contractor who was able to and would perform the work absolutely right would get the work, and the bond strength was considered of great importance—therefore, the desire for some positive mechanical bond as well as the chemical bond of the rods which could only be obtained by a deformed bar of some kind.

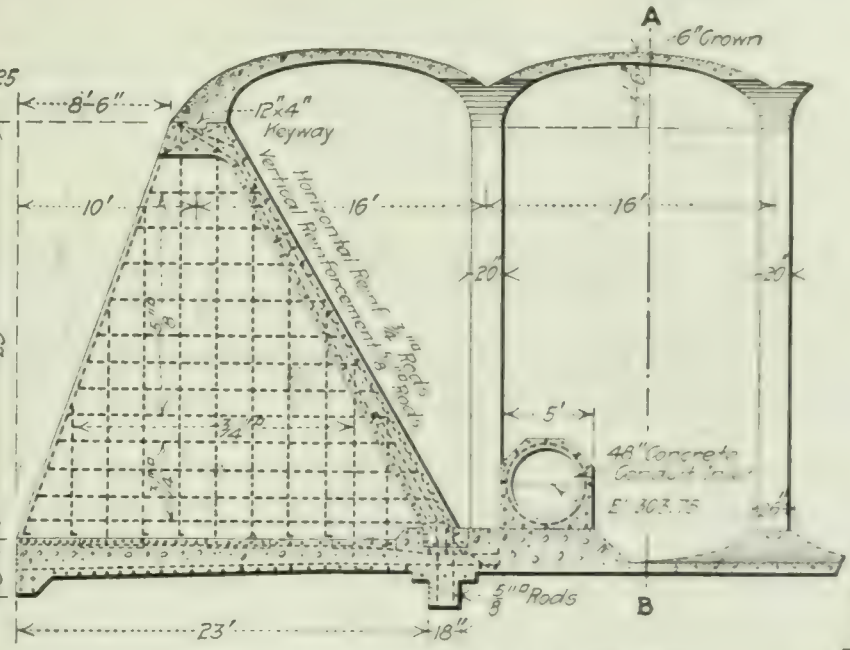
The conduits were designed to permit uniform flow across the entire basin from one side to the other and to prevent any dead spaces. This is to be accomplished by using smaller openings from and into the conduits near the gate chambers. But whether the desired results will be obtained by this design remains to be seen. It seemed to be worth a trial, at least; and if



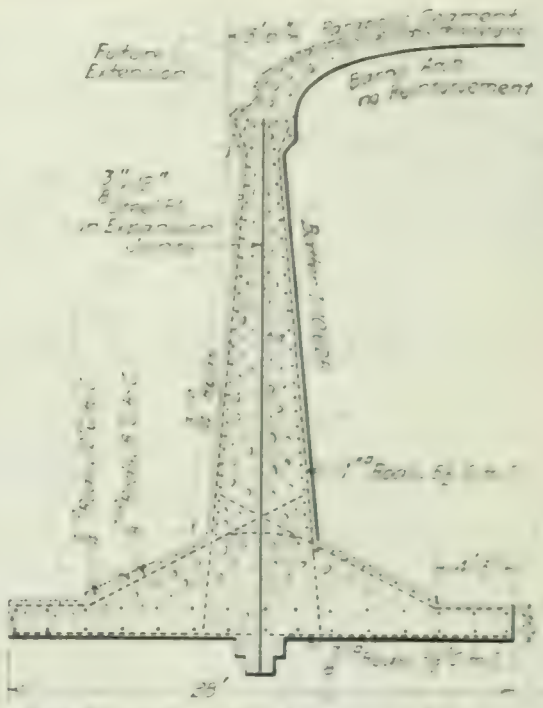
NEW HIGH-SERVICE RESERVOIR FOR ST. PAUL A SQUARE CONCRETE STRUCTURE ALONGSIDE OLD RESERVOIR



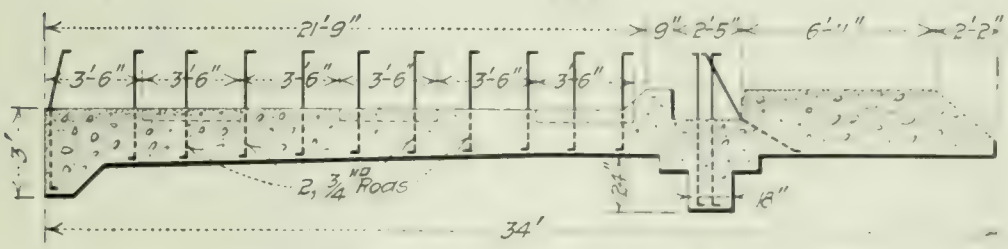
Section A-B



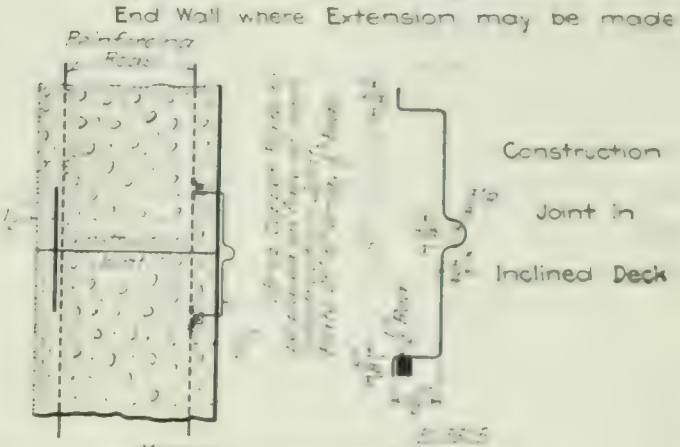
Permanent End Wall and First Bay

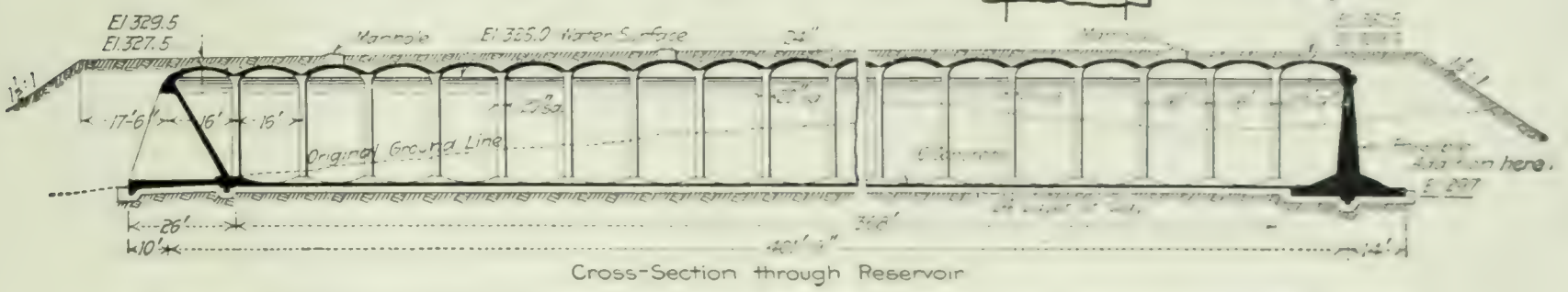


End Wall where Extension may be made



Detail of End Floor showing Ties for Buttress





Cross-Section through Reservoir

RESERVOIR HAS GROINED-ARCH ROOF WITH HOLLOW GRAVITY WALLS ON THREE SIDES

the results are not satisfactory, the openings can be easily changed at no great expense.

Both gate chambers were designed to care for an additional reservoir of equal capacity, and sufficient gates were placed therein to meet every and all demands of flexibility of operation when the additional reservoir is built and put in operation.

No waterproofing of any kind is contemplated to be used in any place on the structure, as from experience on similar works it has been found unnecessary. The concrete, if properly mixed and placed, will give satisfactory results with the 1:2:4 proportions as specified. However, the specifications call for an impervious wall such as should be expected of first-class work, and the contractor must guarantee the work to be reasonably water-tight under working conditions. Should this not be true, he is required to go over the entire surface which is not satisfactory with a cement-gun and place thereon sufficient mortar by this method to satisfy the conditions of the specifications.

It is only natural for anyone doing concrete work to mix and place it as fast as possible, paying very little attention to quality unless the same is insisted upon by the party in charge of the construction work. The specifications have been so drawn that no batch of concrete shall be placed in the work that has not remained in the drum of the mixer at least 1½ min. while the same was running at its normal rate of speed. No spouting of the concrete is allowed excepting such as is absolutely necessary to fill the forms in the usual way from the top, and a proper consistency of each batch is demanded in every case.

Full information for prospective bidders was embodied in the specifications. Test pits were dug whenever and wherever the bidder wished, and samples of the material encountered were taken at every foot of depth the said pits were dug and placed in properly labeled bottles and kept for reference in the office. Information as to railroad sidings and the cost of building sidings to the site was supplied the bidders whenever desired. Available sites for obtaining the clayey material for the blanket and embankments were noted, and analysis of the material made and the bidder informed of the percentage of clay in each with the depth of the material and probable extent of the same; other information relative to sand and gravel pits, location of stone quarries, methods employed in handling similar work on other structures and any other reasonable information were supplied the bidders upon request.

All quantities of various types and kinds were carefully figured and checked and supplied with each

specification in order that no one in making up his bid would have to figure the quantities or classification or be put to any expense or trouble other than was absolutely necessary.

G. O. House is general superintendent of the Water Department. The writer was in direct charge of the design and specifications of the structure and was very ably assisted by J. W. Kelsey, principal assistant engineer of the St. Paul Water Department, and others, all of whom deserve credit for their able assistance. The contract is being carried out by the George J. Grant Construction Co., of Minneapolis.

Standard Plans for Army Camp Sewage Disposal

Single-Story Baffled Septic Tanks, Trickling Filters, Intermittent Sand Filters and Chlorination Employed as Local Conditions Demand

A SINGLE-STORY septic tank of new design has been developed for the sewage-disposal systems of the training camps for the American armies. It has been called by its designer, Capt. L. S. Doten, the sanitary engineer of the office of the Quartermaster General, Washington, a "flotation" type. It is believed by Captain Doten and his associates that this tank is suited better to dispose of the very fresh sewage of these camps than the two-story type with which the army has experienced trouble from foaming; it has been found to remove suspended solids more effectively than the plain sedimentation tank, and it can be built in half the time and at one-third of the cost. The effluent is as readily handled by trickling filters as that from any other tank.

The accompanying sketches show the design for a typical divisional camp (accommodating 40,000 men or more). The appended table shows the ways in which the tank has been employed, and where it has not been used. Chlorination has generally been the final method of treatment of the effluent. In all of these cases liquid chlorine is the agent, experiment determining the dose.

At Wrightstown, N. J., where concrete materials were hard to obtain, a wooden tank was authorized. It was intended at first to employ broad irrigation here as the disposal scheme, but the sand areas were not found adapted for that or even for intermittent filters taking the tank effluent.

At Ayer, Mass., the raw sewage is pumped through an 80-ft. lift to intermittent sand filters. This plan was adopted there because it conformed to state practice, seemed to be preferred by the State Board of Health and was as cheap as the tank and trickling filter. At Yaphank, N. Y., the conditions were much the same; but as the sand there was finer, it was decided to reduce the load on the filters by a preliminary tank treatment.

SEWAGE DISPOSAL AT NATIONAL ARMY CAMPS

	Treatment	Outlet
[illegible]	Raw sewage pumped to intermittent sand filters	Effluent to Nashua River
[illegible]	Septic tanks and intermittent sand filters	
[illegible]	Septic tank and sprinkling filters	
[illegible]	Septic tank and chlorination	Effluent to Patuxent River
[illegible]	Septic tank and chlorination	Effluent to river
Camp Jackson, Columbia, S. C.	Septic tank and chlorination	Effluent to river
Camp Gordon, Atlanta, Ga.	Septic tank, trickling filters and [illegible]	Effluent to creek
[illegible]	Septic tank, chlorination and [illegible] tank	Effluent to Scioto River
[illegible]	None	Raw sewage discharged into city sewer system
[illegible]	Septic tank and chlorination	Effluent to river
[illegible]	None	Raw sewage discharged into river
[illegible]	Septic tanks, trickling filters, settling tanks and chlorination	Effluent to small creek, dry part of year
[illegible]	None	Raw sewage discharged into Des Moines River
[illegible]	None	Raw sewage pumped over levee into Kansas River
[illegible]	None	Raw sewage discharged into city sewerage system
[illegible]	None	Raw sewage discharged into Puget Sound
[illegible]	[illegible]	Sewerage lines for removal of kitchen and shower-bath water
[illegible]	Complete sewerage system and chlorination	Effluent to small creek, generally dry
[illegible]	None	Sewage lead to tidewater
[illegible]	[illegible]	
Fort Niagara, N. Y.	None	
[illegible]	[illegible]	Effluent to brook
[illegible]	[illegible]	
[illegible]	[illegible]	
[illegible]	None	
[illegible]	None	
[illegible]	None	
[illegible]	[illegible]	

Grit Chambers Sometimes Used

The grit chamber shown in the drawings was intended for use where there was likely to be considerable inorganic matter carried by the sewage. In some cases, the grit chamber has been built outside the main tanks (as at Battle Creek, Mich., and Tenafly, N. J.).

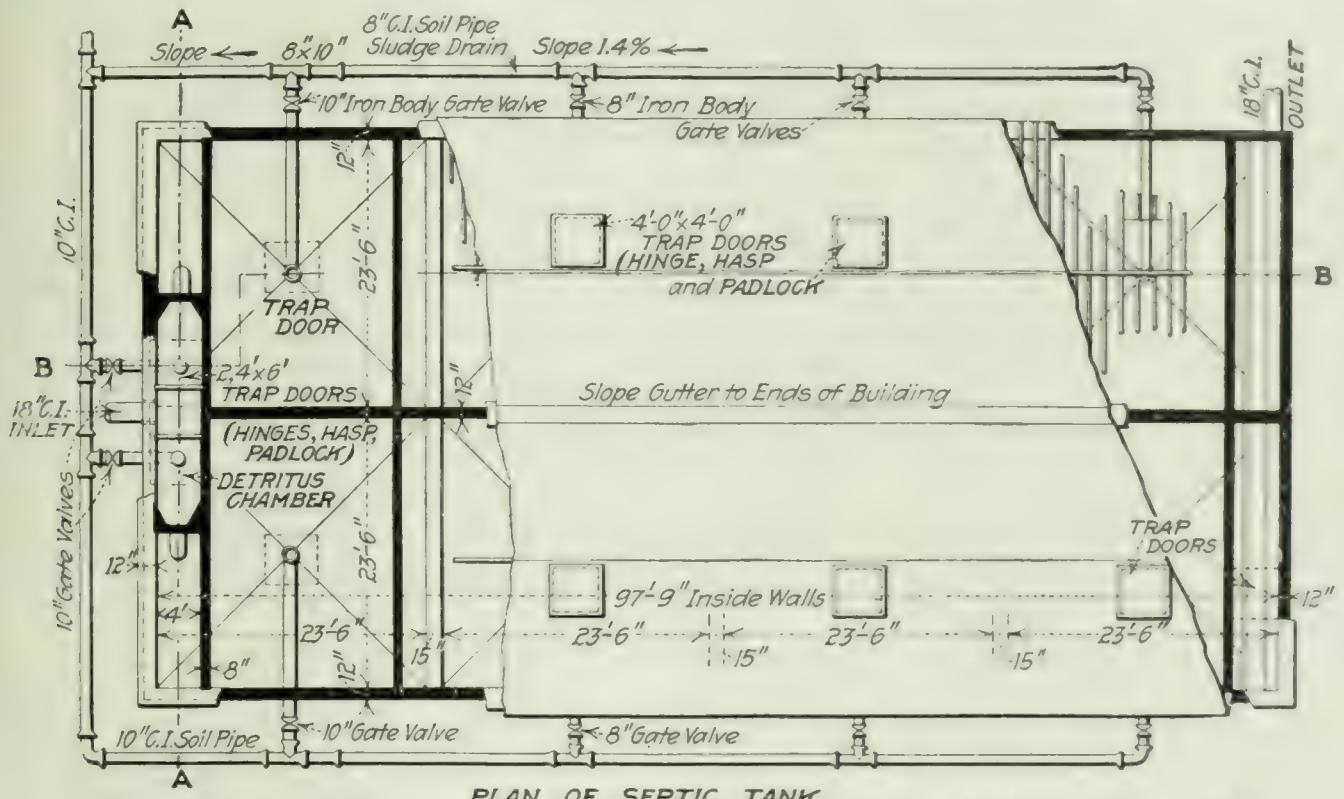
In the event of a camp being unoccupied in winter, the distributing pipe of a filter would be drained to avoid freezing. Even should a camp be occupied, the valve on the blow-off line would be left partially open in cold weather, so that the risers might not be injured during the night when discharges from the siphon chamber would be infrequent.

The sludge drawn from the smaller tanks of the flotation type, which have been in operation the longest, has been well digested and nearly odorless. The disposal of the sludge from these tanks is more or less still an open question. On account of the expense, complete drying beds will not be used at first except in a few cases, as at Tenafly, N. J. The usual scheme will be to bury the sludge in trenches.

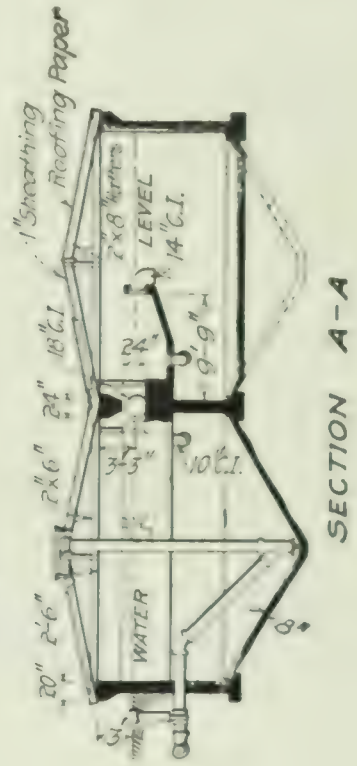
The sizes of the disposal works, and of the trunk sewers as well, were determined with some difficulty. With any reasonable assumption of flow from fixtures,

the water mains and sewers would become absurdly large if all the men in camp were allowed to use the shower baths in one period of the day. It was decided that the men of one infantry brigade should be the largest number permitted to use the shower baths at one time. For the sprinkling filters, one acre (6 ft. in depth) is required for each 30,000 persons. This gives a rate of 1,500,000 gal. per acre.

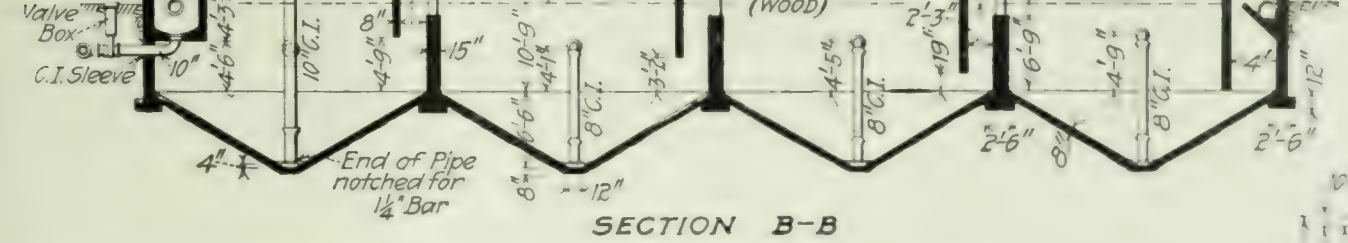
The National Guard camps, with the three exceptions noted in the appended table, are not sewered. Excreta are received in deep pits, with tight covers carrying seats. The urinal trough, which is in the same latrine building, discharges into the pit. These pits are burned out with oil every day. Kitchen waste water is evaporated; each company's garbage incinerator has two pans for this service.



PLAN OF SEPTIC TANK

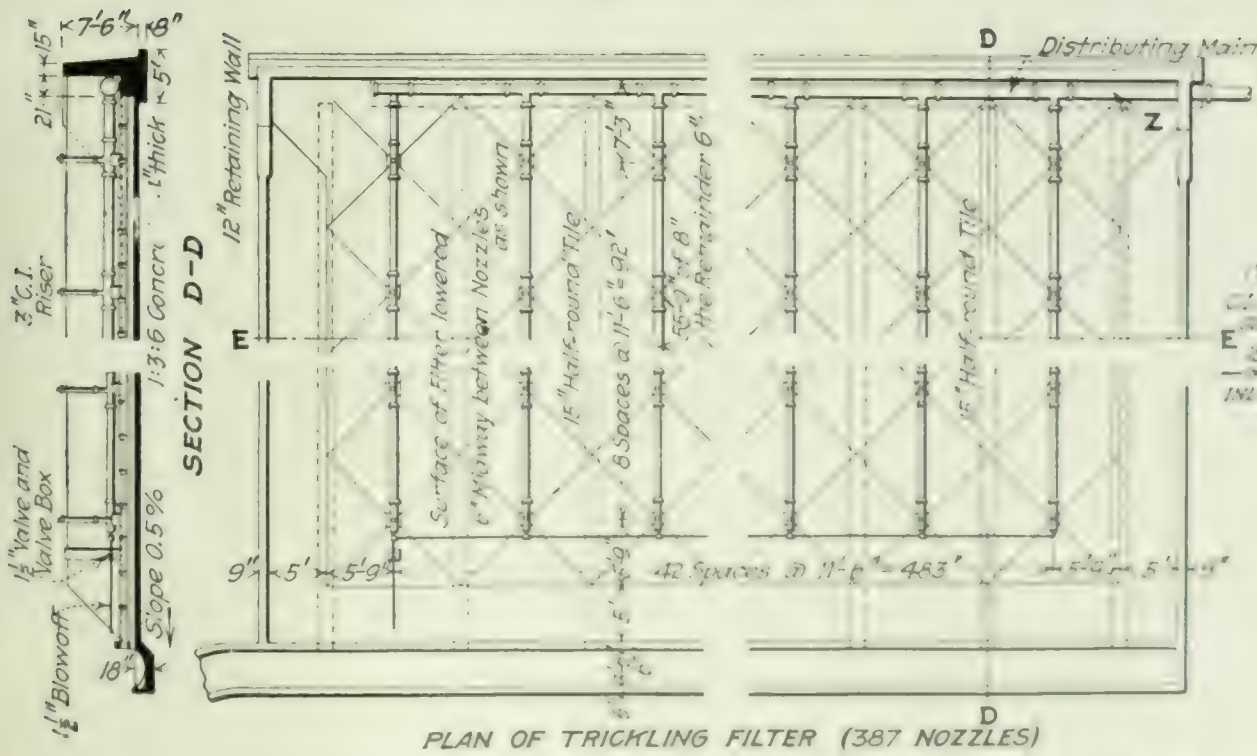


SECTION A-A

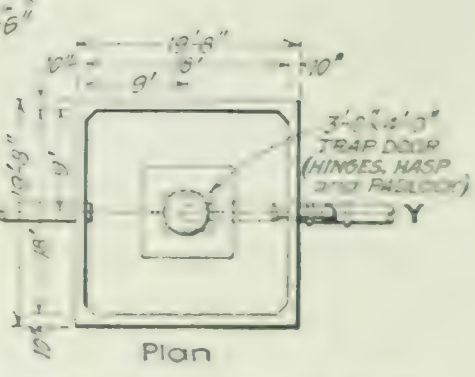


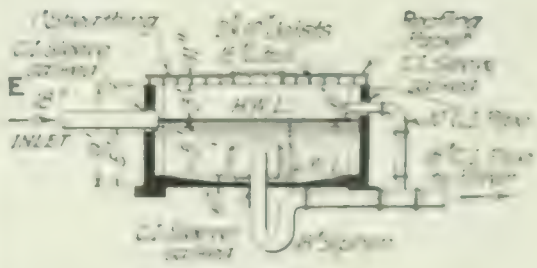
SECTION B-B

DETAILS OF SEPTIC TANK

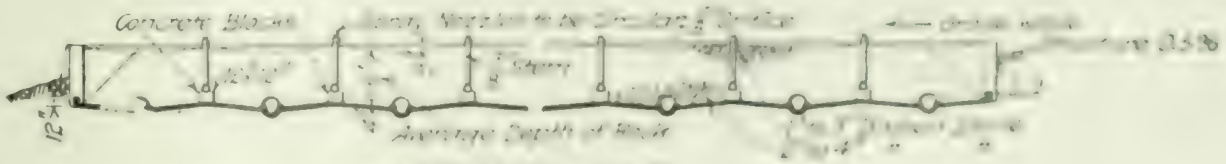


PLAN OF TRICKLING FILTER (387 NOZZLES)





DETAILS OF DOSING TANK



SECTION E-E

DETAILS OF TRICKLING FILTERS

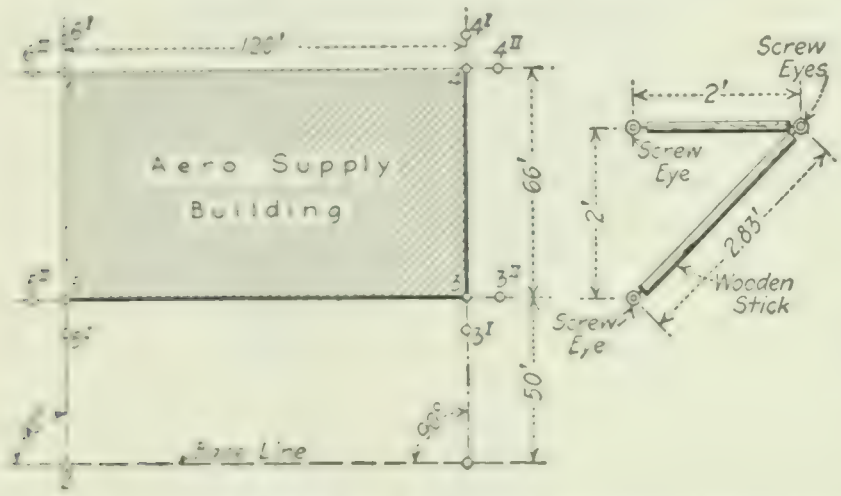
IN ARMY CAMPS USUALLY SINGLE-STORY SEPTIC TANKS AND TRICKLING FILTERS WERE USED

Staking Buildings at Aviation Field Was Much Simplified

By J. E. Smith
Assistant Professor of Civil Engineering, University of Illinois

THE SURVEYING for the buildings at the U. S. Aviation Field at Rantoul, Ill., was essentially a very simple proposition, since although the buildings were of many types and sizes they were all virtually of a rectangular plan. The task was therefore simple transit and chain work, but the large number of structures to be spaced accurately and upon a moment's notice—often with many workmen waiting to begin work—offered good opportunity to devise short cuts for saving time and money.

The field at Rantoul is situated in a comparatively level country, and considerable care was exercised in



FOLDED STICKS SIMPLIFY STAKING OF RECTANGULAR BUILDINGS

the choice of grade lines for the various utilities. The general building line was carried on a uniform grade of 0.2% from one end of the field to the other parallel to the grade of the main road. The large buildings and groups of smaller buildings were located so that the center of the buildings or groups would lie on the grade line.

The building lines were maintained during construction by laying off base lines parallel to the building lines. To locate a building it was then only necessary to offset from these base lines, and to drive the stake exactly at the corner of the building. However, the buildings were not all on the same building line, and piles of materials were numerous and not always placed with regard for the convenience of the engineer. Since, furthermore, the construction of adjacent buildings was begun at different times, each had to be staked out separately and one transit set up seldom served for more than one structure.

The method finally devised was about as follows: The first set-up was at some reference point on the base line, from which points 1 and 2, shown in the illustration, were established. The transit was then set up at 1, a right angle turned off, and the corners 3 and 4 set, also the 2-ft. offset points, 3′ and 4′. While little time was gained in measuring the points in this order, it was found that there was much less likelihood of error if 3 and 4 were set before 3′ and 4′. A similar procedure followed in setting 5 and 6, and 5′ and 6′.

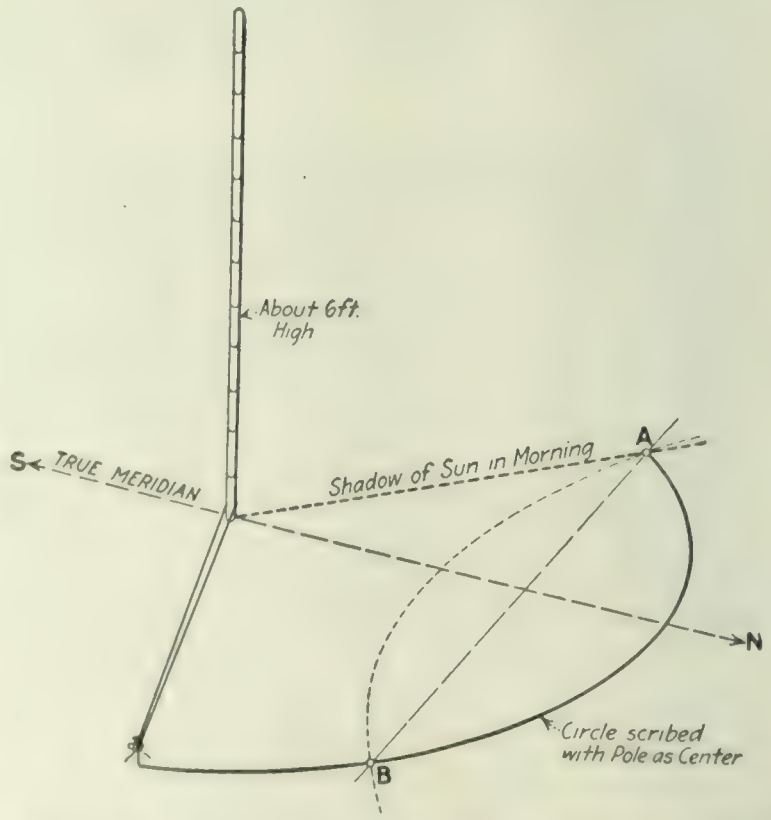
Then 3″ and 4″, 5″ and 6″ remained to be set, and after several methods involving the use of the transit had been tried the following method was developed and used with considerable satisfaction: Two sticks of convenient size were cut to such a length that after a screw-eye was affixed at each end, the difference between centers of the screw-eyes was exactly 2 ft. on one and 2.38 ft. on the other. To locate 3″, the screw-eyes in one end of the 2-ft. stick were centered over the tacks in point 3, and one of the screw-eyes in the other stick was centered over the tack on point 3′. Then when the screw-eyes in the free ends of both sticks were centered over each other they exactly located 3″.

Not only was the time of two set-ups of the transit saved, but the possibility of error through disturbing the instrument, or delay due to obstructed view, was eliminated, and the results obtained were just as accurate as when the transit was used. Forty per cent. of the time of setting up the transit was saved, and in most cases the time required to complete the staking of building was less than half of that required when the transit was used throughout the process.

High Accuracy in Determining Meridian by Means of Solar Shadows

By J. A. MacDonald
Hermanville, P. E. I.

SINCE THE ACCURACY of observations on Polaris at any hour angle depends mainly on the adjustment of the transit, and if taken at elongation the greater accuracy entails a long and tedious observation, which must frequently be made on black, cold nights, a method of making this determination by means of sun shadows should prove of interest to many engineers. The simple method proposed has been used by the writer on many occasions, and so high has been the accuracy



ALL THAT IS NEEDED IS A POLE, A PIECE OF STRING AND A BRIGHT DAY

obtained that he has been able to "check-in" with all necessary precision with field parties using the more common method.

Two or three hours before noon of a sunshiny day, erect a stiff, vertical pole about 6 ft. long on a flat plat

of ground. At a definite time before noon mark the extremity of the pole's shadow, as at *A* in the illustration. With a nail at the end of a piece of line looped about the bottom of the pole, describe an arc of a circle. At about the same time after noon watch for the moment when the end of the pole's shadow touches the arc at *B*. Bisect the arc, or the chord, *AB*, and this point and the base of the pole will be the true meridian.

Frost Breaks in Macadam Roads Due to Inadequate Drainage

By Frank P. Arnold
Wilmington, Del.

A STUDY of 96 places where bituminous macadam roads in Wyoming County, New York, were badly broken up during the spring of 1917 by frost boils indicate clearly that locating a road on a fill does not guarantee good drainage. The breaks studied varied from patches 5x10 ft. to stretches 200 ft. long and for the full width of the road. These holes occured in 42 different localities on four different roads, and were found in a total stretch of about 16 miles. The soil on all the roads was clay.

Of the 96 breaks, 57 were in fill, 17 in cut and 26 at places where there was no appreciable cut or fill. This brings out the remarkable fact that most of the breaks were on fill, and not in cut, as would be expected from a general consideration of the question. It is probable that a higher percentage of the breaks would have been in cut except that clay cuts are usually regarded as suspicious and are sub-based or underdrained more or less carefully.

Analyzing the breaks in a different manner, it was found that of the 96 studied, 45 were on a sidehill slope, nine on a grade, and 21 on both a grade and a side slope. This left only 21 which were on flat grades and slopes. The static pressure due to the sidehill slope forcing the water under the stone of the surface was the probable cause of the breaks in cut. Adequate underdrainage to lower the ground-water level would probably have prevented these breaks.

It was found that the cause of breaks on fill were mostly caused by water getting into the more or less porous bottom course in a cut at the top of a grade and flowing down through this strata to the part of the road which was on fill. Unable to get through the hard clay shoulder, this water manifested itself in a break or breaks on the fill. In one location water came from a spring in a cut at the top of the hill, ran down the hill and half way up a fill over a railroad track —a total distance of 1,000 ft. Breaks were found all the way across this fill, and when the stone was picked up and a ditch cut through the shoulder at the break furthest from the cut, a 2-in. stream of water ran for nearly a day.

A stone filled V-shaped trench, pointing up the hill and placed at the end of every clay cut, will eliminate such breaks in these locations. Furthermore, weeps should be constructed about every 50 ft. to let the water out through the hard shoulders.

Several of the breaks on fill were due to the same cause as those in cut; that is, static pressure forcing



DRAINAGE SHOULD BE PROVIDED FOR WATER WHICH COLLECTS AT FILLS

the water up under the stone. Twenty-six breaks occurred at places where the drainage was poor and water was standing in fields alongside, and other breaks were found to be due to water overflowing the road. On one 5-ft. fill ten holes occurred where the only reason apparent was poor filling material. The record showed that most of the material in the fill at this

Company Housing in the United States

A paper read by Leifur Magnusson, of the U. S. Bureau of Labor, before the National Housing Conference in Chicago on Oct. 15, gives some results of a Government survey of the extent of company housing in the United States. The survey is based on investigations going back as far as 1831, and includes all projects where employers have provided residences for their employees. It was found that about sixty different companies reporting to the survey have spent about $16,000,000 on company houses, which amounts to 28% of the average annual payroll of these companies for a recent five-year period. They house 42% of their employees.

On this basis the survey decided that if an employer proposes to house one-half of his employees, he must expect to invest in houses not including an amount equal to one-third of his annual payroll. If he proposes to house all, he must invest an amount equal to two-thirds of his annual payroll; that is, the proportion which the cost of the houses forms of the payroll is to the proportion of employees housed as about 2 is to 3. Of the companies reporting, the employer gets a gross return of 8.3% on the housing investment, the figures varying from 20% on mining houses in Alabama to 6% on steel company houses in Pennsylvania.

The survey finds that the scientific development of the housing problem has not reached a very high point and that with the entry of so-called town-planning experts the results are better. Not only do layout and proper design of the housing area and of the individual house affect the financial as well as the intangible returns to the company, but proper maintenance, considering such things as the operation of a regular repair department, systematic removal of garbage, encouragement of gardening, etc., is found to be necessary.

ENGINEERING LITERATURE

A REVIEW OF BOOKS AND A LISTING OF NEW PUBLICATIONS

Fifteen Years of Engineering Literature

Conceived by the Late George H. Frost, the Engineering Literature Supplement to "Engineering News" Was First Published in December, 1902. With the Assistance of 250 Contributing Reviewers, More Than 1500 Books Have Been Reviewed. The Constant Aim Has Been to Aid Purchasers in the Selection of Technical Books, to Advance Sound Engineering and to Help Raise the Technical and Literary Standards of Engineering Writing.

By M. N. Baker
Associate Editor, Engineering News-Record, and Editor of "Engineering Literature"

With its present number Engineering Literature completes its fifteenth year. The occasion invites a look backward.

It is eminently fitting to say at the outset that the Engineering Literature supplement to *Engineering News*—a supplement in name and in fact for some years—was the conception of the late George H. Frost, founder of *Engineering News*. He it was who decided that it should be started and that it should be put in charge of the writer as editor. The working out of the new project was left entirely to the editor and to the counsel and assistance of his editorial associates.

In 1902 the reviewing of technical books in the engineering press—and with a few exceptions the same is still true—was for the most part perfunctory in character and the time of publication of the reviews depended largely upon the exigencies of space. Most of the reviews were written by the editors. If any books were sent to outside specialists the ultimate reader was none the wiser, for the reviews were never signed.

Engineering Literature adopted a radically different practice. It provided a fixed time and place and ample space for reviews, and after its first two issues it published contributed signed reviews as well as staff notices. All this made for early, adequate and expert notice of every book on engineering and closely allied subjects. In fact, by the immediate listing of new books under "Publications Received," provided they could not be reviewed in the issue following their publication, the appearance of each new book was made a matter of news.

The original plan and scope of Engineering Literature was outlined with deliberate care in the first number, which appeared Dec. 18, 1902. As the program then announced has been faithfully adhered to in its essential features and in most of its minor details since and still serves the editor as a guide, it is reprinted in full:

Why Established—Books and other publications relating to engineering, the allied arts and sciences, and various public questions of the day are coming from the press so rapidly and the demand for critical estimates of their value is so great that it seems desirable to give them more extended, prompt and systematic attention than is possible in the crowded columns of the main sheet of *Engineering News*. Accordingly it has been decided to issue a supplement devoted entirely to Engineering Literature.

Its Field—Under the title named we propose to cover not only the several branches of engineering and the various arts and sciences related thereto, but also such phases of economics, sociology, municipal administration, public art, exploration, travel, biography and history as appeal particularly to the readers of *Engineering News*. This supplement will be published with an issue of *Engineering News* about the middle of each month, and all subjects requiring more prompt attention will continue to receive it in our regular weekly issue.

Its Method and Aim—The supplement will include reviews and critical notes, announcements of new and forthcoming publications, letters from readers, answers to inquiries, and editorial comments and discussions. Its aim will be to convey prompt and critical information regarding the class of literature already mentioned, and to raise the technical and literary standards of all such publications.

First Aid to Book Buyers—The primary object of the book reviews will be to aid interested persons in deciding whether or not it is worth while to add a given new book to their library. To this end an attempt will be made to give a comprehensive idea of the contents of each volume reviewed, and to indicate its value as a contribution to the literature of the particular subject involved. Such an estimate demands a consideration of the character and scope of each book, both independently and in its relation to other works on the same subject. A possible purchaser who has no book on the subject treated wants to know how complete and authoritative the latest publication is, and in what respect it is superior or inferior to others covering the same field. The man with a well-stocked library, on the other hand, wishes to be informed whether it is worth while to add the new volume to his collection.

To Promote Technical Quality and Literary Excellence—Next in importance to conveying an idea of the contents of a book and their relation to other publications is the consideration of the way in which the subject matter has been presented. This includes both the arrangement of the several parts in relation to each other and the clearness and general style of the language employed. In other words, literary excellence is an essential quality to the best technical, as well as other, writing. This fact has been altogether too generally ignored in the past, but must be borne in mind hereafter by both authors and publishers. In fact, some of the latter are already insisting upon it, as not a few authors have found to their sorrow.

Critical Opinions from Book Readers Sought—Letters criticising engineering literature, with a view to improving its quality, will be welcomed in the columns of the supplement. In fact, it is hoped that they may become one of its most valuable features, since the opinions of those who have read or used a book ought to show both its faults and its merits, and thus serve as a most valuable guide to authors and publishers. The inquiries and answers thereto will necessarily be limited to information not generally known or readily available, and which bids fair to be of interest or value to others besides the inquirers.

Will Point Out Defects and Gaps in Engineering Literature—Editorial comments and discussions will naturally relate to various topics suggested by books under review, and it is hoped that they, like the letters from readers, may also include criticisms of literature both old and new, and particularly references to the gaps in engineering literature. That there are many such gaps engineers well know. Doubtless they would be filled more rapidly if only their presence were more frequently and strongly emphasized by discriminating readers and editors. On the other hand, some fields are already so well covered that it would be well if authors could be directed elsewhere.

Some Advantages—Some of the advantages which we trust will result from the publication of this supplement, as compared with our previous efforts to deal with engineering literature, are more space for book reviews, a wider range of topics covered, increased care in the preparation of reviews, and the virtual addition of two new features: Letters from the readers and users of books, and editorial surveys of engineering literature.

To Advance Engineering Science and Literature—Finally, we hope that with the coöperation of the readers of the supplement and of both authors and publishers, we may eventually do for engineering and other technical books what the best of the literary weeklies and monthlies are doing so well for general literature, thus contributing somewhat to the advance of engineering and the allied arts and sciences, and to the sound development of the literature thereof.

Appreciated and Supported from the Start

That Engineering Literature filled a large want was shown by the reception given its earliest numbers and from the appreciation and support which have been extended to it from that time to this. Surveying the field of engineering literature with promptness, regularity and a never-failing attempt at fairness, it has afforded a guide to would-be purchasers. Letters to the editor show that both individuals and libraries await its reviews before purchasing. On this account, care has been exercised in indicating the scope and the character of each volume and in valuing it as a contribution to the literature of engineering.

Parallel with service to book buyers has been the aim to promote technical quality and literary excellence in engineering books, and to advance both engineering science and literature. Its efforts in this direction have been ably supported by many outside reviewers.

Over Fifteen Hundred Volumes Reviewed

In fifteen years, more than fifteen hundred volumes have been reviewed. This does not include reports and pamphlets, of which hundreds have been briefly noted and still other hundreds merely listed under "Publications Received." It includes chiefly books written and printed for sale. What an output! Does not the mere number suggest the need for keen analysis and unhesitating criticism at competent hands? It would be interesting and instructive to classify this vast output by subject and quality.

This leads to the statement that one of the original objects of Engineering Literature, as set forth in the announcement already quoted, was to make surveys of groups or classes of engineering books. A number of such surveys have been published. Most of the earlier ones were editorial surveys, in which one or another editor of *Engineering News* reviewed a group of books in his own special field. In more recent years like surveys have been made by readers.

If readers and users of engineering books would more often constitute themselves reviewers of groups of books or of individual books, the cause of good engineering literature and of good engineering would be promoted.

Two Hundred and Fifty Reviewers

All unsigned reviews published in these columns have been and still are the work of some member of the editorial staff of the journal of which the Engineering Literature section forms a part. In the case of some important books, and particularly of compendiums, staff reviews may be the joint production of two or three editors or of the entire editorial staff—as in the case of a new or revised edition of an engineer's handbook.

Obviously, the editors have neither the extremely specialized knowledge required for an expert opinion on each of the many and diversified books coming from the engineering press each year, nor, even if they had the knowledge, the time to review the books and perform their other editorial duties. For these reasons, outside reviewers have contributed largely to these columns. The first two numbers contained only staff reviews. Since then, rarely has a number appeared without at least one outside review.

As an indication of the care taken to fit reviewers to books and of how wide the field covered has been, it may be stated that 250 different reviewers have contributed to these columns in the past fifteen years. The list includes scores of the best-known engineers and other scientists of the country and a few foreigners—foreigners geographically, but not in spirit.

Death has claimed at least fifteen of these reviewers. Most of them were widely known, as the following list will show:

Wm. H. Bryan, Prof. Storm Bull, Prof. Charles L. Crandall, Henry Floy, Col. D. D. Gaillard, Maj. Cassius E. Gillette, E. Sherman Gould, Wilhelm Hildenbrand, Prof. Leonard P. Kinnicutt, Emil Kuichling, Col. Smith S. Leach, Geo. W. Rafter, Prof. N. S. Shaler, W. M. Stiles, W. D. Taylor.

The standard for technical books has risen in the past fifteen years. No one thing has contributed more to this desirable end than the improvement which has taken place in the teaching and in the student output of our engineering schools. With a higher quality of technical information there has been a great improvement in the character of the English used. For this also the engineering schools deserve thanks.

In Engineering Literature of Oct. 13, 1904, this question formed the opening sentence of an editorial note: "To what extent should a writer on engineering subjects cultivate literary style?" After quoting from Frederic Harrison's "Early Victorian Writers," in which the author scored "the flat, ungainly, nerveless style of

mere scientific research," and cited Huxley and Tyndall as proof that this need not be, the note continued: "It would be interesting indeed to see a list of engineering writers who have a notably good literary style." Such a list would be much longer today than it would have been in 1904. Several books reviewed in these columns bear testimony to the efforts of teachers and writers to improve the literary style of engineering writings. A notable example is reviewed at length on page 937 of this issue.

It would be foolish to claim for Engineering Literature a fifteen-year monopoly in the upbuilding of technical literature. Such a claim would be all the more foolish in view of the fact that the *Engineering Record*, with which *Engineering News* was consolidated early this year, always maintained a high standard of technical literature—through all its pages as well as in its book reviews. A few years ago it began handling its book reviews more systematically than formerly and also began the practice of having outside reviewers, whose services had long been availed of, sign their reviews.

With the consolidation of the *Record* and *News*, Engineering Literature is now heir to the best that both journals accomplished for technical literature. With the help of its many collaborating reviewers, both invited and volunteer, and with the continued patience and forbearance of both authors and publishers, Engineering Literature will continue its attempt to help advance the science and the literature of engineering.

An American Engineer-Humorist

Sir—Your readers may be interested in the extracts given below, from Prof. F. L. Pattee's recently published book, entitled "A History of American Literature Since 1870." It is significant that "the real father of the new school of humorists," of those who created the "laughter of the west," was a hard-working engineer in close touch with nature and reality. The engineer is forever wrestling with the forces of nature, and reality is for him more than a philosophical term. He is, therefore, more apt to notice the exaggerated and grotesque, more apt to dissolve the incongruities and tragedies of life in an all-freeing humor. Professor Pattee says:

". . . . But the greatest of them all, the real father of the humorists, the man who gave the East the first glimpse of the California type of humor, was George Horatio Derby (1823-1861), whose sketches over the signature 'John Phoenix' began to appear in the early fifties. Undoubtedly it would amaze Derby could he return and read of himself as the father of the later school of humor. With him literary comedy was simply a means now and then of relaxation from the burdens of a strenuous profession. He had been graduated from West Point in 1846, had fought in the Mexican War, and later, as an engineer, had been intrusted by the Government with important surveys and explorations, first in the far West and then in Florida, where he died at the age of 38 of sunstroke. He was burdened all his life with heavy responsibilities and exacting demands upon his energies. He had little time for books, and his writings, what few he produced, were the result wholly of his own observations upon the picturesque life that he found about him in the West.

"Derby was the first conspicuous writer to use grotesque exaggerations deliberately and freely as a provocative of laughter. Irving and many others had made use of it, but in 'Phoenixiana' it amounts to a mannerism. He tells the most astonishing impossibilities and then naively adds: 'It is possible that the circumstances may have been slightly exaggerated. Of course, there can be no doubt of the truth of the main incidents.' . . . . So popular was the Phoenix *Herald* that 'we have now 782 Indians employed night and day in mixing adobe for the type molds.'

"The second characteristic of Derby's humor was its irreverence. To him nothing was sacred. The first practical joker, he averred, was Judas Iscariot: He *sold* his master. Arcturus, he observed, was a star 'which many years since a person named Job was asked if he could guide, and he acknowledged he couldn't do it.' . . . . He delights in the device of euphemistic statement used so freely by later humorists. . . . . He abounds in true Yankee aphorisms: 'When a man is going down, everybody lends him a kick'; 'Where impudence is wit, 'tis folly to reply.'

"It was Derby who wrote the first Pike County ballad. 'Suddenly we hear the approaching of a train from Pike County, consisting of seven families, with forty-six wagons, each drawn by thirteen oxen.' . . . . 'Now rises o'er the plains in mellifluous accents, the grand Pike County chorus:

> "Oh we'll soon be thar
> In the land of gold,
> Through the forest old,
> O'er the mounting cold,
> With spirits bold—
> Oh, we come, we come,
> And we'll soon be thar.
> Gee up, Bolly, whoo up, whoo haw!

"Not much was added to the Western humor after Derby. Mark Twain's earliest manner had much in it that smacks of 'Phoenix.' The chapters entitled 'Phoenix Takes an Affectionate Leave of San Francisco,' 'Phoenix Is on the Sea' and 'Phoenix in San Diego,' might have been taken from 'Roughing It.' Just as truly the chapters, 'Inauguration of the New Collector' and 'Return of the Collector,' 'Thrilling and Frantic Excitement Among Office Seekers,' might have been written by Orpheus C. Kerr. Yet despite such similarities, the later school did not necessarily filch from 'Phoenix'; they learned their art as he had learned it, from contact with the new West. All drew from the same model."

New York City. LEON S. MOISSEIFF.

[Unfortunately, none of the citations reveals Lieutenant Derby's humor in his own professional field, engineering. In *Engineering News* of Dec. 31, 1887, p. 469, appeared a chapter from "Phoenixiana" in the form of a report, dated Feb. 15, 1855, on a military survey for a railway from San Francisco to the Mission of Dolores. Among other equipment the party is said to have had 13 large and small theodolites and 184 solar compasses (one for each chainman, rodman, laborer, etc.). Each man was "armed with four Colt's revolvers, a Minie rifle, a copy of Colonel Benton's speech on the Pacific Railroad and a mountain howitzer," and was provided with a wheelbarrow for the transportation of

the howitzer. Each man was also supplied with "a gold chronometer watch and, by a singular mistake, a diamond pin and gold chain," the last-named furnished in carrying out instructions to supply the party with *chain and pins.*

A Memorable Survey

We cannot refrain from quoting a bit more from the report on this memorable survey:

"While crossing Market Street, being anxious to know the exact time, I concluded to determine it by observation. Having removed the Sidereal Clock from the cart, and put it in the street, we placed the cart in the plane of the Meridian, and I removed the eye and object-glass of the transit, for the purpose of wiping them. While busily engaged in this manner, an individual, whom I have reason to believe is connected with a fire company, approached, and seeing the large brazen tube of the transit pointed to the sky, mistook it for a huge speaking trumpet. Misled by this delusion, he mounted the cart, and in an awful tone of voice shouted through the transit '*Wash her, Thirteen,*' but having miscalculated the strength of his lungs, he was seized with a violent fit of coughing, and before he could be removed had completely coughed the vertical hairs out of the instrument. I was in despair at this sudden destruction of the utility of our most valuable instrument, but fortunately recollecting a gridiron, that we had among our kitchen apparatus, I directed Dr. Heavysterne to hold it up in the place of the true Meridian, and with an opera glass watched and noted by the clock the passage of the sun's center across the five bars. Having made these observations, I requested the principal computer to work them out, as I wished to ascertain the time immediately; but he replying that it would take some three months to do it, I concluded not to wait, but sent a man into the grocery, corner of Market and Second, to inquire the time, who soon returned with the desired information. It may be thought singular, that with so many gold watches in our party, we should ever be found at a loss to ascertain the time; but the fact was that I had directed every one of our employees to set his watch by Greenwich mean time, which though excellent to give one the longitude, is for ordinary purposes the meanest time that can be found. A distressing casualty that befell Dr. Bigguns on this occasion may be found worthy of record. An omnibus, passing during the time of observation, was driven carelessly near our Sidereal Clock, with which it almost came into contact. Dr. Bigguns, with a slight smile, remarked that 'the clock *was nearly run down,*' and immediately fainted away. The pursuits of science cannot be delayed by accidents of this nature, two of the workmen removed our unfortunate friend, at once, to the Orphan Asylum, where, having rung the bell, they left him on the steps and departed, and we never saw him afterwards."

The other portions of "Phoenixiana" have little to do with engineering, but deserve the praise given by Prof. Pattee.

"Phoenixiana" appeared in book form in 1855. It was republished in 1889 with an introduction by John Kendrick Bangs, but even the later edition is now out of print. Both editions were from the press of D. Appleton & Co.—Editor.]

Teaching English Composition to Engineering Students

Reviewed by Mont Schuyler
Associate Editor, Engineering News-Record

THE COMPOSITION OF TECHNICAL PAPERS—By Homer Andrew Watt, Assistant Professor of English, New York University. New York: McGraw-Hill Book Co., Inc. London: Hill Publishing Co., Ltd. Cloth; 5 x 8 in.; pp. 431; $1.50.

Depending entirely upon what our individual ideas may be as to the place of the engineer in society, we choose instinctively between the extremely liberal attitude toward the teaching of English adopted by Professor Aydelotte and the more narrow conception held in many quarters where it is felt that engineers are primarily technical men and that their training should concentrate with absolute exclusiveness upon those studies which are technical—that even so liberal a thing as English composition should be taught from a purely utilitarian viewpoint.

In this, the latest book dealing with the teaching of English composition to engineering students, the author has steered what may be considered a middle course at least to this extent; he has written a book which may be used in the first year's work, or, again, it may be found quite useful in the third and fourth years of the student's college course and as supplementary to his freshman training in pure English composition.

In the first paragraph of chapter I is found the following statement, "An engineer who is inarticulate is quite as useless as one who is professionally incompetent." This thought runs through the whole book, not only between the lines but in definite statements made by the author. He recognizes "that the man who has not the power to give his ideas clearly to others, the man whose thoughts are locked in his brain simply because he has not the ability to communicate them, suffers under a handicap which no amount of professional knowledge can possibly overcome." It is with the idea of unlocking the sealed lips of so many engineering students that in his own course he takes them not only through a precise study of sentence and paragraph structure and the development of ideas, but has two weekly class meetings for informal talks on technical writing, analyses and study of specimens from various sources, and for a drill in paragraphs and sentences. Supplementing this, a weekly 500-word theme of the type under consideration at that time must be written, a semester paper of from 2000 to 3000 words on a subject of special interest to the student, and, in addition, there is a regular weekly conference of at 'east 15 minutes with each student.

But the author, nevertheless, is frank to confess that the book has been written with one aim, and one aim only—to teach engineering students to write better technical papers.

Professor Watt holds that the professional writing of an engineer is all exposition or argumentation, and while he admits that there may be places where pure narration or description may be called for or at least excused, throughout the main part of his book he concentrates attention upon the first two mentioned types of writing.

After two chapters which deal with what he considers the fundamental problems, such as the task of getting the reader's point of view and the use of mechanical de-

tions for assisting the reader, and in which he treats of certain basic principles governing the planning and writing of the whole composition, he plunges immediately into a consideration of the paragraph. The matter in this chapter is more or less in support of the thesis that the paragraph is after all a purely mechanical device intended to serve the reader rather than to add anything to the easy progress of the matter being developed. And no doubt this is a defensible and perhaps accurate conception of the paragraph in *technical* writing. In the author's opinion, the paragraph is something that can be defined closely, not only as to length but as to its position in the composition. With this attitude the reviewer does not care to quarrel, recalling, as he is forced to, that the treatment of the paragraph, as well as the other points brought out in the book, is intentionally utilitarian in character.

Throughout the chapter devoted to sentence construction there seems to flow a better and, at least to the reviewer, a more sensitive feeling. It is as if Professor Watt had more of sympathy with the sentence than with the paragraph. It must be admitted, surely, that the sentence is the higher development, though not so complex a one, of the art of writing. To quote: "Even when he [the student] has learned to avoid the pitfalls of sentence construction which are positively incorrect, he still may write sentences which are slovenly and weak, for the problem of good sentence-making is the problem not only of writing correctly but also of writing effectively. The price which must be paid for good sentences is constant vigilance and painstaking revision."

But this chapter is not a mere eulogy of the beauty of the sentence. Much space is given to mechanical structure, to the uses of punctuation, to sentence unity and to securing proper emphasis. Appended is an excellent list of sentences for analysis by the student.

In the second part of his book, Professor Watt takes up five different types of technical exposition: Technical description, exposition of processes, exposition of ideas, reports and business letters. Here the concepts developed in the first part are applied. This section constitutes by far the largest portion of the book, and though much of it consists of examples, both good and intentionally bad, these are collected with excellent care and with a due regard to the immediate interests of students.

In Professor Watt's introduction to this part, he announces as his aim the "explanation and illustration of some of the more specific principles which govern the composition of the types of exposition with which engineers are most concerned, technical description, expositions of processes, expositions of ideas, reports and business letters." But he warns the student that "the suggestions for effective writing which are here given are not to be understood as representing a body of formulæ universally applicable; they are designed to serve only as general guides." The specimens which he has selected have most of them been submitted to the test of actual class-room use, which as he admits, forces a certain necessary limitation in selection, and the elimination of all articles which are highly technical or otherwise difficult to understand from the students' limited technical experience.

The difference between artistic and technical description is indicated very clearly. The object of the technical writer is, it is definitely pointed out, the reproduction in the reader's mind of a mental image of the object under consideration, or at least of its essential features. He admits the legitimacy of the use of any device or trick which will assist the reader to this end, and dwells at considerable length upon the use of photographs and diagrams, and the use of graphic illustrations, such as comparison with the T-square or the S-hook—objects which are immediately familiar.

Emphasis is placed on the fact that a mere catalog of parts is not a description "any more than a pile of junk is a machine," and the student is made to realize that he should usually endeavor to supply a mental image of the whole object and the parts which are really essential; and that to attempt more than this is unwise, unless the description is long, detailed, and very fully illustrated. A lucid explanation is given of the value of conveying a general idea of the object or appearance of the subject before entering into a technical description of details.

The chapter on reports is well worthy of reading by anyone who has to handle this most usual and difficult type of technical writing. What Bismarck called the "weight of the imponderables"—the psychologic advantages of position, experience, and trustworthiness—is made sufficiently clear to the reader of Professor Watt's book by his quotation of the following perhaps hypothetical interview:

Superintendent: "Did y' inspect that machine?"
Engineer: "Yes, sir."
Superintendent: "Any good for our purposes?"
Engineer: "Yes, sir; we ought to have one."
Superintendent: "All right."

Professor Watt points out that here are the elements of a complete report. And, he says, it may be added that there are probably more reports of this type than of any other.

Irrigation Principles and Methods

OPERATION AND MAINTENANCE OF IRRIGATION SYSTEMS: By S. T. Harding, Assistant Professor of Irrigation, University of California, formerly Irrigation Engineer, U. S. Department of Agriculture. New York: McGraw-Hill Book Co., Inc. Cloth; 6 x 9 in.; pp. 271; illustrated; $2.50.

Reviewed by ANDREW WEISS
Project Manager, U. S. Reclamation Service

This book is an excellent compilation of the fundamental principles and representative methods of the operation and maintenance of irrigation systems in the United States. The author exhibits a thorough understanding of the subject treated, evidently the result of practical experience and painstaking inquiry.

In the first chapter the subject of general maintenance is treated extensively. Statistics of costs, showing the necessary great range of figures due to local variation of conditions, are given. The subject of liability for damages is discussed in the light of current court decisions. This is followed by a complete discussion of the many perplexing problems of canal maintenance which the manager of an irrigation canal of appreciable size must be prepared to solve. The questions of priming canals, of silting and control of seepage losses and undesirable vegetation, of protection against wind erosion, burrowing animals and trespass by range stock, are given in much detail, and numerous remedies with

cost records of their application are given in ample outline.

In the second chapter the relative serviceability, length of life and needful precautionary measures in the maintenance of wooden, steel and concrete structures are discussed. This treatise is amplified by numerous cost data and description of methods sufficient to serve as a reliable guide in the operation and maintenance as well as in the planning of such works. This chapter reflects more of the mental processes of the builder than of the manager and is, therefore, of special value to the engineer or other responsible person charged with the planning and building of a new system or of extensive betterments and replacements.

The third chapter is given to the problem of organization, outlining and suggesting appropriate plans for systems of varying sizes and conditions based upon experiences so far available.

The methods of delivering irrigation water are treated fully in the fourth chapter. The author shows a close acquaintance with the various methods in use, their suitability to different conditions, and points out the gradually increasing use of some form of rotation plan. The disadvantages resulting from the so-called continuous delivery method are perhaps not sufficiently emphasized.

The measurement of irrigation water is treated exhaustively in the fifth chapter. The very complete text, clearly written, is supplemented by numerous tables derived from standard formulae for weirs and orifices, together with explanatory matter showing costs, limitations of use, and corrections to be applied to various kinds of weirs and other measuring devices. Numerous forms for water records are given, selected from well standardized systems.

A chapter of 14 pages is devoted to rules and regulations. It presents in a general way the necessity of these as well as the range and character of detail which it is advisable to cover. Telling excerpts are given from regulations in use. This subject is amplified in the appendix, which gives four complete sets of regulations from leading projects in Idaho and California.

The proper apportionment of construction and operation charges receives thorough study and analysis, and the results are well summarized in a concluding article. The reasons for the tendency toward adoption of quantity rates, as well as the necessary limitations and modifications to suit local conditions, are clearly presented, and in a manner indicating a close acquaintance with the human element involved.

The eighth chapter is devoted to a brief discussion of miscellaneous phases of irrigation operations. Most readers will wish to supplement this information by looking up the references given at its close. In a brief article on drainage he gives an outline of prevailing methods of procedure. Perhaps insufficient emphasis is given to the fact that an entire district or project is responsible for the usual seepage troubles, which consideration should lay the basis for an equal distribution of costs of relief measures.

At the close a short chapter is given to the subject of accounts, suggesting briefly a system of accounting in conformity with up-to-date practices, and in such detail as will enable the management to utilize the results of its operations in eliminating defects and increasing efficiency. Each chapter but one closes with numerous references, many of which are, however, not generally available.

This book is a timely and useful addition to the literature on irrigation practice. It presents in concentrated form a large range of information not elsewhere compiled and of special value to the student of irrigation engineering. It covers much of great value to the engineer or manager charged with construction, as well as operation and betterment, of irrigation works. The experienced manager or assistant will find it instructive, interesting and profitable, pregnant with suggestions for improvement, the need of which is doubtless very general in irrigation practice.

Reclamation Service Works Described

IRRIGATION WORKS CONSTRUCTED BY THE UNITED STATES GOVERNMENT. By Arthur Powell Davis, Chief Engineer, U. S. Reclamation Service. New York: John Wiley & Sons, Inc. London. Chapman & Hall, Limited. Cloth; 6 x 9 in.; pp. 413; illustrated. $4.50.

Within less than fifteen years after the date of the first enabling legislation, the U. S. Reclamation Service expended about $100,000,000 on the construction of numerous irrigation systems scattered over our vast western domain. In 1916 works and water were available to irrigate 1,500,000 acres and water was actually supplied to 900,000 acres. These irrigation works include some of the most notable dams in the world, both in design and height, including the highest of all—the Arrowrock, near Boise, Ida., a masonry structure 354 ft. high from lowest foundation to parapet crest. Tunnels, pressure conduits, flumes, headgates, drops, main and lateral canals, pumping stations, hydro-electric plants, and other irrigation works in great variety of design and material abound.

With the aid of well chosen line drawings and halftones, Arthur P. Davis, chief engineer of the U. S. Reclamation Service, has systematically and concisely described 21 of the 25 projects in the handsome volume under consideration. Fittingly he dedicates the book to "John W. Powell, the far-seeing philosopher; Francis G. Newlands, the constructive statesman; and Frederick H. Newell, the faithful administrator; the pioneers who blazed the way for the beneficient work of national reclamation."

Except for a brief and interesting introduction and a short but valuable final chapter summing up the achievements of the Reclamation Service in terms of ultimate aim—"Settlement and Cultivation"— the entire book is devoted to descriptions of the various projects. The plan followed is to give the history and a general description of each project in a few sentences, and then to describe the works in their natural order, from dam and storage reservoir to water delivery to each farm unit.

Besides the descriptions of structural works, the volume contains information on a variety of special topics. In the order found in the index some of these are: Alkali, action of concrete: cement, sand; capital needed by settler; concrete pressure pipe; crop results; difficulties of settlers; disintegration of concrete; farm unit, size of; grouting foundation; percolation tests; return seepage; sand manufacture, cost of Cost

figures are presented, generally in summarized form. Due credit is given to the leading engineers connected with the several projects. Particular acknowledgment is made to E. A. Moritz, who wrote the description of the Sunnyside project, and to Prof. F. H. Newell, formerly director of the U. S. Reclamation Service.

Besides its value as an account of governmental enterprise in the reclamation of land, the book is a welcome addition to the literature of irrigation, and of dams, canals, pipe lines, and other structures common to hydraulic works.

Essentials of Materials of Engineering

TEXTBOOK OF THE MATERIALS OF ENGINEERING: By Harold F. Moore, Research Professor of Engineering Materials, Engineering Experiment Station, University of Illinois. New York: McGraw-Hill Book Co., Inc. London: Hill Publishing Co., Ltd. Cloth, 6 x 9 in., pp. 204; illustrated; $2.

Frankly a textbook for the initial construction of the uninformed, Professor Moore's little book is remarkably comprehensive. In comparatively brief space he gives all of the essential information regarding the nature of materials used in engineering and outline; some of the problems connected with the inspection and testing of those materials. Aside from its value as an instruction text, the book should have a place as a ready reference for the practising engineer who has forgotten or mislaid some of the details of material manufacture or behavior.

The first chapters present the general principles of the strength of materials. The main part of the book is devoted to separate chapters on each of the various materials. Then follow chapters on the details of testing. A final chapter is added on a subject for which the author is especially qualified to speak, the resistance of materials to repeated stress. As an aid to the use of the book in schools there is an appendix containing lists of questions on the subject treated.

The Legal Side of Engineering

BUSINESS LAW FOR ENGINEERS—By C. Frank Allen, M. Am. Soc. C. E. Part 1: Elements of Law for Engineers. Part 2: Contract Letting. New York: McGraw-Hill Book Co., Inc. London: Hill Publishing Co., Ltd. Cloth; 6 x 9 in.; pp. [illegible]

Books on the legal side of engineering are common and form part of the library of virtually every engineer. Professor Allen's new book, however, seems to fall in a somewhat different class, particularly the first half. It is divided into two parts, one entitled "The Elements of Law for Engineers" and the second called "Contract Letting." The contract section is quite similar to that in other books of this type. The first section, however, on elementary law, is very much clearer and more definitely stated than is usually the case with legal texts written for the benefit of the engineering profession. The chapters take up not only those sections of elementary law which are obviously applicable to engineering, but others of the apparently less related subjects which, however, are shown to bear upon engineering work. The chapter headings, for instance, are: "Evidence," "Contracts," "Torts," "Equity," "Real Property," "Corporations," "Agencies," "Master and Servant," "Sales," "Negotiable Instruments," "Railroads" and "The Engineer's Legal Relations With Others."

Throughout the book a remarkably simple and clear system of arrangement is used, and the value is enhanced by well-thought-out typography. Apparently every effort has been made to leave out extraneous matter such as is common in legal books, for, although Professor Allen is a lawyer, he is primarily an engineer and has considered his book as being addressed particularly to engineers.

Useful Engineering Formulas

EMPIRICAL FORMULAS—By Theodore R. Running, Associate Professor of Mathematics, University of Michigan. Mathematical Monographs No. 19. Edited by Mansfield Merriman and Robert S. Woodward. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited. Cloth, 6 x 9 in.; pp. 143; illustrated; $1.40.

The obtaining of a mathematical expression to represent the relations between two variables is a constant engineering necessity. It manifests itself usually in the finding of an algebraic expression for some curve plotted from physical observations. The literature on this subject has not been too full, so that Professor Running's book should prove quite useful. The subject is one which does not occur very often in an engineer's practice, but when it does he usually has to resort to some textbook to refresh his memory or to instruct him in the elements of the subject. No better book could be found than this one. Although it is of the highest mathematical elaboration, it is quite easily comprehended by anyone who has had the usual college engineering training in the subject.

Port and Harbor Bibliography

SELECTED BIBLIOGRAPHY ON PORTS AND HARBORS: Their Administration, Laws, Finance, Equipment and Engineering—Compiled by William Joshua Barney, C. E., Secretary; The American Association of Port Authorities. New York: The Secretary, 29 Broadway, New York City. Paper; 6 x 9 in.; pp. 144; $1.

The American Association of Port Authorities, through its secretary, William J. Barney, of 110 West 40th St., New York City, has published a book called "Selected Bibliography on Ports and Harbors and Their Administration, Law, Finance, Equipment and Engineering," which is a most valuable reference for engineers engaged in this kind of work. This applies to a great number of engineers today when the terminal and port situation is uppermost in many minds. The book gives references to periodicals and books under a number of headings.

Papers on Activated Sludge

Two papers on the activated-sludge process of sewage treatment, both by Edward Ardern, have been reprinted separately from the *Journal of the Society of Chemical Industry* for Jan. 31 and July 31, 1917 (Broadway Chambers, Westminster. S. W., England). These papers continue the series contributed by Ardern and Lockett to the *Journal* in its issues of May 30 and Dec. 15, 1914, and Sept. 30, 1915.

Typical Deterioration of Brasses

The submission to the U. S. Bureau of Standards, Washington, D. C., of numerous samples of deteriorated brass which have proved to be typical cases, has led to the publication of a bulletin on the typical corrosion of Muntz metal or brass of the type 60 copper 40 zinc.

This is used commercially in a wide variety of forms, such as bolts, sheathing, condenser tubes, strainers, etc., and often changes color and becomes weak and brittle. This bulletin (Technologic Paper 103) shows that the change is due to a selective corrosion of the alloy when exposed to liquids like sea-water. The zinc constituent is leached out, leaving a weak skeleton of copper which may be attacked and reduced to pulverulent form. It is reported that this corrosion is accelerated by certain microstructures, by contact with electro-negative metals, by adhering products of the corrosion, by the annealing and by stresses during corrosion.

Catskill Aqueduct Souvenir

The latest number of the *Journal* of the Municipal Engineers of the City of New York is a souvenir edition, devoted exclusively to the Catskill Aqueduct, the completion of which was celebrated Oct. 12, 13 and 14. Editor Percy C. Barney, chairman of the society's publication and library committee, has presented a history of the Catskill work, with photographs and drawings, and has included biographical sketches of many of the men on the engineering bureau of the New York Board of Water Supply. There is also a tabulated statement of the Catskill aqueduct contracts, giving name of contractor, kind of work and cost as indicated by the final estimate. The price of this number of the *Journal* is 50 cents and copies are obtainable from George A. Taber, secretary, 13 Park Row, New York City.

Sewer Drop Manholes

Six types of sewer drop manholes are described and illustrated in 16 pages of the *Journal* of The Municipal Engineers of New York (Engineering Societies Building, New York City) for September. The article is by Irwin W. Whittemore, assistant engineer, Public Service Commission, First District. The paper is based on studies made in connection with the construction of the New York subways, which necessitated lowering many sewers.

PUBLICATIONS RECEIVED

[So far as possible the name of each publisher of books or pamphlets listed in these columns is given in each entry. If the book or pamphlet is for sale and the price is known by the editor, the price is stated in each entry. Where no price is given it does not necessarily follow that the book or pamphlet can be obtained without cost. Many, but not all, of the pamphlets, however, can be secured without cost, at least by inclosing postage. Persons who are in doubt as to the means to be pursued to obtain copies of the publications listed in these columns should apply for information to the stated publisher, or in case of books or papers privately printed, then to the author or other person indicated in the notice.]

THE J. E. ALDRED LECTURES ON ENGINEERING PRACTICE: 1916-1917. The Johns Hopkins University, Baltimore, Department of Engineering. Baltimore, Maryland: The University. Paper; 6 x 9 in.; pp. 253; illustrated. $1.

Nine different men, mostly engineers, in the three fields of civil, electrical and mechanical engineering, delivered these lectures to undergraduate students in March and April, 1917. The lectures were made possible by J. E. Aldred and the same general plan will be followed yearly hereafter. The lectures are designed to be practical and are open to the general public.

THE CITY MANAGER PLAN FOR CHICAGO: Draft of a bill for the reorganization of the municipal government with explanatory statement. Prepared and presented for public consideration by the Chicago Bureau of Public Efficiency, 315 Plymouth Court, Chicago, Ill. The Bureau. Paper; 6 x 9 in.; pp. 60.

COMMISSION OF CONSERVATION, CANADA: Report of the Eighth Annual Meeting held at Ottawa, Jan. 16-17, 1917. Ottawa: The Commission. Cloth; 7 x 10 in.; pp. 344; illustrated.

DAILY RIVER STAGES AT RIVER GAGE STATIONS ON THE PRINCIPAL RIVERS OF THE UNITED STATES. Volume XIV, for the year 1916—By Alfred J. Henry, Professor of Meteorology. Washington, D. C.: U. S. Department of Agriculture. Paper; 9 x 11 in.; pp. 278.

DETERIORATION IN THE HEATING VALUE OF COAL DURING STORAGE—By Horace C. Porter and F. K. Ovitz. Washington, D. C., Bureau of Mines. Paper; 6 x 9 in.; pp. 38; illustrated.

A DIGEST OF THE DECISIONS OF THE RAILROAD COMMISSION OF WISCONSIN: Covering the Decisions Published in Volumes I to XV, inclusive, of the Commission's Official Reports, July 20, 1905, to Feb. 4, 1915. Compiled by Harold L. Geisse, Secretary. Madison, Wisconsin: The Secretary. Cloth; 6 x 9 in.; pp. 805.

EFFECTS OF STORAGE UPON THE PROPERTIES OF COAL: By S. W. Parr, Professor of Applied Chemistry, Urbana, Illinois Engineering Experiment Station. Paper; 6 x 9 in.; pp. 44; illustrated.

EVAPORATION FROM THE SURFACES OF WATER AND RIVER-BED MATERIALS: By R. B. Sleight, Assistant Irrigation Engineer, Office of Public Roads and Rural Engineering, United States Department of Agriculture. Washington, D. C.: The Department. Paper; 7 x 10 in.; pp. 273; illustrated.

FINANCIAL STATISTICS OF CITIES HAVING A POPULATION OF OVER 30,000: 1916; Department of Commerce, Bureau of The Census. Sam. L. Rogers, Director. Washington, D. C., Superintendent of Documents, Government Printing Office. Paper; 9 x 12 in.; pp. 375; illustrated; $1.

GLOSSARY OF AVIATION TERMS—TERMES D'AVIATION. Compiled by Lieutenants Victor W. Page, A. S., S. C., U. S. R., and Paul Montariol of the French Flying Corps, on duty at Signal Corps Aviation School, Mineola, L. I. New York: The Norman W. Henley Publishing Co. Cloth; 5 x 8 in.; pp. 94; illustrated; $1.

HYDRAULIC CONVERSION TABLES AND CONVENIENT EQUIVALENTS: Water-Supply Paper 425-C. U. S. Geological Survey. Department of the Interior, Franklin K. Lane, Secretary. Washington, D. C.: The Secretary. Paper; 6 x 9 in.; pp. 94.

Most of the tables in this handy collection are designed for use in converting discharge per second-feet per square mile into various equivalents used in water-works, irrigation, water-power practice and storm-water drainage practice. There are also some length, surface, volume, hydraulic and miscellaneous tables and some map scales.

LOCOMOTIVE HAND-BOOK: Compiled by American Locomotive Co., 30 Church St., New York City. New York: The Company. Leather; 4 x 6 in.; pp. 195; illustrated; 75 cents.

This is a carefully compiled little book. Most of the information is of course for the mechanical rather than the civil engineer. There are, however, considerable data on tractive efforts and train resistance, about which few of us know too much, and there are also tables and diagrams at least interesting to anybody interested in that remarkable machine—the modern locomotive.

OHIO TOPOGRAPHIC SURVEY: Final Report, Vol. II, 1917. Surveying Marks and Monuments—By C. E. Sherman, C. E. Columbus, Ohio: The Survey. Cloth; 6 x 9 in.; pp. 760; $1.

THE PRODUCTION OF IRON AND STEEL IN CANADA: During the calendar year 1916. John McLeish, B. A., Chief of the Division of Mineral Resources and Statistics. Ottawa, Ontario, Canada: Department of Mines. Paper; 6 x 9 in.; pp. 50.

RAILROAD COMMISSION, STATE OF WISCONSIN: Opinions and Decisions—Nov. 15, 1915, to May 29, 1916. Compiled by Harold L. Geisse, Secretary. Madison, Wisconsin: The Secretary. Cloth; 6 x 9 in.; pp. 1147.

RAND WATER BOARD: Report for 1916-17. W. Ingham, Chief Engineer, Johannesburg, Union of South Africa. Paper; 8 x 13 in.; pp. 57; illustrated.

SCIENTIFIC PAPERS OF THE BUREAU OF STANDARDS. An Aneroid Calorimeter for Specific and Latent Heats—By Nathan S. Osborne, Associate Physicist. Washington, D. C.: Superintendent of Documents, Government Printing Office. Paper; 7 x 10 in.; pp. 26; illustrated; 10 cents.

SHAPE BOOK: Containing Profiles, Tables, and Data Appertaining to the Shapes Plates Bars Tees and Zees Rolled at the Pittsburgh, Penn., Carnegie Steel Company. Leather; 4 x 8 in.; pp. 351; illustrated; $1.

THE SUBSTITUTION OF OTHER MATERIALS FOR WOOD: Studies of the Lumber Industry. Part XI—By Raphael Zon, Engineer in Forest Products. Washington, D. C.: Superintendent of Documents. Paper; 6 x 9 in.; pp. 78; illustrated; 15 cents.

A historical study of the replacement of wood by other structural materials, together with a statistical account of the amount of wood so replaced and a description of the uses to which the substitute materials are put.

TECHNOLOGIC PAPERS OF THE BUREAU OF STANDARDS. Some Unusual Features in the Metallography of Wrought Iron—By Henry S. Rawdon, Associate Physicist. Washington, D. C.: Superintendent of Documents, Government Printing Office. Paper; 7 x 10 in.; pp. 19; illustrated; 5 cents.

TRANSACTIONS OF THE AMERICAN CERAMIC SOCIETY. Volume XIX: Containing the Papers Read at the Meeting Held at New York, N. Y., May 1 to 3, and at the Meeting Held at Niagara Falls, N. Y., June 5 and 6, 1917, together with Supplementary Discussions and Other Matters Acting by Vote of the Society. Edited by Arthur S. Watts, Editor. The Secretary, Edward Orton, Jr., Columbus, Ohio. Cloth; 6 x 9 in.; pp. 687; illustrated.

TRANSACTIONS OF THE CANADIAN SOCIETY OF CIVIL ENGINEERS. January to June, 1917. Montreal: The Canadian Engineer. Paper; 7 x 10 in.; pp. 447; illustrated.

HINTS FOR THE CONTRACTOR

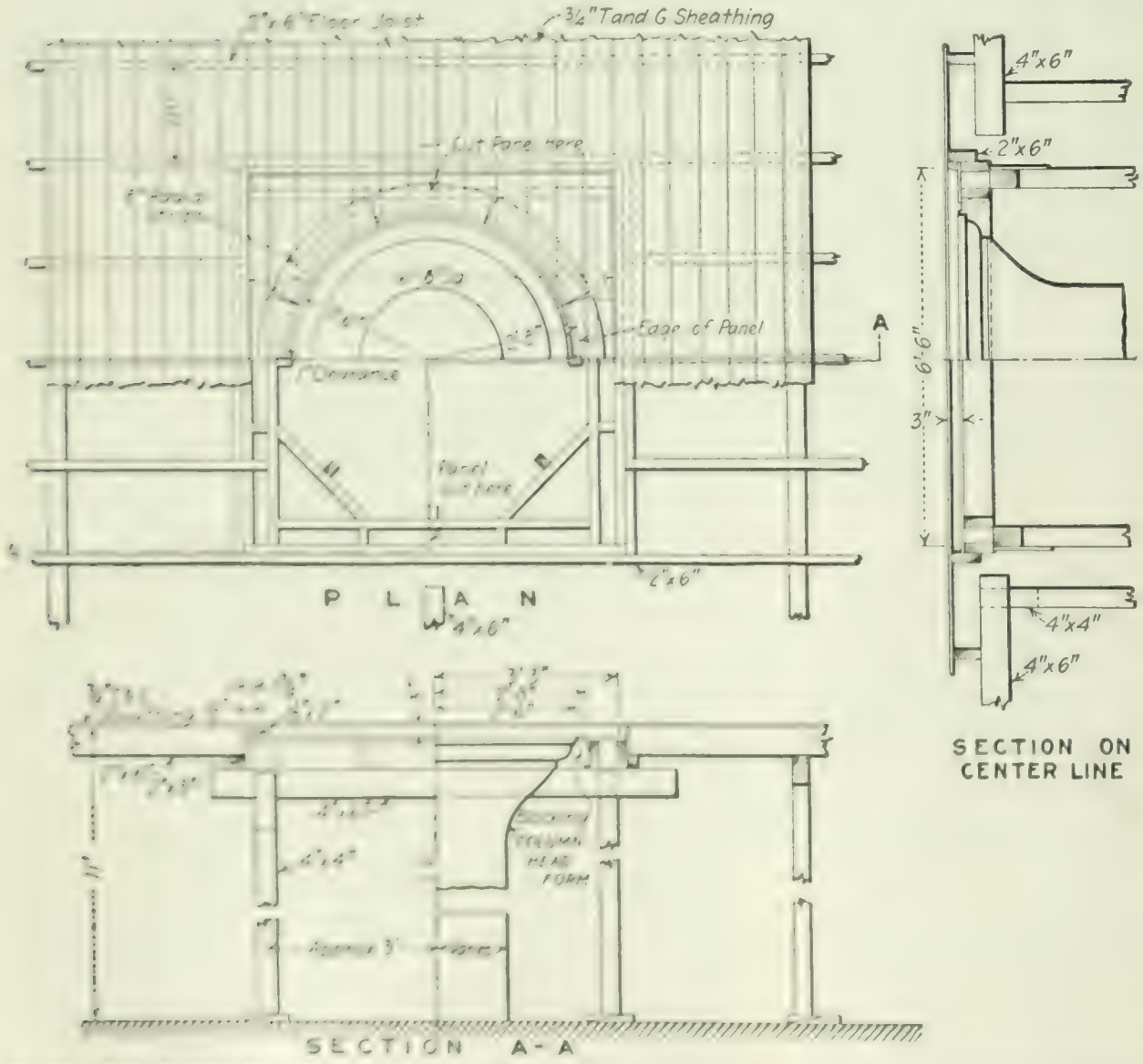
DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Floor Panel Form Permits Removal of Column Forms

FLOOR-SLAB FORMS for the depressed or thickened panels over the column heads have been so made on recent work as to facilitate rapid erection of the form work and also permit removal of the metal forms of the columns without disturbing the floor form. This design, shown in the drawing, was used by Stone & Webster, of Boston, for concrete buildings at Pittsburgh. J. F. Love was the company's superintendent on this work.

The panel form is made 1 in. larger on each side than the metal column-head form which fits into it, and supports this latter by wood blocks nailed in place, as shown. By knocking off these blocks, the metal form is left entirely free. This construction increases the accuracy of setting the column forms. When the wood work is erected and securely braced, the center lines for the column are marked in both directions, and the column-head form is then set by these marks. The narrow opening between the panel and head forms is covered by segmental strips of metal nailed in place.

The panel form is built in halves, which are assembled for erection by nailing a 2 x 6-in. strip along each jointed side. These strips are long enough to rest on the regular floor stringers which are erected on either side of the column before the panel form is placed. As they are the same depth as the joists they do not interfere with the rest of the form work for the floor. The depressed-panel form is supported by separate bents.



FORM FOR DEPRESSED FLOOR PANEL PERMITS EASY REMOVAL OF COLUMN FORM

Fence Posts Driven Speedily By Small Piledriver

IN RUSHING through to early completion the 17-mile board fence at the cantonment at American Lake, Washington, it was found that a small piledriver made it possible to reduce greatly the time required for putting down the posts. About 11,000 posts had to be placed on 8-ft. centers. The posts varied from 5 to 10 in. in diameter and were 9 ft. long, of which 3 ft. was below ground.

The piledrivers, three of which were built, were provided with 4-hp. Fairbanks-Morse gasoline engines operating a small drum by means of a friction clutch. The hammer, of cast iron, weighed 600 lb. and was arranged for a 6-ft. drop when beginning on a 9-ft. post. The entire equipment was mounted on a two-horse truck, the leads projecting over the rear end. The points at which posts were to be driven were marked by pegs and the team was driven down this line of pegs, stopping every 8 ft. to drive a post.

The frame on which the piledriver proper was mounted was attached to the truck by a pin at the forward end, thus permitting the rear end of the frame, and the leads which it carried, to be swung from right to left as desired. By this arrangement it was only necessary to stop the team at the proper distance each time; the swinging leads being depended upon to correct any small error in alignment.

With this equipment a crew of four, consisting of teamster, engine driver and two post rustlers, could drive 180 posts in 8 hours. The actual time of driving per post varied from 1 to 1½ min. The posts were pointed and delivered along the fence line ahead of the driving rig.

As is often the case on construction of an unusual nature, the plan was not a notable success as tried cut

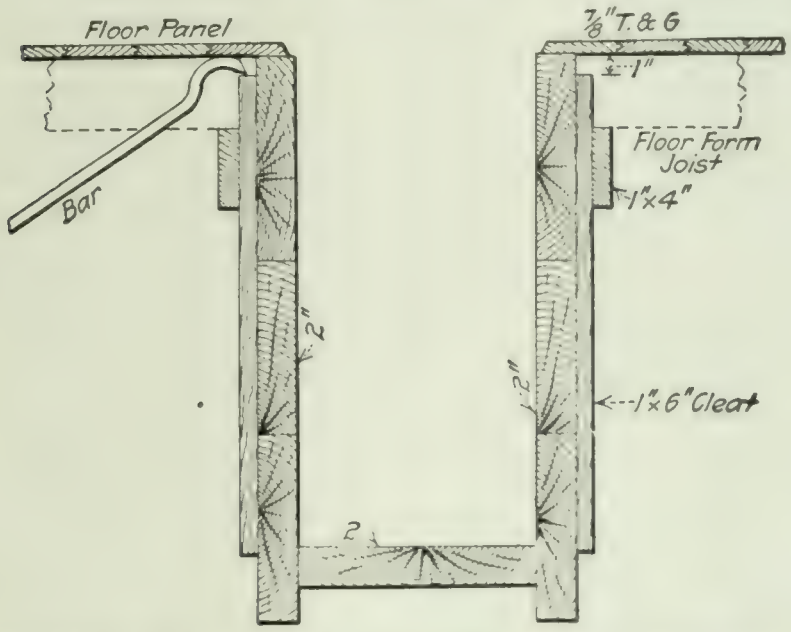
with the first crew, but when a foreman was put in charge who believed that the scheme was a good one, trouble and delays resulting from breakdowns were greatly reduced and the good rate of progress mentioned was attained.

The work was done under the direction of the Hurley-Mason Co., who held the general contract for the cantonment construction, description of which appeared in *Engineering News-Record* of Oct. 4, p. 650.

Cleats on Side of Beam Form Give Good Purchase for Stripping

By Samuel Warren
New York City

IF THE FOLLOWING method is used in making beam and girder forms, it will be easy to loosen them from stripping: Make the side sleats of full 1-in. material, coming up within 1 in. of the top of the side. This will give a perfect purchase for a gooseneck bar, as shown in the sketch, and will prevent injury to the form resulting from the workman trying to get a purchase by digging the end of the bar into the beam side. With the good purchase thus afforded one man can usually loosen the form, and if a man works on each side of the beam form it is sure to come down easily.



CLEATS GIVE PURCHASE FOR BARS IN STRIPPING

Strip for Car Tracks Through Pavements Removed by Machines

BY UTILIZING machines for all operations of cutting through a new asphalt pavement, breaking up the concrete base and loading the material into cars, little labor was required in preparing the roadbed for a street-car track to the new Curtiss aëroplane plant in Buffalo, N. Y. A self-propelling cutting machine of pile-driver type has a 500-lb. weight, which is fitted with a knife in the bottom and has a fall of 3½ ft. This machine with two operators cut 4000 lin.ft. of 3-in. asphalt paving in ten hours. A 15-ft. spiked roller scarified the strip and a Keystone excavator tore up the asphalt and loaded it onto cars. The cutting machine was used also to punch 1-in. holes in the 6-in. concrete base along the edge of the cut, a hole being punched with three blows. The holes were spaced 10 in. apart and 600 lin.ft. was a day's work. The row of holes forms a line on which the concrete broke when struck with a 1-ton pile hammer operated by a steam shovel. A second excavator followed the hammer, removing the broken concrete and earth to grade, and loading the material into wagons or cars. In normal operation the pile hammer broke a strip 10 ft. wide and 300 ft. long in a day. About 1½ ft. was broken off each time the shovel moved.

This work was carried out under the direction of A. P. Illig for the contractor, the German Rock Asphalt Co., Buffalo. F. V. E. Bardol, a member of this firm, devised the cutting machine for use in making repairs on asphalt paving.

Blow Out Supply Line with Steam from Mixer to Prevent Freezing

By Harlan H. Edwards
Danville, Ill.

ON SEMI-MONOLITHIC brick road work being carried out under contract by J. C. Poll, 6 miles east of Danville, Ill., steam from the mixer boiler or road roller is used to blow out the water from the 2-in. supply line along the road in freezing weather. When laid, this pipe was fitted with a 1-in. T every 200 ft. to which a hose could be attached for supplying water to the mixer. When there is any danger of water freezing and bursting the pipe during the night, Superintendent Carl Nelson attaches an old hose to the T nearest to the mixer or road roller, opens successively the other Ts along the pipe line, and blows out all the water, leaving the line empty over night.

City-Manager Plan Proposed for Chicago

Adoption of the city-manager system of municipal government for Chicago, and consolidation of the various local governments in the metropolitan district, are important steps recommended by the Chicago Bureau of Public Efficiency. Modification of the state constitution is a necessary preliminary to the unified government, but the state legislature has already authorized a vote in November, 1918, upon the proposal to call a convention to revise the constitution. In the meantime, application of the city-manager system of government is possible through legislative action, with the approval of the people in a referendum vote. This could be arranged to take effect in 1919, when the term of the present mayor expires.

The bureau has drafted a bill providing for reorganization of the city government on this basis, leaving the consolidation or unification of the various local governments until the necessary constitutional amendments are passed. The proposed law would not create the office of city-manager, but the mayor would in effect hold such a position, as he would be elected by the city council and be subject to its control.

The bill provides for one alderman, instead of two, for each of the 35 wards, with a four-year term and subject to popular recall. All the aldermen would be elected at one time, while under the present system a certain proportion are elected each year. The mayor, city clerk and controller would be chosen by the council. Heads of departments would be appointed by the mayor, and would not need to be residents of the city at the time of their appointment. The three officials and the heads of departments would have no fixed terms of office.

NEWS OF THE WEEK

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

Defense Council Names Highways Committee

L. W. Page and H. G. Shirley Members of Advisory Body in Charge of Construction and Traffic

The appointment of the Highways Transport Committee of the Council of National Defense was announced by Director W. S. Gifford last week. The purpose of the committee is to assist the railroads and other means of transportation in the movement of supplies during the war and to work with the highway authorities to maintain the public roads in shape for such use. The membership of the committee will be:

Chairman, Roy D. Chapin, president, Hudson Motor Car Co.; Logan Waller Page, director of the Office of Public Roads, Department of Agriculture; Henry G. Shirley, chief engineer, Maryland State Roads Commission; George H. Pride, president, Heavy Haulage Co., of New York City.

The membership of the committee, according to a statement by Director Gifford, insures a broad knowledge of all problems pertaining to the construction of highways and the traffic over them. Coöperative work will be at once started with the various departments of the Government interested in the utilization of the roads of the United States for military purposes.

This will complete the list of transportation committees under the Council of National Defense and will give all forms of transportation proper representation in the war activities.

The committee, according to statements made by Mr. Chapin, the chairman, to the Washington representative of *Engineering News-Record*, is not yet complete. It is announced that the members of the committee will gather in Washington the end of this week for an organization meeting, and that its headquarters will probably be in the Munsey Building.

"After our meeting," Mr. Chapin said to the *Engineering News-Record* representative, "we will see what type of work develops, and additions to the committee will be made, selecting men who know the sort of work to be done.

"Naturally we have no policy yet. In the first place, we must make a very careful study of transportation problems around terminals, to avoid terminal congestion this winter. In the second place, we must try to coördinate all the Government department road work that may be necessary from the standpoint of military necessity."

Mr. Chapin stated that after the committee makes a study of these two points it will form a definite publicity policy.

City Managers Will Meet in Detroit

The City Managers' Association will hold its fourth annual convention at the Hotel Statler, Detroit, Nov. 19 to 22. Some of the sessions will be held in connection with the National Municipal League, which will have its annual convention at the same place beginning Nov. 21. Actual experiences of city managers will fill in a large part of the program of their meeting. In addition, there will be a few addresses on pertinent municipal subjects by men not connected with the association, a departure from previous conventions. O. E. Carr, city manager of Niagara Falls and president of the City Managers' Association, states that of the 83 city managers listed in the 1916 "Proceedings" of the association, 30 were known to be engineers and 13 were known not to be engineers, while no information was available regarding the previous professions of the other managers in the list.

"It is very evident, no matter what we do or what we study," he added, "that there must be close coöperation among all the transportation interests during the period of the war."

For thirteen years Mr. Chapin has represented the automobile industry in the good roads movement in this country. He is a vice president of the Lincoln Highway Association, and he said that he had been at work for six months trying to bring about the formation of such an agency as the Highways Transport Committee.

There is already talk in Washington that Mr. Chapin, by reason of the chairmanship he now assumes, may be made an ex-officio member of the War Board of the American Electric Highway Association, recently formed, which is to take the place of the committee of that association working with the Council of National Defense. When Mr. Gifford made the announcement of the creation of the Highways Transport Committee, it was said informally that the highways committee would bring about the greater use of highways and inland waterways for short hauls. As the electric railways are also vitally interested in terminal congestion and short hauls, and as the electric railway war board has appointed Daniel Willard, head of the steam transportation interests, as an ex-officio member, it is felt in Washington, in some quarters, that close coöperation between the Highways Transport Committee and the Electric Railway War Board would be a wise thing, in view of the fact that coördination of all transportation interests is desired.

Shipping Board Provides for Housing of Workers

Better Accommodations and Transportation Facilities Needed for Men Who Will Build Fleets

The United States Shipping Board took further steps to speed up the shipbuilding program and get a small army of new employees to fill the gaps in the big shipyards.

Better housing and transportation facilities are to be provided for the workmen, as complaints have been received from some of the shipyard districts that it would be difficult to provide the proper accommodations for enough men to put on double and triple shifts.

J. Rogers Flannery, of Pittsburgh, has been drafted from the ranks of the Red Cross by Chairman Hurley, of the Shipping Board, to take charge of this work, and submitted his first report on conditions in Baltimore, so that additional men who are badly needed at the Sparrows Point yards can be provided for at once.

U-Boat Again Successfully Trucked Through New York Streets

Having aided in arousing enthusiasm in New York for the Liberty Loan, the captured German U-Boat C 5, renamed the "U Buy a Bond," has been taken to Canada to aid in the raising of the Victory Loan there. The submarine was taken from Central Park to the West 130th Street Pier on a 100-ton steel Reach truck drawn by four motor trucks, two Macks of 5½ and 7½ tons, and two Packards of 6½ tons each. The three heavy sections of the boat were transported through the New York streets on Nov. 7, 8 and 9, by the Howes Transportation and Contracting Co., without damage to the city streets. As stated in *Engineering News-Record* of Nov. 1, p. 828, the three sections of the submarine formed perhaps the heaviest loads ever carried on four wheels through city streets in this country.

Stinchcomb Beaten for Mayor

Cleveland citizens, it seems, are not sufficiently appreciative of the blessings that would flow from having an engineer in the mayor's chair, for the voters "turned down" William A. Stinchcomb, Democratic candidate, on Nov. 6. Mr. Stinchcomb is a civil engineer and county surveyor of Cuyahoga County, in which Cleveland is situated. Some details of his biography were given in *Engineering News-Record* of July 19, p. 143.

General Biddle Now Assistant Chief of Army Staff

Major General John Biddle, who returned from France on Oct. 28, has been appointed assistant chief of staff, U. S. A. General Biddle was formerly president of the Army War College, and is one of the best known engineer officers in the Army. Appointed from Michigan to the Military Academy in 1877, he was graduated with the class of 1881, ranking second and being appointed second lieutenant of engineers. During the Spanish-American War he held the rank of lieutenant colonel as chief engineer, United States Volunteers. At various times General Biddle has had charge of river and harbor work at Nashville, Tenn., at San Francisco, at Savannah, and at Baltimore. From December, 1914, until June, 1915, he was military observer for the United States Army with the Austro-Hungarian army in Austria and Poland. In 1916 General Biddle returned to the Military Academy as superintendent and served approximately a year in that capacity.

Contract for 18-Mile Shandaken Tunnel Awarded to Degnon

The contract for the 18-mile Shandaken tunnel of the Catskill aqueduct, for which bids were received Sept. 11 (see *Engineering News-Record* of Sept. 13, p. 523), was awarded by the Board of Water-Supply of the City of New York on Nov. 9 to the Degnon Contracting Co., the low bidder, the total cost, based on the estimated quantities and the unit prices, being $12,138,000. The incoming Tammany administration, which, however, does not assume office until Jan. 1, has requested that the work be held up. Mayor-elect John F. Hylan and his associates on the Municipal ticket, Charles L. Craig and Alfred E. Smith, have sent the following letter to the Board of Water-Supply:

"Gentlemen: On Nov. 9 your board executed a contract with the Degnon Contracting Co. for the construction of the Shandaken Tunnel, connecting the Schoharie watershed with the Catskill Aqueduct. The contract price was $12,138,738. The contract contains a provision that the contractor shall begin work ten days after the serving of a notice by your board instructing him to begin work. The contract also contains a provision by which the board reserves the right to suspend the whole or any part of the work without compensation to the contractor for such suspension. The period within which the contract must be completed after the giving of the notice is seven years.

"This contract was awarded upon the assumption that the city will need the new water supply by the time the work is completed, and its conclusion is based upon the further assumption that the per capita consumption of New York City is 110 gallons of water per day, and that the increase in population will be at the uniform rate of 157,227 per annum.

"In view of the conditions resulting from the prosecution of the war and their effect upon the price of labor and material and the derangement of industry generally, and the serious strain upon the finances of the whole country by the expenditures required for the war, it seems to us that unless there is some overwhelming necessity that requires the prosecution of this construction work on the Shandaken Tunnel at the present time, that it should not now proceed.

"In order to give the incoming Board of Estimate and Apportionment an opportunity to look into the matter and make such recommendations or take such actions as a full investigation require, we hereby request that your board refrain from serving the notice upon the contractor provided for by Article VI of the contract, and that your board exercise the right to suspend the whole of the work under the contract pursuant to provision VII of the contract for at least ninety days, so that the new Board of Estimate may be properly advised and discharge whatever responsibilities it may have to the City of New York.

Very truly yours,

JOHN F. HYLAN,
CHARLES L. CRAIG,
ALFRED E. SMITH."

1500 Road Builders Have Joined 23rd Engineers

Already More Than 8000 Applications for Enlistment Have Been Received – Prize Drill Held



COMMANDING OFFICER AND STAFF OF THE 23RD ENGINEERS, THE NEW ROAD-BUILDING REGIMENT

Sitting, left to right: Maj. F. S. Skinner, Maj. I. C. Moller, Col. E. N. Johnston, Maj. C. B. Wing, Maj. H. H. Stickney, Jr. Standing, left to right: Capt. W. H Messinger, Capt. R. G. McGlone, Capt. F. H. Ellis, Capt. W. M. Torrance

Men from the far West and the far South have begun to arrive at Camp Meade, Md., to join the 23rd United States Engineers, composed of road builders and other highway construction men. In groups of from 75 to 100 a day, they are coming from all over the country, and are being rapidly whipped into shape. More than 8000 applications to join the regiment have been received, although not all applicants were acceptable and many could not pass the physical examinations. As it stands, however, there are now 1500 men at Camp Meade in the regiment.

These men, according to the Washington representative of *Engineering News-Record*, quoting high army officers, are making a fine showing. Last Sunday a competitive drill between the companies of the regiment was held. It began with a review by Major General Biddle, acting chief of staff of the army; Major General Kuhn, commanding the 79th Division at Camp Meade; Brigadier General Abbott and Brigadier General Winslow, as well as Colonel Johnston, commanding the 23rd, and his staff officers. The first prize in the drill, $200 in cash, was won by Company C; the second prize, $50 in cash, was won by Company D; and the third prize, $25 in cash, was won by Company A. These drills for cash prizes are a feature of the training of this organization, and they have had a stimulating effect on the work of the men.

The regiment is now organizing a full brass band, and is still in want of men who can play the fife as well as build roads. In fact, the regiment is still in need of several thousand axemen, blacksmiths, boatbuilders, carpenters, caterers and cooks, car repairers, stone-crushing plant operators, drill runners, grading men, mechanical engineers, quarrymen, riggers, roller men, shoemakers, tailors, tire repair men, both rubber and metal, and general utility mechanics.

Men of the very highest type are joining the regiment, and Colonel Johnston, 1419 F St., N. W., Washington, D. C., to whom all applications should be addressed, received a few days ago a letter from a Spaniard who served under the Spanish colors during the Spanish-American War, who now wants to join the regiment and fight under the American colors against the Germans by helping to build and rebuild roads in France.

A gala session is being planned for the regiment at Camp Meade. During the latter part of this month, at a date yet to be selected, there is to be a spectacular presentation of colors to the regiment by its friends.

Big Passaic Valley Sewer Will Be Delayed

Cannot Be Completed Next Year as Originally Planned—Cost Now Placed at $15,000,000

Completion of the Passaic Valley, N. J., sewer is not now expected before the spring of 1919, despite the plans and hope of the Sewer Commission to have it ready by Dec. 31, 1918, the time set for finishing the work.

This was stated by Adrian Riker, counsel for the commission, in an official announcement covering the history of the construction, made before representatives of all interested municipalities. In a paper read by Mr. Riker the delays were explained, unexpected obstacles encountered in prosecuting the work were enumerated and detailed data on the cost presented, showing why expenditures had climbed high above the original estimate of $11,500,000, and is now placed at $15,000,000.

However, Mr. Riker explained, the amount to be paid by additional municipalities coming into the league will so reduce pro rata assessments on the fifteen original municipalities in the contract that the cost of these fifteen will not exceed $12,000,000, and may fall to the $11,500,000 originally stated. The health menace in the pollution of the Passaic River was dwelt upon by Mr. Riker in reviewing conditions that forced action for the completion of the big sewer.

Bonds for $2,800,000 Sewers Voted in Toledo

A $2,800,000 sewer bond issue was authorized by a vote of almost two to one at the election in Toledo, Ohio, Nov. 6. H. C. McClure, commissioner of engineering and construction, states that it is planned to enact bond ordinances soon for some $700,000 worth of the proposed improvements, including the Ten Mile Creek interceptor and the Bay View Park pumping plant. This includes six miles of 48- to 72-in. sewers and two siphons. About half of the sewer work will be in open cut and about half in tunnel, the latter being 72-in. sewers. It is expected that bids will be wanted about Feb. 1, 1918.

Chicagoans Vote $1,000,000 for County Roads

That voters recognize the necessity for good roads in war times was emphasized on Nov. 6 in Cook County, Illinois, by the authorization of $1,000,000 bonds to construct 48 miles of hard pavement which will complete five different through routes. Three other bond issues were defeated by large majorities. The decision for roads was made a week previous in Lake County, to the north of Cook, when $500,000 was authorized. The favorable vote of both counties was necessary to obtain state and Federal aid for the Chicago-Milwaukee road.

American Society Moves Quietly to Its New Home

With characteristic absence of fireworks the American Society of Civil Engineers held its first meeting last week in its new home, the Engineering Societies Building, 29 West 39th St., New York. It was the regular semi-monthly meeting of Nov. 7, and the meeting conformed closely to the pattern adopted many years ago for these meetings. One concession was made to the importance and solemnity of the occasion, in that the main auditorium, instead of one of the smaller rooms, was selected for the synoptical reading of the papers; but the attendance indicated that one of the smaller rooms would have been ample.

In explanation of the absence of any special program to commemorate the consummation of the most important step ever taken by the society, it was explained that the Board of Direction had concluded that a technical meeting was not the place for a celebration, and that the celebration would take place at a special meeting Dec. 7. Details of this meeting will be announced later.

Civilian Engineers Put in Charge of Shipbuilding

A readjustment of the organization of the Emergency Fleet Corporation went into effect on Nov. 12 by which several well-known civilian engineers were given supervision of certain details of the Federal shipbuilding construction program. Charles Piez, president of the Link-Belt Co., of Chicago, has been appointed a vice president of the corporation, in charge of the actual construction of the new vessels. James Heyworth, a Chicago contractor, has been placed in control of the wooden ship construction, and Charles Day, of the firm of Day & Zimmerman, of Philadelphia, has gone to London to study the fabricated ship work in England and to apply the experience there to our problems. A. J. Meson, another Chicago engineer, has been detailed to field supervision of the various yards under the corporation's direction. A naval architect, Frank Kirby, of New York, has also joined the personnel.

Atterbury Directs Transportation System in France

Maj. Gen. W. W. Atterbury, formerly operating head of the Pennsylvania R.R. lines, has been appointed head of the transportation department of the American forces in France. He was selected for the post by General Pershing. The new arrangement means that hereafter the Quartermaster Corps will be only a distributing factor in the general supply scheme. The transportation department will handle all transportation of troops and material from vessel to rail heads. It will, likewise, have charge of construction work for transportation, thus relieving the American army engineers of much work.

San Francisco To Have Largest Shipbuilding Plant

The Risdon Iron Works, adjoining the Union Iron Works plant on San Francisco Bay, have been commandeered by the Government and will be operated under Union Iron Works' management in carrying out additional Government contracts. The Risdon yards include 30 acres of ground with eight shipbuilding slips. The decision to take them over for Government work was reached in Washington on Oct. 13.

The Risdon Iron Works have been owned by the United States Steel Corporation since 1911, when they were taken over as a supply and shipping point for the United States Steel Products Co. Changes to be made at once contemplate putting the eight slips in shape for immediate use and the addition of machine shops and other attendant equipment. With this addition the Union Iron Works are said to be the largest shipbuilding plant in the United States.

Simultaneous announcement was made in the daily press of the decision at Washington to create a naval base for the Pacific Coast on San Francisco Bay at Hunters Point. It is stated that at this base at least two dry docks will be provided, capable of handling the largest ships the Panama Canal can accommodate, and that other construction would be undertaken, bringing the total expenditure at the site up to about $25,000,000.

Voters of Cincinnati Approve Charter; Bond Issue Loses

The home rule charter framed by a special committee for the City of Cincinnati was adopted by a popular vote of almost 2 to 1 at the election held Nov. 6. The vote in favor of adoption was 57,791; opposed, 26,301. In *Engineering News-Record* of Oct. 11, p. 716, the principal provisions of the new charter were printed.

At the election the $500,000 bond issue for continuing the construction of intercepting sewers in Cincinnati lost by failure to receive the required majority vote, the vote in favor of the bond issue being 42,255, and against the issue, 26,766. The failure of this issue of bonds to meet with approval will result in a modification of the sewer work planned for 1918 by the city engineer, Frank S. Krug.

Government Takes All Pine Timber for Ships

The Government this week sent out to 500 long-leaf pine mills notice of an embargo on all timbers over 2 in. thick and 10 in. wide, any length. All timbers over these dimensions must be reserved for shipbuilding, unless it is shown that they are needed for other purposes of paramount importance, when the embargo will be released, on application.

$3,000,000 Sewer Bonds Approved in Cleveland, Ohio

Cleveland voters approved by a narrow margin bonds in the sum of $3,000,000 for sewer construction and repair. Cleveland also approved the initiative ordinance enabling the mayor to appoint a rapid transit commission, and voted more than two to one in favor of an eight-hour day for city employees in classified service. By registering their approval of the initiative ordinance, authorizing the mayor to appoint a rapid transit commission, the voters signified their approval of plans for building of a terminal subway.

ENGINEERING SOCIETIES

Calendar

AMERICAN SOCIETY OF CIVIL ENGINEERS, 29 West 39th St., New York; Jan. 16 and 17, 1918, New York; Charles Warren Hunt, secretary.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS; 29 West 39th St., New York; Dec. 4-7, New York; Calvin W. Rice, secretary.

GENERAL CONTRACTORS' ASSOCIATION; 51 Chambers St., New York; Dec. 8, New York; C. A. Crane, secretary.

AMERICAN INSTITUTE OF CONSULTING ENGINEERS, 35 Nassau St., New York; Jan. 14, New York; F. A. Molitor, secretary.

NEW ENGLAND WATER-WORKS ASSOCIATION; 715 Tremont Temple, Boston; Jan. 9, Boston; Willard Kent, secretary.

AMERICAN WOOD PRESERVERS' ASSOCIATION; Baltimore, Md.; Jan. 22-24, Chicago; F. I. Angier, Baltimore & Ohio R.R., Mount Royal Station, Baltimore, Md., secretary.

CANADIAN SOCIETY OF CIVIL ENGINEERS; Montreal; Jan. 8, Montreal; Fraser S. Keith, 176 Mansfield St., Montreal, Can., secretary.

AMERICAN SOCIETY OF AGRICULTURAL ENGINEERS; Dec. 27-29, Chicago; C. K. Shedd, Ames, Ia., secretary.

The Associated Engineering Societies of St. Louis held a meeting Oct. 31. Clinton H. Fisk, chief engineer of construction of city streets, sewers and bridges, read a paper on "The Construction, Maintenance and Benefits of Concrete Roadways." The meeting was held under the auspices of the St. Louis Association of Members of the American Society of Civil Engineers.

The Engineers' Sub-Division, Chicago Association of Commerce, has a committee headed by C. W. Morse, chief engineer, Chicago, Rock Island & Pacific Railway Co., which is making a canvass of drafted skilled artisans and technical men with the idea of assisting them to get into lines similar to their own in Government service.

Cincinnati Engineers' Club is starting the season with much enthusiasm. The unusually large attendance of 100 to 150 appears to be due in part to the lunch feature and in part to the fact that any other opportunity for Cincinnati engineers to get together is exceedingly limited. Plans for the season's program indicate that a major number of the speakers will be from outside of the city. Last year two-thirds of the schedule was made up of local talent.

The Engineers' Club of Columbus, Ohio, is the first organization in the city to recruit its company of reserves to full strength. The company is drilled every Monday evening by Capt. E. A. Silagi. Recent meetings included a paper by C. B. Hoover on "The Sewage-Disposal Problem at Columbus," and one by J. J. Morgan on "The Design and Construction of the New Imhoff Tanks."

The Seattle Branch of the American Society of Civil Engineers recently entertained Maj. Gen. H. A. Greene, commanding at American Lake cantonment, Camp Lewis, Washington, at a luncheon at the Frye Hotel. Major General Greene spoke briefly on the duties and training of the soldier-engineer and of the great service that will be rendered by army engineers in the present war.

The Pittsburgh and Cleveland District Sections of the Association of Iron and Steel Electrical Engineers will hold a joint meeting at the Hotel Courtlandt, Canton, Ohio, Nov. 24. Papers on "Central Station Power," by W. A. Hornlein, and "Electrical Furnaces," by J. D. Donovan, will be presented. At the next meeting of the Philadelphia section, Dec. 1, O. H. Eschholz, Pittsburgh, Penn., will read a paper on "Some Recent Investigations in Arc Welding."

The Southwestern Society of Engineers held a convention in El Paso, Tex., Oct. 18-20, inclusive. At the afternoon session of the 18th, Prof. A. F. Barnes, dean of the engineering school, New Mexico Agricultural and Mechanical College, made an address on "The Engineering School in the War" which was followed by a business meeting and the nomination of officers, which were as follows: For president, Dean G. M. Butler, University of Arizona; first vice president, Dean S. H. Worrell, Texas State School of Mines; secretary, C. E. Barglebaugh; treasurer, R. W. Goddard; for directors, W. E. Robertson and Gerald Sherman. At the evening session, Dr. Ira N. Hollis, president of the American Society of Mechanical Engineers and of the Worcester Polytechnic Institute, spoke on "The Engineer in the Present War." At the morning session of the 19th, there was a demonstration of pontoon bridge building by the Ninth Engineers at Camp Cody and at the afternoon session an address by C. A. Tilton on "The Problems in Army Cantonment Construction" and by Dean G. M. Butler on "Some Effects of the Draft Law on Arizona Industry." The evening session was devoted to a banquet at which Dean F. H. Worrell served as toastmaster. On the 20th, there was a demonstration of trench and fortification buildings by the Eighth Engineers. Announcement was made that practically 20% of the membership of the society is now in war service, and that the spring convention will be held in Arizona and will consist of traveling meetings at the principal mining camps.

The Western Society of Engineers was addressed Nov. 5 by O. P. M. Goss, consulting engineer, Seattle, Wash., on "Lumber and Lumbering." The first meeting of the newly formed mechanical section will be held Nov. 26, at which C. W. Bradley will talk on "Manufacture and Distribution of Gas." Satisfactory progress is being made toward coöperation with the local section of the American Society of Mechanical Engineers, which usually holds four meetings a year at different hotels, a dinner preceding the program.

Philadelphia Engineers' Club conducted a campaign last summer to raise $75,000 for its new quarters, adjoining the present ones. Not to any apathy of members but on account of the unpropitious time and heavy demands in other directions, about $35,000 only was subscribed. There is a well-defined sentiment to turn the club's activities into a social direction and let the Franklin Institute take care of all technical work.

Engineering Society of Western Pennsylvania has just issued its annual year book. Following the example of the Western Society of Engineers, the efficient method of listing alphabetically members of all grades has been followed. The total membership is 1187, segregated as follows: Honorary members, 3; members, 996; associate members, 43; associates, 30; juniors, 90; student juniors, 25. A list of places where the proceedings may be found discloses that there are 46 foreign societies, libraries or institutions and 125 smaller organizations in the United States keeping files.

PERSONAL NOTES

P. TREVINO, consulting engineer for the Leon Springs, Tex., training camp for officers, has been appointed also chief engineer of the Waco, Tex., sewage disposal plant. Mr. Treviño is a native of the City of Mexico, and was graduated from the National Engineering School of Mexico in 1895. He was formerly chief engineer of the National Railroads of Mexico, and has designed and built various sewage disposal plants in Texas.

H. B. VOORHEES has been appointed general superintendent of transportation of the Baltimore & Ohio with headquarters at Baltimore. Graduating from Rensselaer Polytechnic Institute in 1896, he began railway

work in the same year as assistant supervisor of the Philadelphia & Reading at Tamaqua, Penn. Mr. Voorhees entered the service of the Baltimore & Ohio on Dec. 1, 1901, and in August, 1902, was promoted to division engineer. In May, 1910, he became assistant to the president of the road, and on May 1, 1912, became general superintendent of the Baltimore & Ohio and the Cincinnati, Hamilton & Dayton lines.

O. SINGSTAD has resigned as designer with the Public Service Commission, First District, New York, to accept a position in the designing division of the Chile Exploration Co. He has been connected with the commission for the past 7½ years, and has had charge of the design of the East River tunnels of the William St.-East River-Clark St. line, as well as other subway sections.

J. C. HASKINS has resigned from the engineering organization of the Roberts & Schaefer Co., engineers and contractors, Chicago, to become chief engineer of the Louisville Bridge and Iron Co., Louisville, Ky. For a number of years he was in the engineering department of the Louisville & Nashville Railroad Company.

H. C. TITCOMB, maintenance-of-way assistant to the assistant chief engineer of the northern division of the Southern Pacific, at San Francisco, has been appointed superintendent of the Stockton division, with headquarters at Stockton, Calif., succeeding C. H. KETCHUM, resigned.

HAROLD ROGERS, assistant engineer and water superintendent of the Oakdale irrigation district, has resigned to accept a position with the Haviland-Tibbits Co., and will be engaged on drainage work at Marysville, Cal.

IRWIN S. OSBORNE, consulting engineer of garbage and refuse disposal, has joined the Food Administration Service at Washington, D. C., as head of the division of the Utilization of Food and Household Waste.

EARLE L. WATERMAN has returned to the Pennsylvania State College as associate professor of sanitary engineering after a leave of absence for a year and a half. He is in charge of hydraulic and sanitary work in the civil engineering department. Professor Waterman was connected formerly with the Michigan State Board of Health.

CHARLES B. WING, professor of structural engineering at Leland Stanford, Jr., University, has accepted a commission as major in the Twenty-Third Regiment of Engineers. Professor Wing was graduated from Cornell University in 1886, returning as a fellow in civil engineering in 1886-7. After serving his own university as an instructor in civil engineering he became assistant professor and professor of bridge and hydraulic engineering at the University of Wisconsin. He has held his professorship at Stanford since 1892 and has also engaged in practice, especially on structural work. Professor Wing is the author of "Manual of Bridge Drafting" (with C. H. Wright) and "Free-Hand Lettering for Working Drawings."

FRANCIS M. WARING, acting engineer of tests of the Pennsylvania R.R., at Altoona, Penn., has been appointed engineer of tests.

G. E. QUICK is superintending the construction of the Thomas Automobile Factory at Decatur, Ill., for the M. J. Hoffman Construction Co., of Evansville, Indiana.

R. J. WINDROW, recently county engineer of McLennan County, Texas, has been appointed chairman of the Texas Board of Water Engineers to succeed J. C. NAGEL, resigned.

WILLIAM H. ENNIS, after ten years of service as assistant engineer in charge of water-works and sewerage in the Pennsylvania Department of Health, has assumed the duties of superintendent of the House Sewerage Bureau of the City of Allentown, Penn. He will prepare plans of sewerage for the entire city and also plans of sewage disposal, and have charge of the construction of the work.

W. F. MONTFORT, consulting chemist, St. Louis, has been made acting professor of sanitary chemistry at the University of Illinois, vice PROF. EDWARD BARTOW, now major in the Sanitary Corps, United States Army.

R. W. HEERLEIN, contracting engineer of the Massillon Bridge and Structural Co., of Massillon, Ohio, is now also chief engineer of the company.

DR. DAVID B. STEINMAN, formerly assistant engineer in the construction of the Hell Gate Bridge, and subway construction in New York City, has been appointed associate professor of civil and mechanical engineering in the day session of the College of the City of New York. Doctor Steinman was formerly professor of engineering in the University of Idaho.

O. W. HARRAH, formerly assistant engineer, U. S. Reclamation Service, in charge of construction of storage reservoir on the Fort Peck project, Montana, is now attending the Officers' Training School for Engineers at Fort Leavenworth, Kansas.

R. S. HILL has left the U. S. Reclamation Service to become an instructor in the Engineers' Training Camp at Vancouver Barracks, Wash. He holds the rank of first lieutenant.

L. F. VAILE, formerly assistant engineer of the Matanuska district of the Alaska Government Ry., has resigned his position with the Alaska Engineering Commission, and is now at San Francisco.

DR. JESSE M. WORTHEN, for the past eight years superintendent of the Charleston Light and Water Co., of Charleston, S. C., has resigned and has been ordered to active duty as a captain in the Engineer Officers' Reserve Corps, being stationed at Belvoir, Virginia.

J. J. TURNER has been elected president of the Grand Rapids & Indiana Ry. Co. to succeed J. H. P. HUGHART, deceased.

F. M. EDWARDS, who has been acting engineer, has been promoted to city engineer of Jacksonville, Fla., and J. H. HALLETT, chief clerk of the engineering department, has been promoted to assistant city engineer.

F. N. MENEFEE has left the employ of the Fargo Engineering Co., Jackson, Mich., to enter the army in the inspection section, Gun Division, Ordnance Department, with a commission as captain, Officers' Reserve Corps.

HOBART D. SHAW has been appointed engineer of the Drainage Commission of Harrison County, Alabama.

W. C. HAMMATT, San Francisco, has been appointed engineer for the Medford Irrigation district, Jackson County, Oregon. The district is approximately 20,000 acres in extent.

W. S. WOLFE has returned from Detroit to the University of Illinois as instructor in architectural engineering, and is teaching advanced structural work to juniors and seniors.

CARL F. HEINTZE has resigned his position as assistant highway engineer, Sacramento County Highway Commission, California, and is now first lieutenant in the Engineers' Training Camp, at Vancouver Barracks, Washington.

J. P. KEMMERER, deputy county surveyor, San Bernardino County, California, has been made acting county surveyor during the furlough granted J. S. SOURWINE, county engineer, who has received a captain's commission in the Engineer Officers' Reserve Corps. Captain Sourwine has been ordered to the training camp at Fort Leavenworth.

C. F. HEALEY, general manager of the United Engineering Co., Chicago, has been commissioned captain in the Corps of Engineers, U. S. R., and has been ordered to Ft. Leavenworth, Kan., for study at the Army Service School.

HERMAN C. ALLEN, of Wallace, Idaho, has been appointed state highway engineer in place of E. M. BOOTH, resigned to enter Federal Service.

JOHN F. RYAN, formerly general superintendent of the J. J. O'Brien Construction Co., New York City, and CHARLES H. PRESTON, JR., consulting engineer of Waterbury, Conn., have formed a partnership under the firm name of Ryan and Preston, and will undertake general contract work, having already received a large railroad contract. Mr. Preston will

continue his private practice of consulting engineer with an office in Waterbury.

S. A. JUBB, former harbor engineer for the City of Los Angeles, has been appointed supervising engineer of the new naval base to be established at Hunters' Point, San Francisco.

G. H. NICKERSON, formerly in the employ of the Yosemite Ry. at Merced, Calif., and formerly connected with the Santa Fé Ry., has been named as the new engineer of the Oakdale Irrigation District, California.

RICHARD K. MEADE, consulting chemical and industrial engineer, Baltimore, Md., announces that he has formed a partnership with HOWARD T. TOMPKINS, under the name of Richard K. Meade & Company.

CAPT. GEORGE E. MARTIN, for the past three years professor of Highway Engineering at Purdue University, is now in active service in the Engineer Corps, U. S. A.

J. M. OATES, superintendent for the Atlantic Bitulithic Co., Richmond, Va., who has been in charge of contracts in Harrison County, West Virginia, has been transferred to Newport News to take charge of a new contract.

Among the officers of the 109th Engineers at Camp Deming, N. M., are LIEUT. COL. P. F. WALKER, dean of engineering, Iowa State College; CAPT. T. R. AGG, professor of highway engineering, Iowa State College; and CAPT. WILBUR M. WILSON, supply officer, professor of structural engineering, University of Illinois.

B. W. SEARS, assistant engineer with the Coast Bridge Co., of Portland, Ore., and son of GEORGE A. SEARS, vice president of the company, is now corporal with Company E, 18th (Railway) Engineers "somewhere in France."

H. BAYARD FRIEDMAN, recently in charge of construction at the Chevrolet plant at Tarrytown, N. Y., for the W. E. Wood Co., Detroit, is now at the Reserve Officers' Training Camp, Leon Springs, Texas.

GEORGE E. MCINTYRE, who has been structural engineer of Smith, Rea and Lovitt, architects, Kansas City, Mo., has been commissioned first lieutenant in the Engineer Officers' Reserve Corps.

H. F. WALDER, Kewanee, Ill., is now resident engineer on the Cambridge Road, Henry County, Illinois.

BRADLEY W. BARTHOLOMEW, engineer of construction, Flynt Building and Construction Co., Palmer, Mass., has been commissioned second lieutenant, Engineer Officers' Reserve Corps.

EDWARD R. SMITH, formerly junior engineer, U. S. Reclamation Service, on Belle Fourche Irrigation Project at Newell, S. D., is now a member of the engineering staff of the Southern Power Co., Charlotte, North Carolina.

GEORGE W. SNYDER, principal assistant engineer, western Pennsylvania division of the Pennsylvania R.R., has been appointed assistant engineer, maintenance-of-way, vice G. C. KOONS. Mr. Snyder entered the service of the Pennsylvania in 1884 as rodman. In 1907 he became principal assistant engineer of the western Pennsylvania division.

W. T. COVERT, division engineer of the Philadelphia terminal division of the Pennsylvania R.R., has been promoted to principal assistant engineer of the western Pennsylvania division, with office at Pittsburgh, succeeding GEORGE W. SNYDER.

C. E. BRINSER, division engineer of the Pennsylvania Ry. at Altoona, has been made division engineer at Philadelphia; his place at Altoona is taken by A. W. MCCLELLAN, formerly division engineer at Williamsport, who is succeeded by ROBERT C. FARIES, division engineer at Elmira, New York.

C. M. WISMAN, supervisor of the New York division of the Pennsylvania R.R. at Trenton, N. J., has been promoted to division engineer of the Elmira division.

J. C. HACKENBERG, division engineer of the Pennsylvania R.R. at Oil City, Penn., has been promoted to division engineer at Wilmington, Del., succeeding J. R. MCGRAW on leave of absence.

GEORGE G. SCHMIDT, formerly engineer for the Metropolitan Street Railway Co., and at various times engineer for the Pennsylvania R.R., the Belmont tunnels and the Ashokan dam, and who has also been engaged in the erection of industrial plants, is now with the Carrier Engineering Corporation.

JAMES F. TABLER, formerly connected with the Southern Ry. system, Lines West, as assistant engineer at Cincinnati, Ohio, has been appointed civil engineer and superintendent of construction with the Quartermaster Corps, U. S. A., at Boston.

VINTON D. COCKEY, of Morse, Paul & Cockey, consulting engineers, Baltimore, and formerly in charge of the division of surveys and construction, Maryland State Department of Health, was recently commissioned captain in the Engineer Officers' Reserve Corps, and has been assigned to the 305th Pioneer Regiment.

HENRY M. LOVERING has resigned the office of water commissioner of Taunton, Mass., on account of ill health. Mr. Lovering was elected a water commissioner in 1880, succeeding Marcus M. Rhodes, one of the original water commissioners. Elected president of the commissioners in 1894, to succeed Parley I. Perrin, his services have been continuous until this time. Upon Mr. Lovering's resignation, the Municipal Council of Taunton passed resolutions of regret, and acknowledged the city's obligation to Mr. Lovering for his services.

OBITUARY

WILLIAM S. JOHNSON, consulting engineer, Boston, died Nov. 27. He was born in 1867 and was graduated from Massachusetts Institute of Technology in 1889. After some preliminary work with the Massachusetts State Board of Health and the City of Brockton, he went to Brooklyn, N. Y., as sanitary engineer, Department of Health. He then became assistant engineer of the Massachusetts State Board of Health. In 1907 he opened an office in Boston as consulting engineer, and since that time was connected with many engineering projects in New England, particularly in Massachusetts. His last work was in charge of the water-supply at the army cantonment, Camp Devens, Ayer, Mass. Mr. Johnson took a prominent part in the affairs of the Boston Society of Civil Engineers and was chairman of the Sanitary Section in 1908, treasurer of the society in 1906 and vice president from 1912 to 1914. He was also active in the affairs of the New England Water-Works Association.

A. T. HERRMANN, who at one time was surveyor of Santa Clara County, California, died at San Jose, Calif., Oct. 23, at the age of 79.

ALBERT BRAYSHAW, civil engineer in the employ of the British War Department, died Nov. 5 in Brooklyn, New York.

WILLIAM SINCLAIR BACOT, president of the Consolidated Water Co., of Utica, N. Y., died on Nov. 1.

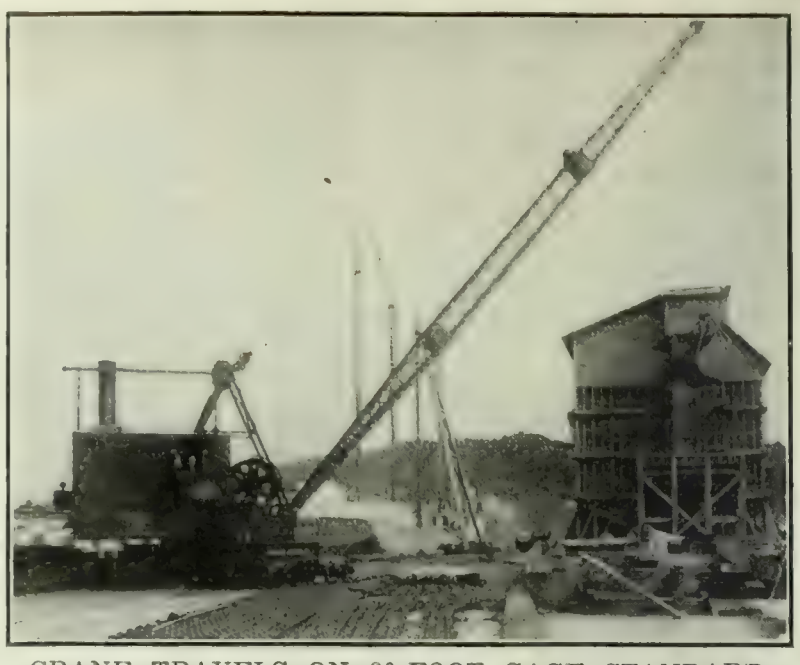
ISAAC S. TAYLOR, architect, who was director of works for the Louisiana Purchase Exposition, and the designer of more than twenty of St. Louis' largest buildings, died in St. Louis, Oct. 28.

ERNEST BELANGER, Montreal, died Oct. 21. He was a member of the commission which visited a number of countries in Europe to obtain information for the government of the Dominion of Canada on technical education. He was 54 years of age.

JOHN D. CRIMMINS, retired contractor of New York City, died at his home in New York, Nov. 9. He was in his 74th year. Mr. Crimmins was identified with many of the greatest public works of the city, such as the putting underground of the telephone and telegraph wires, the building of the Broadway-Columbus Ave.-Lexington Ave. cable line and the later conversion of the line into an electrical

system operated by means of underground wires. He also built part of the elevated railroads and was the contractor for the Fourth Ave. improvement across the Harlem Valley. Mr. Crimmins was one of the first contractors to use the steam drill in making underground excavations. In many years of constructing railways, laying out parks and streets and erecting large buildings he built up one of the great contracting businesses of America, and was said to have 20,000 men on his payrolls at one time.

Federal Export Corporation. Mr. Bayley was chief electrical and mechanical engineer for the Panama-Pacific International Exposition, and has seen service in Japan as resident consulting engineer on mines, railroads and industrial concerns. Mr. Honig, who will have charge of the Oriental mercantile department of the Federal corporation, has spent the past seventeen years selling American products in India, Japan, China, Java and Australia.



CRANE TRAVELS ON 20-FOOT GAGE STANDARD TRACKS AND HANDLES 3 TONS COAL PER LOAD

Notes from

MAKERS OF PLANT AND EQUIPMENT

Greene-Wolf Co., Inc., Hudson Terminal Building, New York City, announces that it is organized to conduct a general business in iron and steel products, including wrought iron and steel pipe, tubular goods and structural shapes.

Davis-Bournonville Co., Jersey City, has recently opened a government sales office in the Colorado Building, Washington, D. C., with Henry R. Swartley, Jr., resident manager. The company manufactures oxy-acetylene welding and cutting apparatus and oxygen and hydrogen producing apparatus, which is being used extensively by both the army and the navy.

King Trailer Co., Ann Arbor, Mich., is claiming a construction record for its new factory. The contract was let to the Austin Co., of Jackson, Mich., on June 25, and five days later construction work commenced. By July 25 the factory was occupied and the company mechanics were hard at work turning out trailers. The new building, 60 x 160 ft. in plan, is of brick, steel and concrete.

Oxford Truck Manufacturing Co., Newark, N. J., has been incorporated to manufacture all kinds of trucks and vehicles; the capitalization is $125,000. The incorporators are John J. Bush, New York, and George W. Nuse, Newark.

Federal Export Corporation has sent Dwight S. Guthrie, Guy L. Bayley and Burtin Honig from Vancouver to Yokohama, where the company's temporary oriental headquarters will be established. Mr. Guthrie, as vice president of the corporation, has had charge of the iron and steel department since its formation. He was formerly associated with the Republic Iron and Steel Co. as district sales manager in St. Louis, Birmingham, Cleveland and Chicago. Mr. Guthrie's duties at the headquarters office, during his absence, will be performed by Samuel Deaner, recently elected a vice president of the

APPLIANCES AND MATERIALS

New Traveling Crane Handles Coal on Terminal Pier

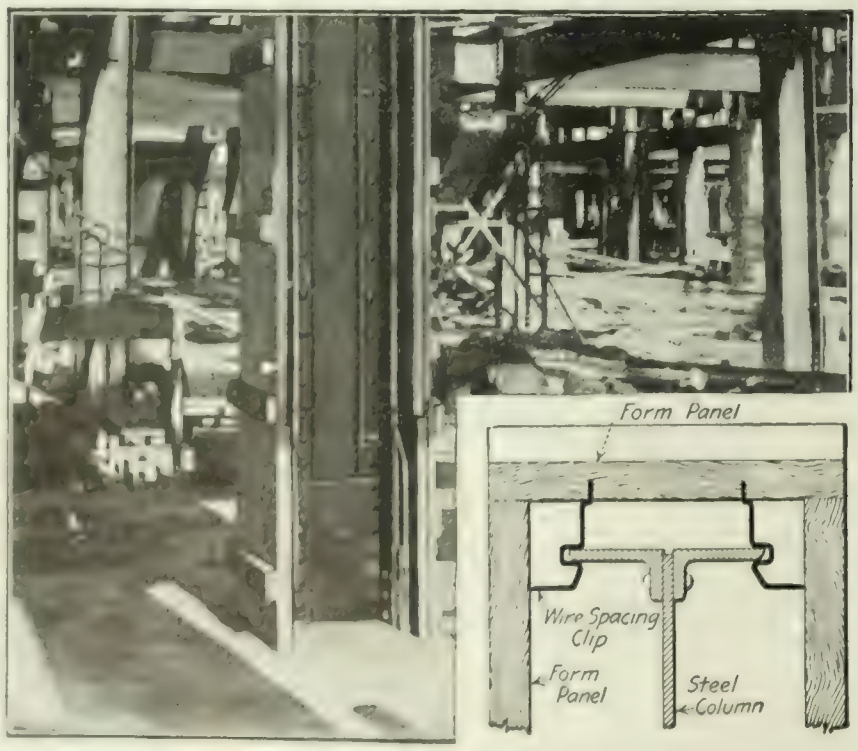
The traveling crane shown in the accompanying view was built by the Orton & Steinbrenner Co., of Chicago, for the new municipal port of Astoria, Ore. The machine travels upon two standard-gage tracks spaced 20 ft. c. to c. It is required to pass around a track with radius of 100 ft. at the end of the dock. This is provided for by equalizing gears on each of the transverse shafts of the car body driving by means of spur pinions, into curved face spur gears on the axles of the trucks.

The car body is supported at each corner by a 100,000-lb. standard truck. The boom is 100 ft. long and handles a 4-cu.yd. clamshell bucket in coal, thus taking 3 tons of coal at a trip. The boiler is a 76-in. diameter vertical tubular with heating surface of 900 sq.ft. The engines are 10 x 10 in. All operations are handled on double gear clutches.

The opening or hold line of the bucket is handled on a drum which is overhauled automatically by a counterweight at the rear end of the cab. The hoist framing, drums and sheaves of this machine are of cast steel and all bearings are bronze bushed.

Clips Hold Forms for Concrete

Form clips acting both as spacers and attachments facilitate casing the steel framework of the new Chicago freight station of the Pennsylvania Lines. The clips are of heavy wire, bent to shape as shown. Before placing the forms, clips are driven in two of the side panels, the bend giving the proper depth. As the panels are erected on the columns the clips are sprung over the flanges, holding the panel in place and at the proper distance. The other side panels engage the longer projecting ends of the clips and hold them in position. The clips remain in place, helping to anchor the concrete to the steel. The only parts projecting are the short ends driven into the forms, and these are readily cut off. The device is made by the American Concrete Equipment Co., 2958 Prairie Ave., Chicago, and has been long enough on the market to have demonstrated its value as an aid in this form of construction.



SIDE FORMS HELD BY WIRE SPACING CLIPS

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ENGINEERING NEWS-RECORD

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DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

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And They Are Fighting in France

THE "Subsidence of Muck and Peat Soils in Southern Louisiana and Florida" was the title of a paper presented two weeks ago at the meeting of the American Society of Civil Engineers. With the exception of three war addresses, equally peaceful topics have occupied the meetings since last April. The fall program, so far as announced, contains no papers bearing on the tremendous industrial and engineering problems which the winning of the war demands that we solve. This is an engineering war, yet the society seems not to recognize its opportunity.

Sacrificing the Prejudices of One's Class

THREE sacrifices must be made by the peoples in this war, said H. W. Garrod, of the labor division of the British Ministry of Munitions, in an address in New York last week. The first is lives; the second, treasure, and the third, which he declared was the hardest to make, is the *sacrifice of the prejudices of one's class.* What a discussion could be hung on those seven words! What visions they bring up of past strikes and lockouts! How they mirror the industrial disputes of the day! How vividly and horribly they foreshadow the future—unless drastic action, drastic for capital and labor, be taken. To those who can think, who see beyond this day or this week, the words are a call to action, action which will speedily settle the situation as between employer and employed, which will force quickly those sacrifices of class prejudices to which Mr. Garrod's words refer. These are times for big men, for brave handling of pressing problems. Only one thing now matters, that we win the war; win it, of course, without doing injustice to anyone. Prejudices will go by the board eventually. Shall it be only after internal strife shall have prolonged the struggle and increased the toll of blood?

Intensifying Class Prejudice

AS AN example of obstinate adherence to the prejudices of one's class, we can conceive of nothing so extreme as the presidential address of William H. Barr before the National Founders' Association in New York last week. He sees the beam in labor's eye; he does not even entertain the thought that there may be a mote in the employer's. His address tells what labor must do; it does not suggest that capital also has responsibilities. He plays strongly on the prejudices of his class, and by so doing assures the militancy of the opponent. There is no note of coöperation. We hold no brief for present labor activities; we feel as strongly as Mr. Barr on most of what he condemns. But we do hold that in his address he failed of his opportunity to prepare the minds of his fellow foundrymen for the era of adjustment and concession and coöperation that certainly is coming. His position would have been all the stronger had he set forth first the employer's responsibility and then emphasized the failings of labor. Mr. Barr is patriotic. He wants us to win the war—he is helping in his plant to do it. But he does not see that a conciliatory spirit and a fair facing of the whole problem is necessary if we are to find a way out of the present industrial difficulties.

Straightforwardness as a Necessity of Today

KEENLY recognizing the differences between England and the United States, the members of the special mission representing the labor division of the British Ministry of Munitions have consciously refrained from giving advice during their visit in this country. But they show a deep appreciation of the difficulties that lie before us, and the uncolored recitation of their experiences [see page 957] should be a sufficient warning. The bare fact of their coming and remaining so long when their own troubles are by no means settled completely is, in itself, startling. Complex as the situation may seem at the present moment, they hold out the hope that it is so only superficially. The danger to guard against is not one of materials, but of man power. The error lies in the assumption of an attitude on the part of those in power which may suggest, either to employer or employed, that any motive besides the clearest and most immediate patriotism lies behind any action which circumstances may force.

An Attempt To Block the Shandaken Tunnel

THE award of the contract for the Shandaken tunnel of New York's Catskill aqueduct on Nov. 9 has drawn the fire of the incoming municipal administration, which will assume office Jan. 1. In a letter to the Board of Water-Supply, Mayor-elect Hylan and two of his associates protest against proceeding at the present time with work which, according to the estimated quantities and bid prices, will cost more than $17,000,000. War conditions, resulting in high prices for labor and materials, are the reasons advanced by Judge Hylan

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for holding up the work. [See last week's issue, page 945.] At present the city is using about 350,000,000 gal. of Catskill water daily, a clear indication that the output of the first installment of the work is not being held in reserve. Of course, as time goes on, the demand will become greater. It was for this very reason that the Schoharie watershed was, long ago, made an integral part of the Catskill project, yet criticism of the Shandaken contract has created, in some minds at least, the impression that it is "extra work," a plum which the outgoing administration was eager to pick before vacating office. As to the immediate need of the project its opponents forget that a tunnel 11 ft. 6 in. x 10 ft. 3 in., inside dimensions, and 18 miles long, can not be constructed in a few months. It is a matter of years. By the time the work is finished, there is good reason to believe, it will supply a real need. It is true that prices are high now. But who will say how much lower they are going to be next year or the year after? Then, too, there is available now the necessary experienced organization. The contractor who was low bidder on the Shandaken job and who secured the award is well qualified to undertake the work, for he has already demonstrated his ability by building the Wallkill pressure tunnel. There is no good reason why the work should not proceed. Certainly it should not be stopped for purely political reasons, and the Mayor of the city stated most emphatically before the national engineering societies last week that it would proceed.

Ocean Ports Must Be Developed

THE secondary ports of the Atlantic seaboard—and by that is meant all the ports but New York, for about 80% of the Atlantic foreign trade passes through that port—have never been able to compete with the metropolis, nor indeed have they even been able to realize a fair proportion of the business promised by modernization and enlargement of their facilities. Habits of shippers, the centralization of the big railroads and the influence of the greatest financial center, all have tended to keep New York the premier port, although the lesser rivals have, with uncontrovertible theory, provided better wharves, more efficient handling and superior railway connections. The war, wrecker of tradition and previous practice though it is, will hardly be able to remove this superiority, but it will certainly bring more close the performance and the promise of scientific development in the lesser ports.

Within a few months the amount of shipping from the Atlantic seaboard will far exceed the capacity of existing ports. Millions of dollars must be expended in the erection of warehouses, wharves and terminal facilities where none now exist. Necessarily all such works already in existence must be taxed to capacity and, what is most important, centralized control in Washington will dictate where and when the unprecedented freight will be shipped. No longer will the undoubted advantages of certain ports be outweighed by ulterior considerations pointing to New York. Every terminal will have to take just a little more than it can conveniently handle. The result will be that shippers will be trained to the use of the lesser ports so that when once more free competition between ports is resumed a certain part of the patronage will remain. In a year, if the Shipping Board's hopes are realized, the United States will be the second maritime nation in the world. No one or two ports can handle the business of the 14,000,000 tons of ships we should have by 1919. It behooves the citizens of every coast city, then, to consider the present-day conditions and forget that in the past the dreams of port enthusiasts too often proved to have the airy fabric of dreams when put into actual practice. Port development in the United States is at last a manifest necessity.

Paying the Penalty for Short-Term Garbage Contracts

AT A TIME when other cities and the Federal Government (at army cantonments) are getting a revenue from garbage, both Philadelphia and the District of Columbia have to pay increased sums on renewing their short-term garbage contracts. True, in both cases, the contracts cover both collection and disposal, but in these times of high prices for garbage grease and tankage, if Philadelphia and the District of Columbia were their own masters and used their freedom wisely, they should at least be able to offset the value of their garbage against increased collection costs. But the Pennsylvania Legislature and the Congress of the United States have not seen fit to authorize long-term contracts. The result is that garbage contractors can charge very much what they please. The evils of the year-to-year garbage contracts at Philadelphia and elsewhere were pointed out in *Engineering News* of July 3, 1913, where it was shown that under short contracts a contractor must either charge a high price in order to get his capital back in a few years or else rely upon political influence for contract renewals.

In 1910 and again in 1911, Philadelphia paid the Penn Reduction Co. $510,000 a year for garbage collection and disposal. The 1912 contract finally went to the same company for $278,000, after a low bid by a competitor and a readvertisement. For 1913, the contract went to the American Product Co. at the still lower price of $229,000. This company did not bid again, having lost money, according to reports. From that time prices have mounted steadily as follows: 1914, $288,588; 1915, $323,588; 1916, $373,588; 1917, $432,000; bid for 1918, $605,266, or $173,266 in excess of this year and $376,266 more than in 1913.

Today, Philadelphia has one garbage-reduction plant idle (if it has not been dismantled), while the owners of another one charge what they please for collection and disposal. Such is the result of one-year contracts.

Cleveland and Columbus, Ohio, own and operate garbage-reduction works, at a reported profit. New Orleans, as was stated in a recent issue, is just contracting for one, with an estimated profit of $100,000 or more a year, after paying operating expenses, interest, depreciation and royalties. New York and Los Angeles, on either coast, sell their garbage to privately owned reduction works. Other cities get money from their garbage by one means or another.

If American cities are not to be allowed to let garbage-reduction contracts for periods of ten years or longer municipally owned reduction plants will be the logical outcome.

Profiteering and the Industrial Unrest

PROFITEERING is a hard word, but the inescapable certainty remains that no few people and corporations are taking advantage of circumstances to line their own pockets even at the risk of forcing a dishonorable peace on the United States and its allies. In a selfish, half-blind way they reason that so vast are the amounts being expended and so seemingly careless is the Government, in its need for munitions of all sorts, that their individual grabbing will not affect the results and will pass unnoticed in the magnificent profligacy of war. They calm any self questioning as to the honesty of their acts by the antiquated economic doctrine that one-half of business is selling as dearly as possible. They would sincerely resent any imputation as to the ethics of their attitude, for it is true that yesterday's commerce was built on the conception that the need of the buyer was the justification of the price. But *caveat emptor* is a dead doctrine—and even though most acts are justifiable under the abnormal suzerainty of Mars, there is one single, overwhelming reason why now, more than at any other time, this doctrine should be reversed to make the seller beware. That reason is the more or less justifiable suspicions of the wage earner.

For labor will prove to be the entity we must learn to handle if victory is to remain on our side. Machines we must have, and capital likewise. Both are necessary ingredients in the dish on which our forces must feed to attain strength for battle. But labor is the essential, the indispensable. Without labor no use can be made either of capital or machines. That fact cannot be denied nor even evaded. Any action that may be taken by those in authority must be influenced by that realization.

Labor, then, must be made to feel that now, if *not* at other times, no one is to be permitted to take an unusual profit. The wage earner watches the prices of the food and clothing he must have increasing day by day. He learns that certain commodities are not to be obtained at any price. He is told by the press, which takes care to point out the significance of it, that vast stores of sugar are being hidden, and that food is dumped at the wharves to keep high prices steady. The billions of the Liberty Loans are beyond his understanding, and he wonders what portion of such vast sums go to the manufacturer as payment for value and what portion as profit over and above the figure his leaders have taught him are excessive even in times of peace.

The sad part of this is that it is partially true; that capital invested in certain industries is earning a profit far beyond reason. It is useless to affirm that the number of such instances is relatively small. One would be sufficient of an irritant to a class grown conscious of its strength and smarting under the memory of wrongs inflicted yesterday. The fact that the Adamson bill was passed under threat cannot be ignored.

Some thin-brained men are talking vaguely of the "conscription of labor." That is sheer absurdity. It is conceivable that the state can conscript wealth. That has been done—is being done now, in a measure. But wealth is narrowly held. It is urged, further, that armies are conscripted. But we are taught from infancy that there is no finer act than the sacrifice of one's life in fighting for one's country, while we have never been persuaded to believe that hard work is noble. Nor does work feed the enthusiasm with the stimulus of personal conflict, for machines do not fight back. Their operators must cajole them into yielding their maximum. The man on the lathe must be willing, eager to make the insensate arrangement of gears and screws and chucks produce the ultimate pound of finished material. This he will not do if his heart is sickened with the feeling and his mind poisoned with the thought that his employer is gaining unusual profit while he is constantly faced with harder necessity.

The *Engineering News-Record* believes firmly that individual ability deserves individual rewards. But war is a time when every custom, every tradition which impedes the coming of victory, should for the common good be coldly set aside.

Code Needed for Design Competitions

SUCH large-scale waste of engineering thought and effort as occurred in the Salem bridge case reported in this journal recently is unfortunate, to put it mildly. The immediate cause of the waste—official dillydallying with a construction problem—may support the belief that engineers were the innocent victims of circumstance, being lured on by empty prospects of distinction or a well-earned commission. But looking farther it is evident that the engineering profession itself is to blame. If a recognized code of practice in design competitions had been in existence, enforced by its general observance among engineers, the Salem case could not have turned out as it did.

As an instance of abuse of the design-competition plan the Salem episode does not stand alone. Such abuse is common enough that many engineers avoid design competitions altogether, knowing that the competitors are likely not to receive fair treatment. Often there are no definite advance requirements, no program, or if one exists it is disregarded when the judgment is made; still more often, properly qualified judges are lacking; the party calling the competition fails to assume any obligation, and, even if a prize or an award of commission is promised, the decision may be so handled—as at Salem—that all competitors are defrauded.

But the competition plan itself can not be condemned because of such abuses. It has held its popularity in Europe, and there as well as in America has proved its value. Indeed, many public-works constructions give grounds for the claim that we need to use the competition plan more often than we do.

Just as in the analogous case of competitive bidding, however, sound practice is the only preventive of abuses. Contract bidding is safeguarded by well-established law. There is no such safeguard for design competition and for that reason engineers must protect themselves; they must make their own law. In other countries they have done so, by formulating and enforcing a code of practice through their societies.

The individual engineer is powerless. Only joint action, through strong engineering societies, can give effect to a code of practice governing competitions. We may hope that following an awakening of society consciousness, now become apparent, this subject will be taken in hand. A single Salem case is enough to probe the need for action.

Hard-Surface Pavements for State Highways

In Selecting Road Types Engineer Must Recognize Today's Demand for Heavy Motor-Truck Traffic and Continuous Yearly Service

By Charles J. Bennett
State Highway Commissioner of Connecticut

IT IS the intention of the following discussion to suggest some thoughts on the development of state highway systems for heavy traffic. There is no intention to lay down any fixed rules or to draw any rigid conclusions, because our experience has not extended over a sufficient length of time to determine what is the exact and best solution of the problem of highway surfaces. Nevertheless, it is increasingly evident to all engineers that there are certain needs of traffic which are not generally met by the highway systems constructed at present. The first of these needs is for a road surface which is usable continuously during twelve months of the year for moderately heavy loads, and the second is the need for coördinating the design of the road and the design of the vehicle.

Considering the first, heavy loads should be able to use the road continuously, since heavy loads are carried for business purposes and on this account demand uniform service during the entire year. Pleasure traffic which, of course, constitutes the major portion of the traffic using the roads at the present time, adjusts itself to weather conditions and is virtually nothing during extremely cold weather. Motor-truck traffic and business traffic on the contrary, demand continuous service, and the highway surface and foundation must be designed to give this desired result.

At the present time the highways are used for long-haul freight under abnormal conditions, and our problem is not concerned particularly with these conditions, since it is thought that eventually the highway system will find its proper place in the scheme of transportation and the adjustment between railroad use and highway use will be made so that each will carry its proper share of traffic.

Co-ordinating Roads and Vehicles

Considering the second need, for coördinating roads and vehicles—the tendency at present is toward excessive loads on motor trucks. It seems that there must be a limit to the weights of vehicles, so that some relation between weights of vehicles and bearing power of road may be found. For purposes of discussion and argument, it is suggested that the limiting load on four rubber-tired wheels should not exceed 25,000 lb., properly distributed, so as to limit the load per in. width of rubber tire to 700 lb. In other words, for ordinary state highway traffic, a truck with capacity of 5 tons should be the largest allowed. Additional weight can be carried by the proper use of rubber-tired trailers under reasonable speed and weight restrictions. Given a reasonable limit for the weight and speed at which these vehicles may be operated, it will be increasingly easy, as experience extends, to design a suitable road surface for traffic needs.

In general, this discussion may be confined to those sections of country which are thickly settled manufacturing communities or to those areas where property values are high, due to concentrated agriculture or development of natural resources. It is evident that in these sections the highway traffic will be greater, yet the land and property will stand a sufficient amount of taxation to justify the expenditure necessary to secure the best highway surface.

Traffic Census as Guide to Road Type

With our present knowledge, it is impossible to figure accurately the advantage of one type of road construction over another, since no charge per mile of use is or can be made. The only criterion is the cost of annual maintenance plus the annual capital charge, and in the experience of the writer it has been found that all types of road are virtually in the same financial class, when the annual cost of maintenance plus the annual cost of financing first cost is taken into consideration. Consequently, the only method of determining what is the best type of road surface is the amount of travel and the duration and requirements of service. For this reason, a traffic census, both present and estimated future, is of value as an indication of the possible use of a road. This census should pay particular attention to classifying traffic and should take into consideration also the possible development of industry.

It occurs often that even with a traffic census, other information being available, it is impossible in the first improvement of a road to do more than grade and drain, leaving the hard surface to be added later as the traffic develops and more money may be expended reasonably on the road. For this reason, the budget of a state highway department should contain an item for reconstruction or replacements in addition to the ordinary construction and maintenance appropriations.

Another factor in the selection of pavement is that many highways connect thickly settled sections, yet run beyond these communities into the country, where the property values are not so high. Through traffic between centers forms by far the greatest percentage of the whole, and there is consequently a need of a uniform hard surface for the entire length between centers to meet the traffic needs. In such a section, it should be demonstrated easily that hard pavements are needed, not so much on account of the reduction in annual cost of maintenance, as on account of the need for safe, usable surfaces during the entire year. This makes it necessary, in the opinion of the writer, for the highway engineers to build rural or suburban roads in the same manner and with the same care as in the case of cities. Furthermore, a hard, clean pavement is always a delight to the motorist and certainly reduces the cost of maintenance and operation of the motor car. While the annual charge for capital invested is high, the cost of

surface maintenance is low and the general result in service is far ahead of that on the cheaper types of road which under heavy traffic in bad weather become difficult and dangerous to travel. With hard surface pavements, a uniformly good condition of surface may be obtained more easily.

In the selection of road types for state highways there are certain requisites which should be secured:

First: Proper foundation and drainage must be provided. This topic has been discussed exhaustively and can be left with the comment that in the case of hard surface pavements it would seem necessary to provide a foundation of portland cement concrete or of bituminous concrete, with the preference given to the former on account of the more definite knowledge of the action of the material under certain conditions.

Second: The pavement should be smooth and hard, so as to give easy traction to vehicles passing over it.

as best judged by the engineer and the amount of money which can be put reasonably into the construction of the pavement.

In general, the width of these hard surface roads should be sufficient to carry at least two lines of vehicles, say not less than 18 ft., except through the centers, where there should be extra widths to accommodate necessary standing vehicles used locally. The shoulders or berms should be hard and reasonably safe to travel at moderate speeds when turning out to pass safely. Much has been said of the necessity of increasing widths of road to accommodate four lines of vehicles, but it would seem reasonable that before the expenditure for highway systems are doubled, there should be proper restrictions to the traffic using the road so as to make it unnecessary to spend this extra amount of money. In general, the tendency of automobile traffic has been toward unreasonable speed without regard to



THREE-INCH SHEET ASPHALT PAVEMENT, 18 FEET WIDE, ON 6-INCH CONCRETE BASE BETWEEN WATERBURY AND NAUGATUCK, CONN., WHERE MOTOR-TRUCK TRAFFIC IS EXTREMELY HEAVY

Third: The pavement surface should be reasonably safe for operation of rubber-tired vehicles. Consequently, it should have a flat cross slope and be of sufficiently rough texture to give a grip for rubber-tired vehicles. It is safe to say that all hard pavements at present constructed are slippery under certain conditions, and here again is need for coöperation between road engineers and vehicle builders in securing a material for road surface or a material for tire construction which will do away with most of the difficulty which exists. Experience shows that by far the greater number of accidents to motor vehicles are caused during slippery weather by the failure of chains or non-skid devices to control the motion of the car, and, in passing, it may be said that the highway engineers are in duty bound to find a proper road surface, even at some additional cost, that the risk to the public will be reduced materially.

Fourth: The road must be of reasonable cost, which should be determined, not so much by the yearly financial cost of maintenance (although this is a prime requisite) as by a coordination between the needs of traffic

the results, but a proper regulation would make a two-line width of road satisfactory for the operation of four thousand vehicles per day even with the inevitable congestion at certain hours.

An endeavor has been made to prove the need for hard-surface city-type pavements on state highway systems outside of cities, and the chief problem which then comes to the engineer, as indicated above, is the selection of the best type of pavement. There is nothing so difficult at present for the engineer as to select the proper type of pavement even if he is left unhampered by outside influence. Virtually no data are available which would aid in determining mathematically the type of pavement to be chosen. The choice of pavement is generally a local engineering problem which can be worked out at the present time only by the use of judgment, opinion and data from a moderately small amount of experience, since the construction of these highway systems has been carried on only through a comparatively short time. It is evident that even with the best of intentions and the use of proper judgment, mistakes will be made, but the following general

ideas would seem to be of value in the selection of type of pavement. These are in addition to the general requirements stated previously.

In the first place, the road surface and material should be chosen so as to give the best service to the traffic using the road, with a reasonable first cost. On this account, so far as possible for portland cement concrete bases or surfaces or for bituminous foundations or surfaces, the local material should be used for aggregate so long as it gives a suitable result. Other types of surface, such as blocks, either brick, wood or stone, should be selected with a view to using the nearest source of supply, not only on account of the reduction of cost, but because of the need of conserving supplies of material and using everything which is available.

The Man with Something to Sell

Regarding the selection of type, the foregoing statement is written on the assumption that the engineer or authority in charge is left unhampered by outside influence. One of the most difficult things with which the highway engineer of today has to contend is the commercial interest which is striving to sell some particular type of pavement. As indicated above, no particular type of pavement has proved its worth sufficiently to be selected as better than any other type. There are two requisites in connection with pavement sales which should be demanded: First, honesty of public officials, and, second, a broader-minded attitude on the part of the pavement salesman, coupled with the same honesty that is demanded of the highway engineer. Given these two requisites, it would seem that a pavement could be selected wisely, with the result fair and just, not only to the community through which the pavement is purchased, but to the paving company or interest which by its endeavors has developed a satisfactory type of pavement. The writer suggests further a fair attitude on the part of paving interests, one toward another. The waste baskets of engineers have been filled with pamphlets condemning types of pavement. These circulars can be issued by competitors only. Every pavement which has been laid has been subject to failure in certain circumstances, and the old adage regarding glass houses applies to all. The highway engineers of today are getting together more and more information regarding the values of different types of pavement, and a blackguarding scheme such as outlined above, only reacts against the probable instigator, who can generally be located.

This article is written in an attempt to outline, in some simple way, first, the need for placing hard pavements on heavily traveled state highways in certain districts; second, the necessity for care and judgment in the selection and construction of these pavements; and, third, the need for honesty and fair coöperation in the dealings between pavement manufacturing companies and the public official who spends the money.

Separate Items for Plant and Paving in Small Town Asphalt Bids

By D. T. Pierce

Eastern Asphalt Paving Co., Philadelphia

ONE OF the difficulties in securing good bids from good contractors for asphalt paving in smaller municipalities has been the cost of transporting and erecting asphalt plants. For the relatively small yardages offered, contractors were not disposed to incur this expense. Furthermore, when they were willing to incur it, of necessity they added the cost of plant installation to their bids, a practice which resulted often in an apparent discrimination against the small town—that is, the small-town official was prone to think that there was discrimination or an attempt at a "hold-up," when he compared his prices with those of larger cities where asphalt plants were already established.

This difficulty has been overcome now by a simple expedient which can be applied in any case where the circumstances are such as to indicate its necessity or desirability. Credit for working out the plan belongs to the consulting engineering firm of Anderson & Christie, of Charlotte, N. C. It consists of calling for bids on the cost of bringing in a plant for proposed work. The clause in the specifications and proposals for 11,000 sq.yd. of paving in Mooresville, N. C., awarded in October, was drawn as follows:

> unit prices stated under this section for the furnishing of tools, equipment, materials and labor for the actual construction of the finished pavement."

The bids under this item ranged from $700 to $1000, the equivalent of about 7 to 10c. per sq.yd. on the work immediately to be let.

The use of such a clause enables the municipality to tell exactly what it is asked to pay for pavement and what is added for plant installation. In the particular case referred to, it brought out three reasonably low bids from the best contractors available, namely, $1.27, $1.34 and $1.40 for sheet asphalt and $1.10, $1.19 and $1.25 for asphaltic concrete, all these bids being on natural lake asphalt and all, as given, exclusive of 4-in. concrete base which was bid at 80, 85 and 90 cents.

The plan devised by Anderson & Christie cannot fail to be of value both to small municipalities and contractors in all sections of the country, but particularly in those states where asphalt paving is spreading rapidly among small towns whose initial awards are necessarily limited.

New York Subway's Gains

The Interborough Rapid Transit Co., New York, in a bulletin says that 183,618 more passengers now ride daily on the company's lines than two years ago, and that every 24 hours 1,350,000 passengers are carried. Of this number 900,000 ride between 6 and 9 o'clock in the morning and 4 and 7 in the afternoon. Mention is made of the rapid growth of travel in the Bronx, which is increasing more rapidly, according to the bulletin, than any other section. The Bronx would rank sixth among the nation's cities if it were a separate municipality, the report says.

England Overcame Labor and Industrial Crisis by Intelligence

Highly Organized State of Both Workingmen and Employers Made Reasonable and Patriotic Agreement Possible—Labor Diluted and Women Used Successfully

Great Britain, a country much older than the United States and in many ways more experienced in the technique of industry and its attendant problems, has sent a special mission of her Ministry of Munitions to this country so that we, her ally, may benefit from a first-hand recitation of war-time industrial problems and of the methods of meeting them which have been developed and successfully applied during the past three years. Sir Stephenson Kent, member of the Council of the Ministry and director general of the Labor Supply Department; G. H. Baillie, chief technical dilution officer of the Labor Supply Department; H. W. Garrod, deputy assistant secretary of the Labor Regulation Department; and Captain Cyril Asquith, director of the artificer's allocation of the Labor Supply Department, have been in this country for over ten weeks, explaining the attitude of the Ministry of Munitions. The addresses, here presented in condensed form, were delivered at a luncheon tendered the mission by the Editorial Conference of the New York Business Publishers' Association on Nov. 13.

War Problems

BY SIR STEPHENSON KENT, K. C. B.

YOUR problems and ours differ. Anything that I or my colleagues may say, I beg that you will take not as advice or suggestions, but simply as a recitation of the experiences that we have had.

The organization of a nation's industries on a war basis is even more important than an army. The army is helpless if there is not organization of the industries and if the munitions are not forthcoming without interruption. Continuity of supply, and an ever-increasing supply are vital to success.

Industrial peace at home is a necessary accessory to the success of your army; without it, it is never going to dare to move. My government called together capital and labor; federations of employers and the executive chiefs of our trade unions. We differ from you in that respect. It is no exaggeration to say that in the engineering trade 80% of the labor is trade union labor.

My government therefore, had two ideal bodies to negotiate with: The committees of these federations of employers, who were fully representative of capital; and the trade unions officials, who fully represented labor. That conference ended in what is known as the Treasury Agreement, which was embodied in the Munitions of War Act. The principal features of that act are as follows:

In the first place, the Minister of Munitions definitely limited the profit that might be made in any establishment that was engaged in the manufacture of munitions.

In the second place, the wage of the labor in those controlled establishments was fixed; it was made quite clear to the trade union heads and to labor generally that there would be no fluctuation or variation in the wages of that labor, except by express consent of the Minister of Munitions, and that he would not give his consent to any such variation unless an overwhelming case was made to him.

The state, then, fixed the profit and fixed the wage. Capital and labor and the government definitely agreed on the principle which, I think, is essential; that a nation's need is not the opportunity for capital or for labor to make money. Having done that, the state realized its duty in regard to the labor, whose wage it had limited.

The Committee on Production was to ascertain what, if any, the increased cost of living amounted to and to issue a national award so as to meet the increase in the necessities of life. That committee meets three times a year and has the necessary statistics laid before it, receives representations from trade unions and from any one else who should have a voice in the matter, investigates the case, then gives instructions that this labor should receive so much extra per week to meet that increased cost. That is paid by the employer and is recoverable from the state.

The third point was the illegality of strikes and lockouts. In peace a lockout or a strike was a matter between the employer and his employees; in war time it is a matter of national concern. The state would not permit, through obstinacy on the part of the employer or his employees, a factory upon which the army was very largely dependent for munitions, to remain out of work. And so, in this Act, it was laid down that any lockout or strike is illegal, and if any one incited the men to go out on strike, or if the employer deliberately locked out his employees, he laid himself open to the maximum penalty of penal servitude for life.

The trade union leaders agreed to waive all restrictive practices on output or from engagement of labor on war work, for the period of the war. The government pledged itself to restore the pre-war conditions on the advent of peace.

The act has, on the whole, worked well. We have

and stoppages, we have had strikes, but they have not been of very great length or of very serious moment. If you take into consideration the very long period of strain that our workmen have suffered under, this is very surprising. In the early days of the war we worked hours that are really disgraceful: One hundred and twenty hours in the week in some establishments. A hundred hours was quite common. That went on for a period of some months.

After this long period, it will be easily appreciated that because of war-weariness any little grievance becomes a matter of very great importance. It is a very fruitful soil for the pacifist, for the professional agitator, for the I. W. W. to work. It redounds enormously to the credit of our labor that we have managed to get through with continued industrial peace.

The Ministry of Munitions is given the solving of all the problems that deal with labor. *These matters are not left to the individual employer. We do not permit one employer to settle some little dispute in one way, another employer a similar dispute in another way. We try and get some definite, broad policy laid down, and then deal with these matters on that policy throughout the country.*

We have a very considerable staff whose duty it is to act as the eyes and ears of the Minister of Munitions. It is their function to know of any possible cause of dissension in any industrial center in the country, and to deal with that cause of dissension before it becomes a dispute.

We have the theory that in war time prevention is one million times better than cure. We have, to a certain extent, been successful, but it is a very arduous business today, because of that fatigue to which I referred

We take the view that today, above all other times, it is absolutely vital to exercise economy from every point of view. Economy from the point of view of food —yes; but economy from the point of view of the materials that are essential to the winning of this war, economy from the point of view of the use of man-power.

We look upon it as a very serious crime if any of these raw materials which we never have a sufficiency of, is used for any purpose other than to help to win the war. We look upon anyone who misuses the skill of any mechanic or any citizen as a criminal.

We have a great number of engineers of the highest qualifications, whose duty it is to investigate the use of man-power in manufacturing establishments. If they find any employer having a skilled workman doing work that somebody who possesses less skill could do they move him on to some work that he should more properly be performing.

That is absolutely vital, and I think that you, in no very long period of time, will also find it vital. This war is primarily a war of mechanics. There is no country that is today at war that has a sufficiency of skilled mechanics.

With every conceivable article of munitions that we send to the army, we have to send some skilled mechanics; we have to deplete the skilled man-power that remains. The better we supply the army, the more difficult our problem at home becomes.

In the early days employers were loyally anxious to do everything they could to assist the government in getting the biggest output of munitions at the earliest possible moment. They thought that it would be of assistance to the country if they accumulated as large a number of skilled mechanics as they could. Of course any such habit as that leads very rapidly to the most vicious of conditions. The man whose labor is being taken from him robs somebody else; there is no finality in it. You get unrest of the worst description. Your labor is always looking to see if it can't find some other employer who will offer it a still higher wage than it is at that moment receiving.

We made it an offense for any employer in the engineering industry to offer inducement to labor engaged on similar work. We also gave the Minister of Munitions power to restrict and regulate the employment of labor in any establishment. If the Minister was dissatisfied with the way any employer was either handling his labor, or was making use of his labor, he had the power to lay an embargo on the engagement of labor in that particular firm. This brought things to some sort of state of order. If we do that in war time, why don't we do something for our country in peace time?

It is an old truism, but people have the government they deserve, and the business communities of the world have got to take a bigger interest in their government in peace time and not leave it till war time in future.

It is absolutely impossible to exaggerate the importance, the overwhelming importance, that labor plays in war. Without labor, without industrial peace, this war cannot be won. Should you fail to solve those problems it will react, and react very seriously, in England. We look to you with a great deal of confidence. We appreciate how enormous those problems are, but we are happy that you will solve them and solve them on the right lines.

Dilution of Skilled Labor and Substitution of Women in Industry

BY G. H. BAILLIE, ESQ.

OUR two schemes for meeting the shortage of labor have been the dilution of skilled labor and the substitution of women for men. Both of those schemes were contrary to the trade union customs and practices as they were before the war, and we have been able to put them in practice only on the basis of the agreement between capital and labor, to which Sir Stephenson Kent referred.

One provision of that agreement had the effect of abolishing all trade union customs and practices during the period of the war. The agreement referred to work on munitions only. Our employers made use of those agreements in various ways. First an unskilled worker was brought into the plant to do an easy job. The man so displaced was put on the more skilled work, and the man displaced was again promoted, and so on until there had been an upgrading of skill throughout the whole shop.

Another method adopted was to draw unskilled men from the non-essential trades, unskilled men who were either over military age or of low medical category. Watchmakers were brought into the tool rooms to do gage making. Our building industry was largely closed

down and we took sanitary plumbers from there and trained them up to do lathe turning for our explosive factories. We also drew from the building industry carpenters and joiners and set them into the shipyards to act as shipwrights and shipjoiners. We took mechanics, textile mechanics, from the textile industries, accustomed only to rough work, and trained them up to the better work of munitions. A third way was by confining the fully qualified mechanic to the highest forms of skilled work. If the mechanic normally had been on a job that could be split up into two or more parts of varying degrees of skill, the mechanic was confined to the part requiring the most skill, and we trained up men and women to do the lesser skilled parts.

Those schemes we called the "dilution of skilled labor," and it helped us to a great measure in dealing with our shortage of skilled labor, but before long practically all the useful men in the non-essential trades had either been drafted into the army or had gone into the munition plants, and to meet our continually increasing demands for munitions, we had to rely upon the women.

It was agreed that a woman undertaking work which previously had been done by a skilled mechanic, should receive the same day rate as the skilled man; if she was on piece work, she was to receive the same piece rate. Only on unskilled or semi-skilled work did the woman's wage differ from that of the man, and then her wage was regulated by an order which fixed a minimum wage at two-thirds that of the unskilled man.

As a result of the good wages that women have been able to earn on munitions work, we have never been short of applicants for any kind of work, and our employment of women at present is limited only by our facilities for training them. They have attracted to munitions work a class of woman who has had a fairly good education, and we have found that she is capable of far better work and can more easily acquire skill than the type of woman that previously had been common in factories employing women.

We have now on munitions work only over a million women. Since the Minister of Munitions began to urge the employment of women about two years ago their employment on munitions has been most striking, both in the extent to which machine shops are staffed by women and in the difficulty of the work on which they are engaged. We have a shop on five-inch shells in which only 6% of the hands are men; and in the machine shop all the tool setters and all the charge hands are women. And we have another shop on six-inch shells in which the proportion of skilled mechanics is one to every fifty women. That shop for output is one of the best shops in the country. On the average, about 80% of the hands in the shell, fuse and similar plants are women—a very important result from the point of view of manpower.

In our largest explosive factory, making cordite, guncotton and certain other explosives, we have 15,000 hands, and of those 11,000 are women. On filling work on small shells, and on fuses and similar articles, percentages well over 90% are reached. On the larger shells the percentages are, of course, lower.

Coming to more highly skilled work, the percentage of women employed is, on the average, a good deal lower, but we have a shop engaged on breach mechanism for howitzer guns in which every machine tool is operated by women who harden and grind their own tools. We have women making screw gages, and the only skilled assistance they receive is that a toolmaker checks the setting of their chasing tools. For that class of work training is required. On the work we have found that no special training is necessary.

The plants engaged on skilled work have little work of a simple character on which the women can gradually acquire skill. To meet that difficulty, the Minister of Munitions has equipped a number of training schools where, however, we do not attempt to give any general instruction. The women are taught to use the foot rule and the micrometer, but after that their training is specialized and they are taught to do a specific job on a specific type of machine. In that way they can acquire considerable skill in from six to eight weeks.

But the larger proportion of the training has been done in the plants themselves. They have started schools in which they have trained women in the use of their own types of machine and when they supply a machine to a customer, they are prepared to send with the machine, as an item in the list of accessories, one or two women who have been trained to use it.

In 1915 all our employers regarded the introduction of a woman into a machine shop as one of the horrors of war—about on a par with Zeppelin bombing and the shortage of sugar. Nothing has been more striking than the change of our employers' attitude toward women in the past two years. If there is now a question between taking on a woman or an unskilled man, the employer has no hesitation at all. The woman has been found to be a better and more conscientious worker than the unskilled man that is available in our country now. And the woman has been found better able to acquire skill rapidly. When it is a comparison between a woman and a fully qualified mechanic, one cannot expect the woman to be so valuable an asset as a man who has been four or five years at his trade. But now the only skilled men we can scrape out of the less important munition factories are of so poor a quality that it is not uncommon for an employer who requires extra staff to take on women and train them himself rather than apply to the Minister of Munitions for the poor quality of man that he knows is all he will be able to get.

I am afraid, gentlemen, that these results of our experience may seem rather far off for conditions now obtaining in your country. But I believe that you are no better off for skilled men than we were at the outbreak of war, because you have adopted the policy of the unskilled operative to a far greater extent than we did in England. I believe that you will find yourselves following our experience. I hope that the results of our experience may prove of some service to you.

Regulation of Trade Disputes

BY H. W. GARROD, ESQ.

WE, IN England, haven't a method, for there is no method, of dealing with trade disputes. But we have had, in all, only three labor disputes since the war began, which could be called serious. One of those lasted ten days, and neither of the other two lasted as much

as a week. They were serious to us. They might not be thought serious elsewhere.

Secondly, I'd call attention to the fact that since the war began we have had no strike which has arisen out of a demand for higher wages.

Thirdly, we have had no dispute in which the responsible officials of the trade unions have not stood loyally by the government and against their men. They bargained when we first passed our Munitions of War Act that there should be no strikes, and in every instance they have used all the influence that they possessed in order to keep the peace.

In the three serious disputes which I referred to just now, and in the great majority of the lesser disputes which have occurred, the men as a whole have not been behind the strike. In the three instances mentioned, at any rate, the work was done by a small band of local trade union officials who were in revolt, not against the government, but against the central officials of their own union, and who were also deeply tinged with pacifism.

But since we have been in this country, a period now of nearly ten weeks, we have been witnesses from a distance of a very considerable number of trade disputes which have been serious, and, in some cases, prolonged. If one-eighth of the industrial troubles of this country in the past two months had taken place in England, over the whole period of the past two years, we should long ago have been compelled to sue for disgraceful peace.

Supplying Skilled Artificers for the Army and Navy

By Captain Cyril Asquith

THE specific work in the Ministry of Munitions which it is my duty to discharge consists in the provision of skilled artificers for service in the technical branches of the army and navy.

Artificer is the army name for a skilled machinist. I think it would probably surprise you to know how large those demands are. The technical branches of the army comprise altogether about half the total personnel. Those crops do not consist wholly of skilled men, but they consist of skilled men to a greater or to a lesser extent. For instance, as we left England a demand was presented by the War Office for 40,000 skilled men to work on the railways behind the lines in France, and about three or four weeks ago we heard that a further demand for 15,000 highly skilled machinists had been presented.

In common with practically every other European power, we made the mistake in the first year of the war of permitting the enlistment of highly skilled machinists who would have been much better employed upon munitions or in technical branches of the army.

At present we attempt to meet these demands, so far as possible, by pointing out to the war office any skilled men whose unit we have been able to trace, and recommend the War Office to transfer them to a technical branch. The only other source is skilled men working on munitions.

In withdrawing such men from the more important classes of work, output suffers correspondingly, and we can't afford that. Nevertheless, the greater the output of munitions, the greater the number of skilled artificers who are needed to maintain them in repair at the front. A rather vicious circle.

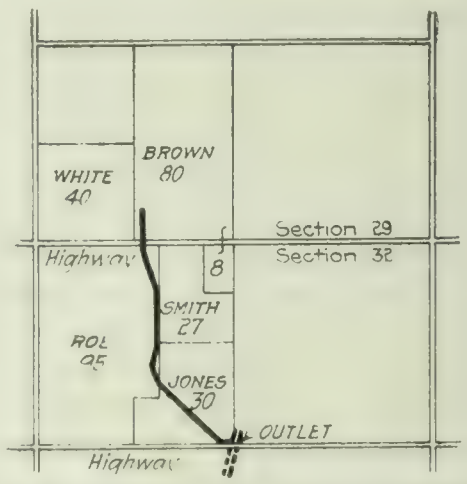
We look to you, gentlemen, to avoid that mistake, and we look to you with the utmost confidence. We know already that your War Department has taken steps to avoid it. It is about the only mistake we think you should avoid. We have been immensely impressed with the enormous reservoir of ability, energy, and resource which America contains. It gives us high hopes of a certain and not far distant victory.

A Method of Allotting Farm Drainage Ditch Maintenance

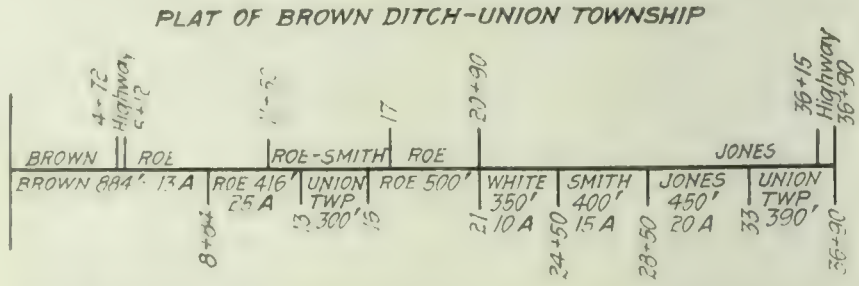
By R. L. Longshore

Decatur, Ind.

THE TASK of allotting the maintenance of drainage ditches is tedious and exacting, especially in sections that are well ditched. In Adams County, Indiana, there are over 200 ditches, varying in length from



PLAT OF BROWN DITCH-UNION TOWNSHIP



PLAT SHOWS PROPERTY BENEFITED AND LOCATION OF DRAIN—LINE REPRESENTS LENGTH OF DITCH—ABOVE ARE SHOWN THE PROPERTY INTERSECTIONS AND BELOW THE LENGTH TO BE MAINTAINED BY EACH OWNER

one-half mile to 14 miles, and it is necessary to re-apportion the maintenance of the ditches, to the extent of 50 to 75 each year. While there is a state maintenance law, it has proved so unsatisfactory that it is changed by nearly every session of the Legislature.

In general, the law provides that the drain be allotted in sections to the landowners assessed for its construction. This work is done by the county engineer, who as far as possible allots the maintenance work to the farmers so that each will be responsible for the section of the drain passing through his farm. After the allotment has been published, a hearing is held and complaints are adjusted. The landowners then become responsible for the sections until a new allotment is made.

A method which has given much satisfaction has been developed for performing this work. The drains

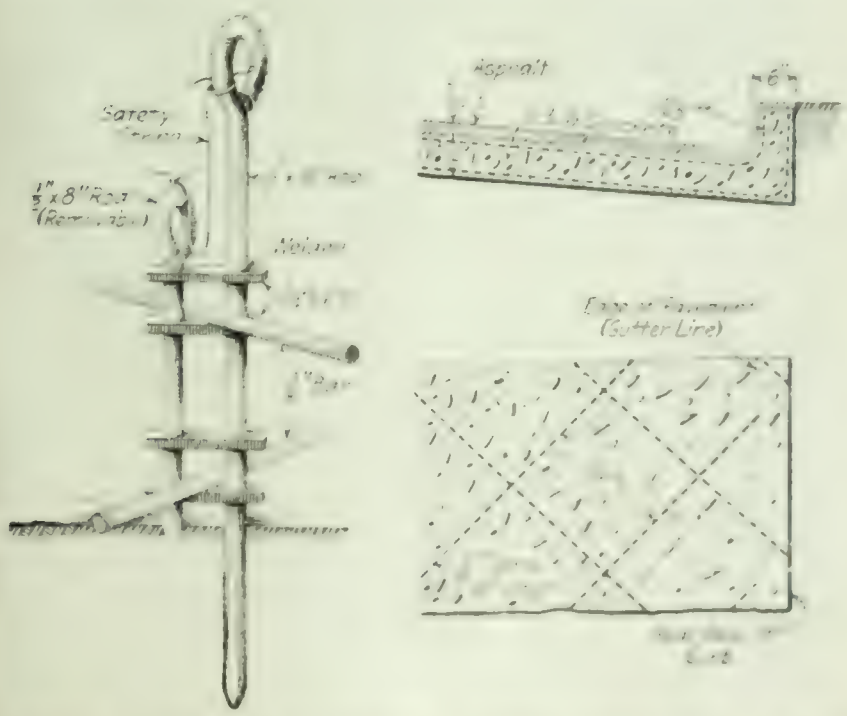
are staked and divided into 100-ft. sections, the field notes showing land-line intersections as well as the condition of the various sections. All factors that tend to make maintenance difficult, such as deep cuts, timber stretches, etc., are noted and are taken into consideration in the allotment.

A plat of the land affected is then made, to show the ditch and the areas benefited in each tract. The drainage ditch is then laid out as a straight line to a scale of 40 ft. to the inch, and marked to show the land-line intersection above. The sections to be maintained by each property owner are then laid off below the line. A graphical method is thus provided which makes it easy to compare the sections as well as their locations, and in case of necessary adjustment it becomes easy to visualize the proper shifting.

Concrete Curb Rests on Reinforced Pavement Base

THE WAXY GUMBO which underlies much of Houston, Tex., dries out rapidly in the summer and leaves cracks 2 in. or wider parallel to the curb and generally about 2 or 3 ft. from it. As a result, the ordinary separate construction of curb and base permits the curb to get out of alignment very easily. Especially is this so when the soil becomes saturated again. So harmful is this action that in one case the base of a 3-in. wood-block surface was found at the top of the curb, although probably settlement of the curb had pushed up the pavement somewhat. To avoid this occurrence, the base is reinforced by diagonal rods 10 ft. long, which are bent up into the curb proper. This makes the base of the curb an integral portion of the pavement, and separate settlement of the curb becomes impossible.

One of the contractors has devised a special support to aid in the placing of the reinforcing of this type of pavement. One of these supports is driven into the sub-grade at every other intersection of top and bottom rods. Since the top rods are all laid at one angle, and the bottom ones at right angles to these, their support



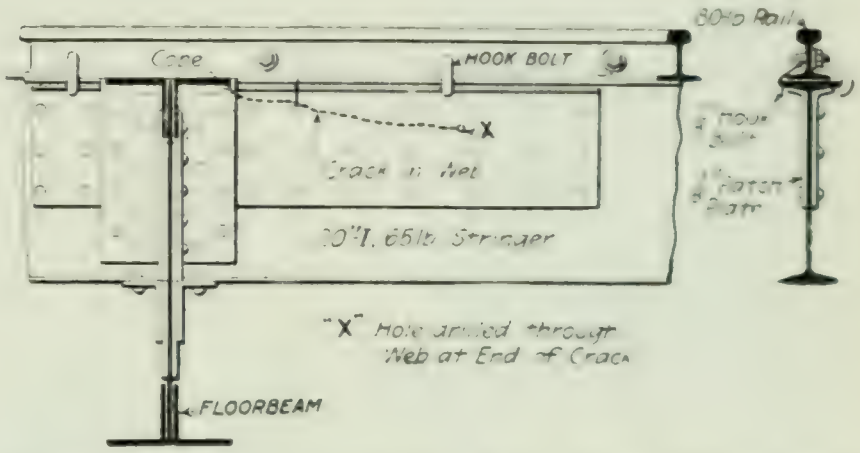
SIMPLE DEVICE SUPPORTS REINFORCEMENT UNTIL CONCRETE HAS BEEN CAST—STEEL RODS TIE CURB TO CONCRETE BASE OF PAVING

in this manner is a very simple matter. After the concrete has been placed the supports are removed without great difficulty.

On account of the extremely flat grades, and a rainfall which amounts to 50 in. per year, the gutters have a 2-in. drop from toe to heel instead of the usual 1-in. drop. Pavements in Houston are planned and laid under the direction of E. E. Sands, city engineer, who also has supervision of the maintenance of all guaranteed pavements.

I-Beam Web Cracks Under Rocking of Rails Clipped to Flange

HORIZONTAL web cracks developed in more than 200 I-beam track stringers carrying the rails directly over and in line with the stringers for some ore bins in Birmingham, Ala., and were repaired by patches riveted over each crack. The details of the construction



ROCKING ON RAILS CRACKED I-BEAM WEB, WHICH WAS REPAIRED BY PATCH

and repair are shown in the accompanying drawing. The stringers are 20 in. 65-lb. I-beams and carry E-50 loading on the 80-lb. rails, which are fastened to the beam by hook bolts placed alternately as shown.

The crack in each case started at the point of cope and extending from 5 to 30 in. along the beam. The failure is thought to have been caused by the sidewise rocking of the rail and beam flange under passing loads which produced bending in the web of the beam. The sharp corner cut made in coping furnished the necessary start for the cracks which traveled almost horizontally along the beam.

As it was not possible in this case to provide other means of supporting the rail on the beam, a small hole was drilled through the web at the end of the crack to prevent further fracture and a ⅜-in. plate, bent to fit snugly under and support the flange, was placed on each side of the web as shown. This method of repair has been proved by many months' service to be satisfactory.

The case is reported by R. E. Parker, structural steel designer, Birmingham.

Education Prevents Stream Pollution

Visitors to San Antonio Canyon, the source of water supply for Ontario, Calif., receive from the attendant at the toll gate at the entrance to the canyon a printed warning against contamination of the stream. Although large numbers of people visit the canyon, the State Board of Health reports that "the supply appears to be relatively free from pollution."

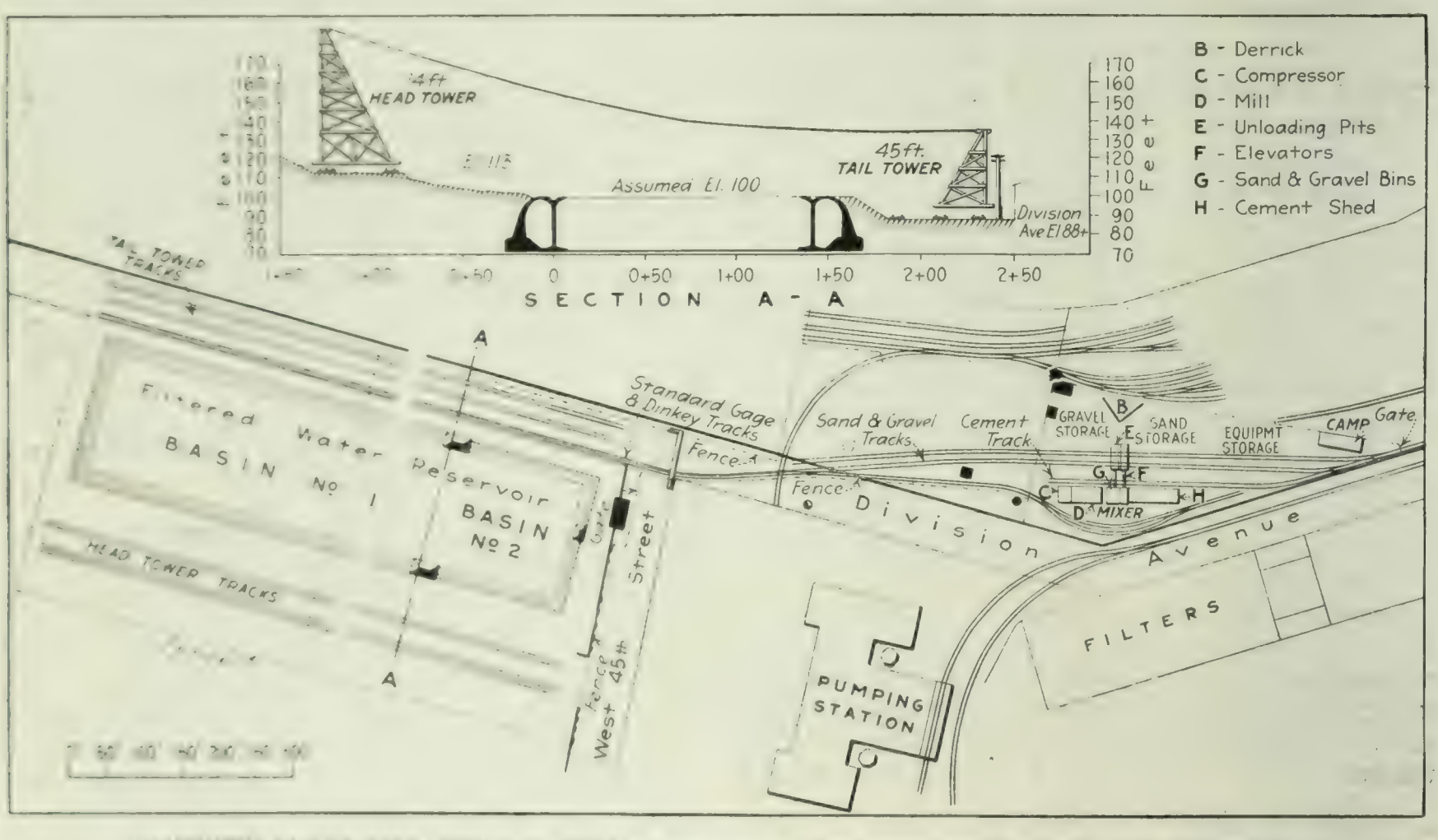
Cableway Handles Relining of Cleveland Water Basin

Filtered Water Reservoir Reinforced with 18,000 Yards of Concrete Placed Without Erecting Construction Plant on Roof, Section of Which Collapsed Last Year

TWO things which stand out about the work of placing 18,000 yd. of heavily rainforced concrete in repairing clear-water reservoir of the Cleveland filter plant are the use of a traveling cableway, spanning the basin, which handled all the hoisting work, and the location of the concrete plant 1000 ft. from the nearest end of the work on private property at an elevation considerably lower than the roof of the basin.

The first was dictated by the contractor's responsibility for the safety of the basin, a small section of which collapsed in the summer of 1916. The location of the smaller basin containing the influent and effluent conduits.

The work of relining included the placing of a new reinforced-concrete floor on top of the old one; new reinforced-concrete sidewalls, varying in thickness from 20-in. at the base to 8 in. at the top, between curved beams at 15 ft. 9 in. intervals inside the old walls; the jacketing of the old 20-in. square columns to form 32-in. diameter circular columns, with spiral reinforcement; and the placing of a new 6-in. reinforced-concrete roof on top of the existing roof. The new roof is



CONCRETE FILLED SITUATED ON PRIVATE PROPERTY 1000 FEET FROM BASIN AND RELINING CARRIED ON WITH CABLEWAY

concrete plant was selected for several reasons. Rail delivery of materials was desired. The filtration plant is located at the foot of a high hill near the old Cuyahoga river bed. The rail approach is along the river bed at a lower elevation than the plant, while the street approach is from the hill. Because of existing buildings it was not possible to set up the concrete plant close to the basin and still along the line of the railroad. It was also deemed advantageous to have at the work storage space not located on the city property, to which the contractor's equipment could be moved as soon as it was released, without waiting for cars or for a decision as to where it had best be shipped.

The repair work done virtually consisted of building a new basin in and around the old one. The reservoir, which includes two basins; the smaller, of about one quarter the capacity of the larger, is of the ordinary groined-arch construction, with the outer walls of the bonded to the beams of the new sidewalls by reinforcement which extends through rectangular holes cut in the old roof. In addition, the old conduits within the walls of the smaller basin were bulkheaded and two new reinforced-concrete conduits constructed within the basin. The old conduits were connected to the new with special ingot iron sections, and the expansion joints of the walls were provided with plates of the same material. Approximately 900 tons of reinforcing steel were used in this work.

The area to be covered was roughly 950 x 200 ft. It was not permissible to erect on the roof of the basin an elaborate spouting plant and the additional equipment required to handle the reinforcing steel, ingot-iron conduit connections, forms and old concrete removed. This would have involved an unnecessary risk on the part of the contractor. Therefore, a traveling cableway of 15 tons capacity and 360 ft. span was erected, with the 75-



HEAVY BRACING REQUIRED FOR WALL FORMS

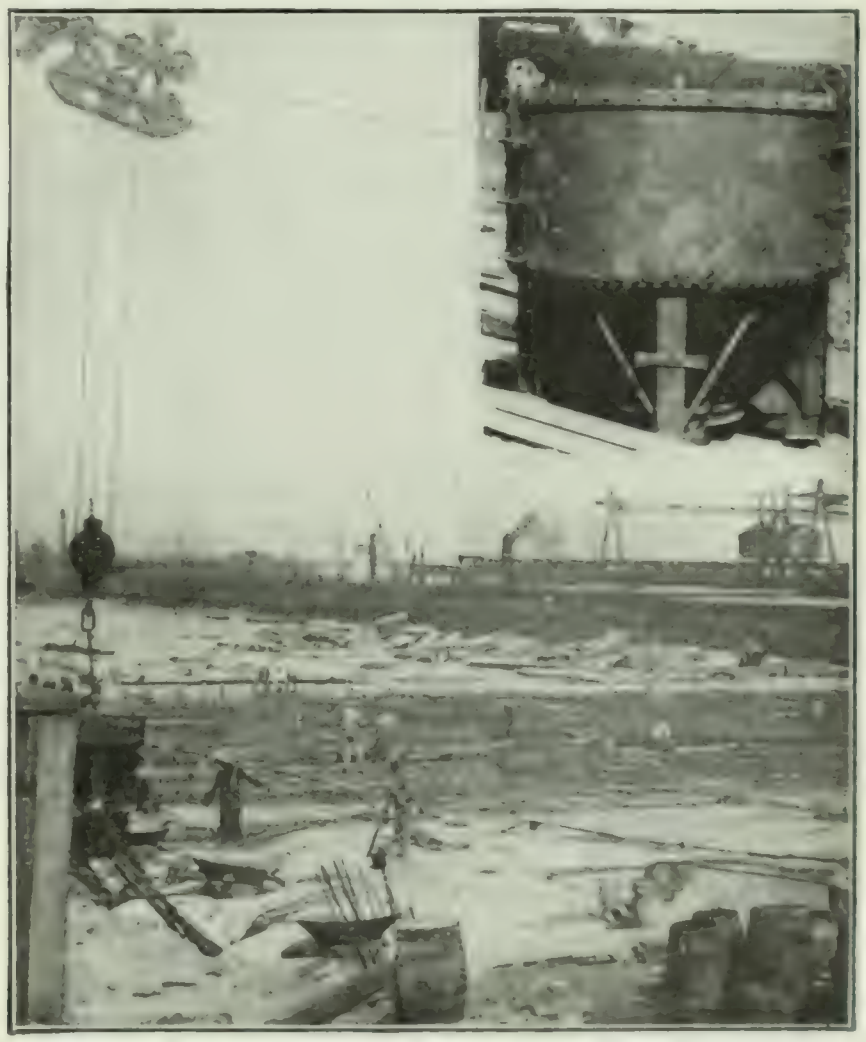
ft. head tower traveling on a terrace on the hillside above the basin, and the 45-ft. tail tower traveling on Division Ave. at an elevation 12 feet below the roof of the basin. Between the tail tower and the basin is the standard gage track for the delivery of material, which by the addition of a third rail was converted into a narrow gage track for the delivery of concrete. The two towers are moved simultaneously by a cable at each and can move the length of the basin in a few minutes.

The concrete plant, as stated above, is located on property leased by the contractor from the railroad. Sand and stone are received in cars on two tracks and dumped into two track bins capable of holding several carloads. Beneath these are two belt conveyors, one to feed the stone and one the sand bucket elevators, which in turn deliver the materials to overhead bins. From these bins the 2-yd. concrete mixer is charged by gravity. The storage capacity of the bins and track hoppers is about 450 yards.

Because it was necessary to dump the concrete from the mixer into a 5-yd. hopper from which the 3½-yd. concrete buckets could be filled rapidly, the mixer was mounted a considerable distance above the ground, as shown in one of the views. It was provided with an elevating loader in order to permit the charging bins to be set much lower than would be necessary for direct feed into the mixer. In addition to the capacity of the bins, material was unloaded from either the track hoppers or from the cars direct by a derrick and clamshell bucket and piled on the adjacent ground, providing a large additional storage space. The cement was handled in cloth sacks either from a shed of about 20 cars capacity or direct from the cars into the charging hopper of the mixer.



COLUMNS POURED THROUGH THREE-INCH HOLES IN ROOF



CONCRETING THROUGH HOLES IN ROOF—INSERT SHOWS CONTRACTOR'S BUCKET

The smaller basin was completed first. The floor was poured first, then in order the central sections of the four walls, the corners with the conduit connections, the conduits and lastly the roof. The columns were poured as rapidly as possible after the floor was completed. In the larger basin the floor was poured in sections of approximately 350 yd. each, the walls in six panel sections of about 180 yd., the columns in groups of 20, and the roof in sections of 350 yd. each.

For the smaller basin a complete set of forms was required for each wall section, and these could be used only once. In the larger basin two sections of forms were provided for both the north and south walls, each

of these sections being set four times to include the corners and west wall. The forms which were used in the smaller basin for the dividing wall were used over in the larger basin, after alteration. There were 26 wall settings, all told. The wall and conduit forms were of wood. The former required an elaborate system of bracing against the new columns, as it was impossible to use wall rods or ties. The circular column forms were of No. 10 gage steel built according to the contractor's design.

The placing of the concrete presented an interesting problem. All the concrete was brought from the mixer in 3½ yard buckets, two dinkeys, hauling two flat cars each, being used to transport the buckets. For pouring the floor a large number of 20-in. holes were cut in the old roof of the basin. Through these openings flexible chutes extended to the floor of the basin. The concrete was dumped from the concrete buckets by the cableway into hoppers to which the chutes were attached. The chutes and hoppers were moved by the cableway.

The lower half of the wall was poured in much the same way, openings being left half way up in each beam and in the center of each wall slab through which the concrete was discharged by the flexible chutes as before. When the walls were filled up to this level, the openings were closed and the rest of the form was poured through rectangular holes at the top of each beam. To aid in filling the curved upper section of the wall slab three 10-in. holes per panel were provided in the old roof at the extreme top of this slab. It was possible for men to work within the wall forms until the halfway mark was reached, and in the beams for their entire height.

The columns were poured through four 3-in. holes drilled through the old column cap. Pounding of the steel forms with wooden mallets was the only possible method of insuring a dense concrete. This, incidentally, is stated to have proved very effective. The roof concrete was deposited directly from the concrete buckets. It was possible to obtain a rate of progress on the walls of 40 yd. per hour and on the roof of 70 yd. per hour.

All told, more than 500 yd. of old concrete had to be removed to carry on the work. This included four panels of roof. Through the openings thus made forms, reinforcing steel and materials could be lowered into the basin. The work was considerably hampered by unforeseen difficulties in the fabrication and delivery of materials, but was in readiness for service before the end of October.

The work was done for the City of Cleveland by the John F. Casey Co. under the direction of Ottamar Stange, of that company. The construction details were planned by E. J. Gass, engineer of the contracting firm, while the work was in charge of H. T. Hammer, superintendent.

Effect of Priority Order No. 2 on New York State Road Construction

By H. E. Breed

First Deputy Commissioner, New York State Commission of Highways

THE embargo went into effect Nov. 1. During October there were shipped for the use of our contractors working on New York State roads about 36,000 tons of stone, gravel, etc. As November marks the close of the building season, there would have been a normal decrease to about 20,000 tons for this month if the embargo had not been in force. Under the embargo the shipments have been virtually nil.

To some of the work that can be carried over without detriment until next year, this makes no serious difference. True, the public must wait a year longer for its roads, and commerce, especially farm commerce, will suffer. The contractors suffer, too, because the cost to them is increased and their plant is held over.

More serious is the damage where the bottom course has been laid, and the work then stopped for lack of the materials under embargo. Large additional expenditures will have to be made next year to put this work in shape again for finishing.

There are at the present time in New York State about 220 live contracts for whose completion 500,000 tons of imported material (stone, gravel, slag and sand) will be necessary. If the embargo is continued in force throughout next year, all work on many of these contracts will have to stop.

The embargo also seriously affects our repair work. Heretofore at this time of year, after the commercial season is over, it has been the custom of the department to order materials and deliver them alongside the roads in readiness for early repair work in the spring. With the present possibility of not getting them until spring there will be a serious delay in maintenance work that will necessitate the roads being torn up later than usual in the season and thereby interfere sadly with traffic.

Conditions are changing so rapidly from day to day that no action affecting the contractors has been taken by this department. Any scheme of operations that might be outlined to alleviate conditions today would probably be insufficient tomorrow. Neither has the Commission of Highways any legal right to involve the state in expenditures other than those obligated by the contracts now in force.

[For other opinions on the effect of Priority Order No. 2 see *Engineering News-Record*, Nov. 15, p. 916.—Editor.]

Ore Found Under Hibbing, Minn.

A 40-acre tract of land in the heart of the City of Hibbing, Minn., will be mined for iron ore by the Oliver Mining Company.

According to the plan, a dozen square blocks in the center of the city, in which are located the leading hotels, the city hall and virtually all the business houses, are to be razed.

It is planned to move the business center of the city to Alice, a suburb south of Hibbing, and it is anticipated that the purchase of the property and the moving of the buildings to their new sites, if accomplished, will cost the mining company more than $1,000,000.

The property owners in the section of the city under which has been located one of the most valuable veins of ore on the entire range will be paid for their property at rates fixed by mutual appraisal.

Establishing the Railway Terminal at Camp Dix

Utility and Speed of Installation Being Imperative, Both Design and Construction Methods Were Quite Different from Ordinary Practice

By W. F. Rench
Superintendent, James McGraw Co., Wrightstown, N. J.

METHODS quite different from those used in ordinary railroad construction had to be employed in building the terminal layout at Camp Dix, the army cantonment located near Wrightstown, N. J. There was need for both rapid progress in the initial stages and a high class of work. The general plan shows a layout in which utility and not precedent was the guide, while the construction methods to be described show as much originality.

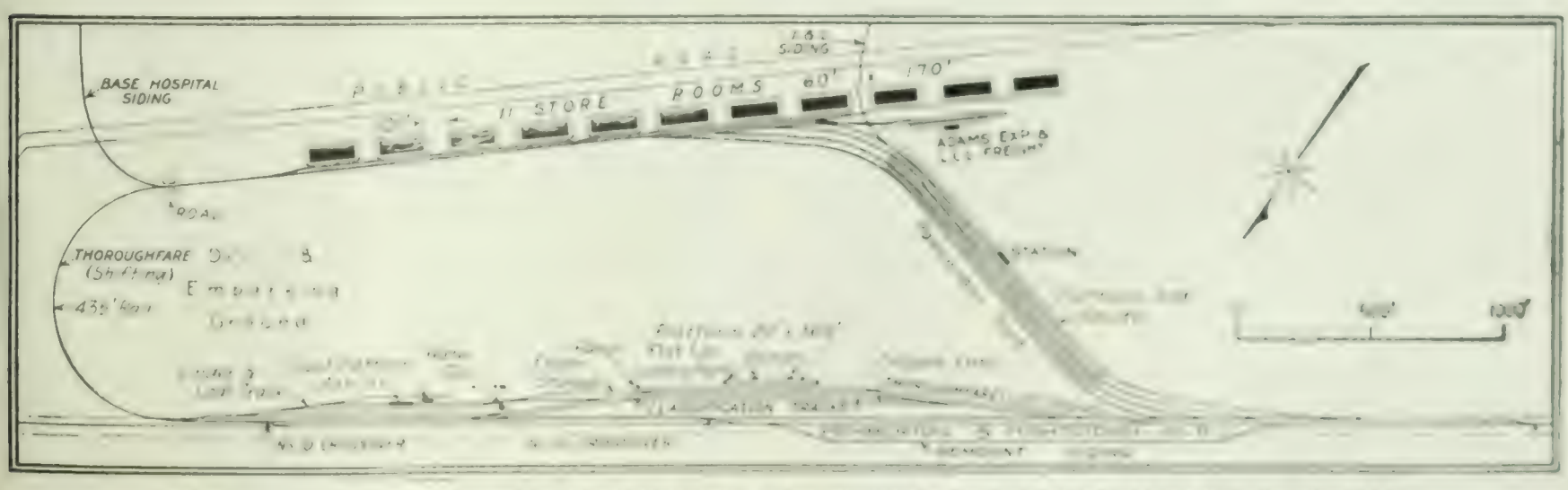
The transportation problem at Camp Dix was virtually the same as at all the other camps. The inside transportation was planned to be done by motor trucks plying between the stations and storehouses over macadamized roadways. The outside transportation was entirely dependent upon service through the railroad connections. The traffic movement at the Camp Dix terminal, being concentrated, is necessarily of an intensive character. The contour of the ground not being entirely favorable, the track arrangement had to be planned with full consideration of both the engineering and the operating features. The plan shows the completed layout except for a siding which serves the garbage incinerating plant, located half a mile from the camp, and the magazine siding somewhat farther removed, through which ammunition is received. The system of tracks is coördinated for the movement of troops and supplies, and especially provides for alternative routing. It will be observed that the yard for engine preparation and dispatch is particularly comprehensive. The presence of a loop track not only facilitates the turning of engines and trains, but also permits the handling of troops, both arriving and departing, without shifting of the train.

The traffic through this terminal amounted during the final weeks of construction to 100 carloads daily, besides four scheduled passenger trains into the new station and many special trains carrying mechanics, visitors and soldiers on leave. This movement required the use of two drills working day and night. The cars of material for the construction of the barracks were classified and delivered in rotation through the siding marked I. & L., which traverses the cantonment and is about two miles in length. It has spurs leading to several of the sections of the camp, there being five spurs in all. The loads for the base hospital reach that point through the siding appropriately indicated on the plan. The remount siding on the opposite side of the main line is for the receiving and reshipment of horses. The Adams Express station and adjacent less-than-carload delivery are conveniently located for the cutting out of cars in such traffic from the passenger trains. The three spurs serving the eleven storehouses are designed to be entered with equal facility from the passenger system, or direct from the main line via the loop. The classification tracks simplify the drill operations for the entire yard.

A feature of the terminal is the considerable amount of switch work involved, which had to be done by a class of labor inexperienced in such construction. There was imperative need for immediate provision of siding facilities to the point where the I. & L. siding diverges, to avoid the haul of 1½ miles from the existing delivery points on the railroad to the first of the barracks to be built. The railroad section forces were assembled for the construction of the tracks upon the right-of-way, and a contract was awarded the James McGraw Co., of Philadelphia, for installing the tracks on the government property, but outside the cantonment.

Work on the terminal layout was started June 18 with a small force, which was increased by gradual stages until on July 18 a total force of 350 men and 18 teams was engaged. The men were housed in a camp built by the contractors, and the teams and drivers were taken care of in quarters provided in the vicinity of a near-by farmhouse. Twelve hours was established as the working day, and the work was continued Sundays and legal holidays.

In order to hasten progress in providing a grade for



TRACK LAYOUT HAS LITTLE RESEMBLANCE TO PERMANENT TERMINALS BUT IS ADMIRABLY EFFECTIVE

the tracks, the cuts were first made with vertical sides 5 ft. 4 in. from the center line on tangents and 5 ft. 8 in. on curves. To avoid an irregular cutting on the curves, middle and quarter ordinates from a 100-ft. string were computed, by means of which supplementary stakes were set every 25 ft. This practice further served to facilitate the immediate establishment of correct line on the curves. Care was also taken throughout the grading to leave a smooth and level subgrade, so that traffic could be run on the tracks as soon as laid and before ballasting or surfacing was done.

The dirt was cast up on top of the ground and afterward hauled to the nearest fill. The track over fills was kept to the lowest practical height and then raised to grade as material became available. All cuts were finally widened to 8 ft. from center line for single track and sloped from 2 ft. below top of rail on a 45° inclination. The tracks were ballasted with cinder to a depth of 6 in. below bottom of tie, for which stakes marking the top of rail were placed, and the tracks were then relined to center stakes newly set on the tangents and adjusted by means of ordinates from a 62-ft. string on the curves.

The grading, entirely earth, amounted to 22,000 cu.yd. of cut, which was mainly used in necessary fill. The completed trackage totals 7.5 miles, and 38 switches were installed. The maximum gradient is 1% and all intersections are properly modified by a vertical curve. The sharpest curve, which is that of the loop, is of 435 ft. radius. Since operation over the whole layout is at moderate speed no elevation was applied to any of the curves.

Track Construction

The track construction throughout follows Pennsylvania standards. The main tracks are laid with No. 2 Pennsylvania system 100-lb. rail and are tie-plated on curves and through-switch connections. New ties were generally used, although a limited number of good second-hand ties were interspersed through some of the less important yard tracks. The material supplied for constructing the switches was all new and similarly of the Pennsylvania 100-lb. section. The frogs are, with few exceptions, No. 8, the stiff pattern being used in the main running tracks and the sliding pattern in side tracks. The switches are the newest Pennsylvania standard and are equipped with heel blocks. The guard rails are partly Pennsylvania standard and partly of the Newhall type. New Century switchstands have been used throughout.

The detailed method of constructing the tracks and switches presents several points of interest. The materials for the track layout, exclusive of ballast, amounted to 200 carloads. They arrived at about the same time, and necessarily were unloaded in mass and redistributed. The delivery was made by teams hauling the ties on wagons, dragging the rails by hooks engaging the bolt holes, and either dragging or carrying the frogs, switches and guard rails.

The ties were laid square to the center line with the required spacing and immediately lined on the proper end to a string stretched between offset stakes at the several stations. When the rails were set up and jointed, the line rail was shifted to its approximate final location on the ties. The detailed lining of the ties at the moment of spiking was thus reduced to a minimum, and extensive relining of the track was avoided. Care was taken to follow up the tracklaying closely with a roughing-in of the line before ballast was deposited.

A special method employed in setting up the switch ties gave good results. An ideal bill was designed for the No. 8 turnout, and a gang was selected for collecting, transporting and laying in place on the grade the required ties for each connection. The engineers gave the frog point and the line of the main track. Several switch timbers were laid edgewise along the straight side of the turnout to form a curb to receive the switch ties laid exactly at right angles with it. The position of the several joints was marked on the timber curb and then the location of each tie of the set. The appropriate lengths of the switch ties were written at the points marked. This saved the usual lost motion of shifting the connection into place after being spiked up, and also supplied a convenient guide for the adjacent grading and tracklaying.

As heel blocks were used with the switches, a nice selection of rails was necessary to avoid bad centering or an excess in cutting of rails. A 33-ft. stock rail on one side with a 25-ft. stock rail on the other and a second 25-ft. rail adjoining served this purpose nicely. The lead and turnout rails consisted generally of a 30-ft. rail and pieces respectively 14 ft. 11 in. and 15 ft. 1 in. long cut from a 30-ft. rail. When these were no longer available, pieces 11 ft. 11 in. and 12 ft. 1 in. long were cut from 33-ft. rails for use with a full-length rail in the lead and turnout. The 21-ft. pieces remaining were placed at the heel of the frog and restored the centering for both main track and turnout.

As the switches were all from main track the turnout curve was lined by means of ordinates from a string stretched between heel of switch and toe of frog. The ordinates used were 6 in. at the middle and 4½ in. at the quarters, whether the frog was No. 6, 8 or 10.

The entire work upon the terminal layout was under the direct supervision of the division forces of the Trenton division of the Pennsylvania Railroad.

Measure Snow Density to Forecast Floods

Hydraulic engineers of the Southern California Edison Co., which operates several hydro-electric systems in southern California, believe that unusually heavy flood stages of the streams can be, in large measure, predicted with the aid of snow measurements. It is the custom of this company to send surveying parties over the more important drainage basins of its system as soon as good weather comes in the spring. These parties take measurements of the snow depth at numerous points to obtain an accurate idea of the quantity.

The snow is sampled by means of a brass tube and its density obtained so that proper allowance may be made for wet and dry snow. It has been found that the percentage of water varies from 20 to 75%. With an accurate estimate of the quantity of water lying on the drainage area in the form of snow it becomes a matter of observing weather conditions and applying runoff coëfficients to determine when this water will reach the streams and what its maximum amount might be.

Brooklyn Naval Storehouse Finished Ahead of Schedule

Eleven-Story Concrete Building Frame Completed with Roof in Fourteen Weeks by 500 Men Working One Shift a Day Monolithic Floor Finished Without Delaying Quick Progress



MOTOR TRUCKS CLIMBED RAMP WITH MATERIALS FOR CONCRETE PLANT

A REINFORCED-CONCRETE storehouse capable of holding 70,000 tons of supplies has been built during the summer in the Brooklyn Navy Yard, and is being completed some four weeks ahead of even the rapid construction schedule required by the Government. Eleven stories high, 180 x 360 ft. in plan, and with monolithic-finish floors, the concrete frame was completed within fourteen weeks after the last piles were driven for the footings. With the 6- to 9-in. floors required by the heavy loads to be imposed, which limited the work as to progress by the hardening of the concrete, the contractor was able to organize a labor force which kept up the best speed possible with one 8-hr. shift a day. This organization, with two 1-yd. mixers and hoists, completed one of the floors in four days and several in five. A pair of 5-ton motor trucks scored an unusual performance in delivering within these fourteen weeks, over a ¾-mile round-trip haul, all of the stone and sand required for the 40,000 yd. of concrete placed.

The first work after the award of the contract for this structure was to drive 3776 concrete piles, which was accomplished in the remarkable time of 30 days, as described on page 62 of *Engineering News-Record* for July 12. No excavation was required, the tops of the piles being at original ground level and a fill of 4 ft. being placed between external retaining walls underneath the first floor. The footings, which extended from the original ground to the first-floor level, were begun on May 21, before piledriving had been finished. All of them had been concreted by June 9, by which time a considerable part of the form work for the second floor had been framed and erected. The actual progress schedule attained for this and the succeeding floors of the building is shown in the table.

The building is designed with rectangular outside and round inside columns. The flat-slab floor system employed has depressed panels at the column heads. The column spacing, 18 ft. center to center in both directions, is uniform throughout the building, giving 60 exterior columns and 171 circular columns. For the latter metal forms were used, all the other forms being made of wood.

Forms for one entire floor and one set of rectangular column forms, requiring in all about 1,000,000 ft. of lumber, were built. The framing of these forms began on May 16, by which time there were about 40 carpenters on the job. The cutting was all done by one saw-mill man, the mill being located at the east end of the building. By the time concreting started on the slab for the second floor, 105 carpenters were on the work, and approximately this number of men were required in handling and reërecting the form work throughout the job. The carpenter force was assisted by an equal or greater force of laborers, about 28 of

ACTUAL PROGRESS OF CONCRETE WORK BY FLOORS

	Commenced	Finished
Footings	May 21	June 9
Second floor	May 21	June 26
Third floor	May 31	June 30
Fourth floor	June 26	July 7
Fifth floor	July 6	July 11
Sixth floor	July 11	July 16
Seventh floor	July 16	July 21
Eighth floor	July 21	July 26
Ninth floor	July 26	July 31
Tenth floor	July 31	Aug. 5
Roof	Aug. 5	Aug. 10

whom were continually engaged in carrying forms on the floor being stripped to the hoists, about 36 in stripping, about 40 on the floor above in carrying panels to

place, and about 14 carrying and placing wood column and wall forms. In addition to this force, one foreman and 18 sheet metal workers were engaged continuously in stripping, moving and reërecting the interior column forms.

The floor forms were planned so as to secure uniform interchangeable panels for all of the flooring except the depressed panels at the column heads. These were made in halves. One of the drawings shows this arrangement, which simplified erection and gave panels of convenient size for handling by four men. Because the building was on Government property, and with open space on all four sides, it was permissible to hoist the forms outside of the structure, which made it unnecessary to leave out sections of the floor above or carry the forms long distances to stair wells or elevator shafts to hoist them. The hoisting apparatus, shown in the photographs, consisted of small gin poles on which winches were mounted. By using five or six of these it was possible to reduce the distance the forms had to be carried.

All the reinforcing, cement and other material received by rail was brought to the Navy Yard reservation on car ferries, and the cars switched to the job over the Navy Yard tracks. The sand and stone for concrete and the grit for floor finish was received in scows, unloaded by a clamshell derrick within the limits of the Navy Yard about ¾ of a mile from the building, and dumped into a portable wood hopper, from which motor trucks could be loaded. On the north side of the building, where the concrete plant was located, the material bins were erected with a ramp leading up to gratings over them on a 10% grade, and down on the other side with a 15% grade. It was thought that the two trucks would do well to carry their rated capacity of 6 tons up to 10% grade, but both the trucks, which



FIRST FLOOR ON FILL AT TOPS OF COLUMN BASES

are Pierce-Arrows, have several times hauled 5 yd. of material up the 15% grade. The trucks are dumped through the gratings over the bins. They worked eight hours a day, and averaged 600 yd. in that time, while the concrete plant was running.

The 300-yd. stone bin was on the south side of the structure nearest the mixers, with the 150-yd. sand bin next and the 100-yd. grit bin farthest from the concrete plant. Underneath these bins, filled by hopper gates, ran measuring cars on two tracks, one for each of two 1-yd. Ransome mixers. On both sides of the charging platform in which these tracks were set was storage space for 16 cars of cement. This quantity of cement was kept on hand most of the time, the mixers being supplied directly from the box cars, which could be switched directly alongside the north edge of the charging platform. By excavating six feet for the concrete mixers, the level of the charging platform was brought slightly below the car floor so that the cement could be handled on gravity rollers.

Both the mixers and the two hoists were belt driven, a 65-hp. motor being connected to each unit. The size of the pulleys was so adjusted that the rope speed of each hoist was 170 ft. per minute, and each mixer made 16 r.p.m. At these speeds the capacity of the mo-



HOSPITAL BEING WAREHOUSED TO GIVE SEVENTY THOUSAND TONS OF SUPPLIES

tor was sufficient to prevent an undesirable change of speed when the hoist was thrown in or out. The hoists used were ordinary one-drum skeletons with a pulley wheel set on the drive shaft. The long drive shaft and pulley were put on the hoist and the entire rig set up at the job by the contractors.

In addition to the concrete hoists, two brick hoists were erected, as shown in one of the photographs, for handling hollow tile used around the elevator shafts and stairwells. On these towers were erected booms for hoisting the reinforcing.

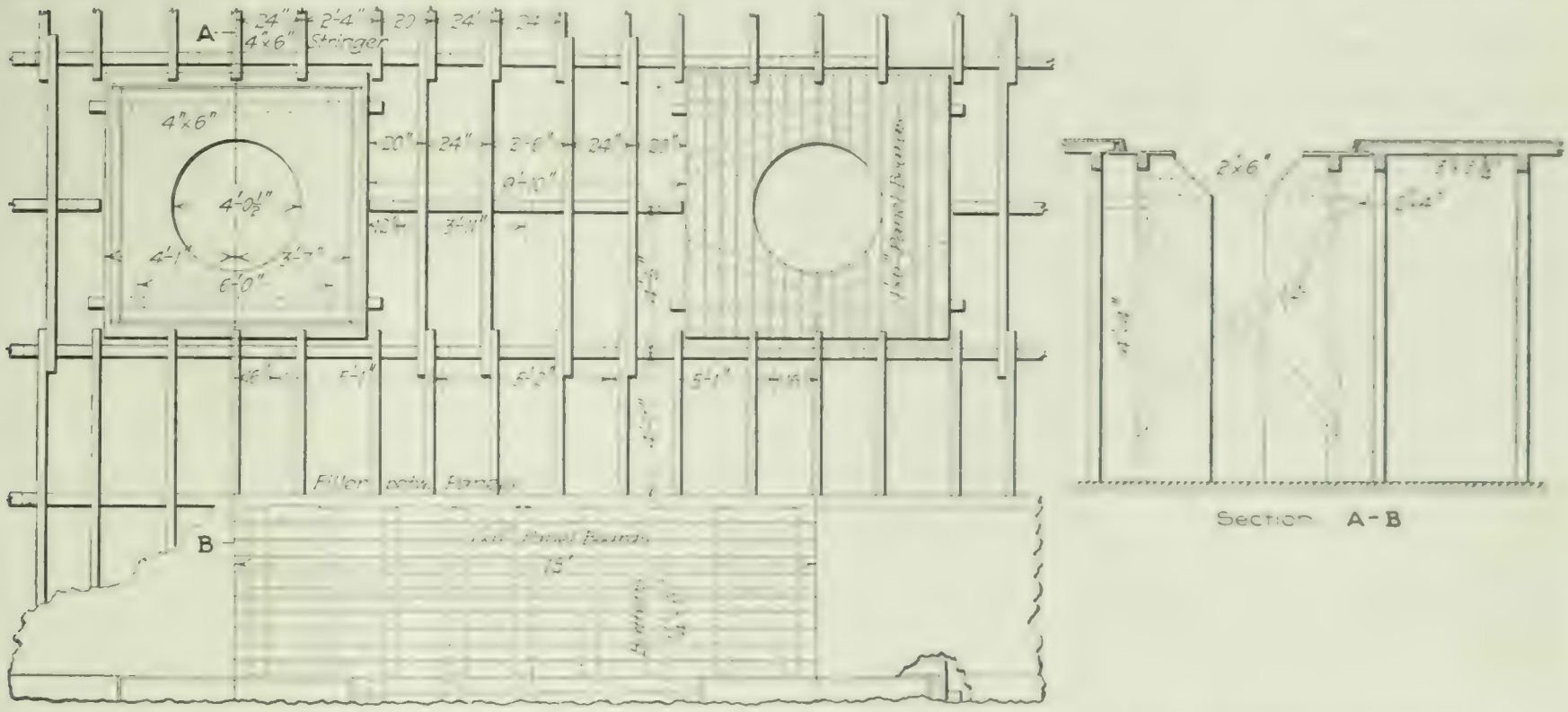
The operation of the mixer plant required 18 laborers and 2 engineers. As the car tracks on the charging platform were given a pitch of 1½ in. in 40 ft. toward the mixers, it was possible for two men to fill, handle and dump each car. One laborer was required to discharge each mixer into the tower skip, another on the water at each mixer, two handling cement for each

The penthouse and skylight structures on the roof were concreted from elevated runways built on trestle work after the roof slab itself had been completed.

About 13,000 sq.ft. of floor finish was deposited in a day by this same labor organization, following up the concrete work. Some 20 cement finishers were required to take care of this amount of work.

The reinforcing was unloaded to stock piles and handled from the piles to the point of use on the floor by a gang of 17 laborers assisting the lathers, who bent and placed the steel. Twenty-six of the latter were employed throughout the work. The reinforcing for the columns was made up and lowered into the forms in full-height units, while the slab reinforcing was supported on cement blocks resting on the form work.

Dirt was brought by the contractor from cellar and other excavation work under way in Brooklyn for the fill under the first floor. This fill, which amounted to



ONLY DROP PANELS ALTERED AS COLUMN SIZE DECREASED—OTHERS WERE INTERCHANGEABLE

plant, one handling sacks at each, and two more transporting cement from the cars to each hopper. During the work each mixer averaged 45 yd. an hour while in service, so that the plant mixed and hoisted, on the few occasions when both machines were kept busy a full 9-hour day on concreting, more than 700 yd. As a rule, however, after 3000 or 4000 sq.ft. of floor had been concreted, one of the mixers would be taken off concrete and used to mix floor finish. With this much start one mixer could concrete as much slab in the remainder of the day as the second mixer could supply mortar for finishing. The ¾-in. finish put on required about 150 yd. of mortar for each floor, using one part of grit, one of sand, and one of cement. The entire concrete plant, as usually operated in this way, averaged 1000 bbl. of cement a day.

The concrete was dumped by the hoists into hoppers at the floor on which work was in progress. From here it was drawn into buggies and wheeled to place. A total crew of 54 laborers on the floor was required on this work, 4 of whom were at the gates loading the buggies, a maximum of 28 of whom were wheeling, 16 engaged in placing the concrete, and 6 in handling the runways.

7500 yd., was completed in time for the ground floor to be finished while the roof was being concreted.

The curtain walls, tile partitions, stairs, steel sash, elevator installation and trim were all begun after the 4th floor was concreted and carried up as the work progressed. It was contemplated in the contract that the Government could occupy one-half of the building on Oct. 23, practically all of the remainder on Nov. 18, and that the entire structure would be turned over by Dec. 9. All of these dates could be advanced at least three weeks, owing to the rapid progress made.

Laborers	72						

A recapitulation of the way in which the labor force in the different trades employed on the work were divided between the principal classes of work required is shown in one of the tables.

The work has been carried out under the direction of

the Bureau of Yards and Docks of the Navy Department, Admiral F. R. Harris, U. S. N., chief of bureau; Civil Engineer Kirby Smith, U. S. N. in charge of storage depots; Civil Engineers L. M. Cox, U. S. N. and W. A. Allen, U. S. N. in charge at New York Navy Yard. The general contract was carried out by the Turner Construction Co., for which the Raymond Concrete Pile Co. drove the foundation piles. For the Turner Co. the work has been in charge of R. C. Wilson as engineer and W. T. Anderson as superintendent.

Wayne County Board Reports on Concrete Road Work

Two-Course Construction Still Practiced Because of Scarcity of Good Pebble Aggregate—Road Shoulders Macadamized

ALTHOUGH its preference is for the one-course type of concrete road construction, the Board of County Commissioners of Wayne County, Michigan, this year built all of its concrete highways in two courses. Scarcity of good quality pebble aggregate for the wearing surface, the chief cause for the adoption of the two-course method last year, as noted in *Engineering Record* of Dec. 9, 1916, p. 705, was the reason for the continuation of this form of construction from Oct. 1, 1916, to Sept. 30, 1917, the period covered by the Board's latest annual report, from which the following excerpts are taken:

Reasons for Two-Course Construction

Our past experience, says the board, has taught us that it is desirable that the aggregates in the wearing surface of our roads should be of a uniform quality, clean, hard, tough and well graded. We have had so much difficulty in getting a sufficient quantity of pebbles that met our requirements that we have changed our specifications from one-course to two-course construction, using Wisconsin granite or trap rock for our wearing course, and washed pebbles or crushed limestone for the lower course. Other things being equal, our preference is for one-course construction, as the two-course work is more expensive in the labor item and in the cost of the coarse aggregates used for the wearing surface. However, we believe that through the uniformity of the quality of the trap and granite, we are justified in making the additional expenditure predicated on our roads lasting for a much longer time.

A material change has been made in our specifications by increasing the width of our expansion joints from ¼ to ½ in. We have found in several instances that roads six and seven years old have buckled at the joints and several slabs have slipped over the top of the adjoining sections. We have made the change as a precaution against future occurrences of this character. From year to year, we are giving more attention to little experiments and care of details. More attention is being given to rigid inspection of aggregates, consistency, mixing, finishing, curing, preparing of subgrade, alignment, laying out and widening curves, all of which add to the cost of our work but more important still, add to the quality, appearance, safety and life. We are also continually improving our maintenance methods, which we believe to also be the part of wisdom.

Labor this summer has been scarce, high-priced, and unreliable, necessitating frequent reorganization of crews. In order to maintain an average working force of 400 men we have hired upward of 1200 men during the past season. We have been compelled to take shipments of pebbles, crushed stone and sand in box cars, making useless our clamshell unloading devices and creating a further shortage of labor to do the work machines can do quicker and cheaper. In addition to labor and car shortage, materials naturally have been hard to secure in quantities that would keep our work going smoothly, and as a consequence thereof we have been unable to complete the work planned and laid out.

Road Maintenance

With the tremendous increase of traffic in Wayne County, the shoulders on our various roads are being used to a greater and greater extent, because the road metal is too narrow. We have had two maintenance crews in the field all season doing practically nothing else but macadamizing or graveling the shoulders in order to relieve traffic congestion. While this might well be termed a "road betterment," we have charged it against maintenance. We expect to continue this work until all of the mileage previously built will have first-class macadam shoulders. On several highways it was found desirable to oil the shoulders to make them dustless. We are now building no concrete road of a lesser width than 18 ft. It has also been necessary to resurface and oil practically all of our gravel mileage, which work is still under way.

We have repaired such defects as have developed in the metal of our concrete road mileage, consisting of cracks and an occasional hole. This problem, however, is a simple and inexpensive one. Equipped with a tar-kettle, several wire bristle-brooms, a wheelbarrow, a couple of shovels, a tar-bucket, and sprinkling cans, a team and a small crew of men are an adequate force for doing this work. Cracks and spalled joints are swept clean with the wire brooms, after which tar, heated to 225 deg. F., is poured into the clean crack and allowed to stand for a few moments to prevent it from bubbling. Clean, coarse, dry sand is then spread on the tar from a shovel. Any pit holes are given the same kind of a treatment. A slight excess of tar and sand is used, so that traffic will eventually iron out the application. Practically all communities having concrete roads have followed the methods of maintenance which we have developed. A grade of tar, known under the trade name of Tarvia XC, is used.

If an imperfection that does not extend through the pavement, yet is over an inch deep, is to be treated, the cavity is thoroughly cleaned out. It is then dried, painted with hot tar, and filled with stone of suitable size so graded that the bulk of the stone will have voids reduced to the lowest possible point. This filling is then firmly tamped or rolled into place. On top of this patch, hot tar is poured, the quantity being so regulated that it will be enough to fill in voids remaining in the pebbles or stone and leave but a slight excess on the surface. Dry sand is then spread on this excess and traffic irons it down as in the case of similar repairs to joints.

One maintenance crew will do all necessary work on from 1 to 3½ miles of concrete road surface in a day. Where we have occasion to repair holes that are two or more inches deep, we clean them out thoroughly, cutting away the concrete so as to give truly vertical sides to the hole, paint the edges with a cement grout, and fill the cavity with a concrete mixture proportioned as was that used in the original construction. The repaired portion is protected from traffic until thoroughly hardened, and hardening is accomplished by keeping the repaired spot covered with a moist layer of earth, kept moist by frequent sprinklings for at least seven days.

In addition to the foregoing, weeds are kept cut; the ditches and drainage structures cleaned out both spring and fall to afford a free flow of water; guard rails and bridges, painted and repaired; and all other necessary items are taken care of to keep our highways up to their highest point of efficiency, prolong their usefulness and make them safe and sightly. We have continued to drag our roads during the winter months to keep the snow leveled down, thus making them safer for travel and distributing the wear over a greater area of roadway.

The total expenditures for this work are as follows:

Tarring and repairing cracks and holes on 150 miles of concrete road	$5,475 76
Tarring and repairing 2 miles of macadam road	831 11
Brick mileage (1½ miles)	302 14
Resurfacing, oiling, dragging, cutting weeds, cleaning ditches, on 20 miles of gravel road	20,040 07
Macadamizing shoulders, cutting weeds, cleaning ditches, on 2 miles of macadam road	1,340 27
Macadamizing and oiling shoulders, cutting weeds, cleaning ditches, on 150 miles of concrete road	25,354 80
	$53,344 15

Another East River Bridge Suggested

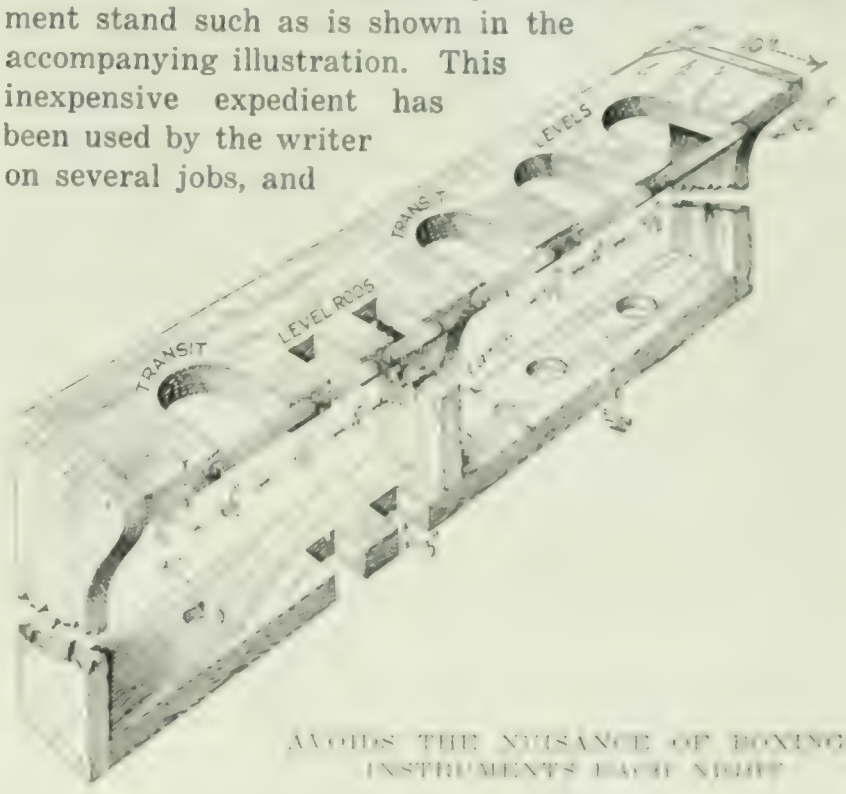
ANOTHER very large bridge structure across the East River in New York City has been projected by one of the city departments and is announced in the report of the Department of Plant and Structures of the City of New York for the year 1916, just issued. The new bridge, for which studies were made by the engineers of the department but which has not yet officially been brought to the attention of the Board of Estimate and Apportionment for the purpose of having money appropriated, is a tri-borough bridge connecting the Boroughs of Queens, Manhattan and the Bronx, and is located just alongside of the Hell Gate arch recently opened to connect Long Island City with the Bronx. The plan provides for a bridge structure approximately 15,000 ft. in length, the Queens terminal of which would be at Second and Potter Aves., the Manhattan terminal at First Ave. and 125th St., and the Bronx terminal at St. Ann's Ave. and Southern Boulevard. The structure is planned to cross Hell Gate channel, Ward's Island, Little Hell Gate channel, to Randall's Island, and then to divide into two branches, one of which crosses the Harlem River to Manhattan, and the other the Bronx River to Southern Boulevard. Provision would be made for vehicular, pedestrian, surface railway and rapid transit railway travel.

At the Hell Gate channel the bridge would be carried by a large cantilever steel span, and for the approaches in Queens and on Ward's and Randall's Island, including the crossing at Little Hell Gate, reinforced-concrete would be used. The Manhattan connection, extending from Randall's Island to First Ave., would be similar in design to the present drawbridges over the Harlem River, with the exception that the opening for navigation purposes would be made by a lift span instead of a swinging span. Inclined approaches are provided for Randall's and Ward's Island for vehicular and pedestrian travel, thereby affording for the first time vehicular communication with those islands from the mainland. The bridge is thought to be necessary in the near future as a means of communication from the upper part of Manhattan to Long Island for motor and motor-truck travel, and as a proper connection in the extension of rapid-transit lines from the Astoria terminal to the Borough of the Bronx, providing a means of communication between Brooklyn and the Bronx, without passing through the Borough of Manhattan. The estimated cost of the entire structure at normal prices for materials and labor would be about $10,500,000.

Stand Eliminates Necessity of Boxing Instruments Every Night

BY GEORGE W. MCALPIN
Junior Engineer, U. S. Engineer Field Office, Maysville, Ky.

ALL THE TROUBLE and waste of time in removing surveying instruments from their tripods and placing them in their boxes at the end of the day's work can be avoided if an office is provided with an instrument stand such as is shown in the accompanying illustration. This inexpensive expedient has been used by the writer on several jobs, and



AVOIDS THE NUISANCE OF BOXING INSTRUMENTS EACH NIGHT

has been found satisfactory in every case. The construction is very simple. Slots cut into a 1½ x 10-in. plank provide recesses into which the tripods and levels may be set. The tripods are then held in the slots by metal latches hinged at one side and fitting over a nail at the other. The feet of tripods and the lower ends of level rods fit into holes cut in another plank set lower

Equalizing Bids for Brick and Concrete Sewers

TO GET truly competitive bids when inviting proposals for sewers of different materials on the same streets a city in the Central West took the friction factor into account. Thus, brick sewers were specified to be larger than concrete sewers, the difference in diameter generally being three inches.

Screens, Filters and Humus Tanks for Indianapolis

Imhoff Tanks and Sprinkling Filters, and Activated-Sludge Process Eliminated—Non-Putrescible Effluent for River Will Cost $3,000,000

AFTER the three latest methods of disposing of sewage had received close consideration, a combination of fine screens, deep filters and sludge recovery in humus tanks has been recommended to the Board of Sanitary Commisioners as the best system for Indianapolis to adopt. George W. Fuller, consulting engineer, made the report. From it the following notes are taken. Other sewage treatment projects considered were Imhoff tanks followed by sprinkling filters, and the activated-sludge method.

The flow of White River, into which the raw sewage now discharges, is insufficient for five months of an ordinary year during the warmer season to prevent objectionable putrefactive conditions. The treatment must therefore, be complete enough to produce a non-putrescible liquid with substantially no river water to dilute it.

The characteristics of this sewage are its freshness at virtually all times, and the relatively large proportion of suspended matters which comes from trade wastes. These trade wastes are found upon studying the individual analyses, made in 1912 and for a year when the testing station was operated, ending March, 1915, to show marked variations at different seasons of the year, and of course, the same is true at different hours of the day, on account of the irregular manner and rate of releasing the wastes at their point of origin.

A personal inspection of the principal industrial establishments was made, and with the understanding that the gas-works will treat their waste products on their own grounds, no material evidence was found that the trade wastes will interfere with ordinary sewage-treatment processes. A large proportion of the suspended matter of the trade wastes comes from packing establishments and canning factories. These facts are of importance in noting the relatively high proportion of organic nitrogen in the local sewage, the analyses of which show that of the total suspended matters about 3% is suspended organic nitrogen, obtained by the Kjeldahl method.

Three Methods Considered

The three methods of sewage disposal which Mr. Fuller considered are as follows:

1. Sedimentation in Imhoff tanks with the sludge put on drying beds so as to allow it to be used by farmers in the vicinity, or for filling low land, and with the settled sewage oxidized to a non-putrescible state in sprinkling filters and settled in humus tanks, frequently spoken of as final settling tanks.

2. Aeration of the sewage in contact with activated sludge, followed by sedimentation, and with the deposited sludge filter pressed and dried in rotary dryers.

3. Fine screens to remove the coarser suspended solids, with the screened sewage applied to deep sprinkling filters for purposes of oxidation, and with the effluent thereof put through humus tanks, the sludge from which will be filter-pressed and dried for sale to the fertilizer trade.

Project 3 represents in a measure a combination of the objects sought by 1 and 2 and is based upon long continued investigations at the testing station of the Massachusetts Institute of Technology and at Worcester, Mass. It is the method which has been recommended by Mr. Fuller for the treatment of the sewage of the southerly part of Cleveland. The sprinkling filter of Project 3 is comparable with that in Project 1, except that the beds would be deeper, with a view to retaining as much soluble organic matter as practicable in order to increase the fertilizing value of the sludge of the humus tanks, in which respect Project 3 resembles Project 2. The purpose of the substitution of fine screens rather than Imhoff tanks is partly to increase the amount of sludge recovered for fertilizer purposes, partly in the interests of economy as to total cost, and partly with the view to reducing odors in the general neighborhood.

In 1914-1915 Indianapolis tried experimentally and successfully the methods outlined in Project 1.

Odor Nuisance Determinative

The reason for considering the other two methods was to inquire into the economic aspects of other means of bringing about equal purification and at the same time lessening the likelihood of odors at a large treatment plant for a growing city at a site now reasonably isolated, but which may not be so isolated in coming years.

With sewage as fresh as will be delivered to the Indianapolis plant, it is not likely that odors will be noticeable more than about 500 ft. distant when the plant is working normally. Imhoff tanks, however, sometimes behave very abnormally and produce seriously objectionable odors, particularly during the first year or two of their operation. These are caused either by the withdrawal of incompletely septicized sludge or by the putrefaction of gas-lifted sludge in the gas vents. Substantially complete protection against odor troubles from Imhoff tanks can be obtained under local conditions by the installation of fine screens in advance of the tanks and by providing spare units of sludge digestion chambers or both.

Some of the more pertinent statements with reference to Project 3 are as follows: Fine screens remove on an average about 10% of the total suspended matters in fresh municipal sewage, and more than this where the sewage contains trade wastes with suspended matter of relatively large size. The screenings, containing about 80% of water, would amount at Indianapolis to more than 8000 tons per year. They can be best disposed of by burning with coal in small incinerators.

A removal of 10% of suspended matters by screens should adequately protect sprinkler nozzles. It is a fact, however, that screens will not remove as much either of organic or of suspended matter as will Imhoff tanks, but the recovery of solid matters after filtration

makes it desirable not to remove a needless amount of suspended matter prior to filtration and then destroy a part of its organic nitrogen through septicization processes.

Unquestionably, it is necessary with screened sewage to use a greater volume of filtering stone per unit volume of sewage in order to bring about an adequate and equivalent degree of purification, as compared with that which would be effected with sewage clarified in an Imhoff tank, other things being equal. This phase of filter loading has been taken care of by assuming that with an Imhoff tank effluent the filters would be 7 ft. in depth and with screened sewage the depth would be 10 ft., the area of filter surface being the same in the two instances.

Removing Suspended Solids

In a process in which the solid matters, settling out from the effluent of sprinkling filters, must be dried for use as a fertilizer, obviously it becomes necessary to resort to procedures which will make as uniform as practicable the removal of suspended solids from the sprinkling filters. This means that it is necessary to lessen the heavy unloading which occurs normally in the spring, with much more suspended matter in the effluent than in the influent of the filters, and to adopt a systematic procedure for distributing this unloading throughout the entire year. This is manifestly necessary in order to keep within reasonable limits the capacity of the plant for pressing and drying the sludge and to keep the operating staff provided with a fairly regular working schedule.

When sprinkling filters are put out of service there is a drying action which causes much of the suspended matter in the upper portions of the bed to dry, crack, peel and pass out with the effluent. It is proposed with these deep beds to resort to this drying action at intervals and then to flush the beds with filtered sewage applied with a hose under pressure. This has been found in England and at Philadelphia to be an effective means of dislodging suspended matters.

From the sprinkling filter the treated sewage will flow through humus tanks of the vertical or Dortmund type having an average detention period of 2.4 hours. The settled sludge will be removed from these tanks with a water content of about 93%, which by resettling in concentrating tanks will be reduced to about 87%. This resettled sludge will then be reduced to a water content of about 75% in filter presses, and dried in rotary driers to about 10%, as required by the fertilizer trade.

The wet sludge removed from humus tanks will average 8 to 9 cu.yd. per million gal., and this will be dried to about 0.7 tons of finished fertilizer product per million gal., containing about 3.5% ammonia, worth at the present time about $7 per ton.

Pressing and Drying Operations

As to the pressing and drying operations, these can be made virtually non-odorous if care is taken to build amply large scrubbing chambers through which to pass the gases from the driers, and then to pass these gases through an ignition chamber maintained at a high enough temperature, by the aid of oil or gas, to destroy the remaining odoriferous products.

Comparing the advantages and disadvantages of Project 1, and in particular upon comparison of this project with other available projects, it is concluded that this method, which a few years ago was almost universally adopted for large inland cities, would give generally satisfactory results, if installed at Indianapolis. It is subject, however, to legitimate criticism along the lines of needless odor production and on the grounds of needless total expense, when consideration is given both to the investment cost and to net operating charges.

On the score of objectionable odors the local situation is such that it is important to take every reasonable step to minimize objectionable odors and to adopt a treatment method which is least likely to show periods of abnormal behavior when the manageability of the plant as to control of odors may become unreliable. The available evidence indicates that if fine screens in advance of the Imhoff tanks and reserve digestion chambers are provided, the control of odors could be made reasonably satisfactory. However, this would add materially to the cost of Project 1 and with no income as to fertilizer product, it would substantially bar this method on the ground of cost.

Of the three methods under consideration, the activated-sludge process is the cheapest one to install at Indianapolis and will produce the most complete purification. By giving liberal credit to the activated-sludge process for the proceeds from the sale of a sludge of a high nitrogenous content to the fertilizer trade, the total annual cost (capital charges and net operating expenses) of this project approximates that of Project 3, but still remains cheaper than that of Project 1, particularly if the latter were to be provided with fine screens and spare digestion chambers for placing all three projects on a parity as to freedom from odors.

Project 3 Preferred to Project 1

Taking everything into account, it is concluded that under local conditions the activated-sludge process is a less desirable one to install than Project 3. This is based on the variable composition of the Indianapolis sewage, on account of variations in quantity and quality of trade wastes, and on the lessened certainty in obtaining proceeds from fertilizer sales as estimated for the activated-sludge process, compared with corresponding proceeds allowed for Project 3.

In comparing the status of the activated-sludge process at Indianapolis with its suitability elsewhere, recognition should be given to the fact that there is no opportunity locally to effect any saving in the purchase of land, or in the construction of intercepting or outfall sewers by locating this compact type of plant nearer the city than would be feasible with a sprinkling-filter layout.

Project 3 has a decided advantage over Project 1, both in point of freedom from odor and in net cost of operation. The investment cost is substantially the same for the two projects and is decidedly in favor of Project 3 if Project 1 were to be equipped with fine screens and separate digestion chambers so as to give equal service as to freedom from odors. Comparing Project 3 with Project 2, the investment cost is somewhat in favor of the latter, although the total annual cost, all things considered, is in favor of Project 3.

It is estimated that this project will cost $3,090,000 for construction, and that the net annual operating expenses, after making due allowance for the proceeds of the sale of fertilizer products, will be about $42,370. As this investment cost is in excess of the available funds at the disposal of the commission, Mr. Fuller recommended the adoption of Project 3A, which is identical with Project 3 as to intercepting sewer, pumping station and screening plant, but which contemplates only about two-thirds of the full installation for sprinkling filters, humus tanks, and sludge-handling arrangements. It is estimated to cost $2,438,000 for construction, with net annual operating expenses of $50,370. This procedure will allow of fine screening all the sewage continuously and the full treatment during short periods of drought of even more than two-thirds of the sewage of the city, and would be a long step toward eliminating nuisances on the river below the city.

The sewage disposal problem of Indianapolis is in the hands of three engineers, B. J. T. Jeup, Charles H. Hurd and Jay A. Craven, who comprise the Board of Sanitary Commissioners.

The commission has decided to study further Projects 1 and 3, especially with reference to the feasibility and expense of pressing and drying the sludge for fertilizer on a large scale, the available markets and the reliability of mechanically operated screens.

The estimates made by Mr. Fuller were based on the prevailing high prices. Since the report has been received prices have dropped somewhat, and the commission is of the opinion that it can build the entire plant under Project 1 or 2 within the available funds, especially since a large gravel bed underlies the site for the plant and will provide aggregate for the concrete of which most of the structures will be built.

Laurentide Power Developed After War's Interruption

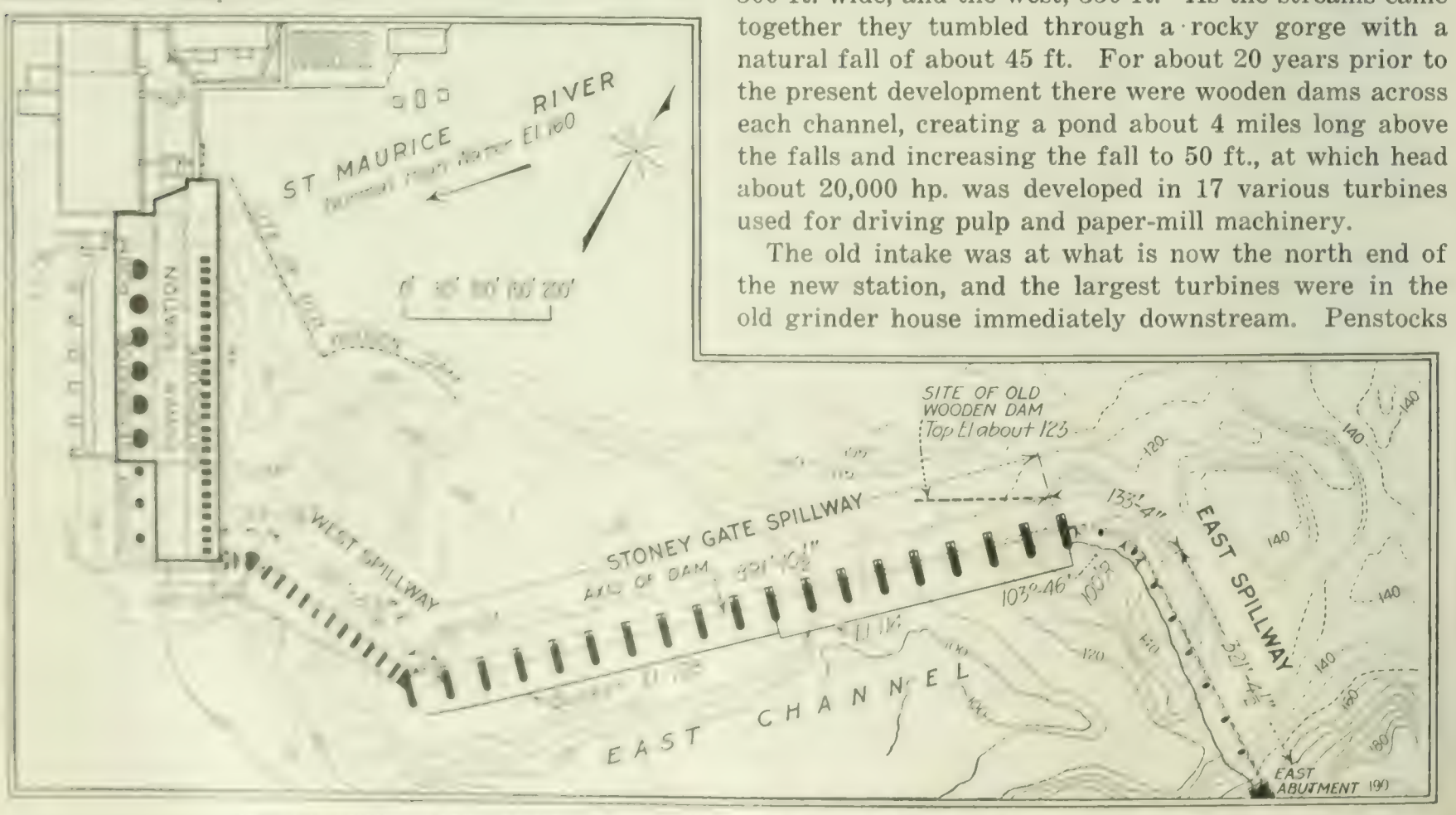
Capacity of Plant Increased by Raising Head to 84 Feet—Substructure Reinforced by Mass Additions—Series of Open and Gated Spillways Will Pass Floods of 200,000 Second-Feet

THE GREAT hydro-electric station of the Laurentide Co., at Grand' Mère, Quebec, is notable for the attention paid to finish on both outside and inside. Some interesting features of the development here are due to a change in the hydraulic conditions made after the work was well under way. The present development shows a record figure of masonry placed per horsepower of capacity created for medium-head plants of this type—having concrete penstocks molded in the substructure. The cost per horsepower of turbines installed, including riparian rights, is notably low (under $50) and will be reduced to less than $40 when the projected installation is complete. There are now in service six (out of nine eventually) 25,000-hp. single-runner units that were the highest in capacity when set and have since been exceeded only by the higher-head machines at Yadkin Narrows, North Carolina.

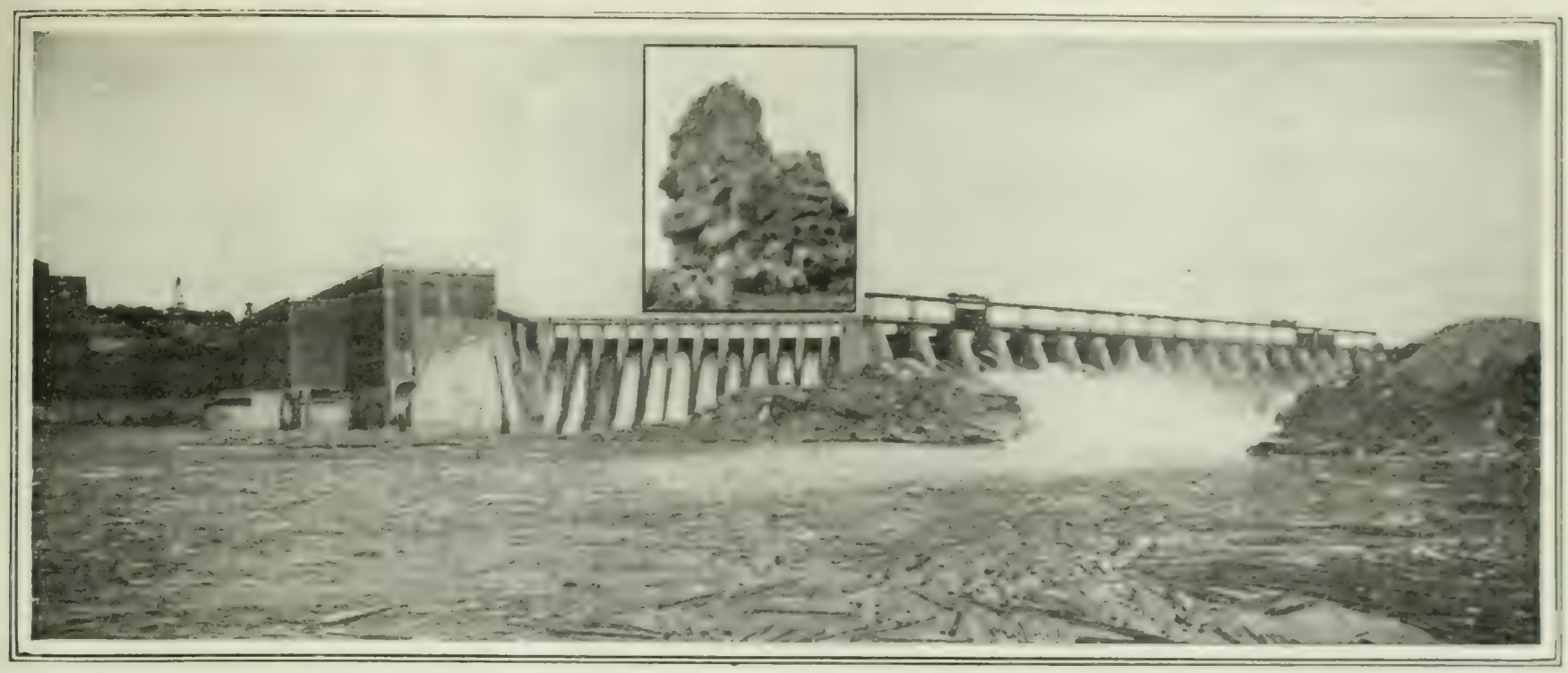
Work on the Laurentide development was started early in 1913, but was shut down in October, 1914, owing to the war. However, the demands for power in the province grew rapidly and the initial construction was resumed in May, 1915, and completed by the beginning of 1917.

The St. Maurice River at Grand' Mère was split by a large rock island into two streams—the east channel, 300 ft. wide, and the west, 350 ft. As the streams came together they tumbled through a rocky gorge with a natural fall of about 45 ft. For about 20 years prior to the present development there were wooden dams across each channel, creating a pond about 4 miles long above the falls and increasing the fall to 50 ft., at which head about 20,000 hp. was developed in 17 various turbines used for driving pulp and paper-mill machinery.

The old intake was at what is now the north end of the new station, and the largest turbines were in the old grinder house immediately downstream. Penstocks



PLAN, HOUSE AND THREE SECTIONS OF SPILLWAY FORM A 2230-FOOT DAM



A LONG CREST-GATED DAM STRETCHES ACROSS WHERE GRAND' MERE PINNACLE STOOD

ran out to the other scattered units. The old intake had to be left in service until two units of the new station were running and electric drives substituted for the old direct-connected mill turbines. This was done by extending the grinder house northward and shifting a unit at a time, without decreasing the production output of the mills. When the shift was completed the old intake was closed by a retaining wall mentioned later.

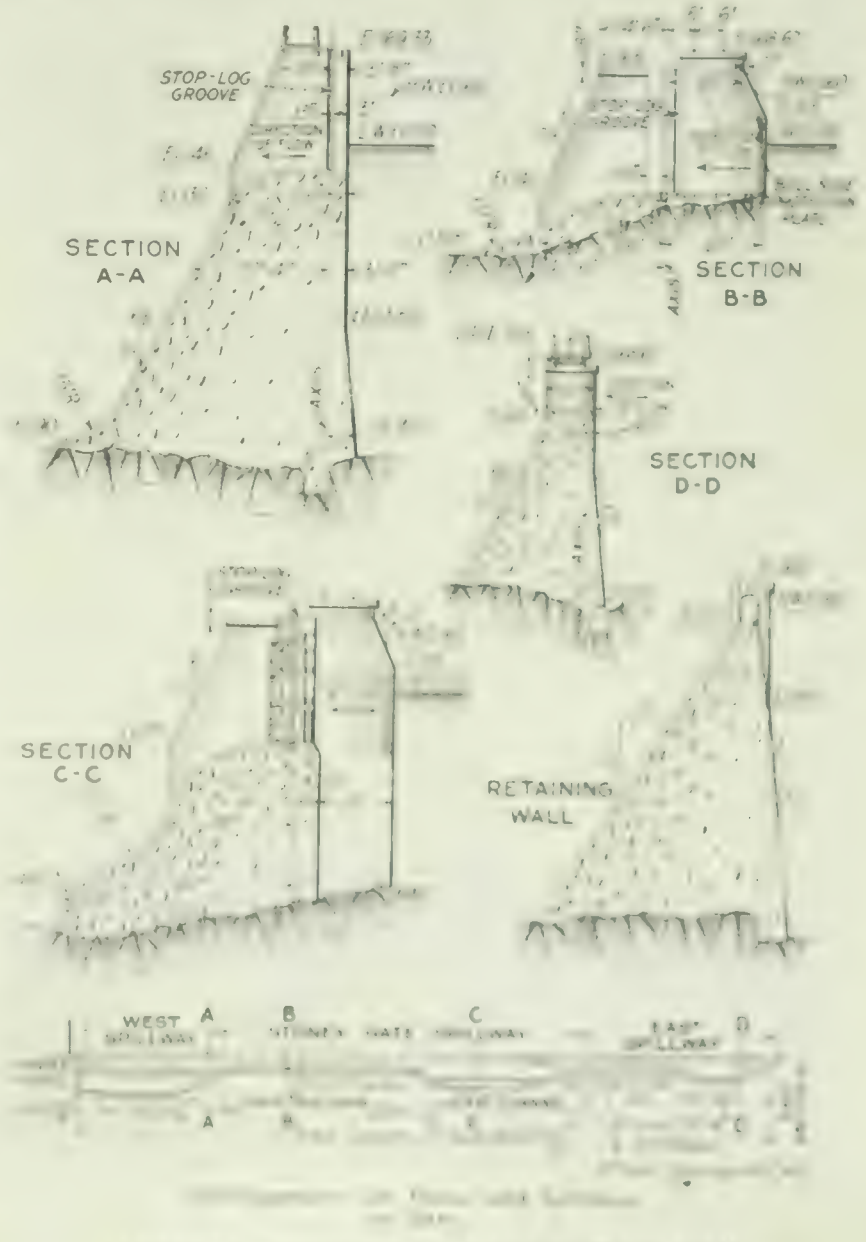
Concrete Dams Replace Wood

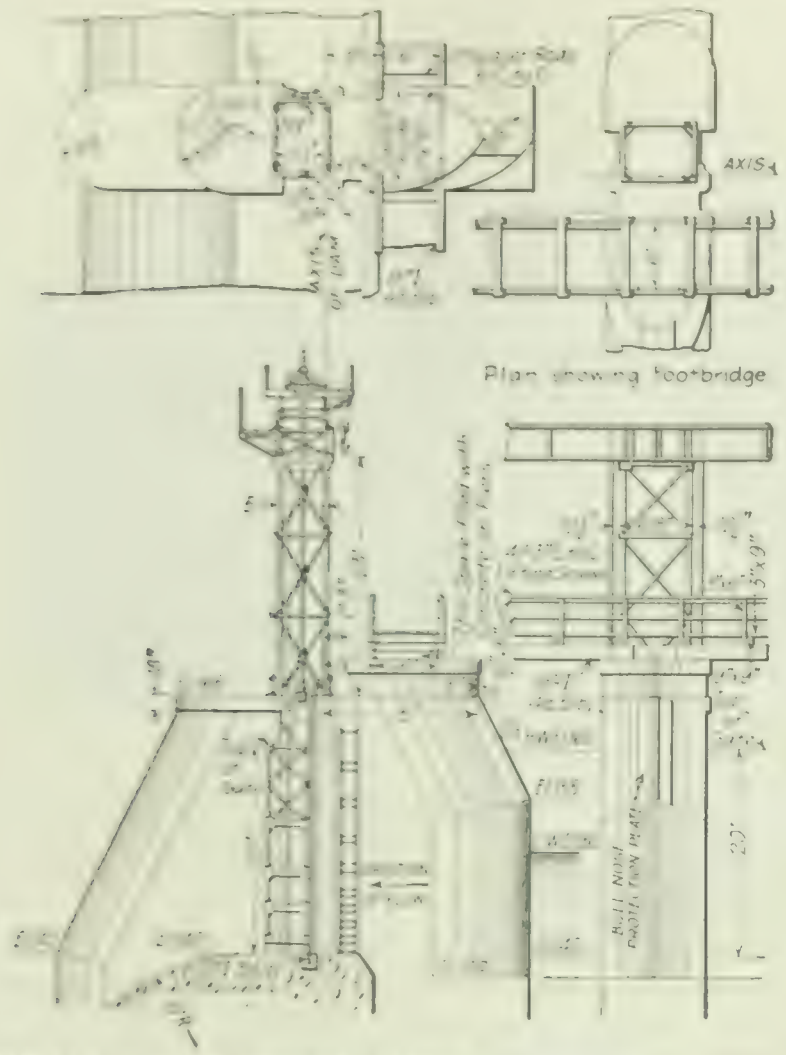
For the new development a series of concrete dams has been thrown across the river, downstream from the old wooden dams. The power house itself forms the dam across the west channel except for a stretch of 330 ft. to what was Grand' Mère Island (now removed). This west spillway consists of a gravity overfall section with 14 piers, mostly 16 ft. apart, supporting a footbridge. Stoplogs will ordinarily be kept between piers on this section of spillway (for the present to El. 156 and eventually to El. 160) when the pulpwood storage yard has been filled in to its ultimate level.

Over the old island, which has been excavated down to El. 144 upstream of the dam so as to give a good approach for high water, and across the east channel the main spillway extends for about 890 ft. It consists of a low gravity overfall section (crest at El. 140, normal water level, El. 160) with 18 gates. Piers, 46 ft. long by 25 ft. high, support the gate frames and footbridge. Beyond the east end of the main spillway is a wing wall, having its crest at El. 160, springing off at an angle and tying into the high east bank.

From the north end of the power house a solid gravity-section cut-off wall on rock runs around the mill's water-supply settling basin and barker room to protect the buildings below the dam. The top of this wall is at El. 168 and the entire development has been planned so that no possible danger can be done with water up to El. 168. With the water at El. 160 and all the spillway gates raised the dam will pass 200,000 sec.-ft. (approx. 12½ sec.-ft. per square mile of drainage area) or 20% more than the maximum recorded flow. At the end of the station there are three sluiceways, together capable of passing about 5000 sec.-ft. One of these sluices has lowering gates to facilitate skimming off trash without wasting water.

The design of the main spillway gates is seen from the drawing. They are of the regular Stoney type. handled from steel bridges. The gate slots are fitted with end and back bearing channels and front sealing angles. Round bronze sealing rods are hung somewhat loosely in the upstream corner between gate and sealing angle as detailed on p. 976.





THE [illegible]-FOOT STONEY GATES ARE HANDLED FROM A BRIDGE BY A TRAVELING HOIST

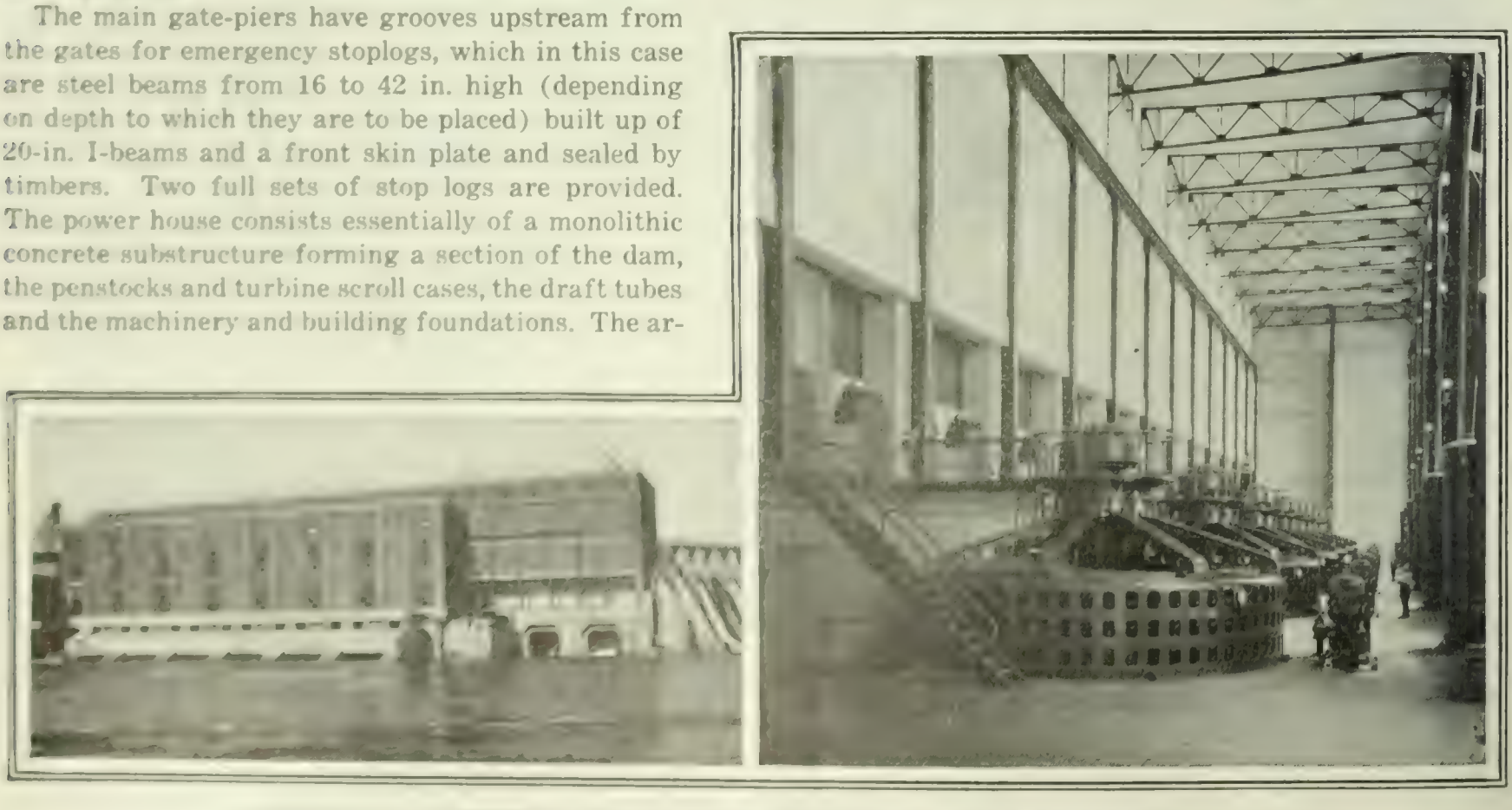
The tops of all the gate bridges are connected by a trolley track of 3-ft. gage, on which the gate hoist is run from place to place. The hoist screws are let down to engage the eyes at each top corner of the gate. After the gates are up they are supported on their own bridges by pins (thrown in by the center lever shown in the accompanying sketch) so that the trolley can disengage and go along. Lowering is of course a reverse process.

The main gate-piers have grooves upstream from the gates for emergency stoplogs, which in this case are steel beams from 16 to 42 in. high (depending on depth to which they are to be placed) built up of 20-in. I-beams and a front skin plate and sealed by timbers. Two full sets of stop logs are provided. The power house consists essentially of a monolithic concrete substructure forming a section of the dam, the penstocks and turbine scroll cases, the draft tubes and the machinery and building foundations. The arrangement is shown in plan and elevation. This results in a generator room on the downstream side 87 ft. high by 45 ft. wide and 325 ft. long (for six units). Back of this room are the low-tension (6600-volt) switching and busbar compartments and above these the transformer room 25 x 25 x 400 ft. Over this in turn is the space 33 x 40 x 400 ft. for the high-tension buses (100,000 volts).

At the north end are the control departments. On the transformer level are control switches and transformers for the mill grinder motors, lubricating and switch oil storage. On the half story above are the storage batteries, the motor-generator sets for 220-volt control circuits, cranes and auxiliary excitation. On the high-tension level are the wash rooms and offices. On the half story above is the control apparatus and benchboard panels, including the switchboard controlling the grinder motors.

On the same level, and of about the same size as the high-tension room, is the gate room. It is separated from the former by the thick top section of the concrete substructure, which, however, is pierced by doors and heating-flues. In the gate room are gratings over the racks in each inlet passage and, upstream from these the emergency gates—plated steel frames in three sections handled by a 20-ton traveling crane. The main gates are placed along the inside wall of the gate room and each is raised or lowered by its own hoist or by the gate-room crane in emergencies.

Underneath the outer wall of the gate room a curtain wall spans between piers and hangs down to El. 147. The warm air from under the roof of the generator and high-tension room is drawn down by a motor-driven fan for each unit and forced into the rack chamber. This is to preserve the heat gradient from the rack bars and gate slots to the water so that no frazil ice will stick. No difficulty has been found with ice, as the approach velocity is very low, less than 1 ft. per sec., and the pond is completely frozen over all winter.



PARTICULAR ATTENTION WAS PAID TO EXTERIOR AND INTERIOR APPEARANCE

The generating units are single-runner, vertical-shaft Francis turbines developing 25,000 hp. at 120 r.p.m. under a head of 84 ft., and each driving a single direct-connected 6600-volt three-phase 60-cycle generator. The notable feature about these generators is the use of mica insulation with which operating temperatures of up to 125° C. can safely be carried.

The weight of the generator rotor and turbine runner (330,000 lb., including 40,000 lb. possible unbalanced hydraulic thrust) is carried entirely by a Kingsbury thrust bearing supported on bridge arms going to the generator armature frame, which transmits the load to the floor. The turbine speed ring serves as a line of interior supporting columns across the interior of the casing chamber.

The Kingsbury bearings are lubricated by oil from a central oil-supply plant coming by gravity through metered duplicate lines. A separate line of oil piping runs to the upper auxiliary (guide) bearing. A small motor-driven pump inside each pit liner returns this oil to the pumping plant for filtering and re-supply. The lower guide bearing is a water-lubricated type with lignum vitæ strips.

The governor for each unit is driven by a lay shaft geared to the main turbine shaft. Water is supplied under 200 lb. pressure to the governors in duplicate pipe lines; the servomotor discharge comes back to the pump room by gravity, is filtered and repumped. The lubricating oil and water-pressure pumps are in a room in a mill building close by the station.

Changes Made on Resuming Construction After Shutdown

As already noted, work on the Laurentide plant was entirely shut down in the fall of 1914 to await the developments of the war, which had halted the old plans for financing. At that time the power-house substructure had been brought up above tail-water, the steel frame erected, and some of the concrete placed for the adjoining 320 ft. of dam and the 458 ft. next to the east bank.

About May 1, 1915, the financing was completed and work started again. When it was decided to complete the construction it was thought economical to employ the Laurentide Co.'s well-organized engineering and construction forces with such few additions as would be needed instead of letting new construction contracts.

The winter of 1913-14 and 1914-15 brought added experience and knowledge of the behavior of a gate-controlled spillway under Canadian winter conditions, so that it was decided to change from the former plans of a solid spillway section of the dam with water level at El. 153, as previously planned, to a gated spillway with the normal water level eventually at 160. This plan resulted in a rise of 7 ft. of headwater.

This meant that the turbines which were originally designed to develop 20,000 hp. would produce 25,000 at the original speed. Being mica insulated, the generators, which were originally rated at 14,700 kv.-a. maximum load were capable of being safely run at the increased capacity without injurious heating.



ON THE CENTER STRETCH OF SPILLWAY ARE STEEL CREST GATES HANDLED BY A TRAVELING HOIST

The consulting engineers, brought into the case at the time of the financing, advised reinforcing the power-house substructure against the greater hydrostatic load by adding concrete above the penstock and extending the tailrace piers downstream. This was done at a reasonable expense, although it delayed the final completion of the station several months.

In the adding of the downstream piers, it was decided to use concrete caissons and air, since the tailrace could not be unwatered with two generating units running. The concrete caisson, as noted in detail in *Engineering News-Record*, Apr. 19, 1917, was built on a platform between double rows of cross-braced piles, lowered by screws, sealed to the rock bottom and filled with concrete. The caissons thus sunk served as the new piers, and were heavily reinforced vertically and horizontally (being designed to act as a cantilever beam taking hydrostatic thrust) and anchored to the old concrete. A heavy deck slab was thrown across from pier to pier.

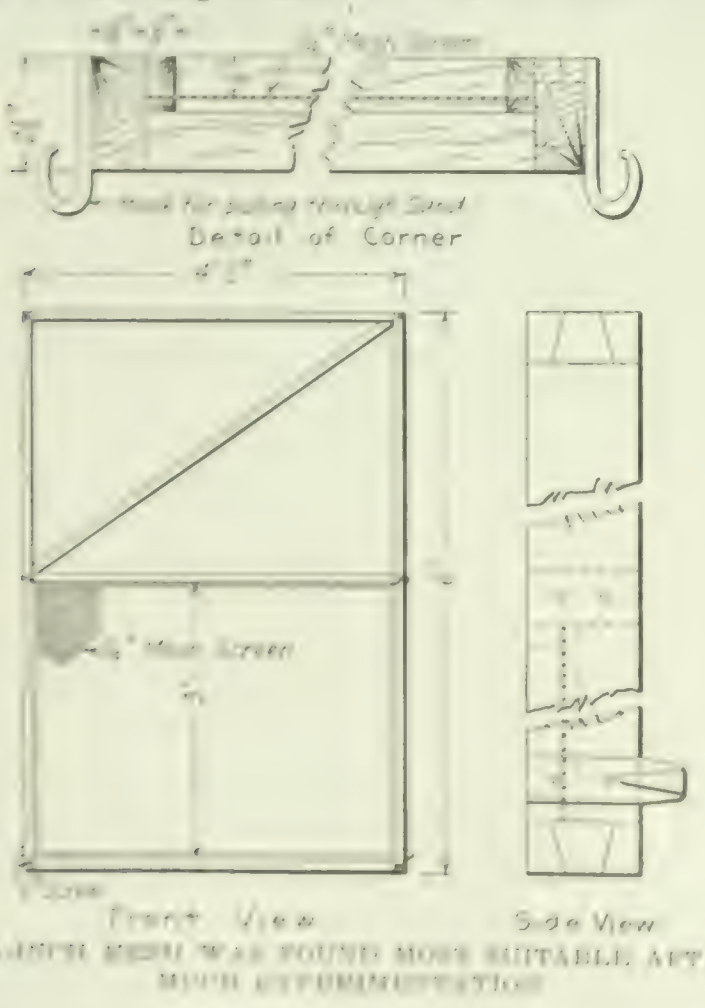
The Laurentide development was originally undertaken by the Laurentide Co., Ltd., the pulp and paper concern, of which George Chahoon, Jr., is president. The original design was made by George F. Hardy, of New York City, as the company's consulting engineer. The work until the shutdown in 1914 was done under contract by H. E. Talbot Co., of Dayton, Ohio. When

the financing was completed, a separate concern known as the Laurentide Power Co., Ltd., was organized to own the power development, and a contract was then made with the Shawinigan Water and Power Co. to operate the station and also to purchase the power—except what was needed for the Laurentide mills. Under these conditions the company completed the construction with its own forces, except that the tailrace caisson work was done under contract by Fraser, Brace & Co., of Montreal and New York. The work since resumption of construction has been in charge of E. B. Wardle, chief engineer of the Laurentide Co., Ltd.

The turbines were designed and built by I. P. Morris Co., of Philadelphia, and the governors by the Lombard Governor Co., of Ashland, Mass. The mechanical parts of the generators were made by the Westinghouse Electric and Manufacturing Co., of Pittsburgh. The generator armature windings, station wiring, switches, transformers and instruments were furnished and installed by the Canadian Westinghouse Co., of Hamilton, Ont. The Dominion Bridge Co., Montreal, furnished all the steel for the station structure, the headgates, traveling cranes and the gates in the dam.

Special Screen To Remove Mud Balls from Mechanical Filters

MUD BALLS in the filter sand which were formed during the first year the filters of the Chain of Rocks plant of the St. Louis water-works were in operation and which were probably due to the low rate of wash used during that period, were removed successfully by pulling a screen through the filter sand while it was being washed at a rate of about 8 to 10 in. vertical rise per minute, according to the annual report for 1916 of E. E. Wall, water commissioner. The screen illustrated in the accompanying drawing is operated by two men walking in the wash-water gutters and holding the screen in a vertical position while two men on top of the division wall pull the screen through the sand by means of ropes attached to the hooks at the bottom of the screen frames. It is necessary sometimes to pull the screen through the same portion of the bed as often as ten or more times, since the mud balls sometimes flow aside with the sand while the screen is being pulled ahead. The bottom of the screen, of course, is held down to the gravel, or as nearly to the bottom of the filter sand as is possible.



The entire bed is gone over in this manner, a special narrow screen being used between the wall and the first gutter. As much as 1,500,000 gal. of water are used during this process of screening.

Various experiments were made with screens of different meshes, varying from $\frac{1}{8}$ to $\frac{1}{2}$ in., and it was found finally that the screen with $\frac{1}{4}$-in. mesh, made of No. 14 wire, gave the best results. The lower half of the frame only is covered by the screen, but since there are only 30 in. of sand in the bed, the screen portion comes well above the normal surface of the filtering layer.

Professional Questions

Engineers are urged to send to the Editor comment on cases presented in this section or statements of their own experiences in matters of professional ethics.

Communications must be signed, but names will be withheld from publication, if the writer so desires.

Engineer Who Guaranteed Cost Got Job

Sir—An article in the "Professional Questions" column of *Engineering News-Record*, Oct. 11, p. 701, entitled "Public Officials Ask Engineers to Guarantee Cost," is of vital interest to many engineers and it is particularly so to us, as we are one of the firms involved, since the article evidently refers to the North Hill Viaduct at Akron, Summit County, Ohio. We wish to call attention to some facts that are not clear in the article.

The Watson Engineering Co., of Cleveland, Ohio, was employed by a committee of citizens to make preliminary studies, surveys and estimates for this viaduct for the purpose of determining its feasibility and as a basis for a bond issue to be voted upon by the taxpayers. The bond issue ($1,200,000) was approved by vote and the company was *subsequently* engaged by the board of county commissioners at the request of the county engineer (as provided by law) to assist the county engineer in making surveys, borings, studies, general plans and estimates for the structure, in order that the location and type of structure should be officially and legally determined. This was necessary to determine properly the compensation and damages due to property owners affected by the building of the structure and approaches. The data and plans prepared by the company were regularly adopted by the board and became a part of the official records on file, and subsequent settlements for compensations and damages to property were based on these and they became a part of the agreements.

One of the provisions of the contract between The Watson Engineering Co. and the board of commissioners was that all amounts paid for preliminary work were to be deducted from the fee for design and supervision of construction—the amount of the fee and other details being provided for in this arrangement.

After the construction of the viaduct had been officially decided upon, the board of commissioners, at the solicitation of some engineers, requested several engineers to submit propositions, estimates, etc., for the preparation of detail plans and supervision of construction. As will be noted by the letter from the commissioners, reproduced below, no guarantee of cost was requested. One engineer, however, criticized the original estimate of cost and stated to the board of commissioners that a structure could be designed at a much lower cost, finally guaranteeing to do this. All other engineers submitted estimates, but declined to guarantee the cost of structure and endeavored to have the commissioners make their selection on the merits of the abilities and qualifications of the engineers considered.

The commissioners, ignoring the county engineer's written recommendation for the engineers that made the original plans (The Watson Engineering Co.), finally selected the engineering firm that guaranteed to design a structure that would cost less than the amount originally estimated. The commissioners stated publicly and privately that the only reason for selecting this firm instead of the one that made the original plans was the guaranteeing of estimated cost.

The points that we wish to make are these: First: This was not an ordinary engineering competition, but involved an engineering firm that had done (very satisfactorily) much work for the county, had been selected to do this work and had been recommended by the county engineer (as required by statute) to continue it, but one particular engineer agreed, for obvious reasons, to guarantee an estimate below the official estimate.

Second: This is not a contingent fee case. It had been decided to build the structure, the bonds had been voted and the survey and the general plans for the structure had been officially and regularly adopted and made a matter of record, and it became a question of the engineers proceeding with the detail plans in the most economical manner, consistent with good engineering practice.

It is not, perhaps, unusual for architects or engineers to do work of a preliminary nature with the understanding that it is contingent upon the work being authorized later, but no such contingencies existed in this case. The guaranteeing of an estimate under such conditions puts the engineer entirely upon a contracting basis and tends to produce a structure that has to be built inside of a certain amount without regard to its character, instead of a structure that should meet all conditions of traffic and appearance. It is interesting to note that no bids were received from contractors on the designs made by the engineers guaranteeing the cost, in response to advertisement, although the structure as developed by them was designed for a much lighter live load than that provided for in the original estimate and was in many ways an inferior structure, in addition to omitting several items included in the original estimate.

We feel that this is an important matter to the engineering profession and that the facts should be presented to your readers in order that there may be free expression of opinion regarding it.

THE WATSON ENGINEERING COMPANY,
W. P. Brown, Principal Assistant Engineer.
Cleveland, Ohio.

[The letter from the county commissioners, to which Mr. Brown refers, follows]:

"Gentlemen:

Beg to inform you that the time for considering the selection of an engineer for the North Hill Viaduct to be erected in this city, has been set for Apr. 13, at 9:00 o'clock a.m.

We are enclosing herewith an information blank which we will ask you to fill out and file with this Board.

Respectfully,
SUMMIT COUNTY COMMISSIONERS."

INFORMATION BLANK

1. Are you a citizen of the United States?
2. Name of firm.
3. Length of time in business.
4. Financial references.
5. List of bridges designed costing over $50,000.
6. List of bridges now under construction or being designed costing over $50,000.
7. Give estimated and final costs of all bridges costing over $50,000 for which your firm has had complete charge.
8. The engineers selected will be required to execute a contract agreeing to design a structure that will cost not to exceed $950,000.
9. Percentage for detail plans, specifications, estimates, and general supervision of the work, including preparation and certification of contractors' estimates. Additional percentage for furnishing competent resident engineer devoting his entire time to the work and for all inspection work, including inspection and testing of all materials used and all concrete inspectors required, and also including all survey and laying out work required.
10. Plans and estimates of cost may be submitted if desired as additional evidence of the candidate's professional ability but preference will be given to work actually executed in judging such ability.
11. How soon after being appointed would you be able to have the detail plans ready so that contract could be let?

Why Not Have All Designs Checked by Outside Experts?

Would not the independent checking of plans and specifications for all important engineering works by experts who have had nothing to do with their preparation be a distinct step forward in engineering practice? The desirability of such a reform has been in the mind of J. A. L. Waddell, consulting engineer, for many years. He has now written to *Engineering News-Record*, expressing himself as follows:

If this independent checking of plans were practiced great disasters, such as the two failures of the unlucky Quebec Bridge, dam collapses, foundation settlements

and many other accidents to engineering structures too numerous to mention, could be avoided. It would add force to these claims were it possible to give a list of the most important failures of engineering works which have occurred during the past three decades; but so doing would raise animosities and cause hard feelings, which is something to be avoided whenever possible.

Without the aid of the law, it would be next to impossible to establish such a custom upon a firm and permanent basis; because, as it is, promoters of enterprises generally object to paying proper fees to first-class engineers for doing the necessary work of designing and supervision. If, in addition, they were compelled to pay some other high-priced engineer to check their engineers' work, they would consider that they were being outrageously imposed upon, and their protest would be both energetic and loud—reaching unto high heaven.

But in providing for the safety of the general public, the financial interests of no set of men should receive much consideration. The governing principle should be "the greatest good for the greatest number." The total amount thus paid for extra checking of plans would be a bagatelle as compared with the economies effected by the avoidance of the expenses of reconstruction, repairs and interference with business—to say nothing of the saving of human lives, which is something to which no money value can be assigned.

It is within the realm of possibility that at first there may be objections raised to this suggested innovation by some designing engineers; for they may feel that their rights and privileges are being encroached upon, their dignity offended, and their *amour propre* insulted.

No broad-gage engineer, however, ought to look at the matter in such a light, because he certainly should be pleased to have all his important work receive an extra check, and thus avoid even the most remote possibility of disaster to his constructions—and all this without any cost whatever to himself.

In order to obtain the greatest possible benefit from the proposed innovation, the work should be divided into two parts, first, the checking of the layout of structure or plant before any detail plans are prepared, so as to settle the question of economics at the outset; and, second, the checking of the final drawings, so as to eliminate all mistakes of computing and drafting.

There is likely to be more objection raised against the first step than against the second, as the designer may not like to have his economics questioned; but, again, if he be a broad-gage man, he will gladly adopt any modification of design which tends toward real improvement or true economy.

There is danger of friction arising between the original and the checking engineers, and this might be deemed a serious objection to the innovation. However, a little possible friction is not comparable in importance to the security against disaster that would in all cases be obtained, for it is almost inconceivable that two engineers, or two sets of engineers, working entirely independently of each other, should make the same error.

It should be understood *imprimis* that under no conditions would it ever be allowable to discharge the original engineer and put the checking engineer in his place, for that would always lay the latter open to a general, but usually unmerited, suspicion of unfairness. If the original engineer be found unfit to do the work, a third engineer should be employed in his stead, and the second engineer should check the third engineer's work.

If, Mr. Editor, you will open your columns to a thorough discussion of this suggestion by engineers in general, you will be conferring a favor upon the entire profession.

Charges for Professional Service

Sir—In reply to the first query of "Engineer" regarding proper charges for professional service, appearing in your issue of Nov. 1, p. 824, permit me to state that the 6% commission suggested by "Engineer" is insufficient should "Engineer" attempt to give complete professional service in connection with the proposed improvement. Should "Engineer" furnish the service which the Code of Professional Ethics of the American Institute of Architects prescribes shall be furnished, then I would say that for a job such as described by "Engineer" the actual cost in money to "Engineer" for handling the work will be at least 6% of the cost of improvement—7½% would be more nearly the proper charge.

Of course, if "Engineer" should furnish such service as is furnished by too many engineers and, I am very sorry to say, by many architects, then the 6% fee is too great. This kind of service briefly is as follows:

The preparation of very crude floor plans and elevations that contain practically no details and in many cases do not even indicate the structural design. Usually on such plans will be found a note reading as follows: "This building shall carry a load of —— pounds per square foot. The contractor to whom work is awarded will be required to furnish the structural design and details satisfactory to the engineer." The same proceeding is true with regard to practically all of the construction. It is left to the contractor to design the building. When it comes to electric wiring, heating, sprinkler equipment, plumbing, etc., no attempt is made to design anything. The plumbing is usually handled as follows:

"All work shall shall be installed in accordance with the requirements of the Health Department and —— fixtures shall be used." For the heating, instead of preparing a carefully worked out design on which competitive bids can be secured, there is note in the specifications that the contractor shall install a heating system to heat the building to 70 deg. temperature with zero outside temperature.

This is the only way these fellows can get away with their low commissions and not be compelled to accept commissions from material dealers or contractors. They do not furnish service; in fact, I am of the opinion that the price they charge for the service rendered provides a much greater percentage of profit than if a fee of 7½ or 6% is charged and complete service rendered. In fact, I am not sure but that any engineer or architect who will do less than provide complete working drawings and detailed specifications of every branch of the work is guilty of a moral, if not a legal, fraud.

F. E. DAVIDSON, A. I. A., M. Am. Soc. C. E.,
Chicago. of Davidson & Weiss, Architects.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

The Engineer Title

Sir—Emile Low's comment on the general misuse of the engineer title, in his letter appearing in *Engineering News-Record* of Aug. 23, p. 369, is quite correct.

The public in general gets wrong and confusing ideas, even from those who are supposed to know; and not until the word "engineer" is displaced, in cases such as those mentioned by Mr. Low, by a more suitable term, as for instance "machinist," which term signifies a person versed in the principles of machines, one who runs a machine or one skilled in the use of machine-tools, and not until such term is accepted officially, as it is all over Europe, England excepted, can we make reasonable complaint against the misuse of the engineer title.

Shanghai, China. H. BERENTS.

Lighting a Drafting Office

Sir—I was very much interested in the account of the lighting of a large drafting office of the Northern Pacific Ry., which appeared in your issue of Oct. 4, p. 662. The article states that: "Photometric tests with 100-watt 'C' lamps previous to installation gave an average of about 8 foot-candles at 2½ ft. above the floor level."

Since there is one 100-watt unit for each 9 x 8 ft., or 72 sq.ft., an illumination of 8 foot-candles would mean an efficiency of utilization of $8 \times 100 \times 72 \div 1260$, or 46%. It is improbable that an efficiency of utilization of 46% could be obtained by indirect lighting. It is therefore assumed that the preliminary photometric tests were made with direct lighting.

The entire illumination for the period from December, 1915, to the fall of 1917, with 100-watt lamps, was evidently approximately $1260 \times 0.25 \div 72$, or 4.4 foot-candles. It has been the writer's experience that the usual indirect lighting system suffers a deterioration of approximately 50% during its first year's use, due to the lack of proper maintenance. In the fall of this year, therefore, the illumination was approximately 2.2 foot-candles. In consideration of the fact that from 8 to 15 ft. is required for drafting, there is little wonder that unsatisfactory results were obtained.

When the 150-watt "C" lamps are installed, it is very likely that the reflector will be cleaned, and an initial illumination of $2050 \times 0.25 \div 72$, or 7.1 foot-candles will result. Should 200-watt "C" lamps be used, an initial illumination of $2920 \times 0.25 \div 72$, or 10 foot-candles, would result. It has always been the writer's practice to allow a factor of safety of 25% for the fall in illumination between periods of cleaning. The 200-watt "C" lamps would therefore be satisfactory, assuming that the ceiling is in good condition.

It is noted that 80-watt "C" lamps are used in those portions of the room where no drafting work is done. There are no 80-watt "C" lamps listed, so I presume 75-watt "C" lamps are used. If this is direct lighting, an intensity of approximately 5.5 foot-candles would be obtained: $865 \times 0.46 \div 72$. This is the correct intensity for office lighting. If 75-watt "C" lamps are used in the indirect fixtures, however, the initial illumination would be only $865 \times 0.25 \div 72$, or 3 foot-candles; and with a deterioration of 50% it would be only 1.5 foot-candles.

For the past six months I have been coöperating with the Industrial Commission of Wisconsin in establishing suitable minimum standards of illumination, and in conducting an educational campaign for better lighting among the manufacturers and employers of Wisconsin. A large number of illumination surveys have been made in factories of the state, and the need for more adequate illumination and better maintenance of the lighting units has been emphasized. DAVIS H. TUCK,
Illuminating Engineer, U. S. Public Health Service.

Madison, Wis.

[The letter printed above was submitted to H. E. Stevens, chief engineer of the Northern Pacific Ry., and his reply follows.]

Sir—Your letter of Oct. 22 is received, with copy of comments made by an illuminating engineer on the lighting of the Northern Pacific drafting room. The tests referred to in our article were made with the indirect fixtures, which were at the time brand new. The ceilings were also new, likewise the lamps. These were 75-watt "C" lamps, but at that time were rated as 80-watt, the tests being made before the lamps were openly placed on the market.

The results given by the averages of a number of tests with these new lamps showed a greater efficiency than 100-watt lamps which had been burned about five months and used in the same fixtures. The 200-watt "C" lamps are now installed in the drafting room as originally planned, and the results are entirely satisfactory.

Your correspondent has evidently had the common experience of all of us as to the difficulty in keeping clean the reflectors of the indirect lighting system. This, it seem to me, is their greatest drawback. These reflectors are natural dust catchers and so inconvenient to get at that they are very apt to be neglected. I think the factor of safety he assumes of 25% between periods of cleaning is quite conservative.

H. E. STEVENS,
Chief Engineer, Northern Pacific Ry.

St. Paul, Minn.

Areas of Segments of Circles

Sir—I have worked out a formula for areas of circular segments which your readers may find useful at times. The formula is

$$A = al\left[\frac{2}{3} + 0.475\left(\frac{a}{l}\right)^2\right]$$

where A = the area of the segment, a, the altitude, or mid-ordinate and l, the length on the chord.

This formula gives the area of any segment not greater than a semicircle with a maximum error less than ½ of 1 per cent. The results are always low. The formula is not suitable for use with logarithms, but the slide-rule handles it well, giving the quantity $0.475(a \div l)^2$ in one setting. It will frequently be close enough to use ½ instead of 0.475.

The formula is derived as follows: When $a/l = 0$, $A = \frac{2}{3}al$. When $a/l = 1$, $A = \frac{2}{3}al + (\frac{1}{3} + 0.1187)al$. The coefficient of al is seen to be greater than $\frac{2}{3}$ by a quantity which varies from 0 to 0.1187. Assuming that this quantity is proportional to $(a/l)^2$ the general formula becomes,

$$A = al\left|\frac{2}{3} + 0.1187\left(\frac{a}{l}\right)^2\right|$$

$$= al\left|\frac{2}{3} + 0.475\left(\frac{a}{l}\right)^2\right|$$

The formula is simply an approximate interpolation. If the interpolation were on the basis of a/l instead of $(a/l)^2$ the maximum error would be about 4% and all results would be high.

L. H. DOOLITTLE,
Corporal, Company F, 313th Engineers.
Camp Dodge, Iowa.

The Engineer and His Looks

Sir—Looking backward over fourteen years' experience in the railway game, I recall the boast of more than one man that his rodman had been mistaken for the engineer—the rodman, especially if a "new" man, having been the best dressed, best appearing man in the party.

I recall the relation of an incident, in which a grading foreman, believing the man appearing before him to be a tramp, attempted to hire the construction engineers.

I recall the joy with which Division Engineer B—— C—— told of his "cussing out" a Pullman conductor. Mr. C—— had been on the "line" a week. He brought muddy boots, dirty, torn clothes and whiskers back with him. The conductor put him in the class to which he appeared to belong and barred his entrance to the Pullman.

I recall the revocation of a privilege granted by a large railroad to its engineers, permitting them to ride in a certain through train. The appearance and actions of the men permitted to use it had proved inconsistent with the desire of the management to attract a certain class of patronage to that train.

I wonder what effect such conditions have upon the judgment of layman and employer on the position of the engineer in life, and to what extent they may be responsible for advertisements such as the one noted in your issue of Oct. 11, p. 673.

N.

Serial Bonds for Road Building

Sir—The writer has studied with some care and considerable interest the article of M. O. Eldridge in the *Engineering News-Record* of Aug. 30, captioned "Serial Bonds for Road Building Save Money," but he differs with some of the conclusions, particularly with those based upon the mathematical comparisons of the three methods. A thorough study of the subject will show that as far as the mathematics of finance is concerned there is a definite law of conservation of value through all the various stages of the process of amortization.

Mr. Eldridge has neglected to make the comparisons of the different methods in a fair way, in that he has fallen into the error of simply adding the various annual payments, without regard to the time they were made, or their amount, and then striking a balance. It would appear that this error is a common one among investigators in the field of finance. The writer had occasion (*Engineering News-Record* of May 10, p. 324) to point out a similar error in W. H. Connell's study.

The only way to strike a balance is to refer the different methods to a common point in time on the basis of value at that time. The easiest way to make such a comparison is at the beginning of a period, as we can then take the various "present worths" from the tables of Bulletin No. 136, which Mr. Eldridge has so frequently quoted.

The requirements for the sinking-fund method of Mr. Eldridge's example is $7536.10 annually for principal and interest. The present worth of an annuity of this amount for 20 years at 4% is $102,415. The annual requirement under the annuity method is $7358.18. The present worth of this annuity is $100,000, the cash value of the improvement.

The present worth of the serial method is more complicated. It is the sum of 20 annual annuities as follows: One of $5200 for 20 years; one of $200 for 19 years; $200 for 18 years; $200 for 17 years; and so on. The total is $100,000.

This shows that there is no advantage whatever in the serial method over the annuity method, and $2425 advantage over the sinking-fund method. Mr. Eldridge's results are therefore in error in stating that the serial method possessed an advantage of $8722 over the sinking-fund method and $5163 over the annuity method.

Now, Mr. Eldridge has figured the sinking-fund at 3½%. This is, to the writer's way of thinking, unfair, because there is nothing to prevent a community's sinking-fund commission from buying its own bonds, and this is frequently done. Furthermore, for purposes of comparison the value of money should be the same for both purposes in a community with any financial standing whatever. If, then, the sinking-fund had been computed on a 4% basis instead of 3½% the annual charge would have been $7353.18. This result would indicate that there is no pecuniary advantage in any of the three methods.

As regards the opportunity for mismanagement and its concealment under the sinking-fund method, the writer agrees that the serial method offers advantages to the public in that any irregularity will be indicated as soon as it occurs.

Mr. Eldridge has overshot the mark in his enthusiasm for the serial method and has thus laid it open to suspicion. The problem of introducing sound financial methods in communities unused to such processes is difficult enough without the introduction of errors in calculations.

The law of conservation of financial values is of no less universal application than the law of conservation of energy.

ADOLPH J. POST.
Shirley, Mass.

Macadam Roads in the War Zone

Sir—I have been very much interested in the article covering the subject of macadam roads under war traffic and the several comments made thereon as appearing in later issues. I have had the opportunity quite recently to talk with one of the American ambulance drivers who has returned from the French front after about nine months of active service in that section. He advises me that *very often* great holes are torn open in the roads, due to bursting shells and that in some places the traffic has been so continuous that

when anything went wrong with one of the vehicles it had to be ditched in order to prevent congestion on the road.

From what I have read and learned from talking to men who have been under fire in this great European war, it seems to me that it would be impossible to maintain, as suggested in one of the criticisms of your editorial, a concrete road under such damaging fire. One does not have to stretch the imagination very far to realize that the natural advantages of the concrete road over the plain water-bound macadam would necessarily be a negligible factor. If the traffic upon the battlefield highway was, as has been stated, virtually continuous, and at frequent intervals the concrete surface was torn open by bursting shells, such a structure would in a very short time become a series of patches over which the traffic would no doubt find fully as much difficulty in passing as over the crude macadam now constructed in the French battlefields. In other words, it seems very foolish to me to try to point out the advantages of higher classes of pavements over the simple water-bound macadam unless it can be definitely shown that those battlefield highways are subject to only the wear caused by the traffic.

G. R. BASCOM,
Municipal and Sanitary Engineer.

Madison, Wis.

Extra-Work Payment Clause in Miami Specifications

Sir—I note the letter of Mr. Victor Windett on page 895 of your issue of Nov. 8, and I wish to express my agreement with his views.

In my experience, both as an engineer and in contracting, I have found that many contractors appear to assume that a margin of 10% or 15% over and above the actual cost of material and labor will cover overhead and general expense, plant, profit and contingent expenses, whereas it is a fact that the proper charges for plant and overhead expense will exceed 10% on large contracts and will often reach 15% on medium-sized contracts.

In making preliminary estimates engineers too often omit the expense properly chargeable to the cost of construction, and this is one of the reasons why proposals so generally exceed the amount of such estimates; another reason being that, unless an engineer has had sufficient contracting experience, he is unable to understand or appreciate the difficulties that the contractor will have to meet and overcome, the risks that must be taken and the additional time that may be required over his time limit.

JAMES RITCHIE,
Civil Engineer.

Cleveland.

Shall Engineering Courses Be Made Shorter?

Sir—Referring to your editorial of Nov. 8, p. 864, on the shortening of Princeton University's engineering course, it may be of some interest to learn how the college of engineering of West Virginia University has met the war situation. By continuing the work of the junior year through the summer of that year and by slightly decreasing the required work, the class which would normally graduate next June will receive their degrees the middle of the coming December. The decrease in the required amount of work was brought about by dropping thesis and some optional courses—the whole amounting to eight credit hours, or about 4½% of the whole course. The reason for lowering the requirements was two-fold; in the first place it served as an inducement to the student to continue work during the summer and in the second place it was felt that these special courses could well be dispensed with at this time.

The results have amply justified the modification of the curriculum. The students did a better grade of work during the summer than they usually do during the regular semester. This was probably due to a number of reasons, such as the absence of outside activities—athletics, dances, fraternity loafing, etc.—concentrating the work by giving fewer courses at one time, and a more serious attitude due to the presence of war.

The real test of carrying school work through the summer is its effect on the work of the regular school year. In general it may be said that the work of the fall semester has been satisfactory although it is apparent that the long summer grind has taken away some of the freshness and enthusiasm from the student's work.

The present conditions justify intensive school work, but *Engineering News-Record* is correct when it states that "study, as such, is not a process that can be carried on continually."

ROLAND P. DAVIS,
Professor of Structural and Hydraulic Engineering.
West Virginia University.
Morgantown, W. Va.

Asphalt at Columbia Cantonment

Sir—We note with interest a letter regarding the paving at the Louisville cantonment, published in your issue of Nov. 8, p. 893. In this connection, permit us to state that the contractor for the Columbia, S. C., cantonment has informed us that in laying the roads for this cantonment he first used a car of Aztec asphalt, then a car of Bermudez asphalt, and after a demonstration of both it was decided to use Aztec asphalt exclusively in the paving work at the Columbia cantonment until completed.

UNITED STATES ASPHALT REFINING COMPANY,
J. R. Draney, General Sales Manager.

New York City.

Let Road Building Continue

Sir—Now is the time for all good men to discuss military roads and priority order No. 2. While it is true that certain highways in time of invasion, in the event of our railroad systems failing us, may be used primarily for the mobilization and maneuvers of troops, artillery and supplies, these highways will be few in number and mileage. Moreover, since this war is as much a war of food and other resources as it is of manpower and ammunition, it is my conception of the road situation in America that every road in the land is a military road. It would be strangely inconsistent for us to proclaim that the kernel of wheat or pound of beef produced in some remote part of our land is war food which may win the war, and at the same time fail to recognize that the road over which it may travel

in order to go to our allies or to our own people is intrinsically a military highway. World's commerce is not confined to intercourse from port to port, neither does it begin at the factory or mill. World's commerce—according to a precise view—begins rather in a trap or seine, at the mine's mouth, in the lumber camp, on the ranch, or at the farmer's door. And world's commerce today is war commerce, which makes every highway in the land a military road.

While we may recognize the emergency which prompted the issuance of priority order No. 2 and may admit that coal is more important now than sand, gravel, broken stone, etc., yet the situation may prove to be a relapse to the early war-cry of curtailing road and bridge work. Let us not forget that the development and conservation of our resources is unusually intimately connected with continued, if not increased, development of all of our highways. The earliest possible recission of priority order No. 2 is the least that can be done for the good of the cause. In the meantime, let the good work for highway planning and improvement go on.

J. E. KAULFUSS,
Highway Engineer, North Dakota Highway Commission.
Bismarck, N. D.

Right-of-Way Computations

Sir—Referring to your issue of Sept. 6, p. 439, the distance along the right-of-way line on a simple curve can be found by the formula, $x = D \pm DO/R$ where D is the distance along the center line of the curve; R, the radius of the curve, and O, the offset to the right-of-way.

In the example given by Mr. Sanow, where $D = 254.9$, $O = 33$ and $R = 1206.57$ it is necessary only to solve $254.90 \times 33 \div 1206.57 = 6.97$ and add to $254.90 = 261.87$, which is the value of x.

This method avoids the calculation of the value of A in Mr. Stevens' formula.

R. B. COLLINS,
Assistant to Division Engineer, Pennsylvania R.R.
Buffalo.

Formula for Haul, Waste and Borrow

Sir—In my article in *Engineering News-Record* of Aug. 9, p. 260, the following correction should be made:

"*d*, cost of hauling and dumping material taken from cut to fill, per cubic yard hauled 100 ft."

The words "100 ft.," left out of the article as printed, are essential if the formula is to produce exact results.

W. C. WEST,
Highway Engineer, Bureau of Public Works.
Manila, P. I.

Railing Designed To Withstand Auto Collision

Sir—The caption to the second cut in the article by H. K. Higgins in your issue of Oct. 4, p. 653, indicates that a concrete railing is unsafe under the impact of a colliding automobile. To this point of view I desire to take exception, knowing from experience that a railing adequate to this purpose can be designed, in fact has been designed and used by the New York State Department of Highways. This rail has been through numerous accidents and in no case has failed to perform its duties. In other words, no vehicle has gone through the railing.

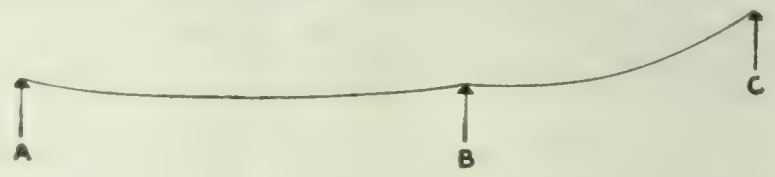
The rail illustrated is not scientifically designed, being merely a concrete substitute for wood, lacking entirely the transverse strength which wood has. From the illustration it can be seen that the effective depth of the concrete in this rail is exceedingly small and the reinforcement is therefore inefficient. On the other hand, the standard rail of the New York State Highway Commission has been carefully designed and the present detailing was arrived at after a thorough study and many practical experiments. The rail is reinforced for tension and for horizontal and diagonal shear.

The two designs are utterly different. To the inexperienced reader it might appear that reinforced-concrete railing in general has not given satisfaction. It is the broad statement of the caption, not the picture of the broken railing, which is objected to. It must be recognized that the function of the railing is not necessarily to remain intact after a blow from a vehicle, but that it has served its real purpose if it prevents a vehicle from going through the railing and down the embankment on the other side. This is what the standard railing of the New York State Department of Highways does.

G. C. WRIGHT,
Assistant Engineer, Monroe County.
Rochester, N. Y.

A Difficult Problem in Chaining

Sir—In a recent survey made by the writer, a 300-ft. steel tape was used whenever possible because, although there was a 100-ft. tape in the party's equipment, only the longer tape had been standardized by the State Bureau of Weights and Measures. In some cases the use of the longer tape made it impossible to hold both ends at the same elevation, and in one case the tape touched the ground at a point near the midlength. While this was known and measurements were taken so that



corrections of proper magnitude might be made for this unusual condition, I found my mathematical equipment too meager.

While it seemed possible to figure corrections on the basis of the tape hanging as a catenary just as if the ends were at the same level, and then correcting for the cosine of the angle, I was not certain how much error this would involve.

The conditions of the problem are shown in the accompanying sketch. A, B and C are the three points of support, all at different known elevations, and point B is assumed frictionless. The pull on the tape at C is known in pounds, as are the constants of the chain, and the temperature and the reading of the tape at A, B and C. I ask your readers whether they can supply an exact solution of this problem; but, if this is not practicable, even an approximate method would be of help not only to the writer but no doubt to many other engineers who have been tempted to make measurements under similar conditions.

DUDLEY PAUL BABCOCK.
Albany, N. Y.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Trussed Booms Mounted Over Columns Double Speed in Erecting Steel

BY L. R. TALBOT
Three Rivers, Quebec

TIMBER booms resting at the center on previously erected columns and rigged with a single main fall, as shown in the photograph, were used in erecting the new power house of the Laurentide Co. at Grand' Mère. This power house has nine units, each consisting of two bays 22 ft. wide. The first contractor did not use this rig, but started to erect the steel work with "Chicago booms." These so-called booms were of timber about 30 ft. long, and were attached to the last column erected. The foot block was a heavy casting attached to the column with U-bolts about 15 ft. from the top, the bottom falls being attached to the top of the column. The boom fall line and load line were carried to an engine on the ground floor. After the two columns and a truss ahead had been erected it was necessary to dismantle the entire rig and reërect it on the next bent. This operation took the greater part of a day.

After the work was taken over by the company the method shown in the picture was substituted. It originated with John A. Wiener, superintendent of construction, and was worked out with the writer, who was engineer on the job.

Two booms 45 ft. long were used. These were trussed on top as shown and mounted on the purlins of the last bay erected. The back end was chained down to the next truss behind and tightened with wedges. The fall line was carried to the drum of an engine on the ground as in the other scheme. An independent falls was attached in the center of each boom for erecting the connecting beams. The booms were given enough elevation to raise the trusses without any trouble.

After a bent of steel was erected and the purlins were placed, it was only the work of a few minutes to unchain the booms and slip them ahead to the next position and chain them down again. After they had proved themselves a success a large U-bolt was made to anchor them down, which simplified the work. This rig more than doubled the speed of the erection.



AFTER NEXT TRUSS IS UP. BUT A FEW MINUTES ARE REQUIRED TO SLIDE BOOM AHEAD

Concrete and Fill Placed Quickly by Car and Incline

BY GEORGE W. MCALPIN
Engineer in Charge, U. S. Dam 33, Ohio River, Maysville, Ky.

MIXED on a tower boat, chuted to a specially constructed car, hauled to the top of a hill on a trestle and there dumped into a hopper to be carried away by concrete buggies, concrete was cheaply placed at Dam No. 29, Ohio River, for the land power-house foundation.

The power-house foundation is being built on the first bank, 30 ft. above the level of, and 350 ft. back of, the land wall of the lock. The job consists in building a concrete foundation of 590 cu.yd., making a 5000-yd. fill and connecting power house to the top of the bank by a concrete roadway.

The mixing plant, described in *Engineering News* of Feb. 1, p. 270, is of the floating type, and carries two mixers and the tower. The mixers on the boat were the only ones available and could not be removed without destroying value of this part of the plant; it was therefore decided to place the boat alongside the land wall and chute concrete to a car to be carried to top of hill. The car, holding a hopper and dumping on the side, was constructed from material on the job, and after completing the concrete work was used to place fill for the terrace. The car was operated by means of



CAR AT LEFT PULLED UP INCLINE FROM MIXER BOAT BY HOIST AND RETURNED BY GRAVITY

cable and hauling engine and returned by gravity. A trestle at the top of the bank brought car to a suitable level so that concrete dumped into a hopper could be taken away in buggies.

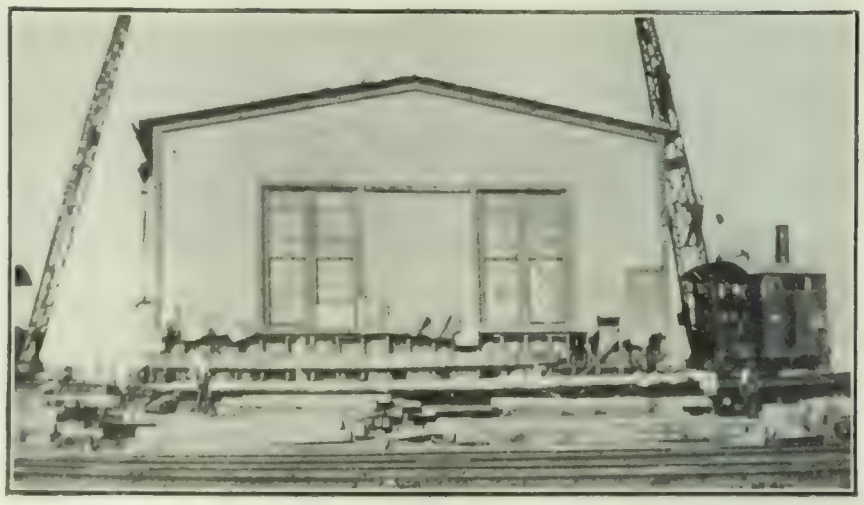
In making the 7-ft. fill material was unloaded from barges by a derrick boat into a hopper discharging into the car, which carried it to the top of the hill and dumped it from the trestle. The material was distributed by a crane using a clamshell and by wheelbarrows. Fill was placed at rate of 300 cu.yd. and concrete at rate of 200 cu.yd. per 8-hour day, the car making the round trip to top of trestle and back in less than 1½ minutes.

Cranes Move Twenty-Five Ton Wooden Building Half a Mile

By John H. Sawkins
Jersey City, N. J.

TWO 15-ton locomotive cranes recently picked up a 25-ton wooden frame building 35 x 42 ft. in plan, and 22 ft. from the floor to the peak of the roof, and moved it from the old Pennsylvania R.R. car repair yard at Greenville, N. J., to the new yard now being constructed just north of the old site.

The building was first reinforced with 6 x 12-in. yellow pine timbers, bolted around the lower edge of the four walls, and 12 screw-jacks, each of 10 tons capacity, raised the structure high enough to allow three 50-ft.



CRANES HAD TO KEEP THEIR DISTANCE



LOAD WAS CARRIED BY THREE 50-FOOT PILES

yellow pine piles to be slipped under the building, their ends projecting 4 ft. beyond the wall at either side. The pile placed in the center of the building was connected at its middle point by two 4 x 12-in. yellow pine timbers to the central truss of the structure. This gave additional stiffness to the two end walls and the end piles added stiffness to the two side walls. The carrying piles were securely bolted to the 6 x 12-in. timber mentioned above. Two slings, each consisting of three loops of three 4¼-in. cables, were connected to the projecting ends of the piles, three turns of the cable being taken around each of the pile ends to reduce cutting action.

Since the maximum allowable load for each of the cranes was 30,000 lb. at a 10-ft. radius, it was assumed that each crane would be taxed to about its maximum

allowable load, since their booms were extended to a 12-ft. radius during the period of moving. The utmost precaution was taken to keep the cranes at the same distance apart, since they were not connected in any other way than through the building itself. Any separation would have thrown an unusually severe load on the crane and might have precipitated failure.

The contractor for the work was Henry Steers, Inc., New York City, and the superintendent in charge, A. R. Moxter.

Build High Fence Around Job To Save Theft of Tools

THE SITE of the clear-water basin at the Cleveland, Ohio, filter plant, together with the property on which the contractor's concrete plant for doing the work was situated, was inclosed in a plank fence more than half a mile long, the only openings in which were a gate for wagons and the workmen at the northeast corner of the basin, and a few gates, kept padlocked, across railway tracks. Ottomar Stange, of the John F. Casey Co., contractors for the relining of this basin, described on page 962 of this issue, figures that the cost of the fence will be saved in small tools and supplies usually lost on a contract job of this size through the peculations of workmen and the operations of local thieves. With the fence, a single watchman is able to look after the work, and men are not so liable to steal wrenches and rubber packing when they know they must pass through a single gate under this man's eye.

In addition, the fence represents a large potential saving in liability for injury to the public. It would not be safe to have self-constituted representatives of the taxpayers wandering over the surface of a concrete roof cut full of holes, and it would have been difficult to keep them off by other means.

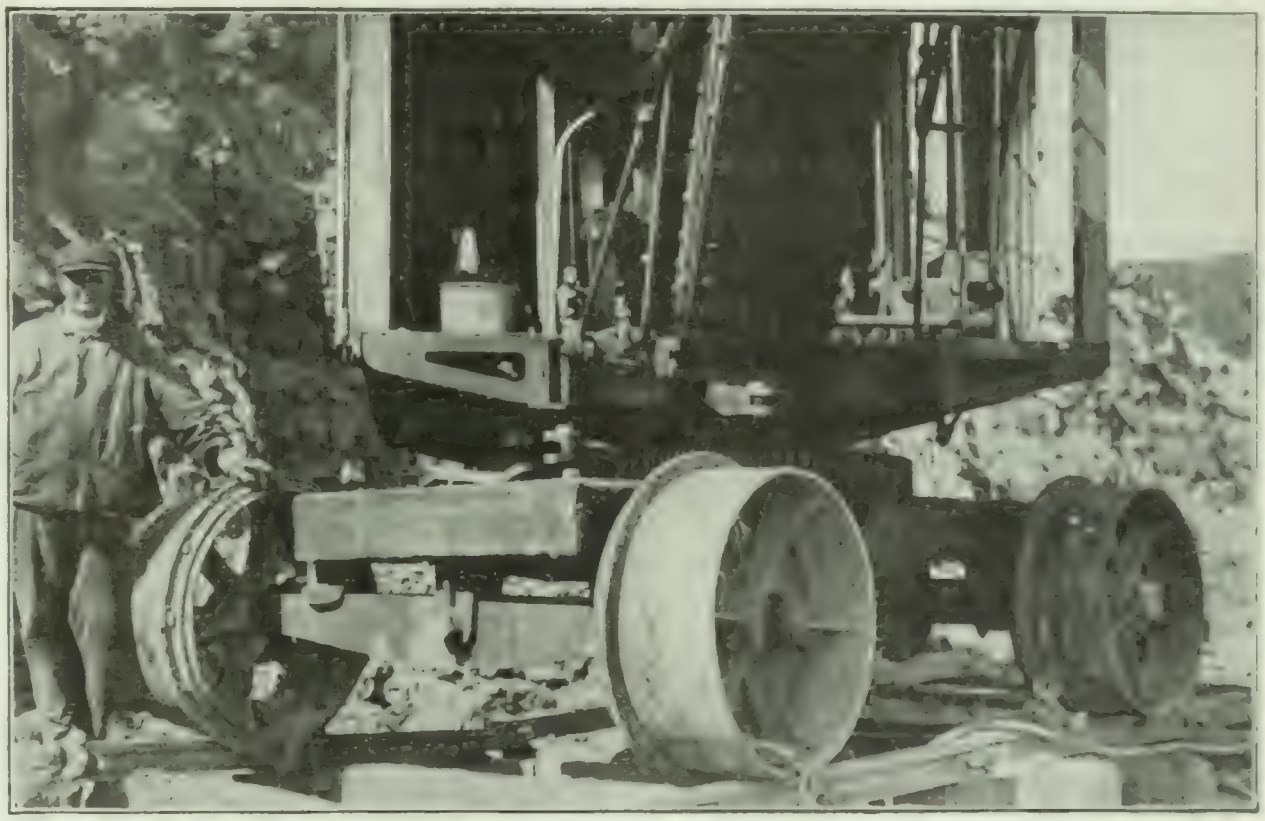
The fence, 2700 ft. long, is made of 4 x 6-in. posts 12 ft. long, to which 11 rows of 1 x 8-in. plank are nailed solid on the outside. This is surmounted by three strands of barbed wire tacked to 2 x 4's nailed to the large posts.



HIGH FENCE SAVED TOOLS AND REDUCED LIABILITY

Shovel on Track with Plank Platform Does Not Fear Slides

REVOLVING steam shovels mounted on platform tracks, and having flanges fitted to the broad-faced traction wheels, are found to move with the toe of a sliding bank instead of being buried with the slide. They are thus ready to start clearing up the material when the movement stops. This method is used for the brickyard shovels of the Duffney Brick Co., at Mechanicsville, N. Y.



STEAM SHOVEL MOUNTED ON TRACK WITH PLANK BASE MOVES WITH SLIDING BANKS

The flanges are put on the inner edges of the wheels, as shown in the picture. The track sections have a plank base 9 x 6 ft., each platform carrying four ties with 6-ft. rails. With the wide-faced wheels mounted on rails it is possible to turn sharp corners by placing the platform sections on chords of a circle and putting in a 4-ft. section of rail to fill the gap on the outer side.

Many Activated-Sludge Plants

About 25 experimental activated-sludge plants have been built in various parts of the world, according to a paper read recently by T. C. Hatton, chief engineer, Milwaukee Sewage Commission, before the American Public Health Association. Of these one was in India, seven in England, and fourteen in the United States. Seven treatment plants have been built in the United States and four more of considerable magnitude are proposed.

NEWS OF THE WEEK

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

Government Takes Steps To Solve Housing Problem

National Defense Council Recommends Aid, Financial and Otherwise, in Care of Labor Supply

In aiding the efforts being made to solve the housing problem, which is hindering war work, the National Defense Council, by its committee on housing, recommends Government aid, financial and otherwise. In its report, which has the approval of President Wilson, the committee asserts that an organization of "reasonable permanency and authority" is necessary to administer such funds as may be available for housing purposes. It recommends that the organization be granted broad powers to conduct building operations, to deal in real estate and securities, and to borrow and loan money. The committee further suggests that the Government loan funds for housing at low interest to those communities which can show the need for aid. It recommends also that in future Government agencies making war contracts give due consideration to the labor supply and housing conditions, and that future contracts be distributed as far as possible to prevent undue concentration of workers in any one locality.

It is suggested that concerns which take Government contracts and provide homes for workmen be remunerated by the Government if additional expense is incurred. Otto M. Eidlitz, New York architect, is chairman of the committee.

Laud Catskill Aqueduct Engineers at Commemorative Meeting

A glowing tribute to the New York Board of Water-Supply, to J. Waldo Smith, its chief engineer, and to the engineering staff, was paid at a meeting held Nov. 14 by the four national engineering societies to commemorate the completion of the main unit of the Catskill Aqueduct. The meeting, whose program included addresses by Mayor Mitchel and President Charles Strauss, of the board, and a nontechnical illustrated description of the project presented by A. D. Flinn, deputy chief engineer of the board, was open to ladies, and it taxed the capacity of the auditorium of the Engineering Societies Building in New York.

Mayor Mitchel characterized the Catskill Aqueduct as the greatest engineering achievement, and spoke enthusiastically of the skill and integrity of the organization, from board to engineering staff. He mentioned the meeting of 37 years ago of Mr. Smith's assistants to other important work in New York and elsewhere, and expressed his appreciation of the place the engineer must occupy in building the city, the state and the nation. Mr. Strauss, called upon because of the inability of General Goethals to be present, disclaimed for the board any great part in the success of the undertaking except in the good judgment or luck displayed in its choice of a chief engineer. He pointed out that the cost of the work to date was $9,000,000 under the estimate, and that water was delivered a year and three months ahead of time. Mr. Smith, called upon for a few words, commended the noninterference of the board in technical matters and the loyalty of his staff.

Mr. Flinn gave a graphic account of the project, illustrated by excellent colored lantern slides. George H. Pegram, president of the American Society of Civil Engineers, presided at the meeting.

Government Calls for Men with Motor Truck Experience

The motor section, carriage division, of the office of the Chief of Ordnance, United States Army, will need several thousand skilled men for its work. This section is intrusted with securing all the special motor-driven vehicles for the War Department—such vehicles as four-wheel-drive trucks, caterpillar tractors, armored cars and tanks—and for work in connection with the maintenance and repair of this equipment and of Field Artillery, artillery carriages, trailers, recoil mechanism, etc.

Men with experience as mechanics, machinists, blacksmiths and storage-battery experts are wanted. There are four ordnance training camps where men with mechanical ability enlisting for the Ordnance Department are sent for special instruction to fit them for the grades of first-class sergeant and ordnance sergeant.

Those wishing to enlist may address the Chief of Ordnance, Motor Section, Carriage Division, 1703 New York Ave., Washington, District of Columbia.

Decision in Lower Otay Dam Case

That the destruction of the Lower Otay Dam was due to the unprecedented floods of January, 1916, and was in no manner traceable to the want of care or prudence in the maintenance of the structure, is considered to be the judicial finding announced in the judgment of nonsuit granted on Nov. 1, in the case of James vs. the City of San Diego, Calif. The case was tried in the Superior Court of Orange County before Judge Z. B. West, and was the first one tried upon its merits involving the failure of the dam.

Bids Opened for the Miami Conservancy Works

All Rejected But Three, and These Are Held for Further Consideration—Bids Exceed Estimate

All proposals on the twelve contracts for flood-control works of the Miami Conservancy District, Ohio, except on two of the items, were informal and conditioned on prices of labor and materials, on the attitude of the National Government toward construction work, or on other possible developments. The works were described at length in *Engineering News-Record* of Oct. 18, p. 728, and will involve an expenditure of $10,000,000. Some of the proposals indicated unit prices not far from the estimates of the district, but the conditions attached would make the final price indefinite. All proposals were rejected except those of R. H. & G. A. McWilliams on contracts 41, 43 and 44, covering about $1,000,000 of channel improvements at Dayton. In these the conditions were such as to make the maximum cost about 10% over the engineers' estimate. These three proposals have not been accepted, but are held for further consideration.

Proposals were received from: H. P. Converse & Co., 88 Broad St., Boston, Mass.; United Dredging Co., Seattle, Wash.; R. H. & G. A. McWilliams, 998 Crete St., Chicago, Ill.; Parsons Construction Co., Security Building, Binghamton, N. Y.; M. C. Connors & Co., 601 West Madison St., Chicago, Ill.; Winston & Co., 12 North Seventh St., Richmond, Virginia.

Hunkin-Conkey Co., Cleveland, presented unconditioned proposals on two dams, but these were received after the bids had been opened and read, and so were not considered.

Plans and Specifications of an Engineers' Dinner

Engineers engaged in the construction of Camp Zachary Taylor, Louisville, Ky., showed on Nov. 10 that they were worthy rivals of Brillat-Savarin in designing a menu. The occasion was a testimonial dinner by appreciative associates given to A. J. Sackett, chief engineer, Mason & Hangar Co. The menu, which was ingeniously called an "inventory," was as follows:

Yellow Pine Cocktail; Blueprint Cocktail; Salary; Olives; Asbestos Covered Almonds; Cream of Tomato, au Remount; Broiled Spring Chicken, au Shiplap; Cauliflower au Concrete; French Peas; Asparagus a la Militaire; Hearth Brick Cream; Petit Fours; Rattrap Cheese; Two-Ply Crackers; Di Mi Tessie! Excess.

Engineering Societies Entertain British Representatives

On Tuesday evening, Nov. 13, the four leading national engineering societies and the United Engineering Society entertained at dinner at Delmonico's, New York, the representatives of the Labor Division of the British Ministry of Munitions, who have been in this country for some months, discussing with American manufacturers and labor leaders the methods used in England for solving the labor problems which have arisen on account of the war. This was the only public function held in honor of the British representatives during their stay in New York.

Col. John J. Carty, U. S. R., chief engineer of the American Telephone and Telegraph Co., presided, and introduced, in turn, Gano Dunn, president of J. G. White Engineering Corporation, who extended a welcome to the mission, Sir Stephenson Kent, H. W. Garrod and G. H. Baillie.

The dinner was attended by a large and representative body of engineers.

Bridge of 3000 Feet Moved Endways 136 Feet

Three 297-ft. 1000-ton truss spans of the Missouri River bridge at St. Joseph, Mo., were shifted 136 ft. 9 in. to new piers on Nov. 14. These piers were built between the old ones, as described in *Engineering News-Record* of Oct. 25, p. 780, and the spans were moved longitudinally to their new supports. For this purpose falsework was built under the spans, supporting a standard-gage railway track under each truss. On these tracks were placed railway-car trucks, of the type used for 100,000-lb. freight cars. A 300-ton hydraulic jack was mounted on each truck, and all the jacks of each span were connected by piping to insure equal distribution of the load.

There were 12 power trucks under each span, with two idler trucks at the middle. A rigid draft rigging connected all the trucks of the three spans, and at its forward end was a pulling beam to which the four hauling tackles were attached.

An electric hoist of 240 hp. operated the cables, and the movement of the 3000-ton load was accomplished in 13 minutes. The work was done by the American Bridge Co., under the direction of R. L. Huntley, chief engineer of the Union Pacific Railway.

Steel for Government Now in Hands of J. L. Replogle

Governmental iron and steel interests, other than ordnance for the United States and allied countries, have been entrusted by the Council of National Defense to J. L. Replogle, vice president of the American Vanadium Co., who will act as director of steel supplies and will have charge of the distribution and be responsible for the prompt and proper execution of all orders.

Mr. Replogle will receive weekly reports from the iron and steel producers, showing the tonnage of iron and steel of the various classifications on order for the United States and allied governments, as well as domestic and foreign orders for general purposes. He will also receive information on mill capacities and mill production, and in cases of retarded output will secure reasons therefor and will endeavor, in conjunction with the manufacturers and the War Industries Board, to remove obstacles which prevent maximum output of war necessities.

Civil Engineers to Have Reserve Corps in the Navy

Examination for Entrance Into Body Similar to Army's Will Close Dec. 31—Qualifications Described

An examination, closing Dec. 31, is to be held to select an eligibility list of candidates for enrollment as civil engineers in the United States Naval Reserve Corps, thus establishing for civil engineers and men in allied branches of construction work the opportunity to become enrolled in a corps in the navy similar to that established over a year in the Corps of Engineers of the United States Army. Successful candidates will be enrolled as required in the United States Navy and will be assigned the provisional rank of ensign, lieutenant (junior grade) and lieutenant, and will be detailed to the work going on under the direction of the Bureau of Yards and Docks of the Navy Department.

The requisites for eligibility are as follows: The candidate must be an American citizen and an engineer in the active practice of the profession of civil, electrical or mechanical engineering, or some business directly connected therewith. To be eligible for the rank of ensign, the candidate must be not less than 24 years of age and in active professional practice not less than two years. To be eligible for the rank of lieutenant (junior grade) the candidate must not be less than 27 years of age and in active professional practice not less than five years, and to be eligible for the rank of lieutenant, the candidate must not be less than 30 years of age and in active professional practice not less than seven years, and must have had responsible charge of work as principal or assistant for at least three years. If approved, the candidate must pass the medical requirements of the United States Navy. Anyone who is now in the army, either volunteer or drafted, may make application, but must obtain his discharge before he can be enrolled. This includes anyone who has been directed to appear before an exemption board. Those now in the United States Naval Reserve Force are also eligible.

Upon enrollment the successful candidate will receive the pay and allowance of an officer in the regular navy, which are approximately: For ensign, $2100; lieutenant (junior grade), $2500; lieutenant, $3100. This includes allowances for commutation of quarters, heat and light, and there is an additional allowance of $150 for uniform. Enrollments are for a period of four years or during the existence of a war or national emergency. Except during a war or national emergency, officers are only given active duty at their own request, and then for short periods.

A permit to take the examination is not required, although a circular for the information of a person desiring to enter the corps is available by writing to the Reserve Examining Board, Bureau of Yards and Docks, Navy Department, Washington, D. C. To compete in the examination it is necessary to fill out the blank spaces in the notification blank, which is obtained by writing to that board and to address a letter to the examining board including the following information: Name, address, voting place, occupation, place and date of birth, height and weight, married or single, children, photograph, evidence of American citizenship, college from which graduated, details of graduation, testimonials in regard to character and moral fitness, testimonials from employers or others conversant with employee's professional ability, chronological statement in detail of professional experience and six names of persons conversant with the candidate's professional ability. All of these details are further elaborated in the circular noted above. If in the opinion of the examining board further examination of candidates is considered desirable, such candidates may be authorized to appear in person before the examining board in Washington.

This opportunity is open for a period of about six weeks more; that is, all applications must be in before Dec. 31 of this year. No announcement has been made of the number of appointments which will probably be made, but it is understood there are openings for a good many men. Work for the Bureau of Yards and Docks comprises all of the construction operations carried on by the navy—that is, piers, cantonments, wharves, dry docks, warehouses, etc., both here and abroad.

Engineers in St. Paul Are Well Organized

The installation of a chapter of the American Association of Engineers in St. Paul Oct. 7 added one more to the list of 16 engineering organizations in the St. Paul-Minneapolis district. Mayor J. A. Irvin welcomed the organization to the city and invited its aid in a city-planning campaign. A resolution offering cooperation and affiliation with existing organizations in the district was adopted.

Engineer Officers Assigned to Military Mapmaking

The following-named officers, Engineer Officers' Reserve Corps, are relieved from duty at the engineer training camp, Fort Leavenworth, Kan., and will report by letter to the director, United States Geological Survey, for assignment to duty connected with military mapping: Second Lieuts. Elmer LeC. Goldsmith, John W. Lewis, Edward J. Francis, Elmo N. Murphy, Carl R. French, William D. Lewis and Charles B. Moore.

The following-named officers, Engineer Officers' Reserve Corps, are relieved from duty at the engineer training camp, American University, District of Columbia, and will report by letter to the director, United States Geological Survey, for assignment to duty connected with military mapping: Second Lieuts. Charles M. Madden, Edward H. Stelle, Frederic E. Smith, Edward P. Asbury, George B. Davidson, Frederick W. Look, Gordon D. Cooke, Joseph W. Geary, Jr., and Walter K. Wood.

Second Lieut. Herman J. Switzer, Engineer Officers' Reserve Corps, is assigned to active duty under the director, United States Geological Survey, for duty connected with military mapping.

Illinois Water-Works Officials See Industries of Peoria

Inspection of industrial plants, all of which are being greatly enlarged, was the feature of the annual fall meeting of the Illinois Section of the American Water-Works Association at Peoria, Nov. 15. An exhibition was staged of the Holt caterpillar tractors on the field where officers and soldiers are being trained to operate the unarmed "tanks." Light farm tractors were most in evidence at the Avery plant. The Keystone Steel and Wire Co. is starting on a most extensive enlargement of its plant. It is inaugurating river transportation of ore from Alabama, having excavated a barge canal from the river to the plant.

After the banquet C. B. Burdick, consulting engineer, described the construction of Camp Grant at Rockford, Ill., from the standpoint of magnitude, speed and organization (see *Engineering News-Record*, Aug. 30, p. [illegible]). The three reasons which made it possible for the Government, usually so [illegible], to house 900,000 men in 75 days were: 1. An elastic and elaborate set of instructions of 100 pages. 2. Good contractors. 3. Responsibility vested in quartermasters who were given almost absolute power.

H. E. Morgan, manager of the Peoria Water-Works Co., presented the facts as to the present conditions of the Lakes-to-the-Gulf deep waterway. He stated that recently an injunction had been dissolved against the use of $5,-000,000 appropriated by the state for an 8-ft. connection between the Chicago drainage canal and the Illinois River.

Concrete Substituted for Steel in Building Elevated Road

In order to prevent an undue delay in construction, owing to inability to obtain necessary steel, the Public Service Commission for the First District, New York, has decided to have Section 3 of the Culver Rapid Transit R.R. in Brooklyn, from Avenue X to Coney Island, built for the most part as a reinforced-concrete structure. This section, which is elevated, extends from a point 500 ft. south of Avenue X on Shell Road to the vicinity of Sheephead Bay Road

The commission last summer received bids for the construction of this portion of the line, but on account of the high prices quoted for steel and the twenty months required for delivery of this material, rejected the bids and took the possibility of an alternative scheme under consideration.

Strong Appeal to Lumbermen for Ship Supplies

In connection with the campaign for speeding up the shipbuilding program, Charles S. Keith, president of the Southern Pine Association, has sent out the following letter to 1000 manufacturers of Southern pine, including both members and nonmembers of the association. It applies to every industry:

"We are engaged in war. Our first duty is to our country and its allies. Material, supplies and food are essential to final victory. Without shipping facilities, our caues is lost. It is up to us to see that the wooden shipbuilding program is not delayed, but expedited. Our greatest need is ships, ships and more ships. We must build faster than Germany can sink. Any manufacturer who does not do his part, by cutting, in advance of the ordinary comprehensive logging operations, the necessary high-grade timber suitable for shipbuilding, and who will not refuse to take orders for material which interfere with the Government orders, is a slacker and a traitor, and is encouraging and assisting our enemies.

"Under such conditions the Government would be justified in the seizure and operation of his plant in the nation's interest, and the association will encourage and assist the Government in such action. No loyal American will thwart such a program, but will aid. We are appealing to you for the best that is in you and the industry."

Rivers and Harbors Congress Indefinitely Postponed

Owing to the difficulty of obtaining hotel accommodations in Washington at present, the fourteenth annual convention of the National Rivers and Harbors Congress, which was scheduled to meet in Washington on Dec. 5-7, has been postponed until further notice. The officials of the congress say it is impracticable to complete arrangements for holding the convention in some other city on the date originally announced.

Urge Raising of Imperial Valley Levees

At a recent meeting of directors of the Imperial Valley District, C. K. Clarke, chief engineer of the district, reported that the last high water in the Colorado had left a "cone" of sand and silt along the Abejas channel of the river as high as the Saiz or Volcano Lake levees, and that unless the levees were raised or the river turned back into the channel followed prior to 1909, the next high water would be diverted northward, causing much damage and flowing into the Salton Sea. Mr. Clarke had just completed a survey of Lower California and states that the threatened danger can be averted by either raising the levees 5 or 6 ft. or by the restitution and strengthening of the Ockerson levee to throw the river back into its old channel. The latter course was preferable, he asserted, and would cost approximately $893,486, as against an expenditure of $1,327,000 for raising the Saiz and Volcano Lake levees.

A bond issue recently voted by the district included an item of $650,000 for raising these two levees.

F. S. Sellew, formerly Government engineer in charge of the Yuma project, has recently stated that to protect the valley from water shortage and inundation immediate steps should be taken to repair and extend the Ockerson levee to the Bee River at its junction with the old bed of the Colorado, closing the Bee River and extending the levee one mile beyond.

Architects' Institute Mobilizes Men for Service

Architects throughout the country have been mobilized for war service by the American Institute of Architects. Some are now in France supervising the building on the aviation fields to be used by America's air forces, others are in training in this country, notably in the camouflage battalion at the American University Camp, Washington, D. C. Three thousand are already at the disposal of the Government.

Civilian Engineers Join Staff of Emergency Fleet Corporation

Reports published that Rear Admiral Washington L. Capps, U. S. N., had been relieved of all responsibility in connection with the Government's shipbuilding program, of which he has been in charge as general manager of the Emergency Fleet Corporation, and that Charles A. Piez, a Chicago engineer recently appointed vice president of the corporation, would be put in supreme charge, have been vigorously denied at the fleet corporation office in Washington.

The understanding at that office is that no "shake-up" has taken place, but that there has been an expansion of the work of the office, under which Admiral Capps will continue in charge of the technical details of the work and Mr. Piez will be in charge of business mat-

ters in connection with the work. In short, there has been a coördination of effort, and assistance has been provided by bringing into the organization a number of engineers from civilian life.

An attempt has been made, in this way, to place the corporation on a business basis, rather than a military basis. It is understood that Rear Admiral F. T. Bowles, U. S. N., retired, will give way to James Heyworth, a Chicago contractor, as head of the wooden ship construction department, although it is not true that there are to be wholesale retirements of naval officers from the work. Rear Admiral H. H. Rousseau, U. S. N., remains as manager of the division of shipyard plants. Charles Day, a Philadelphia engineer, now in England doing research work on the subject, will have charge of the supervision of the building of fabricated steel ships. A. J. Mason, another Chicago engineer, will have charge of inspection work in the field.

Foreign Trade Convention Feb. 7

The Fifth National Foreign Trade Convention will be held at the Gibson Hotel, in Cincinnati, on Feb. 7-9. The principal topic will be foreign trade in its relation to the war.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

AMERICAN SOCIETY OF CIVIL ENGINEERS, 29 West 39th St., New York; Jan. 16 and 17, 1918, New York; Charles Warren Hunt, secretary.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS; 29 West 39th St., New York; Dec. 4-7, New York; Calvin W. Rice, secretary.

GENERAL CONTRACTORS' ASSOCIATION; 51 Chambers St., New York; Dec. 8, New York; C. A. Crane, secretary.

AMERICAN INSTITUTE OF CONSULTING ENGINEERS, 35 Nassau St., New York; Jan. 14, New York; F. A. Molitor, secretary.

NEW ENGLAND WATER-WORKS ASSOCIATION; 715 Tremont Temple, Boston; Jan. 9, Boston; Willard Kent, secretary.

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS; Richmond, Va.; Dec. 4-6, Richmond, Va.; Joseph Hyde Pratt, secretary, Chapel Hill, North Carolina.

AMERICAN WOOD PRESERVERS' ASSOCIATION; Baltimore, Md.; Jan. 22-24, Chicago; F. I. Angier, Baltimore & Ohio R.R., Mount Royal Station, Baltimore, Md., secretary.

CANADIAN SOCIETY OF CIVIL ENGINEERS; Montreal; Jan. 8, Montreal, Prince S. Eolin, 176 Mansfield St., Montreal, Can., secretary.

AMERICAN SOCIETY OF AGRICULTURAL ENGINEERS; Dec. 27-29, Chicago; C. K. Shedd, Ames, Ia., secretary.

The fifth annual session of the Washington Irrigation Institute, E. F. Benson, president, will be held in North Yakima, Wash., Dec. 10 and 11.

The general meeting of the Engineering Society of Buffalo, N. Y., was held Nov. 14, the sections joining in the meeting. C. H. Norton, of Worcester, Mass., spoke on "The Modern Cylindrical Grinding Machine."

The Louisiana Engineering Society held its regular meeting in New Orleans on Nov. 12. The technical exercises consisted of a paper entitled "Yellow Pine Industry in the South," by R. E. Hartman.

The Providence Engineering Society at its November meeting, held Nov. 20, was addressed by Chester L. Lucas, associate editor of *Machinery*, on "The Machining of a 9.2-in. High-Explosive Shell," illustrated by moving pictures. On Dec. 5 the Structural Section of the society will hold its opening meeting, which will be devoted to a discussion of "Foundation Work in Providence."

The British Columbia Institute of Civil Engineers, Victoria, B. C., elected the following officers recently: Chairman, F. M. Preston; secretary, A. O. Noakes; council, B. Hutchison, A. G. King, E. N. Horsey, W. N. Stokes and J. H. Bevey.

The Canadian Society of Civil Engineers held the second meeting of its 1917-18 session on Nov. 8. A series of motion-picture films on the water powers of Canada was shown, with an introduction by J. B. Challies.

The Albany Society of Civil Engineers will hold its regular meeting in Keeler's Hotel, Nov. 27. C. W. Boynton. of the Cement-Gun Co., Inc., Allentown, Penn., will deliver an illustrated address. The proposed amendments to the constitution of the soceity will be presented for action at the regular meeting.

The Structural Section of the Engineers' Society of Western Pennsylvania held its bimonthly meeting Nov. 13. A paper on "Industrial Housing" was read by H. Walter Forster, general manager, Independence Bureau, Philadelphia. Members of the society made an inspection trip on Nov. 17 to the new industrial housing development near the Donora, Penn., plant of the American Steel and Wire Co., followed by an inspection of the steel works. The regular monthly meeting of the society was held on Nov. 20. The feature of the meeting was an illustrated talk on "Radio Telegraphy and Telephony," by S. M. Kintner, general manager, National Electric Signaling Co., Pittsburgh, Pennsylvania.

The Engineers' Club of Trenton, N. J., will hold a special meeting, Nov. 22, at which J. A. Shorey, of the General Electric Co., will deliver an illustrated address on "Centrifugal Blowing Engines."

The Colorado Association of Members of the American Society of Civil Engineers was addressed Nov. 10 by James Munn, engineer, U. S. Reclamation Service, on "The Construction of the Arrowrock Dam." At the December meeting, James M. Gaylord, electrical engineer, U. S. Reclamation Service, will speak on the experience of the reclamation service with reservoir gates and outlet.

The American Society of Agricultural Engineers will hold its eleventh annual meeting at the Morrison Hotel, Chicago, on Dec. 27 to 29. Sewage disposal, land drainage, design and lighting of farm buildings, the use of tractors, and engineering work in food supply are among the subjects included in the program. The secretary is C. K. Shedd, Ames, Iowa.

Dayton Engineers' Club expects to inaugurate its new clubhouse Jan. 1. The club has a scientific section and further development of sections is probable. The plans so far outlined make nearly the whole year's program of biweekly meetings consist of men from out-of-town. The plan followed in developing a program is to assign a particular member of the program committee to each meeting, making it his primary responsibility, aided by suggestions only from the committee, to select and secure the speaker.

PERSONAL NOTES

MAJ. BENEDICT CROWELL, Cleveland, Ohio, engineer officer now in charge of the Washington office of the Panama Canal, has been appointed Assistant Secretary of War to succeed William M. Ingraham. Mr. Crowell is a native of Cleveland. Immediately after the formation of the National Council of Defense he went to Washington and became associated with the work of the General Munitions Board especially in connection with field production. As engineer in charge of the Washington office of the Panama Canal he relieved Lieutenant Colonel Browne of the regular army, who entered field service. It was announced that Major Crowell would resign his commission as engineer officer in order to accept the position of Assistant Secretary of War.

HAROLD D. HYNDS, of the Turner Construction Co., New York City, has resigned as secretary of the American Concrete Institute, on account of his acceptance of a commission in the Signal Corps, U. S. A. His successor as secretary is H. B. ALVORD, of the Aberthaw Construction Co., Boston. Mr. Alvord was graduated from Massachusetts Institute of Technology in 1907 and after some years as instructor at that school and as assistant professor at Bowdoin College, entered the Aberthaw Co. The address of the American Concrete Institute is now 27 School St., Boston, Mass.

A. N. REECE, first engineer of the Kansas City, Southern and the Arkansas Western, has been promoted to division engineer of those roads, with

headquarters at Pittsburg, Kan., succeeding G. H. COOK, resigned.

W. ATWATER, who has been in Modesto, Calif., for several years collecting data for San Francisco to be used in connection with the suit of the Modesto district against that city, has been appointed engineer for the State Water Commission.

J. FRANK BOWAN has been reappointed superintendent of roads and bridges and city engineer of Manchester, Connecticut.

A. J. WITCHELL, engineer of tests, with the Spokane, Portland & Seattle Ry., has been appointed assistant to the general superintendent, Portland, Oregon.

PHILIP F. MILLER, formerly sales engineer for the Pacific Flush Tank Co., has been commissioned first lieutenant in the Ordnance Officers' Reserve Corps.

G. E. VOTAW has been appointed superintendent of the Portland, Ore., division of the Great Northern Ry., succeeding C. A. VERMILLION, retired on account of ill health.

GEORGE K. LARRISON, formerly chief engineer and hydrographer of the Territorial Land Office at Honolulu, has been called into active service as captain in the Engineer Officers' Reserve Corps.

CHARLES T. BAILEY has been appointed chief engineer and hydrographer of the Territorial Land Office at Honolulu, H. T., to succeed CAPT. GEORGE K. LARRISON. Mr. Bailey has been in Hawaii since November, 1912, and he became assistant to Mr. Larrison in November, 1915.

LEE H. POWELL, who was appointed city engineer of Tyler, Tex., has been retained as consulting engineer on Road District No. 1, Sheridan County, Texas, having been chief engineer on that work until Aug. 1.

GEORGE L. KELLY has been appointed assistant to the manager of the American Construction Co., engaged in erecting the aviation camp at Olcott, Texas.

WILLIAM M. TORRANCE, vice-president and chief engineer of the Carson Construction Co., of Savannah, Ga., is now a captain in the Twenty-third Engineers at Camp Meade, Maryland.

H. C. ALLEN, of Wallace, Idaho, has been appointed state highway engineer to succeed E. M. BOOTH, who has resigned his position to enter the army engineering service. Mr. Booth has been highway engineer of Idaho since May, 1915

CHARLES T. PARKER, of Moffatt & Parker, consulting engineers, Oregon City, Ore., has received a commission as first lieutenant in the Corps of Engineers, U. S. Army.

A. L. STRONG, formerly with the Chicago, Milwaukee & St. Paul Ry., is now connected with the county engineer's office of Spokane County, Washington, as inspector and engineer in charge of the construction of concrete roads.

HOWARD A. VIERHELLER, who was with the Conemaugh division, Pennsylvania R.R., at Pittsburgh, is now instructor in civil engineering at the Georgia School of Technology.

PAUL MOLITOR, supervising engineer, has been reappointed for another year for the Madison-Chatham sewerage plant, Chatham, N. J.

JOE MANWARING, formerly superintendent of the Butte-Balaklava Mining Co., has been appointed county engineer of Silverbow County, Montana, to succeed CHARLES M. FEENEY, deceased.

CECIL D. COIL has resigned as superintendent for H. S. Siebert, mausoleum contractor, and is now superintendent for the York Mausoleum Construction and Supply Co., Easton, Pennsylvania.

T. LEROY PIERCE has resigned as assistant superintendent of parks, of Wilmington, Del., to become connected with Lincoln Highway survey work in Delaware. He will have charge as resident engineer when construction work is to be done.

ELMER HENBECK, until recently employed by the Pennsylvania Water and Power Co., has been commissioned first lieutenant in the Engineer Officers' Reserve Corps.

HOLMES A. FRANK, formerly with the Pennsylvania R.R., then with the Foundation Co., of New York, and later in the contracting business in the Maritime Provinces, is now building ships at Liverpool, Nova Scotia.

J. A. HEAMAN, assistant to the chief engineer of the Grand Trunk Pacific, has been appointed assistant chief engineer, with headquarters at Winnipeg.

PROF. EDWARD BARTOW, director Illinois State Water Survey, has been appointed major in the sanitary corps. G. C. HABERMEYER has been appointed acting director of the Water Survey and acting secretary of the Illinois section of the American Water-Works Association during Major Bartow's absence.

GEORGE H. HERROLD, St. Paul, has been elected to represent the Civil Engineers' Society of St. Paul on the Minnesota Joint Engineering Board to succeed Maj. GEORGE W. RATHJENS, 313th Engineers, now stationed at Camp Dodge, Iowa.

O. E. MALSBURY resigned as assistant engineer in charge of the Division of Surveys of the Panama Canal to take up his duties as captain in the Engineer Officers' Reserve Corps at the training camp at Camp American University, District of Columbia.

ALFRED D. BUTLER, for nine years assistant city engineer of Spokane, Wash., has been appointed city engineer to succeed MORTON MACARTNEY, who resigned to become connected with Porter Bros., contractors, of Spokane. Mr. Macartney had been city engineer seven years and a half.

MURRAY C. AYERS, until recently draftsman for the Union Oil Co., at Los Angeles, is now chief of party on road surveys in Tuolumne County, California, for the California Highway Commission.

M. B. DABNEY has succeeded E. BLANCHARD as highway engineer of the Monticello, Miss., district. Mr. Blanchard goes to Yazoo City, Miss., to engage in the same line of work.

L. DREW GODDARD, engineer of docks, wharves and bridges, Detroit, Mich., has been commissioned captain in the Engineer Officers' Reserve Corps.

FRANK L. MCLAUGHLIN, of the Foundation Co., has been transferred to the Pittsburgh district, where he is now in charge of construction of the power station at Windsor, W. Va., for the American Gas and Electric Company.

F. E. HANSON, of the valuation department, New York, New Haven & Hartford R.R., has been commissioned captain in the Engineer Officers' Reserve Corps.

MURRAY BLANCHARD, formerly assistant engineer, the Sanitary District of Chicago, is now captain in the Engineer Officers' Reserve Corps, Ft. Leavenworth, Kansas.

WARREN F. RUGG has been transferred from the New York State Highway Commission to the Bronx Parkway Commission, with headquarters at Bronxville, New York.

CHARLES E. PARRY, formerly city engineer of Ft. Frances, Ont., Canada, is now assistant chief draftsman with the Tampa (Fla.) Dock Co., on detail work for the standard wooden ships for the U. S. Shipping Board, Emergency Fleet Corporation.

MAURICE SCHOTLAND, formerly in the division of designs, Public Service Commission, First District, New York, is now with the Department of Operation and Maintenance, Building Division, Panama Canal.

ADOLF HINRICHS, formerly designer in the office of engineer of structures, New York Central R.R., is now structural engineer in the office of Albert Kahn, architect, Detroit.

R. F. MIRICK, formerly with the Division of Valuation, Interstate Commerce Commission, has become connected with the Gulf Plainville Northern Railroad.

ARTHUR G. LIVINGSTON, formerly with the Board of Water-Supply,

Manhattan Division, New York City, is now first lieutenant, Engineer Officers' Reserve Corps, at Camp American University, District of Columbia.

J. B. DAWSON has been made division engineer of the Southern Pacific Co. at Stockton, Calif., vice G. W. CORRIGAN, who has been transferred to division engineer at Bakersfield, Calif., vice J. P. EDWARDS, resigned.

G. B. FARLOW, formerly second assistant engineer, Southwest district, Western lines, Baltimore & Ohio R.R., is now first lieutenant in the Engineer Officers' Reserve Corps.

ARTHUR L. WARD, who has been engaged in surveying and engineering in western Washington since 1907, is now first deputy under county engineer of Pacific County.

PHIL S. WICKERHAM, Portsmouth, Ohio, formerly in the Government service, Bureau of Public Works, Philippine Islands, has been commissioned captain in the Engineer Officers' Reserve Corps.

CLAUDE C. WASHINGTON, having entered the military service, resigned as resident engineer for the Crystal Block Coal and Coke Co., at Sprigg, W. Va., and has been succeeded by J. H. JONES, of Big Stone Gap, Virginia.

CHARLES M. WHELAN, formerly hydraulic engineer of the Rochester Ry. and Light Co., Rochester, N. Y., is now with the Aluminum Co. of America, Pittsburgh.

A. M. DAVIDSON, first assistant engineer, Southwest district, Western lines, Baltimore & Ohio R.R., has been commissioned captain in the Engineer Officers' Reserve Corps.

WALTER W. GRUBER, formerly chief of party, valuation work, Baltimore & Ohio main line, is now captain in the 308th Regiment of Engineers, at Camp Sherman, Chillicothe, Ohio.

GUY S. MASON, supervising engineer and construction superintendent for the Stewart Engineering Corp., is in charge of construction at the U. S. Naval Station, Guantanamo Bay, Cuba.

M. M. COOK was elected city engineer of Wichita Falls, Tex., vice L. C. HINCKLEY, deceased.

J. M. LEWIS, assistant engineer, Northwest district, Western lines, Baltimore & Ohio R.R., has been assigned to the Second Officers' Training Camp at Ft. Benjamin Harrison, Ind.

C. F. KOPPISCH resigned the position of resident engineer of construction for the Southern New England Railroad Corporation, to accept a position as engineer of construction to construct a railroad from Belgravia, Ariz., connecting with the Ray & Gila Valley R.R., with headquarters at Kelvin, Arizona.

DONALD M. BAKER, formerly a deputy in the county surveyor's office for Orange County, California, is now engineer in the California State Water Commission.

MAX DEITENBECK, formerly assistant engineer in the chief engineer's office of the Gulf, Colorado & Santa Fé Ry., is now assistant engineer in the office of the resident engineer, Kansas City, Mexico and Orient R.R. Co., Kansas City, Missouri.

WALTER G. DANIEL, formerly assistant to the county engineer of Hamilton County, Tennessee, has been appointed an assistant state highway engineer, Tennessee Department of Highways.

THORN DICKINSON, connected formerly with the Valuation Committee of the Chesapeake & Ohio R.R. at Richmond, Va., is now officer in charge of the engineer sub-depot, Camp Greene, N. C., with the rank of second lieutenant in the Engineer Officers' Reserve Corps.

JAMES BRAKES, JR., who was an instructor in mechanical engineering, laboratory and experimental engineering at Syracuse University, is now technical assistant for the Kimberly-Clark Co., Neenah, Wisconsin.

A. M. ZABRISKIE, engineer of design of the Central R.R. of New Jersey, has been made principal assistant engineer. This position has been vacant since July, 1916, when A. E. OWEN was advanced to chief engineer to succeed the late J. O. OSGOOD. Mr. Zabriskie has been in the employ of the Central R.R. of New Jersey since 1904, serving successively as transitman, assistant engineer and engineer of design. Prior to 1904 he was with the Lehigh Valley R.R. two years.

THOMAS W. COTHRAN, of Greenwood, S. C., has been appointed chairman of the State Highway Commission, vice Maj. Monroe Johnson, recently ordered to report for foreign service.

T. D. MYLREA recently resigned as engineer of tests of the city architect's department, Toronto, to become chief engineer of the Trussed Concrete Steel Co. of Toronto.

HENRY F. JONAS, until recently engineer of structures for the Southern Pacific Co. in Texas and Louisiana, has been chosen as supervising engineer for the work of reconstructing the Galveston causeway. Mr. Jonas has been connected with the Southern Pacific since 1890, resigning Oct. 24 to accept his new position.

S. E. SHOUP, of the Kansas City Southern Ry., has been appointed acting division engineer of the Kansas City terminal division, to succeed A. LECKIE, division engineer, who has been temporarily assigned to other duties.

F. B. MARSH, assistant designing engineer of the Board of Water Supply, New York, has resigned in order to become resident engineer, New York District, for the Emergency Fleet Corporation.

JAMES O. HEYWORTH, contractor and engineer, Chicago, was recently appointed a member of the Shipping Board. Mr. Heyworth has constructed three Government locks and dams on the Warrior River, jetty work at Fernandina, Fla., and Port Arthur, Tex., and work at the cantonments for Camps Decatur, Farragut and Ross at Great Lakes, Ill., among other works of importance.

W. J. DURBIN, superintendent of water-works, Evansville, Ind., and A. G. HUSTED, of Cleveland, Ohio, have been added to the staff of the Indianapolis Board of Sanitary Commissioners.

GEORGE P. MILLER is now assistant superintendent of the Delaware and Raritan Canal, Pennsylvania Lines East of Pittsburgh. On Apr. 19, 1887, Mr. Miller entered the service of the Pennsylvania R.R. as rodman. After service in various capacities, including that of supervisor of signals, New York division, and supervisor of New York division "A," Mr. Miller on Nov. 1, 1901, was promoted to assistant engineer of the Buffalo division, and on Aug. 20, 1903, was appointed assistant engineer, New York division. On Jan. 1, 1909, he was promoted to principal assistant engineer of the New Jersey division.

JOHN C. PAYNE, Jersey City, N. J., formerly engineer and secretary with the Riparian Commission and the New Jersey State Board of Commerce and Navigation, has been appointed city expert to look after the city interests in its tax suits against various railroads.

R. B. SLEIGHT, assistant irrigation engineer, has left the Department of Agriculture for active duty with the aviation section of the signal corps.

JOSEPH J. RHOADS, appointed superintendent of the Allegheny division, Pennsylvania Lines East of Pittsburgh, with office at Oil City, Penn., began work for the Pennsylvania as a rodman in March, 1889. After service as assistant supervisor and supervisor in various divisions, he was promoted to division engineer, Eastern and Susquehanna divisions, on July 1, 1905. In 1907 he was made division engineer at Philadelphia, then to the middle division as division engineer in 1910, and on June 16, 1913, he was promoted to superintendent of the Central division. He has also been superintendent of the Schuylkill division.

ELBERT M. CHANDLER recently became consulting engineer for the Selah Nonpot Irrigation District of the Yakima Valley and has charge of the design of the permanent construction of the Selah Canal system. Mr. Chandler was for seven years chief engineer of the Burbank project in Walla Walla County. He is also first vice president of the Washington Irrigation Institute and a graduate of the University of California, 1907.

PAGE & HEBBARD, Philadelphia, have closed their office, owing to the commissioning as major in the Engineer Officers' Reserve Corps of Mar-

shall R. Pugh, who is now commanding the First Battalion, Twenty-First Engineers (Light Railway). The regiment is stationed at Camp Grant, Rockford, Illinois.

R. H. PINKHAM, division engineer of the Pennsylvania at Erie, Penn., has been appointed division engineer of the Pittsburgh division, JOHN ATLEE, supervisor of the division at East Liberty, Penn., succeeding him.

H. H. TEMPLE has been appointed chief engineer of the Pittsburgh & West Virginia Ry. and the West Side Belt R.R., vice W. F. PURDY.

C. WHITFIELD, roadmaster of the Portland division of the Spokane, Portland & Seattle, has been appointed superintendent maintenance-of-way, headquarters at Portland, Ore., the title of roadmaster having been abolished.

R. H. THOMSON, consulting engineer, Seattle, Wash., has been employed by the Public Service Commission of that state to prepare a railroad terminal map of Seattle yards, which will become the standard plan of adjusting switching differences for all railroad centers in the state.

H. W. WAGNER, district engineer of the Atchison, Topeka & Santa Fe at La Junta, Colo., has been promoted to chief engineer, eastern lines, headquarters at Topeka, Kan., succeeding R. A. RUTLEDGE, transferred to La Junta as district engineer on account of ill-health.

JAMES T. GILLICK, formerly assistant general manager of the Chicago, Milwaukee & St. Paul Railroad Co., has been appointed general manager, succeeding P. C. HART, assigned to other duties. MACY NICHOLSON, formerly assistant to the operating vice president of the Great Northern Railway Co., succeeds Mr. Gillick.

E. F. MILTNER, formerly resident engineer for Black & Veatch, Kansas City, Mo., in charge of pavement and sewer construction at Garnett, Kan., has been appointed county engineer of Anderson County Kansas.

T. J. WILLIAMS, JR., has resigned as division engineer of the St. Louis Southwestern Ry. of Texas, at Mount Pleasant, Tex., and has been succeeded by H. J. GRAESER, promoted from office engineer at Tyler, Texas.

JEROME H. FERTIG, formerly assistant engineer in the United States Reclamation Service, is now assistant to the project engineer, Odioco Project, Prineville, Oregon.

I. J. TOURTELLOT, at one time chief of party on Federal valuation of railways for the Interstate Commerce Commission, has resigned as district engineer for the J. B. McCrary Co., engineers, Atlanta, Ga., to become associate professor of civil engineering at the Texas Agricultural and Mechanical College.

F. H. SHEPHERD, federal member of Parliament for Nanaimo, B. C., has accepted the office of inspector of dredges for British Columbia. Mr. Shepherd is an engineer by profession, and has been connected with mining and railway work in Canada, Australia, New Zealand and Alaska. At one time he was chief inspector of mines in British Columbia, which position he resigned in 1911 to enter Dominion politics.

F. W. HILLMAN has been made division engineer of the Chicago & Northwestern, with headquarters at Madison, Wis., in place of L. JUTTON, who has been transferred to the Wisconsin division, headquarters at Chicago. Mr. Jutton succeeds S. S. LONG.

F. O. BROILI has accepted the position of engineer of Public Utilities Commission of the State of Nevada, succeeding W. K. FREUDENBERGER.

S. E. ROBERTSON has been confirmed by the Fiscal Court of Shelbyville, Ky., to succeed G. MURRELL MIDDLETON as county road engineer.

CHARLES M. SCHULTZ, formerly with the New York State Department of Highways, is now with the Central Products Co., of New York.

WILBUR R. GREENLUN, formerly assistant engineer, Mason City, Iowa, has been appointed county engineer of Decatur County, Iowa.

E. O. CARLSON has left the position of assistant engineer of the New York, New Haven & Hartford R.R., with offices at New Haven, Conn., to enter military service, and has been succeeded by A. A. CROSS.

WALTER J. BENNETT, of the bridge department of the Great Northern Ry., has been commissioned as captain in the Engineer Officers' Reserve Corps, and is now in the training camp at Vancouver Barracks, Washington.

U. S. MARSHALL, formerly assistant engineer in the office of the Sacramento County, California, highway commission, is now road engineer in the army cantonment at Camp Lewis, American Lake, Washington.

E. IRVINE RUDD, for the past four years assistant engineer with the Central R.R. of New Jersey, has been appointed engineer of the Public Utilities Commission of Connecticut during the absence of JOHN F. TRUMBULL.

E. J. UMSTEAD has been appointed chief draftsman of the mechanical division of the Bureau of Water, City of Pittsburgh. The division has charge of the design, erection, operation and repair of pumping stations.

CAPTAIN JOSEPH C. WATKINS, who was manager of the McDonald Land and Mining Co., Joplin, Mo., is now at the Second Engineer Officers' Training Camp, Fort Leavenworth, Kansas.

C. H. KNOWLES, Portland, Ore., in charge of Multnomah County's engineering department, recently received a commission as recruiting officer for the 23rd (Highway) Regiment of Engineers, United States Army.

J. D. JUSTIN, formerly resident engineer for the Fargo Engineering Co. on the construction of the recently completed Wissota Dam at Chippewa Falls, Wis., for the Wisconsin-Minnesota Light and Power Co., is now connected with James H. Fuertes, consulting engineer, New York City.

CHARLES W. MURRAY has been reappointed city engineer of Miami, Fla., for a term of two years.

W. O. RENKIN, formerly chief engineer with the A. M. Byers Co., Pittsburgh, has resigned to become manager of the engineering department of the Quigley Furnace Specialties Co., New York City. Mr. Renkin spent some years as resident engineer in charge of organization and construction of the work and Town of Sakchi, Bengal, India, for the Tata Iron and Steel Company.

L. M. NORELIUS has become associated with F. C. SHENEHON, consulting engineer, Minneapolis, as engineer in charge of a large spillway in connection with flood-control improvements at Sioux Falls, South Dakota.

OBITUARY

JAMES P. MCNICHOL, contractor, Philadelphia, died there Nov. 14. He was born in Philadelphia 53 years ago. After graduating from high school, he entered the firm of Daniel J. McNichol & Co., which was founded by his uncle. His father was also a contractor. Mr. McNichol was prominent in city politics and held the office of state senator.

LIEUT. J. H. CARDEW, M. C., graduate of McGill University, died Oct. 5 of wounds received in action on the French front. He was at one time electrical engineer of the Indian Government State Railways.

LIEUT. COL. THOMAS C. IRVING, D. S. O., commanding officer of the First Canadian Engineers, has been killed in action on the French front. As a captain he went over seas at the outbreak of the war with the Second Field Company of the Canadian Engineers. Lieutenant Colonel Irving was an associate member of the Canadian Society of Civil Engineers and a member of the Engineers' Club, Toronto. Prior to enlistment he was vice president of the Moffat-Irving Electric Smelters, Ltd., Toronto.



Manufacturer: Before you fix that price–
Dealer: Before you add that extra profit–
Workman: Before you strike– *Ask yourself*—

"Is this MY boy?"

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"Is This My Boy?"

WE URGED in these columns several weeks ago that it was the duty of everyone to help the country to get on a footing comparable to Germany's. The difficulty in accomplishing this quickly is due to the failure of the individual to make a personal application of the grimness of the war. If we could visualize our own sons standing in a front-line trench at dawn; see them spring to action as the barrage fire ceases, and straighten themselves; follow them over the top, plunging through shell craters, to be stopped by a bullet from a German machine gun; and then be with them through a day of writhing agony, under a parching sun in No Man's Land, or in a jolting ambulance—if we, each of us, could have such a picture with us daily, there would be no profiteering, no strikes, no action that would embarrass those boys at the front, that would leave them without ammunition, or food or warm clothing, that would rob our guns of their shells and explosives, that would curtail shipping and thus keep the needed supplies or reinforcements from France. That our readers may make this personal application, and spread the thought wherever they have influence, we inclose with this issue a picture with the caption, "Is This My Boy?" The picture is an unusual one to go with an engineering journal. But these are unusual times. We are, first of all, American citizens, then engineers and contractors.

Medical Students and Engineering Conscripts

NO ONE who gives more than a passing thought to industrial conditions is willing to minimize the primal need, in our civilization, for the man of engineering training. Yet the war and its operations have so seriously depleted the attendance at technical schools that the next, in fact even this generation, may be seriously crippled in its normal development. How it became possible to take engineering juniors and seniors from schools through the action of the selective draft can be answered satisfactorily only by the assurance that they will be returned—in fact, that they will be refused permission to join any military department until they have received their diplomas or have fully satisfied the authorities that they would have been part of the number normally weeded out at the end of every year through inefficiency or ineptitude. They count no more than one if their course is not completed, and the thousand odd which they number altogether is insignificant in comparison with the future need the country will have for them. No unheard of proposal is this. This journal has urged it repeatedly. Medical students are exempt, and properly so. But who is seriously to affirm that a third or fourth year medical student is of more value, now or in the future, than an engineer with the same amount of training? Questions of this sort need a broader, more intelligent handling, and it is a reflection on the engineering profession that we are so loosely, so ineffectually organized and so weakly led that such a situation can arise and find no agency charged with the care of these things, or strong enough to circumvent its potential destructiveness. The need for action, and now only the national engineering societies can take it, is clearly shown by the data on college enrollment on page 1001 of this issue.

A Quick and Patriotic Move

LAST WEEK for a few days the danger of a railroad strike loomed large. The ghost supposed by a few to have been laid low by the Adamson Law reappeared. Less than a year after that law went into effect the railway brotherhoods, spurred no doubt by the abnormal cost of living and the abnormal wage scale in many industrial lines, forgot their promises not to hamper the Government during the war, and made new demands exceeding those of 1916. Obviously the railroads, hard pressed under present conditions, could not meet the new demands. But the managers, if not the employees, realized as clearly that a strike, or even the threat of one, could not be tolerated in these war times. So they have put their case entirely into the Government's hands, and the brotherhoods, to escape public condemnation, could not do otherwise than follow suit. The outcome may be higher pay and so greater public expense than would result if a fight were made; but the important thing is that there will be no strike.

Engineers Lead in City Manager Profession

THAT the management of cities has become established as a profession, with engineers as its leaders, was shown by the fourth annual convention of the City Managers' Association, held at Detroit last week. As in so many other new fields, engineers have come to the front in this one at a time when no specific or complete training for the work was available. This has been made easier because so large a part of city work is engineering in character, while most of the work of many engineers is administrative. Nearly all the city

managers at the Detroit convention were engineers. If the percentage—80 to 90—does not hold good among executives of enterprises generally, that only goes to emphasize the leadership of the engineers among the city managers. In order that the lead of the engineers may be maintained and, more important still, the success of this new profession be insured, no engineer who aspires to a city managership should fail to recognize that the position requires executive ability, tact, broad vision and deep human sympathy. Without these qualities a candidate will surely fail.

The Work Before the State Highway Departments

WHEN we entered the war there was a tendency on the part of some highway officials to abandon road work—evidently on the theory that it was not a war essential. Unfortunately the issuance of Priority Order 2 which, among other things, prohibited the shipment of road materials in open cars, has seemed to justify this theory. News of the intention to raise the prohibition in the early spring, if possible, and of the appointment of the Highways Transport Committee has not traveled as fast as the priority prohibition.

This is unfortunate. The time demands a hitherto unprecedented activity on the part of the state highway departments. If highways are a war necessity (and this journal, fully supported by the telegrams appearing on page 1032 of this issue, believes that they are) it is vital to secure authoritative data at once and to plan for the improvement and maintenance of congestion-relieving roads.

The first step would seem to be the determination of what highways in a given state can be used as a substitute for twenty- or thirty- or fifty-mile railroad and express routes which may be so badly congested that they are holding up essential industries. Once they are determined, funds can be allocated to them and financial assistance obtained from local communities.

Then the matter of securing contractors will need attention. For two reasons there was relatively little highway work this year:

1. The contractors were unwilling to take the risks due to the uncertain labor and material markets, and the difficulty of securing deliveries, or

2. The contractors, desiring to protect themselves, bid so high that the tenders had to be rejected.

It is necessary that the contractors be relieved of at least some of the risks. The states may assume responsibility for the delivery of materials either by direct purchase or by agreements with the material companies. Contractors, if assured of materials, can well assume responsibility for the labor.

The last step is to determine the railroad cars necessary to transport the materials for these highways and to secure the cars, or authorization for them, from the Priority Board.

Even if cars were now available the preparation of a real war-emergency road program is needed. During the continuance of the war the supply of cars will be uncertain and, even if cars are plentiful, material may be refused in order to force workmen into munitions-making plants. This is what has actually happened in England to every activity which could not prove itself a war service. On the other hand, so keen is the appreciation in England of the value of highway transport as a war measure that the grants for road work by Parliament are greater this year than ever before. The state, therefore, which has not worked out its program on a war-emergency basis is leaving its industrial and business life unprotected by the insurance afforded by highway routes that serve as a substitute for short-haul express and freight service.

It would be well to prepare, in addition to this war-emergency program, a supplementary scheme for the improvement of less important roads that could be proceeded with should it be possible to secure additional labor and materials. Every farm road put in better condition will help to relieve the food tension and decrease by so much the labor involved in starting products on the way to market and to France.

The Highways Transport Committee will naturally take up some or all of the elements of the plan herein suggested and bring its influence to bear for their adoption. Now, however, is the time for action. Many roads need attention at once. The committee cannot possibly cover the country quickly with its own resources. It must get the help of the state highway departments. If they are forehanded, appreciate the need and start their planning, the country will so much the sooner meet and solve its highway-war problem.

Structural Progress Through Dead-Load Stress Measurements

THE fact that elaborate measurements of dead-load stress were made on the Hell Gate arch during its erection, as reported in a paper read last week before the American Society of Civil Engineers, marks a new page in the records of structural engineering. The measurements will take rank among the classics of the science. They would merit high regard if they were nothing more than a model of experimental verification of complex design assumptions. But their real importance lies in the increased knowledge they give us concerning stresses. They are the first recorded determinations of dead-load stresses throughout a large structure.

The Hell Gate results should give an impulse toward adopting dead-load stress measurement as a general practice in structural work. It is surprising but true that many structures offer less uncertainty with respect to live-load effects than with respect to the effects due to fixed load and to construction conditions. These latter effects can be measured by the strain gage; the value of the resulting knowledge is clearly illustrated in the Hell Gate case. Consider what is now known of the load-carrying action of the arch, and compare it with what would be known—and what would not be known—if the measurements had not been made.

Live-load stresses have been measured in not a few structures—enough to outline roughly the possibilities of such work, and some of the detail facts as to the stresses. But dead-load stresses have never been measured, or the results have not been published. J. E. Howard some years ago conceived the idea of making such measurements, and started on the work. But he

failed to publish his observations and the measurements were far less extensive than those at Hell Gate.

What stands out prominently from this new work is the clear-cut information it gives as to secondary stresses. That the measured stresses were generally lower than the calculated secondaries is a most useful and encouraging thing to learn, although some bridge engineers had suspected the fact. But it would be dangerous to generalize from the comparison in this one case, for the overshadowing influence of erection methods makes broad rules inapplicable to the question of dead-load secondaries. As likely as not, in another structure of different type the erection methods may produce remanent secondary stresses much greater than the calculated ones. Members are often placed and connected in a shape and angular relation that represents neither the unstressed nor the full-load condition, nor of necessity an intermediate condition; progressive distortion during erection has equally profound influence, and in consequence it is impossible to dogmatize. Dead-load secondaries can be studied in no other way than through strain-gage measurement. D. B. Steinman's analysis of the Hell Gate figures shows that such work gives closely reliable results.

But there is another important object of strain-gage measurement, namely, determination of dead-load direct stresses. As to this phase of the matter, there is chance for much misconception. It is easy to think that direct stresses are mathematically certain, free from all doubt, since the rules of statics are bound to apply. Let it be conceded that this is so in the simplest structures, that their stresses are as definite as the load distribution in a weighing scale; even so, when dealing with large masses of metal it is satisfying to know that the real stresses match the calculated ones. Further, the feeling of absolute certainty concerning stresses may be carried over unnoticed from ideally simple beam-and-column or truss assemblages to complex cases which afford room for serious doubts. For example, the same rules that are used for simple girders are applied to such highly-organized structures as the columns supporting the Manhattan Bridge, immense cellular plate structures subjected to combined compression and bending. These, however, are very far removed from any type of structure in which stress distribution has been explored by test, and our knowledge of the real tax on those great columns would be markedly advanced had the dead-load stresses in them been measured during erection.

Results of three kinds may be obtained through strain-gage measurements under dead-load, results bearing respectively on (1) local stresses at splices, pin plates and similar special details, (2) the uniformity of stress distribution over a large member, or in other words, the unity of action of the member, and (3) dead-load distortion stresses, or secondaries. For every large structure all three subjects are sufficiently involved in uncertainty to make strain-gage measurements an urgently desirable addition to the regular construction routine. Finally, in many types of structure the strain gage can give necessary information as to type. If in the arch it can discriminate between the three-hinged and the two-hinged condition, it can in a building frame determine the degrees of constraint and tell how many members coöperate in resisting certain loads. Without such information we cannot hope to attain safety, efficiency and economy in right conjunction.

Thus the Hell Gate measurements in more than one way furnish a starting point for new progress. The record of the work inspires the conviction that, when once the practice of measuring dead-load stresses becomes common, both the science and the art of structures will see a great advance.

Whither Are We Going?

UNLESS we take time occasionally to detach ourselves from the details of our war preparations and view events as political phenomena, we lose sight of the tremendous changes which have occurred since April in our economic and political structure. We are in a new era. Economically considered, last March is of a different age. The war has brought changes that generations of peace would not have witnessed. A Washington item of last week, that made hardly a ripple, will serve to show how accustomed we have become to radical proposals and how readily we accept doctrines, extreme as measured by the standards of last year, so long as they are "necessary for the war." Washington dispatches had it that plans were being formulated for the establishment of a credit board for the purpose of attending "to the credit needs of manufacturers and contractors who are filling war orders for the United States Government." The report went on to say that among other things the board "will arrange for the financing either by having the Government make them (the manufacturers and contractors) cash advances or by other means."

While we readily assent to the proposal of Government financing, under present conditions we should not blind ourselves to the magnitude of the step. We are extending public credit to private enterprises. That the products are for the Government does not change the fact. The significance of this course appears when we recall that through practically all time the credit power has been in private hands, not in the Government. It has been the bulwark of privilege and the undoing of those who had the vision, the organizing ability, the inventive genius, but were unable to tap credit sources.

But another thought suggests itself in this connection, how much of this war-time coöperation will be allowed to remain after the war? Will the railroads be allowed to continue their coöperative operation, involving pooling and all manner of practices formerly interdicted? (Some will answer by saying that these are steps toward Government ownership.) Will the advisory committees in the various industries be permitted to exist? Will the nation, heretofore against ship subsidies, continue to be an owner, or at least a lessor, of shipping? Will the Government continue to exercise control over essentials such as iron and fuel and food? In fine, are the national industrial economies which the war has occasioned a permanent acquisition, or will the new structure be swept away when peace comes?

These are not only interesting, but extremely important questions. We do not presume to answer them. We doubt whether they can be answered now. We raise them because they must be answered before long and because engineers should have a part in the answering.

French Engineers Span Aisne River Under Shell Fire

Small Steel Pontons Support First Foot-Bridge—Scows Later Moored To Carry Roadway for Heavy Traffic—Permanent Steel Structure Completed

By Robert A. Drake
Formerly Ambulance Driver, Section 5, American Red Cross, France

BRIDGE construction in war time tests to the utmost the enginer's powers of adaptation and resourcefulness. Quick action and results are necessary, both for saving the lives of the workmen and for preventing the needless destruction of expensive machinery.

French engineers accomplished a notable feat in spanning the Aisne River at ———— during the latter part of April and the first two weeks in June, 1917. On April 15 a terrific curtain fire from the French artillery forced the enemy to bury themselves in their dugouts 1000 yd. from the north bank of the river. The French engineers then faced their first problem in bridging the stream; to make it possible for the French troops to cross the river and establish their lines on the other side. On the south bank, at right angles with the line of flow of the Aisne, 14 steel pontons, each 8 ft. long and 3 ft. in diameter, were laid parallel with one another at intervals of 10 ft. On top of these boats, 10-ft. sections of board walk, made of 3 x 4-in. beams with boards 2½ ft. long nailed across them, were placed so that the joints between the sections were directly over the center of the boats. Large iron hooks fastened the timbers together in order to give flexibility to the floating bridge when the pontons rose or fell as the load on any particular section decreased or increased.

All this work of assembling had to be done under heavy shell fire from the German batteries. At a given signal the engineers pushed the end of the foot-bridge out into the river. Then a new difficulty arose; the current of the stream had such a tendency to carry the floating end of the bridge downstream that the first ponton failed to reach the other bank by 30 ft. The bridge was finally shoved across by letting the whole structure float down the current until its center struck the abutment of the old bridge. Then two men pushed against the masonry until the whole bridge swung up to make a 90-deg. angle with the blank. As soon as the end touched the farther bank, four men made the bridge fast by driving stakes in the earth and fastening steel cables from them to cleats on the first ponton.

Over bridges like these the first French troops charged in numbers that finally forced the Germans to retire to a line of hills ¾ mile from the river. These original foot-bridges were retained even after permanent structures were built, in order to relieve the congestion on the other bridges and also prevent the German balloon observers from estimating the number of troops coming up. The foot-bridges were close to the water and hence better concealed by the banks than the higher wooden or steel spans.

The second problem of the engineers was to provide means for getting trench supplies across the river to the Frenchmen on the north bank. The bombardment was still too heavy to permit an attempt to erect a steel structure, but the small foot-bridges were inadequate in size and strength for supporting the ever-increasing loads of food and trench munitions needed. A bridge large enough for pack mules and small horse-drawn carts was necessary.

The large ponton bridge solved the problem. Seven steel scows, each 35 ft. long, 4½ ft. wide and 3½ ft. deep, were brought up on large six-horse trucks. Each boat was turned bottom up on the flat timber bodies of the trucks, and kept from sliding sideways by a wooden support shaped like a broad U, under each end of the boat, and by ropes fastened from these Us to cleats inside the pontons.



FRENCH OVER AISNE CANAL—BELOW, RUINS OF BRIDGE DESTROYED BY GERMANS
Note the wooden beams and iron cross-braces at the end of the section of narrow gage track leaning against the abutment at the right

On the banks of the stream a nawser from one end of each boat was first fastened to a stake driven into the earth. Then the horses pulled the wagon from beneath the boat, and soon after the pontons were launched one after the other with the bows pointing upstream. The planks of the runway on top of the boats were laid diagonally, and fastened at the edges by 8-in. beams that also kept wheels of carts from running overboard. As the floor of this bridge was 15 ft. below the top of the bank, a wooden runway similar to that on the bridge led over the soft, shell-pitted earth from the end of the bridge to the macadam road above. But this large ponton bridge was used only temporarily.

As the Germans were driven back to a point 2½ miles from the river, the third and final problem presented itself to the engineers; to span the river with permanent bridges strong enough to support the weight of the advancing artillery, heavier munition wagons, auto trucks and narrow-gage railroad trains.

All this construction had to be done within full sight of the German observation balloons that signalled their batteries to hinder and, if possible, prevent the work entirely. At another point farther down the river, higher hills on the northern side of the valley cut off the visibility from the enemy balloons to a greater extent, but this factor of safety was sacrificed somewhat in order to utilize the abutments of the old bridge. The Boches had placed heavy charges of nitro-glycerine on the centers of the trusses, and as a result of the explosions the twisted steel, fallen away from the abutments, was lying in the river below. In their haste the Germans had been forced to leave the masonry intact, but the solidity of the stonework was carefully tested by the Frenchmen before they utilized the piers. There was more than a chance that the wily Boches had secretely undermined the stonework.

Before the war, part of the Aisne at this point had been diverted so that two bridges had to be constructed, one a single span 100 ft. long over the canal, and the other a double span, 220 ft. over-all, over the main body of the river.

A narrow-gage railroad was constructed from the engineers' park (supply station), 3 miles farther in the rear, to the river, in order to bring up the steel and other heavy supplies. The hauls were made by a four-cylinder gasoline locomotive that could draw three loaded trucks at a maximum speed of 8 miles per hour.

The motto of the French engineers was: Use expensive machinery under shell fire for as short a time as possible. So the derricks, piledrivers, trusses and other supplies were not brought up until every possible preparation had been made. There was plenty of labor at the front; the conservation of material was the real problem.

Just as the work was well under way, the German aëroplanes "spotted" the increased activity of the engineers and directed the artillery to increase its firing. The hostile aëroplanes also dropped bombs on the works, so the natural difficulties of the engineers' task were considerably augmented by these human hindrances.



FOOT BRIDGE ON PONTONS WAS RETAINED AFTER STEEL STRUCTURE SPANNING MAIN RIVER WAS COMPLETED

I was driving an ambulance in an American Sanitary Section (Section 5, American Red Cross) at the time and our cars carried an average of 7 wounded engineers a day—all hit either on or near the bridge. Although dugouts were provided for the men in case the bombardment became too heavy, the workmen preferred to stay at work in order to finish the construction as soon as possible.

The principle of bridge-separation guided the work of the engineers throughout. Rather than build a single bridge broad enough for traffic going in two directions simultaneously, the Frenchmen erected two narrower bridges separated by at least 150 ft. although the work involved much more time and labor. The purpose of this separation was obvious; during a bombardment the chances of the shells cutting the lines of communication were lessened considerably by decreasing the width of the bridges, and placing the spans at a considerable distance from each other.

I had a good opportunity to observe the practical value of this method of construction one night when the artillery fire was unusually heavy, for the Boches were trying to keep the supply teams from coming up. On the trip down I crossed the bridges safely with my load of wounded, but on the trip back, shells hit both bridges. The wooden bridge I had passed over on my



HOW THE PONTONS ARE LOADED FOR QUICK TRANSPORT FROM REAR TO POINT OF USE

way down was so badly damaged that traffic could not pass over it at all, but—here the advantage of steel over wood construction was clearly evident—although a shell had hit the steel structure, teams and autos could still drive over the river. I crossed the span over the canal without mishap, but once on the island I was stranded. The traffic over the narrow one-way bridge was hopelessly congested by the double load of teams trying to come down as well as go up. Two teams could pass on the island where we were, but not on the bridge, so there was nothing for us to do but to "sit tight" and wait our turn. I have spent many pleasanter moments than that quarter-hour out there in the blackness, listening to the shrieks of enormous shells aimed at a target only 10 ft. away! When it finally came our turn to move, a French teamster behind us galloped ahead and blocked the way. I know enough French to express myself on ordinary occasions, but I knew nothing but vivid English at that moment.

"You blankety blank blank toasted-in-Purgatory Frenchman, you," I yelled, completely forgetting that the poilu couldn't understand a word I was saying, "get out of my way!"

The very evident emphasis of my remarks made some impression on the teamster's mind, if the words didn't. He pulled out to one side of the road and a few seconds later I was safely out of the danger zone.

The workmen could not make any repairs on the bridge that night because "no lights" was the rule so near the trenches, but at daybreak the next morning the reserve staff of engineers, who lived near the bridge to take care of just such emergencies, were at work repairing the shattered railing. The narrow-gage railroad that passed over the steel bridge also needed rebuilding, so the reserve section of combined steel ties and rails was picked up from beside the road and substituted for the broken section.

The *gendarmes*, who lived in dugouts at either end of the bridges, strictly enforced the one-way traffic rule when both roads were open. As these officers had orders to shoot down any driver that disobeyed orders we were careful to drive over the steel bridge when we went toward the lines, and over the wooden bridge when we were going in the other direction. As the munition teams had their heavy loads of shells going up, the steel structure was used for all the up-bound traffic.

When the teams or autos approached the bridge the policemen made every vehicle keep at least 50 yd. behind the one ahead. This was done for two reasons—first, to make a more scattered target for the German artillery, and, second, to eliminate a possible overload on the bridges. The macadam road near the approaches was always well sprinkled to keep passing wheels from stirring conspicuous clouds of dust that could be seen by hostile observers, and the maximum speed was reduced to 8 miles per hour.

After the bridges were completed camouflage played an important part in protecting the structures from shell fire. All the steel trusses and woodwork were painted a moss green color, the shade of the water below, for the secret of camouflage is to imitate the background as closely as possible. This green paint concealed the bridges from view of German aëroplanes. On either side of the road, at the ends of the bridges nearest the trenches, two 35-ft. poles were erected, and between these poles a ½-in. wire cable supported a screen of heavy chicken wire that hung down to within 10 ft. of the roadbed. Bushes and bits of painted cloth were interwoven in this wire until the whole camouflage made the poles appear exactly like one of the dead trees all along the bank.

As a final precaution against a possible severing of the supply lines, the engineers built a detour that led down the side of the valley across another bridge 2 miles farther downstream. But the question whether a driver should use the direct route or the detour was left solely to the discretion of the individual.

New Los Angeles Reservoir Under Way

Construction has recently been commenced on the Chatsworth reservoir in the upper end of San Fernando Valley, a few miles northwest of Los Angeles, Calif. About 27,000 acre-feet of storage will be thus provided by the nineteenth and last of the reservoirs planned for the Los Angeles aqueduct system. This reservoir calls for the construction of two large earth-fill dams and four smaller dams or dikes spanning gaps between hills.

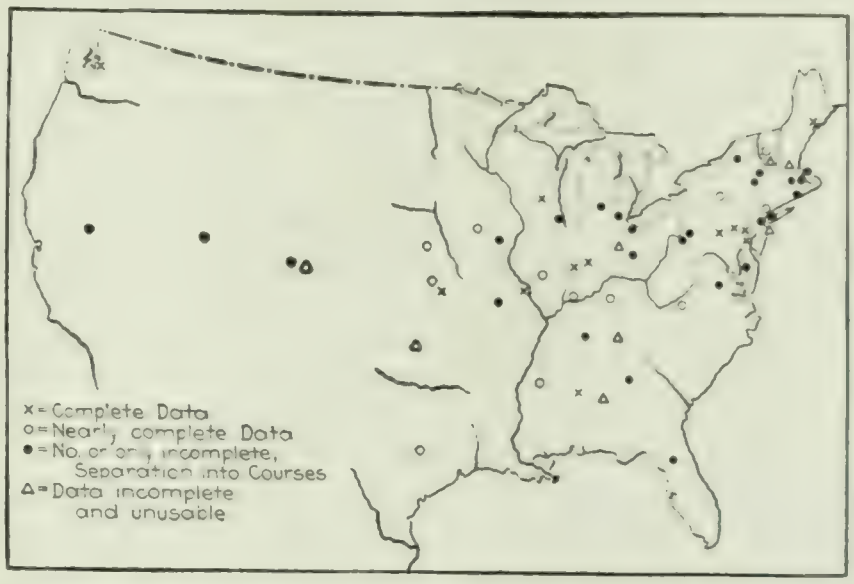
The construction period is expected to extend over more than a year. At the outset there were employed on the work about 250 men, 150 horses and mules, three steam shovels, and three locomotives, with the necessary equipment of small cars. The construction method is similar to that used on other hydraulic dams of the aqueduct; dump cars convey the material from the steam shovels to a conveniently placed sump, whence it is pumped to the dam. The total yardage to be moved on this work is about 1,040,000 cu.yd., of which 740,000 and 190,000 cu.yd. go into the first and second dams respectively.

The main portion of the Chatsworth high line conduit has been finished for several months and serves the adjoining tracts under irrigation. This line will now be extended three miles to bring the aqueduct water to the new reservoir. The conduit is to be completed in time to deliver water next spring and thus take advantage of such storage as the progress of the work on the dam affords by that time.

How the Draft Has Affected Enrollment In Engineering Schools

Seniors and Juniors, Generally Above the Minimum Age Limit, Fail in Large Numbers To Return to School This Fall—Freshmen and Sophomores Affected, Though Not to Same Extent—Chemical Engineering Courses Suffer Less Than the Other Branches—Effect of Depression of 1914 Shown

ATTEMPTING to gage the effect on engineering schools of the entrance of this country into the war, the *Engineering News-Record* sent a letter to 92 institutions requesting information as to the number of students enrolled at the beginning of the scholastic years for the years from 1912 to 1917, inclusive. The request was extended to cover a division of enrollments into civil, mechanical, electrical, and chemical engineering courses. About 60% of those addressed replied to the letter, and of those replying not all submitted data which could be used in the summary of totals which accompany this article. This was to have been expected, but it is believed that a good indication can be obtained from the twenty schools which reported full data on the civil engineering enrollment, the sixteen which reported on mechanical and electrical to the same extent, and the thirteen which gave full figures on their chemical engineering courses.



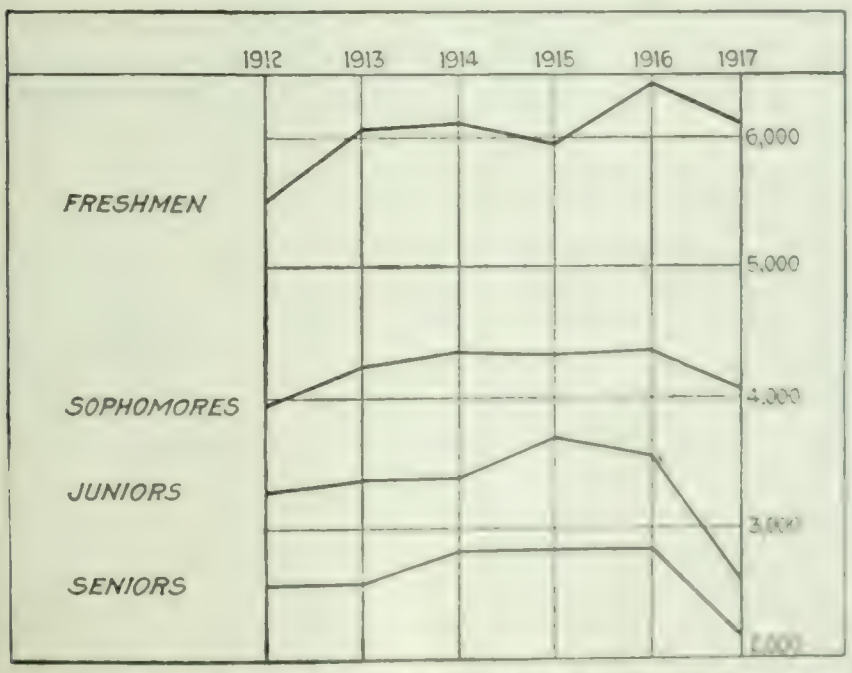
REPLIES SHOW FAIR GEOGRAPHIC DISTRIBUTION

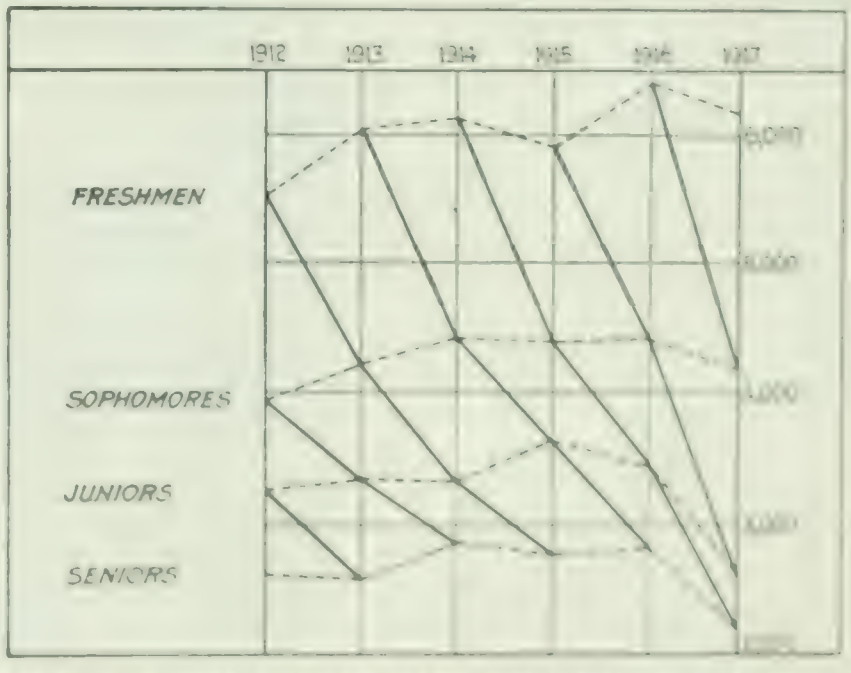
Several rather startling facts stand out besides that sought for. Among these is the effect of the depression of 1914 upon enrollment and the remarkable increase in the number of students taking the chemical engineering course. When considered in conjunction with those taking civil, mechanical, or electrical engineering courses, this is particularly striking, and although it has been noticed before, it is not thought that the extent of this change-over has been fully appreciated. Unfortunately, no request was made which would have brought replies showing the number enrolled for agricultural engineering, but a paper by Prof. Calvin H. Grouch in the October "Bulletin" of the Society for the Promotion of Engineering Education, shows that this course has enjoyed a remarkable popularity, particularly during the last ten years.

But the main interest derivative from the data is the fact that the senior and junior classes were cut as much as 60% in some schools by the operation of the "selective draft" and through voluntary enlistment.

It is not possible to give exact figures in any case, nor would it be justifiable to draw a too definite inference from the partial tabulation appended. It is, however, interesting to point out that while the civil engineering classes of 1916 lost an average of 22% between the enrollment for junior and senior classes, the class of 1917 lost 41%. This is the figure for twenty schools from which sufficiently complete data was obtained, and is even more significant when it is realized that the average loss for the classes of 1913, 1914 and 1915 was only 13% between the senior and junior years.

In the mechanical engineering course the corresponding average loss for the classes of 1913, 1914 and 1915 also was 13%. In this branch the loss for 1916 was 20%, but this fall the enrollment dropped 51%, 10 points more than in the civil engineering course. It is probable that this greater loss may be traced to a drain to the industries.





THE DROOP OF 1914 WAS FULLY MADE UP, BUT THE DRAFT AND ENLISTMENTS HAVE SERIOUSLY DRAINED THE SENIOR AND JUNIOR CLASSES

ENROLLMENT IN CAREER COURSES FOR YEARS 1912 TO 1917, INCLUSIVE

Year	20 Civil	16 Mechanical	16 Electrical	13 Chemical
	805	639	784	279
	679	428	533	178
	557	341	459	116
	468	220	310	110
	850	696	864	296
	684	454	518	204
	543	358	454	148
	465	289	335	112
	811	634	863	326
	662	457	550	226
	520	373	407	190
	470	307	361	141
	810	552	768	450
	560	446	574	282
	526	369	446	202
	468	335	365	155
	745	664	752	455
	512	491	521	283
	443	390	438	195
	408	294	357	137
	738	563	711	490
	450	390	405	341
	283	272	266	172
	259	191	222	125

The electrical engineering courses for sixteen schools shows several rather individual features when contrasted with the mechanical and civil enrollments. The figures for the years 1913, 1914 and 1915 show a decrease between senior and junior years of 19%; for 1916, 20%; and for 1917, 49%.

In the last classification, that of chemical engineers, the data on thirteen schools shows losses as follows: 1913-14-15, 8%; 1916, 32%; 1917, 40%. This is a mortality appreciably lower than in either the mechanical or electrical courses and very similar in many ways to the characteristic behavior of civil engineering students as shown above. The comparatively greater loss in 1916 may reflect the sudden and extraordinary growth of American chemical industries during that period.

The above analysis is based on only a few schools from which full data was obtained, but it clearly points out many of the effects that recent developments have had on the attendance at technical schools. Other schools to the number of thirty-one forwarded figures covering the same years, but showing no clear separation into courses. In general the conclusions that may be deduced from this incomplete data completely bear out the statements made above though it is impossible to estimate the influence of such courses as architecture and agricultural engineering. The same characteristic droop in 1914 can be detected as well as the greatly diminished senior and junior enrollments of this year. The accompanying curves and diagrams include these figures wherever it was possible so to do and still maintain proportion and proper reverence for accuracy. Partial replies from eleven more schools are confirmatory but not thought worthy of inclusion in either the diagrams, curves or tabulations. Not a few institutions replied that they were so busy and in some cases so "plagued with questionnaires of one sort or another" that they asked our indulgence in their not replying to our request.

Defective Concrete Bridge Floor Surfaced with Brick

BRICK pavement has just been laid on a concrete bridge floor that developed serious wear because of defective concrete. The bridge crosses the Iowa River at Tama, Iowa, and consists of three 95-ft. riveted steel pony-truss spans with reinforced-concrete floor slabs. The steel was erected last fall, and the slab was poured in early winter. Before cold weather the concrete acquired enough strength to allow of stripping the forms, but when traffic was turned on, early in April, the surface soon showed wear, and by midsummer it became evident that some kind of resurfacing was needed. It is believed that delayed set due to cold weather, in combination perhaps with inferior aggregate, was responsible for the lack of hardness.

The concrete slab was considered satisfactory in respect to load-carrying strength, but lacking in resistance to surface abrasion. When requested to put the floor in good shape, the contractor proposed to apply a thin surface coat of rich mixture, but the state highway authorities declined to approve this method of repair. Finally the parties agreed on surfacing with a 3-in. grouted brick pavement, the county to pay half the cost of the brick

The paving was done in two longitudinal sections, keeping 9 ft., half the width of the bridge, open to traffic. The surface of the concrete was cleaned by scraping and hand brooming, and was then kept thoroughly wet for 24 hours. The following day a ¾-in. coat of 1:2 dry mortar was spread over the surface, and the brick dropped and grouted

A 3-in. layer of earth over the concrete was allowed for in the original design of the bridge, and the weight of the brick therefore does not reduce the live-load capacity of the structure. Such allowance is regularly made, in the practice of the Iowa State Highway Commission, in the case of concrete floors of pony-truss bridges located on earth roads. On such bridges earth is inevitably dragged on from the road, but often an earth covering is applied intentionally as a means of preventing wear. A bridge not far from the one above mentioned is said to show a maximum wear of 2½ in. in five years since construction; so far as known the concrete of this floor is of average quality for the region.

Thomas H. MacDonald is chief engineer of the Iowa State Highway Commission, which designed the bridge and directed the repairs. John H. Ames is bridge engineer.

Wisconsin Road Board Makes Experiments

Three lines of experiments in road construction are being followed by the Wisconsin Highway Commission. The first deals with the relative values of tars and asphalts as surface treatments for bituminous roads. The second is an attempt to determine the relative values of various types of steel reinforcement in concrete roads. The third subject is the possibility of constructing a serviceable but cheap road by means of hay and tar. The spreading of hay and straw on the roads in sandy parts of the state makes a fair surface for travel, but this does not last long. It is hoped that the tar will preserve and strengthen the layer of hay. The experimental road is giving very promising results.

Illinois Central Raises Line Above Flood Level

Steam Shovels and Dump Cars Handle 5-Foot Lift—Company Work on Old Alignment—Contract Work on Relocations

ELEVATION of its line above flood level for about 50 miles near Vicksburg, Miss., has been undertaken by the Yazoo & Mississippi Valley R.R. (Illinois Central system) in order to avoid interruptions to traffic by overflows which result from the increasing height of flood level in the lower Mississippi valley. This action was decided upon after the severe flood during the winter of 1915-1916, which reached a stage 1.4 ft. higher than any previous record, covered the tracks with 4 ft. of water in places, and stopped traffic for three weeks. The cost of this improvement will be about $1,250,000.

The work consists of raising the grade from 1 to 5 ft. above the present elevation, and includes trestles as well as fill. It extends 21 miles south of Vicksburg and 27 miles north of that city. For most of the distance the change is made on the existing location, and has had to provide for maintaining traffic. At some points, however, improvement is effected by a relocation, throwing the line back along the foothills instead of across the low lands of the overflow district. The work will be completed early in 1918, except through Vicksburg, and plans for the improvement and protection of the line at that point are under consideration.

All the work north of Vicksburg is on the original alignment, and the raising of roadbed and structures had to be done under traffic. For the first 10 miles, to the Yazoo River, the new grade of top of rail is placed at an elevation of 3 ft. above the 1915-16 flood level.

From this point to Smedes, 17 miles, the grade is raised only to the water level of that flood. The reason for this is the probable construction by the U. S. Government of a levee along the Mississippi River, the effect of which will be to reduce the future flood level in the area north of the Yazoo. This levee is proposed by the U. S. Government and will extend from the Terrapin Neck cutoff to the mouth of the Yazoo canal.

Change of grade on the 10-mile section to the Yazoo River was authorized early in 1916 and completed in December, at a cost of $150,000. Changing the 17-mile section north of the Yazoo was authorized in October, 1916. It was begun last March and is to be completed in February, 1918, at a cost of about $375,000.

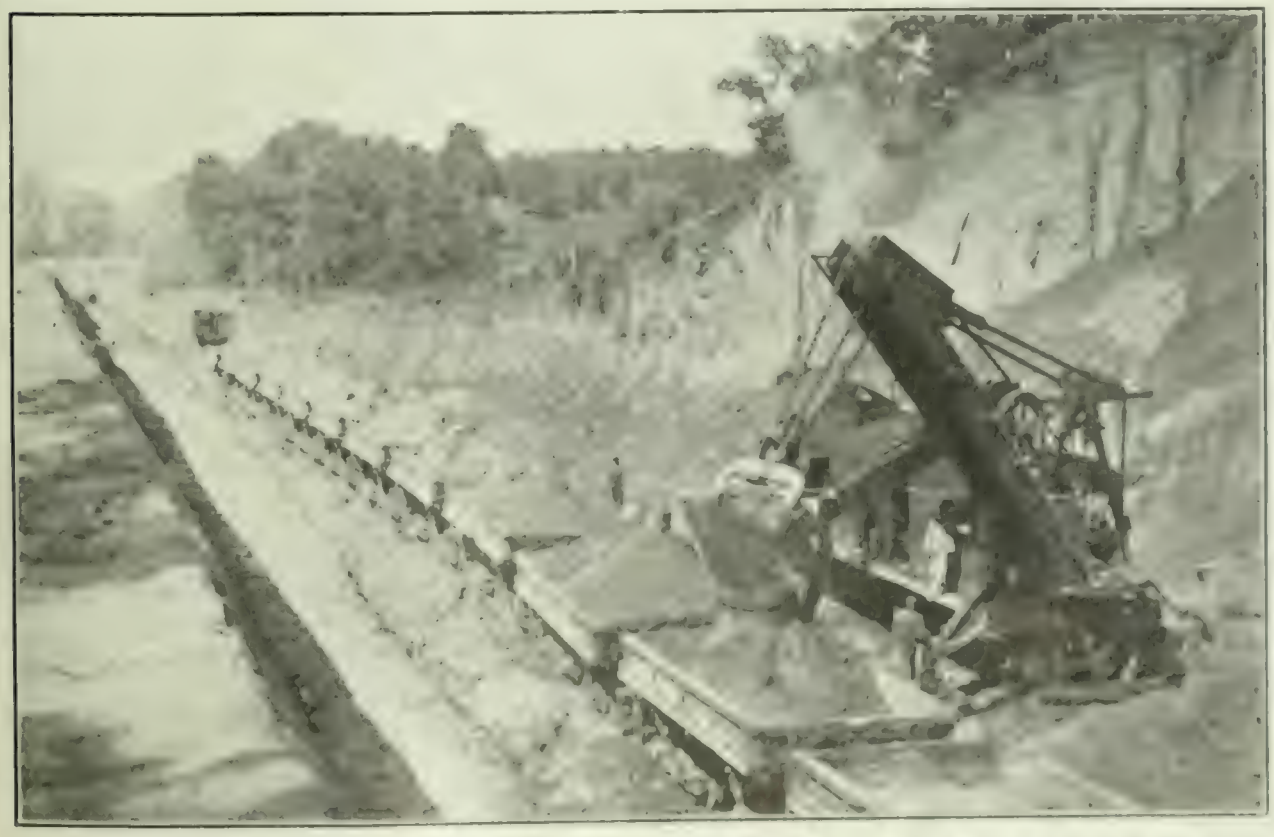
Both sections include new trestles and the raising of old trestles. The new and the old trestles are mainly ballasted-deck structures, built of creosoted timbers and having 6-pile bents. Where the lift of track on the old trestles was 2 ft. or less, it was made by placing additional caps, well secured by drift bolts. Where the lift was more than 2 ft. the same method was used, but an additional pile was driven at each end of the bent, and the new caps were of such length as to extend over the 8-pile bents.

All the work on this 27-mile stretch is done by the railway. The borrow-pit and work trains are operated by the construction department, and the raising and ballasting of track is done by the division forces. In raising the fills, a top width of 18 ft. is given, with side slopes of 1½:1. The material is clay and rock. An allowance of 10% for shrinkage after the track has been raised to full grade has proved satisfactory. Side borrowing was not permissible on account of drainage conditions. A borrow pit was obtained near Kings, making the average haul 13 miles, and excavation was begun on Aug. 1, 1916. Two steam shovels with 2½-yd. dippers are used. The force at the pit averages 40 men.

Excavated material is handled by 70 steel side-dump cars, of 20-yd. and 30-yd. capacity. These are hauled in trains of 20 cars, four 60-ton locomotives being employed for hauling the trains and spotting them at the shovels. The 20-yd. steel cars have been found very satisfactory for this class of work, especially where the height of fill does not exceed 8 ft. The 30-yd. cars are found to be too large for low fills, but suitable where the fills are of greater height.

The dump cars are operated by air, under control from the engine. Each locomotive is fitted with a three-way valve connected with the pipe-line of the dumping apparatus, so that the engineman can dump all the cars in either direction, according to signal from the foreman at the dump. The maintenance of the steel cars is very light, one car repairer being sufficient to handle the running repairs on 70 cars.

The dumped material is moved clear of the track by a steel spreader car. This is operated by a 90-ton locomotive, which also helps push the empty train clear of the



EXCAVATING IN A SLIDING CUT ON RELOCATION SOUTH OF VICKSBURG

dumped material. The spreader moves the material far enough to be clear of trains, but not so far as to cause unnecessary expense in throwing it back under the track.

Raising of the track is done in lengths of 1000 ft., with a lift of 1 ft. each, and with a gang of about 40 men to each length. Thus for a raise of 4 ft. there will be four consecutive 1000-ft. lengths, the first one being at the old grade and each of the others 1 ft. above the preceding length. On this stretch of 4000 ft. the track is on a fill with a narrow crown. Beyond it is the final dumping and filling for permanent grade and width of roadbed, with a gang of about 40 men making a light running surface between this work and the adjacent 1000-ft. length, which is still 1 ft. below final grade.

Track jacks are used to make the raise, and earth is then shoveled under the ties. The general plan is to raise the track as high as possible with the material at hand, and then run the dump-car trains on the track thus raised, to deposit material for the next lift. In this way the raising is kept in advance of dumping, giving the track good drainage, which is of great benefit during wet weather.

Cementing-gravel ballast 12 in. thick is laid on the new subgrade. This is obtained from a pit at Whitaker, 106 miles south of Vicksburg. It is hauled in 30-yd. convertible hopper-bottom ballast cars, with 82 cars per train for the work, north of Vicksburg and 16 cars for the work south of that point.

On the change of grade south from Vicksburg the alignment has been improved by partial relocation. This throws the line back along the foothills, eliminating stretches of old fills subject to wave wash during high water. The new work starts 4 miles below Vicksburg and continues for 17 miles, being in intermittent stretches which aggregate 12 miles in length.

This improvement has reduced the length of line by 0.32 mile and eliminated 233° of curvature. The maximum grade is 0.5% and the maximum curves are 2°. On the remaining 5 miles the grade is raised on the old alignment, following the methods previously described.

Improvement of this 17-mile section was authorized in July, 1916, and begun in August. The grading was completed last August. The cost of grading and bridge work was $600,000, exclusive of the Big Black River bridge, which cost $170,000.

Grading on the relocation work was done by the H. W. Nelson Co., Chicago. The construction plant comprised three steam shovels, 75 wood dump cars of 12-yd. and eight of 10-yd. capacity, a steel spreader car, a wood spreader car, two pumping plants and tanks and a water distilling plant. From four to eight 60-ton locomotives were rented from the railway company. Night and day shifts were operated for part of the time. Track, trestle and culvert work in connection with the grading was done by the railway forces.

All grade crossings of public roads have been avoided for 13 miles on the new line by the construction of two subways, an overhead bridge and a mile of road alteration.

The abrupt rise of the ground on the new sections of line caused considerable difficulty at three points, grades as steep as 10% being operated by the dump-car trains in reaching the shovels at the upper lifts. In several places the excavation struck a blue marl stratum about 6 ft. above the grade line. This gave trouble, as it could not support the load of the upper strata of clay. In one case the grade line was raised to the top of the marl stratum, but elsewhere the cuts were widened until the angle of repose of the overlying material had been reached.

Overflow of the bottom lands of the Big Black River by a high-water stage in the winter of 1916-17 caused the failure of a framed-bent trestle used in making the new fill. This necessitated the construction of a temporary pile trestle, the piles for which were driven by a creeping piledriver (mounted on rollers) while the water was at its high stage. This is shown above.



CREEPING PILEDRIVER CLOSES WASHOUT GAP IN TEMPORARY TRESTLE ACROSS BIG BLACK BOTTOMS

In this 32-ft. fill about 4 ft. of subsidence and 10% shrinkage of material occurred during the overflow. As 3000 ft. of the new embankment has not yet sustained an overflow period, the old line will be kept in condition for service until the next flood. This will provide for traffic in case of excessive shrinkage of the new fill.

The most important structure on the work is the bridge over the Big Black River, which has six plate-girder spans of 75 ft. carried by reinforced-concrete piers and abutments. To meet requirements for a navigation opening, one of the spans is provided with a lifting truss designed by the Strauss Bascule Bridge Co. This is operated by hand.

These extensive improvements were designed and carried out under the direction of A. S. Baldwin, chief engineer of the Illinois Central R.R. M. P. Black was assistant engineer in direct charge of the work.

Commission for Clarksburg, W. Va.

The commission form of municipal government was adopted by Clarksburg, W. Va., on Nov. 6, by a vote of 2852 for and 760 against. The new charter will bring four suburban towns into the city, making Clarksburg the third largest city in West Virginia.

As a Contractor Sees New York State's Road Situation

State Highway Commission's Methods Should Be Changed, It Is Contended, To Meet New and Unforeseen Conditions

By Dana W. Robbins
Of Dana W. Robbins, Inc., Engineers and Constructors, Utica, N. Y.

BY THE closing of the season and by the exigencies of war, the curtain has been rung down on New York State road work. It will stay down, regardless of the war situation, until there is a change of methods or until a new group of contractors is found, willing to contribute bountifully to the public good. Three-quarters of those engaged in the work during the past few years—and there have been over two hundred—have ceased to be active. Most of these are known to have been in financial difficulties. The work as a business proposition is in general disrepute among the banks, bonding houses and supply firms of the state.

Numerous reasons for these failures have been ascribed, including one by an official of the State Highway Commission to the effect that the contractors "lacked imagination." It should be stated that the contractors, generally, regard the present officials of the commission as the most able who have ever directed the highway work; and there is full realization of the fact that the highway law gives the commission little latitude in many directions. Also, many of the oldest and best road-building firms in the state, about whose ability there was no question, were among those which dropped out. To them, and to those who remain, there will occur a number of causes leading up to the present situation which are far from "imaginative."

Cost Estimates in Need of Revision

First: The highway commission, when preparing preliminary estimates, fixes the maximum price which can be obtained for doing the work. Contractors can take work at this price or go out of business with a large loss on plant investment. In the past these estimates have been fair, and bids have been 20 to 30% under them at times. In the rising markets of the past few months, however, the estimates have entirely failed to keep pace, as an examination of prices and comparison with labor, team and equipment costs will show. When engineers have become accustomed to certain unit prices, or costs per mile, it requires considerable mental elasticity to make up a proper estimate at this time, even if the data are at hand. Also, it requires considerable courage to place one of these estimates before a county board of supervisors. Nevertheless, when labor has virtually doubled in cost and lost fully 50% in efficiency it is evident that old ideas as to road costs must go.

Second: The contract and specifications now in use are the cumulative result of the efforts of eight or ten successive highway régimes, each of which, quite naturally, thought of a great many things the contractor must or must not do. What they overlooked the Attorney-General or the Comptroller supplied. Therefore, in signing a contract the "contractor agrees" to the extent of some 20 articles, one of which makes the standard specifications of 85 pages a part of the contract. The "State Commission of Highways agrees," in two brief articles, to pay for the work—only, however, under the numerous conditions mentioned in the next five articles.

There are many pitfalls for the unwary in the whole work of 116 pages. For instance, should a flood wash away a mile of finished road before the guard-rail is painted and the contract officially "completed," the loss is entirely the contractors. If the damage results from the failure of a new culvert to take the flow, the situation is unchanged, except that some time in the future the contractor may be able to recover in the Court of Claims. The damage cannot be paid for in any other way, regardless of the state's responsibility.

The Contractor's Hazard

Or possibly a note on the plans of a road states that stone from a ledge at a certain station has been tested and found acceptable for use in macadam. That would appear to be quite definite and final—but it is not. The commission has reserved the right to reject this at any time (which is proper), but the contractor shall have "no claim for increased payment" and must furnish stone from other sources of supply, which, of course, may be miles away.

On a road let in 1915 local top-course macadam was estimated at $3.75 per cubic yard and was bid at less. Before any top was laid the commission rejected a source of supply indicated on the plans as acceptable. The firm defaulted on the contract and the commission prepared a new estimate for completion in which top-course macadam appeared at $6.60 per cubic yard under the new requirements. In other words, the matter of $2.85 per cubic yard, or $15,000 on one item, was a hazard the contractor should have taken into account when he bid! It is idle to consider the increased cost of work let under such indefinite information, for the reason that the engineer's estimates are based on the accuracy of the first information, and any contractor making allowance for rejections could never get any work.

The matter of stone supply does not work both ways. On one contract "imported limestone" was called for. The contractor located a limestone outcrop within traction-hauling distance of the work and the stone passed all required tests. It could not be used, however, because "imported" means brought by "common carier." This decision was sustained in court.

A note on the plans to the effect that materials "may be from local sources" is held, not to give permission for their use, but to mean that they *may* be used if they pass tests to be made later on, the emphasis apparently being on the "may." Should the later tests result in the rejection of all local materials the contractor must import them without additional compensation.

The cases mentioned are but a few of those which have resulted in abandoned contracts and claims against the state. In the matter of recovery in the Court of Claims the contractors appear to be having considerable success, and this fact should have much weight in deciding upon changes which will make the claims unnecessary and will bring relief to the contractor when he needs it, rather than two years after he has been

forced out of business. Changes in the law will be necessary in some cases. For instance, the voluminous specifications and contract are silent about war, riot, flood, etc., the "Act-of-God" clause not being "among those present." As a result, the official position of the commission is that no unusual situation exists today.

Priority orders, draft laws, and $10 per day wages at cantonments and munition plants are, so it would seem, more hazards which the contractor assumed. Therefore, when he can make no further move of any kind, the commission will cancel his contract and retain any money due, as per articles 10 and 11 of the "contractor agrees." This will eliminate the contractor, but up to date has not seemed to expedite the construction work, for the bonding companies and the commission's own forces seem to be having troubles also. Can it be that they, too, "lack imagination?"

Steel Sheet Piling Repairs Pier at San Juan, P. R.

Floating Driver with Offset Leads Places Coffer Behind Old Bulkhead Rat-Proof Floor of Plank on Broken Stone

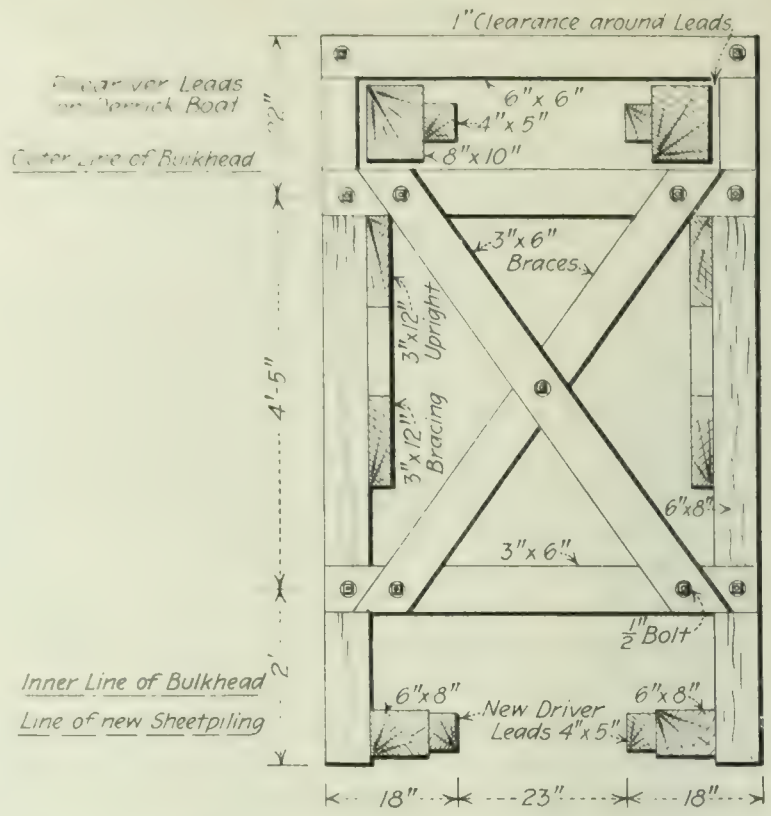
SETTLEMENT of a large steamship pier at San Juan, P. R., necessitated repair to the substructure and superstructure. The work included an inclosure of steel sheet piling, jacking up the columns and trusses, and laying a timber floor on a stone fill. The repairs were designed by H. C. De Lano, chief engineer of the Harbor Board. Construction was carried out under the supervision of Earl K. Burton, of San Juan, acting as consulting engineer for the New York & Porto Rico Steamship Company.

The pier (known as the San Antonio Co.'s pier) is 255 x 290 ft., with a one-story steel shed or superstructure divided into three sections or spans. It was built, about 12 years ago, as a solid fill retained by a bulkhead of timber piles and sheet piling. The superstructure was built on this fill, its columns being supported on small wood piles. In recent years there has been continual settlement of the fill due to the soft mud substratum, and repeated filling has been necessary to bring the floor to its proper level. The columns settled appreciably, some as much as 24 in., and as a result the steel roof trusses were all out of line. These columns were jacked up and heavier foundations were put under them.



PILEDRIVER HAS TEMPORARY LEADS OUTSIDE OF MAIN LEADS

Driving the steel sheet piling by means of a hammer



PLAN OF FRAME FORMING TEMPORARY EXTENSION LEADS FOR PILEDRIVER

in temporary extension leads in front of the main leads of a floating piledriver was a novel method employed for driving this sheeting inside the bulkhead line. The old bulkhead consists of a row of wood sheet piling which is braced on the outside by round wood piles spaced 4 ft. c. to c. Exterior batter piles brace the entire bulkhead and have the same spacing as the vertical piles. At certain places the sheet piling had deteriorated so badly as to permit the fill behind the bulkhead to be washed away, and it was found necessary to stop these breaks by means of steel sheet piling.

The only plant available was a derrick boat belonging to the San Antonio Company. As it was necessary to drive the piles at a distance of 6 ft. from the outer line of the bulkhead, a frame was constructed to fit against the leads of the piledriver mounted on the boat, and thus form new leads in advance of the latter. The 2700-lb. hammer was then placed in the new leads and operated in the usual way.

The new frame was so constructed that it could slide on the old leads, being raised or lowered by means of a second hoisting cable attached to the top of the frame. Thus the frame could be lifted free from the bulkhead, the derrick boat towed to its new position and the frame then dropped back into place. It was then secured to the bulkhead while the piles were being driven. This construction is clearly shown in the accompanying drawing and view.

A further advantage of this frame was in the driving of the sheet piling at locations where it was impossible to anchor the derrick boat directly against the old bulkhead—for instance, behind a pile dolphin in the stream, 8 to 10 ft. from the bulkhead. In such cases the frame was placed in its correct position over the bulkhead and braced in all four directions by cables from the top. The derrick boat was anchored to the dolphin and the piles were driven as before.

No floor had been placed over the old fill, but loose boards were used as dunnage for the cargo, these being placed and removed as necessary. Considerable settle-

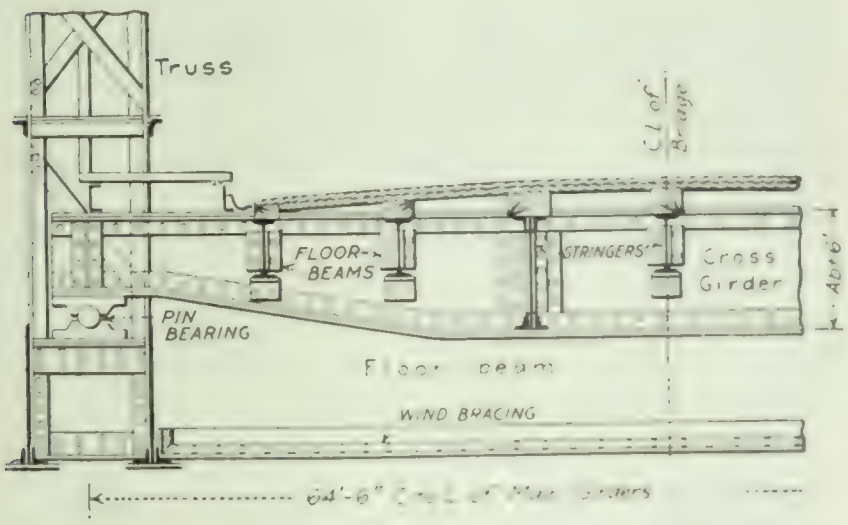
ment of the surface has resulted, some parts of the old earth fill having settled as much as 5 ft., necessitating a large amount of filling in order to keep the floor at its required level. With such a floor, extra labor for trucking cargo was necessary, in addition to the loss of a considerable amount of cargo destroyed by rats.

Owing to the character of the foundation, the fill will always be subject to some settlement, and in order to obtain a floor which would allow easy trucking, and at the same time be rat-proof, it was decided to construct a plank floor on a stone fill. A wooden floor was considered more advisable than concrete because, in case of settlement, the planks could be removed, more fill placed, and the floor replaced. With a concrete floor, the expense of tearing out the slab and replacing it with new concrete would have been excessive.

For building the new floor, the operation consisted of leveling the earth fill and spreading a layer of broken stone 8 in. thick, which was packed to 6 in. by rolling. Before the stone was rolled, creosoted sleepers 4 x 6 in. were embedded so that their tops were level with the top of the packed stone. These were spaced 4 ft. c. to c. On top of these sleepers was placed a floor of 2 x 12-in. yellow pine plank with tight joints and loosely nailed to the sleepers so as to be removed with ease. Care was used to leave no space between the stone and the planking, to make it impossible for rats to get under the floor.

Bridge Floor-Beams Have Pin Bearings

FLEXIBLE connection of floor-beams to the trusses is the feature of a through-truss highway bridge in Holland, built under the direction of the Dutch State Railways. The floor-beams are fish-belly plate girders, with their ends projecting into the trusses and fitted



FLEXIBLE END-BEARINGS FOR BRIDGE FLOOR-BEAMS

with shoes. These shoes rest upon bearing-pins in similar shoes seated in the bottom chord.

This construction, shown in the accompanying drawing, was illustrated recently in *The Engineer*, of London. No details were given. The brief article stated that attempts have been made to overcome the disadvantage of fixing the ends of floor-beams "but without much success as yet." It was stated that a serious disadvantage, in the case named, was the weakening of the bridge laterally, owing to the wind bracing not being connected to the floor-beams, and to the fact that the latter give no support to the trusses.

Special Forms Facilitate Concreting of Viaduct Deck Slab

IN CONSTRUCTING the reinforced-concrete deck slab of the High Line viaduct of the Kansas City Terminal Ry., at Kansas City, Kans., D. Munro is using a special sectional form for the cantilevered edge of the slab. This form can be erected and taken down very quickly, and gives excellent alignment of the slab. It was designed by W. A. Keene, the contractor's engineer.

As shown by the sketch, the form lagging is carried by cantilever frames having a 2 x 6 upright which seats against the web-plate of the outer track-stringer. A 4 x 6-in. wale bearing against the batter brace is tied back to the stiffeners of the stringer by eye-bolts, and thus holds the form in place. There is one bolt at each stiffener—about every 4 ft. For vertical adjustment and to bind the form in place, the upright is made a trifle short and wedges are driven between its foot and the stringer flange.

One form section is 8 ft. long, and has four frames spaced 2 ft. The lagging extends from the center line of one end frame to 2 ft. beyond the other end frame, so that adjoining sections of lagging meet over a frame. By tacking down the lagging that laps over this frame from the adjoining section, the form sections are held true and a tight joint is obtained. The 4 x 6 wale by which the frames are held in is 16 ft. long, and is placed so as to break joint with the form sections, which helps to assure true alignment of the sections.

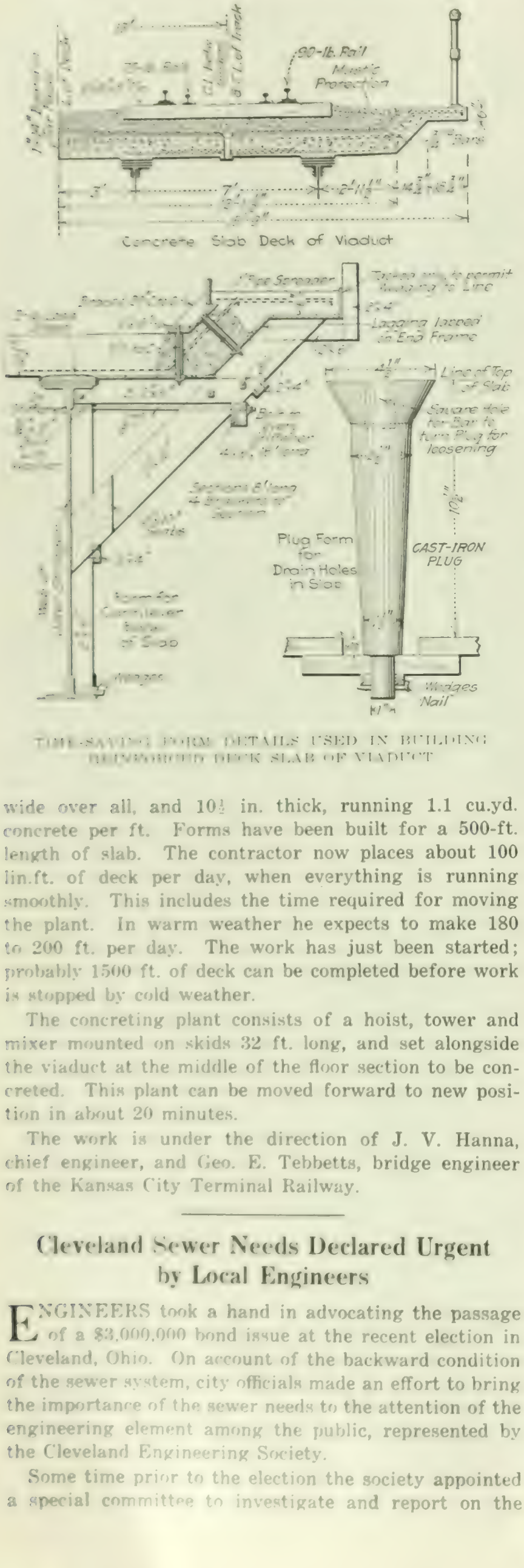
An inside form is required, to shape the curb of the slab. Its construction and manner of support are fully shown by the sketch. Care must be taken to let no concrete work up above the bottom of the 2 x 6 on which this inside form is built; otherwise the form will not strip out easily.

The vertical boards at inner and outer edges of the coping are tacked lightly to the frame members, instead of being nailed securely. Should they not line up accurately, where form sections join, they can be pried loose and wedged into line.

The deck is double-track, and is carried by four lines of plate-girder stringers. The slab is cut by a longitudinal joint on the center line, to forestall cracking due to one-sided deflection under load on one track only. This joint was formed by a 1 x 14-in. board, wrapped with tar paper and set on edge on the center line. The upper edge of the board supports one end of the screed or templet used to shape the floor; the other end of the screed rides on the 2 x 6-in. base strip of the curb form.

Each half of the deck is troughed slightly, draining to the track center-line. Here are located drain-holes at 5-ft. spacing. To form these holes, cast-iron taper plugs are used (see sketch). They seat on a board under a 4-in. square hole in the slab lagging, which hole forms the drip projection around the bottom of the hole. The plug is held firm by a 1-in. stem projecting down through this board, a nail through the stem, and wedges driven between nail and board. By pulling out the wedges and removing the nail, the plug is left free, and can be loosened in the concrete and lifted out by a hooked lever fitting a square hole in the top of the plug.

There are about 7500 lin.ft. of this deck slab, 31½ ft.



TIME-SAVING FORM DETAILS USED IN BUILDING REINFORCED DECK SLAB OF VIADUCT

wide over all, and 10½ in. thick, running 1.1 cu.yd. concrete per ft. Forms have been built for a 500-ft. length of slab. The contractor now places about 100 lin.ft. of deck per day, when everything is running smoothly. This includes the time required for moving the plant. In warm weather he expects to make 180 to 200 ft. per day. The work has just been started; probably 1500 ft. of deck can be completed before work is stopped by cold weather.

The concreting plant consists of a hoist, tower and mixer mounted on skids 32 ft. long, and set alongside the viaduct at the middle of the floor section to be concreted. This plant can be moved forward to new position in about 20 minutes.

The work is under the direction of J. V. Hanna, chief engineer, and Geo. E. Tebbetts, bridge engineer of the Kansas City Terminal Railway.

Cleveland Sewer Needs Declared Urgent by Local Engineers

ENGINEERS took a hand in advocating the passage of a $3,000,000 bond issue at the recent election in Cleveland, Ohio. On account of the backward condition of the sewer system, city officials made an effort to bring the importance of the sewer needs to the attention of the engineering element among the public, represented by the Cleveland Engineering Society.

Some time prior to the election the society appointed a special committee to investigate and report on the sewer situation, so that the importance of the sewer bond issue might be properly gaged. The committee was made up of men who were specially qualified for the purpose by familiarity with the general sewerage conditions of the city. While the subject was under consideration, Robert Hoffmann, chief engineer of the city, read a paper at a meeting of the society giving facts on the sewer conditions. Following this, the committee presented a report favorable to the sewer bonds, and this report was unanimously approved.

The need for city expenditure in connection with sewers arises from the fact that the city as a whole must pay the cost of sewers under street intersections, at least 2% of the remaining cost of local sewers, and the excess cost of any branch or main sewer over the cost of a local sewer.

The city's share of about 100 local sewer projects now under way will amount to nearly a million dollars, and of main sewer projects more than double this sum. Provision must also be made for sewering recently annexed portions of the city and partly developed land within the city, and for rebuilding several miles of sewer that is either too small or too shallow.

Flooding from inadequate sewerage is not infrequent in Cleveland. The city has about 17 miles of street and less than 15 miles of sewer per square mile; to equalize sewer and street mileage requires the construction of 106 miles of additional sewer in the entire city. Sewer expenditures have been exceedingly erratic in the past. The annual expenditure from 1890 to 1916 ranged from a maximum of 25c. (1891) to a minimum of 4c. (1910) per $100 of taxable valuation. The 1916 expenditure was 7c. per $100. The average expenditure per year during the last ten years was less than 9c. per $100.

Consideration was given to the fact that the authorization of bonds does not mean that all the bonds must be issued, or all the work undertaken at once. With the authorization, however, a definite program is in prospect. The problem can be approached in a comprehensive and scientific manner, and the work properly distributed over a number of years.

The society's endorsement of the sewer bonds was fully reported in the news columns of the Cleveland daily papers. At the election all the bond issues asked for—including $5,000,000 in addition to the sewer bonds—were approved by the voters.

Effect of Priority Order No. 2 on Massachusetts Road Work

The following statement regarding Priority Order No. 2 has been received from Arthur W. Dean, chief engineer, Massachusetts Highway Commission:

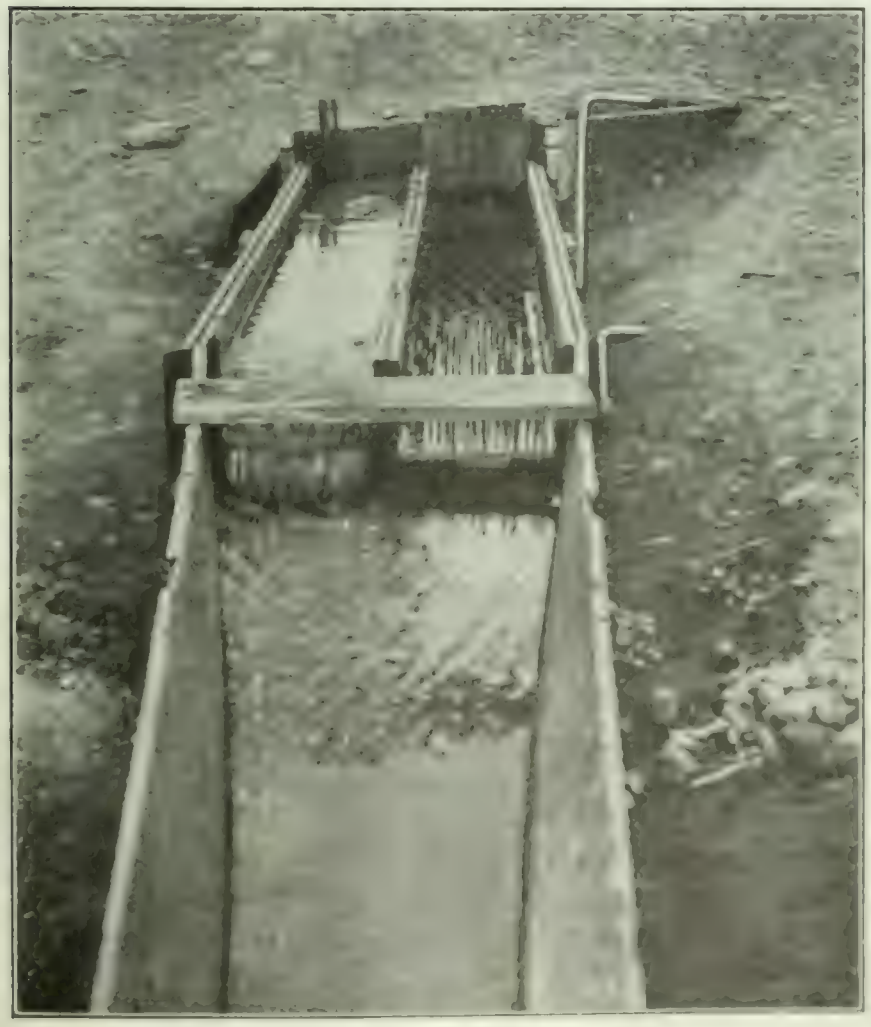
"This embargo makes necessary the shutting down of a number of partially completed contracts. We have been able to get enough ballast cars to ship sufficient stone to make these roads passable for the winter. The effect on future work in Massachusetts will be to permit road construction only in localities where a good quality of local stone can be secured or where there is gravel or other material suitable for making bituminous concrete or cement concrete surfaces."

Activated-Sludge Tests Made by California Cities

Process Competes with Imhoff Tanks and Sprinkling Filters To Produce Effluent for Use on Joint Sewage Farm

WHAT may be termed competitive tests to determine whether the activated-sludge process or a combination of Imhoff tanks and sprinkling filters will produce the most satisfactory effluent for application to the joint sewage farm proposed for Pasadena, South Pasadena, and Alhambra are being made at Pasadena under the direction of a board consisting of the city engineers of the three municipalities, headed by R. V. Orbison, of Pasadena. The other members of the board are John MacMillan, of South Pasadena, and Charles E. Hewes, of Alhambra. A report reviewing the activated-sludge experiments from Jan. 29, when the plant was put in operation, until Sept. 1, and touching lightly on the Imhoff tank tests, was submitted recently to the authorities of the three cities. From this report and notes made at the plant by a member of the editorial staff of *Engineering News-Record* this article has been prepared.

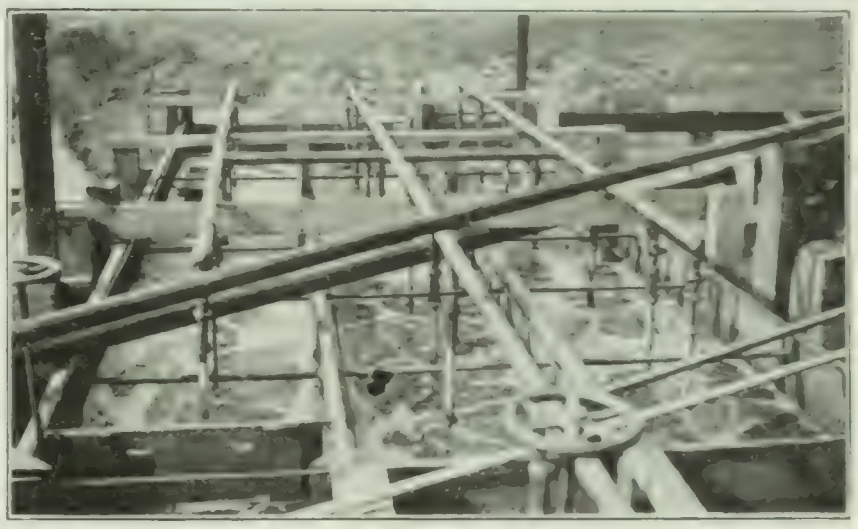
The activated-sludge plant consists of a diverting box, with a weir and a hook gage, a rag picker, an aërating tank, two settling tanks, a sludge re-aërating tank, a No. 1 Nash hydro-turbine blower to provide the air supply, a venturi air meter, an air lift used to raise the sludge from the settling to the sludge re-aërating tank, and a centrifugal pump for lifting excess sludge from either of the two tanks just named. A small laboratory is close at hand.



SPIKES EXTENDING THROUGH PERFORATED PLANK REMOVE RAGS FROM SEWAGE

The rag picker was installed to catch any rags, paper, or waste which pass over the weir in the diverting box. It was designed by E. P. Dewey, assistant city engineer of Pasadena, who also designed the individual cast-iron filtros plate holder mentioned later on. The rag picker, which is in duplicate, consists of spikes set 2 in. apart, staggered, in a 1 x 12-ft. plank and protruding 2 in. through holes in a second plank. To remove the rags, the upper plank is raised by means of levers until flush with the top of the spikes, taking the rags with it, which are then easily shoveled off. Cleaning two or three times a day is necessary.

The aërating tank is 9 x 20 ft. in plan, by 10 ft. deep. Two lengthwise partitions give 60 ft. of continuous



THE SURFACE OF THE AERATING TANK SHOWS GOOD AIR DISTRIBUTION BY FILTROS PLATES

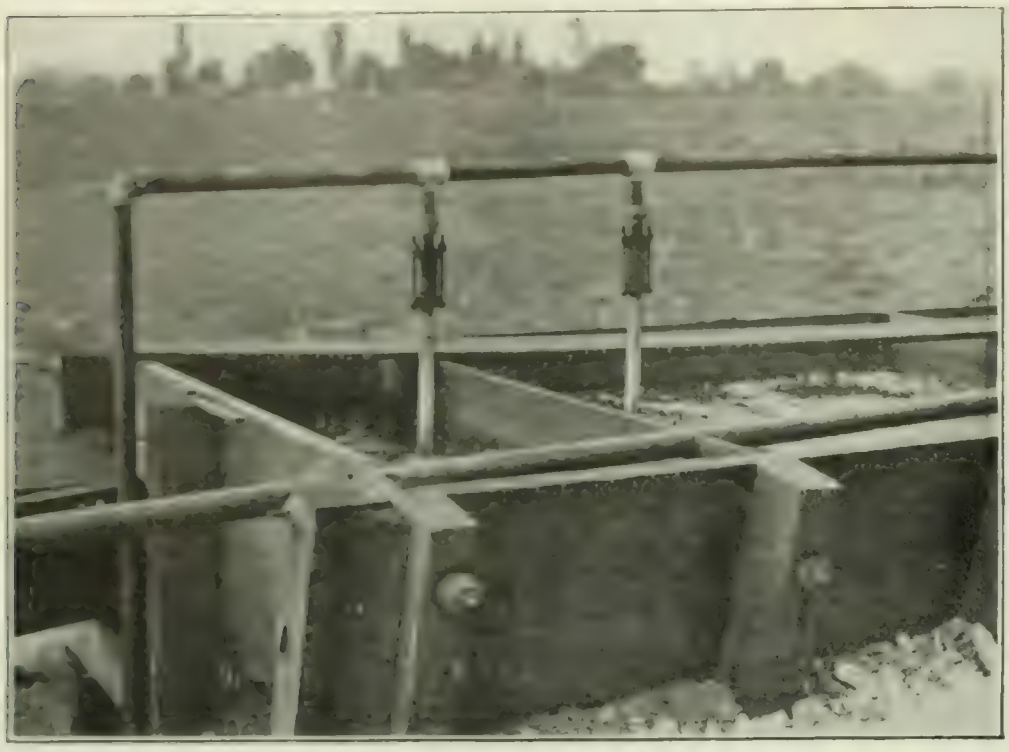
channel in which are 21 filtros plates, giving a ratio of 1 to 8.5 between diffusion and tank area. After the tank was built the board of engineers was informed that the sludge would build up between each plate, and although various tests had not shown any septic sludge, yet to be on the safe side wedges were installed crosswise in the channels between the plates.

Each filtros plate is set in a separate cast-iron frame, on the assumption that only one will have to be replaced at a time. Plug cocks and Dayton couplings at the top of each vertical air pipe permit disconnection and easy removal of any plate without emptying the tank or even stopping its operation.

Two settling tanks were built, but only one was in use at the time of the report. A 12-in. trough and baffle wall are provided for even distribution of the aërated sewage in the tank. Experience showed that the quick-settling aërated sewage soon filled the distributing trough, which was level. Settling was prevented by laying a 1-in. air pipe, with $\frac{1}{32}$-in. perforation, in the bottom of the trough.

The first sludge re-aërating tank was 6 x 6 ft. in plan at the top, 2 x 2 ft. at the bottom and 8 ft. deep, with only one filtros plate. As this was too small for "later needs," it was rebuilt 6 x 12 and 2 x 12 ft. in top and bottom plan and with an effective depth of 10 ft., with four filtros plates. The plates are set in individual frames and are separated by wedges, as in the aeration tank.

From Jan. 29 to Mar. 16 the aerating tank was operated on the fill-and-draw plan for the purpose of building up activated sludge. From Mar. 17 to June 27 the tank was run on the continuous-flow plan. It was found that four hours of aeration, using 1 cu.ft. of air per





PLUG COCKS AND DAYTON COUPLINGS ON VERTICAL AIR PIPES PERMIT REMOVAL OF INDIVIDUAL FILTROS PLATES WITHOUT SHUTTING DOWN WHOLE TANK

The large view shows a part of the sludge re-aërating tank. The sewage aërating or activation tanks are equipped in the same way

gal. of sewage treated per min., with 10 to 20% of activated sludge, followed by 30 min. of sedimentation, would produce a non-putrescible effluent, containing nitrites, with a bacterial reduction of 96 to 99.6%. On cutting the aëration period to two hours, it was found that the sludge was not properly activated and that the final effluent was very poor. The sludge tank was therefore enlarged, as described, to give a re-aërating period of about three hours. A grit chamber was also provided, to remove sand, coffee grounds, etc., but this was abandoned because some of the material in the grit chamber would become septic in spite of several cleanings a day.

On July 23 the plant was again put in service. For two days the fill-and-draw method was used, then the continuous-flow plan. In five days the following results were obtained: Free ammonia, 32.94; albuminoid ammonia, 1.976; nitrites, 3.33; chlorine, 100.08; relative stability at 37° C., 99; turbidity, 30. At this time 2.9 cu.ft. of air per gal. of sewage per min. was being used, but within a few days the air supply was reduced to 1.75 cu.ft., while on Aug. 29 it was back to the early figure of 1 cu.ft. per min.

Having shown that good results can be obtained with 1 cu.ft. of air for 4 hours, hereafter various air volumes and aerating periods will be tested.

The tests thus far indicate that with albuminoid ammonia at less than 2 p.p.m. good nitrification may be looked for on a relative stability which will nearly always be 99+; but if the albuminoid ammonia goes to say 2.30 p.p.m., then "the color will 'shoot' in the incubator before the end of 10 days."

No tests of the fertilizing value of the sludge will be made until aëration questions have been answered.

Sludge drying on open beds gives rise to odors that make that method of dewatering impossible. Even when the activated-sludge was mixed with Imhoff sludge and put on an open bed the odor was so bad that a chemical deodorizer had to be used.

Tests of an activated-sludge plant installed by A. M. Brosius, in which a diffuser wheel and foam chamber are designed to take the place of compressed air and filtros plates, had not yielded conclusive results up to Sept. 1, owing to several plant breakdowns. A Brosius plant at Hermosa Beach, Calif., was described in *Engineering News* of Nov. 9, 1916, page 890.

The cost of the testing plant and laboratory up to Aug. 17, including both construction and operation, had been $6462. Apparently this did not include the Imhoff tank and sprinkling filters. Continuation of the tests for another year is proposed.

The daily flow from the three cities is about 3,000,000 gal. normal and 7,500,000 gal. maximum. At the test plant, 50,000 gal. of sewage are being handled daily on an area of 267 sq.ft., or about 8,000,000 gal. an acre, on a 4-hour aërating period basis. It is estimated that activated-sludge plants will not exceed by more than 60% the cost of Imhoff tanks and that by eliminating the need for sprinkling filters the activated-sludge process would save at least 50% on the construction cost of Imhoff tanks, sprinkling filters, secondary settling tanks and sludge-drying beds.

All-American Canal for Imperial Valley

That an all-American canal could be built to bring water into the Imperial Valley, California, so that the 400,000 or 500,000 acres of land reclaimed by the new project would bear easily the cost of it, is the belief expressed by J. F. Richardson, of the U. S. Reclamation Service. Mr. Richardson recently completed a three weeks' trip over the proposed route of the canal. A 12- to 15-mile timber-lined tunnel, or inverted siphon, to carry the water through sand hills would be more practical than an open cut, it is believed, as the soil formation at a depth of approximately 40 ft. is excellent for tunneling.

This project has been under consideration for some time and a number of studies have been made on the subject. The Imperial Laguna Water Co. is surveying the route for the canal, which it is hoped can be built so as to reclaim the mesa lands under a contract recently entered into with the Department of the Interior.

Balcony of Concrete Theater Has Novel Framing

Diagonal Beams Between 57-Foot Fulcrum Girder and Wall Reduce Cantilever Moments – Cinder-Concrete Steps on Thin Balcony Floors Reduce Loads

THE war has brought about a scarcity of structural steel, but so far, at least, has not caused any pronounced restriction of the construction of new theaters in New York City. One of the latest, the Vanderbilt, on West 48th St., is being built of reinforced concrete because of the difficulty of getting steel, and the engineer, Elwyn E. Seelye, of New York City, has introduced in the structural design several novelties which reduce the amount of material and consequently the cost.

The design of a theater in reinforced concrete presents a problem which is susceptible of several different solutions. The balcony steps may be formed of structural concrete or they may be merely cinder concrete fill on top of the structural concrete. The balcony framing may be formed by the use of cantilevers with the main balcony girder as a fulcrum, or a system of diagonal beams resting on the main balcony girder may be used to eliminate the large cantilevers. The general construction of the reinforced concrete may be beam-and-slab, terra cotta tile and concrete joists, or metal tile and concrete joists.

In this theater the balcony has cinder concrete banks for the chairs and steps, resting on a thin reinforced-concrete floor made up of a slab-and-beam construction poured in metal box forms, which in turn ties into the reinforced-concrete girder frame. This frame has for its main member a deep transverse girder spanning between the wall columns. This main girder does not form a fulcrum for cantilevers as in the usual form of construction, and hence its moment is less because the load from the portion of the balcony in front of the main girder does not have to be balanced by an equal load from the portion of the balcony in the rear. In fact, none of the front portion of the balcony is carried by this girder directly, but it is carried by secondary framing consisting of small cantilevers, resting on a short-span fulcrum girder, which rest on two diagonal girders that in turn react at one end on the main girder and at the other on the wall. The result of this framing is to throw about one-half of the load into the wall, thus reducing the moment on the main girder.



LOOKING UP AT DIAGONAL GIRDER SYSTEM UNDER CONCRETE THEATER BALCONY—MAIN FULCRUM GIRDER RUNS FROM FOREGROUND AT LEFT, STAGE TOWARD RIGHT

The moment on the main girder is further reduced by the fact that the diagonal girders do not react on the main girder at the mid-point of its span. A comparison of this design with that of one with the usual cantilevers showed a reduction in moment in the main girder of about 20 per cent.

The general details of the theater structure are shown by the accompanying drawings. The building is 100 ft. long, 57 ft. wide at the front and 77 ft. at the stage, with one balcony and the orchestra floor, the latter

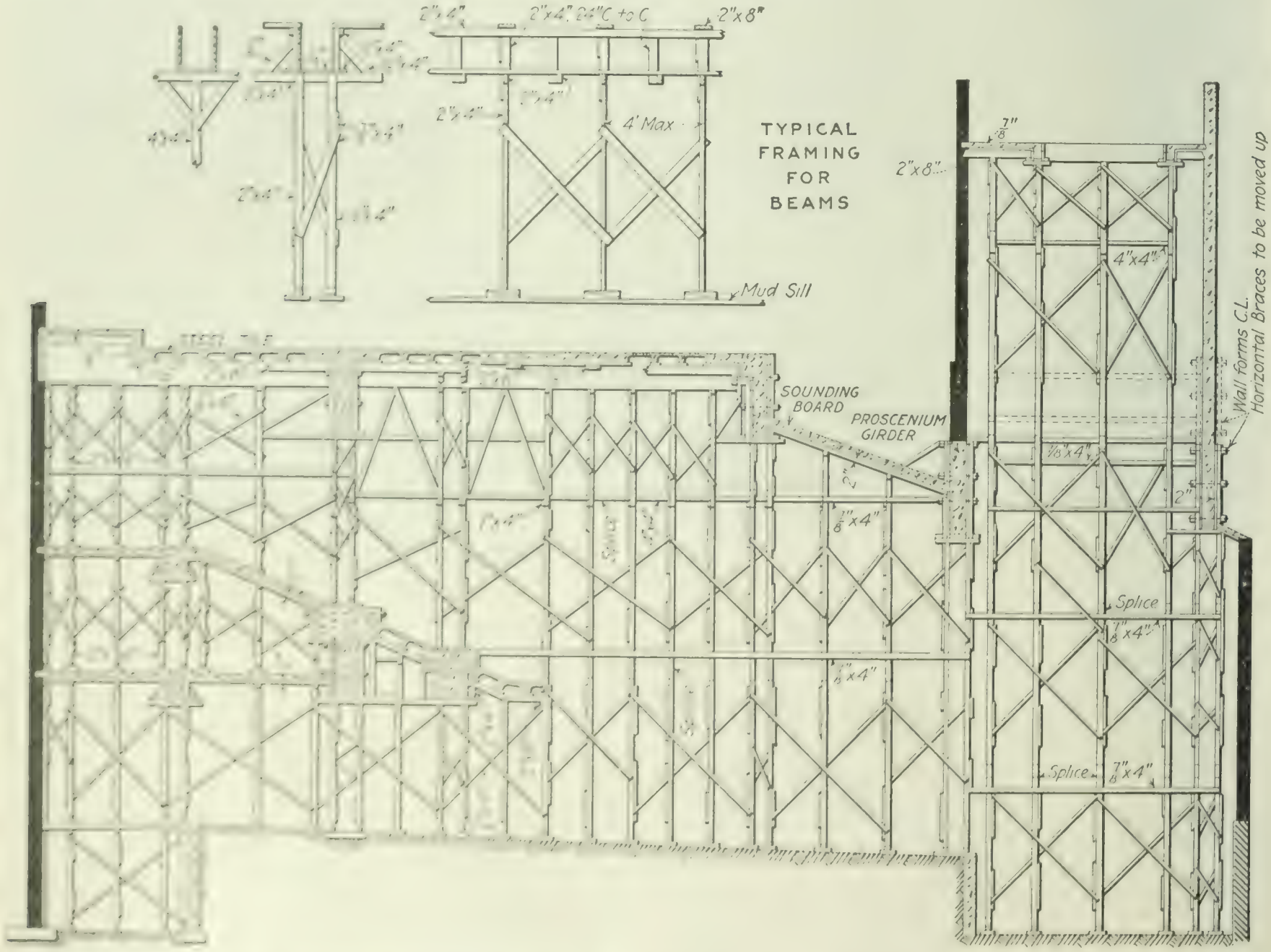
directly on the ground surface. The frame is of reinforced concrete, comprising wall columns, the balcony described in the foregoing paragraphs, stairways, and the stage section which has the usual equipment of dressing rooms and gridiron. The walls are of brick, including the extension of the proscenium wall above the auditorium roof. The roof is of concrete beam-and-slab construction, poured in metal box forms left in place, and framing into long transverse girders and longitudinal beams. The back wall is of special design, as described later in this article.

The main balcony girder is 56 ft. 2 in. in span and 7 ft. ½ in. deep. It is of T-beam section with a stem 22 in. wide and a flange 29 in. thick and varying in width from 4 ft. 6 in. at the middle to 20 in. at the support. A good deal of care was required in placing the steel so that the concrete would surround it thoroughly and develop proper bond, especially as the span of the girder was so great that the bars had to be spliced. The steel was centered in vertical rows and the stone used in the concrete to surround it was screened through a ½-in. mesh, to make sure that the aggregate would not get caught between the bars.

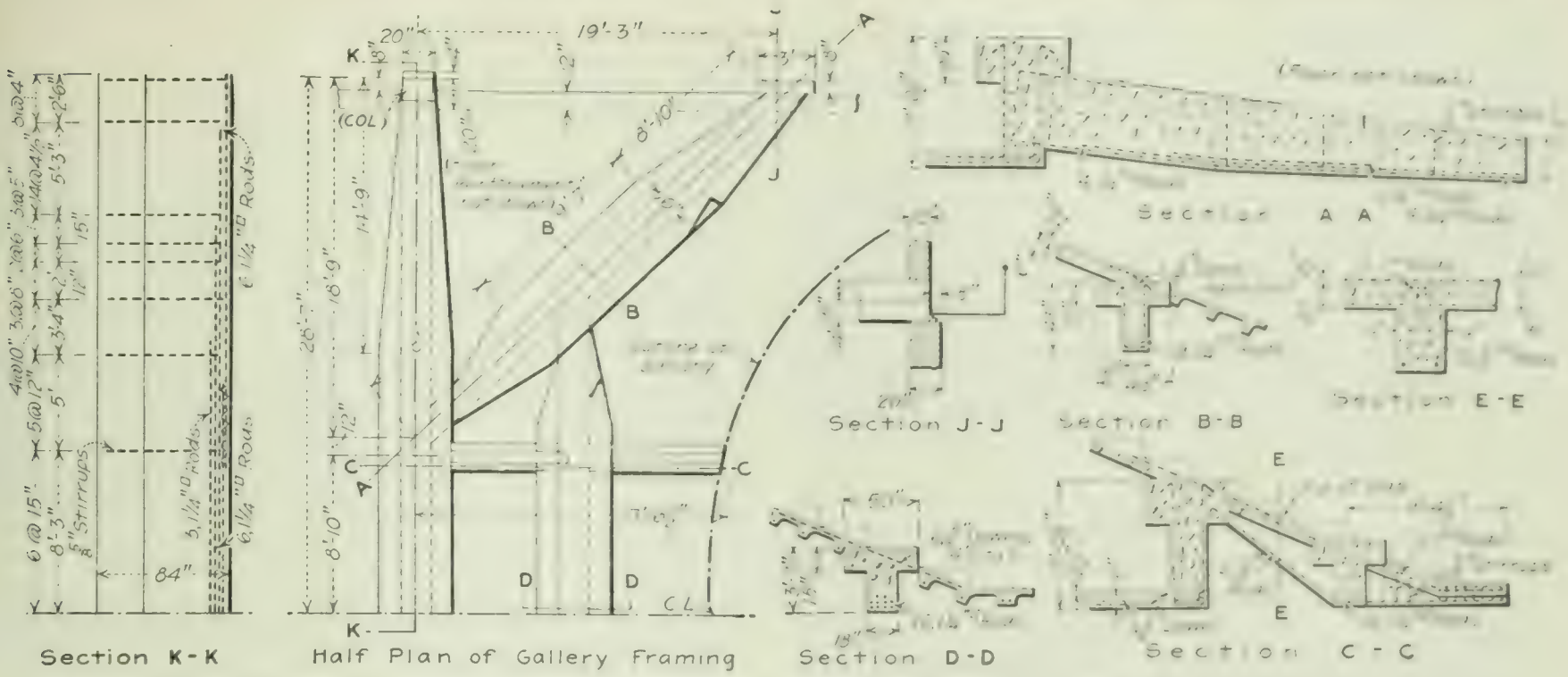
Some question was raised by the engineers representing the mortgagee as to the effect of the shrinkage of this girder on the columns supporting it. It was maintained that shrinkage would be sufficient to pull the columns together and cause high flexural stresses in the concrete. Measurements were taken on the columns before and after pouring, and no movement was discerned. The extreme deflection on the cantilevers when the forms were removed was about $\frac{3}{16}$ in. As to the shrinkage of the girder in its length, the designing engineer is very doubtful if such will occur in a reinforced girder. A plain girder, non-reinforced, would have a marked shrinkage. It is true that this girder was not reinforced in its T-flange but it was reinforced in its soffit and doubtless the compressive stresses due to flexure far more than neutralized any tensile stresses due to shrinkage in the T-flange.

The connection between the column and girder was poured as a part of the girder. That is, the column was poured up to the base of the girder, the column for the depth of the girder poured with the girder, and the upper part of the column next. Reinforcement for the girder extends well into the column. All columns are of rectangular section with vertical reinforcement tied together with rectangular hoops of ¼-in. wire on 12-in. centers.

The diagonal girders and the secondary transverse girder were also designed and built as T-beams with narrowing flanges toward the supports, but the longitudinal cantilevers are prismatic with indented upper sections to carry the floor joist. The floors are laid to the slope of the balcony and consist of transverse joist, made by pouring around steel box forms, and a 2½-in.



SECTION THROUGH CONCRETE THEATER BUILDING, SHOWING FORM LAYOUT AND CONCRETE SECTIONS



BALCONY IS CARRIED ON REINFORCED-CONCRETE GIRDERS FRAMED TO REDUCE CANTILEVER LOADINGS

slab. The steps are of cinder concrete, placed after the whole reinforced-concrete balcony was completed. It will be noted that the flanges of the main and secondary transverse girders each form one of the steps in the balcony.

The cinder concrete steps are built up of a lean mixture about equal to the ordinary cinder concrete fill between wood sleepers for wooden floors, being proportioned about 1 part cement to 2 parts sand to 10 parts of cinders. They are afterward finished with a cement and sand finish 1 in. thick composed of 1 part cement to 2 parts sand, similar to a sidewalk finish.

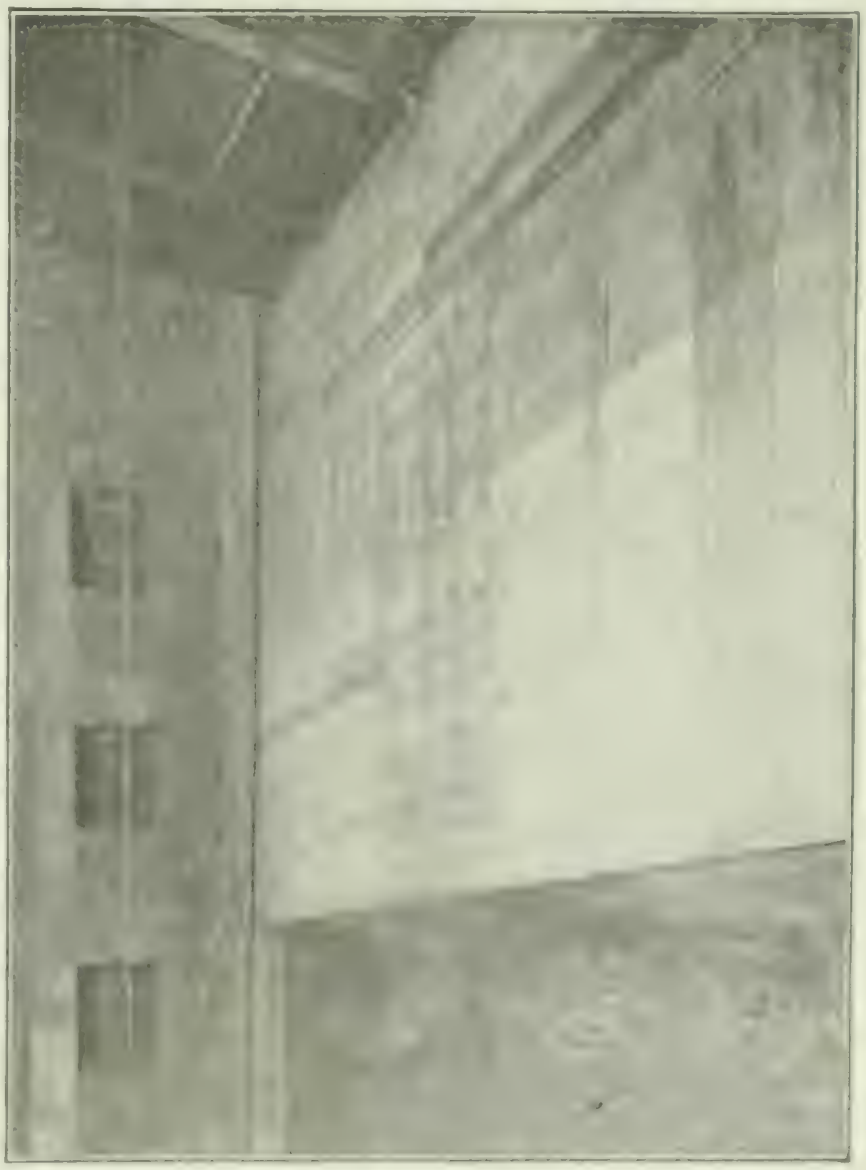
The diagonal girders were made of variable depths in order to clear the sight lines at their lower ends, hence the broken soffit lines shown in the drawing. All ceilings are suspended from the floors or roof, as the case may be.

The original design for the upper wall contemplated a 12-in. concrete wall merely reinforced at the bottom with tension steel and a light network of shrinkage steel throughout. This was modified at the request of the New York Building Department because of lack of precedent, and a girder of 13 ft. deep and 50 ft. span was designed, from which was suspended an 8 in. curtain wall of concrete, 16 ft. deep. Inasmuch as the 12-in. wall was braced laterally at the top by a reinforced-concrete roof slab, the designer feels that the original design would have been perfectly safe and it would have been somewhat more economical in steel and formwork. The girder as built is 12 in. wide at the bottom, spreading out to 30 in. at the top, is reinforced in the bottom with twelve 1-in. rods and hooped, as it were, with ⅜-in. rods as shown in the detail. It frames into columns in the rear wall.

The space between the brick curtain wall and the upper concrete wall is covered with a sloping concrete slab. A similar sloping slab carries the sounding board connecting the lower part of a deep roof girder and the lower part of the proscenium girder. This latter girder is prismatic, spanning 37 ft. between columns. It is 16 in. wide and 7 ft. 10 in. deep. The slab covering the sounding board is 14 ft. 9 in. in clear span with a slope of about 2 on 1

Details are shown of a reinforced-concrete stairway which is made up of broken-back slabs. Where the soffit is reëntrant, stirrups have been provided to prevent the steel from straightening out. It will be noted that in the lower slab, which has a horizontal span of some 20 ft., tile-and-joist construction was used in place of a solid slab. This was done to reduce the dead weight and consequently economize on reinforcing steel.

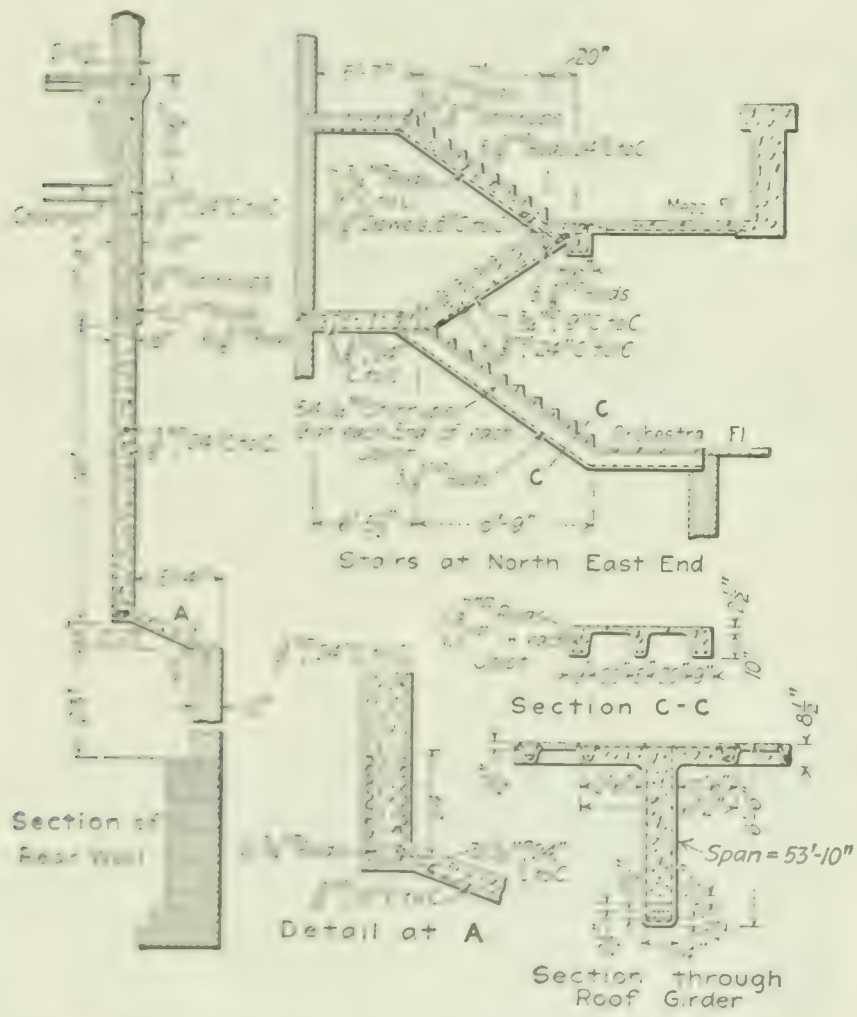
Another interesting detail is the back wall of the stage, shown in the drawings and in one of the views.



UPPER PART OF BACK STAGE WALL, CARRIED FROM DEEP GIRDER

The building law required an alleyway court in the upper part of the rear of the building with an inset of 5 ft. 4 in. from the back stage wall, which is brick resting on a continuous footing wall.

The loadings for the balcony were as follows: Live-load, 100 lb. per sq.ft., 6 in. cinder fill, 36 lb. per sq.ft., tile-and-joist slab, 46 lb. per sq.ft. and suspended ceiling, 6 lb. per sq.ft. Total, 188 lb. per sq.ft. No attempt was made to allow for eccentricity in the columns. The deflection of the girder under full load produced flexural stress in the column which was computed but not allowed for, as the live load on the balcony required



DETAILS OF FORMS IN REINFORCED-CONCRETE THEATER

by the building law was sufficiently excessive over actual loading conditions to compensate.

One of the drawings is a cross-section through the theater showing the form layout. These forms were designed carefully for the liquid load of the concrete. The reader will note that great care was used in lateral bracing, and also care was taken to have direct bearing on the ends of the upright rather than to rely on spiked fish plates to take load. This form plan also indicates the simplicity of the forms for the tile-and-joist construction, only beam bottoms being required. The forms were so constructed that they could be used as a scaffold for brickwork and also for the construction of the suspended ceiling. For the latter purpose a splice was placed in the uprights about 10 ft. below the roof, so that the upper tier of uprights could be removed after the concrete was set and a plank floor be laid at that level.

The reinforcing was the Slick mechanical bond bar furnished by the Berger Manufacturing Co., as was also the metal tile. The diagonal tension was resisted by stirrups exclusively, the main girder steel being straight and some of the bars being shorter than the full length for the sake of economy.

Not the least important part of construction consisted in the inspection. This included the usual precautions in regard to cement and the aggregate. All steel was carefully checked before the concreting operation and the placing and mixing of the concrete was watched continually. Forms were checked for strength before the concrete was poured. The inspector was a man trained in this type of work.

The architects for the Vanderbilt Theater were Pereira & De Rosa and the consulting engineer was Elwyn E. Seelye, who was responsible for the reinforced-concrete design and construction. The work was carried out by Isaac A. Hopper's Sons, Inc., contractors. All of these principals are of New York City.

Condition of Roads in English City Discussed by Engineer

City Surveyor Hadfield, of Sheffield, States That Maintenance Is Chief Work—Tar Spraying Commended

HIGHWAY work in Sheffield, England, for the fiscal year 1916-17, according to the report of W. J. Hadfield, city surveyor, was confined largely to maintenance and absolutely necessary works of renewal. Great attention was paid to maintenance, and every effort made to spend the money available in such a way as to minimize depreciation of the roads. During the years immediately prior to the war extensive schemes of highway reconstruction had been carried out—in particular many of the main roads were entirely resurfaced. Consequently the present reduction of expenditure has not been so seriously felt as otherwise would have been the case. Its principal effect is that surface improvements, such as the conversion of bowlder paving, are stopped. A summary of the Sheffield report, as given in *The Surveyor*, follows:

Some of the busy East End thoroughfares and the older wood-paved streets, it must be admitted, are falling below the usual standard, but they are still capable of carrying the traffic. In any case the number of workmen necessary to repair them permanently is not available, the committee have not the necessary funds, nor is it practicable to obtain the materials required.

It is not likely that the postponement of expenditure will lead to increased cost. A longer life is being obtained from the old paving than would have been the case under normal circumstances, and the chief disadvantage is that in such thoroughfares the traffic is having the use of less efficient road surfaces.

The reduction in capital expenditure during the last three financial years, as compared with the average capital expenditure for the five years before the war, amounts to nearly £60,000. By the end of the current financial year the reduction will be between £85,000 and £90,000.

City Surveyor Hadfield advises the committee that the expenditure of such a sum spread over several years would be sufficient to make up the leeway caused by the present suspension of capital expenditure.

This year's cost is extremely low for Sheffield, work-

ing out at £34 per mile, less than half the figure for the years immediately before the war.

War conditions are not entirely responsible for this reduction. Modern methods of road making have for some years past helped to reduce highway costs, and in this respect Sheffield compares favorably with many other highway authorities, whose general complaint, even before the war, was that costs were increasing.

Asphaltic Pavements

There are now sixteen streets in which lengths of asphaltic surface have been laid. The total area is about 15,000 sq.yd. Careful observations are being made, so that when highway operations on a larger scale are resumed a correct judgment may be formed as to the suitability of this type of pavement for more general adoption.

As far as can now be seen, it is likely to be more economical than wood blocks or granite setts, both of which are likely to remain very expensive for some time to come.

Wood blocks at present are practically unobtainable, but the situation was foreseen, and large purchases were made in the early stages of the war at prices which, compared with recent quotations, have effected a saving of at least £4000, besides securing sufficient materials to carry on at any rate until next year.

Clinker-Asphalt Paving

There has been one important introduction during the year, namely, a road surface which consists of carefully-graded destructor clinker mixed with bitumen or asphalt. This process has been patented by E. J. Lovegrove, borough engineer of Hornsey, London, and carried out by him on an extensive scale with great success.

A license has been obtained from the company which has the working of the patent, and test pieces have been laid in Attercliffe Common, Carbrook St., Carlisle St. and Weedon St. In Carbrook St. an area of over 1000 yd. has been resurfaced, the old macadam being retained as the foundation. In the other cases small areas only have been laid, in situations which will insure excellent tests. In Attercliffe Common, where there is a very heavy traffic, the material is laid right up to the tram rails—a severe condition; in Carlisle St. individual loads of from 50 to 100 tons pass over the trial piece, while in Weedon St. there is a heavy mixed traffic, including motor busses.

So far the results have fully justified expectations, and if this continues to be the case there will be available a cheap paving, more permanent than tar macadam, and therefore suitable for roads with traffic too heavy for the latter, at the same time less costly than setts or asphalt, and with the further advantage of utilizing surplus clinker from the destructor, which now has to be disposed of at considerable cost.

Tar-Macadam Roads

The increase in mileage of this form of paving from 60 to 63 miles is accounted for by the necessity of resurfacing some of the worn-out waterbound roads.

An outstanding feature of highway work in Sheffield is the remarkable success of the tar-macadam roads, which are exceeding expectations both as to length of life and low cost of maintenance.

In particular, the roads paid for out of money lent by the Road Board may be quoted. The last instalment is due for repayment in October, 1918, and the state of these roads speaks for itself—they are nearly as good as when they were laid.

One of these roads—the Chesterfield—has withstood an immense amount of special traffic (connected with war undertakings), which has completely worn out adjoining waterbound roads laid at a later date. Another—Abbeydale—is carrying a considerable motor bus traffic (not in existence when the road was reconstructed) with very little detriment to the tar macadam.

Such work will more than pay for itself, besides being advantageous both to vehicular and pedestrian traffic.

Concrete Roads

The question of constructing roads with concrete surfaces is again being widely discussed, and thoroughfares of this character in other districts have been inspected. Considerable knowledge has been gained, but there is so far no convincing evidence that concrete roads pure and simple would be suitable for wide use in Sheffield. In view of probable restrictions upon the use of other road-making materials, however, it may be necessary to adopt this system to a greater extent than otherwise would be thought advisable.

Many of the asphaltic roads already laid in the city are practically of reinforced concrete, depending for their strength entirely upon the concrete, but having a thin wearing surface of asphalt.

An increased area has been tar-sprayed, or tar-painted. In this way many of the old waterbound roads, which otherwise would have needed reconstruction, have been kept in serviceable condition.

When first adopted, the tarring of road surfaces was looked upon chiefly as a remedy for the dust nuisance; it is now proved to be one of the most effective ways of securing economy in road maintenance, and has undoubtedly saved many roads which without this protection would have gone to pieces during the last two winters, when the weather conditions were particularly severe. The area tarred this year will exceed one million yards, and there are special reasons for pushing this work as much as possible during the present summer.

Simple Rule for Strength of Wooden Beams

By W. J. Howard
Detroit, Mich.

The safe uniform load for a wooden beam 1 in. thick, 10 in. in depth, 10 ft. in span, using an extreme-fiber stress of 1000 lb. per sq.in., is 1111 lb. The safe uniform load for any beam can be found very conveniently from this figure, since the safe load varies directly as the thickness of beam, as the square of the depth, as the fiber stress used, and inversely as the span length. With a 6 x 8-in. beam 16 ft. long and the timber such as to allow an extreme-fiber stress of 1400 lb. per sq.in. the safe uniform load would be:

$$\frac{6 \times 8^2}{10} \times \frac{1400}{1000} \times \frac{10}{16} \times 1111 = 2222 \text{ lb.}$$

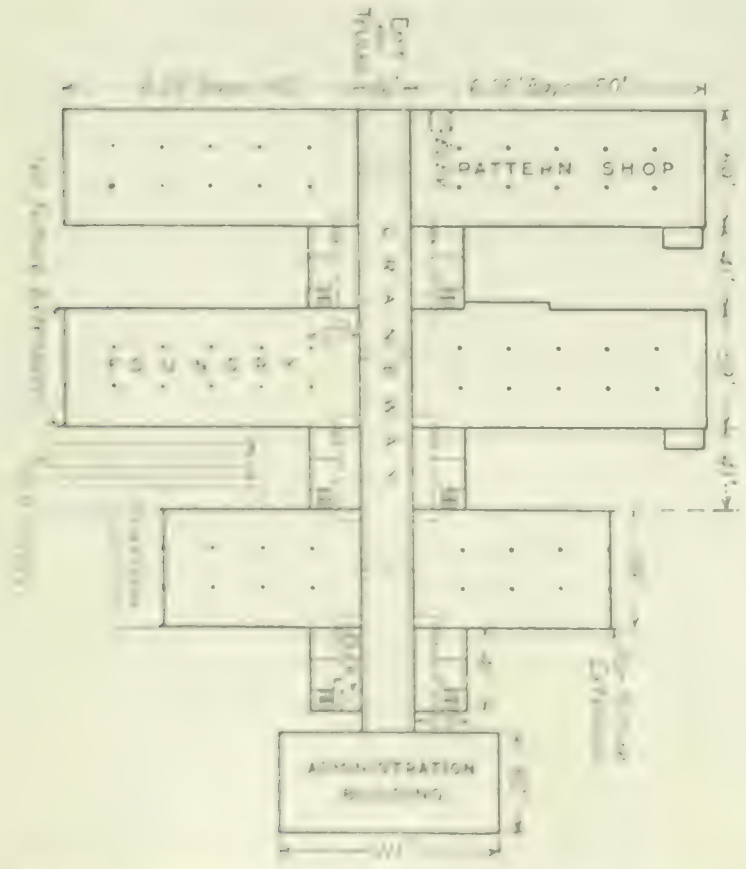
This is particularly useful to field engineers as they only need to keep in mind the safe load for one beam, a number easily remembered—1111 lb. For a concentrated load at center of span use one-half this value.

Unusual Factory Layout Designed to Simplify Operation

Concrete Building for Nathan Manufacturing Company at Flushing, L. I., Can Also Be Readily Enlarged or Changed

AN ARRANGEMENT of shops as wings to a central craneway which leads from an administration building and controls all the various parts of the plant has been adopted for the new factory of the Nathan Manufacturing Co. at Flushing, a part of the Long Island section of New York City. This layout is the most important detail in the fixed purpose of the designers to build a plant which would facilitate operations and most readily permit enlargement. In pursuance of this main idea, the elements of design and equipment were developed. The general layout of the main buildings and some minor details of the structure were described in the *Engineering Record,* Feb. 24, 1917, p. 309. Since then, the building has been completed and put into operation as a factory for the manufacture of various kinds of brass goods.

The structure is mainly of reinforced concrete, the floors being of the flat-slab type in spans of about 20 ft. square. The slab is of a round design, except that the drop head has been omitted. The walls throughout are also of reinforced-concrete, carrying steel sash of a maximum lighting area. The roof of the most of the structure is a concrete slab with Johns-Manville asbestos roofing, but over the foundry, as shown in one of the views, the span was so great as to require steel trusses. These trusses rest on concrete columns and carry a concrete roof, made up of 3-in. reinforced-concrete slabs spanning concrete girders cast around the I-beam purlins. A similar type of roof is used in the power house and in the garage. The roof trusses in the foundry had to be specially designed to carry the high hanging frame on which the molten metal is moved.



The controlling conditions in the design of the building were convenience of operation, ease of making any additions or extensions to the factory, absence of heavy millwright or machine work in case of change of operations or in the kind of operations carried on, and freedom from delay to operations in case of breakdown of some one part.

Convenience of operation is taken care of by the arrangement of the building. This means not only the separation of the various shops, but their interconnection without interference of one with another.

As shown in the accompanying plan layout, the central element of the plant is a craneway, two stories high, 312 ft. long, and 26 ft. wide. Opening out from this craneway are three wings on each side, each housing a separate shop, stockroom or department. All of these buildings are two stories in height except the central wing on the south side, which is occupied by a foundry. In this foundry the two-story height is open from floor to roof, as shown in one of the views. The entrance end of the crane runway is an administration building 50 x 111 ft., three stories high and of a plan varied to meet architectural requirements. At the juncture of the wings with the craneway are additional separate structures, in which are the staircases and toilet rooms. Breakdowns in these rooms will in no way interfere with the shops themselves.

The floor of the craneway and those of the first story shops are on the same level. The openings into the respective shops are of a size sufficient to permit the entry of a motor truck. At the west end the craneway is open to the yard, so that the whole first floor may be controlled by motor trucks. The second floors of the wing shops, besides being reached by the inclosed exterior staircases, are open to bridges spanning the craneway and connecting opposite wings. These bridges, which are shown in the view down the craneway, are also of sufficient width to carry large trucks. Material, then, to reach the second story is dropped by the crane running down the craneway on trucks traveling on the connecting bridges and entering by wide and high doorways into the different shops.

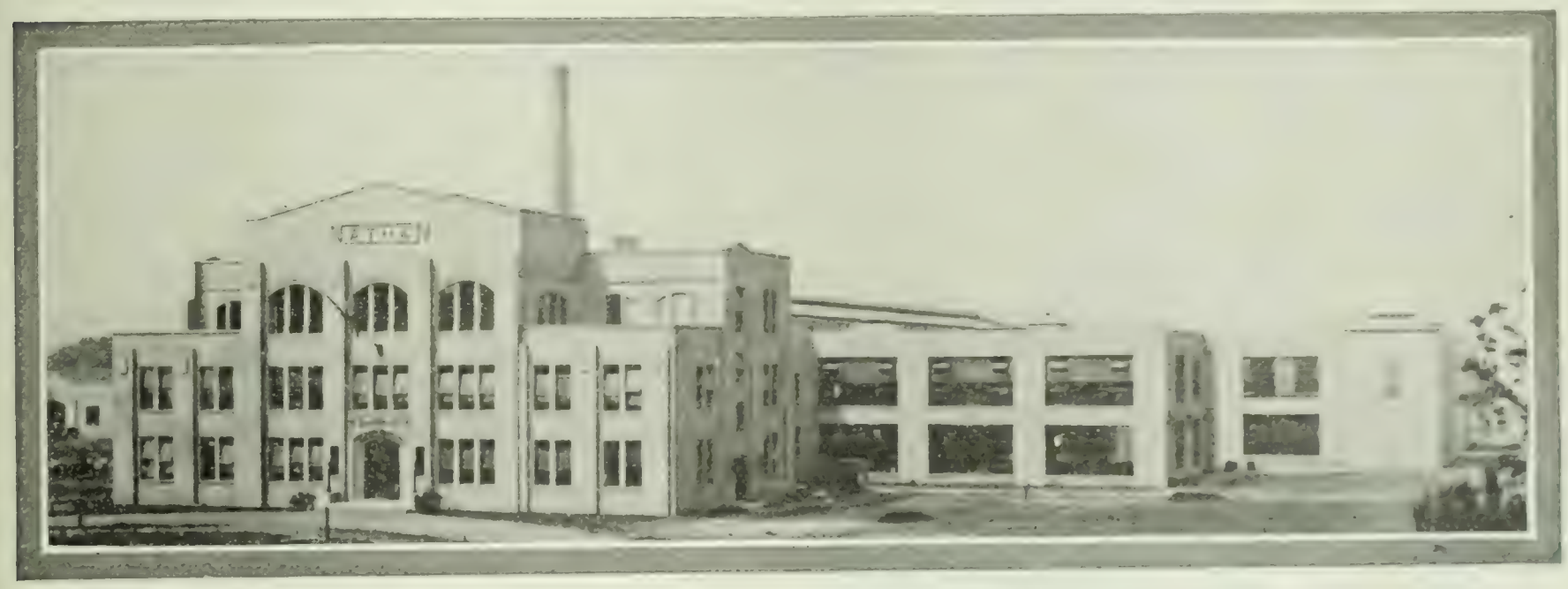
Additions to the plant when needed are also made possible by this layout in wing formation. These wings can be added to or the craneway can be extended and other wings tied to the extension, all without interfering in any way with the present structure.

The design permits very ready and simple change of machinery and equipment in case different kinds of manufacturing operations are required. The flat ceiling, with the drop head omitted, the frequent shaft hanger inserts, and the horizontal and vertical ducts throughout the building make the movement of machinery a matter of unscrewing nuts and bolts and shifting tools, with very little machine work, cutting of metal or of concrete. It will be noted that the shaft hanger inserts are provided with two entrance slots rather than one, thus permitting a certain flexibility in the arrangement or movement of the equipment hung therefrom. It will also be noted that the pipes, except those for sprinklers, are carried at the walls to keep the interferences as low as possible. Two bubble fountains in each shop also require vent pipes.

The general type of floor in the building is wood block,



Typical Wood Block Floor in Shop Wing | Yellow Pine Plank Floor in Shop Wing | Asphalt Block Floor in First Floor Shop



Looking Toward the Administration Building and the First of the Wings of the New Plant



Two-Story Foundry Has Steel Roof Trusses | The Craneway Above Connected to All Wings

INTERIOR AND EXTERIOR VIEWS OF NATHAN MANUFACTURING COMPANY'S NEW PLANT

but other kinds of floor have been laid in two of the wings and a comparative record is to be kept of the wear of the three different floors, all of which are subjected to about the same conditions. The types, all of which are shown in the accompanying views, are (1) an asphalt block on 1 in. of sand laid on the reinforced-concrete slab; (2) a yellow-pine flooring made of 2 x 6-in. tongue and groove plank laid on sleepers in cinder concrete placed on the slab, and (3) a creosoted wood-block paving laid on ½-in. of sand over the concrete slab. In the foundry and storage, which are subjected to an entirely different kind of wear, the floors are of 1 in. of concrete laid on a 3-in. cinder bed.

The building is heated throughout by steam radiators which are, as shown in some of the views, hung on the walls, well out of the way of any of the machinery. In the foundry and in the craneway, however, where better ventilation was required, heat is supplied by hot air.

Skylights over the foundry and over the craneway are of asbestos protected metal with wire glass. The inserts, the steel sash and the reinforcement were supplied by the Trussed Concrete Steel Co.

The building is carried entirely on a pile foundation in an extremely quaking soil. In spite of this there has been no observed settlement, although the building is now under its full load.

The entire plant, in addition to the land, will cost about $750,000. This covers not only the main plant described, but also the adjoining buildings, which include a power house, a terminal building on the nearby waterfront and a garage, as well as the development of the ground from a landscape standpoint. The plant was designed by Eugene Schoen, architect, of New York City, and was built by Rheinstein & Haas, Inc., also of New York City.

Building State-Aid Concrete Road Near Grand Rapids

Rich Stiff Concrete Is Used, Floated by Hand and Finished with a Belt—Teams and Motor Trucks Do Hauling

FEATURES in the construction of an 8-mile concrete road near Grand Rapids, Mich., are a stiff concrete mixture, a reinforced stretch over an old corduroy road, steady local labor and a comparison of hauling by horse with motor-truck hauling. This road, which will extend to Byron Center, is being constructed under the Michigan state-reward act, which requires the work to be done by contract. For such roads, built in accordance with the standard plans and specifications of the State Highway Department, this law provides for part payment by the state. The amount paid varies according to the type of construction, and is $2000 per mile for a concrete pavement 16 ft. wide, as in this case.

Because the season was well advanced at the time when the contract was let it was decided to build three miles this year and the remainder in 1918. Construction on this first section was commenced at the end farthest from Grand Rapids, where it meets a cross-road, and was worked back toward the beginning of the road, which is about three miles from the city.

The concrete paving is 16 ft. wide, with a 4-ft. earth shoulder on each side. It is 6 in. thick at the sides and 8 in. at the middle of the road. The concrete is a 1:2:3 mix, made with Newaygo cement and washed sand and gravel, the coarse aggregate being of ¼- to 2-in. size. The mix is thick and heavy, with comparatively little excess water, and is not of the sloppy consistency often employed in road work.

As the concrete is placed it is leveled with a heavy strike made from a steel angle fitted with handles and bent to the required contour of the road. When dry patches begin to show, the surface is floated with wood floats by a man working from a plank bridge or with a long-handled float operated from the side of the road. The surface is then finished with a belt, which is passed over it twice. The aim of the final treatment is to give a wavy granular finish, avoiding a surface skin of cement.

The day after the concrete has been laid, the finished pavement is covered lightly with earth as a protection from sun and wind. This cover is left on for three weeks, or longer in cool weather. It is then removed by a road-grader and team, being thrown off so as to fill the earth shoulders. The road is then ready for traffic, but is not thrown open until the work has reached a cross road.

The inspector is on the work all the time. His daily report to the county superintendent shows the number of hours of work, the number of sacks of cement used, the lineal feet of concrete road laid, and the survey station at which work was stopped.

Expansion joints are filled with ⅜-in. strips of Vulcanite, no steel being used. The material is allowed to project above the concrete, but after the work is completed it is trimmed off with a sharp shovel.

Reinforcing steel is used only at special points. At one place the gravel road is built over an old corduroy road, and in spite of the depth of gravel due to years of renewal and repair the road was so "springy" as to make rough riding for automobiles. Sheets of wire netting are embedded in the bottom of the concrete, but the concrete is of the same thickness as elsewhere and is laid as a single course.

At one point a spring was encountered just under the edge of the concrete paving. Here steel bars were embedded in the concrete, and a pipe drain will carry the water to the side ditch. It has been proposed to put a riser pipe and watering trough for horses at this point.

Concreting Plant and Crew

A Smith traveling mixer with drum of 14-cu.ft. capacity is used. It is of the high type, with the drum set at such a height as to give the chute sufficient slope for the thick mix of concrete. The chute has a maximum reach of 20 ft. from the drum. To allow for the placing of a long stretch of concrete without moving the machine, the chute can be shortened by swinging up the end section. At the upper end of the chute also there is a gate and hopper with vertical drop pipe, ending in a swinging spout, so that the concrete can be deposited close in front of the machine. In this way a length of 18 ft. of road can be concreted before moving the machine.

The state specifications call for striking or leveling each wheelbarrow load, but in practice the sand and gravel are heaped in the usual way to insure a full load. The water is pumped about two miles to the mixer, through a line of 2-in. to 1¼-in. pipe. The water supply for each batch is measured automatically, but there may be some excess, should dirty water interfere with the proper closing of the valve. The concrete is retained in the mixer drum for at least 16 revolutions, or a period of 45 seconds.

The crew consists of 16 to 18 men, mostly Hollanders from the locality. They are good workmen and stay on the job, so that the contractor is free from the present usual trouble of continual changes in the crew. When the concreting is in progress there are eight men shoveling and wheeling sand and gravel, one operating the mixer, one emptying the cement sacks into the charging hopper, and three shifting the delivery chute and spading the material into place. Two of these men also operate the strike. Other men attend to the steel forms.

The working time is 9 hours, exclusive of the hour for lunch. The highest record is 300 ft. of 16-ft. roadway laid in one day. On the present 3-mile stretch the men are carried to and from work on a motor truck.

The sand and gravel are obtained from a large pit and washing plant near the city end of the new work. At this pit a steam-shovel, working along the breast, dumps the material through a portable hopper upon a belt conveyor extending along the full length of the breast. This delivers the material to a second conveyor, at right angles to the first, which in turn delivers it to an inclined belt conveyor discharging at the top of the screening and washing plant.

The maximum haul is about two miles. This is considered about the economic limit for teams, and ordinarily the contractor would have used his fleet of motor trucks here. The haul, however, is over a temporary road in loose sand, in which the large trucks get stalled. For this reason most of the hauling this season is done with 1½-yd. dump wagons and teams. For the longer haul on next season's work the motor trucks will be used. These include United, Kissel and G. M. C. trucks, all of the end-dump type.

The materials are dumped on the rolled subgrade, the gravel on one side in a continuous pile, and the sand on the other side, with loads about 5 ft. apart. A snatch team helps to haul the loaded wagon into position and to pull it clear of the heap when dumped. Cement in sacks was at first stored in a tent halfway along the work, and thence was distributed by a team, but after the work reached this point the cement was delivered from the city by motor trucks.

The surface of the old road is leveled and surfaced with a grader and team, and then compacted with a 13-ton Kelly-Springfield steam roller. The specifications require a roller of not less than 10 tons. This subgrade, however, is cut up by the wagons delivering material, and has to be filled and leveled to grade by hand in advance of the concreting outfit. After the curing of the concrete pavement, the shoulders are filled and dressed by means of a grader and buck or fresno scrapers.

The culverts are mainly of 12-in. and 18-in. corrugated ingot-iron pipe with concrete end walls. There are also some 36-in. concrete arch culverts. The only large structure will be a concrete bridge, having an arch span of 55 ft. At one point on next year's work there will be a piece of grade reduction, involving 4000 cu.yd. of excavation in a cut 700 ft. long and about 6 ft. deep. This will be handled with a revolving steam shovel having a ⅝-yd. bucket.

The Golden & Boter Transfer Co., of Grand Rapids, has the contract. C. K. Whiting is engineer for the Kent County Commissioners. John Paas is county superintendent of roads and C. A. Payne inspector having direct supervision of the work.

Electric or Oil Engine for Railway

Electrification or equipment with internal-combustion locomotives, for securing better financial conditions, is proposed for the 120-mile New Mexico Central Ry. by the Federal Export Corporation of New York, which has recently purchased the property. The road extends from Santa Fe to Torrance, N. M.

Auto-Eductor Is Used To Clean Chicago Catchbasins

Found To Be Much Quicker and Cheaper Than Hand Labor—Machines Can Be Converted Into Ordinary Trucks

PERFORMANCE and cost data of the cleaning of sewer catchbasins by an auto-eductor (pump and suction device) attached to a motor truck are given in a report by George E. McGrath, superintendent of the bureau of sewers, Chicago.

In August, 1917, the operating cost was $351. The machine traveled 521 miles; cleaned 387 catchbasins at a cost of 91c. each and removed 623 cu.yd. of dirt at a cost of 58c. per yd. This work was in the business district, where all sewer cleaning must be done at night. Cleaning catchbasins by hand in this district costs on an average $3.35 per basin. If the same amount of work could have been done by hand, it would have cost $1296. The cost of operation of the machine was distributed as follows: Driver, $115 per month; two laborers at $3.60 and $3.30 per day; total cost for labor, $283. Repairs, fuel and depreciation, $67. Total cost for the month, $350.

The eductor was invented by G. W. Otterson, and the truck with eductor and all attachments is built by the Kelly-Springfield Motor Truck Co., of Springfield, Ohio. The machine used by the Chicago Bureau of Sewers has



AUTO-EDUCTOR FOR CLEANING SEWER CATCHBASINS IS USED BY THE SOUTH PARK COMMISSION, CHICAGO

a 5-yd. body on a 5-ton truck frame and weighs 7 tons empty. A somewhat smaller truck with this equipment, used by the South Park Commission, Chicago, is shown in the accompanying view.

The eductor consists of a 4-in. telescopic pipe, with a horizontal discharge branch at the top. At its lower end is an elbow connected to a 3-in. pipe, from which a hose is led to the discharge of a centrifugal pump. A 1-in. nozzle from the 3-in. pipe is led into the 4-in. pipe, where it is turned upward.

The 14-in. centrifugal pump is mounted on the right side of the truck frame and its suction is connected to the body of the truck. It is driven by a silent link-belt chain from a power take-off attached to the driving shaft of the truck. The sprocket on this shaft runs idle normally, and is engaged by means of a lever near the driver's seat. A pressure gage enables the driver

to regulate the motor to give the proper speed and pressure at the pump. The ratio of the sprockets is such that the required pressure of 40 to 50 lb. is obtained at a low motor speed.

The body of the truck is a watertight steel box. Its tail gate is hinged at the top and is made watertight by means of clamp bolts which press a rubber gasket against the end frame. The door latches are released from the front end, so that the operator is clear of the water that escapes when the tail gate is opened. An opening in the bottom provides for the attachment of the inlet valve on the pump suction, and an opening in the side provides for the overflow valve. A top plate at the forward end protects the driver from the splash of the discharge.

Within the body is a frame carrying transverse hinged baffle plates, and having a longitudinal partition plate extending the full length of the body. The 8½-in. space between this partition and the side of the truck is termed the clear-water compartment. The first three baffles extend only to the partition and have openings in the upper portion so spaced as to cause the flow of water and refuse to follow a long path. By this means most of the solid matter settles before the flow reaches the end baffle.

This last baffle plate extends the full width of the body and is pierced with ¾-in. holes. Thus the flow is screened as it passes out of the main part of the body and again as it enters the clear-water compartment, with which the pump is connected. Spacers hold the baffles in position when the tail gate is closed. The opening of this gate releases the spacers so that the baffles can swing back and give free discharge to the contents as the body is dumped.

The machine can be converted into an ordinary truck for handling stone, gravel and other material. For this purpose the bottom is made of heavy plate, the baffle frame is removable and the two valve openings can be closed by bolted covers.

In starting its work the truck, with body partly filled with water, is run close to the catchbasin. The eductor arm is loosened and run out to position over the manhole, and then the telescopic pipe is lowered until it rests on the refuse in the catchbasin. The pump is then started, drawing water from the truck body and discharging it into the 4-in. pipe through the 1-in. nozzle at 40- to 50-lb. pressure. This upward jet causes the refuse to flow into the pipe, where it is carried up and discharged into the truck. There the solid matter settles and the water comes back through the clear-water compartment to the pump.

Excess water escapes through an overflow valve and runs back to the sewer. The flap valves of the pump inlet and the overflow are operated by a cable from the driver's cab. Stones up to 2½ in. in largest dimension are passed through the eductor. The truck goes from one catchbasin to another until it is filled, and then to the dump.

Columbus Makes Money from Garbage-Reduction Works

A NET PROFIT of $18,868 was made by the garbage-reduction works of Columbus, Ohio, in 1916, according to the latest annual report of T. D. Banks, superintendent. The amount of garbage treated was 21,862 tons, and the net revenue per ton nearly $0.91.

The total receipts of the plant were $88,564, or $4.051 per ton of garbage treated. The garbage yielded 3.076% of grease, or 1,344,789 lb., and brought a revenue of $69,452, which was over 5c. a lb. of grease and $3.177 per ton of garbage. The tankage yield was 10.307%, or 2253 tons, which brought nearly $8 per ton of tankage or $0.808 per ton of garbage. The remaining $1440 of revenue was for 156 hides, which added $0.066 to the revenue per ton of garbage treated.

The cost of operation and maintenance was $48,424, or $2.215 per ton of garbage. Interest and depreciation amounted to $21,272, or $0.972 per ton, making the total cost of disposal $3.187 per ton. The detailed cost of operation and maintenance is shown by the accompanying table.

The coal consumption totaled 5950 tons, or 0.2726 tons per ton of garbage; electric power, 112.44 kw-hr., or 5.144 kw.-hr. per ton of garbage; gasoline, 18,923 gal., or 0.8656 gal. per ton of garbage.

The estimated population of Columbus for 1916 was 215,000, giving 203.33 lb. of garbage per capita.

Detailed operating figures for the 1913 and 1914 operations of the Columbus garbage reduction work were published in *Engineering News* of May 27, 1915, page 1030.

COST OF OPERATION AND MAINTENANCE OF GARBAGE-REDUCTION WORKS, COLUMBUS, OHIO, IN 1916.*

	Amount	Per Ton
	$3,000 00	$13 7
	656 70	3 0
Labor		
	2,970 28	13 6
	13,123 19	60 0
	4,248 17	19 4
	2,349 23	10 7
	122 26	0 7
	9,145 29	41 8
	60 25	0 3
	795 96	3 6
	256 73	1 2
	3,063 89	14 0
	493 14	2 3
Traveling	3 50	0 0
	71 60	0 3
	16 90	0 1
	197 00	0 9
	55 30	0 3
	1,686 60	7 7
	312 88	1 4
	2 99	0 0
	16 42	0 1
	2,059 48	9 4
	3,555 40	16 3
	161 12	0 7
	4 41	0 0
	$48,424 74*	$2 215*

* Omitting the unpaid items which only could be obtained by making an estimate, a total of a certain expenditure for operation of garbage from the operating cost. Mr. Banks estimated an additional [illegible] $1,000 a year might be [illegible]. This would add about 4½c. per ton to the cost of operation and decrease by that amount the net revenue given [illegible].

Garbage Works in Center of City

Keeping the garbage-reduction works of Rochester, N. Y., at their present central location, instead of removing the plant eight miles to the site of the sewage works, was approved recently when the reduction works were bought by the city. The plant, unlike most garbage-reduction works, is near the geographical center of the city, thus effecting a considerable saving in the cost of garbage transportation. The decision was made on the recommendation of E. A. Fisher, consulting city engineer, after he had visited other reduction works.

Ultra-Violet Rays Finish Treatment of Henderson Water-Supply

Sedimentation, Mechanical Filter and Ultra-Violet Purification Plant Has Been in Service Several Months—New Form of Sterilizer Used—Typical Bacterial Results

By A. T. Smith
R. U. V. Co., Inc., New York City

THE large pressure-type ultra-violet-ray sterilizers now in operation at Henderson, Ky., are the first of this type in the world designed for use in connection with municipal water-works. The water delivered to the sterilizer is first passed through sedimentation and coagulating basins and mechanical filters, and after this treatment it is at all times virtually clear. The sterilizer units are automatic in operation.

The City of Henderson, Ky., located on the Ohio River, about twelve miles below Evansville, Ind., secures its water-supply from the Ohio River. It has a population of about 17,000. Up to 1916, untreated water was pumped to a 4,000,000-gal. reservoir. The storage was equivalent to less than two days' supply, the average daily consumption being about 2,500,000 gallons.

The city, after considering various schemes, finally accepted the joint proposition of the R. U. V. Co., of New York City, and the Pittsburgh Filter Manufacturing Co., of Pittsburgh, for a complete sedimentation, filtration and sterilization plant at the pumping-station site, to have a nominal capacity of 3,000,000 gal. per day and designed to be increased to double that capacity without affecting the present structures.

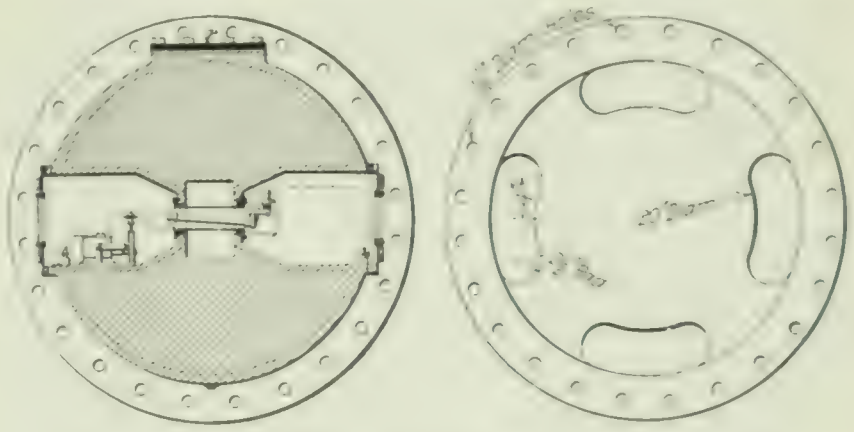
The design was passed upon by J. W. Ellms, consulting engineer, Cincinnati, Ohio. There are two coagulating basins, each 95 ft. long, 30 ft. wide and 16 ft. in depth; and two baffled mixing chambers, 7½ ft. wide, 25 ft. long, and 17½ ft. in depth. The detention period in the coagulating basins is four hours on a capacity of 3,750,000 gal. per day, and the capacity of the two settling basins is 620,000 gal. Six reinforced-concrete filter units were installed, each 17 ft. long by 13 ft. 4 in. wide, with a normal capacity of 625,000 gal. each, totaling 3,750,000 gal. per day.



HENDERSON MUNICIPAL WATER-WORKS HAS COMBINATION MECHANICAL FILTER AND ULTRA-VIOLET PURIFICATION PLANT

The filters are of reinforced-concrete throughout, with a brick building covering the filters and the head house. A clear-well covers the entire area below the filter units and pipe gallery. Adjacent to this, on the outside, is a low reinforced-concrete building, 17 ft. wide by 28 ft. long, in which is placed the ultra-violet-ray sterilization apparatus.

The ultra-violet-ray sterilizers consist of three legs, each comprising five units. The legs are connected in parallel, while the entire equipment is connected in series with the pipe line leading from the clear-water basin to the sump from which the pumps draw their supply. Valved increasers and reducers are provided to connect the sterilizer with the service pipe line, as the sterilizer units are made 30 in. in diameter to secure low velocity.



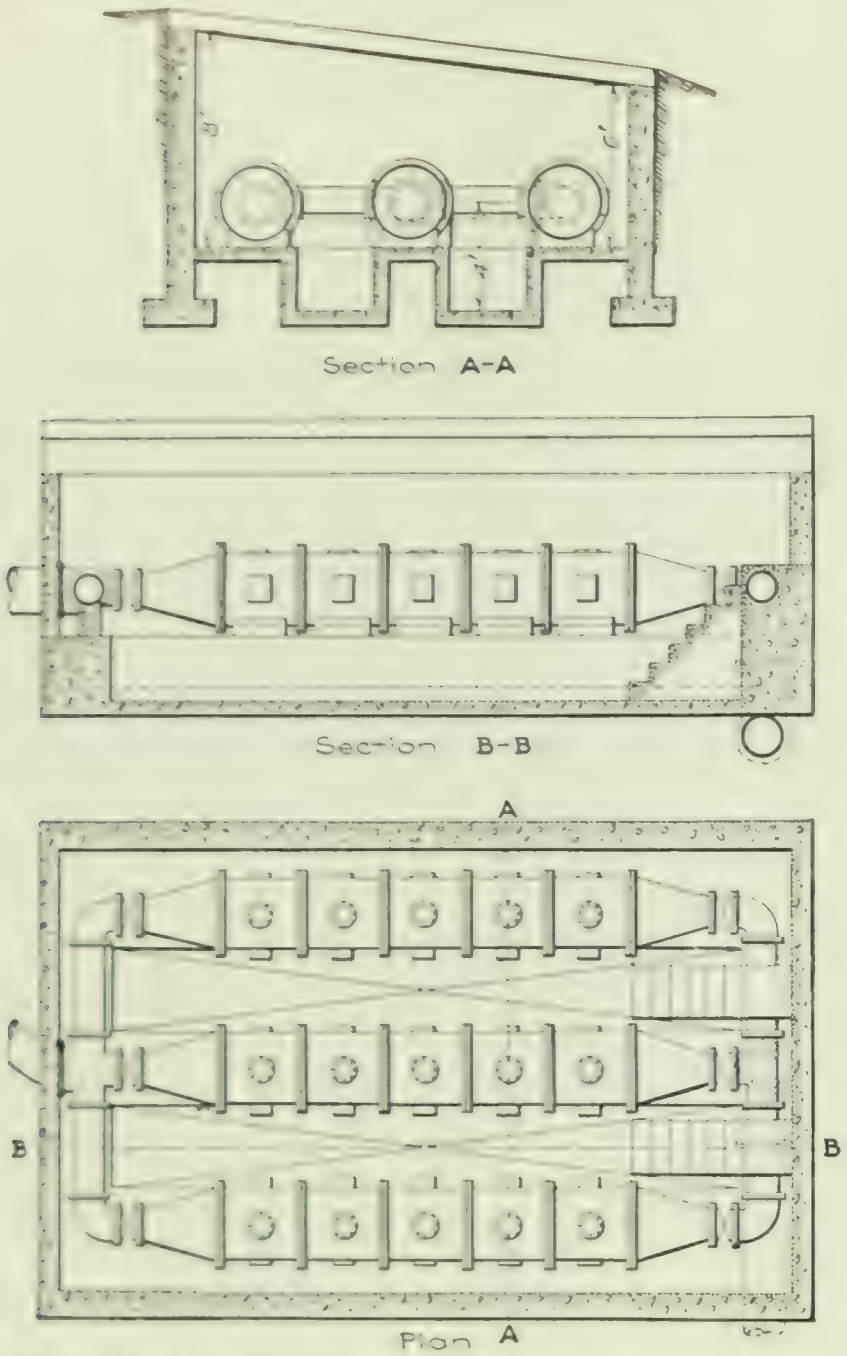
SECTION THROUGH ULTRA-VIOLET UNIT, AND ELEVATION OF BAFFLE

Each unit has a lamp box inserted in its side, equipped with a clear quartz closed-end tube, which projects into the body of the unit and around which the water is forced to flow in a thin film, by means of a baffle placed at 90° to the long axis of the sterilizer. The baffle has a slotted opening to receive the quartz tube and to provide for passage of the water.

Inside the quartz tube is placed a 220-volt direct-



NEW LARGE TYPE OF ULTRA-VIOLET UNIT HAS BEEN DEVELOPED FOR MUNICIPAL PLANTS



ULTRA-VIOLET STERILIZER WAS BUILT WITH THREE PARALLEL FIVE-UNIT LEGS

current mercury-vapor arc lamp. It is properly held in place and automatically tilted by a special support which is located in the lamp box.

An iron baffle plate with four large holes is inserted in each unit to insure bringing each particle of water into the field of the ultra-violet rays during its passage through the apparatus.

Each lamp is provided with a small individual switch cabinet to provide proper electrical starting characteristics. A main switchboard is also provided and placed adjacent to the filter-operating room. This board has mounted on it a tell-tale incandescent lamp for each ultra-violet lamp in the sterilizer, main-line switches and indicating instruments. There is also a warning bell which rings when a tell-tale lamp is lighted.

If any ultra-violet lamp fails or diminishes in power from any cause, the bell rings and the tell-tale lamp on the main switchboard shows which lamp or lamps in the sterilizer are in trouble.

A motor generator set is provided to transform the available alternating current into 220-volt direct-current.

The accompanying tabulated results have been taken from daily tests run continuously for over two months and are offered to indicate the effectiveness of the sterilizer.

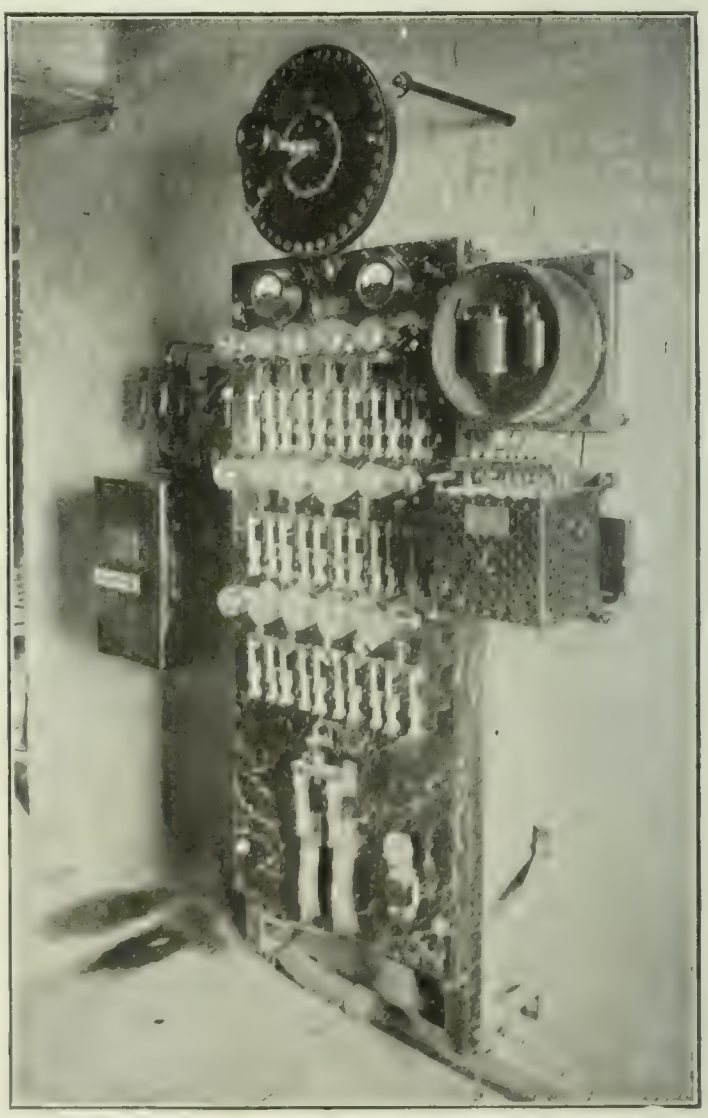
The bacteriological work was done in accordance with standard methods of the Laboratory Section of the American Public Health Association, and the average results were closely checked by the maximum and minimum obtained, which vary little from average results.

TYPICAL RESULTS, BACTERIAL TESTS AT HENDERSON WATER-PURIFICATION PLANT

		Bacteria per c.c., 24-hr. Incubation			
	Total No. of	Total Bacteria		B. Coli	
Sample	Samples	Maximum	Average	Maximum	Average
Raw	25	190,000	85,000	1000 0	276 0
Coagulated	25	1,200	720	100 0	.45 0
Filter	70	320	80	1.0	0.035
Leg 1:					
Influent	52	95	32	1.0	0 260
Burner 1	48	30	16	0 8	0 215
Burner 2	48	20	8	0 8	0 200
Burner 3	48	16	6	0 2	0 136
Burner 4	48	6	2.10	0 1	0 090
Burner 5	54	3	0.31	0.0	0 000
Leg 2:					
Influent	53	75	36	1.0	0 310
Burner 1	47	50	12	0.6	0 273
Burner 2	47	20	6	0.8	0 18
Burner 3	47	7	5 20	0 4	0 117
Burner 4	47	6	1 80	0 1	0 07
Burner 5	54	3	0.38	0.0	0.0
Leg 3:					
Influent	54	95	25	1.0	0.326
Burner 1	47	55	14	0.8	0 240
Burner 2	47	19	9	0.8	0 21
Burner 3	47	12	4	0.4	0 110
Burner 4	47	6	1 60	0 1	0 06
Burner 5	54	3	0.42	0.0	0 0
Tap at pumps	34	11	0.39	0.0	0.0

Rate of pumping 2,200,000 gal. per day to 3,200,000 gal. per day, with little or no variation in results.
Turbidity of raw water varied from 130 to 880 r.p.m.
Filtered water usually clear with maximum turbidity of 5 r.p.m.

The plant was put in operation toward the end of 1916 and has since run under a varying capacity from 2,200,000 to about 3,500,000 gal. per day. The current consumption guarantee of 0.77 per lamp was met in operation. The cost of final sterilization by this method can be estimated from the current consumption, which is 92.5 kw.-hr. per 1,000,000 gallons.



SINGLE SWITCHBOARD PANEL CONTROLS THE ULTRA-VIOLET PLANT

Waterwheel Reversed To Absorb Energy During Test

Method of Rating Efficiency of Hydraulic Units Without Water Rheostat Effectively Used at Crosscut Plant

THE contract for the hydraulic equipment in the crosscut hydro-electric plant built for the U. S. Reclamation Service on the Salt River Reclamation Project in Arizona was let with bonus or penalty dependent upon the efficiency obtained. A careful test was therefore decided upon and the methods by which it could be made were studied and compared. The general features and layout of the plant were described in *Engineering Record* of Jan. 1, 1916, p. 19, and in *Engineering News* of Apr. 20, 1916, p. 740.

It was agreed that the high voltage and low amperage made it inadvisable to use the usual water rheostat method for absorbing load. With the consent of the waterwheel manufacturer it was therefore decided to connect the generator of the wheel under test with a generator of another unit in such way that the latter would be run as a motor. Thus the load could be taken up by the jets from the nozzles retarding the reverse rotation of the buckets.

The specifications provided that any one of the six units might be selected for test, and number one was chosen. The plant is provided with a busbar system of the common double bar or loop type, with disconnecting switches at either end of the loop. For the duration of the test these switches were opened, and all of the plant and interchange load was transferred to one bus. The other bus was used for connecting the unit under test to the unit supplying the load.

Taking excitation from a separate exciter, these two machines were thrown on the isolated bus. On bringing the machine selected for test to speed, the machine selected for load also came up to speed as a synchronous motor. The connections on the unit intended to supply the load were reversed, of course, so that when supplied by power from an external source its direction of rotation was opposite to normal.

Hand Regulation Only

After some experiment it was decided to disconnect the governors and rely entirely on hand regulation. One penstock was used for supplying water to the unit under test and another for supplying water to the exciters and providing the load in the braking unit. With water admitted through the nozzles of the unit operated as a synchronous motor, electric energy was absorbed in direct relation to the hydraulic energy developed by water passing through its nozzles. Therefore, as the nozzles were gradually opened on the unit under test a relative additional quantity of water was admitted to the motoring unit. It was necessary to observe care in manipulation of the field rheostat to avoid the breaking of step on the part of the motor unit, but after some experimenting little difficulty was found in gradually controlling the load and speed of the generating unit.

The stresses imposed on the buckets were the direct opposite of the stresses for which the unit was designed. Notwithstanding this fact, the motor unit was operated in this condition almost continuously for two days. It is notable that the Kingsbury bearing on the motor unit, although designed for rotation in one direction only, showed no undue distress throughout the entire run. The gross efficiency of the impulse wheel obtained was 79.26%, or, correcting for loss of head, due to the requirements of settin the waterwheel runner above level of water in the tailrace, a net efficiency of 83.5% was obtained.

How Tar Mat Is Applied to Concrete Road Base in Maine

TO INSURE a good bond between concrete base and tar mat surfacing, a type of construction which, in the case of the road near North Kennebunkport, Maine, presents a smooth, wearing surface after four years of service, the State Highway Department has adopted the following practice:

1. The concrete base is swept carefully. This is important as a slight film of dust will prevent the tar from sticking to the concrete.

2. One-fourth of a gallon of hot tar (in this case Tarvia A) is applied under pressure by a mechanical distributer.

3. Wherever there is the slightest doubt as to the adhesion of the tar to the concrete, the tar is broomed to insure that the dust, which is always to be found on the surface of a concrete road, does not prevent proper adhesion.

4. Pea stone, as much as 1 cu.yd. per 200 sq.yd. of pavement, is then applied.

5. The mat is then rolled with an 8-ton roller.

6. The surplus screenings are swept away. This is necessary if the second application of tar is to obtain a proper bond.

7. After sweeping, a second coating of tar, about ¼ gal. per sq.yd. is applied.

8. The second coat of tar is covered liberally with pea stone.

9. The pavement is then rolled again with a roller weighing about 8 tons.

10. The surface is blotted with sand.

The following is the record of wear: First year, no repairs; second year, slight patching; third year, slight patching; fourth year, a fair amount of patching; fifth year, liberal patching (estimated); sixth year, re-treatment.

Just what it has cost to keep this mat patched and in perfect condition it is hard to say with exactness, for it is very hard to separate the time spent on patching from the time which the patrolmen or other road laborers spend on other features of road maintenance. It is thought to be conservative, however, to state that keeping this mat in place has cost less than $50 per mile per year. In view of the heavy traffic over this road, which is a section of the Portsmouth-to-Portland road and carries unusually heavy motor traffic, it is thought that the success of this mat is worthy of note. The aim of the Maine Highway Department, of which Paul D. Sargent is chief engineer, has been to get a perfect bond between a good mat and a good piece of concrete.

Concrete Building Has Long-Span Girders and Floor

At Emory University Part of Library Floor Is a Square Slab 37½ Feet on a Side, and in Roof Is a 52-Foot Girder

A SQUARE reinforced-concrete floor slab with a clear span of 37 ft. 6 in. is a special feature of the design of the frame for twin buildings of the new group of structures for Emory University at Atlanta, Ga. Further novelties of the concrete design are a spiral stairway in one of the buildings and a roof girder of 52 ft. 2 in. span which not only carries the roof load but a depending 8 in. concrete partition which was thought too heavy for the long span floor noted in the previous sentence.

The twin buildings of the recently constructed group of structures are placed about 200 ft. apart and are designated as the School of Law building and the School of Theology building, with an open court between. The plan for each is about 53 x 154 ft., with a rear wing in the theology building and a spiral stairway in the law building. Concrete foundations of unreinforced spread footings 2 ft. wide for the walls are carried down to stiff clay, and interior columns are supported by concrete piers without steel, the loads for these two-story structures being relatively light.

The basement in the law building is excavated on the south side only, and has a 6 in. concrete floor. The main entrance is on the longer or court side, at about the center of the building, and leads through an arched passage directly to the spiral stairway in the rear. On the first floor at the west end is the large library, about 52 ft. square, with twelve diagonal columns which support the second floor and are spaced about 7 ft. inside of the walls. Offices and a large lecture room with stepped sloping floor occupy the balance of the first floor. The second floor consists of lecture rooms and offices.

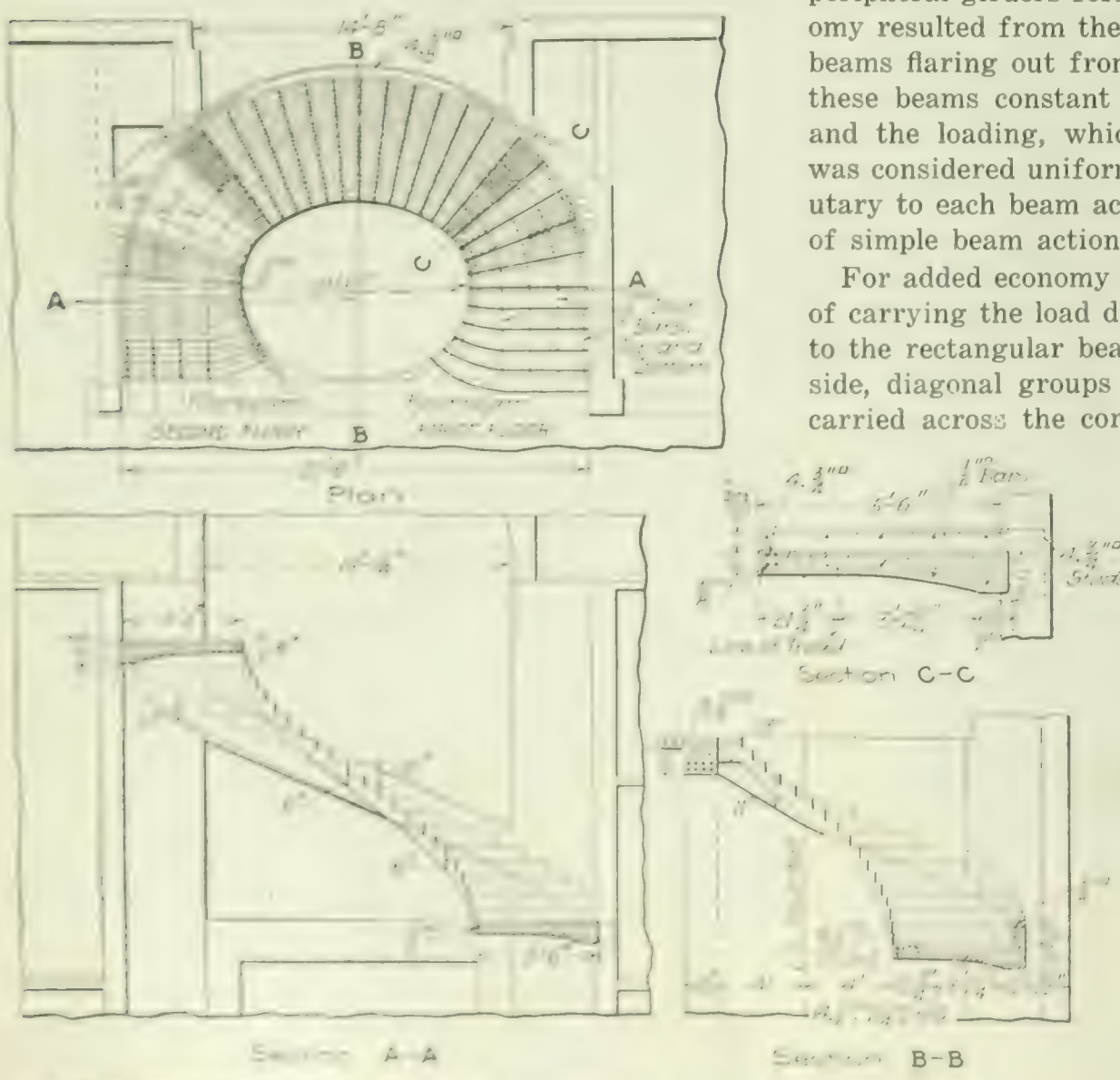
Springing from a beam of the first-floor framing in the law building, a spiral stairway of reinforced-concrete 6 ft. wide winds through an angle of 180° to a parallel beam of the second-floor framing about 18 ft. above. The rise of each step is slightly over 6½ in. and tread 11 in., and the concrete is faced by marble slab treads 3 in. thick and risers 2¼ in. thick. The concrete steps are reinforced, as noted in one of the drawings, by both radial and spiral steel.

To support the curved steps at intermediate points, reinforced-concrete cantilever beams are used at the walls, and the spiral steel is designed to transfer loading to these beams. The walls and columns are located in plan as near the spiral stair as practicable in order to decrease the bending effects of the cantilevers.

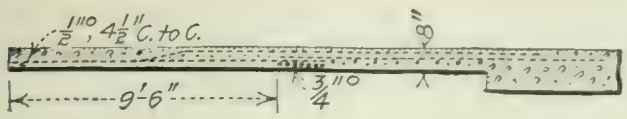
The large unsupported floor slab is located over the library. Here the architectural treatment of the ceiling to give a ribbed dome effect and the structural necessity for economical design of such a large square slab led to the use of diagonal beams curved on the bottom and acting as cantilevers over the columns. These support an 8-in. slab with two-way reinforcement combined with diagonal steel for beam action to carry loads to peripheral girders forming a deep central panel. Economy resulted from the cantilever action of the diagonal beams flaring out from the columns. In the design of these beams constant moment of inertia was assumed and the loading, which is taken as 75 lb. per sq.ft., was considered uniformly distributed over all area tributary to each beam according to the usual assumptions of simple beam action.

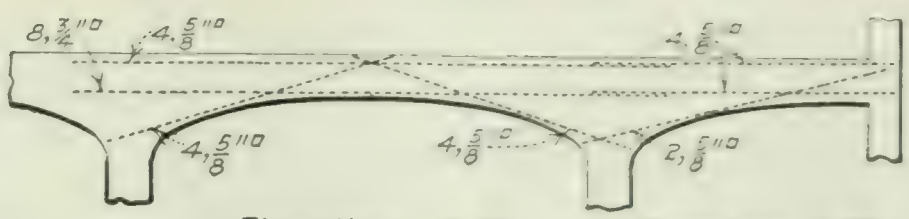
For added economy in the design of the slab, instead of carrying the load directly by two-way reinforcement to the rectangular beams forming a square 19 ft. on a side, diagonal groups of rods, as shown in plan, were carried across the corners of the square, making possible an 8-in. slab by using two-way diagonal rods tributary to these strongly reinforced sections acting as beams.

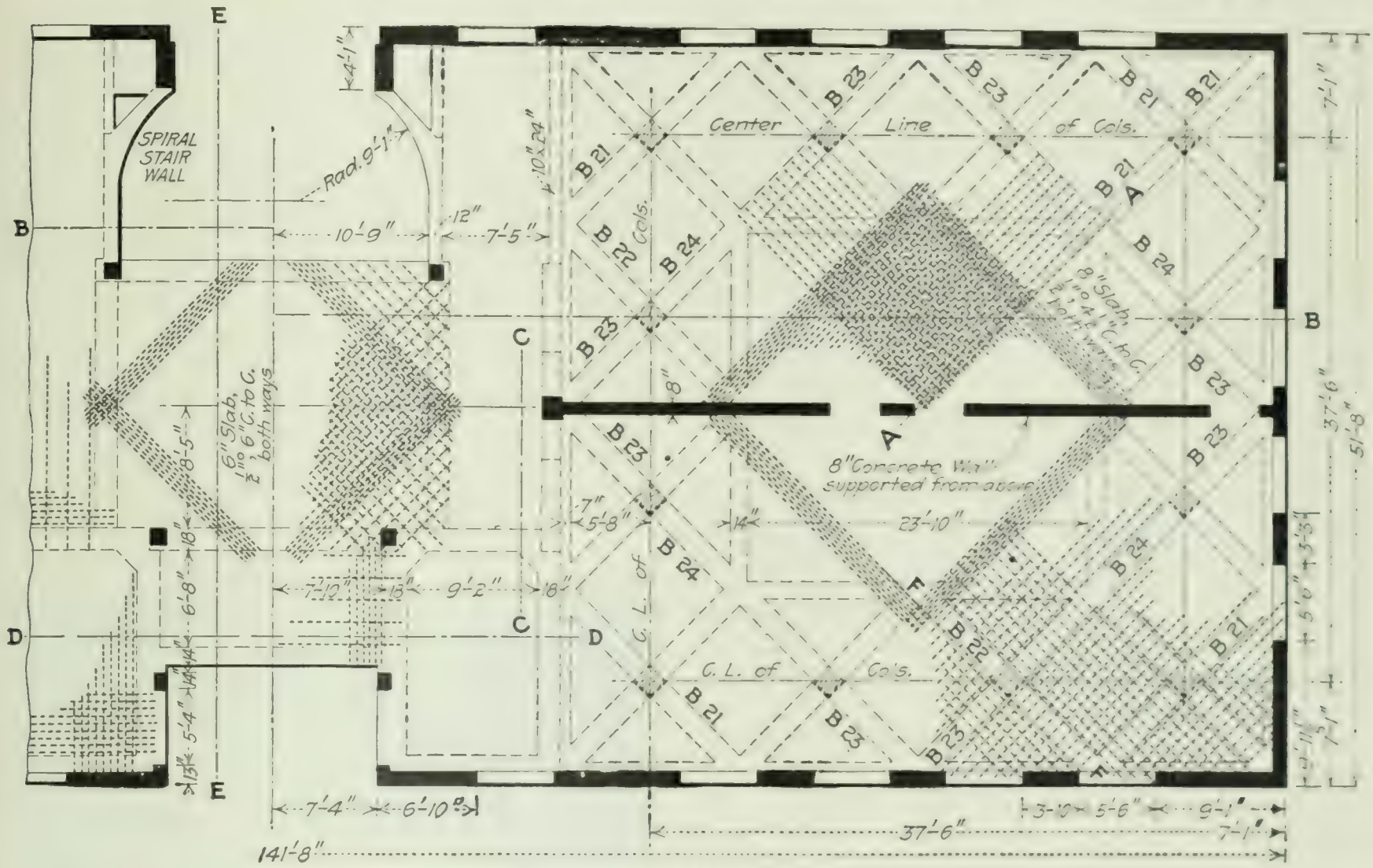
A similar slab in the second floor above the entrance corridor is seen in the plan, about 17 ft. square and only 6 in. thick, where the same principle of load distribution by slab-and-beam action was applied. In the case of the large slab over the library, the dead load was decreased by supporting the 8-in. concrete partition wall, as shown, from a reinforced-concrete girder in the roof above.

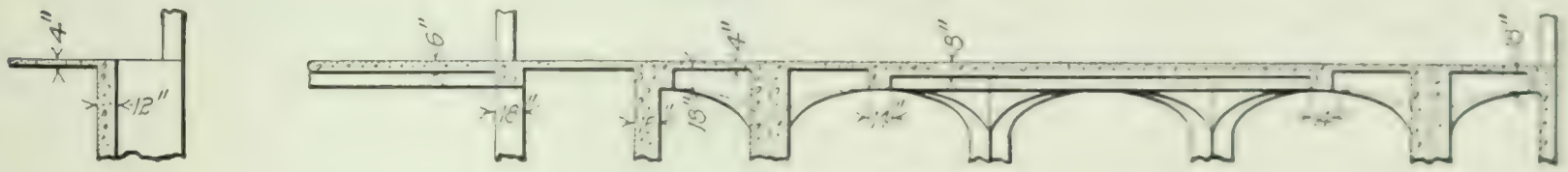


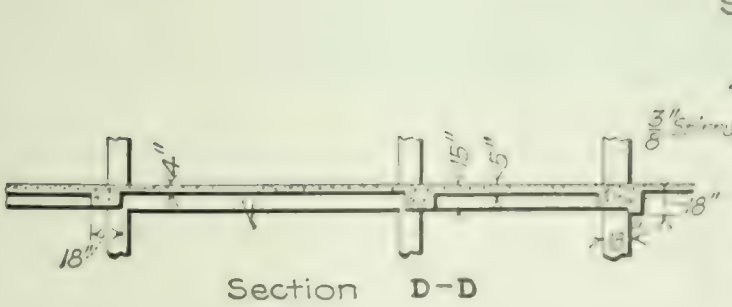
PLAN AND SECTIONS SHOW REINFORCEMENT IN SPIRAL CONCRETE STAIRWAY

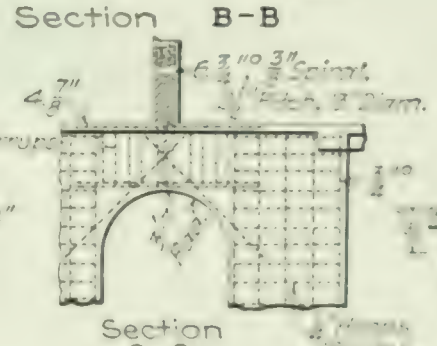


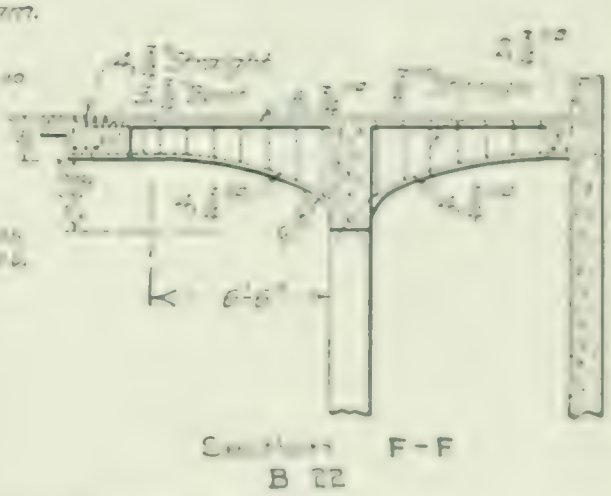










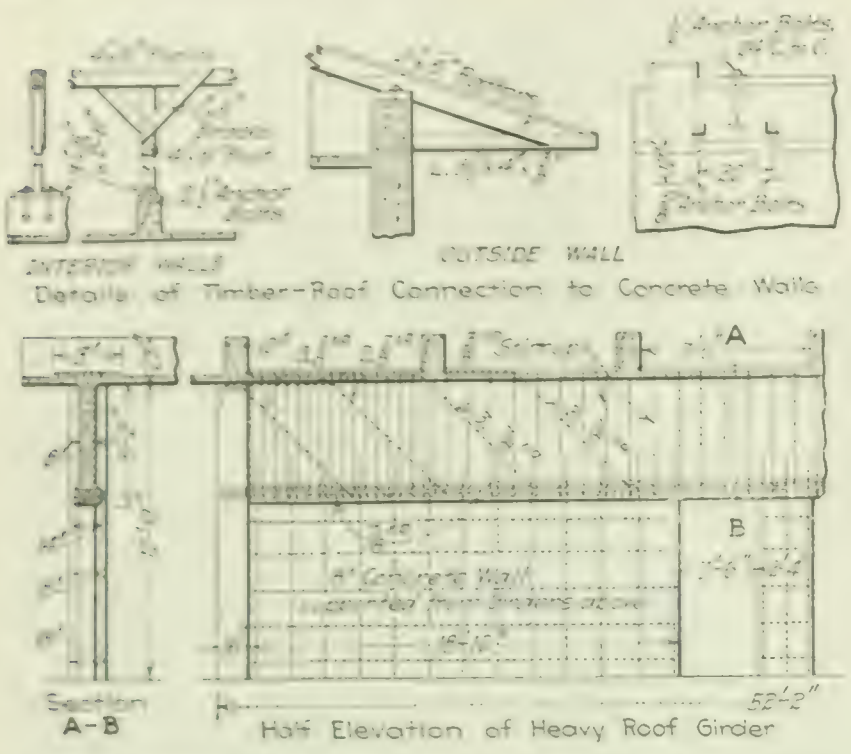




FLOOR SLAB 141 FEET SQUARE IS OF SPECIAL DESIGN

The reinforced-concrete roof girder of 52 ft. 2 in. span, details of which are shown, was adopted to carry the roof loading and weight of partitions to the outside wall and interior column. The latter column is 16 x 18 in. and delivers the load to a wall beam carried by interior walls or columns, as seen in the plan. In designing this large girder, 5 ft. 7 in. total depth, economy was attained by using an 8-in. web thickness with a lower flange widened to 14 in. to accommodate the 22 reinforcing rods required, and using the roof slab as upper flange area.

The 3-in. concrete ceiling is framed into concrete beams which extend upward in order to give a flat ceiling. Above the concrete framework, largely for the



ROOF TIMBER 51 FEET LONG SUPPORTS PARTITION WALL BELOW ROOF

purpose of architectural finish, a red tile sloping roof is supported on timber framing, some of the details of which are indicated in the same drawing as the large roof girder.

The main walls are, in general, 8 in. thick, reinforced in both directions by ⅝-in. square rods spaced on 18-in. centers, with arched opening for doors and windows. The outside walls are finished by large-size colored Georgia marble mosaic formed of 1¼- to 2-in. slabs in varying sizes, set in portland cement. This marble is pink, gray, white or dark green in color and gives a warm-toned appearance to the buildings.

The architects for these buildings are Palmer, Hornbostel & Jones, New York City, and the design and construction were made and supervised under the direction of the contractor, Arthur Tufts, Atlanta, Ga.

Concrete Road Maintenance Details on Toronto-Hamilton Highway

By H. S. Van Scoyoc
Chief Engineer, Toronto and Hamilton Highway Commission

THE maintenance gang on the Toronto and Hamilton cement concrete highway discontinued the use of a horse and wagon and a 3-bbl. tar kettle in filling the cracks and joints this season. A tar kettle having a capacity of only one barrel was substituted and was moved along the highway by the men. A ½-ton motor truck conveyed the men to and from work, transported the tar and blanketing material and hauled the tar kettle when long moves were made. During much of the time the truck and driver were employed by the construction department for a part of the day.

In some of the wider openings the objectionable settling away of the tar was avoided by calking the bottom of the cracks with oakum. This treatment also effected a saving in the quantity of tar required, as none of it flowed away underneath the slab.

In an endeavor to clean out the openings quickly a bellows was tried out, but the results were not satisfactory. All of the cracks were carefully cleaned and the narrow ones [illegible] to a depth of about ½ in. An attempt was made to have the opening wider at the bottom than the top so that the tar would tend to remain in place. Up to the present, substantially all of the tar poured this season is still adhering.

Wire Mesh Instead of Cable in a Western Suspension Bridge

A SUSPENSION foot-bridge was recently built across the Rogue River at Agness in Curry County, Washington, with wire fencing instead of cable as the suspension member. It was necessary to build a high-level bridge, and the cost, weight and difficulty in securing steel cables led to the decision to try the fencing.

The bridge is 659 ft. from anchorage to anchorage; the span over the water is 380 ft. About 2000 ft. of fencing was used in the two sides and the bottom strip. No joints were made on the bridge. The fencing used on the sides has a No. 7 top wire, the second wire and the bottom wire are size No. 9, and the 17 intermediates are No. 11. The crossbars are spaced 1 ft. apart. The flooring of the bridge consists of a field fencing with No. 9 wires at either edge and eight No. 11 intermediate wires. The crossbars in the flooring are No. 11 wire, spaced 1 ft. apart as on the sides.



WIRE-MESH SUSPENSION BRIDGE OVER ROGUE RIVER, AGNESS, WASH

Piers and anchors for the bridge were constructed of cedar logs hewn out with the ax. The main timbers are 12 x 12 in. at the bottom and 10 x 10 in. at the top. The top of the highest pier is 40 ft. above the ground.

Drainage Outlook Points to Betterments Only

Improvements of existing drainage districts, to overcome the difficulties and inadequate facilities shown up so clearly in the 1915 floods, will make up the bulk of drainage work next season, according to a Middle West consulting engineer who has plans for an expenditure of $2,000,000 for revamping projects. Nothing that cannot bring results within a year's time is going ahead, but there is great activity looking toward putting these projects in good workable shape.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Should Engineering Students Be Drafted?

Sir—If the authorities persist in drafting students of the junior and senior classes in the engineering schools, I believe that a serious condition of affairs will result during the next two to six years in this country. I have daily applications for young engineers and have none to recommend. Anyone can understand what the condition will be if the thousands of students who would be engineers next June and the June after are sent to France as soldiers in the ranks or are driven out of school into shipbuilding and allied industries in which they will be exempt from service.

I write this letter to ask you to use the influence of your journal in attempting to correct this situation. In this war and in this country young engineers are certainly as valuable as young medical students.

PALMER C. RICKETTS,
President, Rensselaer Polytechnic Institute.

Troy, N. Y.

The War's Effect on Enrollment in Engineering Schools

Sir—In further reply to your comments on the movement to enlarge the attendance at the technical schools of this country, I beg to call your attention and that of your readers to editorials on pp. 344 and 346 of the October 31st issue of *Engineering and Contracting*, entitled "The Effect of the War on Enrollment in Civil Engineering Departments of American Colleges." From those editorials it will be seen that there is a marked decrease in the number of students in the civil engineering courses of this country. The number of the schools recorded as answering the editor's questionnaire is sixty—certainly enough to give a fair average.

For five years past the number of engineering students in attendance at the schools has been decreasing; and in the present scholastic year, as compared with the preceding one, the drop thus far has been twenty-four per cent. It is true that the freshman classes show a trifling gain of two per cent. This is undoubtedly due to the various appeals made to the public, urging increased attendance, but the percentage of increase should have been much greater in order simply to maintain equilibrium; and, in my opinion, it should have been at least one hundred in order to meet the probable demand for young engineers after the close of the war.

The editorial referred to states that "Since the opening of the college year the advertising of engineering colleges has again become conspicuous by its meagerness." This is wrong; because the freshman classes should be increased in every practicable way. Probably the school authorities deem that it is now too late to add materially to the size of the freshman classes. Under ordinary conditions, that is quite true; but it would not be difficult to have two freshman classes, and let the second one work steadily through all the vacations until next autumn and thus catch up with the first class. In truth, during the war period, and for some time thereafter, all engineering courses should be, as nearly as practicable, continuous, in order that the upper classes may finish ahead of time and get into practical work, where engineering services now are and will continue for some time to be in great demand.

Some instructors may object to the hardship of doing the extra work; but if they feel inclined to complain, they should remember that to work overtime on teaching is far less onerous than serving in the trenches. Again, it is possible to work the students twelve months per annum and to work the individual instructors a much shorter time.

Decidedly, some radical steps should be immediately taken to augment materially the number of men in the freshman technical classes of this country.

J. A. L. WADDELL,
Consulting Engineer.

Kansas City, Mo.

[The *Engineering News-Record* has been fully alive to the necessities of the situation mentioned by Dr. Waddell. The results of its efforts to learn the extent of the damage already done can be found elsewhere in this issue. Attention is also directed to the editorial attitude outlined on p. 996.—Editor.]

Engineers and Civil Service Examinations

Sir—The attention of the U. S. Civil Service Commission has been directed to the letter appearing on page 802 of *Engineering News-Record* of Oct. 25, under the heading: "How One Engineer Feels About the Civil Service Examinations." The statement is made in the article that in attempts to evade the civil service rules there is at one end of the scale "the engineer of ability who resents any attempt at dictation as to the men he shall employ" and there is at the other end of the scale "the politician who wishes to appoint friends incapable of passing the examinations."

The first part of this proposition has not been the experience of the Federal Civil Service Commission; on the contrary engineers of ability in the government service who may at first have opposed the application of the competitive examination system to appointments to their offices have afterward stated frankly that the employees secured through such means were superior in qualifications to the persons they had themselves employed when in private enterprises.

For the ordinary engineering positions, for which it is desired to secure recent graduates from college, the appropriate form of examination, in the judgment of the Commission, is one covering the subjects pursued in the college course. For positions requiring supervisory or administrative ability, as well as wide knowledge and experience of any line of engineering, the form of examination prescribed is that known as the "unassembled" examination. In connection with this form of examination, each candidate submits a sworn statement showing his education, training and experience in detail, which the commission corroborates by confidential inquiry of the references given by the candidate and of other persons having knowledge of the facts. Upon the information so secured a rating is assigned to each can-

didate by a board of examiners competent to pass upon the qualifications required in the positions to be filled.

This form of examination results in the highest type of competition, and the government has obtained through its means men of high attainment in their professions; in one such examination three state commissioners of education were candidates.

J. A. McILHENNY,
President, United States Civil Service Commission.
Washington.

Serial Bonds for Road Building

Sir—The article in your Aug. 30 issue entitled "Serial Bonds for Road Building Save Money" brings to mind the solution of a problem in annuity bonds in *Engineering News*, Nov. 2, 1916, p. 852. My solution appeared in *Engineering News*, Nov. 30, 1916, p. 1042.

In Mr. Eldridge's article no mention is made of one objection to the sinking-fund bond, and that is that these bonds usually bring the holder a higher rate of interest than the sinking fund brings the issuer of the bonds even if the money is promptly and honestly invested. The use of either annuity or serial bonds obviates this objectionable feature.

Regarding the cost of annuity and serial bonds, Mr. Eldridge does not draw a true comparison. In Bulletin No. 136 of the United States Department of Agriculture, the point is made clear that "in order to compare sums of money due at different times, they must be referred to the *same point in time.*" Taking, for instance, Mr. Eldridge's examples of $100,000 4% 20-year annuity bonds shown by Fig. 3, and $100,000 4% 20-year serial bonds shown by Fig. 4, a true comparison is attained by computing the total cost at 4% compound interest of the several annual payments of each class of bonds at the end of 20 years, compounding annually.

COMPARISON OF COST—ANNUITY VS. SERIAL BONDS

				Amounts of Serial Payments at End of 20 Years, at 4% Compounded Annually
		[illegible]	[illegible]	[illegible]
		$7,558 175	[illegible]	$18,961 64
		7,358 175	8,800 00	17,827 19
		7,358 175	8,600 00	16,746 78
				etc.
		7,358 175	5,600 00	6,056 96
		7,358 175	5,400 00	5,616 60
		7,358 175	5,200 00	5,200 00
				$219,107 14

Evidently the sum of the amounts of the annuity payments at the end of 20 years, at 4% compounded annually, is 29.7774788 × $7358.175, or $219,107.90. This comparison shows that there is a difference of only 76c. between the costs of these annuity and serial bonds—not $5163.50, as Mr. Eldridge's paper would lead one to believe.

The writer submits the following derivation for the formula given in his solution of the problem in *Engineering News*, Nov. 30, 1916, p. 1042. This formula is the one to be used in computing the equal annual payment for annuity bonds. One payment,

$$p = A\left(\frac{(b+1)^n}{b(b+1)^n - b^{n+1}}\right)$$

in which A = total debt or bond issue, or value of a single bond; b, 100 divided by the rate of interest, and n, the number of periods of time at the end of which the debt or bond issue is discharged, the interest compounding for each period.

The derivation is as follows:

$$A\left(1+\frac{1}{b}\right) - p$$

= amount at end of first year;

$$A\left(1+\frac{1}{b}\right)^2 - p\left(1+\frac{1}{b}\right) - p$$

= amount at end of second year;

$$A\left(1+\frac{1}{b}\right)^3 - p\left(1+\frac{1}{b}\right)^2 - p\left(1+\frac{1}{b}\right) - p$$

= amount at end of third year;

$$A\left(1+\frac{1}{b}\right)^n - p\left(1+\frac{1}{b}\right)^{n-1} - \ldots - p$$

= amount at end of n th year

Then

$$A\left(1+\frac{1}{b}\right)^n$$

$$p\left[\left(1+\frac{1}{b}\right)^{n-1} + \left(1+\frac{1}{b}\right)^{n-2} + \ldots + 1\right] = 0$$

Adding the geometrical series, where we have given the first term, ratio and number of terms, and calling 1 the first term so that the ratio is positive,

$$s = \frac{a(r^n - 1)}{r - 1}$$

we have

$$A\left(1+\frac{1}{b}\right)^n - p\left\{\frac{1\left[\left(1+\frac{1}{b}\right)^n - 1\right]}{\left(1+\frac{1}{b}\right) - 1}\right\} = 0$$

The factor by which p is multiplied in the above formula may be reduced to

$$\frac{(b+1)^n - b^n}{b^{n-1}}$$

Using this form, and substituting in the formula above,

$$p = A\left[\frac{(b+1)^n}{b(b+1)^n - b^{n+1}}\right]$$

VIRGIL A. EBERLY,
U. S. Engineer Office.
Key Bridge, Washington, D. C.

Sir—I notice that, due to the similarity of the characters 1 and I on the typewriter, you have misread the equation accompanying my letter on road bonds which you published in your issue of Nov. 1, page 849. The correct expression is:

$$\frac{1}{S_n} = \frac{i}{(1+i)^{n+1} - (1+i)}$$

R. AUSTEN McCULLOCH.
New York City.

Ethics and Engineering Salaries

Sir—Immediately after reading a letter on "Professional Ethics and Registration of Engineers" in your issue of Oct. 4, p. 657, I ran across the following in a local paper:

"None of the lumber camps is paying less than $4 a day for the commonest kind of labor, while men skilled in certain branches of timber work receive as much as $8 per day."

It seems to me that a "profession" that is paid at the rates given in the article on "Isolated Road Surveys," p. 660 of the same issue, would do well to turn its attention first to the matter of wages, even if it is necessary to make engineering a business instead of a profession to do so. It does not seem reasonable to expect a man working for $4 a day to be much concerned about "Professional Ethics." He has his own troubles finding a way to feed and clothe himself and family.

I have noticed that an engineer working directly for a business man generally gets as much pay as an "engineer" who is running a donkey engine, but that when he finds it necessary to hire an engineer to assist him he pays just as little as possible, with the desire of showing how cheaply he can do the work and with the result that engineers are held at their own valuation by more and more employers and that the larger concerns employing the most engineers pay the smallest wages.

When business men have to pay engineers—all engineers, not just consulting and chief engineers—in proportion to what they have to pay lawyers or doctors, they and the public in general will begin to recognize the engineer as a professional man, and then it will be quite natural for the engineer to set a standard of professional conduct and, in general, live up to it just as the lawyer and the doctor have done.

Dallas, Ore. S. B. TAYLOR.

Concrete Road Construction Details

Sir—In *Engineering News-Record* of Oct. 4, p. 649, the writer notes an article by P. C. McArdle on the use of a hand roller for compacting the surface of concrete roads and removing excess water. During the past season the writer developed a method for accomplishing these results, which, though decidedly simple, has proved satisfactory.

After striking off with a template the surface is rolled longitudinally with a piece of ordinary gaspipe operated by two men.

Rolling is started at the template and is continued back to the point where the surface is free from excess water. The pipe is then lifted about 2 ft. ahead and rolled back to the template. After the excess water has come to the surface another trip up and back with the roller will remove all the water and leave the surface in good condition for further finishing if it is deemed necessary. A wave of mortar is carried ahead of the roller the first time over, which fills in porous places or depressions. The second rolling removes nothing but water that is virtually clear.

This method is especially valuable when using crushed stone or slag as a concrete aggregate; the coarse material is forced down and a good surface obtained at a very small expense. After a little practice a finisher can produce a surface with the roller alone, which requires no floating. The gas pipe can be used, of course, only on flat slabs, but rolls could be made to conform to any crown desired.

In *Engineering News-Record* of Aug. 23, p. 372, there appeared an article by S. E. Fitch, on the use of concealed wooden strips for transverse joints in concrete pavements. The writer also developed this method and used it on a short section in 1916. This year it was used on a 5-mile section. The results have been very satisfactory, and the method appears to be a solution of the joint problem.

The writer believes Mr. Fitch has overlooked one very important advantage to be obtained by using this method. This is in the quality of the concrete at the joint. On most concrete roads the natural cracks are standing traffic better than the expansion joints. In



ORDINARY GAS PIPE IS USED TO ROLL CONCRETE ROAD SURFACE

striking off, the template many times carries ahead a mixture of pebbles, etc., which contain very little cement. More or less of this is carried to the joint and deposited, making a weak place where there should be the best concrete. Using a wooden strip avoids this, as the finishing can be carried ahead with no breaks for the joints, insuring a surface of uniform quality. A very fine hair crack appears over these strips after about the third or fourth day. With proper maintenance these should be better than the old expansion joint.

B. F. BATCHELDER,
Chief Engineer, Portage County Improvement Association.
Ravenna, Ohio.

Blanket Application for Higher Rates

Reports that water and other utility companies of Missouri recently have been besieging the Public Service Commission for permission to increase their rates led *Engineering News-Record* to ask the commission for the facts. T. M. Bradbury, secretary, Jefferson City, Mo., has replied that only one or two water companies have appiled for increases. Continuing, Mr. Bradbury writes:

"Some time ago the Missouri Public Utilities Association, which includes in its membership some three hundred utilities in this state, comprising all water, gas, electric and street railway utilities, through one of its committees filed a request with this commission for a blanket increase in the rates of all utilities. The commission declined to make such blanket increase and suggested that the utilities make individual applications in those cases where they considered increases necessary and desirable. It was probably the above application which caused certain papers to report that a large number of companies were applying for increased rates."

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Power Loader Removes Old Dump Made in Stripping Gravel Pit

EARTH stripped by scrapers from a large sandpit in Cleveland operated by The Builders Sand Co. had been wasted at one side of the lot until it became necessary to remove it. On account of the labor shortage a power loader with a bucket chain, shown in the photograph, was employed with great success to dig down this pile of dirt and load it on trucks. With the machine 40 trucks holding about 200 yd. could be loaded in one day



UNLOADER DIGS OLD WASTE BANK AT RATE OF FORTY TRUCKLOADS A DAY

by three men, two of whom worked on the ground and one in the truck. This labor cost $10.50 per day, in addition to the expense of the truck and driver.

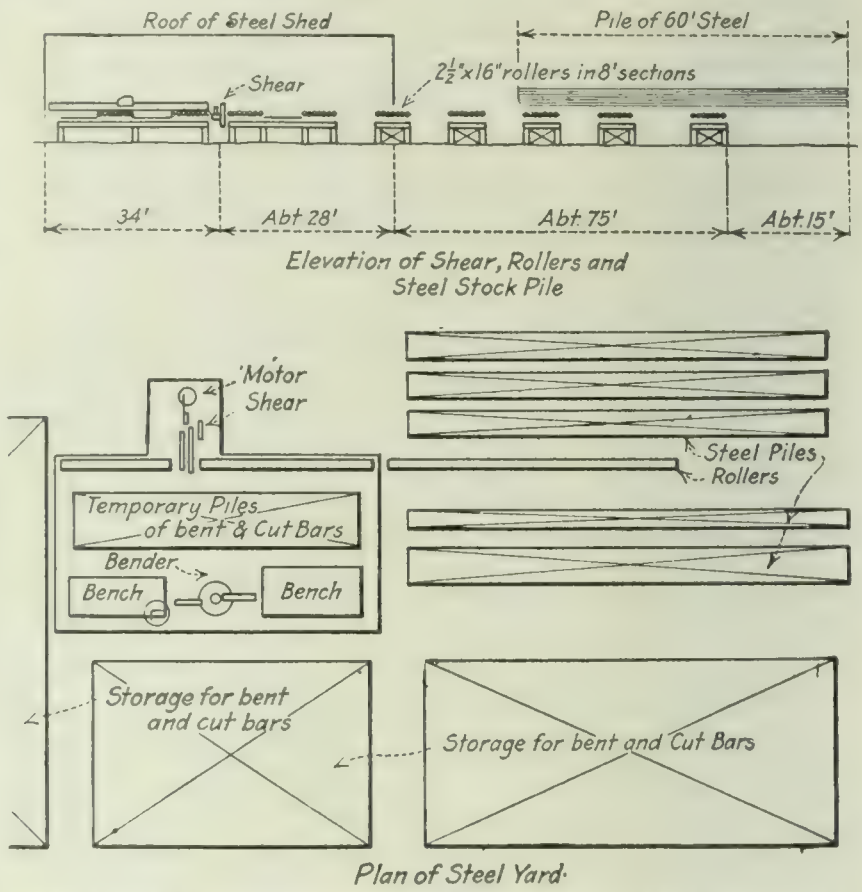
The machine was run by electricity and the charge for the current was very small. The Builders Sand Co. put idle trucks to work on the dirt pile, thus removing [illegible]

Roller Conveyors Handle Long Steel Bars

SEVEN men handle 1¼-in. reinforcing bars 60 ft. long from stockpile over lumber roller conveyors to cutting shears and then to storage piles supplying the steel for a five-story addition to the plant of the Eastman Kodak Co., at Rochester, N. Y. The structure is 152 x 562 ft. in plan and requires 15,000 cu.yd. of concrete. All the steel is cut on the job.

Tables, each consisting of a frame with rollers set in the top, are placed 8 or 9 ft. apart in a line from

the steel shear to the stock piles. There are 75 lin.ft. of 8-ft. roller sections used. Four men put the steel on the tables, and standing between the tables, push it forward toward the shears where three men cut it and pile the cut lengths.



ROLLERS LIGHTEN WORK AND KEEP GANG ON JOB

Across the shed from the shear is a power bender which makes two bends at once on the truss bars for the beams. The bent and straight bars are tagged and the different types are stacked in separate piles in the storage space around the steel shed.

The building is being erected by the Ferro-Concrete Construction Co., for which Stacy Campbell is superintendent.

Buckets and Spouting Hopper on Flat-Car Place Sewer Concrete

ON THE flood protection work at Erie, Penn., concrete for the invert of the large culvert which is to replace Mill Creek is carried in the hopper mounted on the flat-car shown in the photograph, and is spouted to place. The outlet of the hopper is a hand-controlled gate, and the hopper is used for placing the invert, which is, of course, concreted first, and also for any other work where it is desired to keep the flow of concrete under close control. The hopper holds about 3 yd. The flat-car on which it is carried has room also for several concrete buckets, which can be handled by the crane. The photograph shows the flat-car at the central concrete plant, where buckets and hopper are loaded by spotting them under the discharge from the large hopper into which the mixer dumps. The buckets are



HOPPER ON CAR GIVES EXTRA CAPACITY AND MAKES SPOUTING FOR SEWER INVERT POSSIBLE

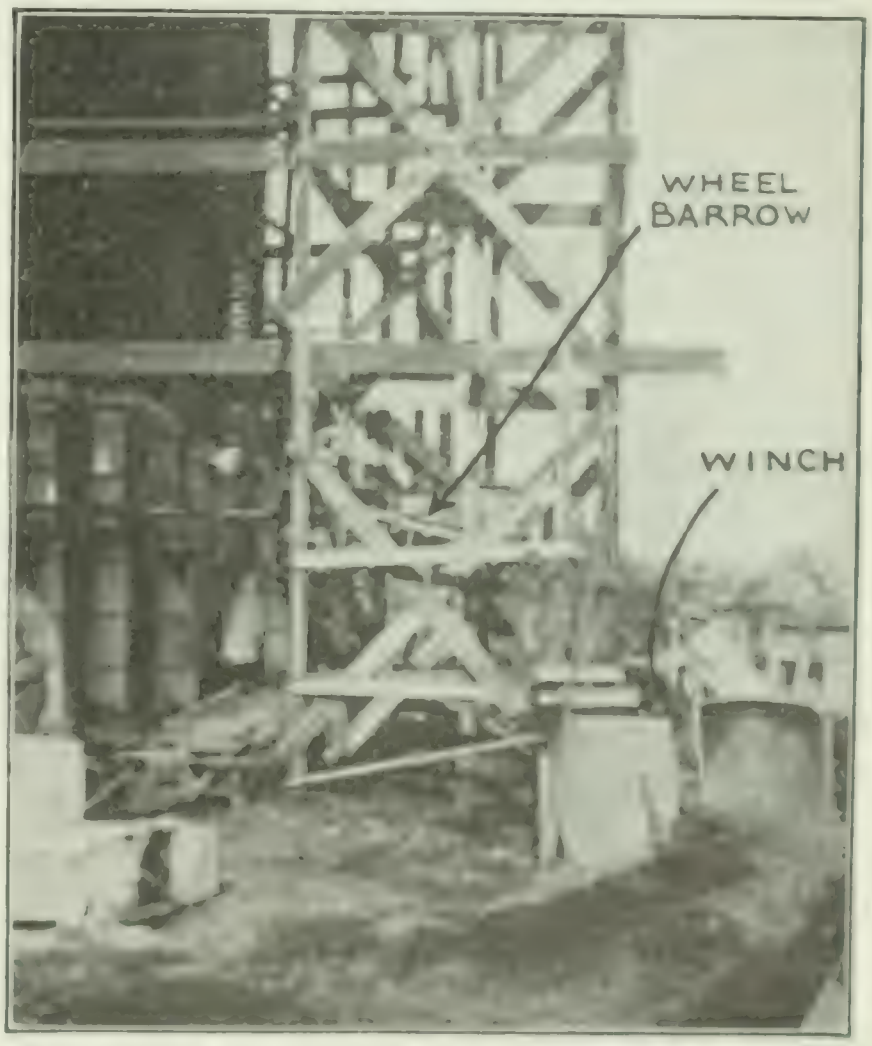
double-line affairs, dumped under the control of the crane operator. The car is handled from the mixer plant to the point of concreting by the locomotive crane which dumps the buckets.

Corner of Scaffolding Turned Into Brick Hoist for Building Steeple

By J. J. Grossman
Fort Edward, N. Y.

IN PUTTING up a 60-ft. brick tower which the writer added to a church building recently it developed that the small quantity of brick did not warrant the installation of a building hoist, and also that hod-carriers appear to be extinct. The difficulty was solved by placing two additional poles at the corner of the scaffolding, putting in a pair of guides between the scaffolding poles and the extra poles, and using a hoisting sling for raising wheelbarrow-loads of brick and mortar. The four poles which formed the hoist-way were carried about 10 ft. in advance of the rest of the staging, a head-block with a single block was secured across the top and a wire rope run through the head-block to an ordinary winch fastened to one post of the tower at the ground. The wheelbarrow sling, attached to this rope, was used to raise all brick and mortar in an ordinary wheelbarrow. The load was swung out and landed directly on the scaffolding and wheeled to the men, eliminating all rehandling.

With this arrangement, having two men on the ground, one of whom turned the winch and the other loaded the wheelbarrows, and a third man on the staging to wheel the material to the bricklayers, it was possible to keep five masons going. The hoist also handled several tons of stone used as trim on the tower. Since the hoist was well braced to the scaffolding, it was not necessary to use guys of any kind.



USING THIS HOIST THREE MEN SUPPLIED BRICK AND MORTAR TO FIVE MASONS

Industry's Use of Highways and Motor Trucks To Relieve Freight Congestion

Engineering News-Record's Inquiry Brings Replies from Manufacturers and Trucking Companies Throughout Country — Many Firms with War Contracts Use Roads for Raw Material and Finished Product Delivery

IN CONNECTION with Priority Order No. 2, effective Nov. 1, prohibiting the use of open-top railroad cars for the transportation of materials necessary for the building and maintenance of highways, *Engineering News-Record* has secured from manufacturers and truck users in various sections of the country evidence to support the claim that good roads at this time of railroad congestion are of vital importance to the industrial life of the nation. Two series of telegrams were sent out, one to a selected list of manufacturers and the other to a list of trucking companies. The two telegrams are as follows:

TO MANUFACTURERS

"Will you wire press rates answers to following questions, so we can estimate war value of highways: (1) Are you using trucks over country highways as relief for railroad congestion? (2) What materials are you hauling and between what points? (3) Are bad roads interfering? (4) How serious would it be for your business if you had to rely solely on railroads? (5) Would better highways help? (6) How? (7) Are you handling war orders?

"ENGINEERING NEWS-RECORD."

TO TRUCKING COMPANIES

"Will you wire press rates answers to following questions, so we can estimate war value of highways: (1) Are you operating trucks over country highways as relief for railroad congestion? (2) How many trucks? (3) What size? (4) Between what points? (5) Are poor roads interfering with your business? (6) How would the business of your clients be affected if they had to rely solely on railroads? (7) Are you hauling for any war industries? (8) Can trucks and highways help relieve railroad congestion materially?

"ENGINEERING NEWS-RECORD."

From the replies, the following digest is presented:

While all the manufacturers replying from the New England territory are not using motor trucks, those that are testify to the service rendered by these vehicles in the present traffic-congestion emergency. It is significant that one of the replies states that motor-truck delivery is proving cheaper than delivery by common carrier. Another manufacturer states: "It would be almost impossible for us to do business if we had to rely solely on the railroads." It is noticeable from the New England replies that manufacturers find the highways in that section well built and maintained.

Monomac Mills, at Lawrence, Mass., which has war contracts to fill, is not using motor trucks and has little complaint to make of the slow delivery on the part of the railroads. In its case, according to its statement to *Engineering News-Record*, better roads would not help.

The A. C. Lawrence Leather Co., South Boston, Mass., on the other hand, which is handling large army contracts for shoes and leather goods, is using two 5-ton motor trucks between Peabody and Boston for hauling finished leather and tannery supplies, the distance one way being 20 miles. The company reports that the use of motor trucks is an advantage and that costs are somewhat less than those by public carrier, when the pick-up and delay at each end are taken into consideration. One of the great advantages of the motor truck, the company has found, is its ability to give overnight delivery. The roads between Peabody and Boston are reported to be good and the company contemplates year-round operation.

In handling big contracts for army equipment, Warner Bros. Co., Bridgeport, Conn., are using motor trucks, and have found all of the state highways in good condition, the routes used being between Bridgeport, Danbury and Stamford. Without good roads and motor trucks, the company reports, serious inconvenience would be caused in delivery to its out-of-town branches.

Although it is handling large war orders, the Norton Grinding Co., Worcester, Mass., is not employing motor-truck delivery as relief for railroad congestion.

"It would be almost impossible for us to do business if we had to rely solely on railroads." This is the statement received from S. J. Townsend, traffic manager of the Brockton (Mass.) Heel Co., which is making deliveries of its products to the War Department. This concern is using motor trucks between Boston, Brockton and other suburbs within a radius of 20 miles for the delivery of sole leather, heels and soles for shoes. Bad roads, it is claimed, are interfering with deliveries.

The Pratt & Cady Co., Inc., Hartford, Conn., manufacturers of valves, hydrants and other fittings, is not handling any war orders and has not found it necessary to use motor trucks to transport material over state highways.

MIDDLE WEST REPORTS RAILROADS INADEQUATE

Four replies were received from the Middle West, as represented by Ohio and Illinois. The Red Line Carting Co., Akron, Ohio, which is doing a big freight-transportation business by motor truck between Canton and Akron and Akron and Cleveland, reports that if its clients depended solely on the railroads they would be swamped. Poor roads, the Red Line Co. reports, are interfering somewhat with motor-truck operation, although this concern has five trucks on the road.

The Knutsen Motor Trucking Co., Cleveland, is doing a haulage business in connection with war industries. It has 25 trucks in service, ranging in capacity from 3 to 6 tons. These trucks are hauling coal from mines to manufacturing plants at Wheeling, W. Va.

"We are operating trucks over country roads," wires the Ohio Freight Delivery Co., of Cleveland, "not only as a relief to freight-congested districts, but for the

amount of revenue derived therefrom. Our service spells door-to-door delivery, from the shipper to the consignee—direct service the same day. We have twenty-five 4-ton trucks on order and are also operating 1- and 2-ton equipment at all of our stations, located at Cleveland, Lorain, Elyria, Akron, Norwalk, Sandusky, Toledo and Canton. These are in operation on a regular daily schedule. If the condition of the roads permit we will, no doubt, extend this kind of service throughout the country. The Ohio Freight Delivery Co. has applied itself as the medium between the freight and express.

"Trucks and good highways are evidently the only means of remedying conditions that now prevail, and the public are demanding service, other than freight service."

From Chicago, S. Inlander & Co. report use of trucks, not necessarily to relieve railroad congestion, but in the regular course of the business of hauling wrapping paper between Chicago and points 25 miles distant. No interference with truck service on account of bad roads has been experienced. The company is not handling war orders and has never had to rely solely on railroad transportation.

Daily Trips Between Philadelphia and New York

Replies from New Jersey and Pennsylvania indicate a widespread dependence on motor trucks for freight.

The Stedman Bent Co., Philadelphia, is operating twelve 5-ton trucks daily between Philadelphia, Chester, Wilmington, Baltimore, Bristol, New York, Trenton, Lancaster, Plainfield, Bayonne, Bethlehem, Allentown and intermediate points. This firm, which is doing hauling for war industries, believes that good roads are essential in this time of railroad congestion and will become more necessary when short-haul zones are abolished by the railroads.

For hauling coal between Hite and Glassmere, Penn., the Allegheny Plate Glass Co. is using motor trucks as a relief for railroad congestion. "Our business would be closed down if we had to depend on railroads," says a telegram from this concern.

The R. H. Comey Co., Camden, N. J., has found railroad freight service so uncertain and unsatisfactory that if it were not for motor-truck transportation between New York and Camden, its plant, which manufactures straw hats and dyes large quantities of wool and cotton for army uniforms, would be closed down. While the roads used are reported to be in fairly good condition at the present time, it is believed that the increased traffic which they will have to carry will destroy them unless adequate maintenance work is carried on.

The following telegram has been received from the H. K. Mulford Co., Philadelphia:

"For the past year we have used motor trucks to relieve the railroad congestion, principally between Philadelphia and New York. We find this service more expensive than freight, but it has enabled us to complete Government contracts and forward emergency supplies, such as antitoxins for tetanus and diptheria serum for pneumonia, dysentery, typhoid and vaccine for smallpox needed by our allies and more recently by our own Government. It is necessary that some method of relieving the present railway congestion be practiced and we believe the motor truck is the only means of taking up this shortage at many points. Between Philadelphia and New York the condition of the roads is almost unbearable, causing serious delay in the running schedule and adding material expense for maintenance and repairs. Better highways would not only help to relieve the present transportation difficulties, but would be absolutely necessary as a war defense measure."

Almost Equal Express Rates

The experience of the Beam Fletcher Corporation, Philadelphia, is embodied in the following dispatch:

"We are giving daily motor-truck express service between Philadelphia and New York; also making trips to all parts of nine eastern states by special arrangements as relief for railroad congestion. We are giving 12-hour service between Philadelphia and New York at rates almost equal to railroad express rate. Our present fleet consists of 22 five-ton White trucks, but this number will be increased next week by 10 more of the same kind and size, now in transit. Roads between Trenton and Newark not very good, but the present condition is not interfering with our business. Our customers would be sorely handicapped if they had to rely solely on railroads, as we are hauling such commodities as require much quicker delivery than railroads and express companies can possibly give, such as export shipments, foodstuffs, chemicals, machinery, clothing, munitions.

"Only large fleets of dependable motor trucks, backed up by experienced organizations, can help relieve the railroad congestion. For example, we can move over 400 tons of freight a day between New York and Philadelphia. As soon as we receive delivery of the balance of our fleet of 32 five-ton White trucks we can give faster service between Boston and Washington, D. C., than express companies can.

"New Jersey's new motor-vehicle law, reducing speed of trucks to 10 miles per hour with sealed governor will, if enforced, make it unprofitable for us to continue operations east of Pennsylvania after Jan. 1."

Railroad congestion has forced the A. B. Kirschbaum Co., Philadelphia, to resort to motor-truck haulage for carrying machinery and uniforms for the U. S. Army between Philadelphia and Reading, where one of its large factories is located. The company is also using motor trucks for shipments between Philadelphia and New York for its civilian business, because of congestion and delays by freight and express. The roads used are reported to be in fairly good condition, although no prophecy is made as to how long they will continue to stand up under the greatly increased service. They telegraph: "If we had to rely solely on railroad service at this time it would be most serious for us and the Government."

Both to relieve car shortage and as a matter of economy, the Alfred Struck Co., Louisville, Ky., is using a number of trucks and trailers of various makes. The trucks are used principally for the delivery of silos, weighing from 6000 to 16,000 lb. each. Forty miles is considered the economical truck limit. The company is not doing any hauling for war industries other than its own work of erecting 29 buildings for the Quartermaster Depot at Jeffersonville, where trucks are used to receive material unloaded from cars.

NEWS OF THE WEEK

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

High Bids Made for Channel Widening at Columbus

Lowest Exceeds Estimated Cost by 22 Per Cent.—City Likely to Modify Plans

Service Director Borden on Nov. 13 opened bids for the $1,900,000 river-channel widening work at Columbus, Ohio, which was recently authorized by city and state authorities. Only three bids were received for the work, and all of them were much above the estimate. After a conference with council committeemen, Director Borden said he would reject all the bids received and solicit another bidding on modified plans.

The three bids were as follows: J. B. Sheets & Co., Pittsburgh, for the work, with concrete balustrade, $2,358,859; with stone balustrade, $2,361,379; Robert H. Evans Co., Columbus, with concrete balustrade, $2,600,349.65; with stone balustrade, $2,616,537.50; W. E. Callahan Construction Co., Omaha, with concrete balustrade, $2,248,811.25; with stone balustrade, $2,262,979.50. The lowest bid is approximately 22% above the estimated cost.

Other large contractors were present, but did not bid because of the uncertainty of present conditions and the cost of labor and coal. One company notified Mr. Borden that it is fully equipped to do the work, but that it does not care to submit a bid. This company expressed its willingness to bid on a percentage basis in case the bids were thrown out.

It is proposed to modify the conditions by decreasing the yardage of excavation from the channel and substituting a cheaper material, below the water line, for the concrete revetments at curves in the channel. It is said that the changes would reduce the cost by more than $200,000. It is admitted that the decrease in excavation would lessen the security from flood, but not seriously, it is said. Any change in plans will have to be approved by the council.

Chicago Fruit and Vegetable Terminal Project Dropped

After waiting in vain two years for a permit from the city council to build a fruit and vegetable terminal in Chicago, the Atchison, Topeka & Santa Fe Ry. has withdrawn its application. Although the company is said to have been acquiring the property for 30 years, and has paid more than $4,000,000 therefor, it has apparently abandoned the project as hopeless.

The general plan was described in *Engineering Record* of June 26, 1915.

Engineers' Part in the War Will Be Keynote of M. E. Meeting

"The Service of the Engineer to the Public in Times of Crises" will be the keynote sounded at the annual meeting of the American Society of Mechanical Engineers, to be held Dec. 4-7 at its headquarters, 29 West 39th St., New York. On the opening day honorary membership in the society will be conferred upon Maj. Gen. George W. Goethals, and this ceremony will be followed by an address by former President William H. Taft.

At the "Keynote Session," to begin at 10 a.m., Dec. 5, Dr. Ira N. Hollis, president of the society, will deliver an address on "Universal Public Service in Peace and War." He will be followed by Gano Dunn, president of the J. G. White Engineering Corporation, New York, who will speak on "The Engineering Societies in the National Defense"; Dr. Charles S. Howe, president of Case School of Applied Science, "Special Education in Time of War"; C. E. Skinner, Westinghouse Electric and Manufacturing Co., Pittsburgh, "Engineering Research"; William P. Kennedy, consulting engineer, New York, "Motor Transportation"; Maj. L. B. Moody, Ordnance Department, United States Army, "Army Transportation"; Leonard Metcalf, consulting engineer, Boston, "The Solution of the Cantonment Construction Problem"; and others.

At the industrial-safety session, on the same day, two codes will be presented for discussion by the Subcommittee on Protection of Industrial Workers, of safety standards for elevators and woodworking machinery.

Engineer Detachment Needs Draftsmen, Clerks and Stenographers

There is being organized under the direction of Lieut. A. P. Morris, Room 195, office, Chief of Engineers, War Department, Washington, D. C., a depot detachment consisting of draftsmen, stenographers and clerks for service at army headquarters in France. It is expected that the first one hundred men will leave about Dec. 1, the balance following as soon as organized. It is necessary that the men forming the detachment go on a military footing, hence the detachment will be organized as follows:

One hundred and forty draftsmen, topographical, architectural and mechanical, with pay ranging from $96 to $51.20 per month; 180 stenographers and typists, $40.80 to $36.60; 80 clerks, $33; 28 master engineers, senior grade, $96; 32 master engineers junior grade, $84; 28 sergeants, first class, $60; 64 sergeants, $51.20; 60 corporals, $40.80; 52 privates, first class, $36.60; 136 privates, $33.

These men must be experts, and advancement will depend entirely upon the man, within the limits indicated above. Applications should include answers to the questions given below and be accompanied by letter giving in detail experience, also recommendations where possible:

Have you been called by local board? Have you been exempted or claimed exemption? Have you been called by local board to report for service? On what date have you been ordered to report? What is your serial number? What is your order number? What is your local board number?

Address all communications to Lieutenant Morris.

State Highway Officials To Hold Annual Meeting

The American Association of State Highway Officials will hold its annual meeting at the Hotel Jefferson, Richmond, Va., Dec. 4, 5 and 6. The program and discussion are open only to members of the association and those eligible to membership.

President G. P. Coleman, of Virginia, will deliver the opening address, his topic being "Present Conditions Affecting Road Construction and Measures Taken to Meet Them." W. D. Uhler, of Pennsylvania, will discuss conditions in the East; S. E. Bradt will speak for the Central West; W. S. Keller, for the South; and a fourth speaker will deal with the situation as its exists in the Far West.

Car shortage, military roads, the Federal-aid road law and other subjects are scheduled for later meetings, the speakers being Charles D. Upham, of Delaware; Col. William D. Sohier, of Massachusetts; Logan Waller Page, of Washington, D. C.; and T. H. MacDonald.

The last day's sessions, Dec. 6, will be devoted to papers and discussions on practical road-building and maintenance topics. These men will speak: H. Eltinge Breed, of New York; H. G. Shirley, of Maryland; F. F. Rogers, of Michigan; Paul D. Sargent, of Maine; John H. Mullen, of Minnesota; and W. S. Gearhart, of Kansas.

Changes at Fort Leavenworth

The work of the engineer reserve officers was brought to a close at Fort Leavenworth, Kan., the day before Thanksgiving. The Fifth Provisional Battalion of 1200 men arrived at the fort for training Nov. 26.

Harris Succeeds Capps as Manager of Fleet Corporation

Rear Admiral Frederick R. Harris, Chief of the Bureau of Yards and Docks, U. S. Navy, has been detailed as general manager of the Emergency Fleet Corporation, vice Rear Admiral W. L. Capps, Naval Constructor, U. S N., whose resignation was accepted by the President on Nov. 23.

Admiral Capps succeeded Major General Goethals in the position early in the summer and has been working since that time beyond his strength. He asked to be relieved on account of physical disability and this request was acceded to by the President on that ground. It is reported that the position was offered to Homer L. Ferguson, president of the Newport Shipbuilding Co., but that he declined. Chairman Hurley, of the Shipping Board, wrote Secretary Daniels, testifying to the value of Admiral Capps' services and requesting that the Secretary suggest the name of some naval engineer or constructor as his successor.

Admiral Harris is head of the Corps of Civil Engineers of the Navy and as Chief of the Bureau has made an enviable record in prosecuting the enormously enlarged work of the Bureau since the war. He is a graduate of Stevens Institute, class of 1896, and before entering the navy in 1903 had considerable experience in design and construction, mainly in connection with harbor projects. His notable assignments in the service were the naval station work at Guantanamo, Cuba, and the construction of dry dock No. 4 in the Brooklyn Navy Yard.

Admiral Harris will retire from the Bureau of Yards and Docks, but the new chief has not as yet been announced.

Highways Transport Committee Begins Its Work

The newly created Highways Transport Committee of the Council of National Defense, of which Roy D. Chapin, president of the Hudson Motor Car Co., is chairman, has begun work in Washington, with headquarters in the Munsey Building. R. C. Hargreaves, who has been working with the Storage Committee of the Council, has been appointed secretary, and two field agents have been sent out to make a detailed study of traffic congestion at terminals.

"We have established contacts with the various government departments," Mr. Chapin said in Washington the past week to the representative there of *Engineering News-Record*, "and we have been requested to supply certain pieces of information, upon which we are working. No policies have yet been decided upon, nor shall we will be able to announce the personnel of an enlargement of the committee, which has been under consideration, until we find just what work we shall be obliged to do. When we do find out that, we shall select the men best fitted to carry it out."

A statement by the committee is in part as follows:

"Gen. Chauncey Baker, U. S. A., in charge of army transportation, has requested that the committee have the highway from Detroit, Mich., to Newport News, Va., put in the best possible shape for a run soon to be made by a quartermaster motor truck train. This trip will be made as a preliminary investigation as to the feasibility of bringing over the highways of the country after Jan. 1 the thousands of standardized trucks destined for France. The first trip will be made by a regular truck company of thirty trucks with full personnel. The men will encamp each night at whatever spot the train finds itself at the end of the day's run."

The committee, it may be stated, is preparing for the War Department an elaborate system of maps of the United States, showing motor truck routes, short runs, and spots where road building will be necessary to connect up chains of highways.

The Official Bulletin says it is not the purpose of the newly appointed Highways Transport Committee of the Council of National Defense, in urging the great utility of motor trucks for carrying freight short distances, to operate any motor transportation; rather, through a continuous study of present problems, and coöperation with other transportation agencies, to bring into its fullest use the possibilities of the motor truck for carrying of freight over distances where it can prove its economy and helpfulness in the present emergency.

City Managers Hold Annual Meeting at Detroit

Engineers Predominate in Fourth Experience Convention of New Profession

The fourth annual meeting of the City Managers' Association, held at Detroit last week, was chiefly an experience meeting, but a few outside speakers and some committee reports gave it a cast somewhat different from that of the earlier conventions. The City Managers' Association was one of a number of organizations, including the National Municipal League, the Society for Training for Public Service and the Municipal Research Conference, which joined in a "municipal week."

The high mortality rate among city managers was mentioned by Ossian E. Carr, city manager of Niagara Falls, Ont., in his presidential address. The association now has only four of the members it had at the time of its organization, four years ago (but it should be noted that the membership was very small at that time). Some of the 1916-17 losses in city managers, Mr. Carr said, are apparently due to popular dislike of commercial practice applied to public business.

A suggestive committee report on city management as a profession was presented by H. M. Waite, Dayton, Ohio. The commissions of a number of cities have made a city manager profession by going to other cities for their managers. There are now seven managers who have gone from one to another managership. That engineers are recognized as qualified for the position of city managers, Mr. Waite said, is shown by the fact that of the 25 managers registered at the meeting this year about 90% were engineers.

City Managers' Qualifications

Dividing cities into three classes, the following general qualifications for city managers were suggested: Cities under 20,000 population, executive ability and engineering experience; 20,000 to 200,000, executive ability, with engineering experience of less importance; over 200,000, executive ability the prime essential.

Actual experience in the work is the best preparation for a city managership. Attempts at producing a city manager by education are hampered by the fact that executive ability, which is the prime essential, cannot be taught in the schools. So far as the schools are concerned, education had better be inculcated primarily along the line of the natural bent of the candidate, such as engineering, with some general instruction in the whole range of municipal topics.

Formal Papers a Departure

Contrary to the practice at earlier conventions, this year's program contained a few formal papers by men not city managers. A review of paving experience at Ann Arbor, Mich., which, among other things, outlined the rise, the flourishing period and the decline of Dollarway pavement in that city, was read by Manley Osgood, city engineer.

A paper on "City Planning for Small Cities, with Special Reference to Industrial Surveys," was sent by E. P. Goodrich, consulting engineer, New York City. The need for efficiency in the industrial sections of our cities in war times was emphasized. The situation demands a plan and that requires a survey. A small city has an advantage over a large one in that it can profit from the lessons taught by the larger cities and plan aright when the city is in the making.

Will Manager Plan Fit All Cities?

At a joint luncheon conference with the National Municipal League there was an extended discussion of the question: "Will the City Manager Form of Government Fit All Cities—Large Cities—Machine-Controlled Cities?" The consensus of opinion was in the affirmative. In fact, it was even urged that the manager form of government was in some respects better suited to large cities than small, because the manager of the large city might be chosen for managerial ability alone and could pick

a staff of specialists, while the manager of a small city must combine in one person some knowledge of many specialties. A machine-run city, it was also urged, would be better run under the manager than the old plan. The negative side of the question was taken by George B. Harris, chairman of a political county committee, who contrasted the present governments of Cleveland and Dayton, with the intention of proving that Dayton had nonrepresentative and Cleveland representative government. The bulk of the voters, nearly all the "toilers," do not want efficient or business government, he maintained, because they think such government is not conducted in their interest but for the benefit of other classes.

In another connection, Gaylord C. Cummin spoke against administrative boards. If there is something to be done, he said, hold one man responsible for doing it.

Economy Not Enough

"Now That We Have the City Manager Plan, What Are We Going To Do With It?" the title of a paper by R. S. Childs, secretary, Short Ballot Association, sounded the keynote of the whole meeting, viz., that economy and efficiency are not enough to insure success in city administration. Mr. Waite said the very newness of the plan had carried them along so far, but would do so no longer. It now depends on the city manager. He must accomplish more and discover new ways of getting closer to the needs of the citizens, but none of these things can be done nor should be attempted until the idea has been "sold" to the public. Much use was made of this word "sell." Mr. Waite explained that it was necessary to impress on the public continually that a proposition was being "sold" to them, but at a fair price. If the public wants two ash collections a week, sell it to them only after they are fully aware of the cost.

Democratic government, Mr. Waite explained, does not require a large council or commission but a small workable one, representing a true cross-section of the voters.

The tendency of managers to be official and cold must be overcome. They must travel along common-sense, human lines. "Do not preach too much about the money saved, but spend it on something else the people want," was Mr. Waite's advice.

The Winning of Publicity

Publicity is becoming a harder problem, for the dailies in small towns are being consolidated, as in Michigan having been reduced one-half in number since the war began. Whether the opposition paper or the one friendly to the administration was left proved almost equally bad for the city manager.

Many cities, said H. M. Waite, are spending large amounts to survey and investigate every kind of activity except the public utilities. Antagonisms arise from lack of service; funds are not available to the utility to make the needed expansions; securities shrink, and the service sinks still lower. Dayton employed an expert to discover where the utilities were headed. Mr. Waite urged every manager to protect the financial basis of the property, avoiding duplication, and to protect the investment already made if adequate service is to be obtained.

G. O. Nagle, Wheeling, W. Va., feels that the local transportation utilities have been going backward for five years and are fast getting into the same financial position as the railroads. He attributes some of the trouble to the increasing powers of state commissions supplanting home rule.

Five Towns Want Managers

Sault Ste. Marie, Mich., Santa Barbara, Calif., Albuquerque, N. M., Xenia, O., and Altoona, Penn., are looking for managers, it was announced.

Circulation of a mimeographed paper among the managers once a month is to be a feature used to get new members for the Association.

The officers elected for the ensuing year are as follows: President, Gaylord C. Cummin; vice-president, C. A. Bingham; secretary-treasurer, H. G. Otis, Beaufort, South Carolina.

Cantonment Builders Pay a Tribute to Major Myers

To indicate their appreciation of the way the army cantonment construction at Camp Upton, Yaphank, N. Y., was handled, members of the engineering, contracting and accounting organizations connected with the work, to the number of several hundred, gave a dinner Nov. 24 at the Harvard Club, New York City, to Maj. O'Kelly Myers, U. S. R., constructing quartermaster. Louis J. Horowitz, president of the Thompson-Starrett Co., the contractors for Camp Upton, acted as toastmaster, and among the engineers who spoke were J. Waldo Smith, chief engineer of the New York Board of Water Supply, James B. Lippincott, consulting engineer and formerly assistant chief engineer of the Los Angeles aqueduct; Robert Ridgway, engineer of subway construction, Public Service Commission, and James F. Sanborn, acting department engineer on the city aqueduct of the Board of Water Supply, who assisted Major Myers in organizing the engineering staff of Camp Upton. At the termination of the dinner Donald W. Howes, engineer of the construction at the camp and principal assistant to the constructing quartermaster, presented to Maj. Myers, on behalf of his associates, a silver service. Major Myers, in the closing address, paid high tribute to the members of his staff and to the contractors.

The committee which arranged the dinner consisted of A. V. Dillon, for the auditor's staff; W. S. Timmis, for the consulting engineers; W. M. Affelder, for the Thompson-Starrett Co., and M. M. Farley, for the engineers of construction.

Joint Committee Unable to Solve West Side Problem

Failure to effect a settlement of the West Side freight problem in New York City is acknowledged by the joint committee of the city's Board of Estimate and the State Public Service Commission, First District, in a statement issued last week by Charles S. Hervey, of the commission. The time allotted to the joint board expires Dec. 1, and the committee has found the New York Central R.R. unwilling to consider any proposal departing from the tentative agreement of 1916. The committee, on the other hand, will not approve that agreement, as it believes such action would permanently establish the company's right to its occupancy of the city streets.

The committee contends that the company has no rights that are not revocable. It has asked the Board of Estimate to repeal the ordinance of 1847 and subsequent ordinances, on which, it holds, the company depends for its continued occupancy of the streets. The committee sought this to give the Public Service Commission a free hand when it takes sole jurisdiction Dec. 1. The board, however, has declined to do more than refer the matter to the corporation counsel for an opinion.

The company and those city officials who backed the tentative agreement of 1916 base their attitude on what they regard as the irrevocable rights of the company, definitely upheld by the courts.

Expect Heavy Motor Truck Traffic in Pennsylvania This Winter

The automobile division of the Pennsylvania State Highway Department already has received more than 5100 applications for 1918 motor vehicle registrations and licenses, the moneys therefrom totaling $40,835. In view of the anticipated all-winter transportation over the main state highways by big motor trucks, all corporations, manufacturers, department stores and other organizations using many trucks and automobiles are especially urged to present soon their applications for 1918 license plates.

Government in Need of Cement Testers and Inspectors

The purchase of enormous quantities of cement by the Government in the present emergency has created an urgent need for experienced cement testers and inspectors in the testing laboratories of the Bureau of Standards. The Civil Service Commission has therefore announced a registration of eligibles for appointment to these positions at salaries of $900 to $1000. Qualified applicants are requested to communicate at once with the Civil Service Commission, Washington, D. C., for detailed information.

Cameron Septic Tank Case Again in Court

To assist in the defense of the suit which the Cameron Septic Tank Co. has brought against the City of Shelbyville, Ky., for alleged infringements of the Cameron septic tank patents, Clyde Potts, civil and sanitary engineer, of New York City, has been engaged by Wallace R. Lane, attorney, of Chicago, who is handling the case for the city. Mr. Lane also represented Knoxville, Iowa, in the Cameron patent litigation. That case was carried to the Supreme Court of the United States and the court held in that suit that the Cameron patents expired with the English patents in 1909, and that the treaty of Brussels did not extend the life of the patents to the full 17 years, as the Cameron company asserts.

Tennessee River Bridge Opened

The Market Street Bridge across the Tennessee River at Chattanooga, Tenn., was formally opened on Nov. 17. The formal opening exercises were conducted under the direction of the Chattanooga Auto Club.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

AMERICAN SOCIETY OF CIVIL ENGINEERS, 29 West 39th St., New York; Jan 16 and 17, 1918, New York; Charles Warren Hunt, secretary.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS; 29 West 39th St., New York; Dec. 4-7, New York; Calvin W. Rice, secretary.

GENERAL CONTRACTORS' ASSOCIATION; 51 Chambers St., New York; Dec. 8, New York; C. A. Crane, secretary.

AMERICAN INSTITUTE OF CONSULTING ENGINEERS, 35 Nassau St., New York; Jan. 14, New York; F. A. Molitor, secretary.

NEW ENGLAND WATER-WORKS ASSOCIATION; 715 Tremont Temple, Boston; Jan. 9, Boston; Willard Kent, secretary.

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS; Richmond, Va.; Dec. 4-6, Richmond, Va.; Joseph Hyde Pratt, secretary, Chapel Hill, North Carolina.

AMERICAN WOOD PRESERVERS' ASSOCIATION; Baltimore, Md.; Jan. 22-24, Chicago; F. I. Angier, Baltimore & Ohio R.R., Mount Royal Station, Baltimore, Md., secretary.

CANADIAN SOCIETY OF CIVIL ENGINEERS; Montreal; Jan. 8, Montreal; Fraser S. Keith, 176 Mansfield St., Montreal, Can., secretary.

AMERICAN SOCIETY OF AGRICULTURAL ENGINEERS; Dec. 27-29, Chicago; C. K. Shedd, Ames, Ia., secretary.

The Brooklyn Engineers' Club held an informal meeting on Nov. 22, at which several speakers gave talks on "War Technical Work by Engineers," illustrated by lantern slides. The principal speakers were John A. Bogart, consulting engineer, who described his design for a nonsinkable ship with hydro-aëroplane accommodations; William T. Donnelly, consulting engineer, who explained his designs for a torpedo-proof steel ship and his economical design for wooden ships; Howard T. Quick, consulting engineer, who explained his ideas for combating submarines by means of a concealment device for ships and also devices for detecting moving periscopes and torpedoes.

The Municipal Engineers of the City of New York, at a meeting held Nov. 28, listened to a paper on "Smoke, Its Cause, Effect and Remedy," presented by Joseph M. Lonergan, assistant director, Sanitary Bureau, Department of Health, New York City. The paper was illustrated with lantern slides.

The Oregon Society of Engineers met at Portland, Nov. 15, and was addressed by A. L. Barbour, commissioner of public works, Portland, on "The Needs for a Complete Cost-Keeping System in City Departments."

At a meeting of the **Canadian Society of Civil Engineers**, Nov. 22, Lieut. Col. C. N. Monsarrat, chairman of the Quebec Bridge Commission, delivered a preliminary address, illustrated by slides and motion pictures, on the Quebec bridge. This was the first of a series on this subject to be presented to the society.

At the group meeting of the **Rochester, N. Y., Engineering Society**, Nov. 16, the subject for discussion was "Contracts." The discussion was led by John F. Ancona, consulting engineer.

The Idaho Society of Engineers met in Lewiston, Nov. 12-13. Dr. C. N. Little, dean of the College of Engineering, Idaho State University, presided. R. N. Bell, state mine inspector, spoke on "The Contribution of Idaho's Mines to the Support of the War"; Dean Francis A. Thompson, of the School of Mines, presented the subject "Common Sense in Mining"; S. E. Vance, of the state engineer's office, spoke on "The State Management of the Distribution of Water." Other speakers were R. A. Foster, president of the Lewiston-Clarkston Improvement Co., and R. H. Mann, engineer for the Lewiston Orchards Company.

At the annual dinner of the **Harvard Engineering Society of New York**, to be served at the Harvard Club, Dec. 6, the guest of honor will be President Ira N. Hollis, of Worcester Polytechnic Institute. Other speakers will tell of war conditions "over there."

The Kansas City Chapter of the American Society of Heating and Ventilating Engineers, organized in January, holds monthly meetings. The chapter has about 40 members. The officers are: F. A. De Boos, president; John H. Kitchen, secretary, 311 New England Life Building, Kansas City, Missouri.

The Engineers' Club of Seattle, at a special meeting Nov. 13, entertained William C. Edes, chairman of the Alaska Engineering Commission. Mr. Edes spoke on "The Present Status of the Government Railway Project in Alaska," saying that before the end of next season the first regular train service over the coast end of the railroad will be established.

PERSONAL NOTES

PROF. J. MADISON PORTER, after 28 years as head of the department of civil engineering at Lafayette College, has given up his teaching work to devote himself to his interests in other lines. He is succeeded by PROF. A. H. FULLER, heretofore dean of the engineering school of the University of the States of Washington.

BRIG. GEN. FREDERIC V. ABBOT has been assigned to duty as brigadier general, Corps of Engineers, National Army, principal assistant to the chief of engineers, United States Army, especially charged with the organization, training and replacement of engineer troops for foreign service in the present war. He has also been placed in command of the garrisoned Engineer Post at Washington Barracks and of its subposts, Fort Foote and Belvoir, on the Potomac, and also in charge of the cantonment at American University, City of Washington, where considerable forces of special engineer troops for service abroad are being organized and trained. General Abbot was formerly on duty in New York as division engineer of the Northeast division, as department engineer of the Eastern Department and as district engineer of the Second New York district, having charge of the Ambrose channel, the Red Hook channel, the Bay Ridge channel and the river and harbor works on Long Island; and also of the construction, preservation and repair of fortifications in New York harbor, and was on the board designing the land defense of New York City against attack by invading troops. While engaged on these duties he acted also as examining officer for commissioning some 775 candidates for commission in the Engineer Officers' Reserve Corps for service in France during the present war.

GUSTAVE R. TOBIA, consulting engineer, New York City, formerly chief engineer of the Panama R.R. Co. and lecturer in engineering at Columbia University, has been commissioned as major in the Engineer Officers' Reserve Corps.

J. H. [illegible], formerly assistant engineer on the Galveston, Harris-

burg & San Antonio Ry., in charge of location and construction of the Ft. Bliss spur, is now with the United States Reclamation Service, Rio Grande project, and engaged in locating a new main canal and lateral system.

GURDON G. BLACK, formerly engineer-in-charge of the supply and purifying section, St. Louis Department of Public Utilities, Water Division, has received a commission as captain in the Engineers' Corps, U. S. A., and is now acting adjutant, 314th Engineers, Camp Funston, Kansas.

JOHN C. PRITCHARD, principal assistant engineer, supply and purifying section, St. Louis Department of Public Utilities, Water Division, is now a first lieutenant in the 26th Engineers, at Camp Dix, N. J.

BRYANT WINSTON, formerly of the power plant section of the Department of Public Utilities, St. Louis, has received a commission as first lieutenant in the Engineers' Corps, United States Army.

R. W. GEARHART has resigned as county engineer of Buchanan County, Iowa, and is now county engineer of Linn County.

H. LESTER NEWHALL, formerly assistant engineer with the Public Service Commission, New York City, is now principal assistant to the chief engineer of Akron, Ohio, water-works.

A. H. GIBBS, of Ilwaco, Wash., has been appointed town engineer.

J. E. NELSON, engineer for the State Highway Department, Oregon, who has been in charge of paving work in Clatsop County, has gone to Wolf Creek, on state work.

ALBERT O. TRUE, sanitary engineer, New York State Department of Architecture, has received a captain's commission in the Engineer Officers' Reserve Corps.

GEORGE D. WHITTLE, highway bridge engineer with the Federal Office of Public Roads and Rural Engineering, has been transferred from Washington to the district office at San Francisco, and will handle the highway bridge work arising in the Western states under the Federal Aid Road Act.

ALLEN F. BREWER, formerly mechanical engineering inspector attached to the Valuation Department, Public Utilities Commission of New Jersey, is now with the American International Shipbuilding Corporation, at its Philadelphia plant.

EDWIN G. PIERCE, consulting chemist for the Republic Motor Truck Co., Alma, Mich., has completed the equipment of a branch chemical and testing laboratory at Alma, which is in charge of C. S. Morgan, of the University of Wisconsin.

MAJ. R. G. THOMAS, Charleston, S. C., has been elected chairman by the State Highway Commission.

S. F. SHAW has been appointed chief engineer of the International Railways of Central America, with office at Guatemala City, Guatemala. He succeeds E. H. STEWART, resigned. Mr. Shaw will have charge of engineering additions and betterments and right of way in Guatemala.

C. R. CHANDLER, assistant engineer of the International Railways of Central America, at Guatemala City, has been appointed engineer of maintenance-of-way.

H. G. LAIRD, superintendent of timber preservation at Gainesville, Fla., has succeeded L. L. SPARROW as engineer of roadway of the Atlantic Coast Line at Jacksonville, Fla. Mr. Sparrow has been appointed office engineer.

GEORGE H. BROWN, division engineer of the Pennsylvania R.R. at Harrisburg, Penn., has been appointed acting principal assistant engineer of the eastern Pennsylvania division, succeeding A. B. CUTHBERT.

FRED OHRT, formerly assistant engineer for the city and county of Honolulu, H. T., has been appointed sanitary engineer to the city Board of Health. He takes the place of S. W. TAY, called into the naval militia service.

E. C. WRIGHT succeeds P. A. BEATTY as division engineer, with office at Wheeling, W. Va., Baltimore & Ohio R.R. Mr. Wright was formerly district bridge inspector, Maryland district.

J. B. MARCELLUS, recently division engineer, Portland Cement Association, Kansas City, Mo., has been appointed state drainage and irrigation engineer of Kansas, with office at Manhattan. He is a graduate of Kansas State University Engineering School, and his work will be done in connection with the extension division of the State Agricultural College.

N. M. STINEMAN, formerly chief engineer for the LaSalle Engineering Co., Chicago, is now a captain in the Engineer Officers' Reserve Corps, and is at the second officers' training camp, at Ft. Leavenworth, Kansas.

S. L. RICE, who was with the Pennsylvania R.R. at Baltimore, is now in the construction division, U. S. Army, engaged in building aviation camps. He is stationed at Dayton, Ohio.

OSCAR P. LAUBSCHER, formerly with George B. Post & Sons, New York, and D. H. Burnham & Co., Chicago, is now with the Federal Bridge and Structural Co., Waukesha, Wis., and engaged at Savannah, Ga., in the preparation of plans and shop details for ship construction.

L. M. RUSSELL, city engineer of Elkhart, Ind., resigns this position Dec. 1 to become associated with ARTHUR J. SWEET, consulting engineer, Milwaukee.

O. S. MAPLE, formerly with the Fargo Engineering Co., Jackson, Mich., and the Texas Power & Light Co., Dallas, Tex., is now a purchasing assistant in the purchasing division of the Emergency Fleet Corporation, Washington, D. C.

CAPT. ALEXANDER MACOMBER, of the Engineer Reserve Corps, in addition to his other duties has been assigned to the command of the Provisional Anti-Aircraft Searchlight Detachment, and has been ordered to Washington Barracks.

LIEUT.-COL. JAMES G. STEESE, Corps of Engineers, U. S. Army, has been relieved from duty at the engineer officers' training camp, Ft. Leavenworth, Kan., and from assignment to the 7th U. S. Engineers, and has been appointed assistant to the chief of engineers, Washington, D. C. Lieut.-Col. Steese has served two tours of duty on the construction of the Panama Canal and Panama Railroad, and was recently Assistant Professor of Engineering at the United States Military Academy.

CAPT. R. R. JONES, chief assistant engineer of Cincinnati, District No. 1, Corps of Engineers, was installed Nov. 12 as officer in charge of the district, relieving COL. LANSING H. BEACH, U. S. division engineer.

CHARLES J. POPELKA, formerly assistant city engineer of Beloit, Wis., is now a second lieutenant in the Engineer Officers' Reserve Corps, and is at the Ft. Leavenworth, Kan., training camp.

JAMES G. COONEY, who was a resident engineer with the Illinois State Highway Department, has become connected with the valuation department of the Interstate Commerce Commission at Chicago.

FREDERICK B. JUDGE, formerly engineer for the American Phosphate Mining Co., Tiger Bay, Fla., is now a first lieutenant at Camp American University, Washington, D. C., in the 20th (Forestry) Engineers.

WILSON FITCH SMITH was recently appointed by the United States Shipping Board, Emergency Fleet Corporation, resident engineer in the Division of Shipyard Plants. He is stationed with the Merchants' Shipbuilding Corporation at Philadelphia, Penn., which has a contract for building a shipyard at Bristol, Penn., in which it will construct 40 fabricated steel cargo

ships of 9000 tons dead weight each. For the past 11 years Mr. Smith was with the Board of Water-Supply, City of New York, as division engineer in charge of the construction of the Kensico Dam, Kensico Reservoir and adjacent portion of the Catskill aqueduct.

JEROME NEWMAN, consulting engineer, San Francisco, has removed his office from the Newhall Bldg. to the Alaska Commercial Building.

L. C. ALDEN, class of 1909, Rensselaer Polytechnic Institute, who received the French military cross of war for bravery in the ambulance service, has joined the Engineer Corps, U. S. Army, in France. L. L. JOHNSON, a member of the class of 1907, is now in British Columbia recuperating from the effects of gas and a wound in the hip, received at the taking of Vimy Ridge. He has also received the military cross.

W. G. STROMQUIST, sanitary engineer with the United States Public Health Service, who was until recently in Wyoming making sanitary surveys of towns and mining camps, has been transferred to the Rural Sanitation Division which has its headquarters at St. Louis.

OBITUARY

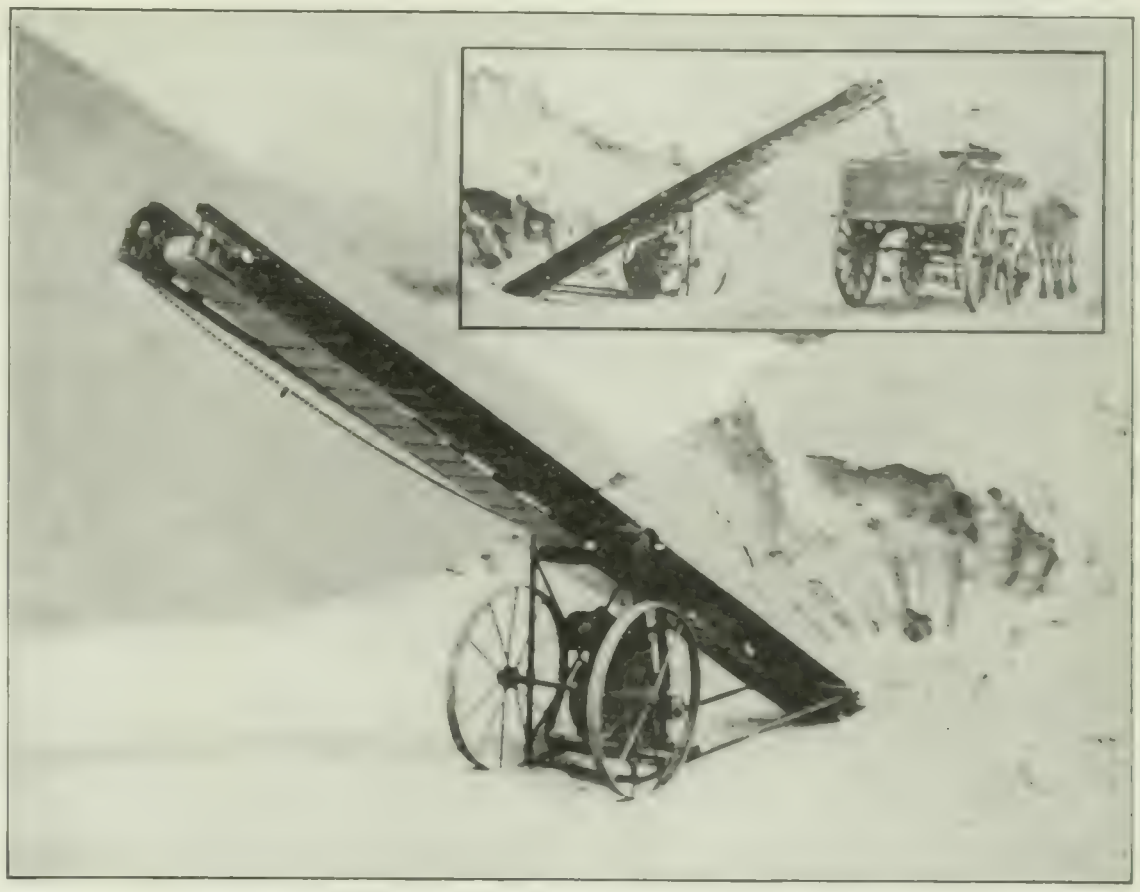
JAMES H. WRIGHT, civil engineer and graduate of Purdue University, died on Nov. 19 at his home at Rockaway Park, N. Y. Mr. Wright, his wife and young daughter were asphyxiated by gas. He was engaged in government construction work at Rockaway Beach for the Stewart Construction Co., New York, with which he was connected nine years. Mr. Wright was formerly in the engineering department of the Illinois Central R.R., and was also employed in highway construction for the New York State Highway Department about nine years ago.

APPLIANCES AND MATERIALS

Portable Conveyor Can Handle Stone and Sand

A new type of portable belt conveyor, known as the Pomaco Scoop Conveyor, has recently been put on the market by the Portable Machinery Co., Inc., of Passaic, N. J., and is the result of fifteen years' experience in the design and manufacture of material-handling equipment. Its makers claim that it will successfully handle coal of all grades, coke, ashes, crushed stone, sand, gravel, sacks, packages and manufactured products.

The name "scoop conveyor" has been given the apparatus because the conveying belt receives its load through a scoop which can be pushed or buried in the material to be handled. This is an exclusive feature of this particular machine and makes it possible for one man and the scoop conveyor to handle materials at the high rate of sometimes 1 ton per 1½ min. The material is raised on a carrying belt, the life of which depends a great deal on the nature of the material handled, though the manufacturers stand ready to guarantee the belt on receipt of specifications of operating conditions. The machines are furnished without power apparatus or with either electric-motor or gasoline-engine drive.

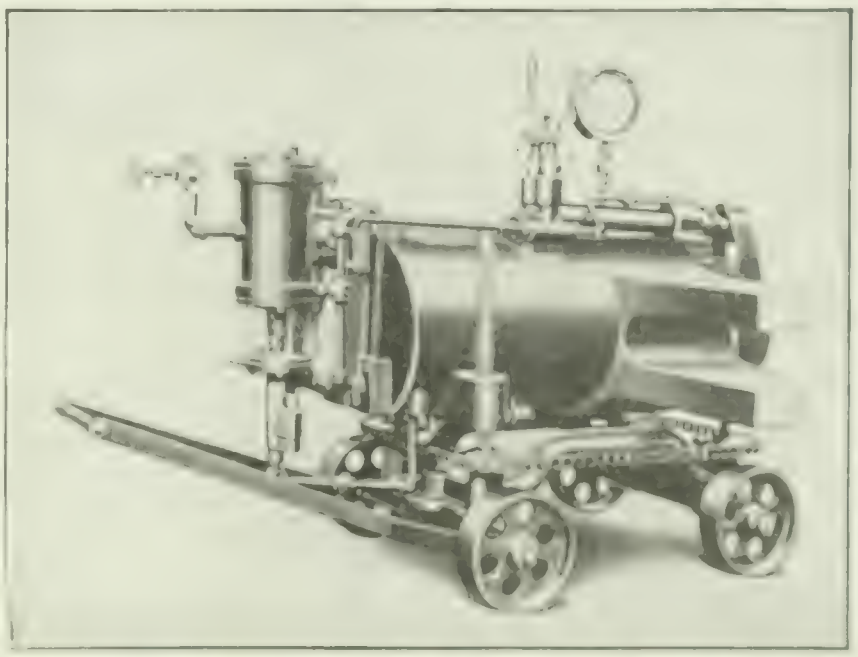


THIS CONVEYOR RECEIVES ITS LOAD THROUGH A SCOOP PUSHED INTO THE MATERIAL

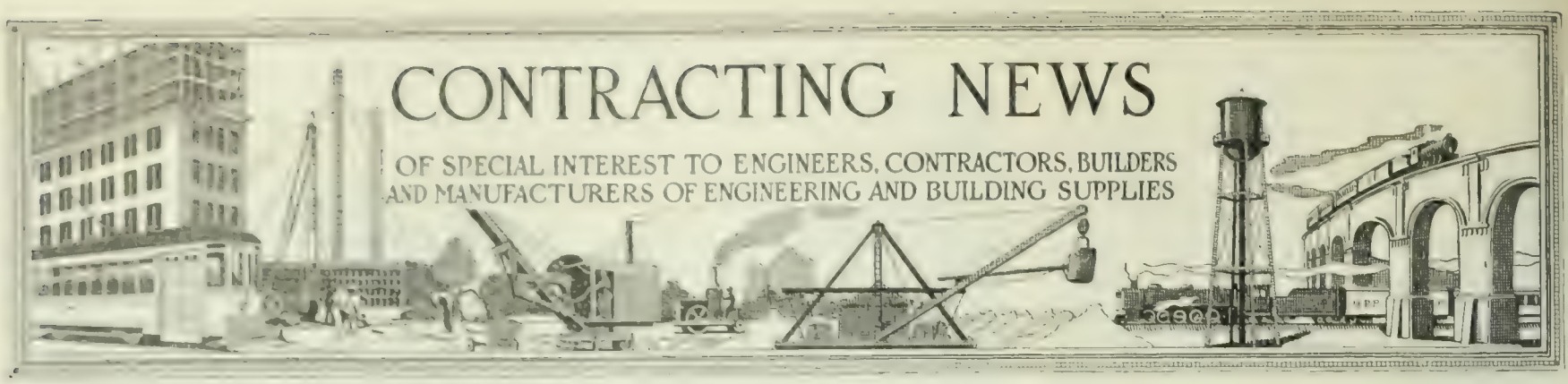
Portable Forcing Press Is Air Driven

A new type of portable press for forcing crankpins into locomotive and engine wheels, or for miscellaneous shop and field forcing work, has recently been put on the market by the Watson-Stillman Co., of New York. The unusual feature of this press is that the hand pump is replaced by one driven by compressed air. This makes the operation quicker and reduces the amount of labor necessary on work of this sort. To make the power connection it is necessary only to run a flexible tube or hose from the shop air-main to the pump engine as is done with pneumatic tools. The operating valves are so placed that the man in charge can actuate the press in addition to directing the work of the men under him. This is a direct elimination of one laborer, and the quicker operation of the air-driven engine speeds the work by approximately 300 per cent.

The press being equipped with a gage which accurately indicates the pressure, it is easy to detect a loose fit by a too easy entry of the pin being forced. This is very important in railroad work and in many other forcing jobs. The body of the press is mounted on screws having their reactions on a flat wheel truck. By turning these screws the center line of the ram can be raised or lowered to meet the center of the work. The ram, after advance, is returned by a small hydraulic cylinder mounted on the top of the press. These presses are built in capacities ranging up to 300 tons.



AIR-DRIVEN FORCING PRESS SAVES LABOR OF ONE MAN



Proposals

For Proposals Advertised See Pages 45 to 49 Inclusive

WATER-WORKS

Bids Close		See Eng. News-Record
[illegible]	[illegible] Minn.	....Nov. 8
Dec. 4.	Laurel, Mont. ..	....Nov. 29
[illegible]	[illegible]	....Nov. 22
	Adv. [illegible]	
Dec. 5.	Jackson, Mich. ..	..Nov. 29
	Adv. Nov. 15	
[illegible]	[illegible]	..Nov. 29
	Adv. [illegible]	

SEWERS

Dec. 5.	Elyria, Ohio ..	....Nov. 29
Dec. 10.	Lake Andes, S. D.	..Nov. 15
[illegible]	[illegible]	..Nov. 15

BRIDGES

Dec. 3.	Akron, O.	....Nov. 22
[illegible]	[illegible]	[illegible]
Dec. 4.	West Palm Beach, Fla.	....Nov. 8
	Adv. Nov. 8 and 29	
[illegible]	[illegible]	Nov. 15
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
	Adv. Nov. 15	
[illegible]	[illegible]	[illegible]

STREETS AND ROADS

[illegible]	[illegible], Ala.	Nov. 15
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	Nov. [illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
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ENGINEERING NEWS-RECORD

A WEEKLY JOURNAL
DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

Volume 79 NEW YORK, THURSDAY, DECEMBER 6, 1917 Number 23

What Is an Unessential?

THERE has been much talk about unessential industries. In fact, the expression will be found frequently in discussions in this journal. It seems reasonably easy to name some industries which can easily be dispensed with. Yet when one hears that certain strong and reasonable representations are being made that the manufacture of jewelry and musical instruments is an essential, one becomes less dogmatic, less sure of his ground. The basis on which it is claimed that jewelry and musical instruments are essentials is that there is a demand for them in foreign countries. If we can, in return for essential goods we are getting from Brazil, the Argentine, and Chili ship products, a favorable trade balance can be maintained. While the citation of this instance indicates how complex are the commercial problems raised by the war, it does not change the fact that some industries must expect curtailment. The big question is the determination of those industries.

The Task Which Confronts America

SPEAKING comparatively, what England has accomplished in the direction of unifying herself for the exhausting effort of war has been simple. A small country geographically, of less than half the population of the United States, possessed of well-developed railroads and manufactures, she has in addition the almost inestimable advantages of a nearly common blood and age-tried traditions. Subordinate to these factors, but of immense practical usefulness, is the almost complete unionization along business lines of her workmen in what are known in England as the "engineering industries." Contrast these conditions with the complex with which we are faced. Every item in the count is reversed to our disadvantage. Yet from this tangle of crossed racial tendencies and interwoven social ideals must be produced that singleness of purpose and unity of action which alone will make our true weight felt in this war being waged that "freedom shall not perish from the earth."

A Problem of Many Factors

IF HIGHWAYS are to be made of maximum service in the present transportation crisis, it will be necessary to meet a great number of problems. Some of these have already been discussed in these columns. A new one is brought up by a statement of the Beam Fletcher Corporation, published on page 1033 of last week's issue. The company says that it will be unprofitable for them to conduct trucking operations east of Pennsylvania after Jan 1 because of New Jersey's new motor vehicle law, reducing the speed of trucks to 10 miles per hour. To construct good roads, to arrange for the proper maintenance of those that can be used in war service, and then to make their use unprofitable by setting a foolishly low maximum speed limit is nothing short of absurd. Nevertheless, this is only one of the many difficult problems which the state highway departments and the Highways Transport Committee will have to meet. If they adopt the right attitude, these organizations, fortunately, will get all the support they need. They can solve the problem of making the highway a valuable adjunct of our transportation system. Courage and an adequate plan are the essentials.

A Momentous Session of Congress

HISTORIANS will have to accord a large place in their annals to the work of the last Congress. Large, however, as were its responsibilities, in some respects the problems that face the coming session are more important. Heavy taxes were levied at the last session, momentous increases authorized in our military and naval establishments, and, in general, the legal authority given to put the country on a war basis. Since those rushing days we have had some time for reflection. Those were the days for action. Necessarily, much was done without provision for the necessary coördination, and gaps are found here and there. This coördination, this readjustment, this filling of gaps, is the work of the new Congress. For example, one of the mighty problems is that of labor. The President intimated in his address to the American Federation of Labor at Buffalo recently that he had a solution or at least some plan in mind. Doubtless it will be put before this Congress. Except the declaration of war itself, it is the biggest piece of business of the year—how shall our labor be redistributed? how compensated? how mobilized and used so that we shall secure the tremendous production upon which the winning of the war is dependent?

Price Fixing Is Progressing

PRICE fixing by the Government for the products of industries essential to the war must soon enter a more comprehensive stage. If, as the Chamber of Commerce of the United States has said, price fixing is intended by the Government to: (1) Enable the Government and public to purchase at prices below the

market; (2) substitute for distribution controlled by prices a distribution based on the requirements of the war; and (3) prevent excessive profits on war contracts, and thus eliminate, among other things, a cause for discontent on the part of labor; then the measures so far adopted evidently have in view the immediate accomplishment only of the first object. It is seen that no basic classification of industries in the order of their necessity or usefulness to the conduct of the war has been attempted, priority orders being issued only on the merits of individual cases, and almost exclusively so far on direct Government work. Such a classification must be made before the second object, distribution by priority, can be obtained. It is plain that with the wide divergence in efficiency of methods and equipment between different units of the same industry some refund in taxes must be collected on war order profits if these, as well as prices, are to be kept low and made uniform. The existing revenue law hardly does this; and the more efficient plants, which produce the larger share of the total in lines where prices have been fixed, are actually making large profits under it. Therefore the accomplishment of the third object has evidently not yet been attempted.

Business men must not judge the success of price fixing yet. The Government has had to experiment and go slowly. For this it cannot be blamed. Moreover, the administration undoubtedly is planning steps for the accomplishment of the last two objects. This journal has shown that price fixing aiming only at the first object is deemed to failure, and the administration has given evidence that it is aware of this fact.

On the other hand, the complexity of the problem must not hold the Government's hand too long, lest disorder and discontent result which may well thwart its efforts. We must have a classification of industry as soon as a practicable one can be arrived at. It need not, and cannot be perfect, but if done as intelligently as the work so far accomplished it will be far better than the lack of classification which now obtains.

States Should Buy Road Materials in Bulk and Store Them for Next Year

CO-OPERATIVE buying of road material for the different counties in Iowa is to be tried next season. As outlined in *Engineering News-Record* of Aug. 30, p. 386, each county is to submit an estimate of its needs to a committee of the Association of County Supervisors which will ascertain all the sources of supply, the prices and the best points to which the materials can be sent for storage until needed. Large purchases will command lower prices, particularly as for shipper and the railroads. Tennessee has had in operation for a year a similar plan, which is even more advantageous for the contractor, because the state buys the materials outright and resells to the counties, while the Iowa committee has no such buying authority. This method or any other which will relieve the contractor from uncertainty as to getting materials will go a long way toward the receipt of reasonable bids, because hereafter a round sum is going to be added for transportation risk. Next summer every kind of traffic facility—motor trucks, freight cars on interurban railways, and barges on waterways—will be in great demand. If there is any late winter lull it should be taken advantage of.

As to the form of contract, every legitimate expedient that highway engineers can think of to get materials on the ground early should be recommended to their commissioners. The flexible partnership contract used so successfully this year in Massachusetts (see *Engineering News-Record,* July 26, page 172) is a laudable attempt to shift upon the state a portion of the risk of the unavoidable contingencies.

For some years past much material has been hauled an abnormal distance when good gravel and stone was obtainable near the work. The quarry nearest the job should have most careful consideration this year. It should be encouraged by being given plenty of time to fill orders. Equipment can then be put in shape and quarry owners can avoid the uncertainty occasioned by rush orders from contractors ready to begin work. Only separation of the materials from the contract makes the stock-pile method feasible, for the contractor can hardly finance the material man and take the chance of possible long time delay being imposed on all work by war exigencies.

In certain localities motor-truck haulage over frozen earth roads will be feasible and less expensive per ton-mile than over the mire of early spring. The middle of January will be none too late to let material contracts. As an example, Cook County, Illinois, authorized a $1,000,000 bond issue Nov. 6, for 48 miles of hard roads. Lake County, to the north, voted Oct. 30 for a $500,000 system. It may be too much to expect that the moneys from these issues will be available before spring, but if at all feasible the contracts for materials should be ready by the middle of winter. When both systems are complete, Chicago and Milwaukee will be interconnected. Much of this joint mileage can be served only by the railroads, but there are other vital parts of the systems in both counties that are within hauling distance of quarries and gravel pits.

No time apparently should be lost in getting the contracts for materials under way. Rulings and recommendations will undoubtedly come from the new Highways Transport Committee, but there is certainty that they will fit in with, rather than impede, the sort of planning here recommended.

Field Extensometer Promotes Safety and Economy

THE prominence recently given to measurements of dead-load stress, as reflected in this column last week, would fail of one important consequence if it did not help to lay further emphasis on service stress exploration. The value of the field extensometer has never received the practical recognition that it merits.

Some engineers have come to know by actual trial that increased safety or distinct economy may often be secured, at negligible expense, by intelligent use of the field extensometer. Measuring stresses in service is capable of revealing localized weaknesses not otherwise detectable; and just as readily can it give reassurance of ample safety in cases where calculation may lead to suspicion. A case in point was reported only a few weeks

ago (*Engineering News-Record* of Nov. 8, 1917, p. 883). The extensometer was applied to an old bridge whose margin of safety was in doubt, and it showed not only that the structure as a whole possesses a considerable margin of strength over the tax of modern loading, but also pointed out a serious local weakness which, once known, was easily remedied. Thus the instrument materially prolonged the life of an important bridge—and that, too, at a time when our national emergency gives multiplied value to every slight gain in service or durability. This single case carries a lesson well worth note.

There is nothing new in measuring live-load stresses by the strain gage; the knowledge of how to carry on such investigations goes back a generation or more. Yet, unfortunately, but little use has been made of it. Only few scattering instances of work like that mentioned above can be found in the literature of recent years. They would be supplemented by many others if the field extensometer became a tool of routine use by bridge engineers. Nothing but unfamiliarity with the instrument and failure to appreciate its possibilities is to be blamed.

Another case from actual practice may illuminate the subject further: An official bridge inspector recently came to feel that merely looking at a bridge did not tell him as much as he ought to know concerning its condition, and he began to carry a strain gage on his inspection trips—which he has since made a regular practice. In going over steel highway bridges he has found that most of them show unsatisfactory conditions in the hip hangers. The common four-angle hanger in many instances shows compression in its outer angles when load comes on the end panels; the inner angles show tension, but a greatly excessive tension. The explanation is ready to hand, of course, being found in eccentricity and floorbeam bending; but the important point is that we ordinarily shut our eyes entirely to such stress actions.

There is little chance to doubt that the safety of bridges in this particular inspector's bailiwick has been increased decidedly by his field extensometer measurements. Existing and future structures will share in the gain, through closer watch being kept on the weak hangers of existing bridges, and through improvement in design of new ones. Similar gain could be realized elsewhere by adopting the same means.

It is correct to speak of live-load stress calculations as being so accurate that verification by test may be dispensed with. But the statement confessedly leaves out of account not only all impact and secondary stresses but also various main stresses—those in stringers, laterals and the like. Viewing a bridge as a whole, the calculations fall short of answering all questions of importance, especially with respect to old bridges. The strain gage rounds out this incomplete knowledge.

The advantages to be secured through wider use of the strain gage in field inspection increase steadily as the demand for maximum safety and economy in our fixed structures becomes more urgent. Most emphatically does the present period, when economy is vital, direct attention to the opportunities which the instrument offers.

Priority Vs. Interfering with Ourselves

THE Government need not hesitate to go the limit in matters of priority. Indeed, the interests of the entire public, of investor and soldier, of manufacturer and workman, of business man and clerk, require it. A period of experimenting with the application of priority orders was doubtless essential to the understanding of the subject, to the intelligent application of the priority principle. This period, however, should now be drawing to a close. The indefinite pursuit of the practice of granting priority only on specific orders, or of lopping off from time to time in an inconsequential way some new unessential industry would not conform to the true principles of priority. Such practices would, in time, merely result in interference with ourselves in the main business of winning the war.

On the present, merely experimental, basis, some contractor finds its naval construction delayed for want of a few tons of special plates and shapes. A request for a priority order by the Navy Department is immediately granted. Then some big steel plant, working on dozens of munitions orders and ship schedules for ourselves and for our allies upsets the operation of two or three mills for a day or more to roll the special material mentioned in the priority order. This journal is informed that such cases not only occur under the present system, but that they are typical of its operation. Production of war necessities has been appreciably curtailed by such practices. Indeed, it is already demonstrated that in using such methods we are actually interfering with ourselves.

There need be no further hesitancy on the part of the administration in going to any length in its priority orders. The steel companies can be told that everything that goes into such and such schedules for merchant ships must be delivered to such and such builders, ahead of other business, that such and such shell rounds must be in the hands of such and such machine shops before similar steel is furnished anyone else; that material for certain war vessels must be turned out regardless of other work.

Let us issue priority orders in terms of ship schedules, munitions schedules, port-improvement schedules, and the like, instead of by the ton! In this way the equally vital schedules in the steel mills can be worked out to secure full-time production—a thing impossible under the present piecemeal, experimental system.

Full priority, which consists of giving an industry total requirements and full information as to time and place of delivery, with the stipulation that the order must be met regardless of other business, will also obviate difficulties that give rise to such child's talk as the proposition to take over and operate the oil industry, where the direct Government consumption, even according to the wildest estimates, will hardly reach three per cent. of the total output.

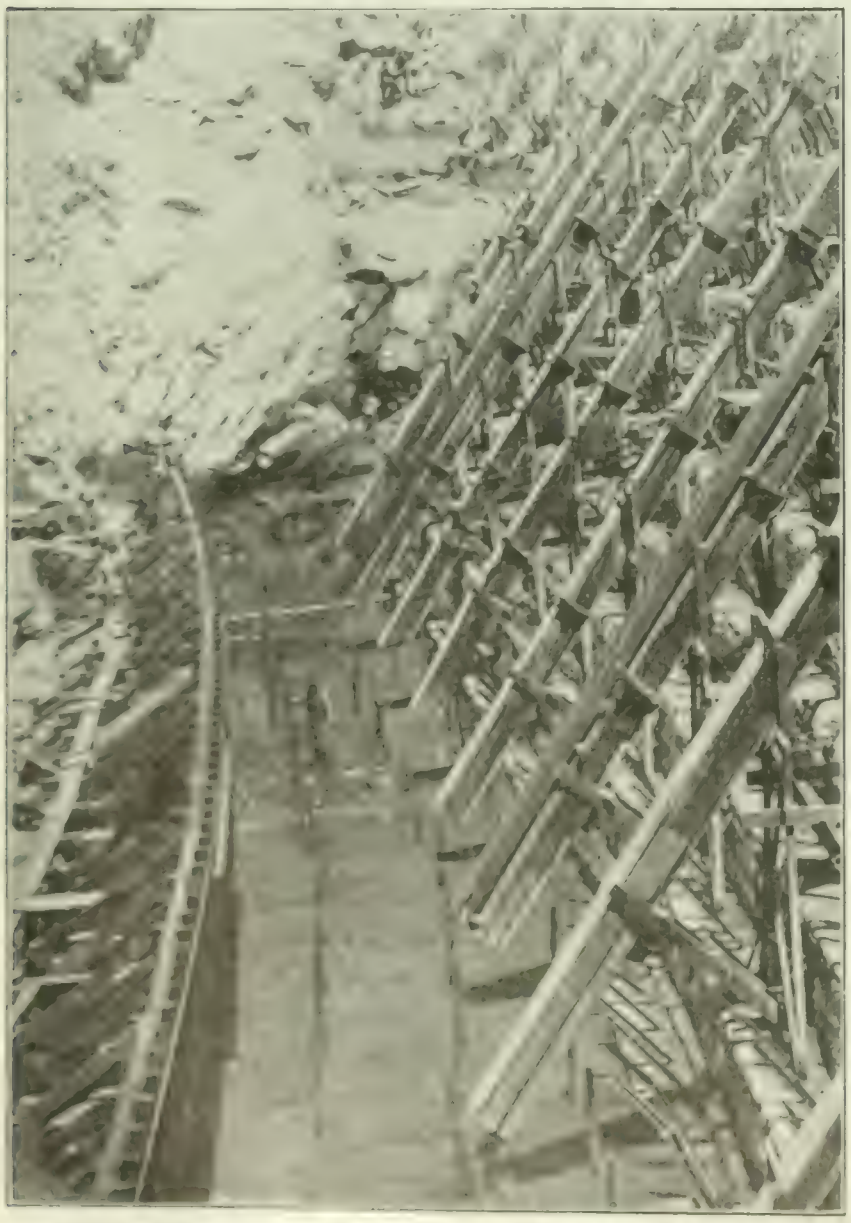
We should have done with half-way measures in this matter. The country will support the most rigid exercise of priority, applied on an inclusive basis. It cannot but chafe and continue to do less than its best if the present and now outgrown methods are persisted in.

How Construction Was Speeded Up by Doing Three Jobs at One Time

In Increasing the Height of Three Dams on Huntington Lake a Flexible System Was Used to Permit Concentration of Labor at Critical Points on the Work

THE Big Creek hydro-electric development of the Southern California Edison Co., the first part of which was completed by the Stone & Webster Construction Co. for the Pacific Light and Power Co. in 1912, stores water in Huntington Lake at an elevation of approximately 7000 ft. From this reservoir a penstock line supplies Power House 1 under a head of 2150 ft., and below this the water is again used in plant No. 2 under a head of 1900 ft. The energy which these plants generate is transmitted at 150,000 volts to Los Angeles, 242 miles away. A description of the general scheme of development appeared in the *Engineering Record* of Sept. 14, 1912, p. 286.

When the plants were put in service in 1913 it was intended to increase the height of the three dams 30 ft., at some later time, to add 40,000 acre-feet to the storage capacity of the reservoir. The decision to make these additions at once was reached in the fall of 1916, and it was decided that every effort would be made to finish the work during the open season of 1917. Authority to begin construction was received Apr. 20, 1917, and by May 1 crews were at work in 6 ft. of snow.



BOTTOMS OF [illegible]-FOOT CHUTES ON DAM 3—NOTE HAND BONDS

When the original construction was completed some of the equipment was retained, and this was quickly made available for use in making the additions. However, in order to pour the average of 1000 cu.yd. of concrete per day, which would be required in order to get in the total of 135,000 cu.yd. on schedule time, careful attention was given to the layout and arrangement of equipment. Considerable new equipment was purchased and a complete rearrangement of plants was effected wherever it was found that this would expedite the work.

Speed being the first consideration, electric drive was used wherever possible, and individual motors were provided in most cases to reduce the trouble and delay attendant upon moving parts. About 40 electric motors are in use on the job, ranging in size from 40 to 200 hp. A total of about 3000 hp. in electrical equipment is used during the full operation of the work.

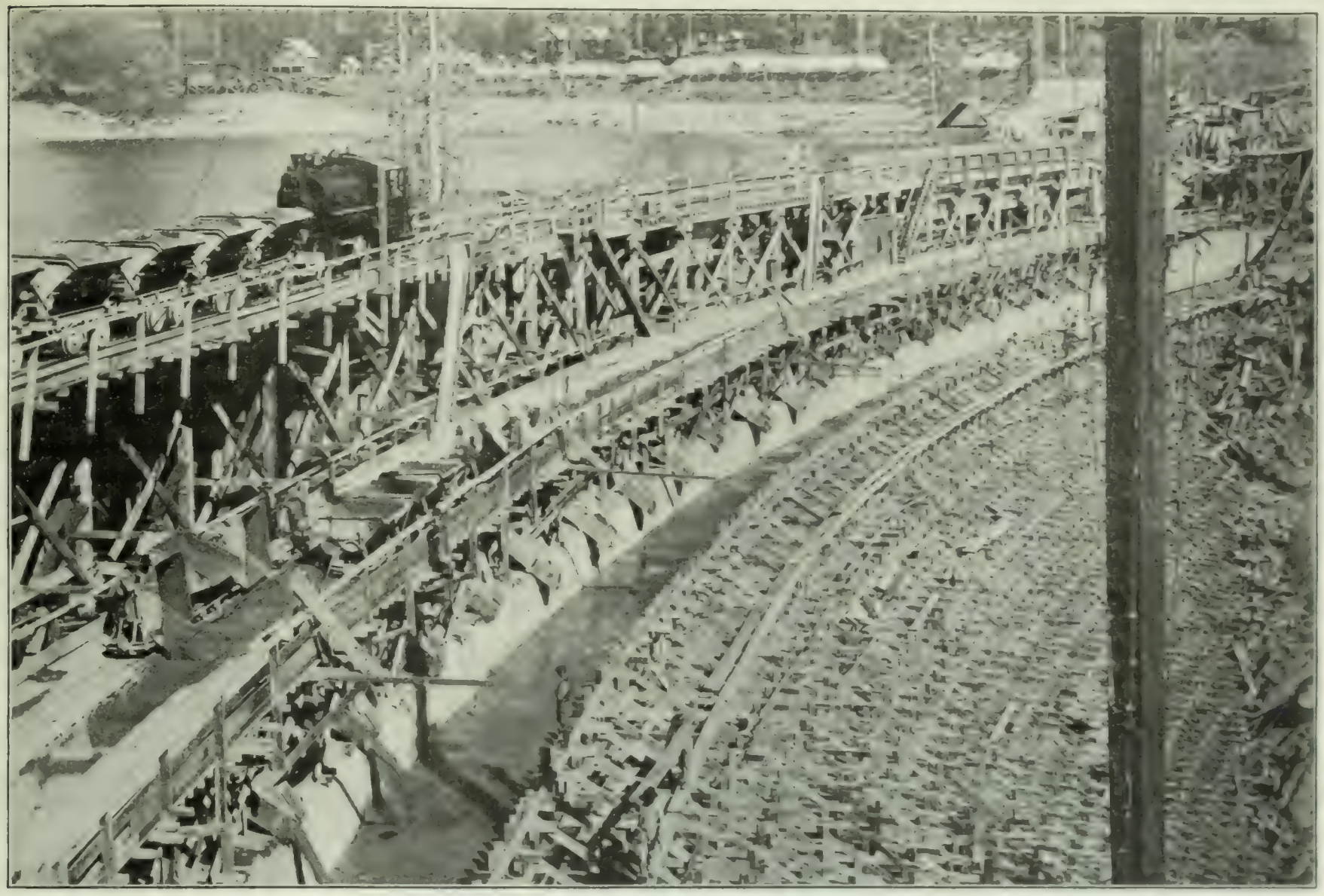
Standard-gage railroad tracks connect all three dams, and sand and gravel is handled in nothing smaller than 6-yd. dump cars, whether on main line or inclines. Cement is delivered direct to platforms from standard railway flat cars which have been brought up an incline from the railroad terminal 2000 ft. below. The location of the quarry, rock crusher and gravel washer, shown in the accompanying sketch, was chosen to afford the most direct delivery of material.

The work on each dam is laid out for two mixers, so two 24-in. gage concrete delivery tracks were put in on each dam. Thus trains from either end could deliver to any point on the dam independent of operations on the other track. By putting these tracks about 3 ft. apart and building between them a continuous line of hoppers, it is only necessary to run the cars to approximately the desired point and dump hastily.

The hoppers are 4 ft. long and the discharge from two hoppers is led into a single chute. When the work started the chutes on Dam 3 were 120 ft. long. Sections were sawed off as the work advanced until the top course was poured with only the short spouts leading from the hoppers. With this plan no time was lost in shifting chutes, and with the chutes only 16 ft. apart concrete was always delivered close enough to its ultimate destination.

The same system of continuous hoppers is in use on all three dams. However, different delivery levels are used on each dam, the concrete being poured up to the elevation of the top of the original dams and then a new trestle is built above this at the elevation of the new top of the dams.

It was most convenient to concentrate first on Dam 3 and two mixers were accordingly installed here. The first concrete was poured on June 5. In the meantime, work preparatory to the addition to be put on Dam 2 was undertaken and whenever the labor force was larger than needed on Dams 3 and 2, work was done on Dam



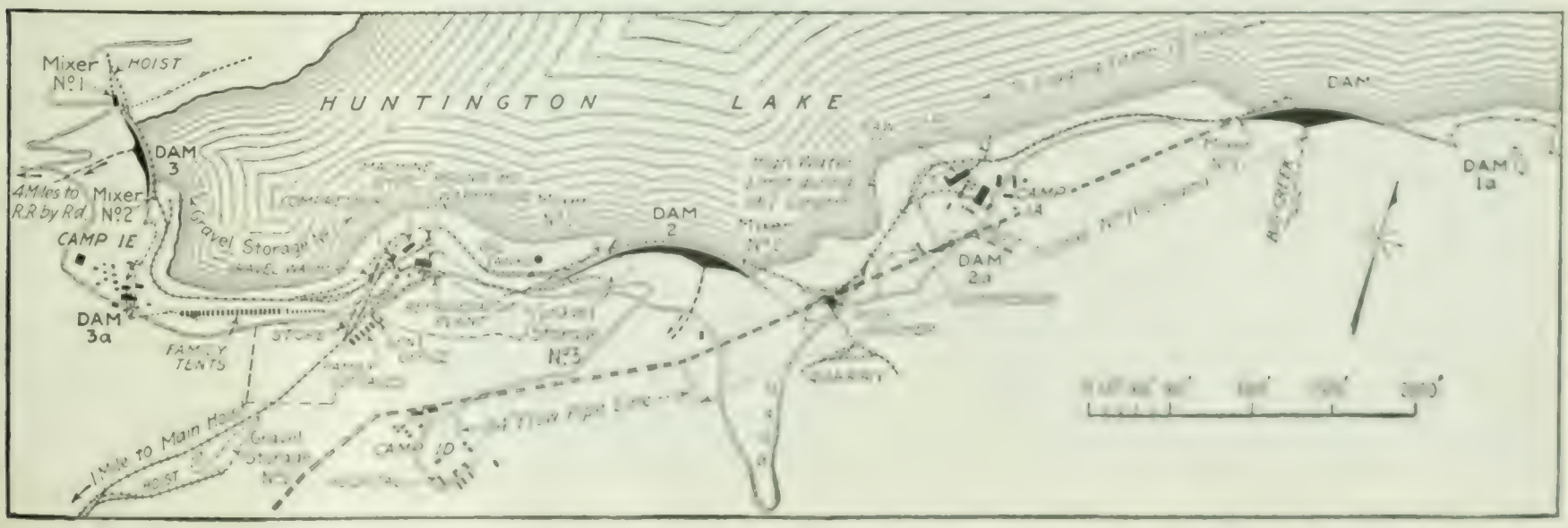
POURING ON DAM 3, LOOKING SOUTH, NEAR FINISH OF WORK

1. Under this system the work on Dam 3 was always kept ahead of that on Dam 2, which in its turn is further along than Dam 1.

By the time work on Dam 3 was well advanced pouring commenced on 2 with two 1½-yd. mixers, and work at this point was given a good start. On Aug. 3, the last concrete was poured on Dam 3, whereupon one of the two mixers from this dam was immediately set up at each of the other two dams, so that thereafter each structure was served by two mixers. The combined output of these four mixers under normal conditions (three of 1½-yd. and one of 1¼-yd. capacity) ranged from 1000 to 1700 cu.yd. per day for two 9-hour shifts, only two mixers being operated at a time.

In laying out the construction scheme it was anticipated that there would be occasional breakdowns of rock crushers, concrete mixers, or, in fact, any part of the system, and the sequence of operations was purposely arranged as stated, so that when shutdowns occurred in some one unit the entire system would not be paralyzed. For example, if one of the mixers at Dam 3 broke down, labor and material could be diverted at once to Dams 1 or 2. This obviates the necessity of reducing output of quarry, crusher and gravel washer, and the rate of progress on the entire project is much greater than if there were no flexibility in the system.

Being 2000 ft. above the railroad terminus and 300 miles from Los Angeles by rail made it highly desir-



CONSTRUCTION LAYOUT PLANNED TO SERVE ALL THREE DAMS WITHOUT DANGER OF TIE-UP BY BREAK-DOWN AT ONE POINT

able to equip the camp to make its own emergent repairs. Not only has this been made a feature of the job, but the purpose has been to provide means for switching labor and materials in emergencies, so they can always be kept moving.

The gravel washer, which has a capacity of 500 cu.yd. per 10-hour day, is probably the most vulnerable point in the system, and in order to forestall shutting down of the work from breakage at this point storage for washed gravel was provided at the plant and at the dams. All screens and bucket conveyors are operated by individual motors. With this precaution and by giving special attention to the plant, it has been found possible to prevent any serious shutdowns.

Material which would not pass through the screens of the gravel washer was sent to a rock crusher beneath it. A rock-crushing plant with a capacity of 500 yd. in ten hours was also built, and a quarry was opened to provide rock for it. With the two separate plants it has never been necessary to stop pouring concrete for more than a few hours at a time.

The incline over which supplies are brought up from the rail terminus at Cascada consists of a single-track, standard-gage line, 6600 ft. long, with a maximum slope of 75%. Standard flat-cars with cable girdle and rigidly braced end built up at the rear are used for hauling freight up to the work. An electric hoist operating the incline consists of one 100-hp. and one 200-hp. electric motor. The ordinary capacity of the incline is twenty 20-ton carloads per day, but it was quite equal to bringing up a 40-ton locomotive that is now in use on the job.

Substantially all the lumber used on the work is turned out by the company's sawmill built on the lake, which has a capacity of 44,000 ft.-b.m. per day. A considerable quantity of good timber was cut in clearing the reservoir area, and this is supplemented by the cuttings of logging crews sent out along the shores of the lake. A very considerable quantity of drift has been picked up in the lake and cut into suitable lengths by an air-operated drag saw mounted on a barge at the sawmill boom. This scrap was made into rough lumber for miscellaneous use.

Anticipating probable price increases and delivery difficulties, at the outset of the work a $100,000 grocery order was placed, covering a complete list of all non-perishable supplies which it was calculated would be needed during the work. These are stored by the company and delivered at the camp in advance of requirement. During the normal progress of the work the three camps at Huntington Lake provide for a total of about 1500 men, all of which, except for about 100 who brought their families, are fed at company mess houses. The charge for board is 75c. per day.



GENERAL VIEW OF CONSTRUCTION EQUIPMENT ON NORTH END OF DAM NO. 3

A—[illegible] B—6-yd. bottom-dump car from be- [illegible] D—Standard-gage track for cement delivery. E— [illegible] F— [illegible] G—[illegible] hoppers

For the married men were provided comfortable quarters, the majority of which are rented at $3 to $5 per month, including light and water. A complete line of general merchandise is carried at the company's store, the prices being cost as delivered at the camp in carload lots, plus 7½% for handling. Virtually all of the carpenters and other skilled laborers who brought families to the work have remained. The rate paid for common labor is $2.50 per 9-hour day.

Bunkhouses for the men are 16 x 30-ft. tents with 6-ft. walls, in each of which ten men are quartered, a cot and pad being provided gratis for each man. A special feature of each laborers' camp is the bath house, in which both hot and cold showers are installed. These are much used and appreciated. Sanitary precau-

tions have been made by leading all sewage to septic tanks and all cookhouse drains to cesspools. Garbage is kept in covered cans and removed twice daily. Under these conditions 50% of the men have remained since the work started and the average duration of service for all the men on the work is 60 days.

The work is being carried out for the Southern California Edison Co., with which the Pacific Light and Power Co. recently consolidated, under the direction of R. C. Starr, hydraulic engineer. William A. Whitmire is general foreman, and E. L. Kilry, master mechanic.

The South's Labor Problem and Its Effect on Road Work

Big Wages Demoralize Negro Workers—Convicts Used Effectively—Outlook Brightened by Greater Use of Machinery

By W. S. Keller
State Highway Engineer of Alabama

FOR the first time in its history the South has come face to face with the labor problem. Whether the problem is one that is temporary and only for the period of the war, or whether it will remain even after peace is declared, is speculative. During the winter of 1916-1917 thousands of negro laborers left the South for the North because of the scarcity of work. It is estimated that approximately one-third have returned.

Fully 80% of the laborers used in Alabama are negroes. Contractors who were fortunate to have good contracts were able to keep their forces intact, but others less fortunate were compelled to sell their outfits and go into other business. Within a period of six months, we went from one extreme to the other. War was declared, military camps were located and work of construction was started. Many old industrial plants, long idle, resumed work and those already at work began enlarging their plants, and unheard of prices are being paid for labor. The average negro laborer cannot stand prosperity. His money burns his pockets and he feels compelled to absent himself from his work for a sufficient length of time to permit the spending of it. Strange as it may seem, the higher the wage scale, the more demoralized becomes the labor.

Situation Which Confronts Contractors

The situation that confronts the road contractor is not the high price he has to pay for labor but the uncertainty of holding an adequate number of men on the job to keep within his contract prices and complete the work within the required time. If he could know that labor would be plentiful and constant, at a fixed price, he could make an intelligent and safe bid, but not knowing, or being unable to surmise, what changes may take place in thirty days, he is "up in the air." It is the belief of many that when Government camp work is completed the price of labor will become normal—at least, the laborer will seek work of a more permanent nature.

The situation is being met in many parts of the South by the use of convicts. Except where state convicts can be used to supplement the county convicts, the greater number of counties have not sufficient prisoners to make an economical working force. This is noticeably so since the "bone dry laws" became effective. That convicts can be economically and successfully used in highway work cannot be denied by those who are familiar with their use in such work. As in every other line of work, there are failures, but it does not take a Philadelphia lawyer to learn the cause of such failures.

Machinery Offers Relief

The use of improved machinery will have to be depended on also to relieve the labor situation. Here lies the source of much waste, however, unless the work to be done has been carefully planned by an engineer and unless a careful study of the most adaptable machinery is made before purchase. Unquestionably, the motor truck will henceforth play an important part in solving the problem. During the past year a number of Alabama counties began using trucks and trailers for construction and maintenance work. Montgomery County, with 450 miles of gravel roads, in using seven trucks, necessary grading machines and trailers, mainly for maintenance. Several of the other large counties are using to advantage such improved machinery.

Alabama plans the expenditure of a combined appropriation, Federal, state and county, of approximately $1,300,000. The last legislature of this state designated a system of state trunk roads on which all state appropriations must be spent unless the trunk roads in a county are completed to the satisfaction of the State Highway Department. In such event state money for that county may be used in building any other main-traveled thoroughfare. Federal aid may be used in like manner. As the trunk road system embraces approximately 3000 miles, one-half of which is now completed, it is safe to predict a completion of the entire system within a year or two. In planning the system, the roads were selected that connected the principal cities of the state and joined the main highways of adjoining states. Every county in the state is touched by one or more of these roads.

Most of the counties are poor and, as they have to bear the larger burden of the expense of construction and maintenance they cannot afford the higher types of road; but the locations of the roads are carefully made and, generally, concrete waterways are installed. When the state and counties grow to such extent that traffic is changed and increases so as to demand a better class of road, they will be well prepared with these features of permanency to make the change.

Standardized British Ships

The first of the standardized ships built under the specifications of the British government has completed its final test and has been put into commission as a cargo carrier. The trial test proved to be an unqualified success, although it was most exhaustive and comprehensive in its nature. The keel of this vessel, designed with the idea of providing a good type of cargo carrier in the shortest possible time, was laid in February, 1917, and by September, 1917, the first ship was fully loaded and ready to proceed on its first voyage. In the opinion of experts, the type is a very efficient cargo carrier and there should not be the slightest difficulty in selling such vessels to private owners after the war.

More Industries Testify to the Service of Good Roads and Motor Truck Haulage

Replies to "Engineering News-Record's" Inquiry Supplement Those Published in Last Week's Issue To Indicate the Effect on Manufactures of Priority Order No. 2, Forbidding Shipment of Road Materials

IN ADDITION to the statements in last week's issue, p. 1032, indicating the extent of industry's use of roads and motor trucks for the haulage of raw materials and finished products, the telegrams reprinted below have been received. Their significance lies chiefly in their relation to Priority Order No. 2, which forbids the shipment of road-building materials in open-top cars. If the order is continued in force the construction and maintenance of good roads, which are to a considerable extent serving as avenues of relief for the congestion of freight on the railroads, will be brought to a halt, except where local construction materials are available. The telegrams from manufacturers and motor truck users follow:

To relieve railroad congestion we are hauling all materials used in connection with making shoes between Whitman and Boston, Whitman and Milford and Milford and Boston. No bad roads. Hauling no war orders. Deliveries into Boston from the West our biggest handicap. REGAL SHOE CO.

Boston, Mass.

We are not using trucks on account of any congested condition, but we are hauling shoes and leather between Boston and Bridgewater. The bad roads are not interfering. The service of the railroads is very good, as we have trolley and freight. We are handling war orders. L. Q. WHITE SHOE CO.

Bridgewater, Mass.

We do not use trucks for relief of railroad congestion. Our principal item is coal received by boat.

Derby, Conn. DERBY GAS CO.

No to all questions yesterday's telegram.

Palmer, Mass. BOSTON DUCK CO.

Using truck for hauling silk between Paterson and New York. Bad roads interfering. Could not rely solely on railroads. Better highways would help. Highways are being repaired between here and New York. Not handling war orders. ORIENTAL SILK PRINTING CO.

Paterson, N. J.

I have been operating a 2½ and 3½-ton truck, hauling lumber from mills to sidings in Victoria, Va. In another month the roads will be so bad in that locality that I will have to abandon the use of trucks until spring, and rely on teams to do my hauling. The material which I am hauling is connected entirely with war industries. That is the reason I put on auto trucks while weather conditions were good. ALEX. MORTON.

Jersey City, N. J.

During last winter hauled gunbarrels, machine parts, and meats from Philadelphia to New York. Milk, Elmer, N. J. to Philadelphia. Road difficulty encountered on normally good Pennsylvania due to increased traffic and climatic conditions. Inability to use trucks in winter would only increase overhead charges on operation for the year. Better highways would reduce operating and maintenance costs, increase general utility of trucks, but snow removal is of utmost importance even with perfect roadbed. Considerable war material hauled Philadelphia tc New York for export.

Philadelphia, Penn. THE UNITED GAS IMP. CO.

We have a number of trucks, but they are all used for city deliveries of our product, paper, both in Philadelphia and New York. Did not think it was necessary to answer by wire. DILL & COLLINS CO.

Philadelphia, Penn.

We are not making sufficient deliveries over the roads to distant points to warrant our going into the question seriously. In regard to war order business, as a railroad and mill supply house, we have a very small portion of this class of orders.

STANDARD SUPPLY & EQUIPMENT CO.

Philadelphia, Penn.

Only using trucks between Baltimore and Washington where road is fine. C. D. KENNY CO.

Baltimore, Md.

We only use trucks from our branch houses to our main house. We do not use them for any outside hauling. HARRODSBURG ICE & PRODUCE CO.

Harrodsburg, Ky.

Answering your questions [see last week's issue, p. 1032] (1) Yes. (2) Wool and 16-ounces O D melton between our mill and Baltimore. (3) Yes. (4) Not serious at this time. (5) Yes, would allow us to load heavier. (6) Exclusively.

Oakland, Md. MELVILLE WOOLEN CO.

I handle butter, eggs and poultry and have houses in sixteen different towns. I operate three trucks at Versailles, one at Arcanum, one at Springfield, two at Covington, one at Troy, one at Xenia, two at Bryan and three at Dayton. Have been using trucks the last four or five years. My trucks are 1, 1½ and 2-ton trucks. The worst roads are those around Xenia. Am not hauling for any war industries. We use these trucks to go to the small country towns and gather up the produce. We also use them for hauling from one branch house to another, in order to make up car loads for shipment. Lots of the little places we make are not on a traction or railroad line. We also make some of the trips with horses and wagons. We use the tractions to ship eggs into Dayton from our various points, but most of our produce is shipped to New York City. Think you will find that a lot of trucking is being done where the distance isn't more than 20 miles. H. B. HOLE.

Greenville, Ohio.

We are not using trucks for country roads. Use railroads exclusively between towns. MORRIS & CO.

Chicago, Ill.

We and our customers have used trucks to limited extent to transport cement from our Buffington, Ind., plant to nearby points in Calumet industrial district in order

to avoid delays caused by railroad congestion and scarcity of freight cars. Poor condition highways has restricted this service. We are now building concrete roads in and leading to our plants in order to establish truck service to steel and other mills in Calumet district manufacturing war materials. Better highways undoubtedly would cause establishment in many sections, of truck service like that projected at Buffington and that between Cleveland and Akron and Goodyear truck service between Akron and Boston. We are handling some war business.

Chicago, Ill. UNIVERSAL PORTLAND CEMENT CO.

We are not operating trucks over highways to any great extent, but could relieve railroad congestion were we to do so. We are hauling for war industries. Motor truck could relieve congestion at this point. Roads within radius of 100 miles good for loads up to 3 tons. Most all business relying solely on railroads.

Dayton, Ohio. DAYTON TRANSFER CO.

This company is engaged in operating dump trucks, chiefly within the corporate limits of the City of Cleveland. We take contracts for excavating work or heavy hauling of bulk commodities, usually on the basis of so much per haul or per truck.

At the present time we have two trucks operating at Camp Sherman for a contractor for the Government on road work. We are, of course, constantly hampered by bad road conditions, but they are over such small areas that it would not be feasible to enumerate the places where we have had difficulty. The hauls which we make are not as a rule such as could not possibly be made by railroads.

We are not hauling directly for any war industries, although the two trucks we have in service at Chillicothe are working under a subcontractor for the Government in the construction of road work at Camp Sherman.

There is no doubt that if all the towns of any size within a radius of 50 miles of the City of Cleveland were connected with Cleveland by good highways, the truck transportation would be a substantial aid in relieving congestion. As conditions exist today, there is a great amount of freight transported between Akron and Cleveland by truck. This business has been created in a large measure by the unsatisfactory service the railroads give between these two points, and by reason of the fact that there is pavement the entire distance.

We operate six 5-ton Packard dump trucks and do not have flat bodies suitable for carrying package freight.

THE ARROW CARTAGE & STORAGE CO.

Cleveland, Ohio.

Only small amount truck operation on country highways due to freight congestion here as yet, but I and many other truck owners are giving this much thought trying to prepare for emergency. I operate five trucks—three 3-ton, two 2-ton units—hauling milk to dairy and stone for road building. Bad roads between here and Chicago, also Detroit, have prevented accepting hauls to these places on offer. Have had several inquiries for war material. My regular clients cannot use railroads only partially and congestion would only mean longer hauls. Road building at a standstill here due to lack of cars for any purpose except coal. I am not hauling for any war industry as yet. Thoroughly believe trucks and better highways would or can be made to relieve railroad congestion. ARTHUR G. WAY.

Toledo, Ohio.

We believe in good roads. Common brick, one of the low grade commodities, not benefitted. Have no war orders. NATIONAL BRICK CO.

Chicago, Ill.

It is my opinion that the roads around Peoria need to be worked after each rain with a drag of some kind. I do a great deal of cross-country hauling when the roads are in any condition and could do more if the roads, which are mostly dirt, were well drained and dragged immediately after each rain. I also find that where they have had a coat of oil that they are always better than those that have not been oiled. I operate one 3½-ton truck but think about a 2-ton truck with a wide tire behind would be a very good size to use for the cross-country haul. My clients would be somewhat delayed if they had to rely upon railroads at the present time. I have not been called upon to haul for any of the war industries but with good highways the motor truck could be utilized to relieve the railroad congestion.

Peoria, Ill. W. T. ROGERS.

We are using one 2½-ton truck and one 1-ton truck operating between Grand View and Rockport and between Grand View and Crisney delivering flour and feed to these points and bringing wheat back to mill on return trip. Roads between Grand View and Crisney are dirt and now impassible on account of mud. Road to Rockport improved and trucks make regular trips. These trucks are operated as matter of convenience on account of quick delivery being required. Better highways would be of great value. We handle no war orders at present. CADICK MILLING CO.

Grand View, Ind.

We occasionally do long distance hauling—very little recently. Have five 5-ton Pierce-Arrows; all our trucks have been occupied continually Camp Taylor past five months until two weeks ago. Roads fine within radius 30 miles Louisville. Cannot answer regarding clients' business. Not hauling for war industries. Trucks and highways can help relieve railroad congestion very materially at higher rates than railroads account higher operation costs. SCHROER TRANSPORTATION CO.

Louisville, Ky.

We operate one 2-ton, one 4-ton and two 5-ton trucks over country highways between Tonopah and Manhattan. No railroad between above towns. We help to some extent to relieve railroad congestion. At certain seasons of the year poor roads interfere with our hauling business. The business of our clients would cease to be if they had to rely solely on railroads. We do not haul for any war industries. Trucks and highways can relieve railroad congestion to a very noted extent.

Reno, Nevada. TONOPAH TRUCKING CO.

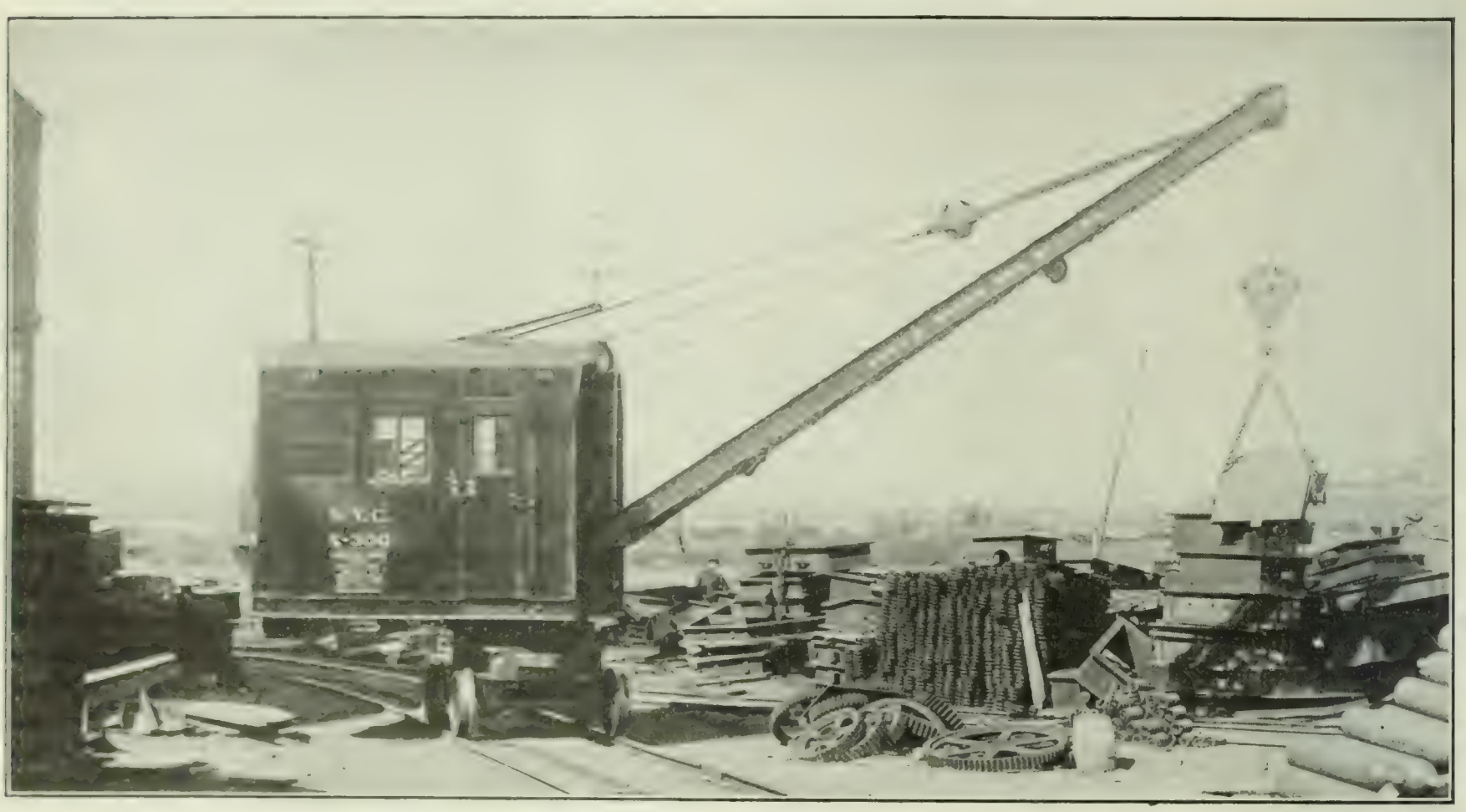
More Money for Electricity Than Railroads

California's electric light and power companies expended more for extensions and improvements than did the steam railroads of the state during the four years ending with 1916, according to a report of the California Railroad Commission recently issued.

Locomotive Crane Sprang from Small Beginnings

Grab-Bucket and Development of Multiple Uses Open Up Wide Fields to Tool Now Indispensable Alike to Construction Work and Industrial Plants—Three Different Types of Power Common

By James Shearer
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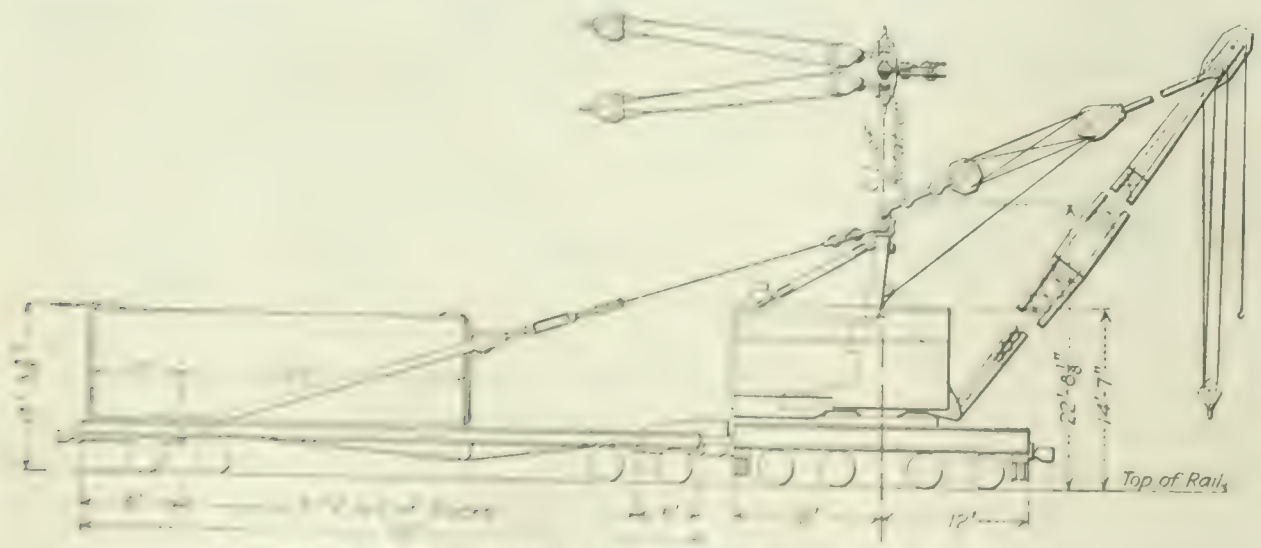


GASOLINE DRIVE PROVING VALUABLE FOR INTERMITTENT SERVICE IN RAILROAD AND INDUSTRIAL YARDS

IT IS a long way from the little iron crane of the early eighties with its maximum load of three tons at 14 ft. radius, to the versatile crane of today that handles a steel girder 130 ft. in the air or swings a 62-ton concrete block into place with ease.

The early portable cranes were simple jib cranes on rotating platforms mounted on four-wheel cast-iron cars, and were not self-propelling. They were intended for hoisting alone with a hook or sling, and it was not until 1899 that the use of a self-filling bucket became at all common. No other innovation has added so much to the value of locomotive cranes as this. The grab-bucket of the now popular clamshell type opened up to the crane the whole field of the handling of bulk material. The materials now handled range from coal and ore to oyster shells and sugar beets, and crane capacities range from small yardage to that of a modern crane and grab-bucket which recently loaded 4000 tons of ore tailings in 7½ hours.

With the perfecting of electric lifting magnets their adaptability to use on locomotive cranes for handling steel and iron was apparent. It was soon found that the greatest success was attained when the generator which furnished current to the magnet was mounted on the crane, making a self-contained unit entirely independent of any outside source of power. Such cranes have handled several hundred tons of material a day with savings of as much as 30 cents a ton.



A CONVERTIBLE CRANE AND DERRICK CAR IS ONE OF THE LATEST DEVELOPMENTS

In many cases a locomotive crane can easily be converted into an entirely different type of machine, by using certain special attachments. With a properly constructed boom and the addition of a dipper arm and

bucket the crane becomes a steam shovel. A Western lumber company used such a crane-steam shovel in building a logging road and reported making a 13-ft. cut at ¼ the cost of previous methods. Similarly, by the addition of piledriver leads to the boom, the crane is converted into a piledriver that will do excellent work within its capacities. Two machines are thus available at little more than the cost of one, a feature appreciated more each year by railroads and contractors. Another type of combination crane is used for drag-line scraper work in addition to its regular work. Jas. O. Heyworth used a crane in this way on part of his contract for the Chicago Drainage Canal.

On account of the increased use of gas engines, it is only natural that attention should be given to their employment as motive power for locomotive cranes. Such cranes have the advantages of not requiring a licensed engineer, of making no dirt and of showing a very small fuel cost. They are especially adapted to intermittent service. While used now only on the smaller sizes, results, in general, have been good. A gasoline-operated crane for general yard work or for light bucket service is shown in one of the photographs. This crane is driven by a 30-hp. motor and is designed to handle a ¾-yd. grab-bucket full of coal at a radius of 20 ft. Making two complete trips a minute, the crane would easily handle a ton of coal a minute and at very reasonable cost. Steam cranes will probably always be the standard, especially for the larger sizes but, with the lower initial cost and upkeep, gasoline-operated cranes will force a way for themselves.

Cranes on traction wheels to run on the ground have long appealed to the layman but not to the builder. Experience has shown that the weight of the crane makes propelling impossible except on hard smooth roads or on planking laid on the ground. The road commissioners of Wayne County, Michigan, use 3-ton cranes for handling road material and, while the cranes have done much excellent work, it was found necessary to lay planking even on good roads before the cranes could propel themselves.

For special erection work in Cincinnati, where there were no railroad tracks at the site and steam operation was undesirable, the American Bridge Co. used a special 12-ton gasoline-operated crane running on very broad traction wheels. This crane, shown on p. 1050, had a 70-hp. motor and a capacity at 40 ft. of three tons. Special provision was made for propelling, with a differential on the driving axle, both hand and power steering, and a choice of speed of 1½ or 3½ miles per hour. It propelled itself satisfactorily to its work over city pavements (after a bond protecting the city against damage was furnished) but required planking on ordinary ground in spite of the fact that it had power enough to spin the wheels.

It is entirely possible that some type of caterpillar traction, such as has proved successful for the famous tanks and big guns in Europe, may yet be developed for locomotive crane service. Until then, the place for a self-propelling crane will be on rails, not on the ground.

Erection cranes, so called, are large-capacity locomotive cranes designed primarily for the efficient placing of the steel members of bridges, buildings or other structures. Their development, keeping pace with the advanced plans of bridge building engineers, has contributed greatly to the successful accomplishment of recent erection feats. While not having the capacity at long radius straight ahead possessed by derrick cars, they have a far greater ease of maneuvering and the obvious advantage of 360° rotation. Nominally rated as 60-ton cranes, in capacity they come between locomotive

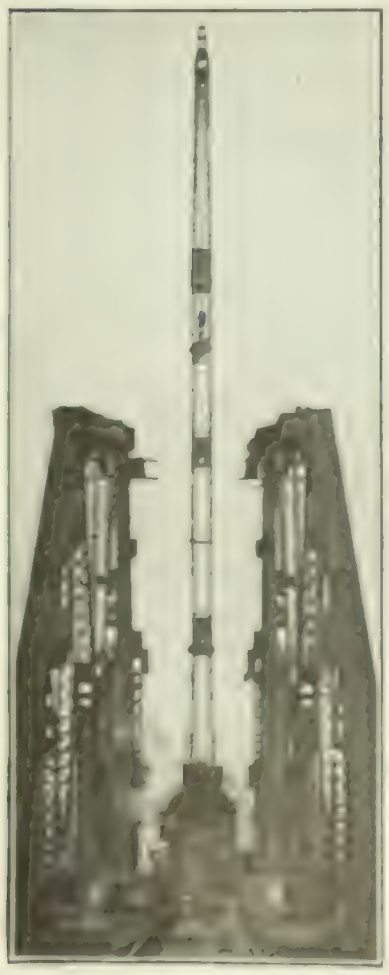


IN THE SHIPYARD, TOO, THE LONG BOOM IS AN ADVANTAGE—THIS ONE IS 100 FEET

cranes and wrecking cranes, but compared with the latter they are found to have greatly increased speed, relatively greater power and greater adaptability to different kinds of work. To facilitate operation, air-operated clutches are provided, as well as a slewing motion of the selective type with a slow speed for heavy loads and a fast speed for light work. In addition to the boom-hoist motion, they have four independent hoisting motions—the main and auxiliary hoists and two winch heads—any one of which may be used for hoisting or holding lines. An air compressor furnishes air for pneumatic tools.

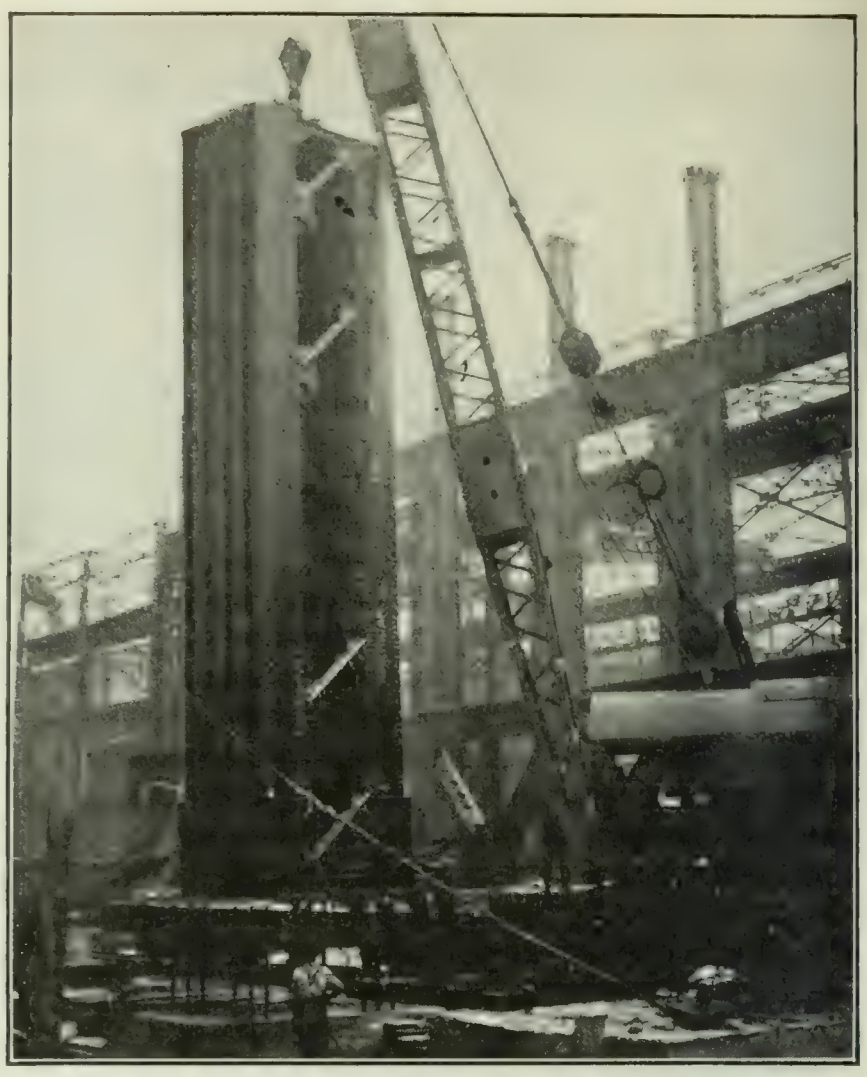
A recent case shows how the use of these large-capacity cranes has influenced steel construction. For a large building at Gary the Indiana Steel Co. used massive built-up columns weighing 46 tons each, to support girders having a weight of 132 tons. Without the cranes, it would have been a problem to transport these unwieldy members to the work, to unload them and to place them. With the cranes, the work was easy. The columns and girders were shipped assembled, were lifted off the cars and placed in position by the cranes.

With the large capacity available, very long booms can be used, particularly when height is the chief aim. Booms 100 ft. long are not unusual and lengths of more than 130 ft. have been used. A crane with such a boom becomes, in effect, a portable four-hoist gin pole with great independence of longitudinal motion and an unusual degree of transverse motion. One of the illustrations shows a 110-ft. boom on one of the cranes that erected the Steubenville bridge, described in *Engineering News-Record* of July 19, p. 104. This was the first cantilever bridge erected entirely by locomotive cranes, even the suspended center span being so erected. This work was made possible, because the erecting engineers had the vision and courage to use on their work a tool that, in smaller sizes, had proved itself on work of an allied nature, and because of the coöperation of the crane builder in developing his crane to meet the essential conditions of modern erection service.



CRANE WITH 110-FOOT BOOM AT SCIOTOVILLE, OHIO

One of the latest developments is along the line of economizing the plant required for a job. It was the idea of the late H. A. Greene, when division erection manager of the American Bridge Co., that an erection crane could be so constructed as to be easily convertible into a derrick car. The one machine would then have the advantage of a derrick car for long reaches straight ahead, and also those of a crane for side lifts or high lifts at shorter radius. In cooperation with the builders, a machine was developed consisting of a 60-ton capacity erection crane with a high-arch A frame anchored to a tender car behind the crane. The backward pull on the boom-hoist system is transmitted through the anchorage to the weighted tender car, which is especially built to resist the 225-ton horizontal component of this pull. The drawing shows a side elevation of this combination erection crane, for which a patent has recently ben issued. When operating as a derrick car with a 60-ft. boom, a load of 60 tons can be handled at any radius from 16 to 56 ft. straight ahead and the crane will propel itself with the load. To make side lifts as an ordinary locomotive crane, the short diagonal from the top of the arch to the rear of the crane is tightened, and the rear anchor to the tender car loosened. The crane can then work and slew in almost a complete circle. Any length boom can be used if the arch and tender car attachments are removed, the crane then becoming a standard erecting crane.



WITHOUT MODERN CRANES SUCH HEAVY STEEL COULD NOT BE SET

Two unusually large locomotive-type cranes have recently been used on notable work where the cranes made possible a distinct advance in construction practice. In each case, in planning the work, the builders decided that if a crane could be adapted to handle the required load at the necessary radius, a departure from the usual methods would be justified by the results. Again it was a case of broad-gage engineers deciding that large locomotive cranes could do exceedingly heavy work just as satisfactorily as smaller cranes had done lighter work. Locomotive cranes were promoted, as it were, to an advanced position.

At Halifax, concrete piers had to be built for an ocean terminal in 45 ft. of water. By using 160-ton wrecking cranes with 45-ft. booms to place immense concrete

blocks, the cost and difficulty of building a cofferdam, and of unwatering, maintaining and removing it, were avoided. There were 3300 of these blocks, most of them 31 x 22 x 4 ft., weighing 62½ tons. With their elaborate lifting tackle they made a load for a crane of 70½ tons. This load was handled at 33-ft. radius by a self-propelling crane having air-operated clutches to facilitate operation. Both *Engineering News* and *Engineering Record* have described the most unusual methods employed at the Halifax terminal.

The other case in which a large wrecking crane was adapted for use as a locomotive crane was in the building of the Metropolis bridge. This was an erection job of unprecedented size which required the placing of large, unwieldy members high above the bridge floor. Conventional construction methods would have called for the building of an expensive special traveler. A departure, however, from the usual methods, with proper planning of the details, allowed a simple tool to be used with unusual success. The solution was big locomotive cranes and falsework.

For the erection of the 720-ft. span, the crane surpassed, in its weight and length of boom, any previously used for heavy erection work. This crane had a boom 130 ft. long and capacity such that, when operating at a radius of 30 ft., it could pick up a 50-ton member, swing around with it and place it in position high in the air as desired. With a 60-ft. boom it had a capacity of 94 tons at 30 ft. and 43 tons at 60 ft. Unusual stability was required, as well as ease and sensitiveness of control. The crane was a 150-ton wrecking crane with an outrigger system for stability that could be extended to 12½ ft. at the center and 8 ft. 9 in. at the ends. Air-operated clutches and two-speed slewing facilitated accurate control. An advantage of these cranes is that when no longer needed for special work they can be equipped with shorter booms and sold to railroads for use as wreckers.

It is evident that the development of locomotive cranes must virtually parallel the development of the methods of using them. In some cases the crane builder sees the need for a new type of machine and demonstrates its value to a purchaser. In the majority of cases, however, it is the prospective user who starts things. If he had a crane that would perform certain operations in a specified way, he could make one machine do the work of two or could replace twenty men or could adopt new methods. As he keeps abreast of engineering practice as it advances, the chief function of the crane builder on development is to reproduce in steel and iron the selected ideas of those restless souls who are always seeking a better way of doing their work. The builders best able to do this have added most to the value of the locomotive crane.

Prof. Whipple Tells of Chinese Floods

AT A recent meeting of the Boston Society of Civil Engineers Prof. G. C. Whipple, president of the society, described his visit to Russia as a member of the American Red Cross Mission. On the return he passed through China and Japan in time to see the great floods which occurred there. The past summer saw several floods in northern China but the worst one occurred in September. This flood covered a large part of the city of Tientsin, and if certain railroad embankments had not been cut in such a way as to release the flood waters the entire city would have been submerged. As it was, approximately 200 were drowned at Tientsin. The cutting of the railroad embankment caused the flooding of 15,000 square miles of land to an average depth of 4 ft., driving at least a million persons from their homes.

The accompanying photograph was taken in Tientsin during Prof. Whipple's visit. As a member of the Red Cross he investigated this flood and the need of relief, and the American Red Cross has already sent a considerable sum of money for the care of the refugees. Its distribution has been entrusted to Roger Greene, and Dr. S. H. Chuan, the surgeon-general of the Chinese army and a former student of Professor Whipple's and Z. Z. Chow, a graduate of the Massachusetts Institute of Technology, are active in the relief work.

In Japan the Red Cross party reached Osaka just in time to witness the flood caused by the greatest typhoon which has visited Japan in fifty years. Here again it was necessary to choose between flooding the city with its industrial establishments and costly engineering works, and an area of farm land. The officials choose the latter alternative and cut the railroad embankments and dikes in order to release the flood waters. In Tokyo the typhoon destroyed buildings, uprooted trees throughout the city and did much damage to life and property.



THE STREETS OF TIENTSIN DURING THE GREAT FLOODS OF SEPTEMBER

Undercrossing Wing Wall Designed To Limit Base Pressure

Box Culvert Forms Main Tunnel and Wing Walls and Floors Built of Slabs Cut To Permit Earth to Tail Through

IN THE undercrossing for the Donner Steel Co., at Buffalo, on the Delaware, Lackawanna & Western R.R., a special type of reinforced-concrete structure was designed to effect economies and to make the base pressure as low as possible. The details of the structure and a perspective showing the general layout are given herewith.

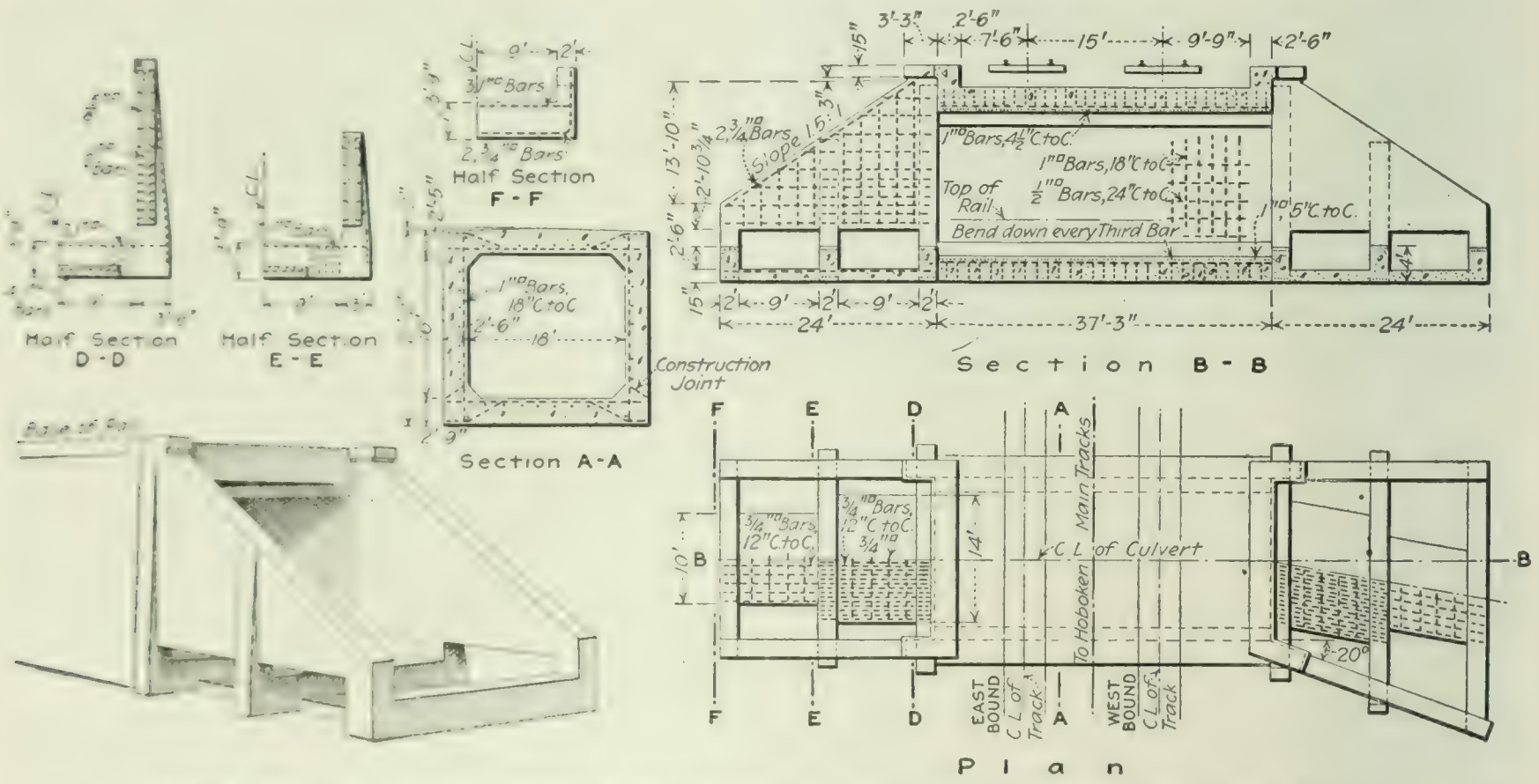
The main crossing is a box culvert carrying the undercrossing, which contains a narrow-gage industrial track. This culvert is 18 ft. wide inside and 15 ft. high, and extends across a distance of 20 ft., which is sufficient to carry the two-track main line railroad above. The earth fill is held by special wing walls separated from the culvert by construction joints, so that any uneven settlement will not cause cracking at the juncture of the box with the wings. These walls are alike in detail, except that on one side a steel approach of 20° is made to take care of some necessity in the yard layout. The other side walls are square with the culvert.

The wing walls are of special detail, designed the first time for this particular structure. They consist of parallel walls sloped on top to meet the fill, and resting on three transverse girders, which in turn foot on floor slabs in the space between the walls. Counterforts are provided with steel on the outside to resist properly the earth pressure on the vertical slabs and frame into the transverse girders. The bottom of the side walls are cut away to allow earth to tail down between the walls. The floor slabs do not extend the whole width between walls, being proportioned in width only sufficient to carry their load with a safe pressure on the bottom. The side walls are in effect slabs spanning between the counterforts.

Earth pressure is thus transmitted to the counterforts by slab action, thence to the transverse girders, and from them to the floor slabs. Assuming the vertical load of the narrow-gage track as being transmitted directly, and assuming, further, that 50% of the horizontal outside earth fill is transmitted as the vertical component to the footing on account of friction on the side walls, the pressure on the floor slab is ½ ton per sq.ft. for the section nearest the culvert, and ¾ ton per sq.ft. for the section away from the culvert. Under the box culvert the maximum unit load is 1½ tons, the limiting value of the ground.

A reinforced-concrete structure of this type was selected because gravity abutments would have required a longer span of falsework carrying the traffic over the construction, and also because of the light foundation pressures allowed by this special design. Gravity sections, especially in the wing walls, would have required piles with a cut-off about 4 ft. deeper than the base of the reinforced-concrete type, and the pressures without the piles would have been excessive. The soil conditions made it necessary to limit the allowable earth pressure to 1½ tons per sq.ft. Other requirements included a clear width of 18 ft., an overhead clearance of 12 ft. above top of rail, for the narrow-gage industrial track which runs through the box, and a concentrated loading on each track distributed over 13-ft. width laterally. The unit stresses were proportioned to provide for Cooper's E-60 live load on the double-track railroad above, with impact according to the formula of the Lackawanna Railroad.

The opening under the vertical slab of the wing wall lessens the horizontal earth pressure. The opening in the horizontal slab between the wing walls, while only of a width necessary to take care of the load, was left also for purposes of construction in that the entire wall could be built, horizontal and vertical slabs to-



NEW TYPE OF UNDERCROSSING PERMITS EARTH FILL TO TAIL THROUGH WING WALLS

gether, in one operation. This precluded the necessity of a construction joint between the base and vertical wall, such as is usual in reinforced-concrete wall construction. This joint in the usual type of wall occurs at a point of maximum moment in the counterforts, making possible the deterioration of steel at this particular point.

The design was made by the engineering department of the Delaware, Lackawanna & Western R.R., under the general supervision of G. J. Ray, chief engineer, and was directly in charge of A. B. Cohen, concrete engineer. The construction was carried out by railroad forces.

Concrete Frame of Building Carries Wood Floor

This Arrangement Substituted for Steel Girders and Cast Columns—Special Construction of Columns and Girders

A REINFORCED-CONCRETE frame carrying timber joists and floors gave the most economical construction for a four-story warehouse of the George Rasmussen Co. at 130 N. Jefferson St., Chicago. The 40 x 80-ft. building has just been completed. The original plan called for cast-iron columns and steel girders, but it was found that a distinct advantage could be obtained by substituting reinforced concrete for the frame, retaining wood-joist floors.



FIG. 1. TIMBER JOIST AND FLOOR ON CONCRETE GIRDERS IN RASMUSSEN WAREHOUSE

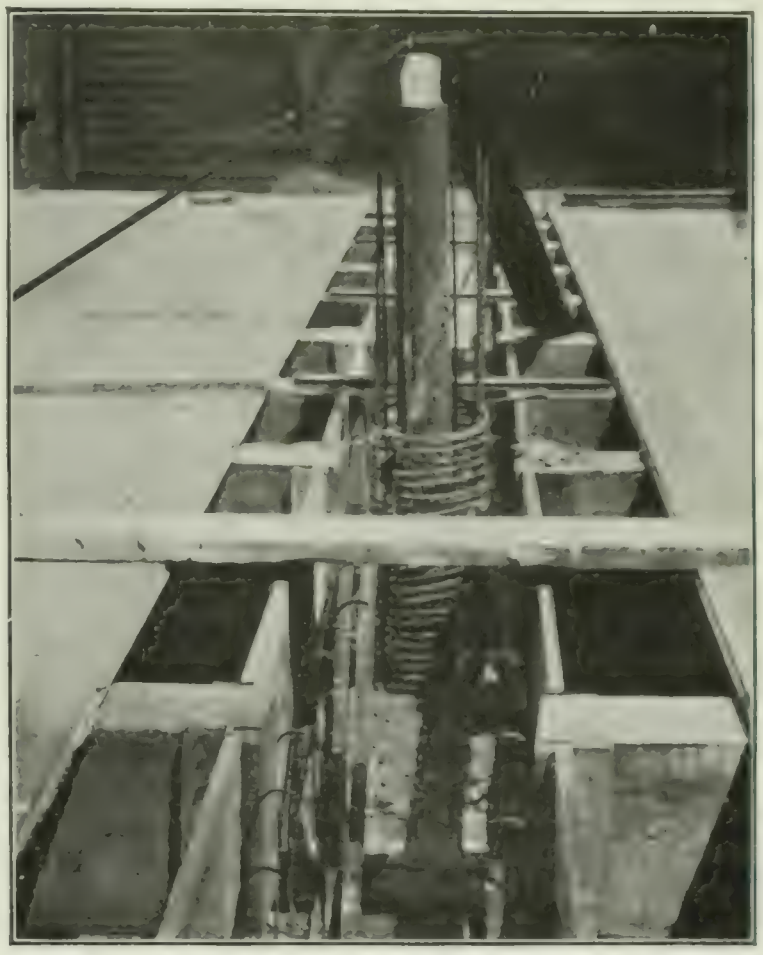


FIG. 2. GIRDER AND COLUMN CONCRETED IN ONE OPERATION; JOIST AND FLOOR IN PLACE

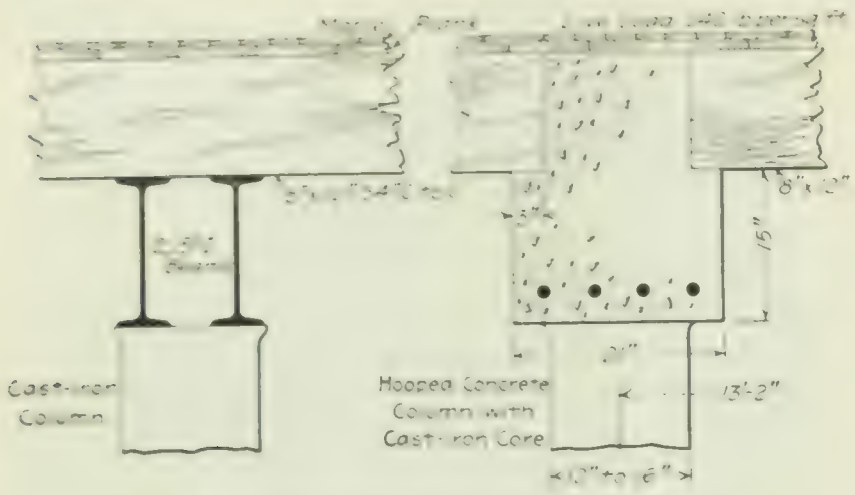
The layout made the floor panel 13 ft. 2 in. x 20 ft., and this column spacing was retained. It was necessary also to observe the originally fixed clearance limit, which allowed for 15-in. I-beams under the floor joists. The final result is illustrated by the view, Fig. 1. The original and final designs are contrasted in the sketch, Fig. 3.

The building was designed for a live load of 240 lb. per sq.ft. of floor. The floor construction consists of 8 x 12-in. wood joists 34 in. on centers, carrying a plank under-floor and maple wearing surface. The girders, spanning 20 ft., were to be two 15-in. I-beams resting on the caps of cast-iron columns. For the reinforced-concrete girders, an additional 12-in. depth was obtained by carrying the girder up to the top of the joists, as shown in the sketch.

The columns are of the concrete-hooped cast-iron section originated several years ago by F. von Emperger, of Vienna, Austria. The type is being applied to several buildings up to 10 or 12 stories high by L. J. Mensch, consulting engineer and contractor, Chicago. In the Rasmussen warehouse the columns have an over-all diameter of 16 in. in the lower stories and 12 in. in the upper stories.

The steel spiral hooping in the concrete which surrounds the cast-iron column core is proportioned as 1% of the total volume of the column. The concrete shell and the filling of the cast-iron core are 1:1:2, while the material of the girders, which under ordinary circumstances would be 1:2:4, is in this case made 1:1½:3 on account of the high compressive stresses resulting from the shallow depth of the girders.

One of the girder forms and a column, ready for concreting, are shown in the view, Fig. 2. The cast-iron column core projects up through the form to a



ORIGINAL AND FINAL DESIGNS

point about 2 ft. above the floor. The method of construction adopted was to frame the permanent timber work of the entire floor, supporting it on the sides of the girder forms, which latter were supported by three pairs of 4 x 4s; and to proceed with concreting in one operation for girders and columns of the story. The over-run of the floor joists which can be seen in Fig. 2, was unintentional but was not considered objectionable.

The design of the columns was based, under permit from the Chicago Building Department, on a compression of 11,200 lb. per sq.in. in the cast iron and 1120 lb. per sq.in. in the concrete. These figures are said to represent a safety factor of about 5 on ultimate strength.

Water Supply "Gift" May Prove Expensive for Austin

By Julian A. Montgomery

Engineer, State Highway Department, Austin, Tex.

UNUSUAL conditions were attached to the acquiring, on Oct. 2, of the Barton Springs as an auxiliary to the present water-supply of Austin, Tex. It was a case of school board arrayed against city administration, and the school board won out, largely because of political reasons.

During the past year there has been considerable agitation regarding the water situation in Austin, a discussion of which was given by the writer in *Engineering News-Record* of Aug. 23, 1917, p. 355. The quality of the water has been improved greatly by the use of chlorine and the acquisition of the sand beach on which the water plant is located. However, the quantity has been so curtailed as a result of the dry weather prevalent for the past year and a half that the city took steps toward increasing the supply. As was proper, before adopting plans covering methods, location, etc., the city began preliminary investigations of the various possible sources of water-supply, including Barton Springs.

The Barton springs are located about 1½ miles southwest of Austin and consist of a group of fissure springs whose source is supposed to be in the highlands to the west of Austin, where the rain seeps down through the many joint and fault planes to the water-bearing layers of rocks below. Their daily flow ranges from 10,000,000 to 40,000,000 gal., depending upon the rainfall. These springs are owned by a defeated candidate for the office of mayor of Austin, who gave them to the school board provided the city would purchase them for $100,000 from the school board, the fund to be set aside as a memorial fund to this defeated candidate, and the interest to be used for manual training purposes. Naturally, the school board urged the purchase, even though a fund was provided already for manual training, and even though the 55 acres on which the springs were located were assessed for taxation at about $800.

Coming at the time it did and with the conditions imposed, the offer was embarrassing to the city administration, which was going carefully, but probably too slowly, into the question. Because the preliminary investigations were not finished at the time of the election, and because the people were impatient to obtain more water at once, and because of the political turn given to the question, the economic aspects were so clouded that there was forced on the city a source of water-supply which probably will prove more expensive and less desirable than some of the other sources that were being investigated.

Besides the $100,000 for the springs, it will cost something like $150,000 to bring the water to the city.

Trinitro-Toluol to Replace Dynamite?

MANY byproduct coke plants in this country are already engaged in recovering quantities of trinitrotoluol for manufacturing munitions, and many more plants which will recover this explosive are going up. Its superiority to picric acid was plainly demonstrated early in the war. It is now a question, according to Milton A. Allen, writing in the *Mining and Scientific Press* of Nov. 10, whether the trinitro-toluol which is recovered by these plants cannot be put on the market in competition with dynamite as a commercial explosive after the war. On the face of the matter, trinitro-toluol is a much more desirable commercial explosive than nitro-glycerine. It does not freeze, does not melt until a temperature of 81° C. is reached, does not ignite until a temperature of 300° C. is reached, and even then does not explode, does not give off the slightly volatile gases which produce severe headache when dynamite is handled, and does not deteriorate under water. The only serious objection to its use is that the explosion produces a large volume of carbon monoxide gas. However, this is also the case with nitroglycerine, and dynamites used for tunnel driving are mixed with nitrate as an oxidizer to prevent the formation of this gas. The same thing could, of course, be done with trinitro-toluol. Apparently, the chief thing remaining to be worked out is the process of putting the explosive up in convenient form for handling, as is done with nitro-glycerine in dynamite sticks.

New York Pavement Openings

In 1916, according to the annual report for that year of Marcus M. Marks, president of the Borough of Manhattan, New York City, there were made about 30,000 openings in pavements, requiring the restoration of about 155,000 sq.yd. of pavement. The openings, according to the report, were made principally by public utility corporations.

Concentrated Pressure Causes Many Pavement Failures

Brick Surfaces Particularly Suffer Because Grout Is Frequently Unequally Distributed Over Area of Vertical Face

By A. H. Hinkle
Deputy State Highway Commissioner, Columbus, Ohio

THE initial cause of many defects and failures in rigid pavements, such as brick with cement filler and cement concrete pavements, can be explained by considering them as the result of an abnormal concentration of pressure. As an example: Take a single English walnut in one hand and you may not be able to grip hard enough to crush it. In fact, you may not be able to crush it by using both hands. But take two English walnuts in the hand and you will be readily able to crush one of them. Nor is this hard to explain. In the first instance the flesh of the hand distributed the pressure over a considerable area of the shell of the nut, but in the second instance the entire pressure was concentrated on a very small area of the nutshells which were in contact one with the other. This concentration of pressures, and not the intensity of the gripping force, was the cause of the failure.

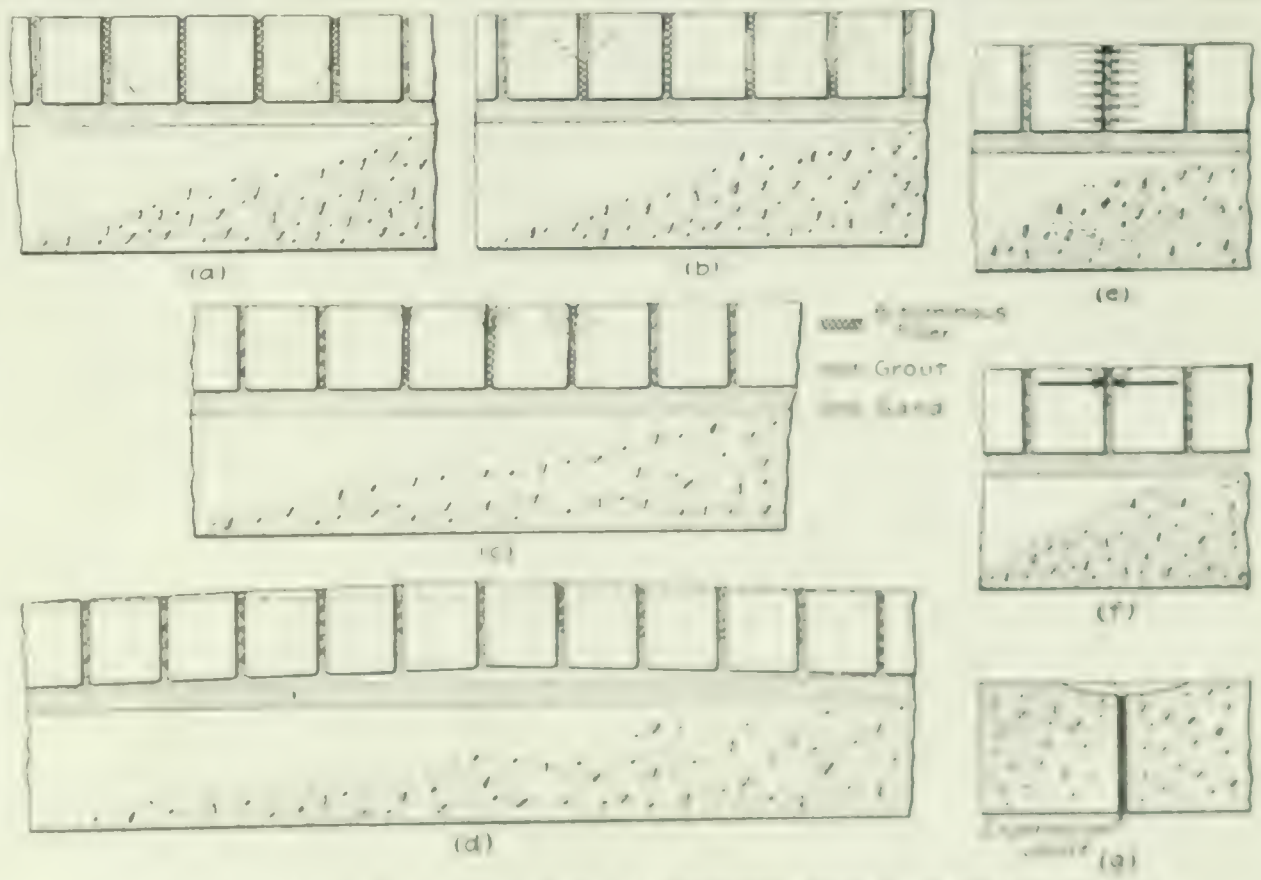
Frequently a failure of a cement grouted brick pavement can be explained in this manner if the joints have only been filled for a short distance from the top. Were the pressure causing the failure distributed over the whole face of the brick, it would be able to withstand the destructive forces, but the concentration of the same total pressure on a small portion of the depth is sufficient to crush that part of the brick.

Partial filling, therefore, usually results in spalling off and crushing the wearing surface of the brick and grout filler. This may occur in small patches or over larger areas, depending upon the distribution of the inadequate filling. An examination of the small patches that have failed in an otherwise satisfactory grout-filled brick pavement will usually reveal the fact that a large percentage of the failures are concomitant with an insufficient filling of the joints. In sandy countries it will be found that sand will drift into the joints after the brick are laid and before the grout filler is applied. If the brick are disturbed after they have been placed on the sand cushion there will result an upward movement of the cushion sand, and furthermore leaves blown into the joint in the fall of the year will be found to be another source of trouble when an attempt is made to completely fill the joints with cement grout.

The almost universal recurrence of crushed brick along the transverse expansion joint in a brick pavement is largely traceable to the concentration of the pressures over a small area of the brick. It must be admitted that this is not the entire cause of such failures, but it holds true generally in that type of joint which is made by filling nearly full with asphalt the three or four transverse joints and then sweeping over these joints with the grout. The result of this method of construction is well illustrated in one of the accompanying views which illustrates the conditions that obtain not only when the joints are filled with asphalt first, but but when they are purposely left empty while the rest of the pavement is being grouted and then filled later with the expansion material. Concentration of pressures under condition of expansion is invariably the result of this method of construction. In some cases the irregularity of the brick causes actual contact between them, or a hard pebble may drop into the joint and become wedged, producing the same effect on a small enough area to exceed the compressive strength of the brick. Hence the brick at such a point spall off or crush badly. This type of joint, happily, is going out of use.

But beyond this pure surface spalling due to only a partial filling of the joints, "blow ups" are frequently traceable to the same class of faulty workmanship. It may be readily seen that the concentration of the pressures on the upper half of the brick surface produces, in effect, a toggle joint which, when the pressures have reached a sufficient magnitude, will inevitably result in an upheaval of the surface. While it is recognized that incompletely filled joints are not the prime and only cause of such failures, it has been observed that "blow ups" frequently occur at places where the grout has not penetrated for the full depth of the brick.

The same theory of concentration of pressures can frequently explain spalled joints in concrete pavements. Careless construction may result in the joint filler being



CONCENTRATION OF PRESSURES MANIFESTED ITSELF IN MANY WAYS

set from ¼ in. to ½ in. or even more below the intended surface of the pavement. In this case, of course, the concrete when laid extends over the expansion material and the stresses set up by an expansion of the pavement concentrate in this thin layer. The condition following such faulty construction is illustrated in one of the accompanying illustrations and the amount that will spall off will depend a great deal upon the depth of concrete over the joints.

Engineers very frequently forget that a pavement is not a fixed structure but is continually changing its volume. While the expansive forces due to the increase in volume may not be very great, in any pavement which is of the rigid type it is necessary to take them into account. Of the two recognized methods of doing this, one is to design the pavement slabs strong enough to withstand the temperature stresses, and the other provides amply for the expansion by means of joints spaced appropriately and constructed of such materials as to allow of compression when the pavement has a tendency to increase in volume.

That the variable density of the sand cushion in certain kinds of foundations at the tme of construction may later cause "hollows" under the brick is recognized and known as a source of trouble. This was commented on in *Engineering Record* of July 3, 1915, page 3, and Aug. 7, 1915, page 175. The importance of a good foundation or support under a brick pavement should not be discredited. This article is not intended to lessen the importance of the foundation, but rather to explain an additional cause for a certain class of defects in construction which may be the sole cause of trouble that is too frequently attributed to the use of poor materials.

In addition, if defective grouting occurs over a place in the foundation which offers little support to the brick, failure will inevitably occur at this point, and while either the defective foundation or defective grouting would have been sufficient in itself to cause failure under heavy traffic, the two defects occurring at the same place are certain to cause failure.

If engineers are acquainted with the theory upon which such failures as mentioned above are based, they will be more on guard against the defects in the original construction of the surface which may lead to such failure, and it is with hope that attention may be focused upon this question that the above matter is presented for consideration.

Handling Freight on New York's New Steamship Pier

Equipment Details for Forty-Sixth Street Wharf on Hudson River Represent Latest Ideas of Steamship Men

By C. W. Staniford

Chief Engineer, Department of Docks and Ferries, New York City.

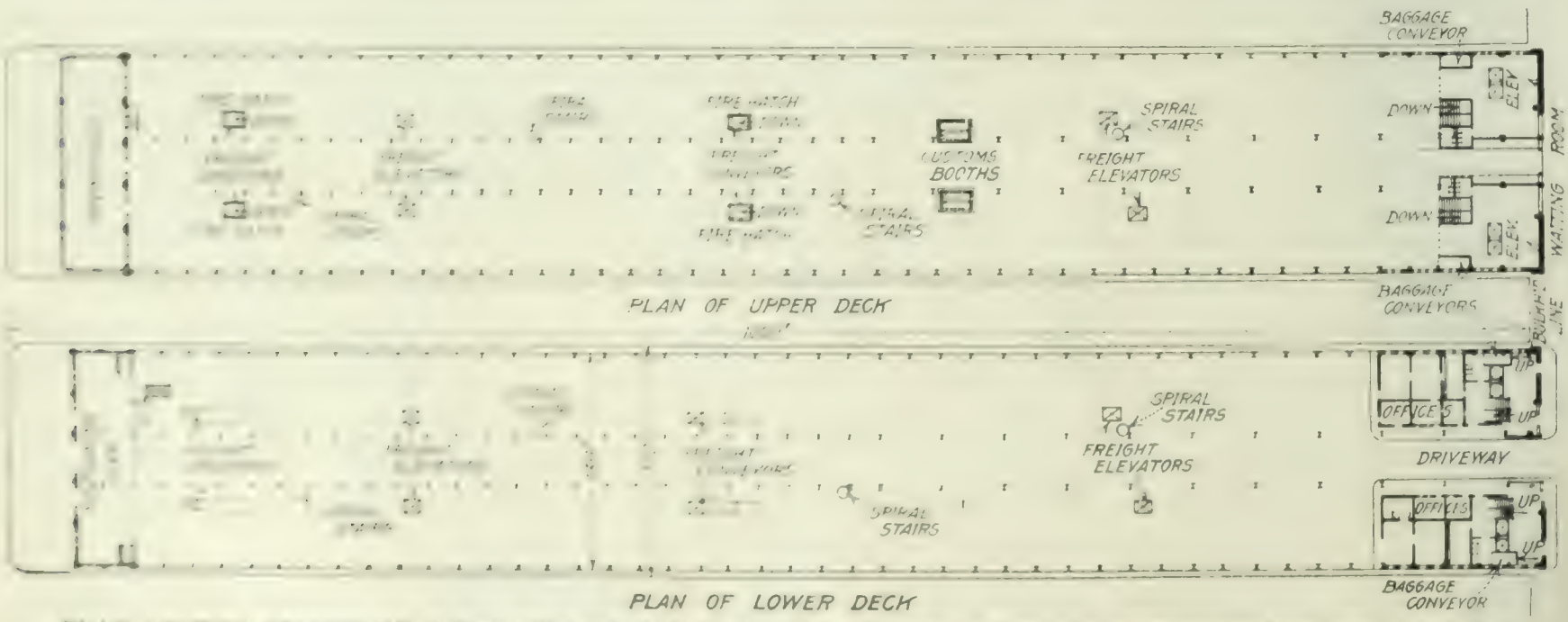
THE new 1000-ft. pier at the Hudson River foot of West 46th St. in New York City is now being equipped with freight handling machinery to fit it for steamships of extreme length and draft. While the leasing company and consequently the boats that are to use the pier have not yet been decided, it is thought that the methods of handling freight on this new pier will represent the latest ideas of steamship men, mainly because the layout is the result of a series of conferences between the Department of Docks and Ferries and representatives of all the leading steamship lines entering New York.

The result of these conferences may be abstracted as follows:

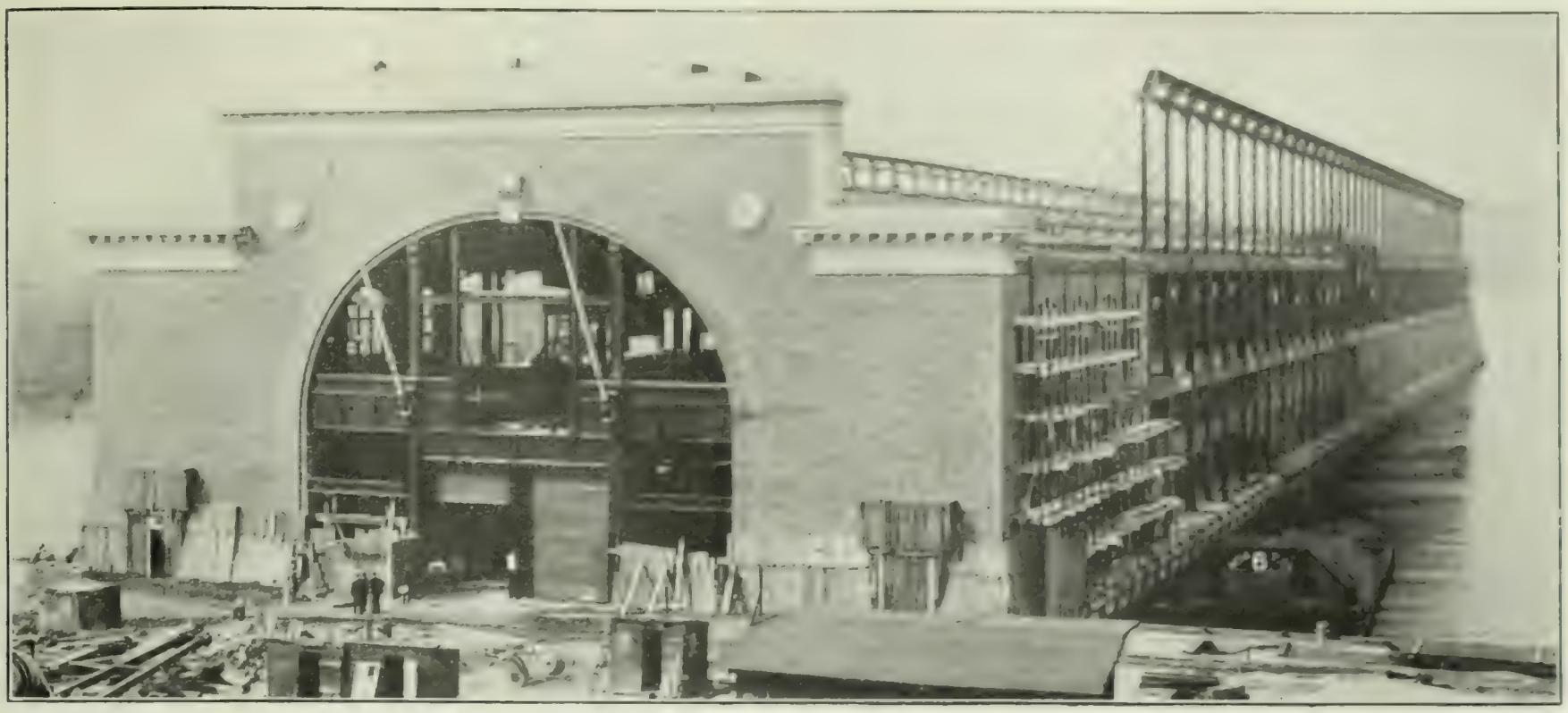
1. All the representatives agreed that the method of handling freight by the use of the extended columns forming cargo masts similar to those already in use at Hoboken, on the Chelsea piers and many other piers in New York Harbor, was the only method to be considered, and consequently this system has been provided, as explained by the writer in an article in *Engineering News-Record*, May 31, p. 453.

2. In all other two-story sheds, freight is handled from the upper to the lower deck by the means of freight elevators. One of the steamship companies concluded that it would prefer to use freight conveyors or escalators in place of the ordinary freight elevator. Other companies preferred to maintain the present practice of using freight elevators.

3. A common practice in New York in unloading cargo



PLAN OF TWO STORIES OF WEST 46TH ST. PIER, NEW YORK CITY, SHOWING FREIGHT-HANDLING LAYOUT



WEST 46TH ST. PIER IN NEW YORK CITY APPROACHES COMPLETION

from the second to the lower deck is by means of an inclined plane surface in the form of a chute from upper to lower deck. With fragile freight these chutes are objectionable on account of the shock received by the package, but are generally deemed desirable for ordinary freight.

4. An unusual idea advanced was the feasibility of placing a movable platform or belt arranged level with the deck inside of the shed and near its side. This moving sidewalk would be used to carry packages immediately upon delivery from the slings to any part of the pier where it might be desirable to deposit them. On account of the cost of this installation, the questionable desirability and uncertain use to which it might be put, and also on account of its interference with other necessary freight handling functions on the pier, the company presenting this plan finally abandoned it.

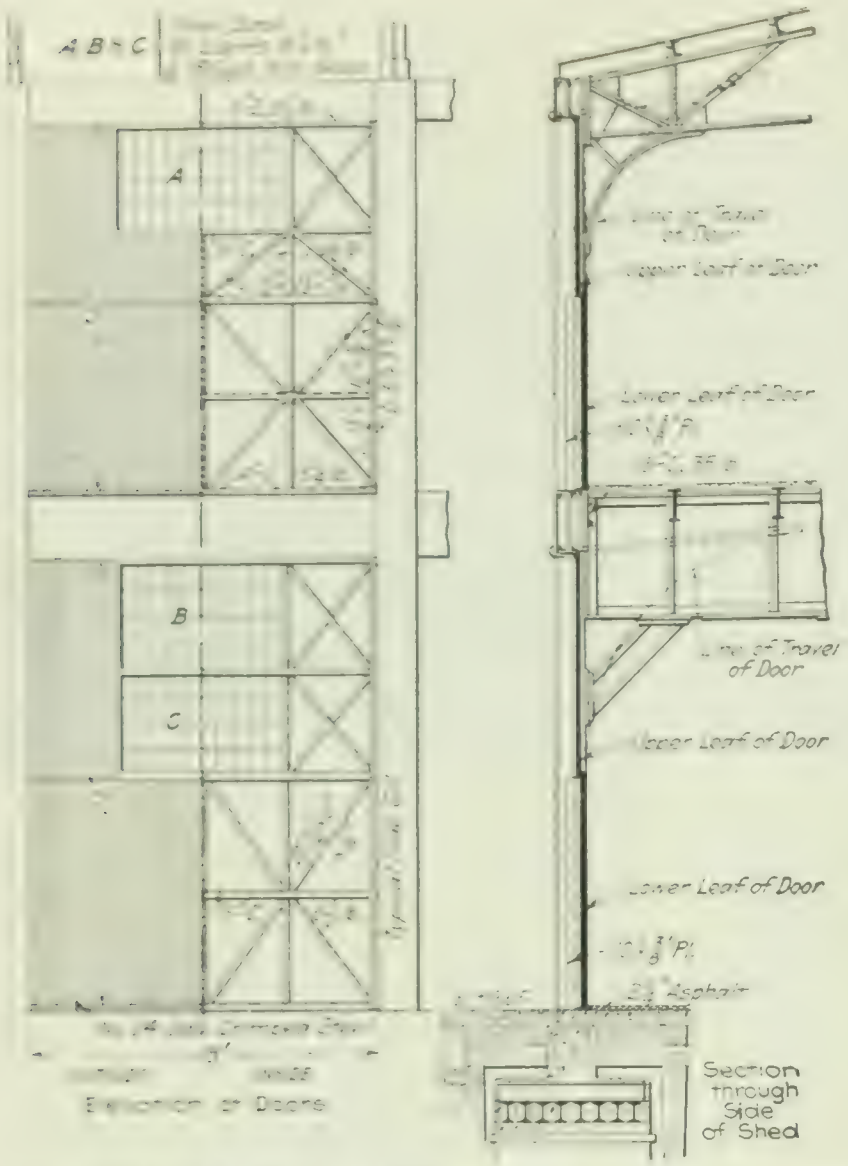
The shed on the West 46th St. pier is now nearing completion and the contract for the mechanical equipment is in force, although the future occupant of the pier is not known. In preparing this contract, therefore, it was impossible to know the exact desires of the future users or lessees of the pier, and on this account a combination of the above requirements has been arranged for in the contract so that any of the larger steamship companies may have the equipment which it desires.

The pier is the one made familiar in the technical press by the long steel cylinder cofferdam laying dry the shore section so as to permit the construction of the side walls in the open. It is 1000 ft. long and 150 ft. wide and carries a two-story shed 139 ft. wide and 921 ft., long with an out-shore one-story extension 47 ft. long. The head house, a brick enclosure of the typical steel-frame section, contains offices on both floors and the remainders of both floors are open to the far end, the lower floors being used mainly for freight handling and the upper for baggage and passengers. At some future time, however, the proposed west side marginal railroad may pass in front of the pier, in which case railway entrance will be afforded directly to the second floor where provision for that purpose has been made. At present there is no vehicle access to the second floor except by elevator and no railway connection at all.

The general disposition of the handling equipment is shown in one of the drawings. There are two passenger elevators on each side at the street entrances, four freight elevators between the upper and lower decks and four freight conveyors or escalators between the upper and lower decks. On account of the uncertain use and desire for the freight chutes they have been omitted, inasmuch as they can be easily placed, without much trouble and expense, at the exact point where they may be desired by the future lessee. Near the street entrance to each pier, two baggage conveyors or escalators are placed at convenient points.

The pier has been wired and equipped with 56 receptacles for the operation of portable electric hoisting winches. These receptacles are so disposed on each deck of the pier as to handle adequately the cargoes of all steamships using the pier. The pier is thoroughly wired and lighted in both decks and offices, current to be supplied from outside. The steam heating is complete, steam pipes being carried and wrapped to all water mains throughout the pier and also to offices, from its own steam boiler room plant. Water-supply for watering ships and for fire protection is provided.

Cargo masts of the latest type have been provided on the sides of the shed. The columns are spaced 20 ft. apart and are extended above the roof level to a height of 80 ft. above the first floor level. The columns are connected at their tops by steel girders, providing a sufficiently rigid support for the blocks handling cargo to the upper and lower decks. The extreme height of 80 ft. was determined upon on account of the steamships of extreme size which will use this pier. The steel girders are extended out from the side of the shed a distance of about 2 ft., by means of a curved built member. This serves as a further protection of cargo against the sides of the shed and gives an easier approach for cargo. The door-heads are protected by means of fenders of curved steel plates filled with cement grout.



SPECIAL DOUBLE DOORS ON PIER SHED FOLD BACK INTO ROOF

It is expected that the occupant of the pier shed will use electric hoisting winches, but the present equipment contract does not call for them. The department has recently installed six on the 35th St. pier, Brooklyn, to be used similarly to those to be installed at the West 46th St. pier. These winches are portable and are mounted on a steel bed-plate on four wheels, one pair of which is provided with bell cranks so that the winch may be properly steered when moving from one location to another. The center winding drum, 30 in. in diameter, 28-in. face, is mounted on a 4¾-in. diameter shaft. Winch heads, 21 in. in diameter and 15-in. face, are mounted on each end of the shaft. The motor is a 35 hp., 500 r.p.m., 230 volts d.c. A solenoid brake is provided. A master controller, provided with shoulder hooks, weighing about 10 lb. and arranged to be carried about and operated by one man, is connected by cable to the controller. The combination of controller and master provides six lowering speeds and four hoisting speeds. The winches can hoist 2150 lb. at a speed of 350 ft. per minute.

The freight elevators are capable of carrying a maximum live-load of 6000 lb. at a speed of 70 ft. per min. The floor of the car is 8 x 12 ft. The passenger elevators are 6 ft. 6 in. x 8 ft., and are capable of carrying a maximum live-load of 3800 lb. at a speed of 150 ft. per min. The machines for operating the elevators are located at the top of the elevator shafts and are of the single worm-and-gear type keyed directly to the winding drum, operated by 20 brake h.p. motor, 2 hr. rating, with 240 volts d.c., at 800 r.p.m. Elevator pits are cut into the pier deck and are depressed 4 ft. The framing is of heavy timber, with the floor and walls tightly calked and lined with No. 10 galvanized sheet iron.

Baggage conveyors have a run of 56 ft. with an apron 3 ft. 10 in. They are supported on light plate-girder frames, designed to carry two tons distributed load at a speed of 75 ft. per min. in either direction. The upper end is 6 in. above the level of the deck so that baggage will be dumped from the high point to the floor. The traveling apron is made of oil finished strips of maple, 1½ in. thick and 6 in. wide, bolted to two carrier chains. Cleats on 8 in. centers are fastened to the maple strips with forks meshed in between at the ends of the conveyor to steal the loads from the conveyor. The conveyors are driven by 10 hp. continuous rating compound-wound motor, with direct current at 240 volts, 840 r.p.m. Push button control switches are furnished at each end.

Freight conveyors, similarly constructed with a run of 53 ft. and a width of 4 ft., 4 in., are designed to carry a distributed load of 6 tons, and operated by a motor of 30 hp. capacity. The conveyor wells on the second deck are protected by pipe rails with gates, and covered by a counterweighted lift door. The lower ends are set in pits similar to the elevator pits.

In handling freight the door equipment is of great importance, as it is necessary to have a door which can be easily operated, which will interfere the least with handling and storage of cargo and will be as weatherproof as possible. These conditions preclude the use of ordinary sliding doors, and in the West 46th St. pier it was determined that some form of lift type should be adopted. The door finally decided upon, shown in one of the drawings, is made by the J. Edward Ogden Co., of New York City. The doors fill all of the openings between columns on both sides of the pier.

Contrary to the usual practice in pier doors, which are generally of wood or wood covered with sheet metal, these are of light structural steel framework covered with sheet metal, which makes them light and easy to operate, and very materially reduces the fire hazard. At the same time they are about as economical as the wooden doors. The doors fit snugly to the jambs and lintels and against a cast-iron weather stop at the deck of the pier, thereby making the openings virtually stormproof. They are in every way the most admirable type of door for pier shed requirements.

The whole design and construction of this pier and shed, including the mechanical equipment, has been carried out under R. A. C. Smith, commissioner of docks, by the writer, assisted by R. T. Betts, deputy chief engineer, and T. F. Keller, assistant engineer.

Seattle Water-Supply Improvement

In *Engineering News-Record* of Nov. 8, p. 901, it was stated that "the plans and specifications for the proposed extensions to the Cedar River Water system of Seattle will be completed under the direction of L. B. Youngs, superintendent of the water department, and sent to the Board of Public Works for approval." These plans and specifications are being prepared and the actual construction will be carried on by the city engineer's department, with T. H. Carver in direct charge as water-supply engineer.

A New Method of Constructing Difficult Foundations

Column Footing Was First Built on Group of Short Concrete Piles, and These Were Later Jacked Down to Desired Load Capacity

By Edmund Astley Prentis, Jr.
Underpinning Engineer for Smith, Hauser & MacIsaac, Inc., Contractors, New York City

DURING the construction of the subways of New York City, particularly in the skyscraper district of Manhattan, a great deal of underpinning has been done. Some of the problems that confronted the contractors, especially on William St., had never been met before but have now been successfully solved, as the subways have nearly all been completed with virtually

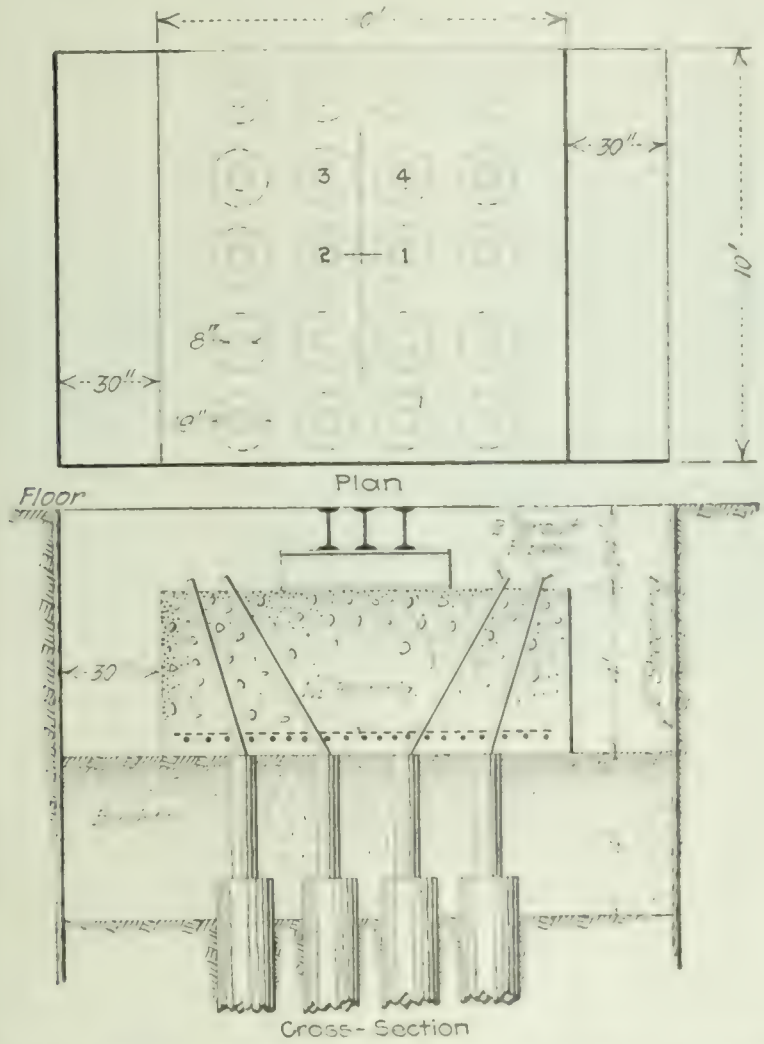


FIG. 1. COLUMN FOOTING IN FIRST STAGE. ULTIMATE CAPACITY TO BE 1000 TONS.

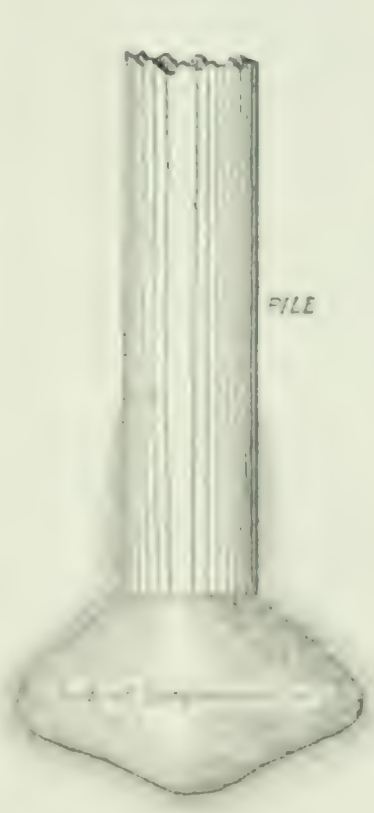
no damage to buildings. In doing this, many improvements have been introduced from time to time, as the engineers and contractors found occasion for them.

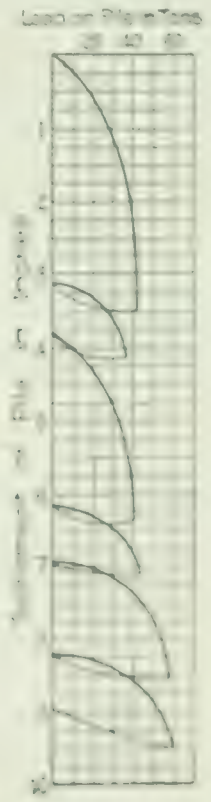
From experience in carrying on this work, a new method of constructing foundations for new buildings has been developed. The method may be said to consist of underpinning the building during its erection, so that the construction of the foundation goes hand in hand with that of the building itself. It is evident that with such a method a great saving in time can be obtained, where for instance caissons would be needed to carry the column loads. In other words, where there are heavy loads to be carried, with rock at such depth that short piles would not reach it, and a spread foundation is out of the question, this new method would supplant caissons.

When a caisson foundation is used, neighboring buildings are always disturbed by the action of the compressed air and by the loss of ground. Furthermore, the time needed is from six months to a year, depending on the depth to be reached and the magnitude of the work. Again, after the lapse of this time the caisson, capable of carrying say 1000 tons, is at first loaded with a steel column weighing only five or six tons, and the full load is not applied to the column support until after the lapse of eight months or a year more, or until the building is completed.

The foundations used in the method about to be described are designed in the usual way as pile foundations. A pile 19 in. in diameter, with a steel shell $\frac{7}{16}$ in. thick, filled with concrete, is allowed 50 tons by the New York building department, which allows 350 lb. per sq.in. on the concrete of the pile. The shells for the piles, in short sections, are driven a small distance into the ground, from 5 to 10 ft., by means of a hammer, and are cleaned out and concreted. Wooden blocks 3 or 4 ft. long are placed on top of the piles and the space around the blocks and the tops of the piles is backfilled with carefully tamped earth. A reinforced-concrete girder with the necessary grout pipes is then cast on this backfill and posts, thus supplying a prelminary support for the column loads. The footing so constructed is ready for the beginning of the construction of the building. (See sketch, Fig. 1.)

When the building has reached a height of three or four stories—of perhaps twenty to be built—the second stage of the construction proceeds. The column will





have perhaps 100 tons weight on it at this time, or if not a slight upward thrust would cause it to borrow load from adjacent columns. The weight of the column plus that of the girder (which weighs about 25 to 30 tons) is sufficient for jacking purposes.

Through the open trench on either side of the girder access can be had to the backfill, which is dug out sufficiently to allow access to pile No. 1. The block of wood which rests on it is removed, and a cast-iron cap 2 in. thick, 21 in. long and 15 in. wide is placed on top of the pile. A hydraulic jack 12 in. high with a ram 6 in. in diameter is placed on the plate and the jack reacting against the reinforced-concrete girder forces the pile into the ground, until a reaction of 75 tons is obtained, which is 50% more than the assigned load. If the pile settles so that its top is at the bottom of the pit, a new section of pile is added on and filled with concrete, whereupon the jacking or testing is done over again.

When the desired 75-ton reaction is obtained, the pile is wedged up by means of two 6-in. I-beams or their equivalent, one on each side of the jack, without releasing the load on the pile. When wedged up the jack is removed and the wedging I-beams are concreted in as well as the constricted space allows. Final contact is made by means of the grout pipes provided in advance through the girder.

The same operation is gone through for piles No. 2, No. 3, No. 4, etc., until all the piles have been tested, wedged and concreted in, and the foundation is finished by the time the building is completed. The same work is done of course for all the footings.

The method of wedging the piles is of fundamental importance, as this is the active means of supporting the building permanently. It is known from many tests that in many soils a cylindrical pile settling under load forms at its base a bulb of compressed soil, the shape of which has been proved to be as shown in the sketch, Fig. 2.

When the load is released, the pile rebounds slightly and the integrity of this bulb of pressure is impaired. Reapplying the load causes the pile to settle to a new and deeper level until this bulb of compressed soil is reformed. A pile settlement curve, of many hundreds observed, is shown in Fig. 3. The method of wedging described above, with the cap and ram, prevents the pile from rebounding when the ram is removed, maintains the bulb of compressed soil at the base of the pile, and actively puts the load on the two I-beams which were wedged in position on either side of the ram.

Two foundation contracts using this method (for which patents have been granted) are at present nearly completed on William St., New York, one for a 12-story and the other for a 20-story building. Smith, Hauser & MacIsaac, Inc., are the contractors and Lazarus White is their directing engineer.

Detroit Belt Driveway Completed

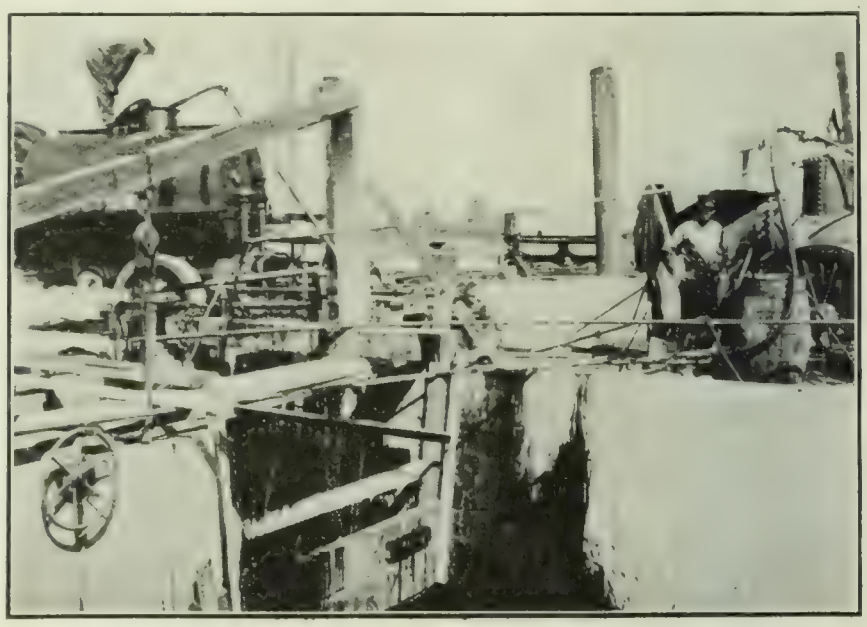
Opening of the outer-belt drive of the Wayne County concrete highway system was celebrated at Detroit, Oct. 11. This marked the completion of a continuous line of about 94 miles of hard road, skirting the boundaries of the county and intersecting the ten radial highways which center at Detroit.

Temporary Oil-Heating Plant Saves 40-Mile Truck Trip

By E. Earl Glass
Los Angeles County Road Department, Monrovia, Calif.

PENDING the installation of the heating and pumping machinery for its new 8-car capacity oil station for Division No. 1, the Los Angeles County (Calif.) Road Department is supplying road oil from this point by means of a makeshift outfit gathered principally from the scrap pile. The cost of erecting this plant was negligible except for the labor, and it has saved the oil-distributing trucks a 40-mile trip for their loads. The cost of operation is extremely low, being $3 for a fireman and $2 for fuel for an 8-hour day.

The scheme of operation is particularly simple. The railroad tank cars of 70% asphaltic oil are unloaded



PUMP IS SUSPENDED FROM BEAM IN HEATING CELL

by gravity to the middle compartment of the concrete pit shown in the illustration. A corner of this pit, measuring 6 x 8 ft., was partitioned off by planks and utilized as a heating cell. A steam coil, consisting of a grid of 1¼-in. pipe on 5-in. centers terminating in a large flat spiral, was laid on the bottom of this cell. The 5 x 8-in. steam pump was hung in the pit from a beam, and maintained just above the oil surface by a tackle and windlass. The suction projects down into the spiral coil mentioned above. The warm oil is pumped through a retort which is a coil of eight lengths of 2-in. pipe in a 24-in. steel casing laid on the ground, fitted with a stack, and heated by an oil burner. From here the hot oil goes to the loading riser. The valve on the end of the steam coil is left slightly open to maintain a circulation of live steam in the coils.

Steam for the coils, pump, retort burner and car-heating coils is furnished by a 24-hp. portable boiler. This outfit, simple as it is, can heat and load an 1100-gal. truck tank of 70% oil to 350° F. in 70 minutes, or if the temperature is raised to only 220° F., the operation can be completed in 50 minutes. A little trouble is experienced in handling natural asphaltic oils, as the water content causes considerable foaming over the coils and often in the truck tanks. This is particularly true, of course, at the lower temperature—the water being virtually all driven off at 350 degrees.

Manganese in the Water Supply of Pierre, South Dakota

Two-Inch Mains Badly Clogged - Aeration and Milk of Lime Treatments Prove Effective in Laboratory Tests

By J. W. Sale

First Assistant Chemist, Water Laboratory, Bureau of Chemistry, U. S. Department of Agriculture, Washington, D. C.

IN OCTOBER, 1916, the Board of Commissioners of Pierre, S. D., forwarded to the Bureau of Chemistry, U. S. Department of Agriculture, for examination a finely divided, black deposit which had been taken from a clogged water main of that city. A preliminary examination showed the material to consist chiefly of oxids of manganese. The deposition of manganese compounds in water mains has been reported so infrequently, especially in the United States (J. Am. Chem. Soc., Vol. 26, p. 714, 1904; Proc. Ill. W. S. Assoc., p. 210, 1912, ibid, p. 81, 1913) that the results of the examination of such a deposit, the composition of the water supply, and the consideration of methods for removing the manganese from the water, are of general scientific interest.

The results of a complete examination of the black deposit from Pierre, S. D., are set forth in Table I.

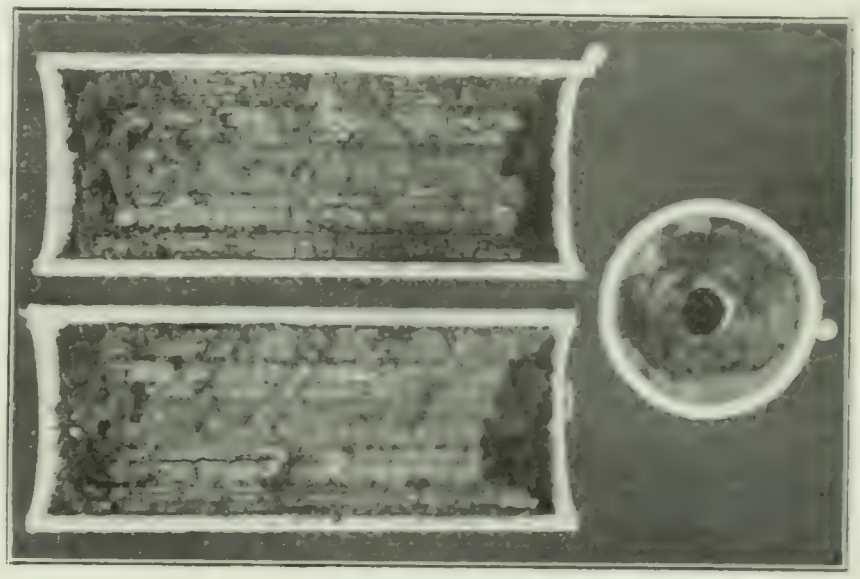
TABLE I. COMPOSITION OF DEPOSIT IN WATER MAINS AT PIERRE, S. D. (DRIED AT 100° C.)

	Per Cent
Silica (SiO_2)	8.38
Manganese dioxid (MnO_2)	58.68
Manganous oxid (MnO)	11.43
Ferric oxid (Fe_2O_3)	1.25
Alumina (Al_2O_3)	1.95
Calcium oxid (CaO)	3.64
Magnesium oxid (MgO)	0.40
Barium oxid (BaO)	0.72
Carbon dioxid (CO_2)	2.26
Sulphur trioxid (SO_3)	2.24
Chlorin (Cl) ..	0.02
Water (H_2O)	9.25
	100.22

Available oxygen 10.8%; phosphorus pentoxid (P_2O_5) 0.00; sodium and potassium, trace; plant tissue, absent; sulphur trioxid (SO_3) calculated.

The chief source of supply is a large open well, about 50 ft. in diameter and 50 ft. deep, situated about 150 yd. from the channel of the Missouri River. In the ordinary water stage the well contains from 12 to 15 ft. of water. The water is pumped 1.8 miles to a reservoir which holds 500,000 gal. This reservoir is thoroughly cleaned twice a year, about $\frac{1}{4}$ in. of black deposit being removed at each cleaning. During the summer months the consumption of water is about 1,000,000 gal. a day, the daily average for the year being about 700,000 gal. No clogging of the mains has occurred at any points far removed from the line which leads from the well to the reservoir, virtually all of the trouble being found in service pipes which lead directly off of this main, and the closer to the well, the more trouble. These pipes close up in from one to four or five years where the trouble is most acute, so that it becomes necessary to re-lay the mains at frequent intervals in order to obtain an adequate supply of water. It has been the custom to scatter a barrel of lime in the well about once in every two months to destroy a vegetable growth which springs up in the summer months.

In November, 1916, a specimen of clogged pipe, 2 in. in diameter, was obtained. The pipe, which was taken from the cooling system of one of the engines at the pumping plant, was almost closed with the manganese deposit, as shown in the photograph, the opening for the passage of water being only $\frac{1}{2}$ in. in diameter. The pipe had been in use only six years. It was not injured by corrosion and, if cleaned out, would have given many more years of service. There were no tuberculations.



CROSS-SECTION AND TRANSVERSE SECTION OF TWO-INCH WATER-SUPPLY PIPE CLOGGED WITH OXIDS OF MANGANESE

Representative samples of the city water-supply were collected in November, 1916, and April, 1917. The analyses are contained in Table II.

These analyses showed that the total amounts of dissolved mineral constituents in the samples from different parts of the system varied considerably. This is, perhaps, not surprising in view of the location of the well close to the channel of the Missouri River. The content of manganese in the well water remains fairly constant. The unusual character of the water with regard to content of manganese and iron is shown also, the source of

TABLE II. VARIATION IN COMPOSITION OF WATER SUPPLY AT PIERRE, SOUTH DAKOTA

(Results stated in parts per million)

	[illegible]	W[illegible]		[illegible]	[illegible]	[illegible]	[illegible]
Date collected	[illegible]	4-6-17	4-26-17	[illegible]	[illegible]	[illegible]	[illegible]
Silica (SiO_2)	23.0			24.8			
Sulphate (SO_4)	168.7			[illegible]	140.4		
Bicarbonate (HCO_3)	210.[illegible]	241.[illegible]	265.4	[illegible]	[illegible]	[illegible]	[illegible]
Nitrate (NO_3)	0.0			[illegible]	0.0		
Nitrite (NO_2)	[illegible]			0.0	[illegible]		
Chlorin (Cl)	35.0	40.0	77.0	[illegible]	79.0	100.0	[illegible]
Iron (Fe)	[illegible]	[illegible]	.07	[illegible]	[illegible]	[illegible]	[illegible]
Manganese (Mn)	[illegible]	7.42	[illegible]	[illegible]	[illegible]	0.0	[illegible]
Calcium (Ca)	60.[illegible]			74.[illegible]	[illegible]		
Strontium (Sr)	[illegible]			[illegible]	[illegible]		
Magnesium (Mg)	[illegible]			[illegible]	[illegible]		
Potassium (K)	[illegible]			[illegible]	[illegible]		
Sodium (Na)	61.0			[illegible]	94.8		
Oxygen required			2.8				
Dissolved oxygen			[illegible]				[illegible]
Free carbon dioxid	16.0		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total dissolved mineral matter	574.7	[illegible]	634.[illegible]	[illegible]	510.4	[illegible]	[illegible]

* The precipitate which separated [illegible]

** No weighable amount to [illegible]

supply containing 2.3 mg. per liter of manganese and only a trace of iron. Usually water containing iron and manganese contains more iron than manganese.

The content of iron and manganese of a number of water supplies in the United States is given for purposes of comparison in Table III.

TABLE III. AMOUNTS OF IRON AND MANGANESE IN CERTAIN DOMESTIC WATER SUPPLIES

Water Supply	Milligrams per Liter Iron	Manganese
[illegible], Mass.	0.73	0.23
[illegible], Mass.	0.60	0.26
[illegible], Mass.	1.49	0.75
[illegible], Mass.	1.21	0.004 to 0.56
[illegible], Mass.	1.05 to 2.02	2.10 to 3.28
[illegible], Mass.	0.14	1.39
[illegible], Mass.		0.07
[illegible], N. Y.		0.37
[illegible], N. Y.		0.30
[illegible], N. Y.		0.20
[illegible], N. Y.		0.12
[illegible], Wis.	1.7	0.58 to 0.64
Mt. Vernon, Ill.	0.6 to 0.8	1.15
Mt. Vernon, Ill.	1.6	1.16
[illegible], Kan.	17.00	2.3 to 3.0
Pierre, S. D.	0.07	

It was noticed that the three samples of water collected Nov. 16, 1916, deposited a sediment on standing. Reëxamination of the supernatant water showed a marked reduction in the content of manganese after intervals of six weeks and 24 weeks (see Table IV).

TABLE IV. REDUCTION IN CONTENT OF MANGANESE IN WATER SUPPLY OF PIERRE, S. D., ON STANDING

Description of Sample	Milligrams per Liter Well	Reservoir	Indian School
[illegible] when received	2.3	0.3	0.5
[illegible] 6 weeks later	0.10	0.06	0.04
Manganese content 24 weeks later	0.03		

Since the water drawn at the city taps must necessarily pass through mains partially filled with the manganese deposit, a test was made to ascertain if the material was likely to be redissolved. It seemed probable that if there was any solution of the material it would be caused by a fresh supply of water with a high content of carbon dioxid. Therefore, a tablespoonful of the manganese deposit was placed in a champagne bottle which was then filled with Pierre well water (collected Nov. 6, 1916, and containing at the time of the experiment 0.03 mg. per liter of manganese and 0.02 mg. per liter of iron). The mixture was carbonated under pressure by means of a special apparatus devised by Dr. H. E. Patten, of the Bureau of Chemistry, and allowed to stand four days with frequent mixing. The pressure was then found to be 40 lb. per sq.in. The mixture was quickly filtered, using suction and the content of manganese and iron determined in an aliquot portion of the filtrate. The filtrate contained 0.62 mg. per liter of manganese and 0.05 mg. per liter of iron, showing the deposit to be practically insoluble even under the extreme conditions outlined above.

A portion of the filtrate obtained above was aërated for several hours by bubbling, allowed to stand 48 hours and quickly filtered, using suction. It was found to contain 0.11 mg. per liter of manganese.

A review of the methods for the removal of iron and manganese from water-supply has been issued recently by the University of Kansas (*Bulletin*, Vol. 17, No. 8, 1916, p. 24). The reader is referred to this publication for a description of the processes used in Germany and in the United States.

It is well known that manganese in water-supply cannot be removed always by the same treatment. The investigation included, therefore, some laboratory experiments on the removal of manganese from the Pierre water-supply. Knowing from the results given in Table IV that the content of manganese in the well water was greatly reduced on standing six weeks, some experiments were made on the sample of well water collected Apr. 26, 1917, with a view to the rapid removal of the manganese.

Several 500 c.c. portions of the sample were treated in different ways. One portion was aërated by bubbling; another portion was aërated by bubbling in the presence of a quantity of the manganese deposit; and other portions were treated with lime water. The details of these tests are given in Table V.

TABLE V. LABORATORY EXPERIMENTS ON REMOVING MANGANESE FROM PIERRE WATER-SUPPLY

	Milligrams per Liter of Manganese	Percentage Removable Manganese
Raw water (collected April 26, 1917)	3.00	
Raw water (containing 3.00 milligrams manganese per liter at time of test) aerated several hours by bubbling, allowed to stand over night and filtered	2.83	5.7
Raw water (containing 3.00 milligrams manganese per liter at time of test), aerated several hours by bubbling in presence of manganese deposit, allowed to stand over night and filtered	0.12	96.0
Raw water (containing 3.00 milligrams manganese per liter) after standing May 2 to 7, 1917	1.60	46.7
Raw water (containing 1.6 milligrams manganese per liter at time of test) treated with lime water at rate of 253 milligrams CaO per liter, mixed, allowed to stand ½ hour and filtered	0.02	98.8
Raw water (containing 3.00 milligrams manganese per liter), after standing May 2 to 10, 1917	1.10	63.3
Raw water (containing 1.1 milligrams per liter manganese at time of test), treated with lime water at rate of 63 milligrams CaO per liter, mixed, allowed to stand ½ hour and filtered	0.20	81.8

The results given in Table V indicate the raw water cannot be freed from manganese by plain aëration or by storing except for an inordinately long time. However, aëration in the presence of the oxids of manganese or treatment with lime water are very effective in precipitating the manganese.

Summary and Conclusions

The deposit which clogs up the water mains at Pierre, S. D., consists chiefly of oxids of manganese. The city water-supply contains manganese and iron in the unusual proportions of 2.3 to 3.0 mg. per liter of manganese and .07 mg. per liter of iron. The solvent effect on the manganese deposit of carbon dioxid mixed with the raw water under pressure amounted to only 0.62 and 0.05 mg. per liter of manganese and iron respectively.

Laboratory tests indicate the manganese in the water-supply can be largely removed by aërating in the presence of the manganese deposit and filtering or by treating with milk of lime and filtering. A high percentage removal of the manganese (68 to 97) is being obtained by deposition in the water mains near the well and in the reservoir. In view of this fact, the chief purpose of installing a small demanganization plant would seem to be to obviate the expense of re-laying or cleaning out at intervals the mains in the vicinity of the well. A consideration of the expenditure which would be involved in installing and maintaining such a plant is an engineering problem which does not lie within the scope of this paper.

Building Activity in San Francisco

Since May, 1906, the year of the great fire in San Francisco, to September, 1917, the Board of Public Works of the city has issued 71,745 building permits. The cost of the work carried on under these permits is estimated at $309,874,235. These figures given include only a portion of the work done on the Panama-Pacific International Exposition.

Reinforced-Concrete Building Has 2000-Pound Floor Load

Steel Storage Requires Thick Slab and Small Panels for Heaviest Load—Beam-and-Girder Type for Main Area

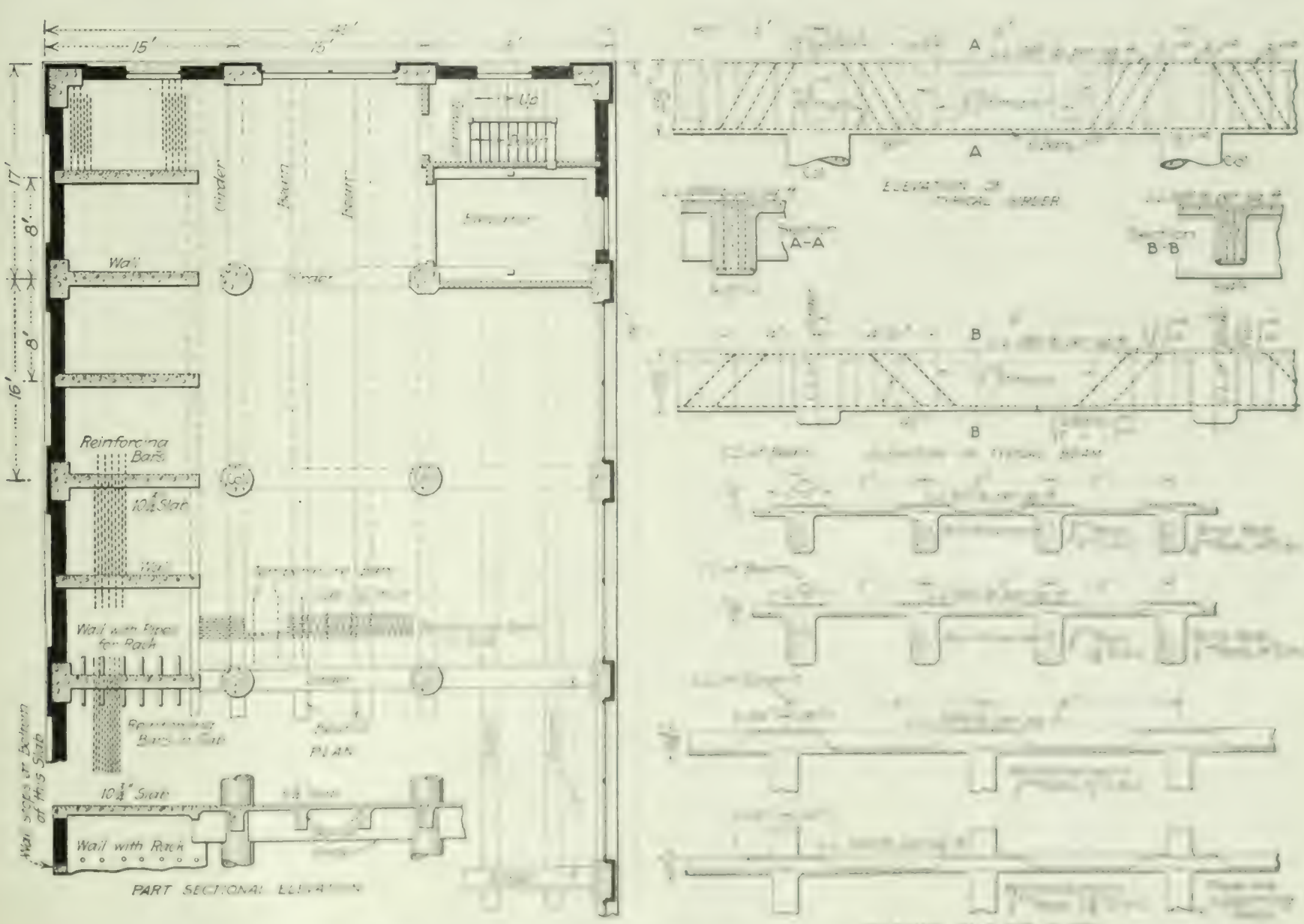
FLOOR loads of 1000 and 2000 lb. per sq.ft. as a maximum and 600 lb. as a minimum are an unusual condition provided for in the design of a warehouse and factory building now being erected in Chicago. These exceptionally heavy loads are due to the storage of steel plates and bars, while the lighter load is to provide for the reaction due to the operation of large punch presses. The building is approximately 45 x 75 ft., with five stories and basement.

The heaviest loading will be for a width of 12 ft. along one side of the second story, where steel bars will be stored. This portion of the floor, about 33% of the floor area, is designed for a load of 2000 lb. per sq.ft. Support is provided by 12 in. concrete partition walls which are built on the foundation girders and extend to the bottom of the heavily loaded portion of the second-story slab.

In the basement and first story these walls are utilized to support racks for the storage of steel rods. The racks are composed of rows of heavy pipes embedded in the walls and projecting 18 in. on either side. The remaining 67% of the second story and the entire area of the first story are designed for a load of 1000 lb. per sq.ft. The three upper floors are designed for 600 lb. per sq.ft. The foundation is a concrete slab laid directly upon the clay, and surmounted by girders running in both directions, as described in *Engineering News-Record* of Nov. 1, p. 826.

The interior columns are located at the intersections of these foundation girders. They are of circular section with the exception of one which is octagonal. Their outside diameter is from 27 to 32 in. in the basement, diminishing to 14 in. in the top story. The reinforcement consists of vertical bars, which number from six to 21 in the lower sections, according to the column loads. These bars are supplemented by spiral wire coils in the interior columns and by horizontal ties in the rectangular or wall columns. The bars are kept 1½ in. from the face of the concrete. The column spacing gives panels 15 x 16 ft. and 15 x 17 feet.

Special floor construction is required for those side portions which are to carry the heaviest loads. Here the slabs are made very heavy and the panels are subdivided into sections 8 x 15 ft. by the supporting 12-in. walls noted above. For the second-story portion carrying 2000-lb. load the slab is 10¾ in. deep, and is reinforced with ½-in. round bars spaced 2½ in. on centers. For the corresponding portion of the first floor, where the load is 1000 lb. per sq.ft., the slab is 8 in. thick, with similar bars at 3¾ in. spacing. In the rear end panel, however, the bar spacing is reduced to 2¼ in. and 3 in., respectively. All these rods run lengthwise of the building, or across the interior supporting walls.



PLAN OF REINFORCED-CONCRETE BUILDING HAVING FLOOR LOADS OF 2000 POUNDS AND 1000 POUNDS PER SQUARE FOOT—TYPICAL REINFORCEMENT OF GIRDERS, BEAMS AND SLABS FOR HEAVILY LOADED FLOORS

The floor design in the main area of these two stories and the entire area of the upper stories is of the beam-and-girder type. The girders extend between the columns, and each panel is subdivided by two beams extending in the direction of the greater length of the panel. The girders of the first and second floors are mainly 21 x 35½ ft., with beams 14 x 29½ ft. On the upper stories the girders are 16 x 31 in. and 14 x 28 in., with beams 12 x 23 inches.

The panel width being 15 ft. and the heavily loaded portion on one side only 12 ft. wide, the cross girders extend beyond the columns to cover this gap. The ends of these girders are built into the cross walls, and are connected by a small beam forming the edge of the thicker portion of the floor slab.

Over the beam-and-girder floor construction the slab thickness is 5½ in. on the first two stories and 4½ in. on the upper stories. The reinforcing bars in these slabs are laid transversely of the building, or across the beams and at right angles to the bars in the heavily loaded side slabs supported by cross walls. In the 5½-in. slabs there are ⅝-in. rods with 3¾ in. spacing. Across these, or lengthwise of the building, are ½-in. temperature bars spaced 24 in. center to center.

The beams and girders have straight bars, bent bars and stirrups. All the slab bars are bent to obtain cantilever action. The bending aids also in resisting the shearing stresses, thereby reducing the number of stirrups, so that in several cases these are entirely omitted. Deformed bars are used throughout.

Two grades of concrete are used for the columns, with a mix of 1:1:2 and 1:2:4. The richer mix provides for higher core stresses, in that section of the column inside of vertical bars, with proportionally reduced sectional area. The 1:2:4 mix is employed for the foundation slab, floors and roof.

Assumed Stresses

The stresses assumed for the 1:2:4 concrete are as follows: In compression, 400 lb. per sq.in. for direct load, and 700 lb. for bending. In shear, 120 lb. for direct shear and 40 lb. for diagonal tension. For reinforcing steel the stress is taken as 18,000 lb. per sq.in. for tension, 10,500 lb. for compression, and 12,000 lb. for shear. Its bond stress is taken as 100 lb. per square inch.

Heavy trucking will be done on the first and second floors, and here the surface of the slabs will be treated with "Vitrifyx." The upper floors will have 1⅝-in. maple flooring on sleepers embedded in a cinder fill over the slab. The roof will have a 3-in. slab, over which will be a cinder fill, sloped to drainage planes and covered with 1½ in. of cinder concrete. The exterior walls are of brick and have large window areas fitted with steel sash and wire glass.

The concrete for the foundation was placed by means of a spouting system which worked very satisfactorily, more than 27.5 cu.yd. being poured in each 8-hour day. This was accomplished in the face of unfavorable conditions due to congestion caused by the presence of old buildings, storage of contractor's material, and continual receiving and shipping of freight by the manufacturing plant.

A tunnel for trucking between this building and two of the old portions of the plant is a feature of the improvements. This is about 130 ft. long, extending under a yard, a building and a public alley. It is of rectangular section, 6 ft. 6 in. wide and 6 ft. 4 in. high in the clear. It has 12-in. walls and 5-in. floor and roof, except that under the alley the roof is increased to 8-in. to provide for the wheel loads of large motor trucks. This tunnel serves also for coal delivery to the power plant, as it connects three large vaults having an aggregate storage capacity of 1000 tons.

Fireproof private garages for the use of the officers of the company form another part of the improvement. These are of vitrified face brick and have roofs of concrete slab-and-joist construction with tile filling between the joists.

This building is being constructed for the Felt & Tarrant Mfg. Co. The architects are L. G. Hallberg & Co., and they also prepared the structural design. The Mueller Construction Co. has the contract for the work.

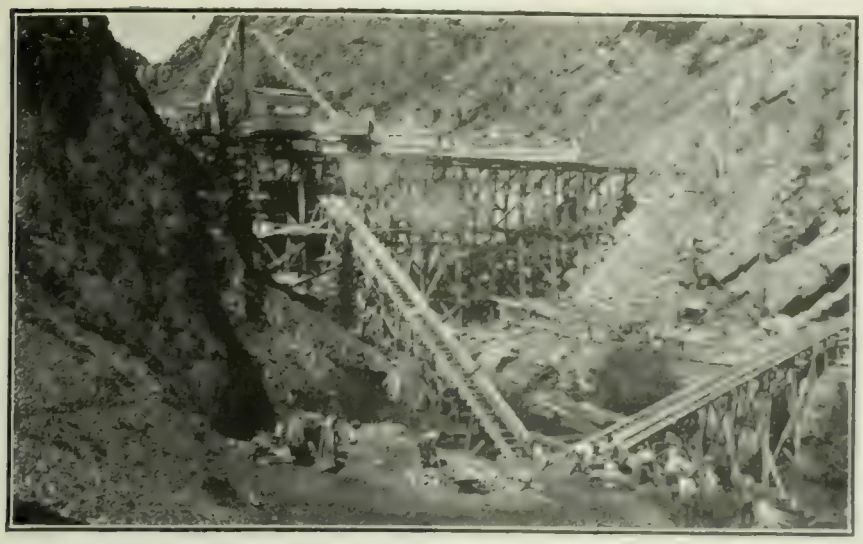
Arch Dam of Sharpest Radius Nears Completion

Motor Trucks Haul Materials 7 Miles to Dam Site on Cimarron River, New Mexico, at Mile-High Elevation

ONE of the shortest radius arch dams for its height yet built is nearing completion on the Cimarron River, New Mexico. The Eagles Nest dam is 140 ft. high, 30 ft. of which is below the river bed, and has a radius of 155 ft. It is 8 ft. wide at the top and 46 ft. at the base. It drains the Moreno Valley in Colfax County at a point where a red granite and porphyry dike, forming a prehistoric lake, has been cut through. The cañon therefore is narrow, 40 ft. at the base of the dam and 300 ft. at the crest. The project is to impound 80,000 acre-feet in the remade lake to irrigate 30,000 acres of the 400,000-acre Charles Springer cattle range.

As the dam is 6000 ft. above sea level, the season is short and construction must be carried on from April to October inclusive. However, work in cleaning and concreting the foundation progressed well into the winter last year, a house heated by steam pipes being built over the excavation. Only small dynamite charges were feasible because the river was carried through the house in a flume suspended from cables to give an unobstructed space below it.

Concrete is prepared in a central plant located at the downstream toe, below a crushing and screening outnt. The mixture of sand and gravel is hauled by motor truck from a point ⅝-mile downstream and dumped onto a grizzly shown in the foreground of the photograph. The finer materials are elevated to the screen and crusher outfit under the trestle. The conveyor crossing the stream brings material from the spillway excavation. The car on the track shown on the opposite bank carries rock plums, for embedding in the dam. At the trestle, these rocks are picked up by the traveling derrick. This derrick has a 65-ft. boom and is used also to lift the concrete buckets to the forms, from a track along the base of the dam.



TRAVELING DERRICK ON TRESTLE BELOW DAM HANDLES CONCRETE FROM MIXER TO FORMS

The spillway at the north end is in a granite saddle of the rock. It will have a length of 50 ft. and a depth below crest of 7 ft., giving, with 1 ft. freeboard, a capacity of 350 sec.-ft., which is in excess of the maximum flood recorded. The outlet tunnel through the rock at the south end has four inlets, at different elevations, leading into the gate-control shaft.

Two 5-ton White trucks, supplemented by teams, have done the local hauling and also that from the railway station at Ute Pass, 9 miles distant. Three or four trips a day are made over the road built for the purpose. This road is of disintegrated granite. A trip can be made in 2¾ hours. The high altitude cuts the gasoline mileage down to three or four per gallon. Only 20 to 30 trips would be possible with iron tires but the hard Goodyear rubber tires stand 2500 miles service, although gravel pit use cuts them out faster.

Work was pushed rapidly on the dam to complete as much of it as possible this year. Labor was scarce and hard to hold. The construction of the 6-mile unlined canal, which begins at the Cinvalco diversion works at the mouth of the cañon, 27 miles below the dam, is only 25% completed, because all available forces were diverted to the dam.

Bartlett & Ranney, San Antonio, Tex., are the consulting and supervising engineers, Willis Ranney being in direct charge. Neil Hansen is the superintendent of construction, which is handled by day-labor forces.

Foaming of Dallas Imhoff Tanks

By Charles Saville and R. H. Gould
Director of Sanitation, Health Department, Dallas, Tex. Of Staff of James H. Fuertes, Consulting Engineer, New York

THE Imhoff sewage clarification tanks at Dallas, Tex., were placed in operation early in January, 1917, and within a few weeks the gas formation in the sludge chambers of some of the tanks was so active, and the partly digested sludge so sticky, that foaming became very noticeable. Large amounts of the light gaseous sludge overflowed the walls of the sludge chambers into the settling chambers. The foaming was continuous in some of the tanks for days at a time.

It was noticeable that the foaming started first in the tanks at the upstream end of the inflow channel, which extends across the inlet ends of three tanks. There are four batteries of three tanks each in the Dallas plant all designed for horizontal flow at right angles to the direction of flow in the inflow channels.

The active foaming of the sludge chambers continued off and on for about three months and then gradually decreased, but even at the present time (Nov. 7), nine months after the tanks were first used, some foaming is still going on.

The only important result of the foaming, however, has been its effect on the appearance of the tanks. The tank effluent has been well clarified and the digested sludge removed from the bottoms of the sludge chambers, even as early as two months after starting the plant, has been inoffensive, and now dries readily to a spadeable condition in less than a week. The farmers are beginning to haul it away for fertilizer.

The most economical method of handling the foaming sludge which spilled over onto the surface of the sewage in the settling chambers was allowing it to stiffen for a day and then using a water spray to drive out the entrained gas, after which it would sink and pass through the slots into the sludge chambers.

Numerous schemes were tried out at various times to stop or lessen the foaming, and they afforded more or less temporary relief, but no certain remedy was found. These included (1) stirring up the deposits in the sludge chamber by means of the pressure water pipes; (2) stirring up and spraying the floating sludge in the sludge chambers; (3) withdrawing some of the partly digested sludge through the sludge pipes; and (4) resting the tanks at intervals, by shutting off the sewage.

The foaming of the Dallas Imhoff tanks is not due, so far as is known, to any special characteristic of the sewage, which is slightly septic when it reaches the plant, but otherwise is normal for a southern residential community of 140,000 inhabitants.

It may be said, however, that the tendency of some Imhoff tanks to foam, during the so-called "ripening period" in the early months of their operation, should encourage more careful attention to those fine points of design which will lessen the possible difficulties of operation during this period. Among other things, it is suggested that in some of the tanks that have been constructed in America during the past five years the capacity of the sludge chamber lying above the slots has been too small in comparison with that of the sludge chamber lying below the slots. For best results it is also desirable that the sludge chamber shall not be too crowded with pipes and partition walls, and that the area of the water surface shall be the proper size. This is more important than that the walls of the sludge chamber should extend far above the water surface. Footways or working platforms should preferably be carried around rather than across the sludge chamber opening.

Utilize Farm Machinery on Road Work

Sand may be applied to a clay road by means of a grain drill, and clay may be applied to sand roads by means of a manure spreader, while a spike-tooth harrow may be used to remove grass and weeds from a newly-graded road or to smooth the roadway in much the same way as with a road-drag. The Missouri State Highway Department suggests these methods to the farmers as means of helping in local improvement of byways as well as of highways.

Highway Department Organized in Texas To Spend $9,000,000

Office System Devised for Handling of Motor-Vehicle License Fees, Which Will Be Spent on Roads

ALTHOUGH the Texas Highway Department was not organized until July, it has issued licenses to 200,000 automobile owners, collected $750,000 for one-half year's fees therefor, laid out a tentative state road system of 5000 miles, organized an active engineering department, and issued a manual of instructions. This manual includes details of making county road maps and bridge plans, and a system of numbering bridges and culverts.



MAP OF 26 THROUGH ROUTES ADOPTED AS STATE HIGHWAYS IN TEXAS—SYSTEM IS DIVIDED INTO SIX DISTRICTS

The state-road system laid out by the department, as shown on the accompanying map, includes 26 different routes aggregating 5000 miles. This map shows also the six districts into which the system is divided for supervision of the construction work.

The organization of the department consists of two bureaus—engineering and registration. At the head of the former is the state highway engineer, George A. Duren. The latter is headed by the secretary of the department, D. E. Colp.

Engineering Organization Not Yet Complete

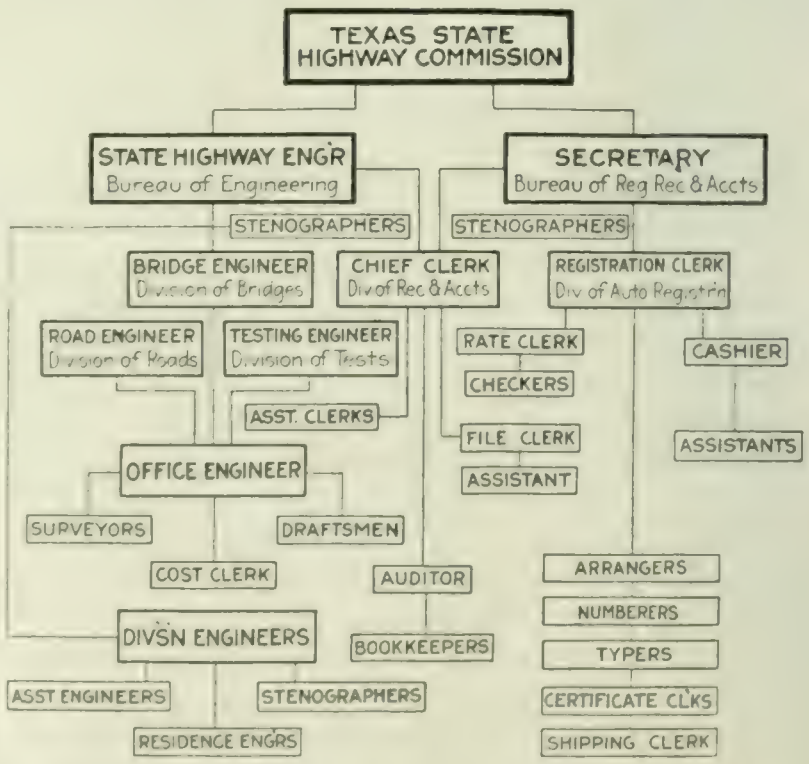
The engineering bureau is beginning already to get in touch with the county officials and engineers. The accompanying organization chart shows that this bureau has three divisions: Roads, bridges and tests. The first undertakes the solution of road construction and maintenance problems. The second division designs the bridges and supervises their construction. The third division handles the testing of all materials entering into both roads and bridges. The central engineering office is in charge of an office engineer, Julian Montgomery, who handles also the assignment of surveyors and draftsmen.

For the inspection of construction the state is divided into six divisions, with a division engineer in charge of each. Only one man has as yet been appointed, M. C. Wellborn, formerly city engineer of Austin, but the staff will be completed as the activities of the counties increase and their applications for aid are entered. In many cases personal contact by the division engineer or other official is all that is necessary to start the county officials on a construction program. Resident engineers under the division engineers will probably not be appointed for a time, as the duties may be assigned to the county engineer as long as he reports to and is accountable to the state highway department. It is his duty to prepare a county map and to make location surveys, plans, profiles and estimates of costs.

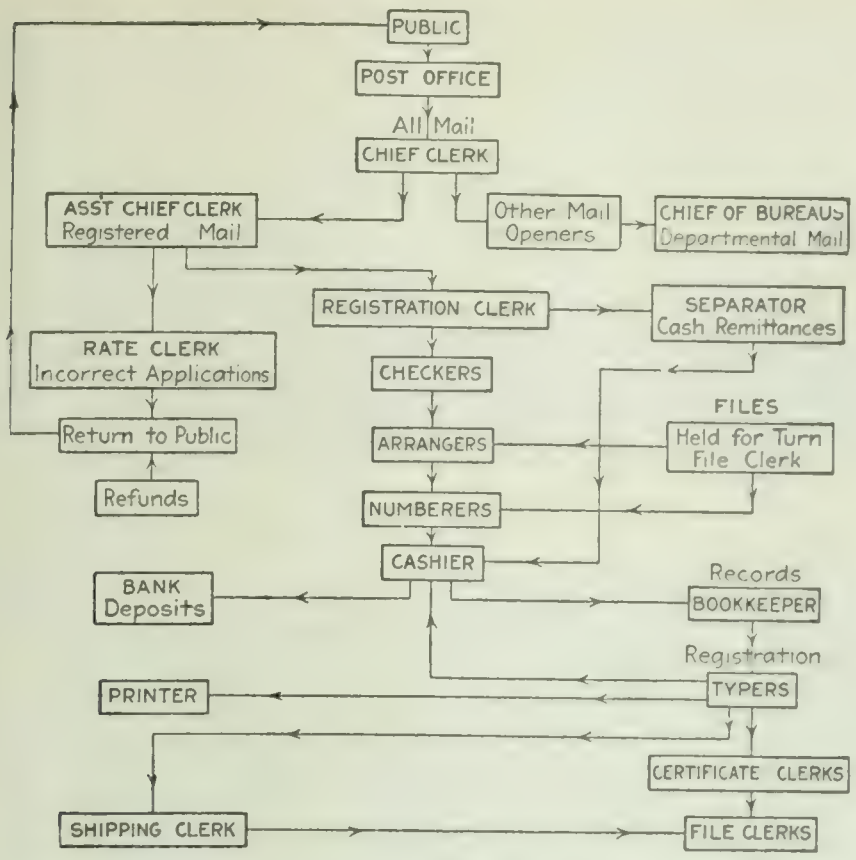
Construction Program is Large

Some idea of the aggregate magnitude of the work may be gathered from the program of the bureau of engineering, which is planning for an expenditure of $9,000,000 in five years. Of this amount the Federal Government will supply $4,515,750. The state's share of the $9,000,000 will be provided entirely from the licensing of automobiles and other motor vehicles. The license fees are 35c. per horsepower for automobiles, and range as follows for commercial trucks: $20 for a carrying capacity of ½ to 1 ton per wheel; $40 for 1 to 2 tons; $60 for 2 to 3 tons; $150 for 3 to 4 tons; and $300 for 4 to 5 tons. Above 5 tons per wheel an additional $500 will be charged for each 1000-lb. increase. No load greater than 800 lb. per inch width of tire per wheel will be permitted, and no vehicle having a total gross weight of more than 14 tons will be licensed.

Collection of the license money, 50% of which must be returned to the counties, was the first and immediate work of the department. For this purpose a large group of clerks had to be employed, numbering 60 at the time, as the rate of handling when fully organized reached 3500 applications daily. The procedure followed in the registration of the applications and fees is shown in the second of the accompanying charts.



ORGANIZATION CHART OF THE TEXAS HIGHWAY DEPARTMENT



PRESENT ORGANIZATION FOR REGISTRATION OF LICENSES IN TEXAS HIGHWAY DEPARTMENT

Analysis of this organization by an engineering economist, A. L. Luedke, of the U. S. Office of Public Roads, indicated that there was too much diffusion of responsibility and money, but in the main the scheme of organization was satisfactory. He established simple checks on the existing system and made suggestions for handling next year's work. These are outlined in the third chart. The principal changes relate to the new positions of the separators and the cashier. By this method, if adopted, the former will handle the cash remittances direct to the cashier and the latter will receive cash and other remittances before they go to the arrangers.

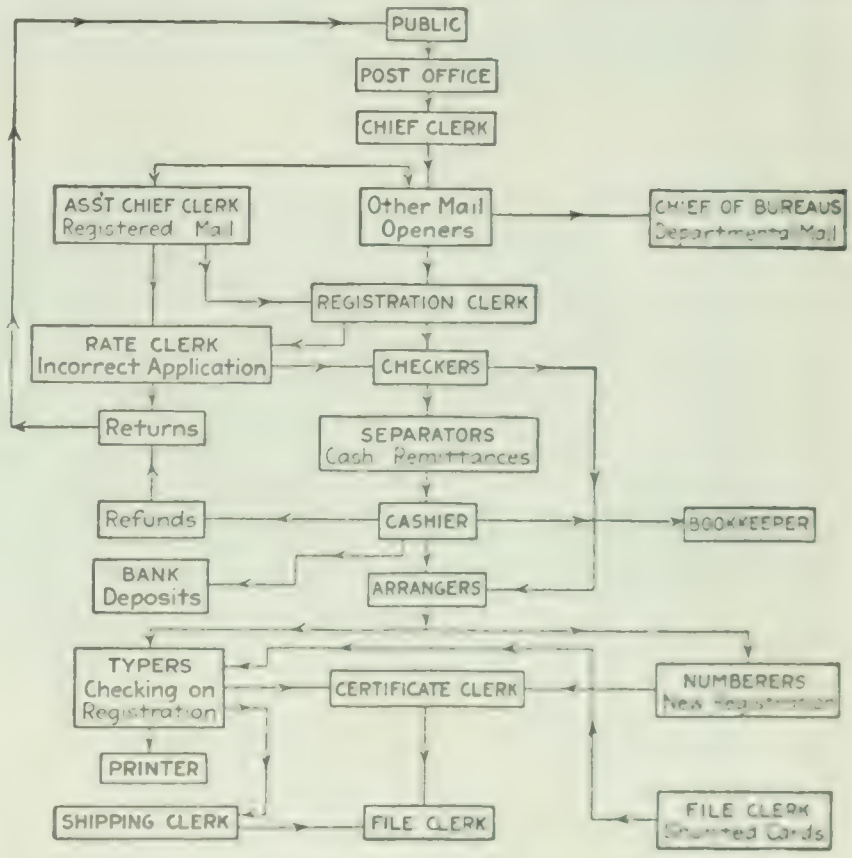
To reduce the work of the office force it is planned to have the applicant virtually make up the office records. For this purpose the registration cards, 4¼ x 10 in., will be so printed as to allow for cutting into four parts for different uses, as follows: A dummy remittance card, giving information as to car and owner; an index card, to be used to check against the old registration typewritten sheet so as to correct registration of previous year or to note transfer of ownership; an index card by name, to check up present index by name; and fourth, a certificate to be returned to the owner when registered. The certificate will be designed so that it is necessary only to place a stamp on back of card and mail to owner, the address having been written by the applicant.

Under the old plan, an average of 500 certificates could be issued per day per clerk, requiring 500 working days for a total registration of 250,000 expected next year. By the proposed plan, the saving will be about $600, allowing $400 for the handling of the mail and sorting of the certificates. It is estimated that with the method of stamping the original record the number of typists can easily be reduced from 14 to 6, for it is not considered necessary to retype the original list each year.

Even this year, when everything was new, some economies were effected as, for example, in the method of typing the registration list. Ten registrations are put on a sheet of letter-size paper in two rows, the digits 1 to 0 always appearing in the same relative positions. A face copy and four carbons are made for use as follows: The face copies are bound up in book form for file. The first carbon provides a label address to be pasted on the envelope returning the registration card and metal seal. This work is done by contract at 50c. per 1000. No. 2 carbons are bound up in loose-leaf books and go to the state printer to make up a directory for the use of county clerks and chiefs of police.

No. 3 carbon is used first to make up a shipping list for numbers, which are shipped not to individuals, but in lots to some garage owner, road enthusiast, or official in the town. To the distributor is sent his quota of names from the No. 3 carbons. The last carbon, No. 4, is a general utility list and may be segregated according to type of car or engine numbers for quick reference in case of stolen vehicles.

Another economy was in the sending out of the round pressed metal seals and registration cards as first-class



PROPOSED ORGANIZATION FOR REGISTRATION OF LICENSES

mail. The total weight came so near the 2-cent limit that a sheet of instructions, even on the thinnest paper, could not be added. These instructions were therefore stamped on the back of the envelope. Motorists are to retain old numbers but must have new seals each year.

The personnel of the commission, appointed by the governor, is Curtis Hancock, chairman; Thomas R. McLean and H. C. Odle.

Speeding Up Ship Program

With the coöperation of the lumber industry, the Emergency Fleet Corporation's program is being speeded up. It is said that within a short time a ship a day will be put in the water by the United States at yards along the Atlantic and Gulf coasts, in addition to almost as many wooden vessels now being built for private interests. The Pacific coast will also contribute about 200 standard type wooden steamers.



AUG. 7. WALLS BEGUN—AUG. 14. WALLS FINISHED, ROOF IN PROGRESS—SEPT. 4, BUILDING COMPLETED

Machine Shop Is Erected in 40 Days

ERECTION of a machine shop 132 x 432 ft. in 40 days has been accomplished at the plant of the Minneapolis Steel & Machinery Co. in order to facilitate its work on munition contracts for the U. S. Government. The building is mainly one story high, with six second-story bays. It has concrete footings, brick walls and steel interior columns. I-beam roof girders support wood joists and sheathing covered with felt and asphaltum roofing. About half of the floor is of 6-in. concrete, the balance having creosoted wood blocks on a concrete base. Steel sash is used for the windows in the main walls and the transverse clerestory roofs of the second-story bays. The quantities were about 300,000 brick, 1500 yd. of concrete, 175 tons of structural steel, and 400,000 ft. b.m. of lumber.

Placing of 1500 yd. of fill was begun July 25. On Aug. 7 the concrete foundation and floor had been placed, and bricklayers were at work on the walls. The walls were completed for the main floor by Aug. 14. On Aug. 28 the second-story bays and roof were completed, and the steel sash was being placed. The building was completed ready for painting Sept. 4, at which time part of the machinery had been installed.

Light hand derricks were used in the erection of the roof framing. The force during the different stages of the work averaged 50 men for concreting, 30 bricklayers, 25 men erecting the steel, 50 on the roofing, and 10 on the steel sash. The building was designed and erected under the direction of J. B. Gilman, chief engineer, and A. M. Burch, construction engineer for the company. The work was done by day labor.

Typhoid Data in Ten Largest Cities

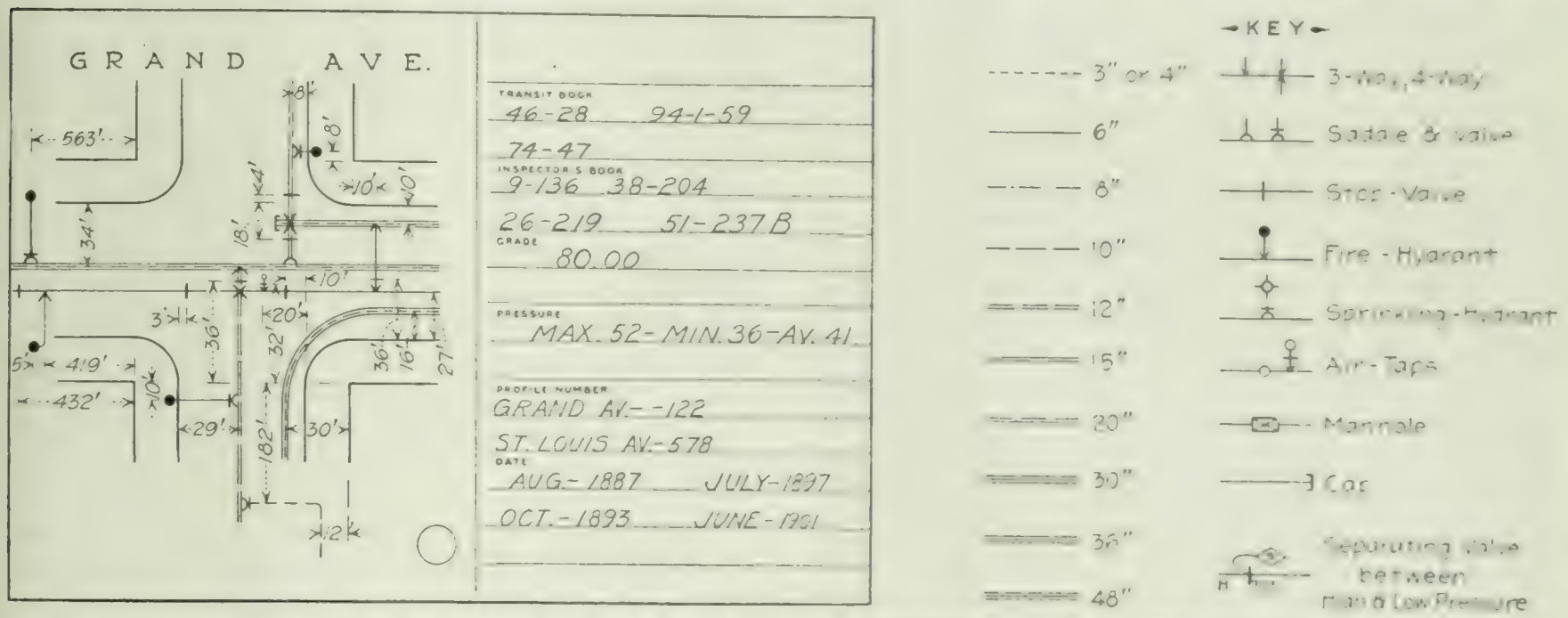
Typhoid death rates in the ten cities of the United States with populations in excess of 500,000 were as follows in 1916: New York, 3.85 per 1000; Chicago, 5.12; Philadelphia, 7.49; St. Louis, 9.38; Boston, 3.44; Cleveland 5.34; Baltimore, 18.15; Pittsburgh, 8.63; Detroit, 15.22; Los Angeles, 2.78. Rates for all causes in Detroit are high, 19.25, because of the under-estimation of its population by the U. S. Census Bureau. Los Angeles has an abnormally low record of all deaths, 12.35. It is a "young" city and has only recently passed the 500,000 mark. Baltimore has filters and still is the highest in typhoid. Flies doubtless carry the germs there.

Location of Water Mains, Connections and Valves Kept on Card File

ANY card system of keeping records which has proven its value by twenty years and more of continual use, without radical change, is worthy of notice. In this class falls the card system for recording the location of water mains, valves, connections, fire hydrants and other special fixtures, which is in use by the Water Department of the City of St. Louis. This system comprises the use of specially printed 4 x 6 cards kept in drawers and referred to ordinarily only by members of the office force of the distribution system. The accompanying illustration gives a very clear indication of the nature of the card and the information kept on it. Each size of pipe and each particular fitting has a special symbol, and the situations of all valves are marked, showing their position with reference to the curb or building line.

The street running from bottom to top is an east and west street, and from left to right, a north and south street. The east and west streets follow each other alphabetically in the drawers; that is to say, Atlantic Ave. would come before West Ave., and all intersections with north and south streets are represented by succeeding cards which start from the most easterly intersection of the east and west street with a north and south street. Therefore, to locate any intersection it is necessary only to know which of the streets is an east and west street.

Each card is inclosed in an envelope of transparent paper, which keeps it from being soiled by the rather excessive handling to which cards of this sort are subjected. It is only possible to take the cards from the drawer by unlocking a special keeper-rod, the key to which is guarded carefully and is never allowed to leave the possession of the chief draftsman of the water department.



LOCATION OF ALL PIPES IN CITY READILY DETERMINED FROM THIS CARD

SOCIETY SERVICE

A Section Dealing with the Results of Teamwork by Technical Men

Human Interests Predominate in Kansas City Engineers' Club

NO HOME, no official publication and no stated meetings—yet the Kansas City Engineers' Club of 250 members is a success. The best engineers of all groups belong to it and at least 75 members turn out for its ordinary monthly meetings, which are held at the University Club. At the annual banquets there is virtually a full attendance. The meetings usually take the form of evening dinners or smokers at which there is plenty of singing by the members, with some cabaret attraction. The occasion of the meeting is usually a talk of more than ordinary interest by some engineer or layman. Maj. Gen. George W. Goethals, Ex-Governor Hadley or H. M. Waite, city manager of Dayton, Ohio, are men the club likes to hear. Local men appear only when they are handling work of unusual interest or after having passed through some unusual experience.

Engineers, 25 years of age and of good character and satisfactory professional standing, are eligible. Non-engineer admissions are limited strictly to 20% of the total membership. The executive committee and secretary reclassify the membership from time to time to keep the committee on admissions informed of the number in each group. The annual dues are $5, with a special charge for those attending each meeting.

The success of the club, in the opinion of most of its members, lies in the fact that human interests rather than technical matters predominate, also that the most prominent engineers have taken an active interest since its start. An *esprit de corps* has been generated and the members feel they are part of a real unit of 250 live engineers who have materially strengthened the engineer's standing and influence in the city.

H. G. Hunter addressed the first meeting of the season, Nov. 9. A smoker attended in eighty, relating his experiences connected with erection work at Rostov, Russia. Lieutenant Simins, of the Canadian army, told of his repeated journeys "over the top."

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Areas of Segments of Circles

Sir—In your issue of Nov. 8, p. 894, the letter of Leopold Pistner shows how the trancendental formula for the area of a segment of a circle may be replaced by a converging series. The present writer had already gone through this mathematical investigation in his search for a rational basis for the Molesworth formula, to which attention was called by him in your issue of Oct. 4, p. 657; but no form suggestive of the latter formula had been reached.

Evidently Mr. Pistner's letter was written before the appearance of the writer's, mentioning the Molesworth formula, or he would have noticed that, with three terms taken of the converging series, the results reached are far inferior in accuracy to those of the Molesworth formula; the latter involving nothing more troublesome than one square and one square root, whereas the former contains the three fractional powers whose indices are $\frac{3}{2}$, $\frac{5}{2}$ and $\frac{7}{2}$. With four terms taken of the series, probably the resulting accuracy would equal, if not surpass, that of the Molesworth formula; but the additional term involves the power of index $\frac{9}{2}$.

One object of the writer's letter of Oct. 4, was to call forth, if possible, some information as to the history and foundation of the Molesworth formula.

I. P. CHURCH,
Professor of Applied Mechanics and Hydraulics, Emeritus, Cornell University.
Ithaca, N. Y.

Are Fine Screens Needed for the Activated-Sludge Process?

Sir—Reading the abstract of Mr. Hatton's paper, recently presented at the American Public Health Association's convention in Washington, entitled "Conclusions on Activated-Sludge Process at Milwaukee," and published in your issue of Nov. 1, any one who is watching closely the development of the activated-sludge process is impressed with two points—namely, the progress being made at Milwaukee in solving the sedimentation tank problem, and the intimation that a fine-screen installation is desirable as a component part of the proposed activated-sludge plant.

There is a statement at the end of the first column of the article to the effect that "sewage from an industrial community should be fine-screened before passing into the aerating tanks."

Further along in the article there is also the following statement:

"We found at Milwaukee that we could save from 15% to 20% air when treating a sewage passing a 20-mesh screen, as compared with the same sewage passing a 1-in. grid screen."

I am a little confused as in the former statement particular emphasis is placed on the fact that this conclusion is based on the author's "observations," covering two years, while in the latter statement the word "found" is used.

I believe no advantage is taken if Mr. Hatton's statements were interpreted to mean that fine screens are desirable at Milwaukee, even if the cost of accomplishing their work was high. Their desirability seems to embody the idea of smooth plant operation. The developments along sedimentation tank lines are appreciated, and particularly as they apply to recovering a sludge with the lowest moisture content that is practicable. However, since the Cleveland activated-sludge unit has been operating almost continuously during the past two years and there has been no evidence to indicate that fine screens instead of bar gratings are desirable, I am, therefore, much more concerned with the latter point. My desire for more information is further emphasized by the fact that the use of fine screens instead of bar gratings at Cleveland's two lake-front plants involves an additional expenditure of $500,000.

I also believe that the Cleveland data are sufficient to warrant their being given considerable attention, and for the following reasons:

1. That the Cleveland unit was the first to be designed and operated where the degree of purification involves simply clarification.

2. That this plant was the first to operate having aërating tanks with the saw-tooth bottom and the sewage flowing crosswise to the air diffusers.

3. That present data indicate that perforated pipes as air diffusers can be depended upon.

4. That the idea of using glass buildings, similar to hot houses, over sludge beds was first developed at the Cleveland testing station.

5. That the city has tested, during a nine-month period, a sewage screen with $\frac{1}{32}$-in. slots when treating an average daily sewage flow of 5,000,000 gallons.

Since I have read the second and third reports of the Milwaukee Sewerage Commission with the purpose of securing information about the accomplishments of fine screens, I would like to take the liberty of asking Mr. Hatton the following questions:

1. Did the 15% or 20% saving of air apply to the process when the purification involved clarification or when the treatment was carried to the point of nitrification?

2. Will the total annual saving (fixed and maintenance charges) affected by the 15% or 20% reduction in the quantity of air required be sufficient to offset the identical charges pertaining to a screen installation?

3. Will Mr. Hatton tabulate in such form as to compare the quantity of screenings removed by the 1-in. grids and the quantity removed by the 20-mesh screen?

GEORGE B. GASCOIGNE,
Cleveland. City Sanitary Engineer.

[Copy of Mr. Gascoigne's letter was submitted to T. Chalkley Hatton, chief engineer, Milwaukee Sewerage Commission, whose reply follows.]

Sir—Answering George B. Gascoigne's queries 1, 2 and 3, I beg to submit the following:

1. All of our investigations have been made with a

view to obtaining a stable effluent; we have therefore been concerned in clarifying the liquor to that end only. Cannot therefore answer the question.

Questions 2 and 3 may best be answered together. To do this I will quote from my latest report to the Sewerage Commission, dated Aug. 15, as follows:

"During the past months, especially since we have revised the diffusers in our plant on Jones Island, the indications have been more and more pronounced that fine screening preliminary to aëration would be advisable if the process is to be satisfactorily operated.

"The character of sewage produced in Milwaukee creates in the aërating tanks large masses of hair, lime, entrails, leather finding, pieces of hides and bark; these are constantly deposited upon the surface of the diffuser plates, interfering with their efficiency and stopping up the orifices to the sludge pumps.

"Much of this mass is inorganic matter which adds nothing to the richness of the activated sludge, and should never reach the aërating tanks; much is organic matter in such large particles, and of such a character, as to be little changed by the process, and some of it, while being organic, can add just as much nitrogen to the final sludge produced by being passed direct through the dryer as though it had first passed through the treatment tanks, and a large proportion of air necessary to partially reduce this organic matter to ammonial nitrogen would thus be saved.

"From data obtained at the testing station after more than two years' observation the following production of screenings may be expected from the Milwaukee sewage:

1930 Period	Flow m g d	Tons Coarse	Tons Fine	Tons Total	Tons Dried Sludge
Min. flow	60	10	35	45	10
Average flow	85	14	51	65	14
Avg. with storm flow	86	14 2	52	66 2	15
Storm water flow	165	28	98	126	28

Coarse screens, 1-in. grids. Fine screens ½-in. slots.
Screenings 80% moisture. Dried sludge 10% moisture.

"From the preceding table it appears that during the 1930 period an average of 15 tons of dry sludge would be produced from the screenings. Of this about 12 tons are produced from the fine screens. Estimating the cost of dewatering, by pressing, from 98.5% to 80% moisture as $4.82 per dry ton, the daily average saving in favor of fine screening would be $53.84 or $19,652 per annum. At 10½% for interest and depreciation this represents a capital investment of $187,162.

"Assuming 10% of air can be saved by installing fine screening (and our investigations indicate from 15 to 20%), and that it will require 1.5 cubic feet of air to treat a gallon of sewage, the annual saving for the 1930 period would be $11,771, representing a capitalization of $112,105.

"Therefore, from the best evidence before me the overheads saved by fine screening would amount to $31,423 annually, representing a capitalization of $299,267.

"From the table appearing in the appendix to this report the estimated cost of the fine screening plant is $227,615, and the cost of operating the same, exclusive of overheads, is $0.23 per million gallons or approximately $7000."

From the above it would appear that coarse and fine screening would break about even, but aside from this is the advantage of "smooth plant operation," as Mr. Gascoigne has so well stated it, which, to the operator, means success or failure in the activated-sludge process. Throughout our entire experiments upon each type of tank nothing has given us so much annoyance and caused as frequent shutdowns as the accumulations of masses of sludge upon diffuser plates, in settling tank bottoms, draw-off pipes, valves and pump runners. Upon a large plant this would mean increased operating expenses and increased tankage.

For at least eighteen months the writer disagreed with every member of his staff as to the necessity of fine screens, but the evidence was so conclusive that he was forced to acquiesce.

T. CHALKLEY HATTON,
Chief Engineer, Sewerage Commission.

Milwaukee.

Determining Meridian by Means of Solar Shadows

Sir—One would gather that the method described in the article entitled "High Accuracy in Determining Meridian by Means of Solar Shadows," in the issue of Nov. 15, p. 932, was an original or at least an uncommon method, and one which for accuracy was to be compared favorably with the methods of determining the meridian by observation on Polaris. As a matter of historic interest, it is worth noting that this method of determining the meridian by equal altitudes of the sun is one of the oldest of which we have record.

A mathematical study of the method will show that for certain seasons of the year, leaving errors of observation out of consideration, one might expect an error of 0.05′ or more, due to change in the declination of the sun between the times of observation. This error would, it seems to me, be small as compared with the accidental errors of observing under the conditions described. To me it would seem unlikely that, for the length of staff and other conditions described, the probable error of the meridian determination would be less than 30′ or, say, roughly $^1/_{_}$ of the precision that might easily be attained by observation on Polaris, and although "high accuracy" as a term is rather meaningless unless qualified, from the standpoint of the engineer it would seem that its use in the article referred to was in a sense an abuse.

R. E. DAVIS.
Associate Professor of Civil Engineering, University of Illinois.

Urbana, Ill.

Sir—J. A. MacDonald's article in your issue of Nov. 15, p. 932, was interesting, but it would have been much more so if he had stated the precision obtained or how successive trials agreed with one another. There are so many probabilities of making errors in the method described that it seems to the writer very crude.

In the first place, the space used must be not only flat but absolutely level. In case one point is only a few inches higher than the other—less than would be detected by the eye—the time at which the shadow would cross the arc of the circle would be materially changed. This would make an appreciable error in the North line as only ½ in. difference in the location of the cross point

would make $\frac{1}{16}$ in. error in the bisector. In addition to this, the exact point of the shadow is hard to trace. On a surface such as a concrete walk it is difficult enough, and on a dirt surface, with the line scratched by a nail, it is much more so. Again, if the nail is not held exactly plumb the circle will vary quite appreciably.

Assuming, however, that the two points are located absolutely correctly it becomes an extremely difficult operation to transfer this line to a system of survey lines. To begin with, we have a base only about six feet long. I take it for granted that the instrument is to be set up on the chord of the circle. The sight is probably taken on the top of the pole. Presumably, the line has to be thrown backward by inverting the telescope and here we have the adjustment of the transit entering in, the very thing Mr. MacDonald was trying to avoid. In case we remove the pole and sight forward, there is no check on the only sight used. If the sight is taken on the bottom of the pole the adjustment of the instrument again enters into the problem. Also the alignment of the pole must be perfect. It must be remembered that an error of only $\frac{1}{16}$ in. in any place will make a difference of several minutes in the North line.

There are other things to be taken into consideration. The line in the dirt must remain intact for several hours. The pole must not be touched for the same length of time. A cloud over the sun for only a few minutes at the critical time in the afternoon causes the loss of the whole day, or a stiff breeze may spoil the whole operation. And it must be borne in mind that a six ft. base is an extremely short base from which to work, with the best of conditions.

If all these chances of error are considered it appears to the writer that the old method is the best. It takes but little, if any longer, can be made when the party is not otherwise engaged, and when done properly is bound, without any doubt, to result in the necessary precision.

CHAS. M. BELL.

Woodcliff, N. J.

Practice in Through-Girder Kneebraces

Sir—A query as to top-flange column length of through girders, and the design of the kneebraces by which the flange is stayed, appeared in your issue of Sept. 6, p. 470. It seems to be the usual practice among designers to assume that these gussets do brace the top flange sufficiently, making the distance between gussets the column length L in the formula $p = 16{,}000 - 200\frac{L}{P}$.

The size of the inclined angles of the kneebraces is usually fixed by arbitrary choice or judgment based on past experience, just as the size of sway bracing for through bridges or the size of girder web stiffeners is assumed. The results obtained are perfectly satisfactory. In a great number of designs for railway bridges examined, 3½ x 3½ x ⅜-in. angles were found to be used for these inclined angles, almost without exception.

A careful study of a dozen of our up-to-date textbooks on structural design showed that in six of them nothing was said about these kneebraces. In five others, a very brief description was given, merely stating that the object of such kneebraces is to brace the top or compression flange. In the remaining one, Thayer, Vol. 2, pp. 37 and 86, a method of design is given. The side thrust of the top flange per panel length, produced by the tendency of this flange to bend in a horizontal plane, is taken as one-tenth of the short-block compressive strength of the top flange, divided by the number of panels in the span. To this thrust per panel is added the wind load per panel on the upper flange, and the whole is applied at the upper end of the kneebrace. The brace is then designed as a vertical cantilever girder, the inclined angles forming one flange and the main girder stiffener angles the other flange.

Cheltenham, Penn. CHARLES D. CONKLIN.

Specially Ruled Sheets in Drafting Room

Sir—Referring to the article entitled "Specially Ruled Sheets Have Wide Use in Drafting Rooms," by R. T. Dana, which appeared in *Engineering News-Record* of Oct. 25, p. 799, I would suggest a remedy by means of which the obliteration or removing of a ruled line by erasing may be avoided.

If paper thin enough for blueprinting is used and the section lining is sufficiently heavy, these lines may be readily seen from the back of the paper. If, therefore, the back of the paper be used for drawing purposes it is apparent that erasing will not injure the ruled lines unless a hole is made through the paper. For this purpose an onion skin paper, while expensive, is eminently satisfactory, it being tough and standing a lot of handling, and erasing injures it but little.

F. G. SWITZER,
Assistant Professor, Mechanics of Engineering, Cornell University.
Ithaca, N. Y.

Should Engineer or City Council Decide What Material To Use?

Sir—The letter of H. S. Morse, in *Engineering News-Record* of Oct. 18, p. 756, relating to the question whether the engineer or city council should "decide what material to use," brings up for consideration a matter which is of vital importance to the engineer. It has to do with the attitude held by the general public regarding his worth, as well as with the recognition of his peculiar qualifications. Just as a city council will fix the kind of material of which a pavement or sewer is built, so will the ordinary manager or superintendent of an industrial plant attempt to dictate to the engineer, and the engineer has no recourse. If the judgment of the manager is in error the engineer is sure to be blamed for failure, while the manager takes all commendation in case the material or method chosen proves proper and satisfactory. In either case the engineer has been relieved of responsibility in the matter.

I will state three cases in my own experience which have been humiliating to me, and no doubt other engineers can give similar instances of interference with the work for which engineers are supposed to be employed. Some seven years ago I was placed in charge of construction of certain work for a mining company in Mexico. Two buildings had been ordered built of adobe by instructions from the superintendent, in spite of the fact that in both cases moving machinery and

shafting were to be installed. All suggestions to change the material fell on deaf ears. The result was that the adobe walls failed, due to the shock. Who was to blame?

While in the employ of a cement company a few years ago, I was given charge of the construction necessary for the replacing of several miles of cast-iron pipe for steel riveted pipe which had deteriorated badly and was bursting in innumerable places. Without referring the matter to me an order was made out for a certain quantity of 10-in. cast-iron pipe, the order being placed with the understanding that the quantity required would be changed later to conform with the engineer's estimate. It was found after installation that a 12-in. pipe should have been used to secure the required discharge. I was promptly accused of making a wrong recommendation and was struck by the superintendent when I expressed my opinion in the matter. Who was to blame?

In another instance, while employed by a certain smelting company I was supervising the construction of some heavy foundations. A pier footing which carried a very heavy load had been laid out and the foreman was instructed to center the pier over the footing. It was found necessary to move a large wooden drain, as it had been constructed on the footing area. After a portion of the drain had been moved the superintendent of the plant gave instructions to stop shifting the drain without referring the matter to the engineer in charge of the work. The result was that the pier was cast off the footing center. The ground had been broken up by blasting during the original construction work and was well saturated with water from the drain. Unequal distribution of loading was therefore dangerous. Who was to blame?

What can the engineer do to protect himself in such cases? Instead of taking a leading part he is forced by circumstances to follow the requests and demands of men not qualified to direct work, but who hold the whip hand, being in the position of employers. This trouble is most apparent in corporations. Where is the trouble—is it in the engineer himself, in his training, or in the general attitude? Can coöperation among engineers which tends to improve their political and social status help in the solution?

E. G. SHEIBLEY,
Riverside, Calif. Civil and Sanitary Engineer.

Paving of Parkway Drives and Boulevards

Sir—In his article on park driveways in *Engineering News-Record* of Oct. 18, p. 746, Mr. Whinery says:

"It will be noted that recently many engineers of experience in this line of work require that the concrete shall be thrown open to travel for some months or even years before the bituminous coating is applied. The rationelle of this practice is obviously to secure the roughing of the surface of the concrete so that the bituminous coating will adhere to it. Why not secure this effect at once by the treatment here suggested?"

The roller treatment favored by Mr. Whinery, followed by a belt, is probably the best concrete road finishing practice today and, if the concrete be placed at the stiffest consistency that can be handled, will give a smooth and dense surface with less cost than hand-troweling. But the article referred to condemns the troweling of the base to obtain a smooth, dense and impervious surface. I consider the clean, hard surface of hand-troweled mortar the one advantage of the two-course pavement. If properly cleaned and dry, there is less chance of the coating ever parting from it than any rough-finished concrete, where the engineer puts his faith in an apparent mechanical bond, as anyone can testify who has tried to remove the asphaltic oil from a clean curb face.

The principal cause of the parting of the asphaltic carpet is the failure of the surface bond in the concrete. A thin skin of mortar is found on the under side of almost all the parted oil cake or carpet, showing that the adhesion of the coating is sufficient, ordinarily, to remove the surface of the base. This weak surface skin is most noticeable with wet mixtures and most nearly eliminated in the "sidewalk-finished" base. It can be removed by the treatment mentioned by Mr. Whinery, exposure of the concrete to traffic for several years; then, if desired, the bituminous surface may be applied.

Because of our excellent and cheap natural asphaltic oils, California engineers have experimented further with the surfacing of concrete roads than they would under Eastern conditions, but the tendency now is to build the concrete base so well that the bituminous "wearing coat" becomes unnecessary, thus dispensing with the added cost of construction and the continual maintenance of the carpet. Such a road is cheaper, smoother and almost free from wear and maintenance.

Monrovia, Calif. E. EARL GLASS.

Rapid Methods for Accurate Calculations

Sir—In this age, when young engineers are working under pressure, it is painful indeed to watch the arithmetical methods used by those unacquainted with the following simple time savers:

Additions—With the several quantities placed in vertical columns, certain digits always can be grouped mutually, usually in pairs totaling ten, which totals are summarized more easily and quickly than a greater number of figures of different denominations. Often it is advisable to pass in its consecutive order a certain figure which, however, should be picked up before it is forgotten. Briefly, in the addition of many figures, one should aim, when running down a column, at securing as often as possible a total ending in zero.

Multiplications—Here again the benefit of the digit zero comes into play. Take for instance the multiplication of 32 by 98. It is a comparatively simple matter to multiply 32 by 100 and from the result deduct the product of 32 and 2. Again, suppose we desire to multiply 25 by 96. Here we make use of the fact that 25 is ¼ of 100 by dividing 96 by 4 and multiplying the result by 100.

The writer appreciates and is heartily in sympathy with the ever increasing uses of the slide rule and the adding machine, but he does not sympathize with the enthusiast who reaches out for his slide rule and actually wastes time performing the operation.

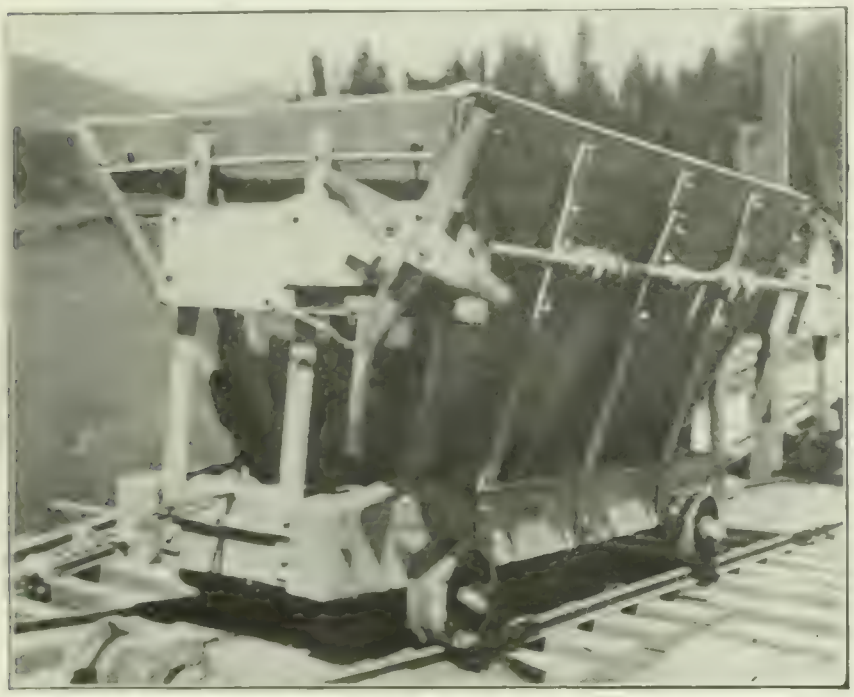
Cleveland. H. S. JACOBY.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

A Home-Made 6-Yard Dump Car

IN THE work at Huntington Lake, Calif., where 135,000 yd. of concrete are being placed on rush schedule, all of the cars which handle sand and gravel are of 6-yd. capacity. In order that the cars used on the inclines might equal the capacity of those handled by steam locomotive on the main line tracks, some 6 cu.yd. bottom-dump cars were built up in the company's shops.



HOME-MADE 6-YARD CAR WITH BOTTOM DUMP

These cars, as shown in the accompanying illustration, are of wooden construction, being simply a hopper with hinged bottom mounted on a solidly built wood truck reinforced with ½-in. strap iron. The bottom is tripped by a lever operated from either end of the car and is returned to place by a pair of cables which wind up on the longitudinal pipe serving as an axle and are operated by the ratchet hand wheels at either end.

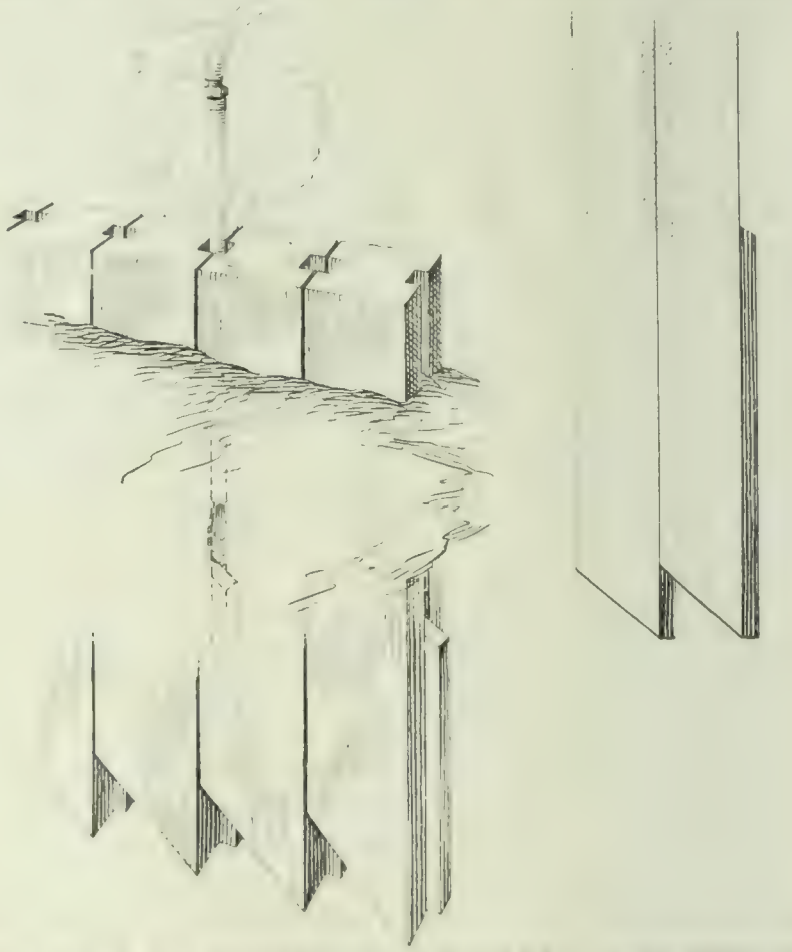
The large capacity of these cars has been a material advantage in hastening the work and the bottom-dump scheme has given the maximum speed with a rigidly built car body.

A general description of the work of raising the three dams on Huntington Lake, which is under the direction of R. C. Starr, hydraulic engineer of the Southern California Edison Co., appears elsewhere in this issue of *Engineering News-Record*.

Cleaning Concrete Sheet Piling Grooves with the Steam Jet

STEAM under 200 lb. pressure was found to be the very best way of cleaning out the débris from the slot formed by the opposing grooves in adjacent concrete sheet piles which were designed to be filled with grout to make the job tight. The construction of these piles can be seen in the accompanying illustration, which shows also the 5-ft. guiding tongue at the bottom and the wedge-shaped point of the pile, which was to keep the following pile snug up against the one driven just before. The tongue, of course, followed in the groove of the preceding pile, and was expected to clean out this groove.

In spite of the care taken to prevent the entrance of débris, many of the slots were completely choked before the grouting could be attended to. The removal of this débris presented a problem of many difficulties, and though several methods were tried, no one of them proved of any value until the contractor hit upon the idea of using a steam jet for this purpose. By using steam from a locomotive which could be spared occasionally from work in another part of the job, steam was delivered at 200 lb. pressure through a ¾-in. pipe which was so rigged that it could be raised and lowered in the groove. A considerable quantity of water was used with the steam when the cleaning was started, and this helped to loosen the material, which was then expelled by the dry steam. The work was done by Teichert & Ambrose, contractors, Sacramento, Calif., and was part of a continuous curtain wall of concrete sheet piling, 2085 ft. long, built for a bypass weir, near Sacramento.



GROOVE TO BE GROUTED WAS CLEARED OF DÉBRIS BY STEAM UNDER 200 POUNDS PRESSURE

Portable Concrete Plant Builds Freight Station Platforms

PLATFORMS in the new Pennsylvania freight terminal in Chicago are being built from a portable concrete plant having a daily capacity of 150 cu.yd. The ground floor is well provided with tracks, so that it is



MIXER AND BINS MOUNTED ON ADJOINING GONDOLAS
Skip car travels as shown by dotted line, from beneath bins D over mixer car B to hopper C, where it discharges into mixer A

easy to cover its entire area. A two-car portable plant was therefore devised by the contractor. On one car is a ¾-yd. Lakewood mixer and skip-car incline, and on the other are storage bins under which the skip passes to receive the charge of sand and coarse aggregate. Cement is added from cars on a nearby track through a one-batch hopper at the end of the mixer car. Two bin-cars are provided, one being loaded outside the station, while the other serves the mixer. A number of openings are provided in the storage bins, so that substantially the whole charge of the bins comes into the skip without shoveling. Thus the crew is reduced to as few men as would be required for an ordinary stationary plant of the same capacity. A. S. Armstrong is the superintendent for C. W. Rosenthal & Co., contractors for the concrete work. The George A. Fuller Co. is the general contractor.

Motor Trucks Loaded by Steam Shovel Do Well on Hotel Excavation

By O. L. Davis
Omaha, Neb.

IN REMOVING 9500 yd. of dirt and 1000 yd. of old masonry for the basement excavation for the Conant Hotel in Omaha, motor trucks loaded by a ¾-yd. revolving shovel which part of the time used a grab bucket took out the material for $1.40 per yd., with a two-mile haul.

The main basement, 66 x 132 ft., averaged 14 ft. deep, while the sub-basement, irregular in shape, has a floor area of 3000 sq.ft. and extends 15 ft. deeper. The steam shovel began at one corner and dug itself down on an incline, which was paved behind it with heavy planking. The motor trucks were backed down to receive their loads and hauled out under their own power with the assistance of a hoisting engine. As the street which the trucks entered on leaving the lot was narrow and congested, the block at the top of the incline was anchored to a post low enough to clear the axles of the trucks, and was set one truck-length from the top of the incline. This allowed the trucks to stop just clear of the traffic while the cable was being taken off.

The excavation of the basement itself was completed in this way, after which a timber incline was erected and the earth incline removed, and the excavation of the sub-basement begun. In excavating the sub-basement the steam shovel was fitted with a long boom and a ¾-yd. clamshell bucket, which enabled it to stand near the foot of the incline at the basement level and load the trucks with material dug out of the sub-basement. The capacity of the shovel is rated at 400 yd. a day with the dipper and 300 with the bucket, but this output was not realized on account of the difficulty of getting trucks in and out of the lot. It is estimated that delays from this cause alone ran the cost of handling the material up 30 or 40c. a yd. Five-ton trucks were used, and the haul was about two miles one way over city streets.

The general contractor for the hotel is The Selden-Breck Construction Co., while the excavation work was done by The Partridge-Thomson Co.

Automatic Signals Favored in Australia

Automatic block signaling is approved on the New South Wales Government Railways, and is being introduced under two distinct conditions. On suburban lines it is used in order to shorten the headway between trains, and thus increase the traffic capacity. On country lines in districts that are thinly settled but have considerable through traffic it is found that automatic signals between stations afford improved facilities for dealing with through trains without requiring an increased force. The cost of installation and maintenance is greater than with manual signals, but there is a net saving in cost and an increase in safety due to the elimination of manual operation. Thus the 108 block sections equipped in 1916 would have required 46 signal towers, with a staff of 138 men whose wages would amount to not less than $120,000 per year. A cab-signal and train-control system is being tried experimentally on the Richmond Branch. An audible signal is given in the cab and must be acknowledged by the engineman. If he fails to stop within a given distance after receiving a "stop" signal, a partial application of the brakes is made automatically.

NEWS OF THE WEEK

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

No Industry To Be Classed As Non-Essential

New Manufacturing Resources Bureau Will Study Proper Control of Making of Luxuries

Walter S. Gifford, director of the Council of National Defense, has allowed it to become known in Washington that plans which were said to be on foot to make public a list of 525 industries in the United States in the relative order of their importance for the conduct of the war will not be carried out. The same information was obtained by the Washington correspondents at the office of Dr. Garfield, fuel administrator, where information in regard to the proposed order has been sought on the ground that if any industry was deemed unessential by the Government, its supply of coal would be shut off, and its name placed toward the end of the proposed list of 525 industries.

Instead of tabulating industry in classes to be known as essential and non-essential, the Council of National Defense is organizing what is to be known as a Bureau of Manufacturing Resources. The new bureau will afford a point of contact between all manufacturers and the Government, and the new bureau, as well as the Commercial Economy Board of the Council, will point out to manufacturers of what have heretofore been considered as luxuries the fact that they must expect some curtailment of their business during the war, thus opening the way for their coal and their labor to reach munition plants, etc. The plan will also give manufacturers of so-called luxuries an opportunity to convert their factories and forces wherever possible to the production of articles greatly needed for the war—the War Industries Board assisting by finding for such manufacturers Government contracts suited to their plants.

The question of imports and exports was played the principal part in the decision not to make public a list of non-essential industries, and Washington has been guided by the experience of England, when Spain refused to furnish pyrites unless Great Britain took also citrus fruits, as well as by other instances, in other countries. The Chamber of Commerce of the United States recently sent to business men all over the United States statements that it might be necessary to furnish Chile with jewelry and limousines if the United States wants nitrates and copper.

These subjects have been under consideration in Paris at the Allied confer-

ence, and it is understood that an international board, to deal with the subject of imports and exports, under which lies the question of what industries are essential or non-essential, will be created, with Oscar T. Crosby, assistant secretary of the treasury, now in Paris as a member of Colonel House's mission, as the representative on the board of the United States. It is understood that the board will continue its work during the period of the war, with headquarters in either London or Paris.

To Exempt Engineering Students from Draft

From sources of information at Washington, D. C., considered to be highly reliable, *Engineering News-Record* has learned that the War Department will soon put into effect an order exempting students in engineering schools from the army draft. While details of the plan cannot yet be definitely stated, it is believed that the cooperation of professors in the technical schools will be sought in order to determine which students shall be exempt and which shall be liable for military service. Very large powers, it is believed, will be conferred upon selected members of engineering school faculties in choosing the men to finish the technical courses. A student exempted during his college course will, however, be subject to call by the army after graduation. Students not designated by their professors as needed to complete their engineering courses, will be subject to the draft in the same way as any other individual between the prescribed age limits.

Ship Lumber Coming Fast

Five million feet of ship lumber was the production for the week ending Nov. 23. Double that amount is expected shortly, according to W. J. Haynen, assistant purchasing agent of the Emergency Fleet Corporation. A considerable number of mills in the Southern-pine industry, which have heretofore cut no ship timbers, are coming forward with offers to produce schedules or part of schedules.

Changes in Columbus Channel Plans

Changes in the plans for the river-channel widening work at Columbus, Ohio, to which reference was made in last week's issue, p. 1034, were approved by the council service committee. The concrete work on levees is reduced and the original estimate of excavation needed is revised, without decreasing the capacity of the new channel.

"Impossible! Don't Try It!" Friends Told Harris

But Man Who Is Now General Manager, U. S. Shipping Board, Built Dry-Dock in Quicksand

Rear Admiral Frederic R. Harris, Corps of Civil Engineers, United States Navy, who has been appointed by the President to succeed Rear Admiral Washington L. Capps as general manager of the Shipping Board, Emergency Fleet Corporation, is called by the Official Bulletin "a man who has succeeded in important engineering lines." The Bulletin goes on to say:

In 1910 an attempt to build a dry dock in the quicksand at the Navy Yard, New York, resulted in disaster by failure of two contractors. The condition brought about interfered seriously with the various operations at this navy yard. The abandonment of the work as impossible was seriously considered.

Admiral Harris insisted on undertaking the work, against objection that it was imposible, and volunteered to undertake the completion of the dock. Although assured by many of his friends that he was needlessly risking his professional reputation on an impossible feat, the work was completed successfully through his efforts, by employing an entirely new method of dock construction, involving the sinking of caisson foundations through the quicksand to rock.

In January, 1916, he became Chief of the Bureau of Yards and Docks, in his 41st year, the youngest bureau chief and officer holding the rank of rear admiral in the Navy, and is at the present time the youngest officer in the Navy having the rank of rear admiral of the senior half, for which permanent rank he was selected in June, 1917.

Service Board To Prepare Plans for West Side Problem

Instructions have been given by the commission to the chief engineer of the New York Public Service Commission, First District, to prepare plans for the removal from grade of the New York Central's freight tracks on the west side of Manhattan, New York City, and for the substitution of electric for steam operation. The commission holds that when the plans are made and presented at a hearing, the company can be compelled under the present law to execute the work at its own expense.

To solve other phases of the problem, however, an investigation is ordered into the validity of the permits and franchises under which the company occupies its present position.

Quebec Bridge Now in Service

The great Quebec bridge across the St. Lawrence River, affording a new through all-rail route from central Canada to the port of Halifax, is now carrying its share of war traffic to the seaboard, having been formally opened to traffic with appropriate ceremonies on Dec. 3. Officials of the Canadian Government Railways, members of the Board of Engineers and others rode across the bridge in a private car attached to the first train of freight to be moved by this route.

The design, fabrication and erection of this cantilever structure, the longest span of any kind in the world, have been described in numerous articles in *Engineering News* and *Engineering Record*. The successful raising of the central suspended span, the last important erection operation, was reported in *Engineering News-Record* of Sept. 27, p. 580.

United Society Will Welcome Civil Engineers to New Home

A meeting to welcome the American Society of Civil Engineers to its new home in the Engineering Societies Building, 29 West 39th St., New York, will be held tomorrow evening, Dec. 7, by the United Engineering Society and the three national societies, the American Institute of Mining Engineers, the American Society of Mechanical Engineers and the American Institute of Electrical Engineers.

The announcement states that "appropriate ceremonies will signalize the association of the societies for the first time under one roof and the augmented solidarity of the engineering profession which that association promotes." The convocation, to which ladies are invited, will be held in the Engineering Societies auditorium.

The committee on ceremonies consists of E. Gybbon Spilsbury, chairman; Gano Dunn, D. S. Jacobus and William L. Saunders.

Main Is Elected President of Mechanical Engineers

Charles T. Main, of Boston, a consulting engineer who has served in several public offices for the purpose of advancing the idea of good government, has been elected president of the American Society of Mechanical Engineers, which includes in its membership 8500 mechanical engineers. Mr. Main was born in Marblehead, Mass., in 1856 and was educated at the Massachusetts Institute of Technology, from which he was graduated in 1876. Three years later, after continuous service in the Institute as assistant in the department of mechanical engineering, he became a draftsman at the Manchester Mills, Manchester, N. H., leaving this concern in 1881 to enter the employment of the Lower Pacific Mills, Lawrence, Mass., where for eleven years he acted in the respective capacities of engineer, assistant superintendent and superintendent. Since 1892 he has practiced as a consulting engineer, with offices in Boston, until 1907, being associated with F. W. Dean in the firm of Dean & Main.

Mr. Main has designed and supervised the construction of numerous industrial, steam-power and water-power plants, among his largest undertakings being the Wood Worsted and Ayer Mills in Lawrence, Mass., and four hydro-electric developments for the Montana Power Co., aggregating about 230,000 horsepower.

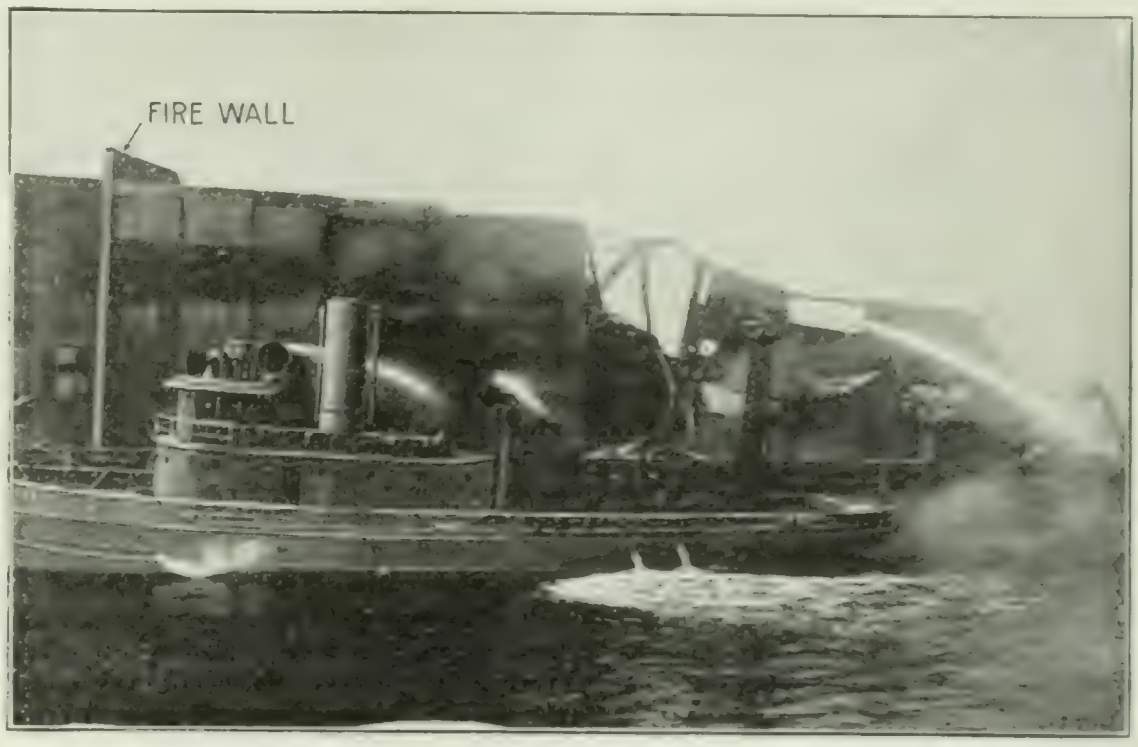
Mr. Main became a member of the American Society of Mechanical Engineers in 1885 and has served on its Board of Managers for the past three years. He is also a member of the American Society of Civil Engineers and other engineering and technical societies.

Annual Meeting of Am. Soc. C. E.

The 65th annual meeting of the American Society of Civil Engineers will be held at the new headquarters of the society, 33 West 39th St., New York, on Wednesday and Thursday, Jan. 16 and 17. The business session will take place Wednesday evening

Fire Wall Saved Part of Pier

The accompanying view of the recent fire on Pier 8 of the Baltimore & Ohio R.R., at Baltimore, Md., shows how a reinforced-concrete fire wall projecting above the roof isolated the fire which destroyed all of the adjoining Pier 9 and the forward end of Pier 8.



FIRE KEPT FROM REAR END OF PIER BY FIRE WALL

Pier 8, completed in 1908, was built with concrete piers on piling, the piers supporting steel columns that carried the second floor and roofing. The first floor was supported on piling capped and decked at the floor line 8 ft. above the water. The steel frame was covered with corrugated iron, the roof covering being of composition slag. The floors were of heavy mill construction. The pier was divided into two sections by a reinforced-concrete fire wall projecting 4 ft. above the roof. This fire wall, in addition to affording vantage points for the firemen and tug-boats to fight and retard the progress of the flames as the fire was rapidly spreading toward the land, effectively stopped the fire and saved one-half of the pier. The fire protection consisted of 6-in. water pipe, running the whole length of the pier, with sufficient number of fire lines with hose to cover the entire area of the pier, supplemented by numerous barrels of water and buckets.

Gen. Black Asks $892,000,000 for Engineers in France

Engineer operations, including the equipment of the corps, and railroad and other construction for the expeditionary force in France will cost nearly a billion dollars in 1919. The exact estimate, made public in the annual report of Maj. Gen. William M. Black, chief of engineers, is $892,000,000, and is based on providing for the engineer operations of 1,500,000 men

Equipment of the engineers is estimated at $135,000,000. For this work this year Congress appropriated $1,174,000, but a deficiency of $12,100,000 was incurred in outfitting the ten special railway regiments alone. One of these regiments helped stem the German assaults on the British front at Cambrai this week.

Congress provided $94,500,000 for engineer operations this year, but deficiency items totaling $186,000,000 have been submitted.

The report shows that equipment for 70 divisions, or approximately 1,000,000 men, was purchased within 500 days after the declaration of war, including 8,700,000 articles, among these four miles of pontoon bridges.

America Must Keep Business Moving

Idea That All Activity Apart from War Is Unpatriotic Is Losing Ground—Construction Apt To Be Active—Material Prices Firm

Speculation as to how particular kinds of construction activity will be affected by the war continues to be rife, but it is all the time becoming clearer that the general volume of construction work cannot, at least, be greatly decreased. People are beginning to awake to the plain fact that the commercial and industrial development of this country must continue if we are to win the war. This aspect of the war was forcibly illustrated by Charles W. Mears of the Winton Co., in a recent address before the Cleveland Rotary Club, in which he pointed out that if America is compelled to follow the war experience of France and Great Britain with regard to her industries, it will be doubtful that the war can be won at all. France first met with the experience of being unable to fight and produce at the same time, for lack of men and materials. She called on England for financial assistance to obtain abroad the things she could not make at home. England next met the similar experience of being unable to fight and at the same time maintain the normal industrial life of the country and its tremendously important foreign commerce. So serious was the situation for these countries that there is little doubt of their inability to have carried the struggle even thus far had they been confined to their own resources. However, the markets of the world were open to them, and British credit was large. Before it was exhausted this country had entered the war on the Allies' side. This country is the reservoir from which our allies have for three years drawn the material resources with which they have carried on the war and maintained their populations, now employed almost exclusively in war industries. If this country in turn be reduced to the same basis, where could the allied coalition turn for further assistance?

War Materials Not Wealth

It is evident on a moment's reflection that a large part of the labor engaged in war industries is not producing wealth, but for all practical purposes is idle, in the economic sense that its products are wasted. It is axiomatic that wealth must be had to be taxed or to be subscribed for bonds to pay for continuing the war. Evidently, since those war industries which produce materials to be wasted are not creating wealth, they cannot of themselves support the war. There must, therefore, be sufficient goods, farm products and other commodities created by the population of this country to supply our allies and ourselves, and to produce annually sufficient wealth to stand the drain of war.

It is evident, from this point of view, that unless the business life of this country can go on largely "as usual," after the elimination of wasteful practices which have long handicapped our industrial life, ourselves and our allies will have a hard time to keep the field until a military decision can be reached. In plain words, should this country be compelled to warp its industrial life to the extent that has been necessary in France and England, and should Germany throw open the Russian Empire and organize its economic resources, this country and its allies would face defeat.

It is true that some branches of the administration have apparently failed to grasp the tremendous significance of this fact. In consequence, we see thousands of men thrown out of employment in the passenger automobile industry by the regulation of the supply of steel to their employers, without apparent provision for making use of them elsewhere. In consequence, we find the U. S. Chamber of Commerce warning the Priority Board that industries which appear to be non-essential to the conduct of war must be kept alive in order that their products may be traded for the war materials not produced in this country, in which class fall many sorts of supplies essential to the manufacture of munitions. In consequence, we narrowly escape a priority order, which, it is true, would have supplied the workman of the Northeast with coal to warm his house, but which would, at the same time, have starved him, as was shown by Mr. Hoover, and would have thrown him out of a job by making it impossible for the industry which employed him to continue business.

Nevertheless, the priority order did not go into effect; the warning of the Chamber of Commerce is generally appreciated; and there is no doubt that the situation in the automobile industry is attributable to nothing worse than a momentary lack of coördination between departments of the administration. The truth that this country must not curtail, but must actually increase its production of wealth, as distinguished from its production of materials to be wasted in prosecuting the war, is thoroughly appreciated by those in authority, and, to be put in practical effect needs only to be driven home to the general public.

Construction Expected To Be Active

Since it is granted, then, that to win the war this country must not throw away its commercial strength, but must increase it, it is hardly to be expected that we can get along during the war without construction work. Even in England construction has remained active, the remodeling and enlarging of industrial plants, the providing of accommodations for workmen, and the maintenance and improvement of roads having been found essential to the war industries themselves. How much more these things will be needed in the United States can readily be appreciated when it is understood that we must not only develop vast war industries, but that we must produce the major part of the economic wealth which is to sustain the allied coalition until the war is won.

Government demand for cement, sand and gravel, particularly on the north Atlantic seaboard, has made the supply for other work scarce. It is said that, with the increased cost of fuel and labor, the margin afforded by present cement prices is narrow, and in consequence the market is very firm.

Steel can be bought at the new prices for first-half delivery, and the quotations for reinforcing bars given this month are from mills which have the actual steel to deliver. Of course, if there is a great rush, the material will not go round; but in any event the bar situation should be much better than of late.

Other material prices are, in general, firm, with some advances, showing that, in spite of decreased building permits, general demand is holding up well for this time of year.

If Your Copy of Engineering News-Record Is Late

The offices and equipment of both the constituent units in the consolidated McGraw-Hill Publishing Co. are now under one roof. In the confusion incident to the removal of what was formerly the McGraw Publishing Co.'s plant from West 39th St. to the Hill Building, at 10th Ave. and 36th St., New York, there may be some slight delay in your receiving your copies of *Engineering News-Record*. For this we ask your indulgence, with the assurance that after readjustments have been made the combined facilities of the two big plants will leave nothing to be desired in the way of prompt and efficient service

McKay Bequest Not Usable in Harvard-Tech Merger

The Massachusetts Supreme Court has just rendered a decision denying Harvard University the right to use the Gordon McKay fund in connection with the Harvard-Technology coöperative plan of engineering education. The court rules that the bequest must be applied to a separate scientific school. Anticipating the possibility of such a decision, Harvard has refrained from drawing upon the fund, most of which, according to the terms of the will, is not yet available, so that there will be no problem of restitution.

Road Builders' Convention

At a meeting of the directors of the American Road Builders' Association held Dec. 3, it was decided to hold the 15th annual convention of the Association in St. Louis during the early part of February. The exhibit will be small.

Testing Society Remits Dues of Soldier Members

In the November circular of the American Society for Testing Materials it was announced that the dues of members who enter the active military service of the Government, and so notify the secretary-treasurer, would be suspended during the period of such service; and that while in such service the members should retain all the privileges of membership in the society, including its publications, for which they may apply upon their return from military service.

The finance committee does not recommend any change in the dues of members entering the civil and non-active military service of the Government, for the reason that the society has always had members in these branches of the service, and the committee does not believe it would be right to treat differently those now entering the service.

Committees of the society are requested to transmit to the secretary-treasurer, Prof. Edgar Marburg, University of Pennsylvania, Philadelphia, Penn., the manuscripts of their annual reports as early in the year as possible, and preferably before Mar. 1.

Will Raise Volcano Lake Levee To Protect Imperial Valley

At a recent meeting of directors of the Imperial Irrigation District, the question of flood protcction work needed immediately was discussed with C. E. Grunsky and George G. Anderson, the consulting engineers for the district. In accordance with their recomendations, it was decided to make Volcano Lake levee the main line of defense and to confine protective work this season chiefly to that work.

This decision, which is not in entire accord with the recommendations of C. K. Clarke, chief engineer of the district, was made when the consulting engineers pointed out that the presence of back water in the Volcano Lake territory did not menace the valley if Volcano Lake levee was maintained in good repair, and on the contrary would be helpful in that it would deposit silt and promote the growth of vegetation, thus raising the ground level in a desirable way. Accordingly, it was decided to increase the height of Volcano Lake levee about 2 ft. and not to attempt an extension on the Ockerson levee.

Cleveland Opens Long Viaduct

The Detroit-Superior Aves. Viaduct over the Cuyahoga River, Cleveland, Ohio, was formally opened to traffic Nov. 21. The upper or vehicle deck is now in service, but the lower deck, which is to carry street cars, cannot be used until the depressed approaches and stations at the ends are completed. The bridge crosses the river by a steel arch of 591-ft. span, which is exceeded in this country only by the 977½-ft. Hell Gate arch and the 840-ft. Upper Niagara arch.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

AMERICAN SOCIETY OF CIVIL ENGINEERS, 29 West 39th St., New York; Jan. 16 and 17, 1918, New York; Charles Warren Hunt, secretary.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS; 29 West 39th St., New York; Dec. 4-7, New York, Calvin W. Rice, secretary

GENERAL CONTRACTORS' ASSOCIATION; 51 Chambers St., New York; Dec. 8, New York; C. A. Crane, secretary

AMERICAN INSTITUTE OF CONSULTING ENGINEERS, 35 Nassau St., New York; Jan. 14, New York; F. A. Molitor, secretary.

NEW ENGLAND WATER-WORKS ASSOCIATION; 715 Tremont Temple, Boston; Jan. 9, Boston; Willard Kent, secretary.

AMERICAN WOOD PRESERVERS' ASSOCIATION; Baltimore, Md.; Jan. 22-24, Chicago; F. I. Angier, Baltimore & Ohio R.R., Mount Royal Station, Baltimore, Md., secretary.

CANADIAN SOCIETY OF CIVIL ENGINEERS; Montreal; Jan. 8, Montreal; Fraser S. Keith, 176 Mansfield St., Montreal, Can., secretary.

AMERICAN SOCIETY OF AGRICULTURAL ENGINEERS; Dec. 27-29, Chicago; C. K. Shedd, Ames, Ia., secretary.

AMERICAN CONCRETE INSTITUTE; 27 School St., Boston; Feb. 7-9, Chicago; H. B. Alvord, secretary.

The Brooklyn Engineers' Club will meet today to hear a lecture by Edward A. Leslie on "The Economical Combustion of Oil," illustrated with lantern slides. Mr. Leslie will lay stress on the prime importance of the conservation of America's oil supply during the war and will describe a new type of oil-burning furnace, the Skiovsky method of burning liquid fuel. Mr. Leslie is connected with the General Combustion Co., Chicago. On Dec. 13 the club will hold its annual meeting for the election of officers and the transaction of other business.

The Engineers' and Architects' Association of Los Angeles, Calif., at its regular monthly meeting, Nov. 16, was addressed by Congressman H. Z. Osborne on "The First Six Months of the War." Thomas D. Allin, commissioner of public works of Pasadena, assisted by R. V. Orbison, city engineer, gave an illustrated talk on the subject of sewage-disposal plants, and James T. Barkelew, engineer and patent attorney, spoke on the subject of patents.

The Engineers' Society of Western Pennsylvania will give a smoker to its members on Dec. 7, in the English Room, Fort Pitt Hotel, Pittsburgh.

The Oregon Society of Engineers has entered into a new field of activity, that of sponsoring courses of lectures to be given in Portland by members of the faculty of the Oregon Agricultural College. Three courses will be undertaken, the subjects being "Thermics," "Engineering Mathematics" and "Structural Engineering." Each course will comprise eight lectures. These courses will not be elementary in nature, but will partake of the character of post-graduate work, designed for practicing engineers who since graduation have lost touch with the scientific progress of the world.

The Hawaiian Engineering Association at its recent annual meeting, held in Honolulu, elected the following officers: Chairman, Carl B. Andrews; vice chairman, J. A. Gibb; secretary, F. O. Boyer; treasurer, Irwin Spalding.

With a view to assisting in the food conservation movement, the **Detroit Engineering Society** dispensed with its "Feather Party," which was to have been held Nov. 26.

The Engineering Society of Buffalo, N. Y., at its electrical meeting, Nov. 21, listened to a lecture on "Electricity on the Barge Canal," by L. H. Hart. On Nov. 15 Mr. Hart delivered a lecture on "The Barge Canal" at the University of Wisconsin.

The Canadian Society of Civil Engineers will hold today the fourth meeting of the 1917-18 session, at Montreal. The speaker will be George F. Porter, engineer of construction, St. Lawrence Bridge Co., who will address the society on "The Erection of the Superstructure of the Quebec Bridge." This is the second of a series of lectures dealing with the bridge, just opened for service, and is illustrated with lantern slides.

The Nebraska Association of Members of the American Society of Civil Engineers will hold its ninth regular meeting Dec. 8, at Omaha. A feature of the meeting will be an inspection of the Minne Lusa pumping station and the sedimentation basin and laboratory at Florence, Neb., called the most modern coagulant plant in the country. In the evening there will be addresses by Andrew Jacobson, chief chemist of the station, and George T. Prince, on the operation of the station.

The Engineers' Club of Dayton, Ohio, held its first meeting of the season on Oct. 2, the lecturer of the evening being John T. Faig, professor of mechanical engineering at the University of Cincinnati, who spoke on the "Economical Use of Coal by Communities," illustrating his talk with lantern slides. The utilization of byproducts and conservation of natural resources were the main topics.

On Oct. 16, the club was addressed by its vice president, C. F. Kettering, president of the Dayton Engineering Laboratories Co., on the subject of aviation, in which a sketch was given of the history and development of the art of flying with heavier-than-air machines.

At the regular monthly meeting Nov. 6, M. Lukesh, physicist at the Nela Research Laboratory, National

Lamp Works, of the General Electric Co., spoke on the "Art of Lighting, Its Practice and Possibilities." The latest phases in the development of artificial daylight and various color effects were described and illustrated with lantern slides and experiments.

At the midmonth meeting, Nov. 20, August Foerste, professor of geology, of Dayton, addressed the club on the subject of the geology of Dayton and its vicinity.

The Civil Engineers' Society of St. Paul at its November meeting was addressed, for the first time in its history, by a young woman. The speaker was Miss Winnifred Gregory, assistant librarian chief of the industrial arts department of the St. Paul public library, which includes the $4000 technical library, donated to the public library by the Civil Engineers Society. The title of her paper was "The Engineer and the Book." The appointment of Miss Gregory as librarian of the industrial arts department came about through the request of the society. She was librarian of the school of mines library, University of Minnesota, for four years.

PERSONAL NOTES

WARREN R. NEEL has been appointed chief engineer of the State Highway Department of Georgia. Mr. Neel is a graduate of the Georgia School of Technology, and has been identified with large engineering enterprises, especially in Mexico, in which country he was connected with the engineering and construction of the Mexican National highway. In the administration of his department Mr. Neel will be assisted by H. E. ANCHUTZ, formerly with the Florida Highway Department, and J. W. BOYD and E. DAVIS.

JOHN M. MALLOY, of Davenport, Ia., county engineer of Scott County, is now a second lieutenant in the National Army at Fort Snelling.

F. C. CLARK has left the position of superintendent of the New Castle Construction Co., New Castle, Del., to accept the position of superintendent of the Kenilworth plant of the American Can Co., at Kenilworth, New Jersey.

S. F. BLOYER has left his position as draftsman with the Cumberland Valley R.R. Co., and is now in the engineering department of the H. Koppers Co. of Pittsburgh. He is now at Steelton, Penn., where the company is constructing a byproduct coke oven plant for the Bethlehem Steel Company.

ROBERT E. WISE has resigned the position of designing engineer with the Board of Water Commissioners of the City of Hartford, Conn., to accept a similar position with the Connecticut River Conservation Co., at Turners Falls, Massachusetts.

KASTENHUBER & ANDERSON will close there office at Easton, Md., on Jan. 1, for the period of the war. Both members of the firm have entered the army, E. G. KASTENHUBER, JR., as first lieutenant in the Sanitary Corps, and JOHN ANDERSON as sergeant, Battery C, 310th Field Artillery.

PHILIP BRUTON, formerly superintendent of reclamation and irrigation work in San Joaquin Valley, California, with C. E. Grunsky, consulting engineer, San Francisco, is now a lieutenant in the Construction Division of the Aviation Corps, National Army, and is stationed at Vancouver Barracks, Vancouver, Washington.

FRANK LEE, engineer maintenance-of-way of the Canadian Pacific Ry., with headquarters at Winnipeg, has been transferred to Montreal, exchanging places with A. C. MACKENZIE.

RUSSELL A. TRUFANT, formerly with Hartley L. White, Braintree, Mass., is now office engineer for the Cameron County Water Improvement District No. 2, San Benito, Texas.

J. H. A. BRAHTZ has been retained as consulting engineer for the proposed bridge across the Zumbro River to replace the bridge near the power dam, to be built by the City of Rochester, Minnesota.

ERICH A. ZACK, formerly assistant city engineer of Beloit, Wis., is now connected with the Iowa Highway Commission as assistant engineer and chief inspector on the Camp Dodge cantonment road.

GEORGE W. HAWLEY, for the past four years assistant engineer, South San Joaquin Irrigation District, California, is now engineer in charge of San Pablo project for the East Bay Water Co., Oakland, California.

E. B. TOURTELLOT, county engineer of Clayton County, Iowa, for the past four years, is now maintenance engineer, North Dakota State Highway Commission.

WILLIAM B. MCCALEB, formerly superintendent of the Philadelphia division of the Pennsylvania R.R., has been appointed general superintendent of water companies, with headquarters at Philadelphia. Mr. McCaleb entered the service of the Pennsylvania R.R. in March, 1880, as chainman with an engineer corps at Connellsville, Penn. He became superintendent of the Sunbury and Shamokin division in 1896; in May, 1902, he was promoted to superintendent of the middle division at Harrisburg, and in June, 1903, be became superintendent of the Philadelphia division.

A. W. THOMPSON, vice president of the Baltimore & Ohio R.R., and formerly chief engineer, has been appointed chairman of the operating committee of the Railroad War Board, which will coördinate the thirty-eight important railways in the Eastern group of the United States into one single system. This system comprises 122,000 miles of track. Its operating revenue for the twelve months ended June 30 was $1,750,000,000.

GEORGE B. DUSINBERRE has resigned as water commissioner of the city of Cleveland, Ohio. He will continue his work as an engineer.

W. G. READ, formerly assistant engineer, has been made engineer of the Kansas Public Utilities Commission, at Topeka, in place of CAPT. T. J. STRICKLER, who is at present at the Engineer Officers' Training Camp at Ft. Leavenworth, Kansas.

W. L. BENHAM, of the Benham Engineering Co., Oklahoma City, has been commissioned major in the Quartermaster's Department, Camp Funston.

R. B. LEE has been made city engineer of Hutchinson, Kan., vice CAPT. G. L. MCLANE, regimental adjutant of the 110th Engineers at Camp Doniphan, Oklahoma.

V. L. LOGAN, who was formerly assistant city engineer of Hutchinson, Kan., is now sergeant in Company A, 110th Engineers at Camp Doniphan, Oklahoma.

MATT GRAHAM, for six years with Black & Veatch, consulting engineers, and later with the Western Brick Manufacturers' Assn., has been made city manager and engineer of Augusta, Kansas.

BERT C. WELLS, for eight years city engineer of Wichita, Kan., has been appointed city manager of Eldorado, Kan. His place as city engineer of Wichita is taken by P. F. BROCKWAY, formerly assistant city engineer.

NORMAN F. STRACHAN, assistant engineer, Kansas State Board of Health, has resigned and is now serving in the ranks of the 23rd Engineers (Highway Regiment) at Camp Meade, Maryland.

ANDREW GROFT, formerly engineer for the American Cement Plaster Co., is now in the 23rd Engineers (Highway Regiment) at Camp Meade, Maryland.

F. M. VEATCH, formerly chief chemist, East St. Louis Water Co., East St. Louis, Ill., has been appointed assistant engineer of the Kansas State Board of Health, succeeding ALBERT H. JEWELL, who resigned to become assistant engineer for the Michigan State Board of Health.

GEORGE A. ARMES, chief engineer of the Union Iron Works, has been appointed assistant district officer of the Western division of the U. S. Shipping Board at San Francisco.

GALEN B. OWEN, promoted from the office of superintendent of maintenance of the Erie R.R., with headquarters at New York, to that of chief engineer of the Erie R.R. and the New York, Susquehanna & Western R.R., has been connected with the Erie since April, 1903, when he was appointed assistant to the general manager.

There was a break in his service with the road from 1913 to December, 1916, however, when he was engaged in other than railroad work. Before his connection with the Erie, Mr. Owen was successively rodman, assistant engineer, roadmaster and engineer of construction on the Lehigh Valley R.R. From August, 1896, to July, 1902, he was division engineer and superintendent, maintenance-of-way, on the Baltimore & Ohio R.R., and from July, 1902, to April, 1903, engineer, maintenance-of-way, of the West Virginia Central & Pittsburgh R.R., now a part of the Western Maryland. Mr. Owen was born July 31, 1860, and was educated in Towanda, Penn., at the high school and institute.

J. McCREADY, municipal engineer of North Vancouver, B. C., recently tendered his resignation to the City Council.

NEIL COVENTRY has been appointed city engineer of Harrison, Idaho.

J. S. LONG, of the Long Building Co., Seattle, Wash., has taken charge of the construction of the Y. M. C. A. construction work at Camp Lewis, American Lake, Washington.

H. D. BARNES, until recently employed by the Chicago & Northwestern Ry. as inspector on bridge concrete work on the lines west of the Missouri River, is now in the maintenance department, Black Hills division.

CAPT. H. S. BAKER, constructing quartermaster, Camp Bowie, Fort Worth, Tex., has received a commission as lieutenant colonel of engineers in the National Army. He is principal assistant city engineer of Chicago, on furlough. His previous military experience was as first lieutenant with the National Guard in Texas in 1916.

W. R. SIDES, until recently assistant to the contract manager, Turner Construction Co., New York, is now assistant to the president of William Whitman & Co., cotton manufacturers, Boston.

F. H. DODDRIDGE, who has been employed in the United States Engineer's Office, Cleveland, Ohio, for the past three years, on river and harbor improvements, has been transferred to Washington, D. C., as field engineer on the new Key bridge across the Pomotac River.

MAJ. G. W. FREEMAN, of the Engineers' Reserve, has been made head of the St. Paul, Minn., engineering district, succeeding D. W. LOCKWOOD, of Duluth. Major Freeman was assistant engineer in the St. Paul district from 1906 to August, 1917.

R. C. YEOMAN, dean of engineering, Valparaiso University, Indianapolis, has been made associate professor of highway engineering at Purdue University. He was graduated from Purdue in 1907 and was with the National Bridge Co., the Pennsylvania R.R. and Southern Indiana Traction Co. before going to Valparaiso in 1909. Professor Theroux will assume his duties.

MAJ. DABNEY H. MAURY, Engineer Officers' Reserve Corps, has closed his office in Chicago for the duration of the war. For some time past he has been in Washington looking after water-supply problems in connection with cantonment construction.

W. I. JOHNSON, formerly at Butte, Mont., as superintendent for the Foundation Co., concrete lining the Granite Mountain Shaft for the North Butte Mining Co., is now superintendent of construction for the Foundation Co. at the League Island Navy Yard, Philadelphia.

FRED B. GREENLEAF, until recently in charge of the construction of a barking plant for the Great Northern Paper Co., at Millinocket, Maine, has returned to Auburn, Maine.

HARRY W. BELL, until recently with the H. Koppers Co., of Pittsburgh, is now with the Bridge Department of the Interstate Commerce Commission, Southern District, at Chattanooga, Tennessee.

HENRY C. SHELDON, formerly with the Gifford-Wood Co., of Hudson, N. Y., is now with the Wellman-Seaver-Morgan Co., Cleveland, Ohio.

T. J. MADLEN, who was superintendent for the Cooper-Widenmann Construction Co., Detroit, is now with the Masters & Mullen Co., Cleveland, Ohio, as superintendent of construction.

GEORGE R. ARCHIBALD, for the past eight years Carey Act inspector for the Salt Lake Division of the field service, United States Land Office, has resigned to take up the practice of consulting irrigation engineer, with headquarters at Jordan Valley City, Oregon.

C. M. OSBORN, for ten years city engineer of Lorain, Ohio, has been appointed first city manager of East Cleveland, Ohio. Mr. Osborn is a graduate of Case School of Applied Science. He will enter upon his new duties Jan. 1.

J. WARREN JONES, resident engineer in charge of the St. Louis office of the Phoenix Bridge Co. and the Phoenix Iron Co., has been appointed office engineer to assist in the Division of Shipyard Plants of the Emergency Fleet Corporation, Washington, District of Columbia.

HERBERT M. HALE, until recently with the Holbrook, Cabot & Rollins Corporation on Catskill Aqueduct and New York subway work, has gone to the Turner Construction Co., New York, as assistant to the contract manager. Mr. Hale had been with the Holbrook company for six years, prior to which he was with the New York Rapid Transit Commission and the New York Board of Water-Supply.

ROBERT S. PARSONS has been made assistant to the president and general manager of the Erie R.R. and the New York, Susquehanna & Western R.R. He has been assistant to the president and chief engineer of the Erie R.R. at New York. Mr. Parsons will remain in charge of maintenance and construction, with headquarters in New York. He has been with the Erie R.R. since 1895.

OBITUARY

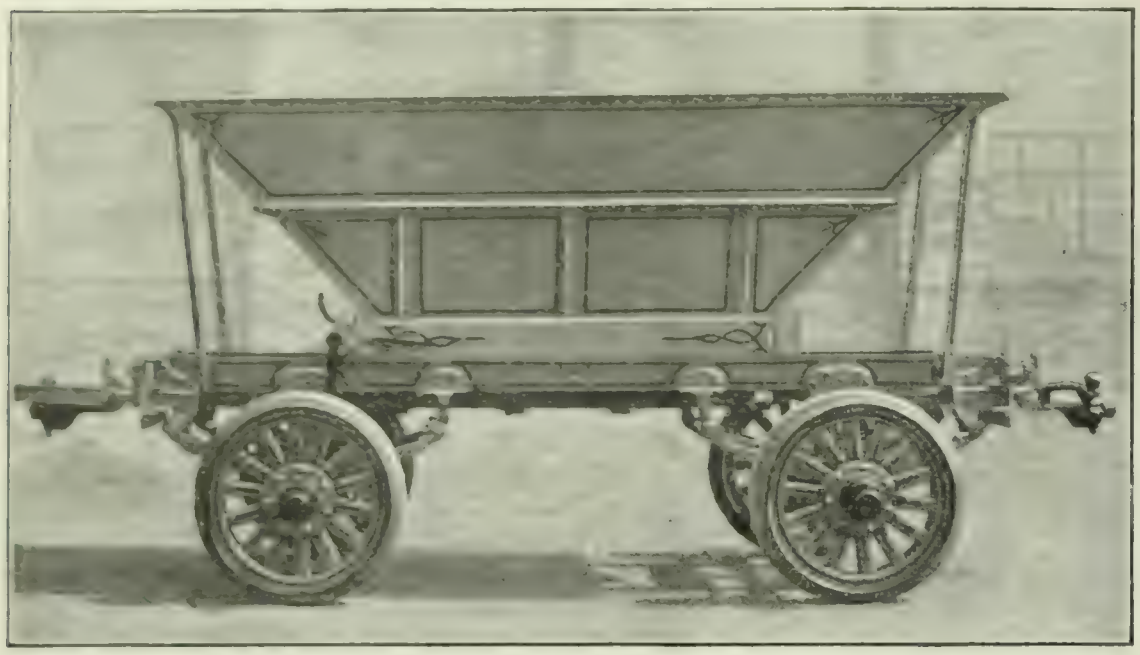
JOHN J. SHEAHAN, owner of the Sheahan Construction Co., of Roanoke, Va., died at Rochester, Penn., Nov. 19. Mr. Sheahan was engaged in railroad construction work in the Southern and Middle States. He was at one time machinist and engineer on the Chicago Drainage Canal and also master mechanic in Richmond, Va., in the course of the construction of the canal and the power house in that city. He was born in Frederick County, Virginia, 53 years ago. One of his brothers is Thomas Sheahan, railroad general contractor, Hagerstown, Maryland.

HARVEY C. MILLER, chief engineer of the International Railway Corporation, died in Newark, N. J., Nov. 23, in his 56th year. Mr. Miller began work as an axeman on the South Florida R.R. in 1879. He left Florida in 1887, when he became connected with the Nicaragua Canal Construction Co., with which he remained until 1893, engaged in railroad location and construction work, and also canal surveys and location. Later he went to the Guatemala Northern Ry., returning to Nicaragua in November, 1897, and remaining until February, 1899, as principal assistant engineer to the chief engineer of the Nicaragua Canal Commission for the United States Government. Mr. Miller was connected also at one time with the Hastings Paving Co., on work in Brazil. He returned recently from Santo Domingo, where he was engaged in overseeing construction of concrete viaducts for the Dominican Government.

ALEXANDER Y. BAYNE, president of the Minneapolis Bridge Co., died Nov. 31 in Minneapolis. Mr. Bayne was 62 years old and had lived in Minneapolis since 1880. Besides being engaged in bridge building he was president of the Queen of the West Mines company.

CAPT. ASA ROGERS died at his home in Petersburg, Va., on Nov. 27, in the 83rd year of his age. He was a Civil War veteran, serving in the Confederate Army as a captain of cavalry. After the war Captain Rogers resumed the practice of his profession as a civil engineer, being associated with the late Gen. William Mahone, assisting him in the rehabilitation of what is now the Norfolk & Western Ry. system. He was one of the engineers who built the famous long bridge near Farmville, Va. Captain Rogers was active in politics

and at the time of his death was employed as a deputy United States marshal.



TRAILER FOR ROAD WORK HAS BOTTOM DUMP

BUSINESS NEWS

Hamilton Now with Walworth

L. F. Hamilton, until recently manager of the advertising and specialty department of the National Tube Co., Pittsburgh, assumed approximately similar duties with the Walworth Manufacturing Co., Boston, Dec. 1. The Walworth company purchased the Kewanee works of the National Tube Co., Aug. 1. Mr. Hamilton has been identified with the exploitation of "Kewanee" products since 1908. His place in the National Tube Co.'s organization has been taken by W. L. Schaeffer, formerly assistant to Mr. Hamilton.

APPLIANCES AND MATERIALS

Truck Trail Wagon Has Bottom Dump

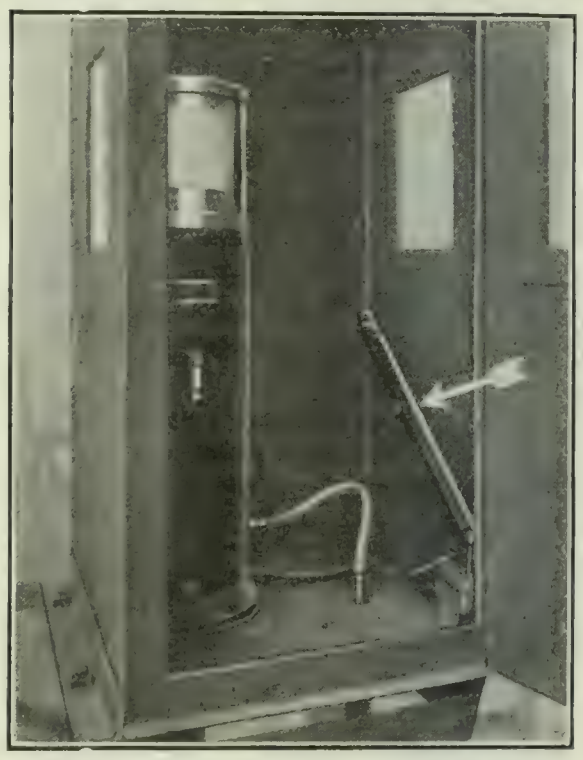
Controllable gravity discharge through bottom doors is the feature of the auto-trailer shown in the accompanying view, and recently introduced by the Warner Manufacturing Co., of Beloit, Wis. The 4-yd. steel hopper body is mounted on a 5-ton frame, and the weight of machine empty is about 1590 lb. The wagon was designed specially for road construction, and has the doors controlled by a ratchet device, so that the load can be spread as desired, while at the same time it is kept clear of the wheels.

The frame is 56 x 46 in., and the track of the wheels is 56 in. The axles are of alloy steel with roller bearings and Sheldon hub. The wood wheels are of the artillery type and have solid 4-in. rubber tires 36 in. in diameter. Semi-elliptic plate springs are used, 48 in. track with those of the leading vehicle. This device was described in *Engineering News* of Mar. 15, 1917. The length of drawbar from center of axle to hitch attachment is 7 ft., with adjustments which permit of increasing the length to 10½ ft. or 14 ft.

Jacketed Electric Heater Unit

The steel-jacketed electric heater unit shown in the accompanying illustrations has been put to innumerable uses in all kinds of industrial plants. Besides such applications as in crane cabs and valve, pump and meter houses, there have been scores of miscellaneous applications. The ease of conducting electric current to remote corners, to moving crane cabs, etc., make the use of an electric heat simpler than that of any other. The heater units shown are of 500-watts capacity, can be connected up in multiple to any A.C. or D.C. circuit where the voltage is not in excess of 250 volts. Only as many as are actually required need be installed, yet additions can be made easily as adding electric lamps. Just as lamps are placed singly or in groups in locations where light is required, so also are these units mounted singly or in groups in locations where heat is required.

The units are flat, the dimensions being $^{3}/_{16}$ in. x 1½ in. x 23¾ in. All parts are inclosed and no porcelain, cement asbestos or molded insulation material is used. Insulated eyelet holes permit the use of ordinary screws for mounting—terminal connectors being placed at each end. In mounting, space is provided between units and between the unit and the surface on which it is mounted to allow for a good circulation of air. The installation view shows one of these C-H units installed in the gas valve house in the coke plant of the



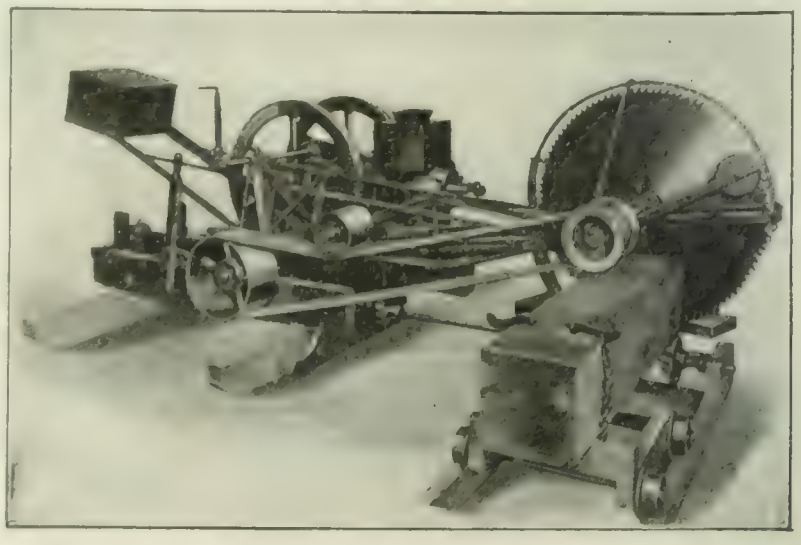
EASILY INSTALLED AND OCCUPIES BUT LITTLE SPACE

Corrigan-McKinney Co., Cleveland. These units are designed and manufactured at the New York works of the Cutler-Hammer Manufacturing Co., Milwaukee.

Portable Crosscut Saw Is Driven by Gas Engine

A new portable heavy-duty crosscut saw has been put on the market by the C. H. & E. Manufacturing Co., Milwaukee. Driven by a 10-hp. gasoline engine it has cut through a 12 x 12-in. timber in 6 seconds, and can handle sticks up to 16 in. square.

As the photograph reproduced at the right of this article shows, the saw itself is well guarded to prevent accidents, and is counter-balanced, the operation being through the pinion and quadrant. The wooden lever in the rear of the frame operates a clutch through which is driven the bevel pinion, which engages lightly with the timber as it rests on the carriage. Through this pinion the timber is moved back and forward to the point where the cutoff is desired.



CUTS THROUGH 12 x 12-INCH TIMBER IN SIX SECONDS

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Civil Engineers Welcomed to New Home

LAST Friday night the American Society of Civil Engineers was formally welcomed to its new home. It was an auspicious occasion, not the least impressive feature of which was the hearty good-fellowship by which it was characterized. There was enough of formality to lend the appropriate dignity; enough of cordiality to show that the welcome came from the heart and not merely from the head. Many were the suggestions as to the broader meaning of the occasion, but in this all agreed—that it was the outward sign of a movement toward unity in the profession. It was felt, too, that this day was the beginning of greater things for the engineer. There will be none to dispute this interpretation of the event; none to withhold their help that the greater things may be accomplished. With 32,000 strong men working together and organized for action, the profession can count upon playing a part in the nation's life such as has not even been hinted at in the activities of the past. The present crisis urges to action. The union under one roof has come at an auspicious time.

War Terminals and Traffic

LAST week Irving T. Bush, Chairman of the War Board of the Port of New York, urged the creation of a water terminal board to handle in an executive way all export shipments during the war. Almost at the same time the railroads of the country recommended to the administration the appointment of a traffic manager to prevent the confusion which now exists by reason of the various executive officers issuing orders for urgent freight movements without coördination among themselves and without knowledge of conditions under which freight must be moved. Meantime, it is understood that the committee on port facilities of the Council of National Defense, which has been making a study of the subject, has recommended that the comprehensive terminal plan which it has worked out shall be administered by central authority in the War Department for the purpose of handling all supplies for the forces of the United States abroad. These three recommendations coming from entirely different sources only emphasize the fact that this well-recognized problem is pressing for immediate solution, delayed only by action on the railway situation. It is evident that an executive authority with power to regulate the shipment, handling and loading on ocean carriers of freight other than that for the army is just as necessary, if congestion and delay are to be avoided, as a proper executive authority to meet the transportation needs of the War Department itself. Whether two terminal boards or traffic managers are needed or whether one central authority would serve the needs of the War Department better is questionable. In any event, the situation requires that settlement of the difficulty should come quickly.

The Real Issue as to Sewage Plans at Cleveland

IN THE latest stage of the Cleveland sewage-treatment plans the real issue before the State Department of Health—in fact the only issue—was whether available data indicate that fine screens will meet the local requirements laid down some years ago by the old State Board of Health. As stated on page 1128, the decision was in the negative. The advocates of screens will be given another chance to prove their claims, but conditions may compel the city to treat the screened sewage by the activated-sludge process. This would apparently be going much farther in sewage treatment than would otherwise be necessary to satisfy the State Department of Health. So much remains to be learned about both screens and activated sludge that engineers and cities facing sewage-disposal problems will be glad to have Cleveland provide data on both processes from a large plant if it is disposed to do so—all the more glad if the data pass the scrutiny of the Ohio State Department of Health.

Carrying Your Terminal Facilities with You

WE HEAR much about terminal congestion. There is discussion of their relief by the highways. Just how that relief can be afforded is shown by two examples cited by Col. William D. Sohier, chairman of the Massachusetts Highway Commission, at the Richmond convention of state highway officials last week. At the time of the Salem fire, it was desired to obtain tents from the armory at Framingham, 26 miles south of Boston. Salem itself is 16 miles north of the Massachusetts capital, so that the distance was 42 miles. The tents were on the ground at Salem three hours and ten minutes after they were 'phoned for. The other instance cited by Colonel Sohier was the moving of a regiment with all its equipment, cooking apparatus, etc., in two hours from Framingham to Boston Common, 26 miles. Had the railroads been utilized for either of these jobs, it would have been necessary to employ terminals at both ends. With the motor trucks and the highways, however, as one engineer aptly expressed

it, the terminal facilities are carried with you. Aside from relief of terminal congestion, there was, in addition, the time saved, for it would have been impossible to accomplish either of these jobs so quickly had it been necessary at the point of initiation to truck from the armory to the railroad station, then to load on railroad cars, and finally, at the delivery end, transfer from cars to local transportation agencies. Truly, the motor truck does allow you to carry your terminal facilities with you.

Industries Using the Highways

ANENT the preceding note, attention is called to the replies received to the *Engineering News-Record's* inquiry regarding the use of trucks and highways for relieving freight congestion. The inquiry was necessarily hasty. There was no attempt to find all examples of such use. The replies, however, published in the issues of Nov. 29 and Dec. 6 are conclusive evidence that the value of the highway as a relief agency is not a matter of theory, but is fully appreciated by the industries of the country. Every day new evidence of such use comes to hand, but sufficient has been presented to satisfy the present purpose—that of demonstrating clearly that the manufacturers of the country are turning to the highway to relieve them of the embarrassment of express and freight delays.

Influence of State Highway Officials' Association

THE American Association of State Highway Officials has found itself. This statement is no reflection on the conduct of the organization in the past. Every new body must go through an evolutionary process before it reaches full effectiveness. The association has progressed fast. It was organized in November, 1914. The members have now come to know each other well, and a frankness, based firmly on mutual understanding, has been developed that results in action and augurs well for the future. The organization already has great influence. It is the body with which the Secretary of Agriculture and the Director of the Office of Public Roads logically deal in connection with the general problems rising out of the administration of the Federal-Aid road law. But the organization has even greater potential power. Its members are the responsible factors in the road policies of the states. As such they are in a position to set new standards for highway construction, to bring about uniformity in state highway laws, and to exercise a large influence on such matters as the regulation of motor vehicles. Moreover, since highway standards, on account of the increase in heavy and fast motor-truck traffic, are rapidly approximating city pavement standards, it is inevitable that the association's influence will be felt in the municipal pavement field. The Richmond meeting showed plainly that the organization is attuned for action. No evidence was needed to demonstrate the ability of the members individually. Their positions in their states guaranteed that. Richmond merely demonstrated that they are equally efficient collectively.

Criticism Not Insult

IN HIS address before the American Society of Civil Engineers on the history of the society, delivered in New York Wednesday of last week, the secretary, Charles Warren Hunt, arraigned this journal for its editorial of Nov. 22 entitled "And They Are Fighting in France," stating that it was an attack upon the loyalty of the society and an insult to the board of direction and to the membership. The pertinent part of his address appears on page 1091. This journal and its two predecessors have frequently commented upon the American Society of Civil Engineers. The tone has always been one of respect, never of insult. Criticism has been voiced, but joined with admiration of the organization and appreciation of the place it holds in the profession. Nothing could be further from this journal's intentions than to question the loyalty of the body or to offer insult to the board of direction and the membership. Comment was intended on the fall program of the society, which we believed should contain war subjects. Nothing else. Suffice it to say that if Mr. Hunt's interpretation represented the attitude of *Engineering News-Record* we would consider his reply not only justified but moderate in tone. For any offense we have unwittingly given we duly apologize.

Engineering Students Allowed to Continue Their Courses

THE engineering-student exemption order of Dec. 8, published in detail in the news pages of this issue, closes the long agitation for the recognition by the War Department of the importance of conserving the supply of engineers. Members of the profession have been as one in their contention that to shut off the supply of engineers at the source, in order to increase slightly the rank and file of the army, would be dangerous. On the other hand, they have realized that a demand for universal exemption of engineering students would be unwarranted, for no engineer would be so bold as to assert that every student at our engineering colleges will become an engineer, the exercise of whose technical talents will be of more use to his country than his services as a private of the line.

By the ruling the dilemma is met by permitting the more promising students to complete their engineering courses, and then present themselves to the government for assignment to duties, probably military though possibly civilian, selected with due regard to their qualifications as engineers. Thus will be met the danger that the engineering school will become a refuge for draft evaders, and the more present danger that the engineering student of draft age, in his anxiety to serve, or in some cases to escape the charge of being a slacker, will volunteer in some non-engineering capacity. As it now stands, the designated engineering students will be "in the military service of the United States," and will know that they are serving their country according to the country's needs.

There may be some room for argument as to the proportion of exempt students, but that decided upon is according to the best judgment of the army officials and many of their advisers from the technical schools. It will undoubtedly work out much better than the original-

ly intended flat one-third of the present classes would have worked, for now the low-grade man cannot benefit by the voluntary enlistment of those above him in class standing or promise of future development.

The ruling, it is clear, puts a large responsibility on the engineering faculties. They must make their judgments on a human rather than on a purely scholastic basis, and must judge their present material in the light of experience with the professional progress of past students. The question up to them is not so much "How good a student is this boy?" but, "How good an engineer will he turn out to be?"

Action by the State Highway Officials

TWO things stand out in connection with the meeting of the American Association of State Highway Officials at Richmond last week—the vigorous action on the interpretation of the post-road clause in the Federal-Aid road act, and that on the highway problem as affected by the war. With reference to the first, the association called upon the Secretary of Agriculture and the Attorney General to interpret the post-road clause more liberally, while steps were taken to have the essential road work plans put into the form of a program for presentation to the Highways Transport Committee and to the Priority Board. We are sure that the interests of highway development throughout the country were very greatly furthered by these actions.

In reference to the call for a more liberal interpretation of the post-road clause, every one must have the greatest sympathy for the arid states. Under the present interpretation federal aid cannot be granted unless the route in question may be expected at a reasonably early date to be used for mail carriage. In the arid states, the long trunk lines go through great desert stretches without habitation, and it will be many a year before there will be mail service over them. These states, therefore, are estopped by this interpretation of the law from making use of the federal-aid funds allotted them under the statute. In other words, under the present interpretation the law is void with reference to these states. Certainly, there could have been no such intention in Congress. In fact, had this possible interpretation been foreseen, it is all but certain that the law would not have been passed in that form.

The engineers of the far Western States, therefore, will have with them the sympathy of highway engineers throughout the country in their plea for a more liberal interpretation of the post-road clause.

In reference to highway problems as affected by the war, the association called upon all state highway departments to prepare a war program, involving the designation of the essential war roads and of the amount of material needed for their construction and maintenance. These programs will clear through the executive committee of the association and by it will be presented in due course to the Highways Transport Committee and to the Priority Board. This is a most important and well considered action.

Moreover, every one at the Richmond convention will carry home to his state a very clear conception of the place that the highway holds in the war scheme, not only as an agency for the transportation of the agricultural and industrial products of the country, but as military thoroughfares should the occasion demand. This point of view will be of inestimable advantage in the preparation of the war programs which the departments will undertake.

Summarized, then, the meeting was a most important one for the engineering interests of the country as well as for the nation as a whole. At a critical period in highway development it faced the issues squarely, and took determined action. The personnel of the organization is such as to guarantee a carrying out of the plans proposed.

The Commerce Commission Recognizes the Railroad War Crisis

AT LAST the government seems to recognize the plight of the railroads. The Interstate Commerce Commission has indulged in the refreshing novelty of an extended recommendation to Congress, and, for perhaps the first time since its creation, has admitted that the railroads need constructive help rather than further regulation. The commission admits that if the railroads are to carry the burden thrust upon them by the war, they must be relieved of the restrictions which have been thrown about them by Congress, and must have the financial backing of the government.

As to the methods by which these restrictions may be removed and this aid extended, the commission makes two suggestions. The first is that the railroads continue under private management, with the repeal of restrictive acts, at least for the duration of the war, and that they be given the assistance of government loans. Under the second plan, the government would take over and operate the railroads, guarantee a return to the present owners and spend its own money to bring the roads up to the physical requirements of the situation. Were government participation in railroad affairs forced in peace times, this journal would unqualifiedly prefer the former of these solutions. In war times, however, the power that may be delegated to railroad officials taken over by the government with the lines may be so great and so freed from political interference that efficient operation can be secured. Moreover, the future is so uncertain, the problems that may arise are so large, that perhaps direct government handling is the only possibility for meeting the situations effectively. Under present circumstances selection between the plans is difficult. The tendencies of the times unquestionably are in the direction of government operation.

Perhaps it is unfair to characterize this new attitude of the commission as an admission of the failure of the restrictive regulation that has been in effect for more than a generation. War conditions like the present could not have been foreseen even five years ago. *Engineering News-Record* rejoices that the commission has reversed its position of last summer and now perceives that there is an emergency. At the same time it is evident that either plan will require masterly handling for maximum effectiveness on the one hand and justice to both the public and the security holders on the other.

With developments coming thick and fast, and with an address expected in the near future from the President to Congress, further comment on the plans can best be deferred to a later issue.

Concrete Shipbuilding Firmly Established by Norwegian Firm

Company Founded Eighteen Months Ago Has Well Developed Shipyard and Has Turned Out Twenty Concrete Vessels, from Small Lighters and Tugs Up to Floating Dry Docks and 1600-Ton Sea-Going Freighters

REINFORCED-CONCRETE barges and ships up to 1600-ton capacity have been built in the past year by the Fougner Steelconcrete Shipbuilding Co. in its yards at Moss, near Christiania, Norway. This company, which was formed in May, 1916, started in to build small concrete lighters or barges, but by gradual development worked into the design and construction of larger towboats and finally of self-driven vessels of small tonnage. It now has on the ways power-driven ships of 1600-ton capacity and, under contract, awaiting the approval of the marine registry of the Norwegian Government, a 4000-ton freighter. All of these vessels, as well as a floating dry dock, have been built under contract for commercial or governmental use.

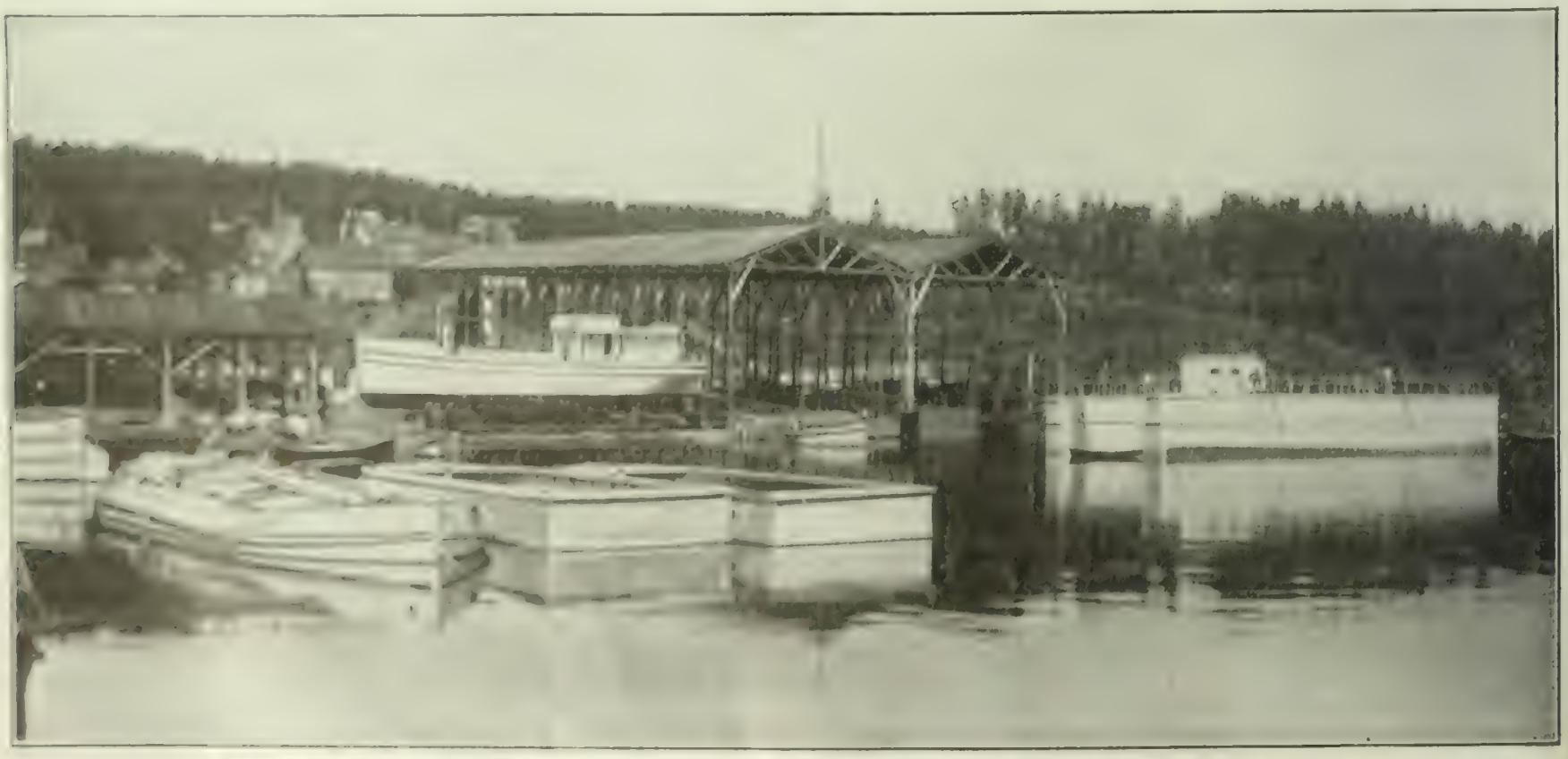
The company was founded by Nic. F. Fougner, a Norwegian engineer who has had extensive experience in reinforced-concrete construction in the United States and the Far East. Mr. Fougner in 1914 built in Manila a 50-ton concrete lighter which was put into immediate service and has been in successful use ever since. Encouraged by this venture, he returned in 1916 to Norway and built the plant at Moss, from which have been turned out about twenty reinforced-concrete vessels and which is now about to be enlarged to take care of orders for more boats.

The first vessels turned out in the yard were lighters of about 100-ton capacity of the general type shown at the left in the view of the yard. The structure comprised a reinforced-concrete keelson, reinforced ribs and a thin shell of concrete plastered on expanded metal or poured around rods. This variation of plastered and poured concrete continues through the Fougner practice today, as will be explained later.

From the lighters progress was made to formed scows or towboats, up to 200 tons capacity. One of these is shown in one of the views. These boats have the more developed shape of a ship, but otherwise resemble the earlier scow. A number are in use for coasting tows up and down the Norwegian coast and one or two have been bought by the Norwegian Navy.

Late in the past summer the yard built and launched its first sea-going boat, the "Namsenfjord," which also is the first concrete sea-going boat. It has received the Class A-1 rating from Lloyds and is now in service for Norwegian coastal traffic. Some views and drawings of the "Namsenfjord" are given herewith. Although very much smaller than the concrete boats now under construction in the Moss plant, its construction is typical of the Fougner design and will therefore be described.

The "Namsenfjord" is 84 ft. long, 20 ft. wide, and 11½ ft. deep from deck to keel, having a draft of 9½ ft. It is 200 tons dead weight, or 350 tons capacity, and is driven by a Bolinder crude oil engine of 80 b.-hp., permitting a speed of about 7½ miles per hour. The cross-sections shown herewith give an idea of the construction. Briefly, there is a reinforced-concrete keelson with cross-frames of reinforced concrete every 4 ft. These frames are continuous along the sides and bottom of the boat, and are tied into the keel by rod reinforcing. Particular attention is paid to the continuity of this rod reinforcing in the transverse frames, so that the bottom, side and deck frames, though cast separately, will form a rigid member. This is insured by continuous rods and by additional knee-brace rods at the corners of the hull. The skin, 3 in. thick, is of concrete reinforced with wire mesh or expanded metal. It is tied into the



YARD AT MOSS, NORWAY, WHERE CONCRETE BARGES AND SHIPS ARE BEING BUILT





CONCRETE STEAMER "NAMSENFJORD" ON THE WAYS AND ON TRIAL TRIP

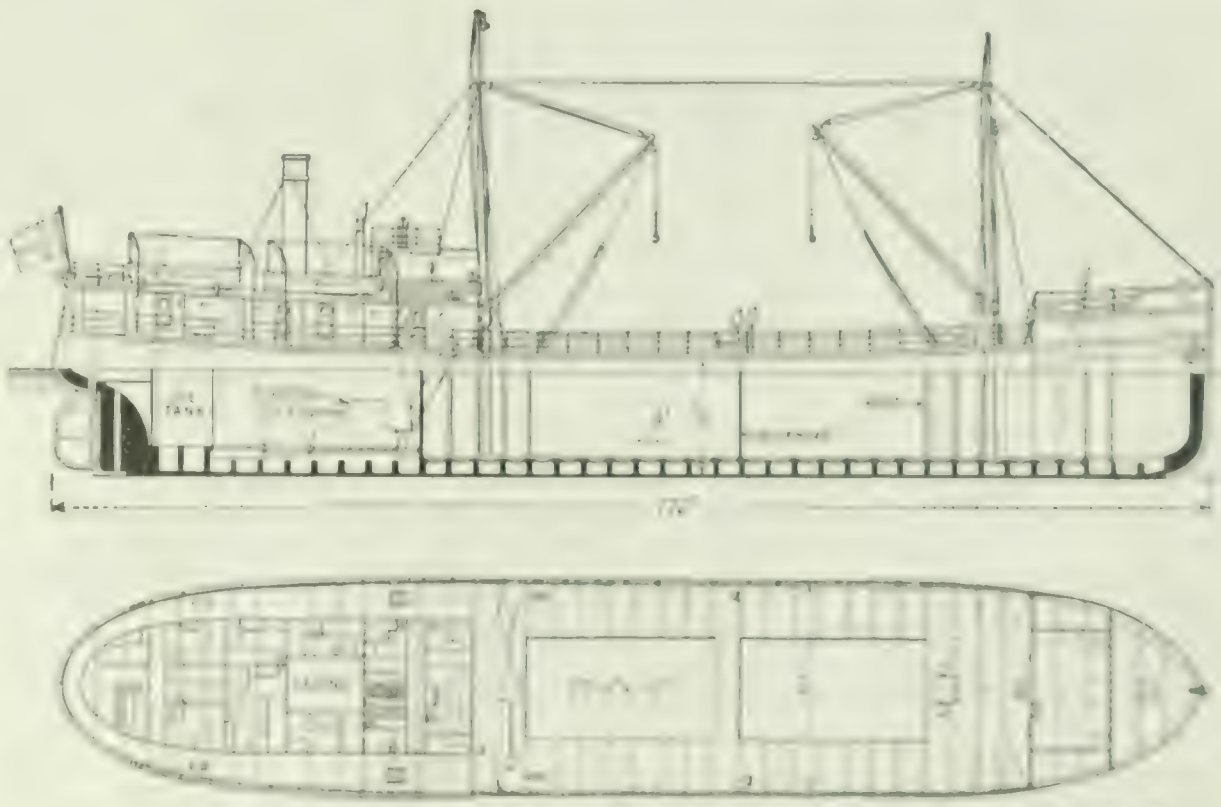
frames and especially reinforced with a longitudinal beam at the outer corners of the hull. There are center posts at intervals, of light wrought-iron pipe filled with concrete, supporting deck-beams which frame at the side into main frames. Two hatchways are provided of a construction shown in one of the sections illustrated. The hatch coamings are longitudinal beams framing at their ends into main deck beams and carrying the deck alongside the hatchway on beams which are partly cantilevered from the side frames and partly flexural beams across to the hatchway coaming. A double bottom is provided by precast concrete plates spanning the tops of the keel frames and tightly jointed over these frames. On top of this interior plating 2 x 4-in. timbers are laid above each frame and on them are spiked the 2½-in. floor timbers for the hull.

The hull is divided into water-tight compartments by continuous transverse bulkheads, located as shown on the elevation of the 1600-ton ship. These are walls of concrete, reinforced with metal lath.

A special reinforcing of longitudinal and cross beams is provided for the engine bed, as shown in one of the small cross-sections. The engine exhaust is through the rear mast, which is hollow. The cabin is of wood. Wooden fenders are provided along the hull and a wood stem is bolted to the bow. The rudder and its fittings are of iron.

In building this hull the bottom is poured in wooden forms up to the top of the longitudinal hull beam at the lower corners of the hull. For the sides the framing is either plastered or poured, depending upon different conditions. For a small boat, such as the "Namsenfjord," the reinforcement, both the rounds and metal lath, is erected for the total height of the hull and concrete poured in between the metal lath, using it as a form. The outside and the inside of the lath are then plastered to give the full section. In higher boats this process is duplicated, except that short heights of lath are put in at a time, thus leaving a smaller lift of concrete at one operation. For a still larger boat, where the unsupported reinforcement would be too flimsy, the usual wooden forms are used for the main frames and the concrete poured as it would be in any concrete construction. The construction is continuous for the whole hull, however, so that no joints are left in the surfaces exposed to water. Concrete is placed continuously, even though it takes 24 or more hours of work.

The same variation between plastered and poured concrete holds for the deck construction, convenience of



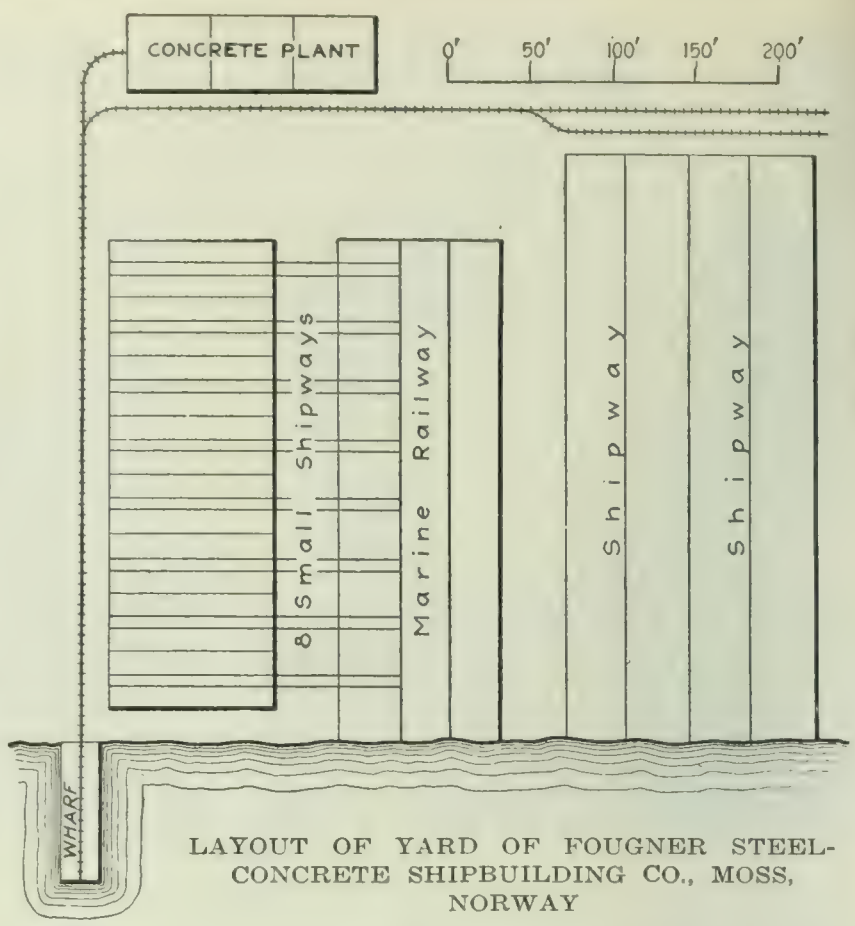
GENERAL LAYOUT OF [illegible]-TON REINFORCED-CONCRETE POWER DRIVEN SHIP NOW UNDER CONSTRUCTION

operation and the stiffness of the reinforcing being the governing considerations. It is reported that the "Namsenfjord" is remarkably stable and steady. Moving pictures of it in the harbor of Christiania which have been shown in this country seem to bear out this contention.

A drawing of the 1600-ton boat is also given herewith. This boat is 172 ft. long, has a width of 31 ft., a height of 18 ft. and draws about 15½ ft. of water. In general details it resembles the design of the "Namsenfjord" except of course it is made stronger to meet the increased size. It is also provided with considerably increased accommodation for crew. Two of these boats are on the ways at Moss, one to be launched in December and the other in January. The company has also contracted for a 4000-ton capacity ore carrier for the Sydvaranger Mining Co. of Norway. This boat is 254 ft. long, 40 ft. wide, and has a 19½-ft. draft, and is to be equipped with two 300-b.-hp. Diesel engines. The keel has been laid for one of these large boats, but further construction is awaiting the authorization of the Norwegian Marine Registry, which has a committee investigating it preliminary to authorizing its registration under the Norwegian flag.

The concrete ships built according to the Fougner system have a ratio of dead weight to displacement from 12 to 15% greater than the similar ratio in steel ships.

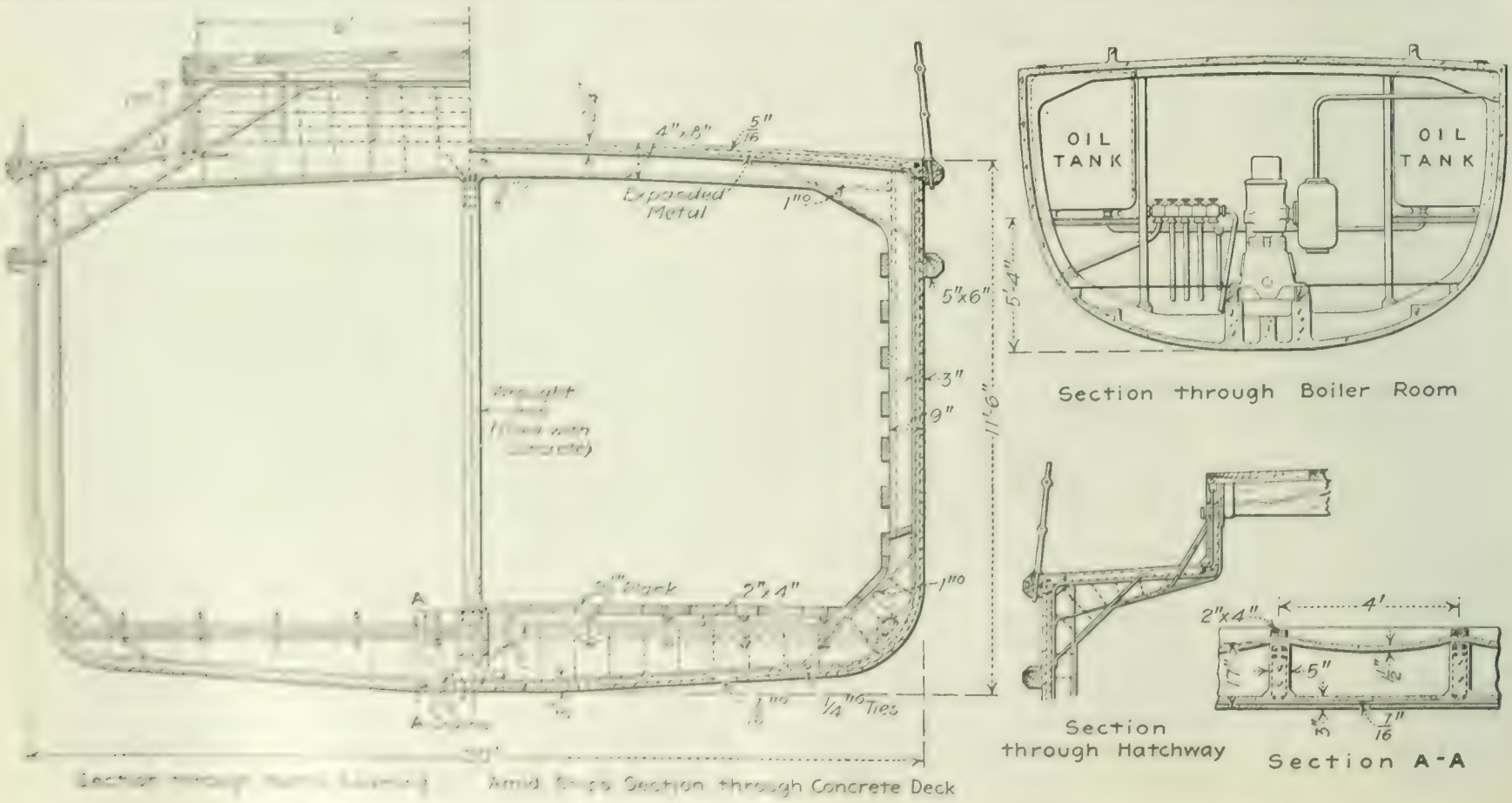
A view and drawing are also given herewith of the Moss yard. There are here eight covered ways parallel to the water front, on which are poured the smaller vessels. These ways are about 100 ft. long and are reached at their rear by a narrow-gage railroad track connecting with the concrete plant. At the front of the ways is a marine railway leading to deep water. The boats are constructed under the covered ways in timber platforms resting on rollers on the rails of the shipways. By means of these rollers the completed hull is shoved down on the marine railway, from which the hull is launched sideways. In the view the "Namsenfjord" is on this marine railway just preliminary to its launching.



LAYOUT OF YARD OF FOUGNER STEEL-CONCRETE SHIPBUILDING CO., MOSS, NORWAY

Beyond the marine railway are two covered shipways for the construction of the vessels of larger size. These are about 400 ft. long and will accommodate the largest boats now under construction in the yards. The large ways are of the normal beam-and-pile type, and the launching from them is to be done stern on.

Behind the shipways is the concrete plant. The sand, gravel and cement are brought in by boat to the wharves at the end of the narrow-gage track and transported by cars on that track to bins over the mixing plant. Here two mixers turn out the concrete into cars on the narrow-gage track, which run behind the small ways. Hooks traveling on overhead longitudinal rails in the middle of each shipway pick up the concrete buckets off the small cars and sliding down the ways by gravity deposit the concrete whenever desired for the hull. The



DETAILS OF CONSTRUCTION OF "NAMSENFJORD," 320-TON CONCRETE STEAMER

hooks and buckets are hauled back by power winches. For the large ways the same performance is repeated; that is, the tracks run to the rear end of the ways, where longitudinal overhead trolleys pick up the buckets to distribute the concrete anywhere along the shipway. All power is electric, bought from the municipality, which runs a hydro-electric plant.

Considerable experimenting has been done with the concrete materials for the ships, but a conclusion has finally been reached to use a mixture of 1: 2½ of cement and a natural gravel found nearby, the largest particles of which do not run over ¼ in. In the earlier work a 1: 1½: 2 or 1: 1½: 2½ concrete, with the large aggregate not running over ½ in., was used, but later developments showed the small aggregate to work better around the steel in the small sections of the ships. Particular attention is paid to the mixing and proportioning of the concrete, expert engineers being employed as inspectors for this part of the work. It is claimed that the resulting concrete is quite water-tight.

First Concrete Dry Dock

In the view of the shipyard is also shown the floating dry dock which has recently been completed by the company, the first concrete dry dock ever built. This is of the usual type of floating dry-dock design, with poured and plastered sides and poured frames. It is to be used by a company building pleasure craft and will float a ship up to about 100 tons. The company has also recently built a tug, which is not shown in any of the views.

The Fougner Steelconcrete Shipbuilding Co. has been incorporated in the United States and has offices at 18 E. 41st St., New York City. Nic. F. Fougner, the president, is in this country at the present time arranging for the development of a yard where concrete ships may be built.

Automobile Costs on Sun River Project

Costs of running two 5-passenger automobiles on the Sun River Project of the U. S. Reclamation Service for 1916 were as follows: No. 1 ran 7726 miles at 11.28 cents per mile; No. 2, 5280 miles at 10.85 cents per mile; No. 3, 7089 miles at 7.92 cents per mile. The first car, according to the *Reclamation Record*, closed the year with a total mileage of 28,975 miles. Although the car was overhauled and in good condition, its operation was not considered economical, on account of the cost of repairs and delays from such cause. It is estimated that the machine did work that would have required the constant use of two good driving teams used alternately. The average cost of feeding a team on this project is $1.40 per day. If there be assumed a plant charge of 60 cents—the average for the project for the 1916 season—against each team and wagon, and 30 miles for an average day's trip, the teams would have cost 15.23 cents per mile. This is based on 730 team days and 258 plant-charge days. Comparative team-unit cost for the year's travel for No. 2 machine is 12.67 cents. Only one team would have been necessary. To transport by team the resident and construction engineers using the No. 3 machine would have required two single driving horses at a unit cost of 8.3 cents.

Society's War Activities and Journalistic Criticism

Secretary of American Society of Civil Engineers Discusses Recent Editorial in Engineering News-Record

AT THE meeting of the American Society of Civil Engineers in New York, Dec. 5, Mr. Charles Warren Hunt, secretary of the society, gave a history of the body for the past 25 years. In the course of his paper, Mr. Hunt recounted the war activities of the organization, and criticised an editorial which appeared in *Engineering News-Record* of Nov. 22, p. 951. That portion of Mr. Hunt's paper relating to war activities and to this journal's editorial is reproduced herewith. Editorial comment will be found on page 1086.

Mr. Hunt's Paper

The pertinent part of Mr. Hunt's paper follows:

In a recent issue of *Engineering News-Record* the following editorial appears:

"And They Are Fighting In France." "The 'Subsidence of Muck and Peat Soils in Southern Louisiana and Florida' was the title of a paper presented two weeks ago at the meeting of the American Society of Civil Engineers. With the exception of three war addresses, equally peaceful topics have occupied the meetings since last April. The fall program, so far as announced, contains no papers bearing on the tremendous industrial and engineering problems which the winning of the war demands that we solve. This is an engineering war, yet the society seems not to recognize its opportunity."

It is unfortunate that such an improper, unfounded and sarcastic editorial insinuation should be made about an organization whose aims and objects are clearly unselfish, in a commercial publication on which the profession in a large measure depends for its technical news.

The time for this attack upon the loyalty of this society—just after it has become one of the founder societies—leaves an impression of malicious intent.

Of late all of us have heard much of the use of previously unheard-of methods of warfare, and the writer feels sure that every right-minded member of our allies of the mining, mechanical and electrical societies will unite with the members of this society in condemnation of this misuse of editorial prerogative.

It is hoped that the following brief statement—written before the appearance of this insult to the board of direction and to the membership of this society—will be a sufficient answer.

War Activities

As soon as war was declared, the society placed its facilities at the disposal of the Government, and, both as an individual organization and jointly with the other founder societies, has done all it has been asked or permitted to do. The value of the engineer has been recognized to a greater extent than ever before, and in the wonderful progress made in raising, training, transporting and maintaining the new Army of the United States, as well as in the investigation and solution of new problems, he has been a most important factor.

A joint committee representing the national societies,

of which William Barclay Parsons, M. Am. Soc. C. E., was chairman, was active in securing the legislation which provided for the Engineer Reserve Corps, and committees made up of members of these societies have been instrumental in recruiting engineer regiments in many parts of the country.

In 1915, in the absence of President Marx, the writer was requested by a sub-committee of the Naval Consulting Board to coöperate with it and representatives of other national societies, to formulate plans for industrial preparedness. He reported to the board of direction, on Jan. 17, 1916, that a plan had been developed by the sub-committee, acting in conjunction with the five national societies representing the civil, mining, mechanical, electrical and chemical engineers, for securing complete statistics of the industrial strength of the country. Under this plan, in each state of the Union, one representative, recommended by each of these societies, was appointed as an associate member of the Naval Consulting Board, and the five engineers thus appointed in each state constituted a board to secure the necessary information for the Government through the aid of the more than thirty thousand members of these organizations. As is well known, this great work was carried to a successful conclusion.

In these and in many other ways the society, and its board of direction, has been active in the present emergency.

Every member of the society must read with pride our "Roll of Honor," the first issue of which, incomplete as it undoubtedly is, contains the names of 575 engineer officers who are now serving in the army and navy. Since that list went to press, 148 have been added to it, and it is still incomplete. This means that more than 8½% of the entire membership wears a uniform. The list, however, does not contain the names of hundreds of other members who are serving their country unobtrusively but still no less unselfishly and effectively, on advisory boards or simply as citizens. The writer knows of many cases where at great personal sacrifice such work has been and is now being done.

Only a few days ago a suggestion was made somewhat timidly over the telephone by J. W. DuB. Gould (one of our members who is devoting his time to the service of the Government but who is one of those not mentioned as not listed on our "Roll of Honor") that perhaps the society might consider some arrangement by which the United States Food Administration could secure the use of the house we so recently vacated, in order to carry on its work in New York City and State. The writer at once said that he believed that the society would be glad to offer this house for the use of the nation, for the purposes specified, free of charge.

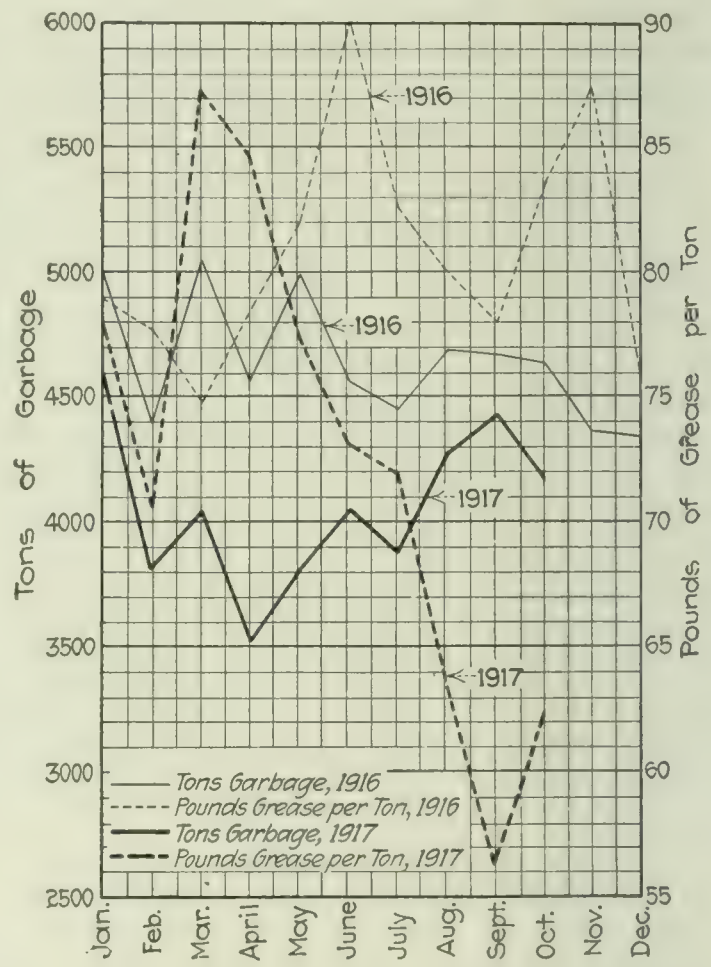
It was not possible to get the board together; indeed, in these busy times, a meeting of the executive committee is difficult to secure. By telephone, however, each available member of that committee has given his unqualified and enthusiastic support to the proposition; the arrangement has been made, and the United States Food Administration Board will begin work at our old home on Friday of this week.

It is perhaps unnecessary to state that the head of this most important board is a member of this society—Herbert C. Hoover.

Quantity and Quality of Garbage Lowered by War Conditions

Figures from Boston Show Marked Reduction in Amount of Grease Recovered from City Wastes

MARKED reductions both in the output of municipal garbage and the amount of grease recoverable from it this year, as compared with 1916, are disclosed by figures compiled by the Boston (Mass.) Development & Sanitary Co., which has the contract for handling the bulk of the city's household wastes. The accompanying curves tell the story. Two reasons, it is believed, have combined to produce this result—the increased cost of



HOW HOOVER FOOD CAMPAIGN AND HIGH COST OF LIVING IN WAR TIMES HAVE REDUCED QUANTITY AND GREASE CONTENT OF BOSTON GARBAGE

virtually all food stuffs, and the conservation campaign of Food Administrator Hoover and his staff.

Taking the figures for August, September, and October, 1917, it is seen that the amounts of grease obtained per ton of garbage were 62.1, 56.4 and 63.7 lb., as against 80, 78, and 83.6 lb. during the same months of the previous year. A comparison of the total quantities of garbage produced during the two years is also highly significant, especially when it is pointed out that normally an increase of about 5% can be expected, due to growth in population.

The inference to be drawn from these figures, is, of course, that war conditions are stopping waste in Boston kitchens. Not only this, but families in Boston are consuming less meat than formerly, as is indicated by the smaller quantities of grease recovered from the garbage. The results are particularly valuable in that they show the changed conditions to be expected in the operation of public or private garbage reduction works.

Military and Other Highways in War Time

An Address, Slightly Condensed, Delivered Before the American Association of State Highway Officials at Richmond, Va., Dec. 4, 1917

By William D. Sohier
Chairman, Massachusetts Highway Commission

THE subject of military roads is one of the utmost importance to the world at the present time; in fact, the results of the war really are going to depend fully as much upon roads and highways as they are upon any other one factor, because it is manifest that if you cannot feed your men, move your guns, supply them with artillery and ammunition, you cannot maintain an army in an existing location.

While the railroads and steamships are vitally necessary to bring the supplies and men, ammunition to the artillery, and everything needed for modern war, to the country, and from the large storehouses to the railheads, the soldiers in the trenches, and more particularly the soldiers back of the trenches that are holding the long battle lines, have to be almost entirely supplied over the roads.

Which Highways Are Important

The whole battle of Verdun was really fought, as far as the French were concerned, with soldiers, ammunition, guns, and supplies that were transported over the roads, because one railroad which originally supplied that region was cut by the Germans, and the other one was dominated by their artillery. The consequence was that the army was supplied with ammunition, guns and men that came over the roads.

From one point of view, all roads which are of any importance are military; to wit, any roads which have to be used for the transportation of any of the products which are necessary for the conduct of the war or the feeding of the people with the articles that are necessary to sustain life. It is a question of relative importance, but under existing conditions we should certainly confine our efforts to those roads which are of the most importance from this point of view.

Military Roads in France

Virtually all of the roads in France were military roads. The French road system was admirably adapted to be used for military purposes. This can be illustrated by a few figures:

France, with a population of ten times that of Massachusetts, and an area of about twenty-five times the area of Massachusetts, had, when the war started, over 371,000 miles of macadam road. These roads had been built for many years; they were all graded, with foundations where necessary, and all had adequate drainage. Virtually all had a hardened surface of waterbound macadam, though a certain percentage had been built with a bituminous surface.

There were about 32,000 miles of national or departmental highways, or about 10% of the whole. These main arteries connected all the more important cities and villages with a network of main highways through the whole of France.

The width of the "Route Nationale," including ditches, was 60 ft.; the macadam surface was usually 24 ft. wide, with about 15 ft. of graded road on each side and then a ditch. The "Route Departmentale" was about 42 ft. in width, with a macadam surface usually about 18 ft. wide.

Secondary Roads

There were also over 107,000 miles of road of secondary importance, what might be called county roads, connecting all the little towns, villages and hamlets. There were 47,500 miles of road that were perhaps of interest to two or more towns. These roads were graded about 30 ft. in width, including ditches. Then there were about 184,000 miles of what might be called ordinary country roads.

The roads of the least importance had a macadam surface about 9 ft. in width, but were graded 27 ft. in width.

So far as I can learn, it was this road system which enabled the armies of France to stem the German armies' rush on Paris, and to throw them back to where the trenches were first made.

France has been so well supplied with roads in most of the sections on the battle line that it has been unnecessary to build very many more, except in particular places. The big problem has been to keep up and maintain what they had, with the tremendous traffic that had to go continuously over them.

In a few instances, when the battle line became established certain roads and cross roads were so located, for instance, near Verdun, that they were easily visible and subject to shell fire. Therefore, a few miles of road have been relocated on the lee side of the hills where they were out of sight of the German batteries and relatively safe from shell fire.

Maintenance

The traffic has been so tremendous that naturally the roads have been very rapidly worn out, and as they had to be kept in continuous use, certainly whenever that particular section of the battle line was active, it was impossible to do more than throw material onto the road and allow the traffic to roll it down.

When divisions have to be moved the utmost capacity of the main roads is required for the trucks, artillery, etc., and the slow-moving trucks and the light motor ambulances and other motor vehicles have to take longer routes on the roads of less importance, so that these country roads have been absolutely necessary during the war.

The slow-moving horse-drawn vehicles are required to hug the shoulders of the road, the fleets of motor trucks pounding steadily by in the middle, spaced about 50 ft. apart, traveling at from 12 to 15 miles an hour.

During the attack at Verdun, the Bar-le-Duc-Verdun road, about 50 miles in length, had to carry a continuous procession of about 5000 motor trucks every 24 hours.

The roads were kept constantly in repair by putting on broken stone whenever it could be obtained, though of course when any serious large break in the road occurred it had to be filled with any material available, quite often stone from the foundations of buildings, brick and other material.

Whenever there was a lull and it was possible to put the roads into better condition, it has usually been done by scarifying by hand and building half the road surface, possibly 1 or 2 in. in depth, of broken stone, in some localities obtained by rail but usually from some local stone supply, or the stone taken from the villages where the buildings had been destroyed. The stone has been broken up by hand, either at the source of supply or on the side of the road, and when it was possible steam rollers have been used to consolidate it.

When the actual fighting is going on it has had to be shoveled in from the roadside and allowed to compact under traffic, which it does very rapidly in wet weather. Occasionally clay or dirt has been used to help it bind.

This repair work has been done by men who were not of fighting age or by prisoners of war.

Experienced Road Engineer Necessary

The experienced road builder of executive ability has found his place in this war. The roads back of the English army are being built and cared for under the direction of Brig.-Gen. H. P. Maybury, who was one of the English county engineers and was afterward one of the engineers on the Road Board in England; and he has under him, in charge of the road work, experienced men. One of these men, formerly with one of our large companies, is now a lieutenant-colonel. Back of one of the British armies this engineer has had charge of the roads for two years, and has had from 10,000 to 12,000 men working on them constantly. Twenty-five or thirty per cent. of these have been German prisoners.

In order to keep the roads merely passable they have had to use up to 2000 tons of metal a day. Broken stone costs $7.50 a ton. It isn't a question of cost, however; it is a question of keeping the traffic going.

Experience in England

I fear the people in this country, and particularly our legislators, are not really awake to the tremendous importance of good roads if this country is to do its part in the world's war. They are important, not only from a strictly military point of view, but they are absolutely essential if the country is going to grow and harvest its crops, and supply not only our own soldiers but our allies with the food that they cannot live without.

The experience of England and what she has done since the war started, on her highways, is perhaps the best example that we could follow. England has not been invaded, but she has had to enlist, train and equip large armies, has had to organize to make tremendous numbers of guns, enormous quantities of ammunition and supplies of every kind.

It is very significant that she, with her tremendous network of railroads and small area, has found that her roads, especially the main roads, were of vital importance. With all the tremendous additional expenditures made necessary by the war, and with undoubtedly a large number of the uninformed public saying that she must save every dollar possible—why not stop some of the expenditures on roads?—she has not only not stopped these expenditures but has actually increased them in many places.

Highway Work in England and Wales

England and Wales have over 151,000 miles of road, of which 32,000 miles are urban roads and over 118,000 are classed as rural roads. The expenditures are shown in the accompanying tables:

TABLE I. HIGHWAY EXPENDITURES BY LOCAL AUTHORITIES IN ENGLAND AND WALES

Year	Mileage	Maintenance	Average Maintenance per Mile	Total Including Interest and Improvements
Urban Roads:				
1909	32,000	$21,415,590	$670	$51,651,625
1912	32,807	23,033,180	700	52,120,330
1914	33,624	25,612,680	760	54,918,810
Rural Roads:				
1909	118,692	19,627,950	165	20,814,405
1912	118,665	23,942,200	190	24,266,545
1914	118,461	26,965,385	225	28,592,035
Total Rural and Urban:				
1914	152,085	52,578,065	345	83,510,845
1915	.....	.....	....	87,836,655

TABLE II. HIGHWAY APPROPRIATIONS MADE IN ENGLAND AND WALES DURING WAR BY GOVERNMENT DEPARTMENTS

	By Road Board	Appropriations by War Departments For Public Roads	Total Government Aid
(a) 1914	$7,036,330		
(a) 1915	10,440,180		
(a) 1916	1,847,315	$5,256,655	$7,103,970
(a) 1917	1,006,660	2,011,835 (b)	3,018,495

(a) Financial year ending Mar. 31. (b) June 30, 1916 to Mar. 31, 1917.

TABLE III. WORK ON PUBLIC ROADS IN ENGLAND AND WALES SANCTIONED TO MAR. 31, 1917

By War Department	$5,925,790
By Admiralty	418,235
By Ministry of Munitions	886,940
By Timber Supply Department	36,525
Total	$7,267,490

Total expenditure on roads, public, private and government, by above department, expended under the supervision of the Road Board, to Mar. 31, 1917, $13,800,705.

In 1912, two years before the war, England was spending on her 32,000 miles of urban road over $50,000,000 a year, including improvements and interest. The average cost of maintenance was $700 a mile a year. She was spending on her 118,600 miles of rural road over $24,000,000 a year, including improvements and interest. The average yearly maintenance was about $190 a mile. On her road system the local and county authorities were spending over $75,000,000 a year, including improvements and interest, with an average expenditure of $300 a mile for maintenance alone.

This was an increase of about 10% over her expenditures in 1909. She had just established a Road Board which was existing in various counties and some municipalities with government aid.

The year that the war started this Road Board made grants for the improvement of various roads, amounting to about $7,000,000, in addition to the amounts that the other authorities were spending.

In 1915, the second year of the war, the local authorities were spending a little more than they spent in 1912 on the urban roads, about $760 a mile for maintenance in place of $700.

The revenue which the Road Board had been receiving up to that time from motor vehicle fees, taxes on gasoline, etc., was turned into the general revenue, and

their grants for the improvement of roads were reduced to $1,200,000.

This work was carried out under the direction of the Road Board, and according to its report it included the reinstatement of roads damaged by extraordinary traffic caused by the various departments interested in the war, and which had formed the subject of claims against the departments concerned.

The board states also that in some places improvements were required for the ordinary public traffic, in which case the Road Board and the highway authorities contributed.

What is particularly noticeable is that the heavy traffic, and particularly the motor truck traffic, was obliging the authorities, in order to keep the roads passable, to strengthen and improve the surfaces of the roads. As Table III shows, the war branches of the government, aside from the Road Board, spent no less than $7,267,490 on the public roads. The same departments spent a total of over $13,000,000 for roads on private land and on government land and on public roads.

When one considers the relatively small area of England and Wales, and the relatively small mileage that has to be maintained, these large expenditures are extremely significant.

Retrenchment Not Recommended

In the year 1916, apparently the Retrenchment Committee had suggested that highway improvements and grants for that purpose be discontinued. The Road Board, however, after considering the matter, fully decided that this ought not to be done, that "while the majority of schemes should be deferred, such work should now be undertaken as is required in connection with improvements of road crust necessary to prevent the serious deterioration of roads of real importance. We recommend, therefore, that such advances be approved by the treasury as are, in their opinion and in that of the Road Board, required in order to prevent such deterioration."

Consequently, that year they decided to approve grants amounting to $1,000,000; but, of course, in addition to this there were the expenditures that were made by the various war boards.

Military Roads in the United States

Certainly all highway authorities should coöperate to the utmost of their ability in building and maintaining the roads which are of vital necessity to this country.

Taking my own state—Maj.-Gen. Leonard Wood, U. S. A., when he was in command of the Northeastern Department, wrote Governor McCall, in substance, that the roads in Massachusetts were of the utmost importance, from a military standpoint; that we were well supplied with the regular diagonal roads, that he thought they were adequate for their purpose, but that it would be of inestimable advantage if proper radial and concentric roads were built which would connect the main arteries of travel and enable an army to be maneuvered and kept constantly supplied at whatever point might be made necessary by military exigencies.

Which roads are of military importance will differ in the different parts of the country. I cannot consider them all.

Roads connecting camps, places where troops are concentrated and from which they may be moved, or leading to forts or other points of military importance, are, of course, of the greatest importance from the military point of view. Also, the roads from the nearest railroads to such camps or forts.

Military Roads to Repel Invasion

Taking the country as a whole and considering merely the possibility of an invasion, the only serious possibility at the present time would be an invasion upon either the east or west coast.

Take the east coast; I think all military authorities will agree that the probable landing place of any foreign foe would be somewhere between Norfolk, Va. and Portland, Maine. The objectives of a foreign foe landing on this shore would undoubtedly be the thickly-populated and rich sections of the country, which would be comprised within a very small area, at any rate within a line drawn from Baltimore to Cleveland or Chicago at the west. If this territory were taken it would virtually cripple all of our industries, take a large proportion of the wealth of the country and would include nearly all of our manufacturing plants where we make ammunition or guns or ocean-going ships or warships, and a large part of our coal and iron supplies.

Military Roads on East Coast

In the New England States the roads of military importance would be the roads connecting the important centers of manufacture, supply and population, the radial roads in and out of the seacoast cities, and, perhaps equally important, a concentric road connecting up those radial roads to enable troops to be fed and supplied on any line which they might have to follow.

Near the cities that might be subject to attack, the military roads would be not only these radial roads, but say a concentric road a short distance out of the city 5 or 10 miles, and another lateral or radial road farther out, say 10 to 12 miles. It would probably be very desirable to have a secondary line running back from the seacoast 50 or 75 miles to connect up the larger places and the main roads.

The same sort of system of military roads would be necessary in the other states that might be subject to attack.

Of course, taking the country as a whole, a road would be of great military advantage that was back of the seacoast a sufficient distance and connected up our main centers of population and industry in the whole of the United States.

Mexican Border and West Coast

A good road along the Mexican border that would enable the troops to be rapidly concentrated, at any given point of attack, by motor trucks or even machine gun companies on motor cycles or small motor cars, would prove of great advantage in the case of any raid upon the border. Our troops suffered greatly from the lack of such roads when they were on the border last year.

A good road of this character a short way back would allow the troops to be considerably scattered but to be quickly concentrated at any desirable point.

I think the west coast is now being provided with roads of military importance. The topography of the

country practically settles where these roads have to be; north and south main roads have to run mainly in the valleys. Perhaps from a military point of view we need more laterals to connect them up, and some more concentric roads to enable an army to be maneuvered properly at likely points of attack.

Highways Supplement the Railroads

But there is another aspect of highway work in the war times. No doubt as our railroads are becoming congested and it will take considerable time before they are enlarged sufficiently to take care of the traffic, the highways will have to do more and more of the transportation of the country.

In some instances, the best that can be done may be to connect the rich farming community with its railroad center, having in view, of course, the possibility of a continuous through line later to connect with some other large center.

In other places the route or main line will be a through highway that will enable the large centers of manufacturing or those at which agricultural concerns are concentrated, to move their stores by motor truck whenever that becomes necessary.

Stronger Roads Necessary

We must realize the tremendous traffic that any road which is supplying an army or is near an army post must carry, and build the roads and bridges accordingly.

When we consider that a regiment of infantry today is 3600 men, and that a motor truck company has twenty-seven trucks, one wrecking car, and five motorcycles; that an infantry company has twenty-seven trucks and five motorcycles, or else twenty-eight teamsters with 112 draft mules, seven riding mules, and twenty-seven wagons to a company, you will readily see that a division which consists of six regiments, or three brigades of two regiments of infantry, one brigade of cavalry, one brigade of artillery, one regiment of engineers, and one battalion of signal corps, would make a very heavy amount of traffic on any highway that had to supply them.

Practically speaking, one division requires almost one road to itself. With all its equipment it would be nearly 15 miles, one day's march, long.

To move such a division by railroad requires 16 trains, 16 locomotives, about 104 sections, a total of something like 1500 railroad cars of various descriptions.

You must consider that each division has a brigade of artillery which consists of two regiments; each regiment has three batteries of four guns each, with six horses, and six caissons with six horses. These guns and caissons average about 3 tons each.

Each regiment of artillery is supplied by an ammunition train, and takes about ten ammunition wagons to each regiment of infantry.

With the heaviest guns used today it is probable that all of our bridges on the main lines or lines that might be used ought to be built to stand at least 15 to 17 tons. Some of the heavy guns now being made weigh 17 tons and have fully three-quarters of the load on the rear axle.

While these heavy loads must occasionally be carried, it is very likely in the future that the heaviest guns will have to be moved either on rails or on caterpillar tractors.

The main thing, therefore, that our roads must be made to stand is the continuous pound and wear of the 3- to 5-ton trucks and of the heavy wagons on iron tires with 4- to 6-in. wheels, the weight of which will not exceed, probably, 3 tons. Each of us in our own locality must see that we use materials, if possible, that are capable of withstanding this traffic.

Foundations Necessary

I think we should all pay a great deal more attention to the foundations of our roads than we have done in the past, when the traffic was lighter.

In my own state there is a tremendous commercial traffic in motor trucks. They are constantly on the increase. Most of our main roads have to carry 100 to 150 a day, and some of them have a much larger number. This is going to require stronger roads, thicker macadam, and a foundation in a great many places where the old macadam or gravel road would have held under the traffic of a few years ago without such foundations.

I think as soon as matters get a little more straightened out we shall have the active coöperation of the military authorities—at any rate, their support—in our endeavors to build the roads.

This has been shown already in Massachusetts. The Ayer cantonment, which has something over 30,000 men, was built about two miles from the railroad station on a fairly decent gravel road in a small and poor country town. The road was rapidly destroyed in a couple of months, and was becoming almost impassable.

Coöperation by the Military Authorities

The Highway Commission and the County of Middlesex are now coöperating with the government officials in building this road. We cannot build it as substantially as we would like, as we haven't time, but we are building a 6-in. bituminous macadam road, putting in the foundation where necessary and all necessary drainage.

The government officials are taking charge of this work under a percentage contract, and the state has agreed to pay one-half the cost, not to exceed $15,000, and the county has intimated that it will pay one-third of the cost, not exceeding $10,000.

The necessity of roads, from the military point of view, is shown again in the City of Quincy, Mass., where the government is constructing a large shipyard to turn out destroyers and other vessels. The existing highways were inadequate, as was the single line of street railway. Here the authorities in charge of building the yard for the government have decided to widen the road and put in two street railway tracks, the street railway company to repay the cost, and they are building from 15 to 17 ft. of bituminous macadam road on each side. They are widening the whole road to 60 ft., and the government is going to pay out of its funds, the whole cost of the highway widening.

The absolute necessity of good roads from a military point of view is already well recognized by the military authorities in this country, especially those who have had to do with the engineering and transportation departments or large bodies of troops.

I wrote to the War Department in Washington, asking what roads they considered of military value, how they should be built, etc., and received an answer dated Nov. 26, from Maj.-Gen. W. M. Black, Chief of Engineers, U. S. A., important parts of which are as follows:

The requirements of a military highway do not differ in any material respect from those of a highway for modern commercial purposes. The character of the roadbed should in general be the same as for a modern commercial highway, and in general a road designed for modern commercial purposes would serve well for military purposes. In practically all cases roads which are valuable in a military way are those connecting important commercial centers. Of course, there are some cases where roads interconnecting certain defensive works, or connecting such defensive works with neighboring commercial centers, are needed for strategic and other military purposes, but the number of such cases is small compared with the total length of roads useful for military purposes.

As to the question of what military roads must be prepared to carry in the way of traffic, it may be stated that our existing ordnance liable to accompany a field army will have its heaviest representative in a 12-in. howitzer weighing about 27,000 lb., 18,600 of which are on the front wheels and the remainder on the two hack wheels. The wheel base or distance between the front and rear axles is 18 ft.; width of track, 7 ft. 4 in.; width of tires, 8 in.; width of tire shoes, 12 in. This howitzer is to be drawn by a 75-hp. caterpillar tractor weighing about 25,000 lb. Comparison with the largest present-day commercial trucks shows that a road substantial enough for such will suffice for the ordnance load, so that in this particular as well as in a strategic way roads suitable for commercial purposes will meet the military requirements.

In short, it is the opinion of this office that any road that will serve for present-day commercial motor transportation will be satisfactory for prospective military traffic of all classes.

As you are probably aware, there were introduced at the last Congress two bills (Senate Bill No. 2470, by Senator Chamberlain, and House Bill No. 5165, by Representative Dent) which provided for a comprehensive system of military highways for the United States. It is believed that it is only in some such way as this that the problem of military highways will ever be satsifactorily solved, that is to consider the needs of the United States as a whole, to work out a project to meet such needs, and to complete such project in the order of the relative importance of the roads making up that project.

Major P. S. Bond, Corps of Engineers, U. S. A., says:

The motor car saved Verdun to France. But there is one highway in France which enjoys the same distinction. For three months, 24 hours a day, an endless procession of motor trucks, two abreast in each direction, traveled this highway going to and from Paris.

Without transportation an army is helpless, and transportation is impossible without suitable military roads. It is, therefore, essential that roads should be laid out and constructed with a view to military use as well as to the uses of peace, especially on frontiers most likely to be the scene of military operations. A little intelligent forethought and supervision by the Federal authorities would meet military needs with comparatively slight increase in expense.

It is of great importance also that there be no weak links in our distribution system. Troops and supplies will move both perpendicularly and parallel to the line of battle, and both cross and parallel roads should be paved. A section of unimproved road on an otherwise well-paved route might become impassable for large trucks, thus nullifying the military value of the entire stretch of road.

Good roads and railroads increase the useful productive capacity of our mines, fields and forests. Every road in every part of the land which connects a producer of any commodity with a shipper or consumer of that commodity will play its part in enabling the nation to bring to bear its full strength in armed conflict, and the better the road the more perfectly it plays its part. Therefore, every good road which is a necessary artery of supply or travel, as distinguished from purely pleasure routes, is an esential part of the system of national defense, even though it be not located in the theater of actual military operations.

A country-wide system of military roads, with a marginal highway around the entire country, will do much to solve the problem if it is properly prosecuted. Our splendid railroads will be of little use to us unless we complete our distribution system and are prepared with good trucks and good roads to distribute supplies to the points where they are needed.

The best and most comprehensive presentation that I have seen of this subject has been made lately by Maj.-Gen. Leonard Wood, U. S. A. What he says is much to the point and so practical that I cannot do better than to quote him as follows:

Of course, war demands a nation's entire resources, and the most efficient means of delivering them are needed. Thus a systematic well-planned network of roads which can be regularly used commercially is not only a good investment, but may be of tremendous value to our military forces. While hastily or improperly built roads should not be rushed at this time, on the chance that they might be of some strategic value to our armies, substantial highway construction of economic value should not be curtailed because we are at war. Through routes connecting centers of production, or population, aid in the prosecution of war by providing additional facilities for transportation of men and supplies.

There are also many roads, more especially along our coasts, the construction of which would probably not be warranted from the commercial standpoint, but which are a very real necessity in coast-defense plans. These, for example, might connect points of supply with selected points of defense, or enable the easy shifting and concentration of defending forces. Present roads are inadequate for such purposes in practically all coast states. It would be well to select the roads to be improved at this time after consultation with the War Department, and build those which have the greatest strategic value. It might frequently happen that a location which would make the highway a military asset would serve the community as well as another location which might be a military liability.

As a general rule, highways and highway bridges which are capable of sustaining modern commercial traffic will also stand under military loads. A bridge or road designed for the commonly used loading of a 17-ton road roller will be safe for practically all military loads and can be easily strengthened for the heaviest field guns now in use. Military plans are based on existing conditions and therefore field guns and their carriages are designed to be transported over the bridges and roads in the theater of operations. If heavier structures were the rule, larger guns would be forthcoming. At present the largest siege guns are transported in sections, the heaviest section weighing about 18 tons, most of which is on one axle, but distributed over a considerable area by means of "caterpillar" wheels.

Highway bridges to be of military value should, therefore, be designed for the heaviest commercial loading with a clear width of roadway of not less than 24 ft. and preferably 30 ft. From the military standpoint it is desirable that they should be (1) as nearly as possible of standard design, (2) difficult to put out of commission, (3) easy to strengthen, and (4) easy and quick to repair or replace in case of partial or total destruction. Structural steel, reinforced concrete and masonry are the only materials which answer these requirements, and at the same time have the permanence desired for this class of work. Structural steel fulfills the conditions named more completely than the others, but simplicity in design, using standard members and substantial construction, are prime requisites. The heavier the type of construction the more adaptable it is to any given military situation.

To be of value to armies in campaign, roads should be paved for a width of not less than 18 ft. and preferably 20 ft., and the total width between inside edges of ditches should be at least 30 ft. This will provide for two lines of motor trucks and allow a space on either side for the emergency repairs of broken-down vehicles, or the movement of troops. A shoulder width of 12 ft. either side of the pavement, would be very desirable, as this would give room for infantry marching without interfering with the use of the pavement for loaded vehicles. Low grades are, of course, very desirable. A grade of 3½%, if not too continuous, is without objection, and occasional short stretches of 5 to 6% grades can be negotiated without serious difficulty. Any steeper grade has a marked tendency to bunch and slow up traffic, requires lighter loading or more animals, and consequently reduces the capacity of the road.

The foundation for the paved road should be capable of carrying the loads mentioned above, and its depth of course depends on the material used, character of subsoil and

climate. It is apparently the tendency in this country to slight this part of the work in order to reduce costs. The speed as well as the weight of motor trucks demands the most painstaking and substantial construction. The foundation and substructures should receive the most careful attention, as they are liable to fail in bad weather or when needed in an emergency. Heavier foundations than are customary would not only be good military insurance, but also lengthen the life of the wearing surface under peace-time traffic.

The requirements of the wearing surface for military purposes may be stated as, (1) absolute dependence in all kinds of weather, in all seasons of the year, under the most severe usage, (2) wear resistent, so that extensive or frequent repairs or maintenance will not be necessary, (3) easy and quick to repair without interrupting traffic and with simple tools and materials, (4) low in tractive resistance, and (5) offering a good foothold for horses and a good grip for rubber tires, and at the same time smooth enough to allow a good rate of speed for motor trucks. Here again it is seen that military requirements coincide closely with industrial considerations. Only the highest types of standard pavement surfaces answer these requirements completely. Wearing surfaces which are not suitable for use in our cities will not stand up under concentrated highway traffic. The block pavements such as stone or vitrified brick are probab'. the best types, but in localities where these materials are not available carefully prepared sheet pavements of proven worth can be used satisfactorily. Methods of construction or types of surfacing which are used to cheapen the first cost at the expense of the requirements stated above should not be used. They are also proving uneconomical under modern commercial traffic.

The shoulders of a road paved for a width of 20 ft., being little used for traffic, may be lightly surfaced for a width of from 2 to 5 ft. on either side. The tractive resistance of this shouldering material should not be much greater than the pavement in order to avoid accidents when motors going at a high speed turn off the paved portion. In many localities oiled, rolled earth will answer; in others crushed rock must be used.

The construction of highways and highway bridges built by an army in the field would necessarily be governed by other considerations than those discussed. Timber would, for example, be used to a considerable extent in bridge building. The European armies, however, are giving dependability and permanence greater weight than formerly. Under war conditions only the highest type of construction can long withstand the strain.

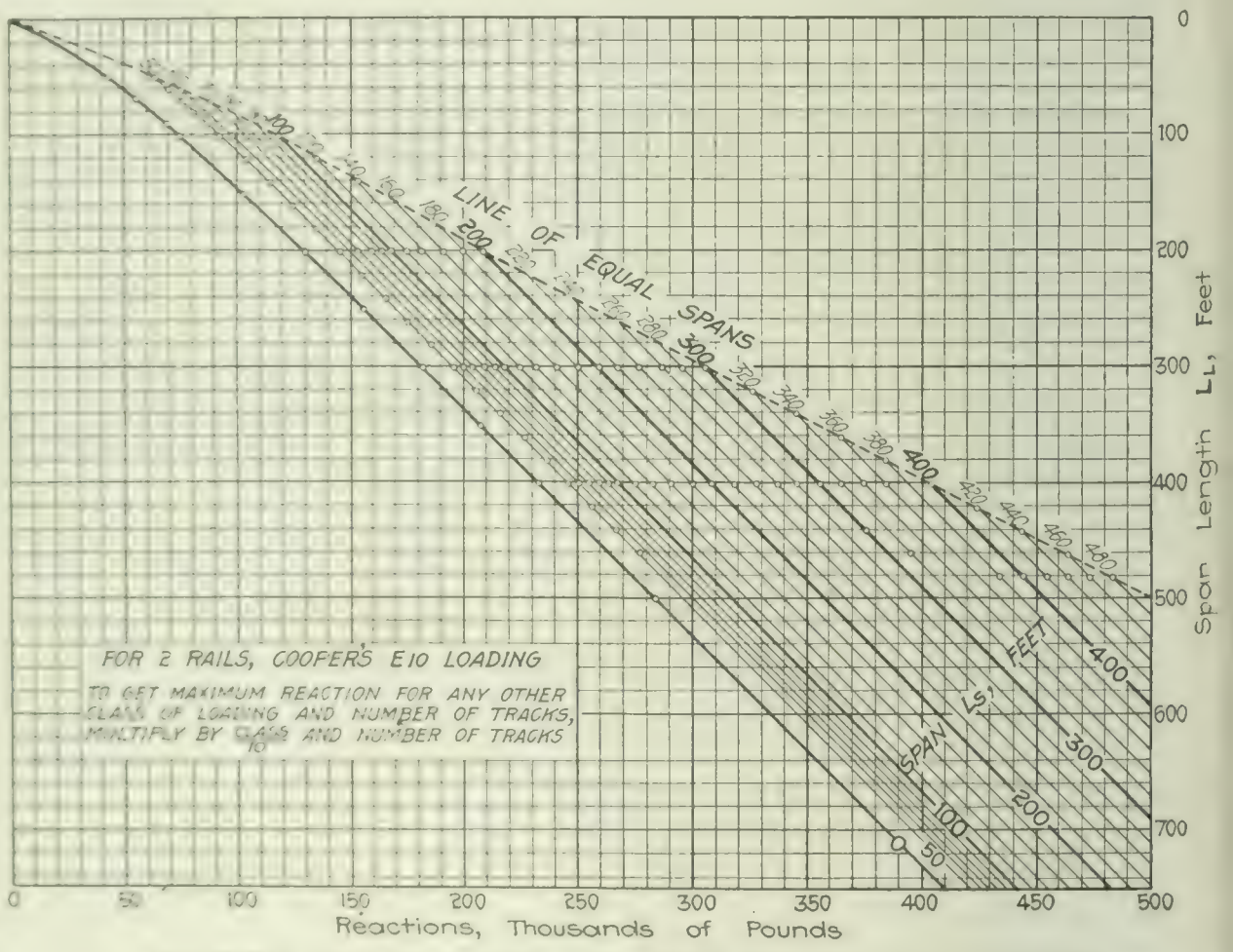
In conclusion, I would urge consideration of road construction paralleling our Eastern seaboard, particularly in those localities where important fortifications exist with no first-class connecting road. No one can foresee the outcome of the present crisis nor those crises which will follow. These matters of preparedness which cannot be handled over night should be considered well beforehand and provided for while we still have time and allies to defend us.

I think we should all confine ourselves to the building and maintaining of the roads that are really of the utmost importance to the military arm and to the country. We should not waste any effort on roads that are not of much importance. We should pledge ourselves to the utmost endeavor to this end, and I know the government will not find any body of men in the whole United States that will be more loyal and more active and more efficient than the Association of State Highway Officials.

Maximum Live-Load Pier Reactions for Railroad Bridges

By F. R. Sweeny, C.E.
Pittsburgh, Penn.

THE live load for which railroad bridge piers and abutments must be designed is determined from the heaviest type of locomotive to be used, by means of the criterion for maximum floor beam reaction. According to well-known formulas, the maximum reaction occurs when the two adjoining spans are loaded in direct proportion to their lengths. That is, if W_L represents the load on the longer span L_L, and W_S the load on the shorter span L_S, the maximum reaction at the pier occurs when $W_L/W_S = L_L/L_S$. With the aid of a moment diagram the proper wheel to be placed over the pier to produce this maximum reaction is located by trying several just to the right and then to the left until one is found which gives a ratio of W_L/W_S too large in one position and too small in the other. Occasionally several wheels will satisfy this criterion, and only by trial can the maximum condition be obtained.



MAXIMUM LIVE-LOAD PIER REACTIONS FOR RAILROAD BRIDGES

If different combinations of span lengths are taken and the maximum reaction worked out for each case, the results may be reduced to the simple diagram shown, in which the inclined lines represent the shorter span and the ordinates the longer. On the horizontal axis, just below the intersection of these two lines, will be found the maximum reaction in thousands of pounds. This diagram is worked out for two rails of Cooper's Class E10 loading. To determine the load for any other class and any number of tracks, multiply the values given in the diagram by the ratio of the class in question to 10 and then by the number of tracks.

At the upper end of the diagram, where relatively short spans are involved, the effect of the concentrations is to curve the lines slightly, but in the longer

spans a large portion of the load is uniform and the lines are almost straight.

The diagram may be reduced to the following very convenient formulas, which will give results accurately enough for designing purposes. For Ls between 50 and 100 ft., the maximum reaction

$$R = \left(\frac{L_L + L_S}{2} - 20\right)\frac{class}{10} \times N$$

For Ls one hundred feet and over

$$R = \left(\frac{L_L + L_S}{2} + \frac{1900}{L_S}\right)\frac{class}{10} \times N$$

where N is the number of tracks.

The maximum reaction for abutments will be found on the diagram where $Ls = 0$. This may also be reduced to approximate formulas. Where L is between 50 and 100 ft.

$$R = \left(\frac{L}{2} - 20\right)\frac{class}{10} \cdot N$$

For L over one hundred feet.

$$R = \left(\frac{L}{2} - 30\right)\frac{class}{10} \cdot N$$

All reactions found by the above formulas are in thousands of pounds.

Car Shortage and Its Relation to Highway Work

Extracts from an Address Before the American Association of State Highway Officials at Richmond, Va., Dec. 4

By Charles M. Upham
Chief Engineer, Delaware Highway Department

IN DISCUSSING the subject of "Car Shortage, Its Present Condition and the Remedy," let it be understood that this convention is not discussing this subject to see if there is a possible way to get around or overcome any of the priority orders, nor to criticize or hamper in any way the decisions of the Council of National Defense. The purpose is to draw forth in discussion any points that may lead to a situation or condition so that highway work can continue; so that highway work can be taken out of the class of non-essentials and not be grouped with theaters and musical instruments, and that Priority Order No. 2 can be so modified that open-top equipment can be used for the delivery of materials in the construction of certain highways, at least.

Inadequacy of Freight Rates

In order to discuss these conditions on a solid foundation, it seems to me that it is time well spent to review the conditions during the past few years and to state a few of the things that have been done to relieve the present conditions. In 1912 or 1913 the railroads asked for an advance in freight rates of approximately 15%. This increase, they pointed out, could be utilized for new equipment, additional track, new terminals, etc. They received about 5%. This led the railroads to economize and make fewer big improvements. The depression of 1914 was then about to make matters worse for the railroads, and in April, 1915 conditions were such that the records show that there was an excess of 327,000 idle freight cars, and that at no time since 1908, with the exception of a very few months, was there an excess in unfilled car requisitions; the idle cars numbered from 7000 to 400,000 during this period. Surely this did not indicate the necessity of new car equipment or new rail equipment, or new terminals.

In August, 1914, the war commenced, and during the latter part of the year 1915 congestion in certain districts started. The excess of idle cars quickly diminished until September, 1916, when the scarcity of freight cars began to be felt. These conditions grew rapidly worse until May, 1917, when the unfilled car requisitions totaled 148,000. By coöperation and efficiency this situation was temporarily overcome and conditions were bettered, so that in September, 1917, the unfilled car requisitions were reduced to 34,000. The activities of the past few months and the great increase in volume of production have overcome the gain made by the efficiency, and once again the total of unfilled car requisitions is increasing, and we have not yet reached the maximum demands.

When asked, "Why the present conditions?" one person says, "Not enough cars," the next person, "Not satisfactory terminals," and the next, "Not sufficient tracks," and still others assert, "It is the motive power," and if the truth were known, the chances are they are all correct. Would a reply, "Not sufficient improved highways," be incorrect?

Reasons for Shortage

The reasons for the present car shortage and freight congestion can be summed up as follows:

The present railroad equipment, which has remained virtually constant for two or three years, is now asked to handle an amount of freight that has greatly increased in volume over normal conditions, and is still increasing. The situation has come to such a state that it is very probable that it will be impossible for the carriers to handle all the traffic that is offered during the coming winter. During the first five months of our entry into the war, our railroads handled more freight than in the corresponding months of 1916, which year broke all records. The traffic handled in these five months exceeded the total traffic moved in any entire year prior to 1904.

In six months, May to October, 1917, 18% more coal was moved than in the corresponding months in 1916. About 116,000 carloads of freight have been hauled to the camps, and up to date 17,000 carloads of freight have been handled for the Shipping Board. Approximately 75,000 carloads of supplies each month are being moved to the camps. This year the railroads have hauled the largest passenger business ever known, besides transporting over a million soldiers to the camps. These movements in themselves do not mean so much, but they have complicated matters and increased the difficulty of moving freight traffic. All of these increased demands have been met while the railroads have virtually the same facilities as they had two years ago.

Much has been done to overcome the present situation or car shortage, but probably the greatest factors are the "pooling" of all freight cars and later of the entire equipment east of Chicago.

One of the many things that has assisted toward overcoming the present car shortage has been the intensive loading of cars. It is only recently that railroads have loaded their freight cars to marked capacity. The carriers are now asking that all heavy commodities be loaded to 10% in excess of the marked capacity of the cars, and that all light-weight or bulky freight should be loaded to the full cubical capacity. The car service committee informs us that for every ton increase in the average load per freight car for all the equipment of the United States an additional 100,000 cars are made available.

It has been found that the average time consumed by shippers in loading and unloading freight is about two days. This indicates that the shippers generally plan not to release equipment until expiration of the free time allowed. Any reduction in the time of loading or unloading of freight will make available a large number of cars and will assist materially in overcoming the present want of equipment.

At present there is a shortage of many thousands of freight cars and this will increase during the winter months and bring acute conditions unless every shipper loads to capacity and every consignee unloads cars immediately. Such has been the coöperation since the war began that the railroads have been able to move approximately 25% more freight than in the same period last year.

Highway as a Means of Relief

Even with all that is being done, with the close coöperation between railroad and shipper, the maximum efficiency of the railroads will soon be reached. Our canal and waterway systems, very valuable assets, are not sufficiently developed to take much of the freight. Electric railways can help, but the great increase must be transported over the highways.

Just how can the highway be economically utilized? It is doubtful if there would result a saving by sending a truck on very long journeys, even over good highways. While I have not the figures at hand, it would seem to me to be possible to send trucks on journeys of one day, or a day and a night, up to 200 miles, on good highways. Many of our largest cities in the congested districts are located so that trucks picking up freight one day can deliver it in another city during the next day. If trucks were used for all freight between near-by cities, this would relieve thousands of cars for "long hauls," and also prevent congestion at over-burdened terminals. If our truck lines were developed they could take care of l. c. l. freight within certain zones and release thousands of cars. One instance I know of is where a small safe was the only piece in the car. This could have been handled by truck and thus made one more car available for longer distance freight.

Already freight trucks are operating to a small extent between cities. The present freight congestion can be greatly remedied by increasing this kind of traffic. This will mean, however, the proper maintenance, and in some cases, the construction of highways.

In such a time as this the construction of highway work should not be carried on as it has been formerly. In some sections that cannot be called essential, traffic and freight have been bumping over poorly constructed or non-improved highways for years and years. The construction at this time of these roads could not be called essential, though no doubt it would be beneficial. In other places traffic has been bumping over roads that have been poorly maintained. It would not seem that they should be repaired just at this time. But there are roads that are located in such a way as to have an economic and military importance. [The reader is referred to a paper on "Military and Other Highways in War Time," elsewhere in this issue.—Editor.]

All state highway officials should make a list of roads the construction and maintenance of which they deem of economic or military importance, giving their reasons for each case. They should also estimate the number of cars needed for the construction or maintenance of these roads and the time that these cars should be needed. Then a committee should be appointed to confer with the Highways Transport Committee, which would take up the matter with the proper authorities and inform the highway officials how many cars will be available for highway service. In this way a coöperative program could be outlined and the more essential highway work be continued.

Burn Sewage Gas to Eliminate Odor

Gases arising from the three Imhoff tanks at Rock Hill, S. C., created so great a nuisance that they have been collected in improvised gas-holders over the gas slots and then burned. J. G. Barnwell, city manager, in reciting the experience of the city at the recent City Managers' convention, stated that the city had suits pending against it aggregating $200,000 and others threatened, bringing the amount to $500,000. The allegations were on three counts: Stream pollution, discoloring stream and smell from works.

Experts have studied the situation, and as a result the pollution is remedied by chlorination. Experiments indicated that chlorine, acting as a bleach, would also eliminate the color if used at mills, which were compelled to treat 4000 gal. of wastes daily at a cost of 15c. per 1000 gallons.

The gases from the Imhoff tank were found to be methane and sulphuretted hydrogen. They were given off in the sludge, which foamed badly. Finally, it was concluded to build up the sides of the 2 x 23-ft. gas slot one foot higher and erect a gas-holder arrangement.

A flame 6 in. long consumed continuously 2 cu.ft. per hour, thus eradicating the odor nuisance.

In discussion, O. E. Carr remarked that at Niagara Falls, where many chemicals are made, the difficulty is to keep the chlorine, naphtha, etc., out of the water and sewage. The problem has not been solved, but put up to the manufacturers. Two naphtha explosions in sewers have occurred already, in a carbide factory.

A member of the City Managers' Association recounted an experience with a woolen mill in a case where similar suits were brought. The Imhoff tanks and filters could not handle the domestic and mill waste on account of lint clogging the filters. An arrangement has now been made by which the mill stores its 65,000 gal. of waste until night, when this is sent to a special ¾-acre filter bed of its own. Treated separately, both sewages can be handled successfully. Incidentally, a pitometer survey had recently reduced the water consumption from 1,000,000 to 660,000 gal. daily.

Mechanical Plant Largely Used in Pennsylvania Road Maintenance

Labor Difficult to Hold During Past Season—Great Increase in Use of Roads by Motor Trucks—Embargo Halts Work

By George H. Biles
Second Deputy State Highway Commissioner of Pennsylvania

IN PRESENTING the problems of road maintenance work in Pennsylvania this résumé is given with the single thought of enumerating the facts briefly, rather than of attempting any detailed elaboration of the difficulties and obstacles we have encountered during the past season's work and of describing measures to which we have resorted in order to accomplish results under what can be truly called abnormal conditions. Pennsylvania acquired a system of highways comprising approximately 10,200 miles, composed of various types of improved and unimproved roads. The latter approximated 80% of the total mileage, which, under the law describing this system, specified that they should all be taken over for maintenance and construction by the State Highway Department. It is doubtful if any other state has approached the road question in this way, the general practice being only to take roads under control for maintenance after they have been built or reconstructed.

This system of state highways is augmented by approximately 400 miles of state-aid roads which are maintained jointly by the state and the township or borough, each paying 50% of the cost. The state, however, performs the actual work and finances it, and after proper certification of cost, it is reimbursed by the township or borough.

The maintenance and repair of our highways are financed from the revenues derived from auto license fees which, for the present year, will reach about $3,270,000. This anticipated fund was budgeted at the first of the year to the various classifications of the work, such as resurfacing, oiling, general repairs, etc., and upon estimates received from the several district engineers, authorizations were issued with which the work under each engineer was prosecuted. After the authorizations had been issued, estimates were requested for materials which had to be purchased, such as stone, sand, gravel, stone chips, dynamite, fuse, caps, culvert pipe, bituminous materials, etc., and from these estimates bidding schedules were prepared and advertised for contract. When the contracts were awarded, preparations were begun at once to take care of the deliveries so that when the season for work arrived material should be on hand and the usual delays in receiving materials should be eliminated.

Mechanical Devices Largely Used

Realizing that the labor situation would be tense we installed mechanical devices for unloading the larger shipments of stone, gravel and stone chips, and engaged numerous motor trucks, in addition to those owned by the department, to insure quick deliveries. On the unimproved roads the road machines or graders were started early, and these roads were put in good condition in the early summer, which is most essential in earth road maintenance. Organizations of men and equipment were started where partial deliveries of materials had been made, but we had not progressed far when the effect of the abnormal conditions were becoming apparent. The contractors furnishing our materials were affected in their car supply by the diversion of cars to shippers of coal and other materials used in the fabrication of war supplies. Companies requestioning 25 cars daily received between four and seven, and in most cases these were flat bottom cars.

Under such conditions unloading devices had to be abandoned on account of the inability to secure the hopper-bottom cars, and the delays thus occasioned affected the work to such an extent that considerable loss and expense were sustained, and the original organizations were disrupted before the work was nearly completed. This condition was true more particularly on the main heavily traveled roads, which were subjected to added traffic under the new conditions. Various embargoes were established, and in some sections it is utterly impossible today to get shipments of materials to accomplish the urgent repair work on the highways.

Labor Difficult to Hold

These conditions naturally had their effect on what little local labor there was left, which it was quite difficult to hold on account of the uncertainty of employment. A fair percentage of increase in rates was looked for and considered when estimates were prepared, but in some cases they had advanced 100%, annulling entirely all previous calculations. There has been such a dearth of suitable labor that rates were not by any means the only consideration.

Damage from flood, cloud-burst and other catastrophe has been greater during this season's work than ever before in the history of the department. Many miles of earth road have been rebuilt and worked on this account as many as five times, each succeeding working adding to the difficulty, for as the season advanced there was less opportunity for the earth road to compact and become as solid as is possible when worked in the early part of the year.

The legislature, which adjourned in June, changed the location of approximately 100 miles of state highways,



WORK ACCOMPLISHED TO DATE

General Report

Type of Road	Miles Completed
[illegible]	6,028 283
[illegible]	192 905
[illegible]	115 777
[illegible]	1 999 076
[illegible]	143 519
[illegible]	83 610
[illegible]	54 071
[illegible]	13 619
Total	8,630 660

Resurfacing

Type of Road	Miles Completed
Gravel	4 536
[illegible]	41 387
[illegible]	130 417
[illegible]	0 796
Total	177 138

Other

[illegible]	Dollars Applied	Miles Completed
[illegible]	3,287 331	1,073 383
[illegible]	1,037,500	395 508
Total	4,324 831	1,468 891

Bridge Construction

Type of Road	Number Completed
[illegible]	2
[illegible]	2
Total	4

and this, with the acquisition of 69 miles of old turnpikes or toll roads (which action could not be anticipated in the beginning of the year), added to the difficulties of financing the work.

Motor Truck Traffic Heavy

Excessive use of the highways has been marked, on account of the transportation of innumerable articles by means of motor trucks and horse-drawn vehicles in lieu of the railroads. These conditions were more pronounced in the soft-coal counties of the state, where small mines were opened and the products hauled in all kinds of conveyances to some nearby city or railroad point. Continuous trains of such vehicles traveled night and day and the roads, especially the unimproved ones, were unable to withstand the effect of such use. Special effort is being made, where it is impossible to secure suitable material, to cover the worst portions of these roads with cinder, slag, gravel, shale or some other coarse and satisfactory material, keeping it as smooth as possible by continuous dragging, which method will be followed until the road freezes up hard and smooth. This method will be resumed again, whenever practicable, after every thaw.

In order to cope with the problems thus presented, where shippers had contracts for the delivery of material to several destinations, orders were issued to concentrate on certain projects in the order of their importance. Organizations and equipments from work which had to be held in abeyance were transferred to points of urgency and also to locations where local material was available for the work as planned. Mechanical devices have been used wherever possible; stone and gravel mechanical spreaders were used where practicable and man power assigned to forms of work in which the use of machinery was not feasible. Small, two-horse grading machines took the place of much of the hand labor in shoulder work along the improved stretches of road.

[illegible]

[illegible]	[illegible]
[illegible]	6,693 [illegible]
[illegible]	232 [illegible]
[illegible]	103 [illegible]
[illegible]	[illegible] 111
[illegible]	2,465 [illegible]
[illegible]	208 [illegible]
[illegible]	142 299
[illegible]	[illegible] 212
[illegible]	[illegible]
[illegible]	[illegible] 459
[illegible]	7 428
[illegible]	228
[illegible]	194

Motor-driven vehicles were used when possible and expedient in transporting labor from one point to another, and in some instances crews have been transferred 30 or 40 miles at a single change. This transportation was made by small auto busses and touring cars carrying 5 to 8 men and was paid for on the mileage basis, in no case exceeding a rate of 10c. per mile for the entire crew. These groups of workmen acted as flying squadrons which were the only possible means of getting the necessary work done. At the period of maximum activity approximately 11,000 men were employed and the equipment listed in the accompanying table was used.

The priority order of the United States Government is the paramount problem which confronts us today. Aside from the necessity of closing down all our work dependent upon railroad shipments, it will be quite difficult to forecast the possible effect of this order on the future until the survey of conditions now under way is completed and analyzed; but on the face of affairs, it would appear that we are approaching an unparalleled era in the prosecution of road work in general, and, except where materials suitable for maintenance work are easy of access, no extensive work can be undertaken. Activities should be directed mostly to the important arteries of travel and the less important roads kept in as good a condition as possible, with the means at hand, until the crisis is past.

Automatic Lights Aid Lake Navigation

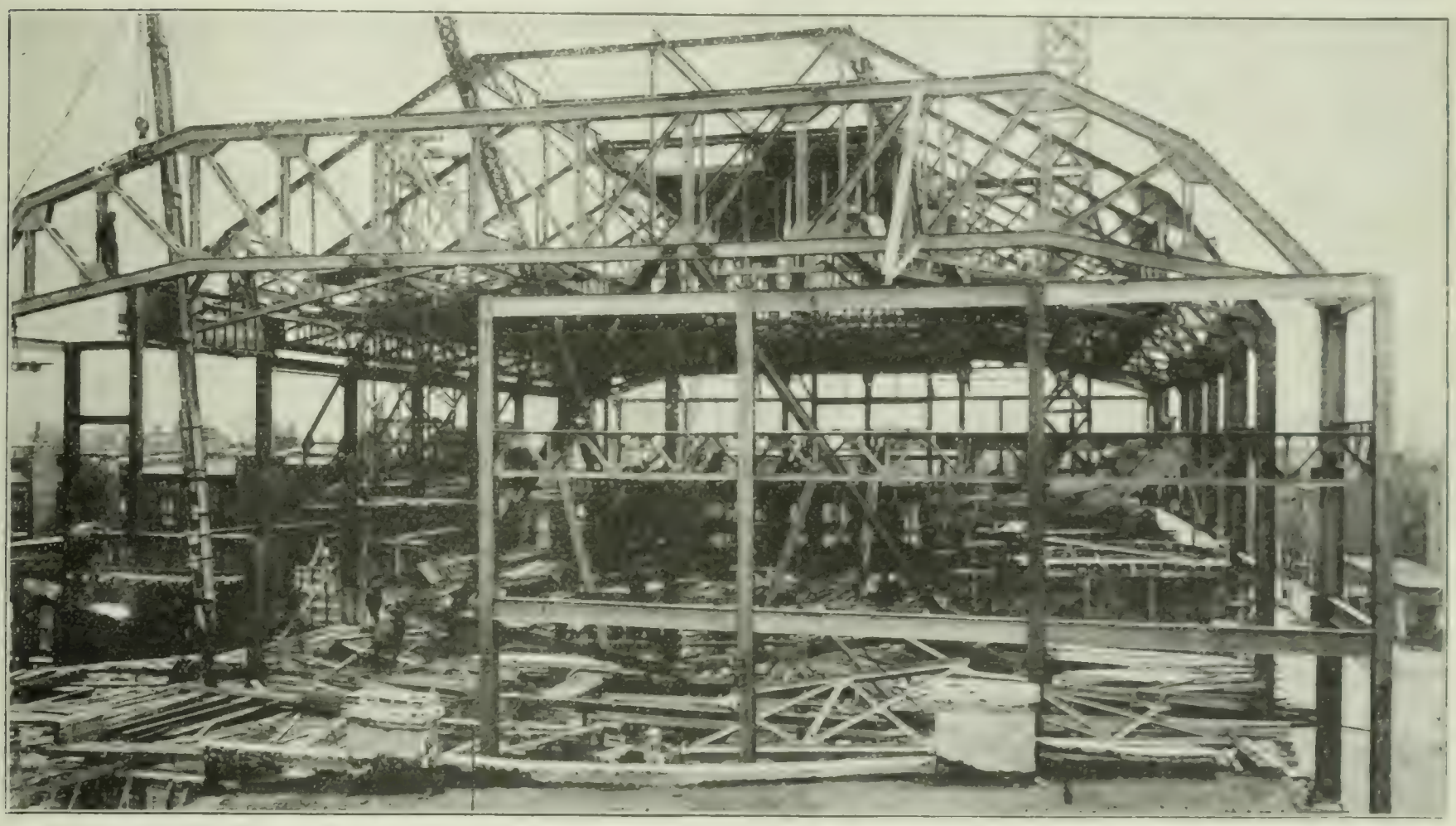
Long-burning lamps, lighted and extinguished automatically according to changes in atmospheric light, are used on the beacons and gas-buoys for the guidance of vessels in the Livingstone channel of the Detroit River. The fixed beacons burn acetylene gas, and the buoys burn oil gas. Each lamp is provided with a regulator and flashing chamber, and a pilot light which burns continuously.

Automatic control of the main light is provided by a sun valve, which shuts off the gas during the daylight period and turns it on at dusk. This valve is operated by utilizing the difference in light-absorbing power of bright and dark surfaces, with the consequent difference in heat-absorption and expansion of these surfaces. The apparatus consists of three bright rods placed around one black rod. The acetylene lamps will burn for more than 100 days with one set of tanks, and the oil-gas lamps will burn about 90 days without the buoy being recharged.

The American Gas-Accumulator Co., of Elizabeth, N. J., and the Safety Car Heating & Lighting Co., of New York, were contractors for the acetylene-gas and oil-gas apparatus, respectively. Plans for the lighting of the channel were prepared by Charles A. Park, superintendent of the 11th Lighthouse District, and the work was under the direction of Edward L. Woodruff, lighthouse inspector of that district.

Steel-Frame Hall Forms Top Story of Concrete Building

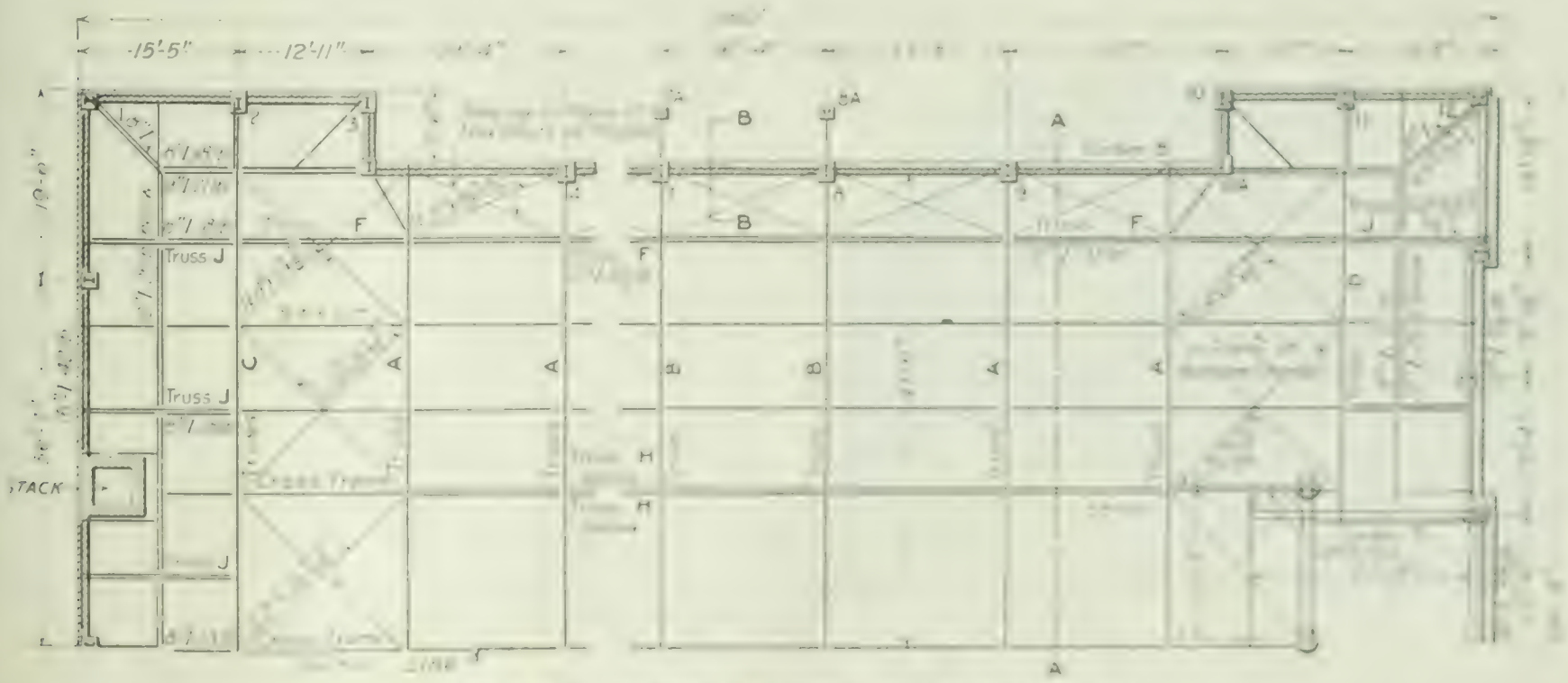
Long Span Steel Trusses Carried on Tall Steel Columns Seated on Concrete Columns of Main Building Below—Special Form of Monitor Roof Used



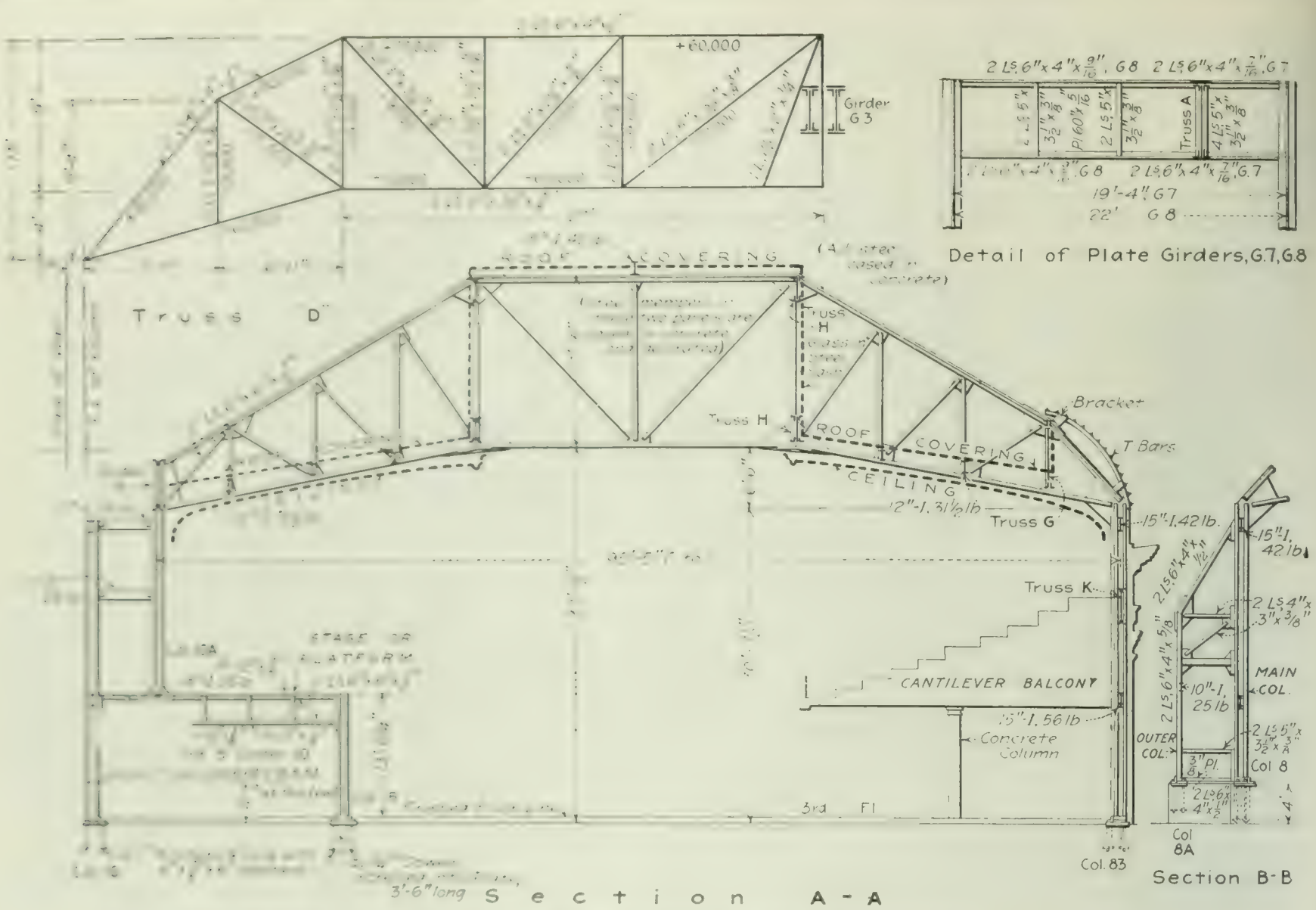
ERECTING STEEL ROOF TRUSSES FOR HALL ON TOP OF A THREE-STORY REINFORCED-CONCRETE BUILDING

STEEL structural framing for an assembly hall at the top of a reinforced-concrete building recently erected in Chicago was adopted on account of the necessity of providing a large clear floor space in the hall and on account of the economy of the lighter steelwork over concrete for the long spans. Steel roof trusses of 95 ft. to 104 ft. span are carried on tall steel columns. A wide inclined balcony of reinforced concrete is carried on inclined cantilever girders whose upper ends are supported by the steel framing between the colmuns. The structure will be the headquarters of the Amalgamated Association of Street and Electric Railway Employees of America. It is located on Ashland Ave. at Van Buren Street.

The building is 180 x 106 ft. in plan and has three stories and basement, with stores on the first floor and offices and lodge rooms above. The reinforced-concrete construction includes these two floors and the floors of



ROOF PLAN OF STEEL FRAMING OF ASSEMBLY HALL



CROSS-SECTION OF ASSEMBLY HALL, SHOWING ROOF ARRANGEMENT ON TRUSSES

the assembly hall. It has square columns, with a main spacing of 16 x 16 ft., carrying three flat-slab floors. The slabs are 9 in. thick on the first and third floors, and 8 in. on the second floor. The assumed live loads are 100 lb. for the first and third floors, and 50 lb. for the second floor.

Steel trusses 95 ft. 5 in. and 96 ft. 9 in. c. to c. of bearings span the top floor. They are carried by high steel columns, and with a camber of 6 ft. 6 in. in the bottom chords they give a maximum headway of about 37 ft. The trusses and columns form an integral structure, the ends of the chord members being riveted to large connection plates on the tops of the columns. An unusual form of roof is obtained by forming a monitor or clerestory roof within the depth of the truss. This includes the two middle panels, and has vertical sides of ornamental glass in steel sash. The roofing is laid along the top chord in these middle panels, and along the bottom chord in the side panels of the truss.



THREE-STORY REINFORCED-CONCRETE BUILDING IS MOUNTED ON STEEL-FRAME HALL. SPACE IS BEING FILLED WITH CONCRETE. THE FOLLOWING ISSUE GIVES ARCHITECTURAL DETAILS OF THE BUILDING

This arrangement leaves the ends of the trusses exposed above the roof, but they are concealed from view from the street by a cornice and a curved line of ornamental tiling which gives the appearance of a mansard roof. The exposed portions of the trusses are fireproofed and weatherproofed by incasing them in concrete.

In the main trusses all the members are pairs of angles forming a T-section with a cover-plate on top of the top chord. At the front of the building the interior architectural design made it necessary to omit the middle panels of the first truss. This truss, shown in the drawing as truss *D*, consists therefore of two 41-ft. side trusses having their inner ends framed against box girders supported on wall columns and interior columns. These girders carry a reinforced-concrete clock tower.

The last truss at the rear of the building (truss *C* in the drawing) is of much heavier construction than the others, as its span is increased to 104 ft. 3 in., while

its depth is limited to 10 ft. instead of 17 ft. 3 in. as in the shorter spans. In this truss the chords are pairs of channels with reinforcing plates on the webs, and batten plates across the flanges. Cover plates are used on the top chord. The verticals are composed of pairs of channels, and the diagonals are pairs of angles. This truss is unsymmetrical, having an extra panel at one end, so that it is 55 ft. 2 in. long on one side of the center line and 49 ft. 1 in. on the other side.

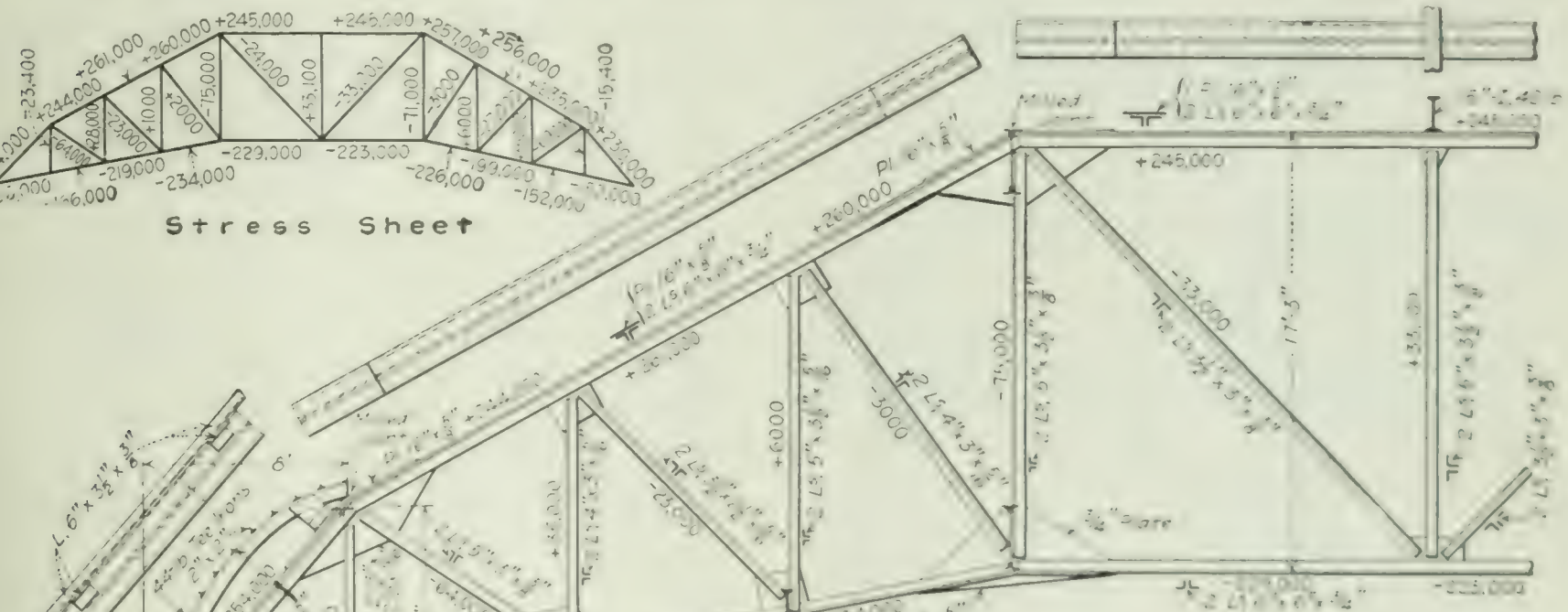
The spacing between the trusses ranges from 16 ft. 2 in. to 17 ft. 8 in. Longitudinal bracing is provided by lines of I-beams and lattice girders framed between the vertical members of the trusses, and there is also diagonal bracing in the planes of the end posts. The two trusses at each end are connected in pairs by struts and vertical cross frames, and by diagonal bracing in every panel at the plane of the bottom chords. At the ends of the building the roof is covered by short trusses extending from the main trusses to the walls.

The flat portions of the roof have a tile and concrete joist covering, carried by a frame work of I-beams. The end posts of the trusses have curved channels attached to brackets and carrying lines of T-bars for the book-tile covering which receives the ornamental tile concealing the exposed ends of the trusses. The roof is designed for a wind load of 30 lb., and a snow load of 20 lb. per sq.ft. of exposed surface.

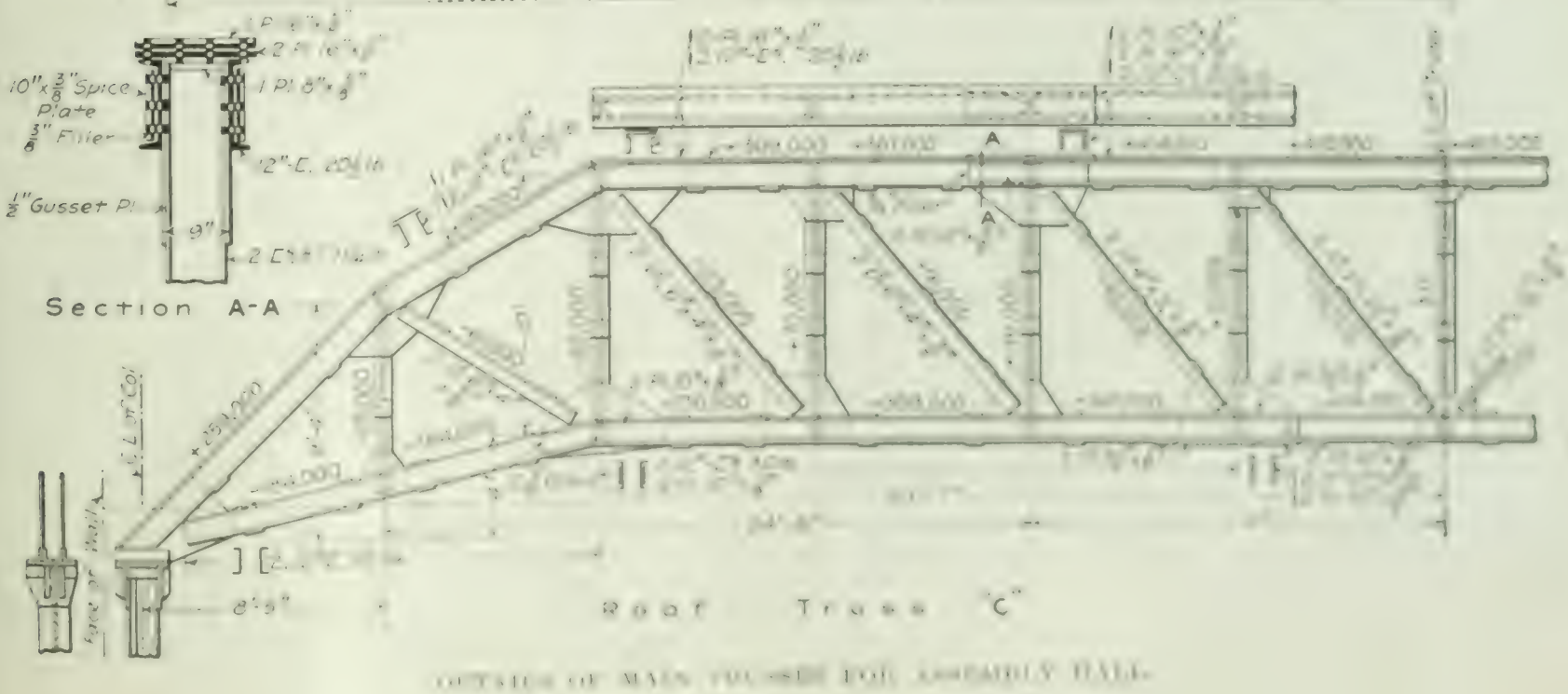
Owing to the height required for a hall of this kind the steel columns supporting the roof trusses are about 30 ft. 6 in. high. They are connected longitudinally by lines of I-beams and lattice trusses framed between their webs. The columns are of H-section, each composed of a web plate and four angles. Their shoes, at the third floor level, are anchored to the tops of the reinforced-concrete columns of the lower part of the building.

Unsymmetrical column spacing on one side necessitates carrying two of the roof trusses with one end seated on a longitudinal truss between the tops of adjacent columns. Near the middle of the building, on

Stress Sheet



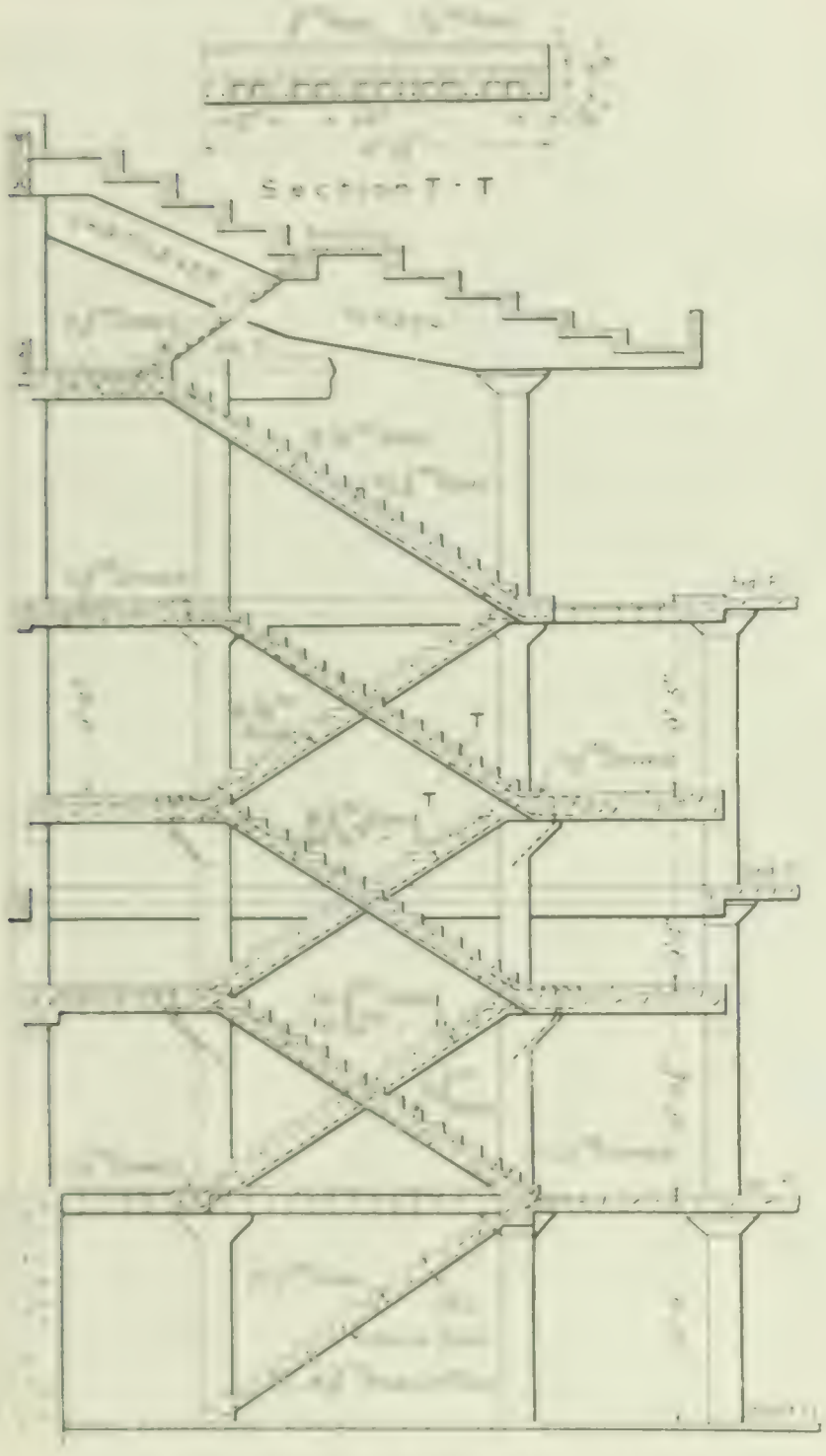
Roof Trusses "A & B"



Section A-A

Roof Truss "C"

OUTLINE OF MAIN TRUSSES FOR ASSEMBLY HALL



REINFORCED-CONCRETE STAIRS AND BALCONY FOR STEEL-FRAME ASSEMBLY HALL

the opposite side, the width is increased, and the outer wall supports supplementary steel columns which are composed of pairs of angles and are tied to the main columns. The narrow space between the inner and outer columns is used for stairways.

A wide balcony extending along one side and both ends of the hall is carried by inclined reinforced-concrete cantilever girders. The girders are 32 ft. long, and have the upper end carried by the horizontal steel framing between the columns, while near the lower end of each is an interior concrete column, leaving a cantilever projection of 16 ft. The concrete floor of this balcony has the upper face formed in steps for the rows of seats. It is designed for a live load of 100 lb. per sq. ft. On the opposite side of the hall is a stage or speaker's platform, having a frame of steel girders and columns. The main floor has a clear width of 78 ft. between the columns of the gallery and platform.

Two double-stairways of X-shape are provided for exit from the hall. Each is about 18 ft. wide, with two lines of 8½-ft. stairs in opposite directions, as shown in one of the drawings. The idea is that two 8-ft. stairways with separated entrances are safer and give greater capacity for handling crowds than a single wide stairway. Each 8-ft. stairway is also subdivided by a central railing which divides the crowd and provides an additional hand hold to supplement the hand-rails on each side. The stairs are designed for 100 lb. live-load.

The landings are 16-in. slabs, midway between the floor levels. Both stairs and landings are of concrete slab-and-joist construction, with tile filling between the joists. Solid slabs, however, are used for the basement flights. The stairs are finished with mastic safety treads and cast iron nosing.

The Francis M. Barton Co. is architect for the building, and also designed the structural steel framing for the hall. The reinforced-concrete work was designed by the Barton Spider-Web System Co. The contractors were the Wieboldt Construction Co. for the concrete and masonry, and Wendnagel & Co. for the structural steel.

Circular Reservoir Floor Built in Concentric Rings

Reinforced-Concrete Slabs Arch Between Circular Shoulders Which Also Support Timber Roof Columns

By Carl E. Hasse
Santa Monica, Calif.

A 1,500,000-gal. reservoir recently completed for the City of Santa Monica, Calif., is in effect a circular tank, 130 ft. in diameter and 15 ft. deep, with reinforced-concrete walls, with a timber roof supported on timber posts and a concrete floor which furnishes the main novelty of the design. This floor is composed of annular rings of reinforced-concrete slabs footing on circular sills which also carry the roof posts.

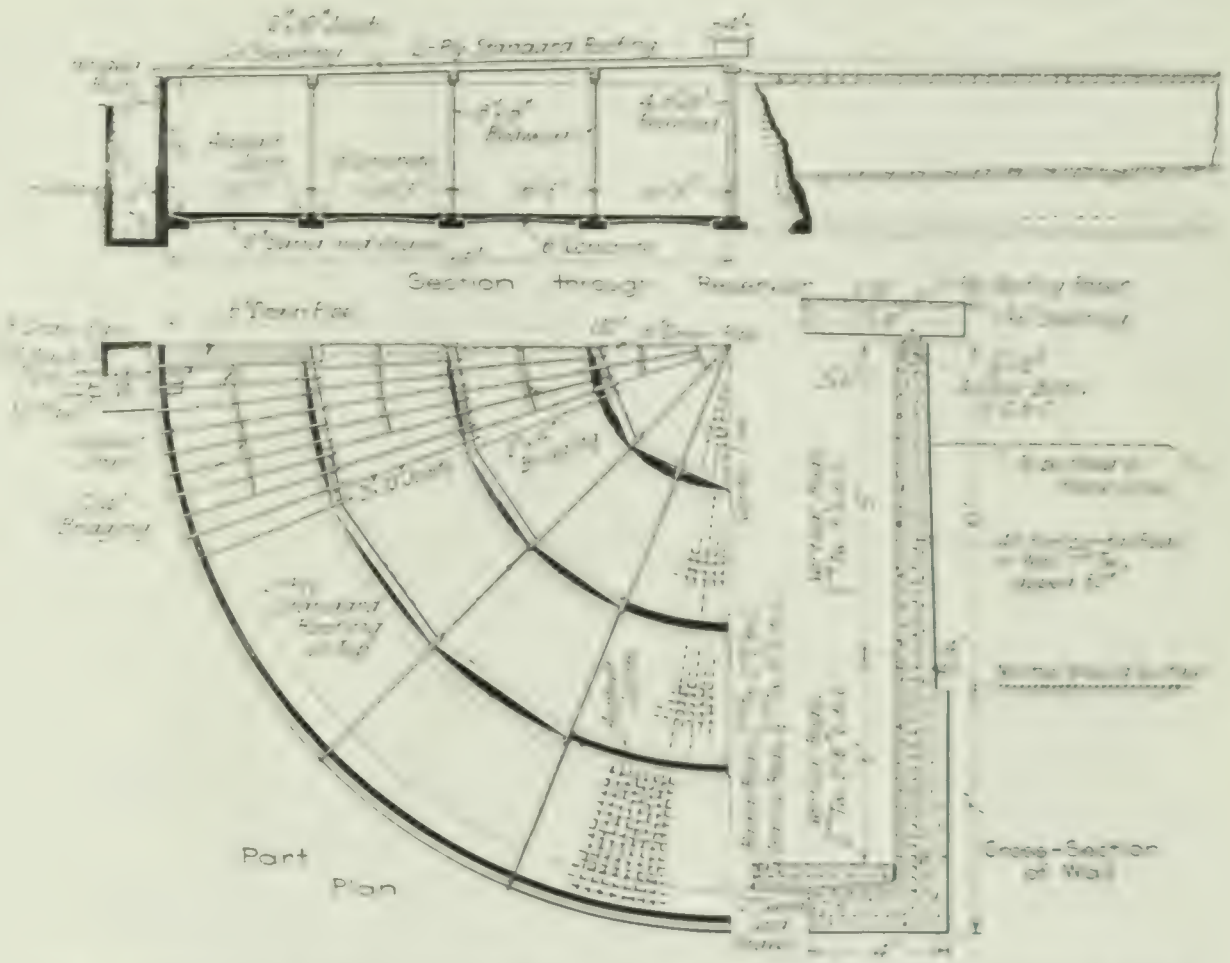
Approval of a bond issue in an election in the spring of 1916 enabled the city to purchase the four private water companies which had been serving the city and some adjoining territory, and the subsequent consolidation and organization into one system included meterings, extensions and increased storage capacity. The reservoir of one of the smaller companies was so inadequate that the building of a new reservoir of sufficient capacity was deemed an immediate necessity. The old reservoir was an earth excavation with sloping sides and flat bottom, lined with concrete.

The new reservoir is shown in the accompanying drawings. In plan the floor is laid in the form of four concentric rings, each 15 ft. in width. The edges of the slabs are separated from the piers by a 1-in. asphaltum-filled, hot-poured joint. The slabs are 6-in. thick at the center and 8 in. at the piers, and rest on a cushion of well tamped sand and gravel. They are reinforced with ½ in. square rods radially and with ¾-in. rods longitudinally, both sets being spaced 12 in. on centers. No particular care was taken to smooth the surfaces of the shoulders of the piers before the slabs were poured.

The outside walls, also of reinforced concrete, are vertical on the inside. The top width is 10 in., thickening to 14 in. at a point 10 ft. below the top, and below this point the walls have a uniform thickness of 18 in. The walls are reinforced horizontally with 1 in. square

rods spaced as shown in the accompanying drawing, and vertically with ½ in. square rods of varying lengths spaced 2 ft. 6 in. on centers. A backing of earth fill extends about two-thirds the height of the wall.

The roof consists of two-ply roofing paper laid on 1 x 6-in. sheathing nailed to 2 x 10-in. redwood tarred joists arranged radially and spaced 30 in. at the outer wall. The joists rest on 8 x 8-in. redwood caps on the intermediate posts and on 2 x 6-in. plates on the wall. The spaces between the joists at the wall are covered tightly with ordinary galvanized window screening. The original plans called for 3-in. galvanized pipe posts for the roof supports, but 8 x 8-in. tarred redwood was substituted, thereby effecting a saving of about $250. The original central post was of reinforced concrete, circular in section. In its place are four 8 x 8-in. tarred redwood posts set at the corners of the 4-ft. square concrete base.



NEW RESERVOIR HAS CONCRETE WALL AND FLOORS AND TIMBER ROOF

The concrete throughout is a 1:2:4 mixture to which was added 5% of hydrated lime. The inside face of the wall has a ¼-in. coat of 2% Medusa cement for waterproofing.

Water was turned into the reservoir July 18, and no leaks have appeared. The completed structure cost $13,760. W. S. Dole, deputy water commissioner, designed the reservoir and it was constructed by city labor.

Cantilever Concrete Trestle Bents Carry Steel Spans

Three Tracks and Gantry Crane Are Carried on the Trestle with Suspended Steel Bins for Ore and Coal

HEAVY loads and special conditions of loading are involved in a three-track trestle of novel design at the new Haselton No. 5 blast-furnace plant of the Republic Iron and Steel Co., Youngstown, Ohio. The bents, which are spaced 16 ft. c. to c., are of reinforced concrete, each having two posts and a heavy cross girder or cap with cantilever extensions beyond the posts. Extending between the bents and built integrally with them is a reinforced-concrete wall which carries a rail for one leg of a traveling gantry crane and acts as a retaining-wall for the ore stock-pile. The bridge of the crane spans the trestle. It carries a trolley with grab bucket, serving the tracks, bins and stock-pile.

Beneath the caps are steel bins for ore, coke and coal. The bins have bottom gates for loading electrically operated charging cars which run on a surface track betwen the trestle posts. This track space is paved with brick. Ore may be dumped into the bins from cars on the middle track. It may also be handled from cars on the outer tracks or from the stock-pile of the grab bucket of the gantry crane. From the bins it is delivered to the charging cars, and these in turn dump into a hopper which feeds the skips on the charging incline of the blast furnace.

The bins are suspended from the trestle by inclined U-bolt hangers, which are in the planes of the sides of



CONCRETE TRESTLE WITH CANTILEVER CAPS CARRIES TRAVELING GANTRY CRANE AND ORE BINS

the bins. The sides are stayed by horizontal rods anchored into the trestle post and the retaining wall. The hangers on the outside are embedded in the concrete stringer between the bents, the stringer being inclined so as to form a continuation of the sloping side of the steel bin. The hangers on the ore bin side are embedded in a stringer formed as part of the wall which carries the crane rail. In the former case the load is carried directly by the stringers. In the latter case it introduces an overturning stress in the tall and relatively thin wall. This is provided against by a very wide toe on the outer side of the wall.

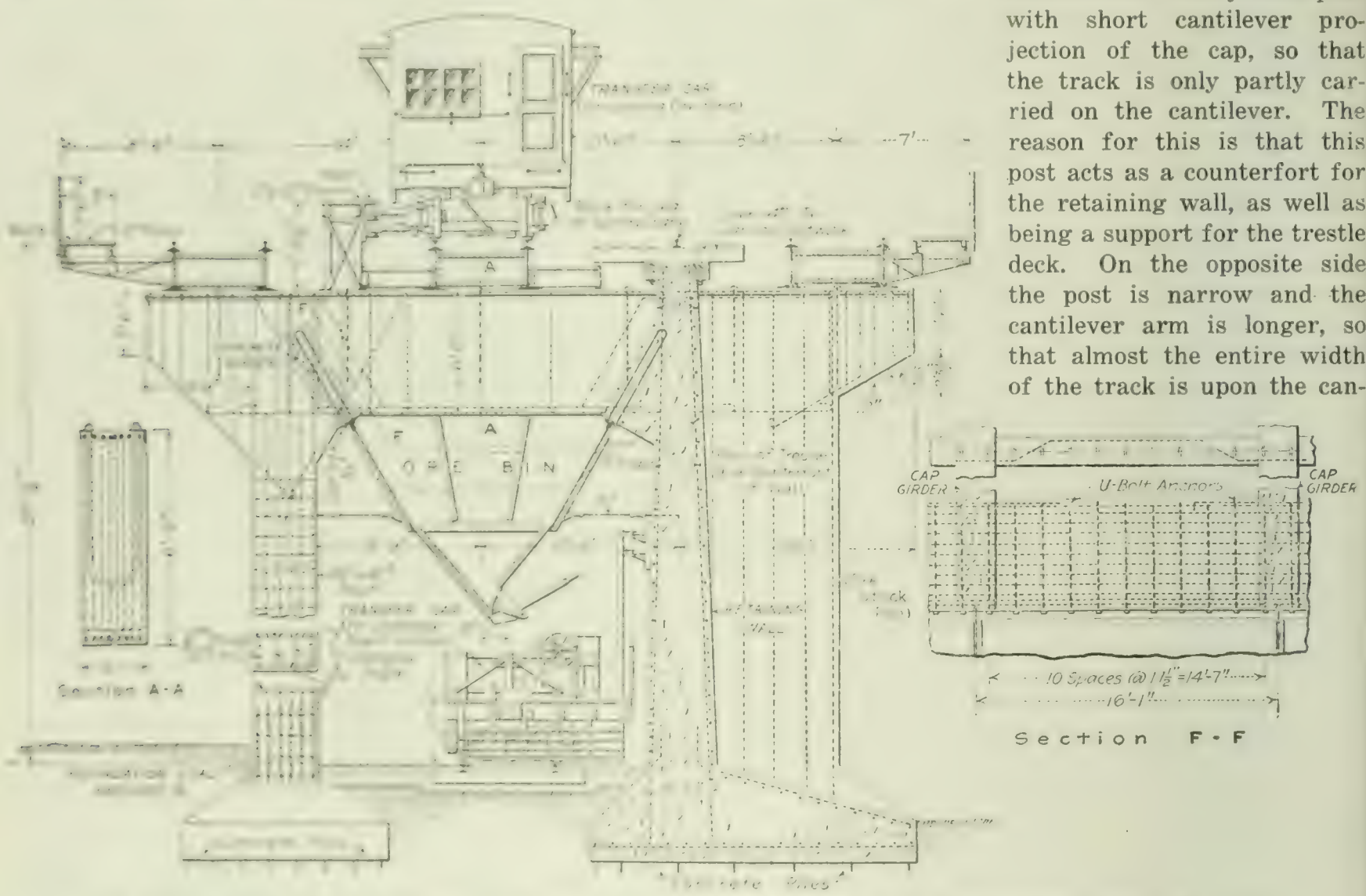
The capacity of the bin for one bay, 16 ft. long, between centers of bents, is 2636 cu.ft. if filled to the bottom of the track stringers, or 3122 cu.ft. if the load is heaped up to the top of the stringers. With ore at 150 lb. per cu.ft. the weight of load will be 177 or 209 tons respectively

The track stringers are 30-in. I-beams, resting only on base plates on the caps, and those of each track are connected by cross frames. The 85-lb. rails are laid upon the top flanges of the I-beams and secured by bolted rail clips. These separate single-track spans are designed for 100-ton locomotives, and the trestle bents are designed to carry such locomotives running simultaneously on the three tracks. The two outer tracks are mainly for railway cars, from which material is unloaded by the gantry crane, the grab bucket delivering the material required either to the trestle bins or the stock-pile.

The middle track is for bottom-dump cars or an electrically operated transfer car. This latter is loaded by the gantry with ore from the stock-pile and discharges it into the bins.

The load on the single rail carrying the leg of the gantry crane is 68,000 lb. for each of the four wheels. The outer track stringers have cantilever brackets carrying footwalks. Walks are provided also along the ties of the single-rail crane track and on the steel structure which carries the third-rail conductors for the middle track.

The bents are not symmetrical about the center line. One side has a very wide post with short cantilever projection of the cap, so that the track is only partly carried on the cantilever. The reason for this is that this post acts as a counterfort for the retaining wall, as well as being a support for the trestle deck. On the opposite side the post is narrow and the cantilever arm is longer, so that almost the entire width of the track is upon the cantilever. This construction was used in order to keep the bending in the cross girder or cap at a minimum and also to provide a support for the inclined concrete girders which support the steel bins.



CROSS-SECTION OF REINFORCED-CONCRETE TRESTLE WITH ORE BINS SUSPENDED BENEATH DECK

The narrower posts have rectangular footings, while the footings of the wider posts are connected by the broad toe of the retaining wall. The foundations in both cases are Raymond concrete piles, cast in place. Under the broad continuous footings they are spaced 36 in. on centers transversely and 39 in. longitudinally. Under the rectangular footings they are spaced 18 in. on centers transversely and 33 in. longitudinally. The soil is mainly a sand and gravel fill.

The trestle is about 612 ft. long. Beginning at one end, ten bays are utilized for carrying ore bins, as described. Then come five bays for coke bins, and the bents for these have no steel reinforcement. These are followed by three bays for ore bins, two for coal bins and one for a scrap bin. The concrete is a 1:3:5 mix, and all reinforcement is of square twisted bars.

This structure was designed and built by Arthur G. McKee & Co., contracting engineers, Cleveland, Ohio.

Engineering Graduates and Industrial Demands

By L. W. W. Morrow
Associate Professor and Acting Director, Department of Electrical Engineering, University of Oklahoma

Remarkably clear is this treatment of the relation of engineering education to the demands of industry, which appeared in the October "Bulletin" of the Society for the Promotion of Engineering Education, and is, by permission, reprinted in its original form. While "Engineering News-Record" realizes that the article is primarily addressed to the faculties of technical schools, Prof. Morrow's presentation of the historical eras of modern engineering, the causes underlying the transitions which have occurred and are occurring, and his explanation of the difficulties that must be overcome in reducing the time-lag between curriculums and the type of engineer graduates demanded by industry, are full and illuminating. He points out that there is no uniformity in course content or manner of treatment in the numerous schools, intimating that a closer understanding among them might be of value to everyone. The article closes with a plea that the industrial world be made aware of educational conditions and of what they should expect of four-year graduates.

THE current technical press has contained several articles regarding the capabilities of engineering graduates in the industrial world. At the meetings of the various technical societies there have been frequent criticisms of present educational methods and engineering curriculums.

It is alleged that the present curriculums are unsuited for modern industrial conditions; that educators are too academic and are not in touch with the progress of industry and the problems encountered in the commercial field; that educational methods are antique and inefficient; that the content of the curriculums is out of date and unbalanced.

Charges are made that engineering graduates are lacking in thorough training and knowledge; that they use bad English; that their knowledge of fundamentals is very hazy; that their training makes them more suited for designers than anything else; that graduates have no knowledge of commercial methods, apparatus or economics; that as a whole the graduates have a hazy idea of several things but accurate knowledge of none.

It is stated that engineering graduates are from one pattern; that initiative and personality are repressed rather than cultivated; that they have become inaccurate and lazy through improper training.

Other criticisms are made but, in general, the foregoing statements express the sentiments of those advocating reform in curriculums and educational methods. The men who make the criticisms are industrial engineers; men who judge engineering schools by their product and its fitness for their requirements; men who demand efficient employees; men whose viewpoint is necessarily that due to their environment.

These men are unaware of the fact that engineering educators have been working to improve curriculums and educational methods for the past ten years through the Society for the Promotion of Engineering Education; they do not know of the great strides made in the field of engineering education. Their criticisms are strictly selfish and are made solely from a commercial viewpoint.

On the other hand there are enough criticisms to cause engineering educators to pause and consider them. The criticisms may be just in some respects; there may have been too great a tendency to remodel and change engineering educational methods and curriculums from a purely academic point of view. From an analysis of the criticisms it may be possible to consider more specifically industrial demands. At all events the criticisms should be considered with a view to eliminating them through educational campaigns or through educational changes.

A consideration of the points alleged leads inevitably to a historical sketch of the growth of engineering and changes in industrial conditions; the growth of the engineering school and finally the changes in the relations between the schools and the industrial world.

The character of engineering training has always changed with the demands of industry. The designer gave way to the operator who, in turn, is being supplanted by the specialist and executive.

Historically, engineering may be divided into three eras, each era being determined by the chief industrial demand. These eras are as follows in point of time: the era of the designer and inventor; the era of the operator and constructor and finally the era of the specialist and executive.

The demand for inventors and designers was greatest at the beginning of the so-called industrial age. The invention of the cotton gin, power loom, steam engine, machine tools; the discovery of new forces for use in transportation and communication and for the transformation of energy; the development of the factory and concentrated manufacture as against the individual producer, all these things created a great demand for inventors and designers—men who were qualified by fundamental knowledge of science to design and produce new machines, to discover new applications for available forces and to investigate existing forces with a view to developing machines for commercial application.

The years from 1890 to 1900 saw the multifarious applications of the forces, materials and ideas developed during the previous era. The railway, the telephone, the power plant, the steam engine, the electric motor and generator, the turbine and water wheel, the machines for the manufacture of diversified products—all these were developed and applied with great rapidity.

The great development in commercial applications of engineering machines created a demand for skilled operators and constructors. Men were desired who were capable of constructing machines from design drawings; men were wanted in the drafting rooms to make the drawings; men were wanted to operate the engines, machines and power plants used for commercial purposes. The combined demands for the above types of men were so great that the industries were forced to train men through the adoption of the apprenticeship system.

Economic reasons have forced the several changes in the engineer-type. The concentration of power development, of manufacture, of sales, and of financial resources, is responsible for the present type.

The years from 1900 to the present time were noted for the concentration of power production; of manufacture; of sales organizations; of financial resources. The industrial world was organized and concentrated for economical reasons. The engineering fields were divided and subdivided for reasons of efficiency. It was an era of efficiency and economy in design, operation and production. The industrial world desired executives, highly trained specialists in engineering, organizers, business managers and financiers in connection with its engineering and industrial problems and conditions.

The foregoing historical divisions of the industrial age are not strictly accurate, as each division is not a discontinuous function of time. There is a demand for all types of men at the present time; as the limits in industrial developments have never been ascertained, however, the most insistent demand is as outlined and the supply is least. The demand for designers, operators and constructors has been greatly lessened by the increased supply of such men developed by the industries and the technical schools. The gage of the peak demand for men is found in the salaries. At this time few designers, operators or constructors receive $10,000 per year, yet many executives, specialist engineers, sales engineers, consulting engineers and efficiency engineers receive that figure. Fifty thousand dollars would be a better comparative figure as regards the number of men receiving such salaries in the two classes.

The engineering school is a product of the industrial age and is a result of industrial demands. It was born in the inventive era and was a direct result of the desire for men who had fundamental training in science sufficient for them intelligently to use the newly discovered machines, forces, materials and processes. The engineering school grew gradually from a school of pure science to one of applied science because of the insistent demand of industries. The growth and evolution of curriculums were slow processes and lagged far behind industrial demands as regards time.

The era of application and operation gave an impetus to engineering schools that has existed almost to this time. The demands for skilled operators, draftsmen and mechanics were so great that industrial organizations were forced to supply some of the men through apprenticeship systems. The engineering schools were insufficient in number to fill the demand for their products. New engineering schools were founded in great numbers. The field of pure and applied science was sharply divided and defined in this era. The engineering curriculums were changed in order to train students in the use of industrial apparatus in wood and machine shops and in testing laboratories for steam and electric machines. The schools devoted a great amount of time to design and drafting and also taught the fundamentals of engineering as contained in the pure sciences. This was the golden age for engineering schools —their products were in great demand and excited no criticism; the engineering profession was very popular and caused the schools to receive private and state support as well as a great increase in the number of students.

The sudden popularity of engineering created during the period previous to 1900 filled the schools, and produced a surplus of designers and operators when these were no longer the prime need of industry.

The era from 1900 to date, with the resulting changes in industrial conditions and demands, has greatly changed the working conditions for engineering schools and caused some dissatisfaction with their products. The popularity of engineering as a profession created in the previous era caused a large increase in enrollments for several years and in the number of engineering schools. These conditions existed long after the initial industrial impetus had ceased. The schools still kept in view the training of designers and operators although the demand for such men was decreasing yearly. Engineering schools continued to add large and expensive shops and laboratories to their equipment; some even attempted to manufacture commercial products in order to train students in commercial methods. The apex of this condition as regards the engineering schools was reached long after industrial demands had changed. The time-lag between school curriculums and industrial conditions is very great and can only be shortened by more intense coöperation between the schools and the industries through faculty associations with industrial pursuits.

The engineering schools awoke to existing conditions in industrial pursuits only a few years ago—the prime source of awakening being a decrease in engineering enrollment. This was explained in part by the growth in popularity of agriculture at this period, but this alone could not be sufficient reason for the decrease in the popularity of engineering as a profession. Upon investigation, the schools found that the industrial conditions and demands had changed. Industry now desired specialist engineers—a man who was not only an electrical engineer but also a specialist in one branch of electrical engineering such as railways, telephony, illumination, transmission, etc. The engineering problems were largely problems in economics and no longer those of design or operation. The industrial world also desired executives and business managers and could not obtain a sufficient number. Industry was looking to the engineering schools for their supply and found it unfitted for the existing conditions.

The schools found it advisable to conform to industrial demands, as their salvation and life depended upon their products obtaining larger salaries than were being given them. In a haphazard way and at different times the schools began to change their curriculums to con-

form to the new conditions. In this revision of curriculums, instead of omitting previous courses and replacing them by others of the desired type, they simply added to the existing curriculums specialized courses in engineering, economics, business law and business management and made no attempt to increase the time alloted for an engineering degree. Civil engineering students, for instance, were not only given the previous content of the curriculum but were also given specialized courses in concrete construction, hydraulic engineering, structural engineering, railroad and highway engineering, economics, English, business management and business law. The same conditions held true in electrical and mechanical engineering.

During the elapsed time the knowledge of fundamental laws and their applications had increased, and so required more time for their assimilation with the same degree of thoroughness.

> *The schools were forced to attempt the impossible in order to maintain their reputation as the most valuable source of men trained for industry. The four-year course proves inadequate.*

What was the result? The schools found that they had attempted the impossible; they found that it was impossible to have such curriculums in a four-year course. They found their graduates were not thoroughly trained even in fundamentals; that their reputations were on the wane; that their enrollments were decreasing as a consequence; that criticisms were severe; that radical steps must be taken to avert disaster. The realization of this condition was a slow process and was marked by no organized effort, on the part of the schools, to revise their educational methods and curriculums. Even now a great many schools do not realize that such conditions exist and have taken no steps to analyze the trend of engineering education. The situation is aggravated by the demands of industries for the type of men that cannot be furnished by engineering schools in a four-year course; the industries do not realize the conditions engineering educators face or the problem they have to solve—industry demands results irrespective of conditions. The schools have proven through costly experimentation that the type of men demanded is an impossibility, yet some schools are still trying to supply the demand.

The industrial engineers desire men trained in fundamentals, operation, design and construction and specialized engineers along one line; they desire men trained in economics, business organizations and executive duties. They criticize the schools because they do not furnish such men in a four-year course.

The schools should admit without question that they fail to supply the demand; that they cannot do so under present conditions in a four-year course. It is impossible to train a high-school graduate in four years so that he will possess all the qualifications demanded by industries. The schools should admit these facts and submit their brief to industrial engineers.

Engineering schools are facing a crisis. Industry demands results that are not forthcoming. The lives of engineering schools depend upon their supplying the demands of industry. The problem must be solved and will only be solved by the efforts of engineering educators, for they are the ones vitally interested. An educational campaign is the first step in the solution of the problem. Industry and industrial engineers must be made to realize that they are demanding the impossible, that engineering schools have attempted to supply such men and found it impossible, with the result that the schools have been criticized because their products are inaccurate, hazy and ill-trained in many respects.

What is the solution of the problem? How can industrial demands be satisfied?

> *Longer courses and summer and coöperative courses became inevitable. Strong graduate faculties and other radical changes partially meet the situation, but a new attitude toward the question is likewise demanded.*

A six-year course has been offered as a panacea. The objection to the six-year course is the time required. Industries have offered no inducements to cause men to take six-year courses. Curriculums for six-year courses are very immature at the present time. Such a course requires a strong graduate faculty, as the time has not arrived for abolishing the four-year course. The criticism that curriculums are faulty, that all students are given the same training; that initiative is not developed; that there are no facilities for training in commercial operation, methods, processes, and executive duties—all these conditions cannot be changed by simply spreading out the present curriculums over two more years.

Six years is required to give accurate and thorough training in the fundamentals of engineering and some specialized training in a main division of engineering such as civil, electrical or mechanical. The engineering schools are equipped to give such training as to faculty and apparatus. It is feasible to balance curriculum content and to allow for the natural aptitude and personality of students. From the above considerations it would seem that the addition of two years would not help to supply the commercial demand except by removing the criticism as to inaccuracy in fundamentals. It would merely give the student a proper foundation.

Commercial methods in manufacture, operation and construction can only be obtained through academic and commercial coöperation. It is impossible for the schools to have up-to-date equipment on a commercial scale. This criticism could be readily removed, however, through coöperative effort. Students could be required to work in the industrial world at least two summers before a degree is granted. The type of work, pay, etc., could readily be worked out in specific cases. This field offers a splendid opportunity for development.

Fundamental training in engineering is the best foundation for executives and organizers. It is not possible to give more than this foundation in a four-year course, so the only way this demand can be filled is through the graduate school. There is no place for such special training in the four-year course and students will not take graduate work unless there is some inducement for such work. This condition holds true for specialists in one line of engineering. The schools should remove all specialization from their four-year courses. They should develop strong graduate schools, they should obtain the coöperation of industries and offer inducements to proper men to pursue the graduate courses.

Some of the faults at present found with technical graduates are traceable to this being a period of transition, but manufacturers should realize the national limitations of what may be accomplished in school.

Taking up the chief criticisms, it is found that in many cases engineering graduates of recent years have lacked thorough and accurate training in engineering. This was due to faults in the curriculums and methods of teaching and also due to the attempt of industrial engineers to get the impossible. This condition and the above criticisms can be removed through removal of specialization, balancing the fundamental curriculum content and educating the industrial engineers.

The supply of specialists and executives demanded by industrial engineers can only be obtained through strong graduate schools. The graduate schools can only be developed through coöperative effort.

The knowledge of commercial apparatus and methods demanded by industry can be obtained through required commercial summer work, provided industries coöperate with the schools to offer some inducement for such work.

The schools should bear in mind the fact that their function is to furnish industrial engineers and should not be too academic in their aims and curriculums. The present curriculums of engineering schools show a startling difference in content. There is no uniformity in curriculum content, time allotted the different courses or methods of presentation. It seems feasible to have a better agreement among engineering schools as to the above points.

The industrial world should be made aware of educational conditions through an educational propaganda; should be taught what to expect of four-year engineering graduates; should be strongly urged to coöperate with the schools as to summer work and, finally, should offer inducements to students to pursue graduate work so as to cause the development of strong graduate schools.

Some of the criticisms are well founded and can only be removed by conscientious effort of engineering educators, other criticisms are not logical and are made through ignorance of the conditions and results possible in engineering education.

Synchronous Motors Drive Camden Pumps

A recent example of electric pumping which is mutually advantageous to water-works and an electric-supply company is found at the Del Air Station in Camden, N. J. Here two 12-in. 5,000,000-gal. single-stage centrifugal pumps are each driven by a 200-hp. Westinghouse synchronous motor. Power is received at 2200 volts direct from the lines of the Public Service Electric Co. During a test run, these two pumps operated against suction heads of 27.33 and 26.5 ft., and a pressure head of 150 ft. The over-all efficiency was about 72%. In addition to the main units, there are two rotary vacuum pumps, each driven by a 10-hp. induction motor. The desirability of such an installation to the power company lies in the long hours of use and corresponding high load factor, and the possibility of high-power factor by over-exciting the motor fields.

Mechanical Loading at Concreting Plant Eliminates Laborers

Estimate Indicates That Crew of 25 Men Can Do Work Ordinarily Requiring Force of 42—Bins Mounted on Truck

SPECIAL equipment of a traveling concreting plant has been planned in order to eliminate the usual gang of wheelers and shovelers for loading the charging skip of the mixer, and thus reduce the present difficulties of labor shortage. Greater capacity of output is also claimed for this plant. It is designed particularly for concrete road and paving work, or for placing the concrete base for other paving.

At the head of the plant is a steam roller or tractor hauling a light derrick car having a 20-ft. boom and ½-yd. grab bucket. The roller supplies steam for the derrick hoist. Next to it is a self-propelling bin car for 3 yd. of sand and 3 yd. of stone. Behind the bin car is a self-propelling mixer, preferably of 1 yd. capacity. Stone and sand are piled on opposite sides of the roadbed, leaving a passage for the roller and derrick car. The grab-bucket loads the materials into the bins, which discharge through spouts directly into the charging skip or scoop of the mixer. This skip must be of the box type, and is marked with gage lines showing the proper depth of charge for the coarse and fine aggregates.

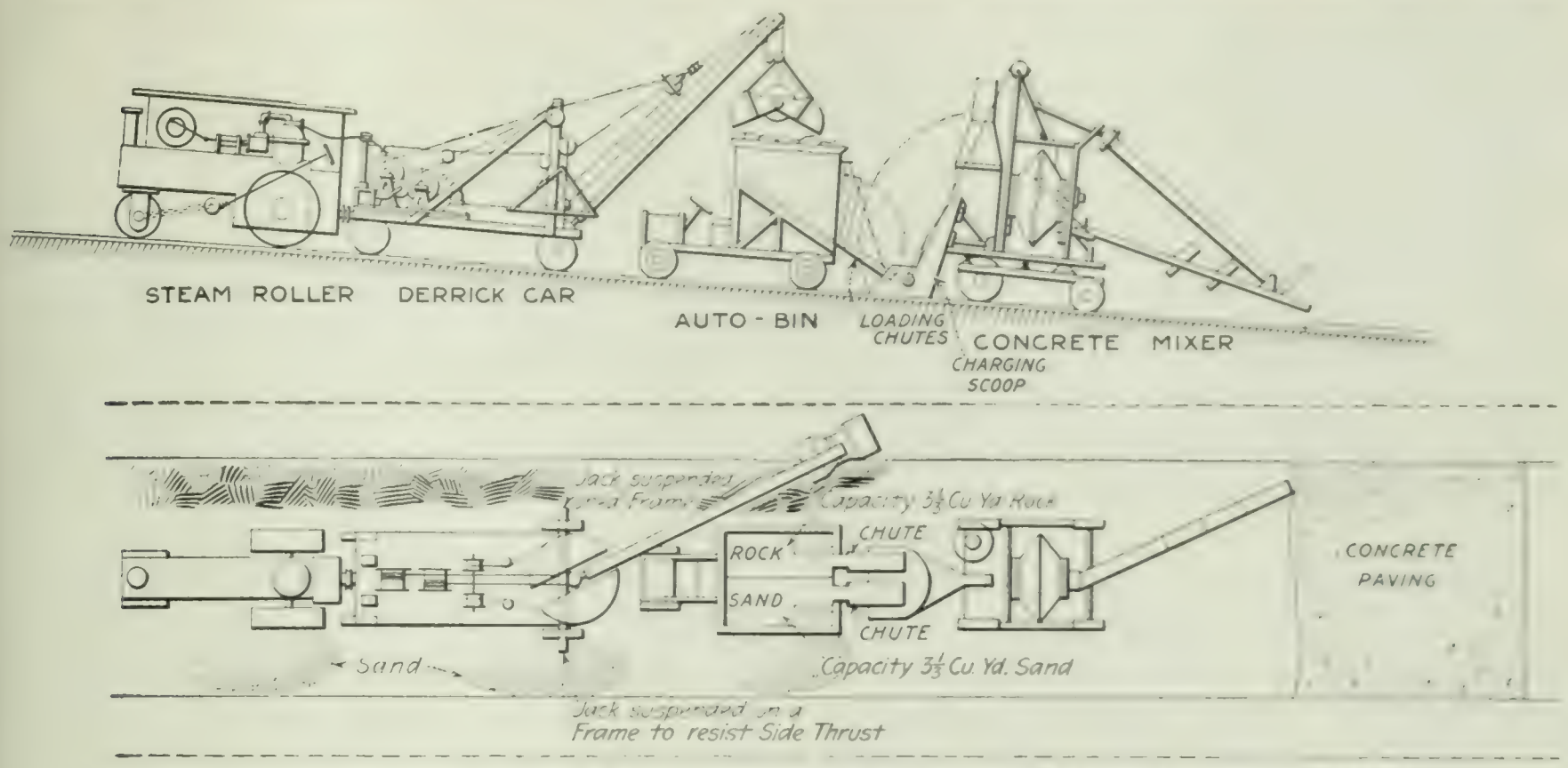
A locomotive crane on traction wheels may take the place of the roller and derrick car, but the roller is a part of the contractor's plant and both roller and derrick are operated by one man. The outfit as first described, is likely, therefore, to entail less expense for new equipment. Ordinarily a three-drum hoist would be required for the derrick, but by means of a special device a two-drum hoist can do the work. The bin car is made a separate unit in order that it may be kept in position to feed the scoop of the mixer.

This concreting outfit and method of working have been devised by O. N. Gardner, Jamestown, N. Y. He estimates that a crew of only 25 men will be required, as compared with 42 men where the ordinary method of working is employed. Furthermore, he asserts that the charging of the mixer can be done in 90 sec., as compared with 110 sec. by hand work, so that the output capacity will be increased materially. The accompanying table shows the force for the ordinary wheelbarrow system and the new grab-bucket system.

For the force and wages given, with 30c. per hour for common labor, the daily cost for labor would be $85.50 per day for the mechanical system and $131.50 for the

FORCE FOR CONCRETING PLANT WITH HAND AND POWER CHARGING OF THE MIXER

	Daily Wages	Wheelbarrow System	Grab-Bucket System
Wheelers for stone	$3 00	15	
Wheelers for sand	3 00	7	
Concrete graders	3 00	4	4
Foreman	3 00	4	4
Screenmen	3 00	3	3
Cement tenders	3 00	4	4
Engineer	5 00	1	1
Mixer operator	5 00	1	1
Ambulance operator	5 00		1
Engine and derrick operator	5 00		1
Clean-up for grab bucket	3 00		2
Foreman	4 00	1	2
Foreman	5 00	1	1
Water boy	1 50	1	1
Total men		42	25



ROAD OR STREET CONCRETING PLANT DISPENSES WITH WHEELBARROW AND SHOVEL GANG

hand system, or a saving of $46 per day. The figures are based on a mixer with drum holding 1 cu.yd. of unmixed material and a 4-bag batch of 1:1½:3 concrete. The volume of loose material in the charging skip would be four cu.ft. of cement, six of sand and 12 of stone, or 22 cu.ft. The batch of mixed concrete would have a volume of about 14.66 cu.ft. With 40 batches per hour the concrete placed would be 217½ cu.yd. per 10-hr. day. But with the slower charging of the mixer by the hand system there would be only about 320 batches and a smaller output.

No road or street work has yet been carried on with such an outfit. Direct loading of the material bins by a grab bucket has been employed in the construction of retaining walls by Mahoney & Swanson, contractors for grade separation work on the Erie R.R. at Jamestown, N. Y. The bins and mixer are mounted on a car, and in the first place the materials were shoveled from cars to a bucket elevator serving the bins. At the suggestion of Mr. Gardner a locomotive crane with grab-bucket was installed, loading the materials directly from cars into the bins. He states that this effected a saving of $20 per day in labor and increased the output capacity of the plant.

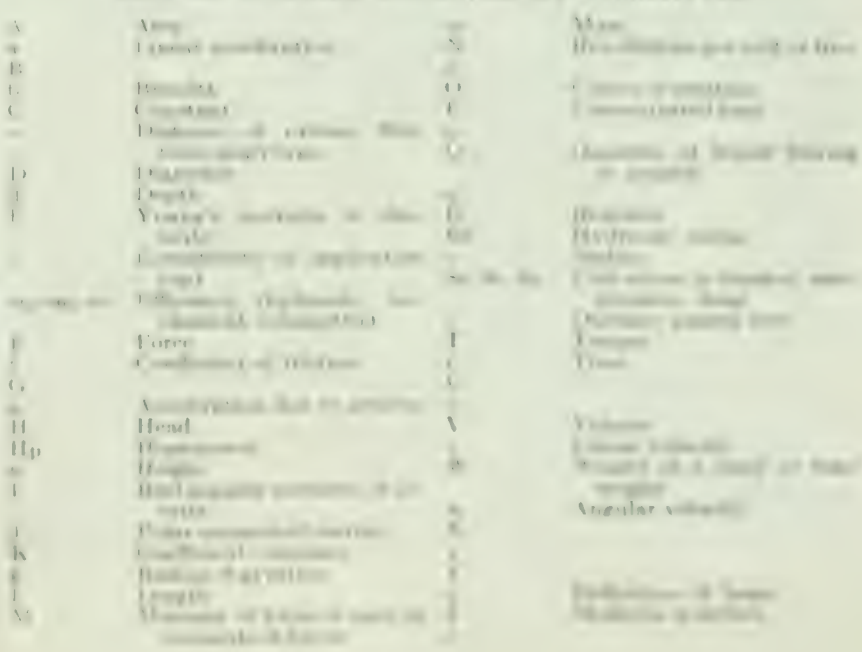
Standard Symbols for Mechanics and Hydraulics

Committee of the Society for the Promotion of Engineering Education Hopes to Unify Present Practice

LETTERS sent to professors of mechanics and hydraulics who are members of the Society for the Promotion of Engineering Education, and to certain other persons, were the starting point of the efforts made by the committee on technical nomenclature of the society to standardize symbols which are used in mechanics and hydraulics. These letters requested that the recipient suggest such symbols as he thought should be used as standard in these two divisions of knowledge. The replies were considered, together with the suggestions made in an article in *Engineering News-Record*, of Apr. 12, page 102, by R. Fleming, of the American Bridge Co. Of the 18 replies received, only 13 were accompanied by a list of symbols, and of the five remaining only one proposed standardization of symbols by the committee.

It is very interesting to note that of the 65 concepts considered by the 13 men turning in definite suggestions, agreement was had on only one; that for rectangular moment of inertia. The use of I in this instance, is of course universally understood, but it is not so easy to see why two of the replies should oppose the use of g for the acceleration due to gravity or E for Young's modulus of elasticity.

The list as received and organized was sent to about 50 men—professors, editors, and engineers—accompanied by a letter explanatory of the method followed in making the list, and requesting that criticisms be freely made. To this request there were 19 replies, of



which number three were sent by editors of technical journals, five by engineers, and the rest by professors in various universities. The committee also received suggestions from representatives of some of the national engineering societies and from a number of prominent publishers of engineering books. It is felt, therefore, that while the list is not large, it is fairly representative.

Practising engineers approved heartily of the idea of a standard list, as did the editors, who objected to the use of Greek letters with the exception of π. Neither of these classes expressed a preference as to the particular symbols that might be selected, provided they received universal acceptance. On the other hand, professors went into considerable detail and showed strong preferences, but differed widely in their views.

The majority of the replies approved of a standard list based on the one submitted, and, acting on this, the accompanying list was drawn up and will be submitted by the committee as a "suggested" standard to the next annual meeting of the Society for the Promotion of Engineering Education. There is hope, however, on the part of the committee that publication and consequent criticism may result in a better and more widely acceptable list of standard symbols for mechanics and hydraulics which the committee may feel more willing to indorse as "approved."

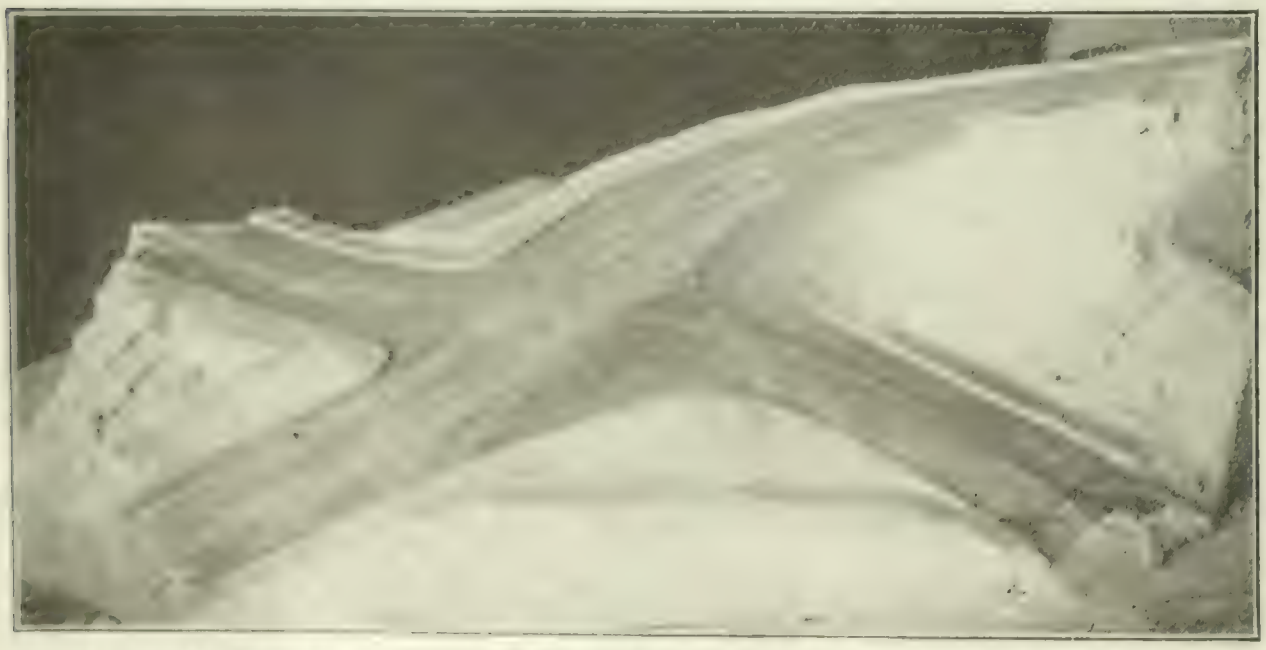
The members of the committee on technical nomenclature of the society are John T. Faig, chairman; S. C. Earle, W. D. Ennis, F. N. Raymond and Charles Warren Hunt.

Cement Model Gives Grades at Complex Street Intersection

HOW to find the smoothest riding surface for street intersections where all four come together at different grades, is a problem which presents itself frequently in San Francisco, a city "built upon seven hills." A solution has been found in the use of models made of cement mortar and surfaced with neat cement.

The illustration shows a model made for an intersection where two of the streets are on very heavy grades and, because no two angles of intersection were alike, the four curves all had to be different. In such cases the models are most effective. The scale in this case was 1 in. to 3 ft. for the vertical and 1 in. to 10 ft. for the horizontal.

The model is carefully made to scale and the grades are established, to the point where the intersection surfaces begin, in the following manner. Pieces of cardboard cut to scale, and to the preliminary grade for curb and rail, are set in their proper places and fastened to a baseboard. The intervening spaces are then filled with a stiff cement mortar and rough shaped to grade with a trowel and putty knife. The surface is smoothed out after the addition of about ½ in. of neat cement to the mortar surface. In working up these surfaces consideration is given to the route carrying the heaviest automobile traffic, allowing it the more favorable curves if preference is to be shown.



ACCURATE MODEL ESTABLISH

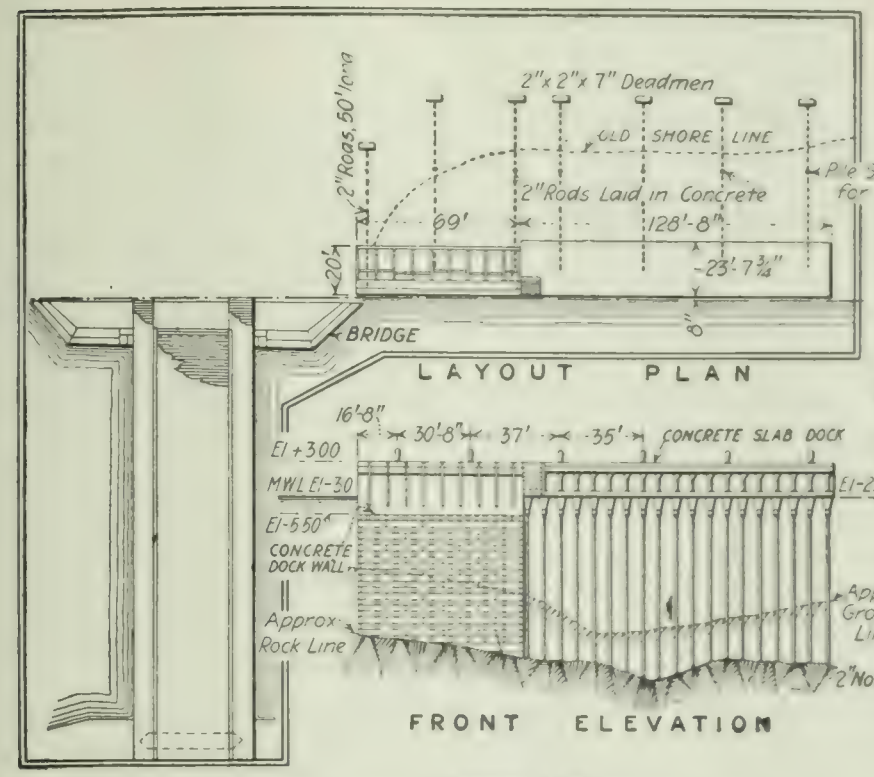
After the model has been finished acceptably, the material is allowed to harden and from measurements, carefully made with a steel scale, a set of notes is prepared, showing the location and grades of the four curbs and giving elevations on each vertical curve along the center line, (1) at the beginning of the curve, (2) at its midpoint and (3) at the end. In addition to this, the grades of center lines are shown in the notes at several convenient points along the tangents.

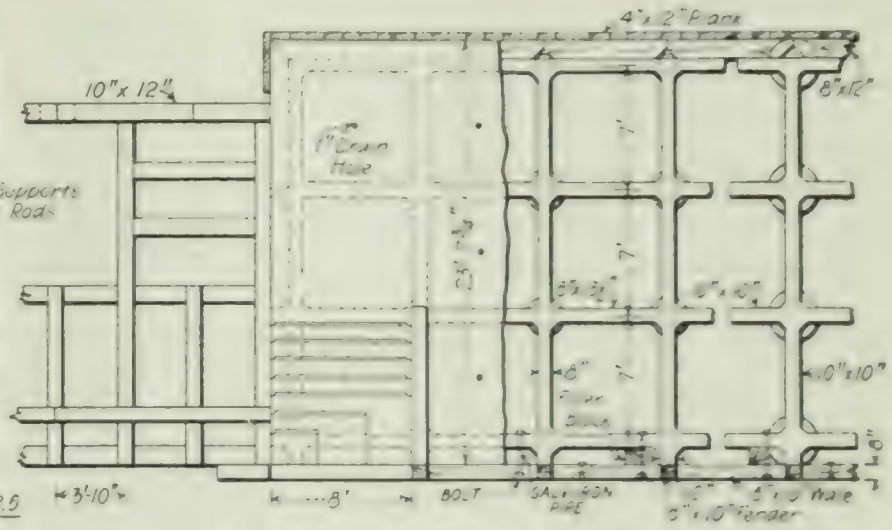
The plan has been developed and applied to construction work by James M. Ownes, assistant engineer in charge of highway design, under M. M. O'Shaughnessy, city engineer of San Francisco.

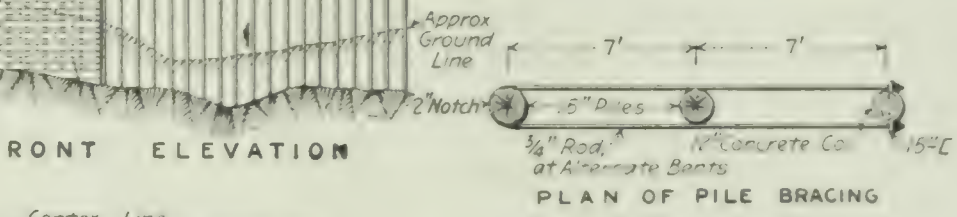
Wharf Has Combination Timber and Concrete Piles

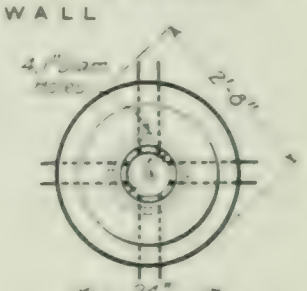
Precast Concrete Columns Fitted to Caps on Wooden Piles Which Form Foundation Frame for Concrete Quay Wall

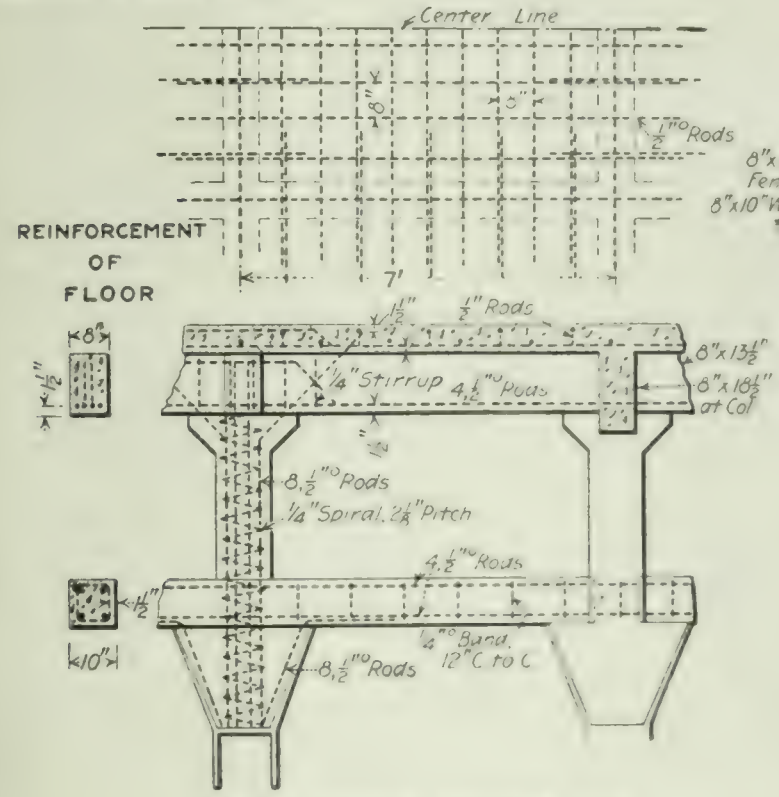
THE City of Buffalo has now under construction on Bird Island, which lies between the Black Rock Channel and the Niagara River, a short length of quay wall of remarkable design. The wall or wharf is being built in about 20 ft. of water at what will be the bulkhead line but which is now about 50 ft. outstream from the shore line. A fill is eventually to be placed behind the wall so as to make it a marginal quay bordering on the Black Rock Channel, as shown in the layout plan herewith. A stretch of 69 ft. of the wall immediately alongside of a bridge is of the typical Great Lakes construction; that is, a timber crib filled with rock, carrying a concrete block face wall. Extending therefrom a distance of 128 ft. 8 in. is the quay wall, the subject of this article. This wall is a reinforced-concrete beam-and-girder superstructure, resting on columns which are combination timber and concrete. The details

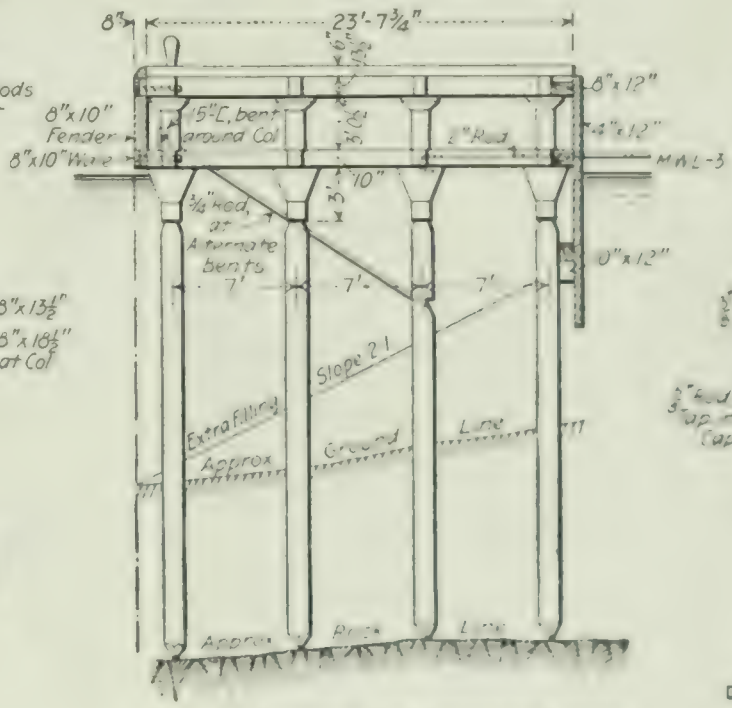


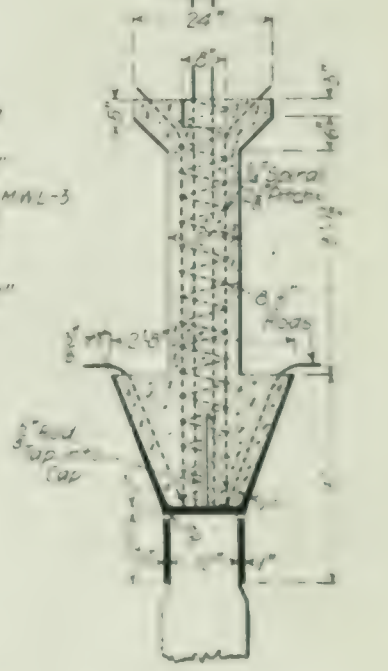












STRETCH OF CRIB DOCK AND COMBINATION TIMBER AND CONCRETE FRAME DOCK AT BUFFALO, N. Y. NEW WHARF AT BUFFALO HAS PRECAST CONCRETE COLUMNS FITTING INTO TIMBER PILES FOR BASE SUPPORTS

of this structure are shown in drawing herewith.

The footing piles are of wood 14 to 16 in. in top diameter. The top is trimmed down to fit a special cast-iron cap which carries the precast column, into which the framework of the wharf fits. This column has an enlarged conical base fitting into the bell of the casting, and from this outstanding base the main column shaft rises leaving an annular ring on which are carried the concrete stringer beams which form the lower frame of the wharf. The main column shaft is belled out at the top and grooved there to carry on a center line the transverse and longitudinal reinforced-concrete beams of the upper part of the wharf. The pile footings are tied together by ¾-in. rods notched into the third pile from the outside and rising to the outer row.

In construction the precast and fitted wood and concrete column-piles are to be set one by one by a derrick boat in their proper location and lowered through the very soft bottom to rock. The proper cut-off length will then be noted, the pile pulled out and sawed off on the bottom to bring it to the proper elevation. A row of these piles will then be placed, the fill being put in beforehand in cases where there is not enough cover over the rock to insure stability. When a bent of these piles is in place and properly braced, the reinforced-concrete framework above will then be deposited in forms in place.

As shown in the cross-section, the quay wall is nearly 24 ft. wide, will be protected on the outside with a fender system, and has on the inside a line of continuous timber sheathing to lower the slope of the tailing fill. When in position the wall is tied back to deadmen in the solid ground with rocks fitted with turnbuckles and set into the next to the inside row of column piles.

This work was designed in the office of the city engineer of Buffalo, Capt. G. H. Norton, and the work is being done by the Great Lakes Dock and Dredging Co., W. P. Feeley, district engineer.

SOCIETY SERVICE

A Section Dealing with the Results of Teamwork by Technical Men

Twin Cities Have Extremes in Societies

Observers of engineering society activity have often had occasion to remark the striking difference in society interest in the neighboring cities, St. Paul and Minneapolis. An illuminating statement is made by a prominent local engineer in reply to questions as to the reasons for this difference. He confirms the belief that much less working coöperation is secured in Minneapolis than in its sister city, and explains the situation partly by local conditions and partly by organization factors. The following summarizes his statement:

Minneapolis was settled by men of old New England stock who have controlled the financial situation and in a large measure the government of the city, notwithstanding the present Swedish population. St. Paul is a cosmopolitan city, with French, German, and Irish predominating; when two of these elements conflict, it is a draw unless the third can be induced to take sides.

Minneapolis Has a Close Organization

The Minneapolis Engineers' Club has a limited membership. This limit was 75 until a short time ago, when it was raised to 125. There are probably 250 more eligible to membership. The society is governed by a board of directors virtually self-perpetuating. There is not much interest in the society, because if a member starts anything the board of directors can kill it. Virtually no activities are started, except those initiated by the board of directors. The majority of the board of directors has always belonged to the conservative element, the higher social class of the city, and as one of them, of good old New England stock, expresses it, they have "preferred quality to quantity." The directors rather look upon all talk of engineering coöperation as being somewhat plebian in principle. When the club has a meeting, it is usually in connection with a dinner, somewhat formal in character and held at one of the promient clubs. There is probably more dignity in the club's doing than the ordinary member of an engineers' club likes.

Democratic Principles Govern the St. Paul Society

There is no limit to membership in the St. Paul Engineers' Society. All classes of engineers and those surveyors who have good reputations are members. There is no board of directors. The officers constitute the governing body, and they carry out the wishes of the majority of the members as expressed in open meeting. In every respect the society is a democratic organization. There is now a committee working to revise the constitution, to make it even more democratic and to enlarge the scope of activity of the society. The condition of membership is honorable service in the fields of engineering and allied sciences. The object of the organization is to make the profession of ever-increasing service to society.

A progressive spirit directs the work of the St. Paul Society. When any member suggests action likely to promote the good of the society, it is certain to get the prompt support of all. The members are alert in keeping track of what is going on locally and advising the officers or the chairmen of committees.

Of course, this harmonious condition is occasionally troubled by objections arising from timidity or conservatism. Some members urge greater caution, and express a fear that the society may become radical. Up to the present, however, nothing undignified has been done, nor is it likely to be.

What Happened to the Joint Engineering Board

The remarkable Minnesota Joint Enginering Board movement, started some years ago to bring the engineers of the Twin Cities—and of the whole state, for that matter—into closer touch, was checked in its progress early last season, after making a good start. Last year the Board carefully analyzed every bill presented to the legislature that in any way could affect the engineers, and it went on record concerning their merits, favoring or opposing this or that bill or certain of its features. Later the Board lost several prominent members: Mr. Darling, representative of the American Society of Civil Engineers, went to Russia, Mr. Street, of the American Institute of Electrical Engineers, left the country, and George Rathjens, secretary, was made a major and went to war. As a result it has been dormant during the summer. Now, however, there is promise of renewed activity. The Board was reorganized Nov. 3 and is at present outlining a campaign of work.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

The Engineer in Politics

Sir—The letter by C. E. Drayer in your issue of Nov. 1, entitled "The Engineer in Politics" was read with a great deal of interest.

Recently the writer had occasion to meet the president of one of the leading banks of Cleveland. During a conversation on various subjects this man said that he considered the profession of civil engineering the highest one in which a man could engage, and expressed regret that the engineer did not seem to realize his social and political status and take the place in the community to which his profession entitled him. The banker was asked what he considered it necessary for the engineer to do in order to gain this enviable position. He replied that it was simply a matter of coöperation.

I mention this case merely as an illustration of the fact that the public is more than ready to recognize the engineer, but the regrettable fact is that most engineers are not willing to be recognized as leaders in the body politic; not that they do not feel capable of living up to the standards required for the maintenance of a prominent position socially and politically, but because.

apparently, the engineer is naturally unobtrusive and unassuming.

I think it safe to say that every engineer realizes the importance, or rather the necessity, of coördinated and concentrated effort where large things are to be accomplished, and I think it likewise true that every engineer secretly wishes the profession to take its proper place in the community—and yet the most obvious means of accomplishing this end, coöperation, is continually disregarded.

Engineering News-Record has consistently preached this doctrine for a number of years, and it is beyond dispute that the majority of engineers in this country realize the importance of coöperative effort if the dream of leadership in public affairs is to be realized. Therefore, why not coöperate? B. H. SIMPSON.

Cleveland.

Specifications for Topographical Surveys of Drainage Districts

Sir—There has been considerable comment in your columns recently regarding topographical surveys and the cost of same. I am attaching herewith specifications covering survey work for drainage districts in Kansas. The law requires that every drainage district organized shall cause a topographical survey to be made by some competent engineer, showing the physical characteristics and location of any right-of-way, roadbed, bridge or other property or improvements under the control of any railroad company; also the location of all highways, public utility property, state and municipal improvements, ditches, farms, lakes and bayous.

The attached specifications were made up with the idea that the survey should fulfill the requirements of the law. In regard to costs of such surveys, there have been a number of contracts let at prices ranging from 14 to 21c. per acre. The topography of the districts surveyed is generally rolling and some have considerable timber, though very little dense undergrowth.

I would be glad to have suggestions in regard to the specifications from other engineers.

J. B. MARCELLUS,
Manhattan, Kan. Engineer in Charge.

[The specifications follow.—Editor.]

Contract and Specifications

for

Topographical Survey, Drainage District .....
..... County, Kansas

This agreement, made and signed this ..... day of ....., in the year ....., by and between the Board of Supervisors of ..... Drainage District ..... and representing the taxpayers of said district, and hereinafter known as the party of the first part, and ....., a civil engineer of ..... and state of ....., hereinafter known as the party of the second part.

Witnesseth: Said party of the second part in and for the consideration hereinafter mentioned hereby agrees to furnish all professional services, labor and materials, for making a complete and accurate topographical drainage survey and plat of certain lands in said drainage district and in full accordance with the specifications hereinafter mentioned in this agreement.

WORK TO BE DONE

The work contemplated under this contract consists of the field and office work necessary for making a complete and accurate topographical survey and map of lands subject to overflow or subject to direct injury from overflow by excessive water from .... All such land to be within the boundaries of Drainage District ....., ... County, Kansas. Land which is within the boundaries of the aforesaid district, but which is without question above the flood plane of the above mentioned stream and thereby not subject to direct injury shall not be included within the survey. Where existing ditches, flumes, conduits or other methods of conveying water are adjacent to boundaries of the district, they shall be accurately shown and sufficient data given to compute their capacity.

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DETAILED SPECIFICATIONS

1. The general field work may be done with transit and stadia. Stream cross-sections must be taken with the usual engineering leveling instruments.

2. The datum plane used for determining relative elevations may be assumed.

3. Boundaries of the land subject to overflow or subject to direct injury by water from ..... must be determined in the field with reasonable accuracy. Enough data must be included so that such boundaries may be described and accurately platted.

4. Sufficient elevations must be determined so that one-foot interval contours can be plotted with accuracy. The elevations of controlling points such as high or low banks on water courses, beds of bayous, depressions and ridges which cannot be practically shown by contours must be indicated on the drawings by figures.

5. Substantial bench marks shall be established during the progress of the survey, and the distance between adjacent bench marks shall not exceed one-half mile nor shall any point in the district be more than one-half mile from a bench mark. The location, elevation and description of these bench marks shall be shown upon the finished map.

6. Channel cross-sections must be taken of ..... at intervals along the channel not exceeding 2000 ft. Channel cross-sections shall be taken at all bridges spanning the above stream.

7. The property and fence lines shall be accurately shown.

8. The names of land owners and number of acres controlled by each owner within the boundaries of this survey shall be determined and shown on the finished map.

9. All public roads, railroads and corporation property shall be shown on the finished map.

10. The meanderings of ..... shall be accurately determined. All minor streams within the

boundaries of this survey shall be shown with reasonable accuracy.

11. The topographical map of the surveyed area shall be neatly and carefully plotted to a scale of 1 in. equals 400 ft. A tracing of this map will be furnished to the party of the first part. The cross-sectional areas of ..... shall be plotted on the margins of the finished map to a suitable scale.

12. The party of the second part will be required to turn in to the party of the first part the field books used in making the survey.

13. The traverse line elevations and established bench marks shall be run with an engineer's level. A maximum error of one-tenth of one foot into the square root of the distance in miles will be allowed.

14. The border line of timber areas shall be shown with reasonable accuracy upon the finished plat.

15. All or any portion of a village or incorporated city included within this district shall be shown by streets, blocks and lots upon the finished map.

16. All public roads, school buildings, farm buildings, cemeteries, railroads and corporation property, shall be properly located and shown on the finished map.

17. Maximum high-water marks shall be determined at controlling points in the stream valleys. Maximum high-water marks shall also be shown as near as possible to channel cross-sections herein specified. The locations and elevations of these high-water marks shall be shown in the finished map.

18. In cases of dispute relative to details to be included in the survey and the methods of the work, the same shall be referred to ....., Drainage Engineer, Kansas State Agricultural College, Manhattan, Kan., and his findings shall be final and conclusive.

19. The final acceptance of the survey shall be subject to the approval of the said drainage engineer. In approving the work the said drainage engineer shall have free access to all field books, maps, computations, sketches, or other data acquired by the party of the second part in carrying out the provisions of the contract.

20. The party of the first part assumes no risk nor is responsible in any way for damages resulting from the carrying out of the provisions of this contract.

21. All work not herein specified but which is ordinarily included in a topographical survey of this nature shall be done by the party of the second part without extra charge.

EXECUTION OF CONTRACT

The work shall begin ten (10) days after the signing of this contract and the same shall be completed according to the provisions of the specifications on or before ....., 191...

UNIT PRICE OF WORK

It is further agreed that in consideration for the completion of the work as hereinbefore specified and described in this contract, the party of the first part agrees to pay the party of the second part ..... cents (.....c.) per acre for each and every acre included within the surveyed and platted topographical area.

PAYMENTS

Upon the completion of the survey as specified and the approval of said survey and map as hereinbefore specified, the party of the first part shall within ten (10) days after the acceptance of the map by the said Drainage Engineer, pay to the party of the second part full and complete compensation for said survey.

In testimony whereof the parties to this agreement have hereunto set their hands the day and year first above written.

.....

[Seal] .....

.....

(Board of Supervisors, ... County, Kansas, Party of the First Part.)

.....

(Civil Engineer: Party of the second part.)

St. Paul Curtails Public Work

Sir—Referring to your editorial of Nov. 15, p. 908, on "Engineering Advice Should Guide Next Season's Municipal Work," I am glad to say that St. Paul has fallen into line by postponing almost a million dollars' worth of local improvement work. This is due directly to the recommendation of the city's chief engineer, Oscar Claussen, that local improvements ordered or pending on order be again called to the attention of property owners, before the work is let or started by the city, with revised estimates showing the cost of the work according to the best information now available on the labor and material situation, in order to obtain the property owners' present views.

During the past month the council, of which M. N. Goss, commissioner of public works, is a member, postponed ten paving projects totaling $431,000, four sewer projects totaling $389,000, and one ornamental lighting system estimated at $105,000. The largest paving project was Raymond Ave., from University Ave. to Dudley St., $114,000. The largest sewer project was Kitsondale Relief Sewer, $371,150. The ornamental lighting system was for 4½ miles of five-light clusters from the Minneapolis city limits along University Ave. to the present downtown lighting system of St. Paul—a fine civic project and desirable, but not a necessity.

Paving work this season has been delayed and in fact postponed, due to the inability of the street railway company to secure track material for relaying their tracks before the street is paved. Two large jobs postponed in this manner are Grand Ave., Milton to Cretin, 2¾ miles, estimated at $125,000, and Concord, from Ada to Annapolis St., estimated at $49,000. This work will be done next year if the company can get rails, but otherwise not, although the work is ordered and the money available.

One of the largest sewer projects ever before the city has been under consideration for the past two years. This is the St. Anthony Hill Relief Sewer, estimated in September, 1916, to cost $797,000, an important sewer project for a rapidly growing residence district. The increased paving area and other permanent improvements have so changed conditions in the district that the present sewer system is now inadequate to take care of the drainage, and storm water backs up in many houses. About 9000 pieces of property are involved in the assessment for this system, and at the hearing in

1916 the council, because of the tremendous protest put up, refused to order the system in, although urged to do so by Commissioner Goss and Chief Engineer Claussen. This protest was due largely to misconception, ignorance of charter provisions, and the absence of a campaign of education, which is necessary before people can understand why, as cities grow, these additional sewers must be provided. The protesters also insisted that a bond issue be floated to pay for the sewer, which was the former method in St. Paul, while the 1914 charter provides that all sewer costs must be assessed against the property benefited. The council postponed the hearing for a year and it came up again last week. The estimated cost is now $1,136,000, due to increased costs of labor and material, and, though the project was again urged by both the chief engineer and the commissioner of public works as being necessary from a sanitary standpoint, the council again refused to order the work done, on account of war conditions.

On local improvement work which is being offered to contractors now and for the past two months, they have refused to bid except on the most select work, and here have bid high. Their attitude is that they do not know what conditions will be next year and they prefer to take chances on losing their organization and having no work to start on in the spring, rather than to go against these uncertain conditions. The appended letter indicates how the situation developed as much as two months ago.

GEORGE H. HERROLD,
Assistant City Engineer.

St. Paul, Minn.

CHIEF ENGINEER'S RECOMMENDATION CONCERNING ABSENCE OF BIDS

St. Paul, Minn., Oct. 16, 1917.

Mr. M. N. Goss,
Commissioner of Public Works.

Dear Sir:

With reference to bids submitted on Oct. 15 for various classes of assessment work, you will notice that there were nine jobs on which we did not receive any bids. I therefore recommend that on all jobs that have been advertised from four to seven times the advertising be discontinued and laid over until next spring, when conditions may be such that contractors will appear more inclined to bid.

If any of the parties interested in this work appear at the office, I would recommend that they be told of the existing conditions and be asked to induce some contractor to put in a bid at a certain price, and if the interested property holders are satisfied with this price, we would then advertise the particular job as required by the charter, and award it at the price given.

O. CLAUSSEN,
Chief Engineer.

Twisting Munition Steel Bars Tests Them for Reinforcement

Sir—In the article in your issue of Nov. 15, p. 927, describing a reservoir for the City of St. Paul, I was interested in noting that the use of twisted steel bars for reinforcement was not permitted.

I have no desire to start a riotous debate on the merits of plain, twisted or deformed bars, as I believe enough has been said on this subject in the engineering press in the past few years.

There is one feature, however, I believe worthy of note, and it is a point which we have considered of vital importance in the construction of the works for the Greater Winnipeg Water District; and that is, that the twisted-steel reinforcement has considerable virtue by reason of the fact that each and every bar is subject to a test in the twisting operation. This is of the utmost importance in these days when the quality of steel as obtained from the mills varies from time to time, due to the requirements of munitions manufacture.

We have found that in order to get deliveries in sufficient quantities to keep pace with the work, it is necessary to accept steel which has been rolled for munition work. This not only furnishes a product of a highly desirable quality for reinforcement, but it is a step in the conservation movement, so necessary these days. Munition steel, being a high carbon product, is given a rigid test in the operation of twisting; consequently, we have the assurance that every bar that goes into the work contains no flaws or defects.

Be it said to the credit of the steel manufacturers and the quality of their product never has better steel been produced nor fewer rejections made, even under the severe test of twisting, than has been the case with this high-carbon steel. Of the thousands of twisted bars bent to various shapes for our work there have been fewer breakages than with the former mild-steel bars.

When it is considered that in the design of reinforced-concrete work the stress in the steel is kept at much lower values than would injure the bond of even plain bars, particularly in structures bearing virtually static loads, it would appear that the virtues of twisted bars should bear considerable weight in the mind of the designer, if for no other reason than that of the valuable individual tests given to the bars in the operation of twisting.

M. V. SAUER,
Engineer of Design, Greater Winnipeg Water District.

Winnipeg, Man., Canada.

Variations in Transit Needles

Sir—I have a Gurley light mountain transit and three needles for it. I set this instrument up, carefully set the needle with a magnifier so that it was on an even division of the compass circle and then set a mark. I then tried another needle and found that they differed on the meridian by 30′. I tried the third needle and found that it differed 55′. I did the same using each of the three pins and found the same result, each needle settling very nicely to its own meridian. All the needles were in first-class condition, and so were the pins. I then set up in the same place and sighted on the same successively with a Brandis instrument, one made by Berger, and one by Keuffel & Esser, and found that they all differed from one another, the differences varying from 15′ to 1° 15′. All these instruments were in good condition in every way, as far as I could see. I have long been aware that needles differed, but hardly thought the differences would be so large. I had no extra pins or needles for any of the instruments except the Gurley, but the differences between two of the others exceeded the differences given above. I would like to hear some of your readers' experiences.

W. NEWBROUGH.

Kemmerer, Wyo.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Auto Engines in Home-Made Dinkeys Saved Money on a Rush Job

IN PLACING the 135,000 cu.yd. of concrete, which is a feature of the work being done this year on rush schedule at Huntington Lake, California, it was decided to use gasoline engines for hauling cars of concrete from the mixer to forms.

First attempts were made with a type of gasoline engine supplied by the maker already mounted on 24-in.



FORD ENGINE ON HOME-MADE TRUCK HANDLING CONCRETE TRAIN

gage truck. The next step was the purchase of a second-hand Overland automobile engine mounted on a homemade truck for industrial service, and, finally, the experiment of adapting Ford automobile engines to home-made trucks was tried and found to be by far the most satisfactory method, besides being cheaper in first cost as well as cost of operation per yard of concrete handled.

The Ford engine is used complete as it comes from the factory as far as the main driving shaft. This is geared directly to a transverse shaft carrying sprockets with chains running to front and rear axles of the car. The relative sprocket diameters are such that the truck runs normally in high gear, making about eight miles per hour on level track without load.

The engine is mounted on a track built up in the company's shops from standard parts, the frame being made up of 8-in. longitudinal I-beams with suitable bracing. Wheels are 12 in. in diameter, of the ordinary pressed steel type used on industrial tracks. The driving sprockets are inside these beams, so that no moving parts project. A 10-gal. gasoline tank mounted above the deck of the truck is housed over to constitute a seat for the driver. Wood buffers are provided at front and rear equipped with coupling connections to suit the ½-yd. Koppel cars which the truck ordinarily operates.

The advantages of a four-cylinder, 22-hp. engine make the Ford trucks far more satisfactory than the one-cylinder, 8-hp. engine first tried, although the latter cost considerably more. The Overland car which was tried out had ample power but was found to be more expensive to operate in this service and the mechanical arrangement of chain drive, etc., was found to be more troublesome. The Ford trucks were built up at a total cost of about $600 each. Two are now in service and two more are under construction.

A general description of the work of raising the three dams on Huntington Lake, which is under the direction of R. C. Starr, hydraulic engineer of the Southern California Edison Co., appeared in *Engineering News-Record* of Dec. 6, p. 1044.

Mixing Sand and Gravel Before They Go to the Mixer

IN INSTALLING the construction equipment for raising the three dams on Huntington Lake, California, which work was described in our last week's issue, a rock-crushing plant with a bunker capacity of 500 cu.yd. was built. Because of the location of the quarry and the



BELT CONVEYOR ELEVATES AND MIXES SAND AND GRAVEL

desired bunker capacity, it was necessary to make the structure 125 ft. high, and it was not desired to add to this the 12 ft. more which would have been required if materials were to be delivered by gravity to cars at surface level.

In order to keep the tracks at grade without increas-



CAR RUNS FROM PLANT AT LEFT ALONG TOP OF WALL TO INCLINE OVER FORM

ing the height of the bunkers, it was decided to deliver the materials from the bunkers onto a belt conveyor which would lift the materials and deliver them into cars on surface tracks. A ⅝-in. rubber belt conveyor, 30 in. wide and 54 ft. long was then installed.

Two men attend to the loading of materials. One, stationed at the lower end of the belt, controls the doors from the bunkers, and the other, at the upper end, controls the direction of the stream into the cars by means of the deflector valve over the end of the belt, as shown in the accompanying view. He also signals the operator beneath the bunkers when the blow is to be cut off, and directs the "spotting" of the cars.

To economize time a compressed air winch is installed near the bunker siding to shunt the cars as they are filled. Thus the steam locomotive has only to uncouple from the string of empties it brings in, and couple up to the waiting train of loaded cars.

Measuring boxes in the bottoms of the hoppers were originally used in determining the proportion of sand and crushed rock, but after the operators became familiar with the proportion measurement was discontinued and the operator simply adjusted the gates in sand and crushed rock bunkers.

Shuttle Car Carries Concrete to Forms

CONCRETE for a harbor wall along the Genesee River at Rochester, N. Y., for the New York Barge Canal, is placed by a dump car running upon the top of the completed portion of the wall. The concrete is made in a stationary plant, and delivered from the mixer to the bucket of an elevator tower at the back of the wall. From the tower it is spouted into a steel dump car running on a track on top of the wall and operated by a small locomotive.

On reaching the section that is being concreted the car is run up an incline to the top of the Blaw steel form, and is there dumped. The car is of the side-dump type but adapted to bottom dumping by cutting a hole in the bottom and fitting this with a cast-iron frame and gate. A wooden frame on top of the car body increases its capacity. With a 1-yd. mixer and car, concrete can be placed at the rate of 20 yd. per hour.

The contractor is M. H. Ripton. The work is under the direction of F. P. Williams, division engineer for the state engineer and surveyor.

Motor Truck on Rails Hauls Concrete Cars

THE ubiquitous Ford seems to relish abuse, as may be seen in the accompanying view where one of the multitude is hauling one yard of concrete on standard-gage railway construction. No essential modification of the car was necessary in this case, the tires simply being removed, and flanges bolted to the rim. The necessary drawbars were bolted to the frame of the the automobile itself, and the arrangement has proved adequate to the task of drawing two yards of dirt.

The modifications are the ideas of John Donovan and W. F. Borden on work being carried on at Pottstown, Penn., for the Philadelphia & Reading Railway.



A NEW USE FOR AN OLD MACHINE

War Service Is Keynote of Busy Meeting of Mechanical Engineers

"Keynote Session" Takes Precedence Over Large Technical Program at Last Week's Annual Meeting—Extracts from Principal War Addresses Define the Engineer's Service to the Country

Service to the Public Is the Essence of Engineering Society Life

Dr. Ira N. Hollis, the retiring president, in the keynote address "Universal Public Service in Peace and War," defined the part which the engineering society should play.

What does our society stand for in the scheme of this world's affairs? As the years have passed, we have come nearer and nearer to a true conception of what our public relations should be, and this war has brought about a sudden large vision of our duties. They are not to be found in reforms put forward by the weak, or by self-seeking manipulators of public opinion, either within or without our society, but rather through a state of mind. We owe it to our country to think clearly and rightly, and to throw the whole weight of our society into the scale for sound legislation, good government, and public conscience. The engineer's philosophy is shown in his actions rather than in his words, because he has never learned to explain himself. It is expressed in the desire to serve. No profession can claim a higher motive.

The Society's Activities Will Be Devoted to War Purposes

President-elect Charles T. Main, in his speech of acceptance, declared war service to be the duty of the engineer and of the American Society of Mechanical Engineers.

The record of the engineering profession and the work which they have done in the past year is worthy of mention, but I feel that we have hardly begun to bear the full measure of the work which we should do. I trust that we in the next year may do something which is commensurate with the responsibilities of the profession.

This is not a time to discuss future policies, and it would be impossible to do so, owing to the rapidly changing conditions; it would be impossible to predict a policy which would cover the entire year. But there is, however, one ruling and central motive which every member of this society and every citzen of this country should set up, and that motive is the concentration of intellect, strength, resources and life, if necessary, to a satisfactory ending of this great war.

THE country's needs in the war crisis dominated the annual meeting of the American Society of Mechanical Engineers, held last week at New York. The principal sessions were given up to war matters. A series of striking addresses dealt with some of the manifold and vital relations of the engineering profession to war supply requirements. Both the retiring president and the president-elect, Dr. Ira N. Hollis, of Worcester, and Charles T. Main, of Boston, gave official expression to the society's readiness for fullest war service. Portions of their remarks are quoted above.

Though the technical proceedings of the meeting embraced subjects of fundamental importance—as, the formulation of new power test codes, and the discussion of a possible organized effort to bring about the saving of millions of tons of coal per year—yet they were relegated to auxiliary sessions. Of the major sessions, the two held Wednesday, Dec. 5, were given up to the broader war subjects. Some important paragraphs from these addresses are reprinted below. At the Thursday sessions two important special subjects were discussed: The Woman Worker, and Training and Employment for Cripples.

William Howard Taft, former President of the United States, addressed the society on Tuesday evening, in conjunction with the conferring of honorary membership on Major-General George W. Goethals, builder of the Panama Canal. After delivering an appreciation of Goethal's work on the Isthmus, Mr. Taft paid tribute to the engineer's part in the war and voiced a demand for reserving engineering students from immediate fighting-line service to supply the nation's technical reserve. These words of primary importance to the profession are reproduced below. The remainder of his address Mr. Taft devoted to an analysis of the war causes and some of its possible effects.

Speaking with intimate knowledge of the busy and complex developments in the national war organization, Gano Dunn, of the J. G. White Engineering Corporation, reviewed the growth of some important engineering offices at Washington, outside of the Departments: the Naval Consulting Board, the National Research Council, the General Engineering Committee, the War Committee of the Technical Societies, the American Engineering Service Committee, etc. He emphasized the value of a roster of engineers, and indicated that delay in preparing such a list had resulted because several volunteer bodies undertook to prepare it. More perfect coördination of the engineering committees at Washington is in prospect. "Those of us who have felt that, because he was not yet called upon, he was not going to have a place in this great war will soon, and very soon, have a call for everything we can render."

W. P. Kennedy spoke on "Motor Transportation." Leonard Metcalf reviewed the great problem of building the cantonments for the national army. He pointed out that the contractors on this work realized an average

net profit of only 2%, and also called attention to the unsuspected extent of the country's resources in contracting. "There was no difficulty in selecting a hundred or more contracting firms each capable of handling millions of dollars of work in a year." A still-existing need of the war work, he said, is "better coördination of the Government construction program—ways, means, and priority."

The woman worker question was opened by two men who are in close contact with it: John W. Upp, of the General Electric Co., and C. B. Lord, of the Wagner Electric Manufacturing Co. Mr. Upp described results obtained, and some of the necessary elements in training, selection of work, safety provision, and the like. Mr. Lord, on the other hand, spoke of the psychological factors in female shop-work: the influence of monotony, of color and cleanliness, of needless irritation, of woman's greater self-consciousness, etc. Many factory managers followed these speakers and brought forward a large amount of testimony in favor of the high efficiency and wide adaptability of women in the shop. Expressed in its broadest terms by F. E. Blake, of the Union Metallic Cartridge Co., the tendency of the remarks was to the effect that "all operations in the shop that do not require man's strength are handled by women with uniform success," and that "the girls are in the shop to stay."

A significant development of the meeting was the passage of a motion calling for steps to develop means of training mechanics. This followed an urgent appeal by a representative of the Military Engineering Committee for furnishing mechanics able to engage in army repair work. An alarming shortage in repair artificers exists at the moment.

Engineers Must Be Saved for Technical Service To Aid the War

William Howard Taft, former president of the United States, in an impassioned address on the war which now engages the nation's energies, points out the great need for conserving the human resources in engineering.

You engineers, all, constitute one of the two professions that are indispensable to the country in the carrying on of the struggle in which the people of the United States are now about to devote themselves: your and the medical profession. You as the constructors of all the material and all the equipment, of which so much is needed now in modern warfare to make effective the work of our boys at the front, and the medical profession to furnish as far as may be the aid in restoring to the ranks those whom the fortunes of war disable.

We have a conscription law, which is justified on the ground that it was a selective draft. We know that under that law those whose services can be most useful to the country in the trenches will be sent over, and those whose services can be most useful to the country in preparing and in saving men and materials should be retained in those places, so that they might not be wasted in the trenches and elsewhere, in which others could do just as good work as they—others who could not discharge the services required of engineers or physicians. We should all profit by the mistakes which England made in allowing her doctors and her medical students and her engineers and engineering students to go into the ranks and be sacrificed. Because of this England has reduced the supply of those indispensable persons so that she is embarrassed, and greatly embarrassed.

Congress and the Administration should see to it that the medical students and the engineering students should be reserved for the work for which they are particularly fitted; that the engineer students and the medical students should be required to go on and complete their preparation as engineers and physicians, so that they may become engineers and doctors, and may then be gathered into the service.

Military Transportation Today Is an Engineering Problem

The army depends on motor-truck transportation, says Major L. B. Moody. Engineers helped the War Department solve the transportation problem.

When you go into the zone where troops are operating the first assumption is that there is no road; and also that transportation becomes specialized. The Medical Corps do not want their patients handled on the cubic-foot or pound-per-mile basis. Likewise, the engineers have special apparatus, such as portable searchlights and demolition equipment. The Signal Corps has its wireless outfit and equipment for their aëroplane service, etc. The Ordnance Department shares in the motor transportation, as it furnishes all the field guns and the materials known as munitions.

When the question of replacing the horse in this special service came up, it was referred to the Ordnance Department. The great difficulty in replacing the army horse is where you have no road and where you have got to be one hundred per cent. certain that you will get there. If the general supply trains fail on the main roads, the men might go hungry for a day; that is not desirable, but it is possible. But if on the other hand you wish to use a gun for a certain purpose it is of no use to have it arrive the next day, it must be there on time.

As to the volume and the organization you can say that practically every gun handled by the United States army will be handled by motor equipment; and if we get an army approximating those on the other side you will get some idea from the number of guns engaged where this has grown.

From operating the experimental equipment we had, at the middle of April last, we have progressed from one officer in charge, a couple of officers, and a couple of draftsmen and five desks, to the point where we have schools turning out to repair these trucks, 30 to 50 trained officers and several hundred trained men every month. We have the estimated number of men actually building these (not counting those in related industries), and they number about 50,000. The number of officers actually on duty is from 300 to 400, the number of enlisted men running into the thousands, all for repairs only. The cost is in excess of the cost of the Panama Canal.

We are endeavoring in the Department to handle

this problem ourselves, but we would have been nowhere but for the assistance we have gotten. Without the assistance of engineers we would be nowhere.

Airplane Production Problems of Vast Magnitude

The military airplane program is a tremendous undertaking both as to production of the machines and as to providing the manpower. Its magnitude is reflected in the following paragraphs from an address by Prof. W. F. Durand, of Leland Stanford University, on "The Aircraft Problem."

In the three centers of airplane production at the present time—Dayton, Detroit and Buffalo, new factories are either completed or on the point of occupancy aggregating something like 35 to 40 acres of ground area, to say nothing of the gallery space. Early in the next year there will be occupied actively in the production of airplanes something like 50 acres of ground area with their gallery space which did not exist eight months ago. And this is without taking into consideration the automobile factories. Acres upon acres of existing automobile areas are running solely on airplanes and airplane parts. And we may certainly anticipate within a few months that this air-factory capacity will be actively occupied in turning out airplanes at the rate of at least several thousand per month.

The demands for supplies are at the limit of our productive capacity. The demand has been incessant for timber—spruce, spruce, and again spruce. Serious difficulties have been found in the way of supply. Substitution of other woods has been thought of, and while the woods have different characteristics from spruce they yet give effective service. And then there are possibilities in the way of metal substitutes which seem to hold hopeful and interesting possibilities.

One of the questions which presented itself again and again, and aside from the questions of policy or program, and one which is vital to the engineer, is that of standardization—standardization of elements and standardization of type. The standardization of elements, such as screw-threads and fastenings has progressed very satisfactorily. There is to be held soon an International Standardization Congress, and I understand this society will have one of its eminent past-officers at this conference, at which we may anticipate a still further approach toward standardization by way of elements and parts.

Parallel with the tremendous stream of production we must have development, research, investigation and a program which is seeking to contact with the unknown and the new; developing, judging, testing and determining all the technical characteristics and their adaptation to the conditions of active service.

Two or three problems not solved yet are of special importance. One is, supercharging airplane engines, the engine to be supplied with means to promote the maintenance of the power at high altitudes, and not suffer the loss normally attendant upon working in a rarified atmosphere. Another problem is modifying at will the pitch of the airplane propellor. It is of small use if the propellor is to maintain its same pitch in an atmosphere of reduced density; the engine will speed beyond the limit and the rotation speed of the engine will impose a limit upon the power which could be developed. Another is that of the spark plug. It is found that in the higher pressure of aëronautic service the spark plug based on automobile practice rapidly breaks down. The insulating characteristics are lost in one hour, or ten hours.

You are all familiar with the design and development of the so-called Liberty Motor. The first engines as you will remember were built in an astonishingly short period of time: A matter of 28 days from the time two men sat down in a room at the Hotel Willard until a motor was set up, and two days later it was ready for test at Washington. The motor has met and is meeting the full expectation of its designers. It has had, as every design is expected to have, minor difficulties and troubles, but not one of them has been fundamental, and it is now in course of active production, on a large scale.

We were impressed with the serious purpose with which the captains of industry in this field of production are approaching this problem. They realize its magnitude and its importance, and they are approaching it with high purpose and patriotism; and with the presence of such a pervading spirit in the industries of this country, we are going to make good with regard to our program of airplane production.

How the Engineering College Will Adapt Itself to War Needs

Two vital subjects discussed by Charles S. Howe, President of Case School of Applied Science: Holding the students of engineering colleges to complete their studies, and revising the courses to fit students more quickly for war service.

Does the country need engineers in time of war? Have we enough engineers now to supply the need during the war and after the war is over?

It would be needless to mention these questions were it not for the fact that if the present methods are carried out there will be no teaching in engineering colleges after a few months have passed, and the engineering colleges are the only places where systematic education in engineering is given. Engineering instruction is carried on to some extent in some shops, and very efficiently carried on, but there is no systematic attempt made over the entire country to give engineering education in the shop. Hence the colleges of engineering are the institutions to which we must look for engineers in the future if we need them.

The War Department is greatly interested in this question and is now taking steps to provide adequate training for a certain number of engineering students. It looks now as if some method would be adopted at Washington before very long whereby engineering students may go on with their training, just as medical students are now going on with their training.

Another question which has been before us is the question of special training during the war.

I think that all of the colleges have insisted on military drill as part of their training. Nearly all of the

colleges have established some military engineering work. For instance, they have taught the students how to build military bridges; they have taught them how to lay out intrenchments, how to make rapid plans of any regions of country, how to do reconnaissance work; how to make maps which could be used by the army officers, and various other things connected with military engineering.

Work has also been given to some extent in the mechanical and electrical engineering departments. Men have been trained in the application of electricity as necessary in the army. Some of us have gone to the military engineering schools where we have been able to find out just what instruction is given the army men in signalling, for instance, and in the use of searchlights, as well as in military telephony and telegraphy. The Chief of Ordnance has suggested that the colleges give their students in machine design in the future the designing of heavy guns and gun carriages, instead of the ordinary machine design.

Some of our institutions will teach their chemists a great deal about explosives, giving them not only the chemistry of explosives, but the methods of manufacturing the explosives—without actually manufacturing the explosives—and teach them the chemistry of all the ingredients that go into the explosives. Quite a number of professors of colleges of chemistry have visited the explosives factories in order to find out the latest methods in use in the manufacture and handling of explosives, as well as to ascertain the different materials that enter into them.

There is still another important question before the engineering colleges. If they lose all of their men over 21 years of age except the physically unfit, and have left, therefore, only the freshmen and sophomores, the greater part of whom are under twenty-one years of age, is it necessary for them to change, or is it not advisable for them to change, their courses of study in order to fit these men for the actual things they may have to do after they go into the army? It has seemed to some of us as though we ought to do this; that is to say, that if we know our courses in the engineering colleges are to be limited to two years, that we ought materially to change our courses of study during those two years in order to fit the men for some of the engineering work which it would be possible for them to do.

Engineers and the Fuel Problem

Prof. L. P. Breckinridge of Sheffield Scientific School says that fifty million tons of coal must be saved, and engineers must help in bringing about this saving.

The fuel problem, precisely stated, is that the coal-bin of the United States is not full. How much do we need to fill it? One hundred million tons. Can we get it? We will try to produce more coal. We may produce fifty million more than we have ever produced, but we shall have to save another fifty million.

If you will build a coal-bin 1000 ft. on each side, that coal-bin will have to be 4½ miles high to hold the coal which will be and must be mined this year in the United States. It takes a good deal to fill that; but if everybody saves a little coal they will save fifty million tons.

One-third, 35 per cent., of the entire freight hauled by our railroads is coal. We would like to fill the coal-bin but we would like to get rid of the job of hauling it. We need the railroads for other things. Sixty-five per cent. of all the coal produced is used to make steam. That is a good deal of coal, but it shows the desirableness of using economy, of saving a lot of this coal by saving steam, and by saving the power we make for steam.

The fuel administrator has a coal-conservation department, Dr. Noyes, and his activities reach to every state. The Bureau of Mines, augmented by a committee appointed by the four national engineering societies, is acting as technical adviser to this conservation department. The various engineering societies can give much help to this question of conservation in their own locality. They should coöperate with the Fuel Administrator in their particular locality. The United States Chamber of Commerce committee on coal conservation has invited Dr. Hollis to appoint some engineers to sit with them, and so they are helping in that way; and in the State Fuel Administration offices engineers are working to save coal.

War Appeal to Drainage Engineers

It is suggested in the November Bulletin of the Oregon Society of Engineers that members of the society who are familiar with the drainage laws of the state coöperate with the farmers of the state to the extent of giving their time in the preliminary stages of the formation of drainage districts. Formation of such districts is needed to bring much of the Willamette Valley to the highest possible state of productivity, but the preliminary investigation calls for an outlay of capital on the part of a few, which is reconvertible only in the event of the actual organization of the district and the completion of the work. "This seems to be an opportunity," says the Bulletin, "for engineers who for any one of a hundred reasons have not been able to bear arms against our enemy, to engage in the work of increasing the food supply, without a great sacrifice on their part."

It Pays To Keep the Labor You Have

Employers are finding labor harder to get and harder to keep than ever before, and yet before the war the overturn was large, according to figures collected by John Lind, assistant secretary of the National Lumber Manufacturers' Association. In 1913 Henry Ford lost $2,500,000 in hiring, fitting and "firing" 52,445 men, to keep a working force of 13,000 men. The men lost $454,000 in wages. A Pittsburgh corporation with a steady payroll of 16,000 men had a labor overturn in 1916 of 187%. The Rock Island Lines in prosecuting track-elevation work in Chicago last year found it necessary to put 2874 names on the payroll in six months to keep a force of 400 working. (See *Engineering News-Record* of Apr. 26, p. 186.) In the United States shipbuilding yards the labor overturn is 500%, according to Meyer Bloomfield, expert for the U. S. Shipping Board, as given in *The Nation's Business*. Experts estimate that it costs from $40 to $150 to hire, fit and "fire" a workman.

Joint Committee on Concrete Ships Makes Report

Cement Association and Concrete Institute Join in Study of Concrete for Floating Craft and Design Large Barge

FOR some months past a joint committee from the American Concrete Institute and the Portland Cement Association has been working, with consulting engineers and naval architects, upon the problem of the design and construction of the concrete barge or ship. Under date of Nov. 27, the two committees made a report, which is presented in abstract herewith. The personnel of the two committees is as follows: American Concrete Institute, L. C. Wason, C. R. Gow, R. W. Lesley, M. M. Upson, H. C. Turner, Chairman; and Portland Cement Association, Jos. Brobston, F. W. Kelley, W. S. Mallory, S. P. Crapo, Edw. D. Boyer, Chairman. Robert W. Boyd, of New York City, was consulting engineer.

The report notes the existence of several concrete barges and ships but states that information as to these vessels is too meager to be of much assistance to the committee. It concludes that the report, then, had better confine itself to a general statement of the several elements which make up the concrete ship problem and a discussion of the information obtained from the tentative design of a concrete ship. The several points taken up in order are as follows:

Relation between Carrying Capacity and Displacement—The displacement of a ship is the weight of the water she displaces, and is therefore the sum of the weight of the ship itself and its cargo capacity expressed in tons. The cargo capacity will hereafter be spoken of as the "dead weight."

It is apparent that the efficiency of a ship as a cargo carrier depends upon the relationship between dead weight and displacement. Expressed in terms of per cent., in the average cargo ship built of steel, the dead weight is from 70 to 75% of the displacement—taking into account as weight of ship all spars, fittings, deck houses, anchors and chains, auxiliary engines and tanks, but not boilers, engines or coal. In a wooden ship, the dead weight is from 60 to 65% of the displacement. It is quite evident that from the difference in weight of materials, it will be difficult to design a ship of concrete that will give a relationship between dead weight and displacement approaching that of steel. However, if ships are to be built of concrete for commercial use, the weight of the ship must be such as to provide a reasonable dead weight or cargo capacity for the displacement.

Transverse Strength—The stresses in the transverse members of a ship are, in still water, functions of the draft and the stiffness, and may be computed by mathematical processes, although the computations are long and laborious. When the material is reinforced concrete, the problem becomes much more complicated. Experience has shown, however, that numerous elements other than draft effect the transverse strength of a ship, such as the effect of rolling in a sea way, impact with docks or other ships, and stresses incident to going into dry dock. The transverse members of cargo ships of today are, therefore, not designed to withstand computed stresses, but are designed in accordance with various rules which embody the result of long experience in the construction and use of ships. It should be noted in this connection that granting of insurance depends on compliance with these rules.

Steel ships are of two different types, (a) framed ships, in which transverse ribs or frames are spaced from 18 to 24 in. on centers, the plating being riveted to these ribs without intermediate longitudinal members, excepting in the bottom; and (b) longitudinally framed ships (Isherwood), in which deep frames are spaced from 10 to 15 ft. on centers, with intermediate longitudinals to which the plating is riveted.

From a comparison with the ordinary steel ship design, it would appear to be not difficult to design transverse members of reinforced concrete of equivalent strength to steel members—the question of strength only being considered.

Longitudinal Strength—A ship must be able to meet conditions which are unlike any to which land structures are subject.

In determining the longitudinal strength of a ship, it is customary to assume two conditions. Under the first condition, the ship is assumed to be suspended between two wave crests—the length between crests being equal to the length of the ship between perpendiculars, the height of the wave being equal to one-twentieth of that length. In this case, the ship as a whole is acting as a simple beam supported at the ends. This condition is termed "sagging." Under the second condition, the ship is assumed to be supported amidships on one crest of the same wave. Under this condition, the ship as a whole acts as a cantilever. This condition is termed "hogging." It is apparent, therefore, that when a ship is riding the waves both the deck and the bottom of the ship will be required to withstand tensile and compressive stresses alternately—the maximum tensile stress following the maximum compressive stress at very short intervals. In a steel ship the entire cross-sectional area of the midship section acts to resist these stresses, taking into account, in determining the moment of inertia, all of the continuous members, such as continuous scantlings and deck side and bottom plates. In the concrete ship, equivalent strength must be provided. In the case of the concrete ship, however, only the steel reinforcement can be relied upon to take tensile stresses. The concrete assisted by the steel will take the compressive stresses.

The effect of the rapid change of the character of the stress in either the deck or the bottom is much more serious in the case of a concrete ship than in the steel ship for the reason that, owing to the low tensile stress of concrete, cracks will occur at the extreme fiber under relatively low tensile stresses in the steel. These cracks, if any, alternately opening and closing, may tend to cause disintegration, with resulting leaks or impairment of the reinforcement.

At the present time, little information is available as to the effect of such reversal of stress, and but little can be hoped for until an actual trial has been made of a concrete ship in a sea.

Elasticity—There is an almost unanimous opinion among naval architects and seafaring men generally that a concrete ship will be so inelastic that she will tear herself to pieces in a sea. While it is doubtless true that in a concrete ship there will not be the same readjustment of stresses as in a steel ship when subject to the action of a heavy sea, experience with reinforced-concrete structures generally has shown that such structures have considerable elasticity and there is ample reason for the hope that reinforced concrete will prove a suitable material for shipbuilding purposes.

Effects of Sea Water on Concrete and Reinforcing Steel—Until very recently, little information has been available as to the effect of sea water on concrete. The recent work of the Bureau of Standards, acting in coöperation with the Portland Cement Association, has thrown considerable light on what may be expected from the action of sea water. The result of their investigation tends to show that inferior concrete or concrete of which the surface skin has been impaired suffers serious disintegration when in contact with sea water. Inasmuch as in most instances the structures examined, which form the basis of the report of the Bureau of Standards, were built without thought as to the action of sea water (it being assumed that there would be no deleterious action) there is every reason to hope that where the effect of sea water is appreciated, and where steps are taken in the way of selected materials and adequate workmanship, assuring a good mix and a satisfactory surface skin, the concrete will not so deteriorate.

With regard to the effect of sea water on the reinforcing steel, there is some question as to whether a thin layer of concrete can be relied upon to protect the steel from corrosion. To provide a thick protective layer of concrete outside of the reinforcing steel is practically out of the question, owing to the large increase in weight. If the reinforcement, therefore, is to be maintained in perfect condition, the steel must be protected by galvanization and by increasing the efficiency of the protective concrete by means of additional care in materials and workmanship and by a surface coating of a waterproofing character.

Relative Cost—Just at the present time, the demand for tonnage is so great that any ship of reasonable capacity that can be used for carrying cargo will prove financially successful. The relative costs of ships of concrete and steel,

or concrete and wood, is not therefore as important a consideration as it will be after the war when conditions again approach the normal. However, it is necessary to have an adequate idea of the probable cost of a concrete ship as well as a comparison with the cost of steel and wooden ships.

Speed of Construction—Speed of construction is of vital importance in the shipbuilding program today owing to the immediate requirement for tonnage. If it shall be found that the concrete ship can be constructed in much less time than a steel or wood ship, this fact will contribute largely to the success of the concrete ship.

After this statement of the problem the committee notes that there is a radical difference between the design of a barge for still-water use and of a barge or ship for ocean trade, due to the serious effect of wave action in the open sea. It assumes that at present the vital need is for an ocean-going vessel and devotes its design study to a boat of that type. The vessel design is a 2000-ton, self-propelled barge of a length of 227½ ft., a beam of 42 ft. and a loaded draft of 18 ft., at which draft it would have a displacement of 3675 tons. This vessel is designed in detail in the report. It is stated that the total cost of hull, exclusive of equipment, would be $126,000, or about $63 per ton of dead weight. Against this the committee assumes that the cost of a similar steel hull would range from $90 to $120 per ton and of a wooden hull $70 to $100.

The report concludes as follows:

The designs of various other types of ship in which reinforced concrete has been proposed, either alone or in combination with structural steel, were examined by your committee.

In some of these designs cellular sides and bottoms are proposed. Although double sides and bottoms in ships have distinct advantages, when the material is concrete, such a design appears out of the question, not only because of the considerable increase in weight, but also because of the added complication to the formwork—already a large item in the cost of a concrete ship.

Designs have been proposed in which structural steel members are used as reinforcement. While such members assist somewhat in maintaining the lines of the ship during the construction of the form work, the added advantages can hardly offset the increased cost due to the fabricated steel work and the inefficient use of the reinforcement.

One design has been proposed in which structural steel members are used to support a shell of reinforced concrete. While the claim is made that a ship can be built of the proposed design with only about one-half the steel used in a steel ship of the same capacity, and at much greater speed of construction, the difficulty of making the two materials act together, thus avoiding cracks, makes the design as proposed of doubtful value.

Your committee feels that it is not its function at this time to prepare any detailed plans for a concrete vessel. It is manifestly impossible to design a type of vessel that will be applicable to all classes of service. A barge for use on the canals of New York would not be an efficient type for use in harbors or on the Ohio or on the Mississippi.

Vessels heretofore built have demonstrated that the small barge for still-water service can be built and successfully operated. The solution of the larger problem of a concrete ship will include the solution of smaller vessel problem, in which questions of strength are not of the same prominence.

Although there are some questions regarding the concrete ship which can only be answered by actual experiment, the studies which your committee has made point to the commercial success of the concrete ship.

Your committee suggests that specifications for a concrete vessel should embody the following principles:

1. Both cement and aggregates should be selected with great care to insure a concrete of maximum efficiency.
2. The concrete should be placed in one continuous operation to insure monolithic construction. The concrete mixture should be such as will develop a crushing strength in excess of 3000 lb. per sq.in. when tested in standard cylinders at 28 days. A concrete consisting of one part portland cement, one part sand and two parts ½-in. aggregate may be expected to give such a concrete. The mixture and workmanship must be such as will assure impermeability.
3. The reinforcing steel should be in the form of deformed bars and should be galvanized.
4. In parts of the vessel where cracks in the concrete would tend to cause leaks, the stress in the steel should be kept low (preferably less than 12,000 lb.).
5. Some form of elastic waterproofing coating should be applied to the hull below the deck.

It is understood that the committee will now proceed to the design of a smaller concrete barge of a type suitable for use in the harbors or in the inland waterways of this country.

California Sewage Plants Are Neglected

SEWAGE-DISPOSAL plants in California are now regularly inspected by the State Department of Health. Recent reports indicate that few plants are doing as good work as they might. According to the department's monthly bulletin the City of Auburn, which has a tank with two flowing-through chambers over a common sludge-digestion chamber designed only for parallel operation, persists, although previously instructed, "in an unusual and erroneous method of operation, namely, passing the sewage into one of the flowing-through channels, down through the sludge-digestion chamber, up through the slot and out of the end of the second flowing-through channel. The tank at Whittier is overworked and requires frequent breaking up of scum. The farm on which the effluent is disposed is neglected, but no nuisance is created. Plans for doubling the present size of the disposal plant required at Anaheim are under way. At Chino a 20-acre sewage farm shows neglect but the newly constructed tank is operating satisfactorily.

A new activated-sludge plant at the Folsom State Prison has recently been put into operation to handle the sewage produced by the 1500 inmates. The type of plant was dictated by the fact that it must be located at the base of a cliff below the administration building. The ordinary objections to cost of power, etc., do not pertain here, as the prison generates its own power on the American River. It is expected that the prisoners will be used to operate the plant. The effluent will be chlorinated before being discharged into the American River, because, 20 miles below, the City of Sacramento gets its water supply from the mingled waters of the American River and the Sacramento River. This installation will take the place of a sewage farm on the hills above the river where the topography was such that it was extremely difficult to hold the sewage. It was continually breaking away and reaching the river in large volumes.

Portable Pine Houses for Army in France

Portable knockdown wood houses, to be erected of standard panels fabricated in this country and used for hospitals and barracks in France by the American forces, will require 300,000,000 ft. of pine lumber, according to the Southern Pine Association. The knockdown portable house of standard-sized units was decided on for use in Europe because of the scarcity of labor. Panels made up in this country can be put together quickly with bolts by the troops when they are received abroad. The lumber mills, which do not employ large carpenter forces, propose to furnish the material only, the panels being built by contractors.

Cleveland Sewage Screen Plans Withdrawn from State Department of Health

City Will Submit Plans for Screens and Activated Sludge and Request Postponement of Latter Until Screens Have Been Operated a Year — Screened Sewage To Be Disinfected During Bathing-Beach Season

IT WAS agreed at a conference held in Cleveland, Nov. 15, that the plans for treating the sewage of a portion of the city by fine screening, which had been before the State Department of Health for some months, should be withdrawn by the city, and that in their place there should be submitted for approval plans for fine screens to be followed by a secondary process—probably activated sludge. It is understood that the screens will be installed at once, and that if after they have been in operation at least a year they have not yielded an effluent satisfactory to the State Department of Health, then a secondary process shall be installed in accordance with detailed plans to be approved by the department.

Exact Terms of Agreement

The terms of the agreement, as stated by Dr. A. W. Freeman, state commissioner of health, in a letter dated Nov. 16, addressed to Alexander Bernstein, director of public service of Cleveland, are as follows:

"On yesterday Mr. Dittoe, chief engineer of this department, and myself conferred with you and your engineering advisers in regard to the proposal of the City of Cleveland to install at the W. 58th St. site a sewage-treatment plant of the fine-screen type, which proposal had been submitted to this department for approval under date of June 2, 1917. It seems desirable to reduce our conclusions to writing in order that there be no future misunderstanding.

"The attitude of this department in the matter was expressed substantially as follows: The pending proposal is defined by your consulting engineer as providing for a degree of modification amounting practically to the removal of 10% of the total suspended solids of the sewage to be treated, with chlorination of the effluent during the bathing period. The point for determination by this department, therefore, has been whether or not this degree of purification should be considered sufficient and as complying with the order of the State Board of Health regarding the pollution of Lake Erie and the conditions of approval of the site at W. 58th St. If the proposed degree of purification should be determined to be satisfactory by the department, we would, of course, leave the details of the method to be used to the determination of the City of Cleveland, specifying only that such method comply with generally understood and accepted engineering principles.

"The proposal under consideration has received the careful and prolonged attention on the part of our engineers which its importance deserves, and the advice of a competent consultant has been obtained. The method proposed, that of fine screening with chlorination during the bathing season, is somewhat novel, and examples of its application to comparable conditions are not readily to be found. Determination of the effect upon the lake of the discharge of an effluent so treated is, therefore, largely a matter of individual judgment, and in our opinion the method proposed would not attain the results specified in the order and conditions previously communicated to you by the State Board of Health.

"Upon presentation of these facts you stated that it is the desire of the City of Cleveland to withdraw the present proposal, and to substitute therefor a new proposal involving the use of fine screens with an additional process for secondary treatment. It is suggested by your consulting engineer that this secondary treatment be by the activated-sludge method. It is understood that you will propose to install screens at once, and to add the secondary treatment process if after at least one year's trial of the screens alone it is found that the effluent from the screens does not satisfactorily meet the requirements laid down by the State Board of Health.

"If this is the intention of the city, this department will expect to receive a request for withdrawal of the present proposal. We further indicate to the city our willingness to approve a proposal along the general lines indicated, provided the city agrees in good faith to install satisfactory secondary treatment, should an investigation to be made by this department, based upon at least one year's operation of the screens disclose, in the opinion of this department, the necessity for such additional treatment. It is understood that studies for secondary treatment are to be made and plans prepared prior to the submission of the proposal suggested by the city, and that this secondary treatment meet the conditions previously laid down by the State Board of Health."

The Case Briefly Reviewed

For several years past, Cleveland has been under orders from the State Board (now department) of Health to stop the pollution of Lake Erie and the Cuyahoga River. The plant at W. 58th St. is one of three proposed by the city to that end. The State Board of Health approved the site in January, 1914, with the condition that the works built there "shall be designed for the clarification and disinfection of the sewage, the dispersion of the effluent without nuisance in Lake Erie and for the disposal of the sludge with a minimum production of odors." The objects to be obtained by the treatment are prevention of contamination of the city water-supply and of bathing beaches; prevention of visible pollution of the lake and bathing beaches by floating and suspended matter, gas-lifted sludge, particles and discoloration; and the prevention of sewage odors.

After the operation of a sewage-testing station in 1913-14 under the direction of R. Winthrop Pratt, consulting engineer, and George B. Gascoigne, it was decided that the choice for the W. 58th St. plant lay be-

tween Imhoff tanks and fine screens of some then undetermined type. More data on screens were deemed advisable. Reinsch-Wurl screens of a nominal daily capacity of 7,500,000 gal. were installed, under contract, by the Sanitation Corporation. Test results were recorded by the city under the direction of Messrs. Pratt and Gascoigne from Mar. 20 to Sept. 10, 1916. The Sanitation Corporation made tests, Oct. 23, 1916, to Feb. 20, 1917. George W. Fuller, as consulting engineer for the city, conducted supplementary tests from Feb. 27 to Mar. 3, and from Mar. 5 to 7, 1917.

In August, 1916, Messrs Pratt and Gascoigne recommended that the city install Imhoff tanks instead of fine screens at the W. 58th St. site and on Oct. 10, 1916, the State Department of Health received for approval plans for coarse screens, grit chambers, Imhoff tanks and disinfection—the latter for summer use. On Nov. 15, 1916, the city withdrew these plans, so they were never acted on by the department.

Early in 1917 Mr. Gascoigne submitted a report to the city, approved by Mr. Pratt, adverse to fine screens. Soon afterward Mr. Bernstein called in George W. Fuller, consulting engineer, New York City, for advice on sewage treatment. His report, dated May 14, 1917, recommending fine screens rather than Imhoff tanks, was abstracted in *Engineering News-Record* of Aug. 16, p. 308, as was also the Gascoigne report just mentioned.

On June 4, 1917, the State Department of Health received from Messrs. Fuller and Gascoigne plans for fine screens, as recommended by Mr. Fuller. These plans provided for treating 127,000,000 gal. of sewage a day by bar screens; 96,000,000 gal. by grit chambers; and 64,000,000 gal. by fine screens and (summer) disinfection, and for the passage into Lake Erie through the existing submerged outfall sewer of 85,000,000 gal. a day, which is the full capacity of the outfall. Excess flows would be discharged through storm overflows.

An exhaustive report on this plan for consideration by the state commissioner of health was made Aug. 11 by W. H. Dittoe, chief engineer of the Ohio State Department of Health. A copy of Mr. Dittoe's report was sent for study and opinion to Earle B. Phelps, professor of chemistry, U. S. Public Health Service, and consulting engineer to the International Joint Commission, under an arrangement made with the surgeon-general for the coöperation of the Public Health Service. Professor Phelps' report was dated Sept. 6. Conferences were held during the summer and fall, and meanwhile Mr. Dittoe and Mr. Fuller both prepared supplementary memoranda.

On Oct. 1 these reports and memoranda were submitted to Dr. Freeman. The final outcome of the various reports and conferences was the understanding reached Nov. 15 and set forth in the letter by Dr. Freeman to Mr. Bernstein, as printed above, that the plans for fine screens alone would be withdrawn and in their place plans submitted for fine screens and a secondary process, probably activated sludge, with a postponment of the installation of the latter until screens had been tried for a year. This agreement does not cover the proposed plans at the E. 140th St. and the Cuyahoga River sites.

Operation of Proposed Bond Issue Plan for State Roads of Illinois

In the accompanying table, arranged by the late Wm. W. Marr, chief highway engineer of Illinois, is shown the operation of the bond issue plan recently passed by the legislature of that state, and which will be submitted to the voters in November, 1918.

Issuance of the bonds will start in the year 1920. At that time, and annually thereafter for five years, there will be put out an issue of $10,000,000 each, making in all the sixty millions. With the aid of Secretary of State Emmerson and his staff, this division has arrived at what it estimates will be a very conservative collection of motor license fees each year. This scale is shown in the first column of the table. These collections are figured up to 1944, by which time at the latest, it is estimated not only can all interest on the bonds be paid, but the aggregate principal retired, as well, thus wiping out the State obligation. Meanwhile, contracts will be awarded in 1920, and as soon as the work can be done, contractors will rush the 4000 miles of modern highway to completion. The table shows clearly the sequence proposed in issuance of the bonds, payment of interest and principal and manner of maturity.

HOW PROPOSED ILLINOIS ROAD BOND PLAN IS EXPECTED TO OPERATE

Year	Estimated Motor Fee Collections	Payment on Principal	Interest	Total Payment Principal and Interest	Available for State Aid [illegible] (Including Maintenance)	Outstand[illegible]	First Maturity	Second Maturity	Third Maturity	Fourth Maturity	Fifth Maturity	Sixth Maturity
1920	$4,800,000	$2,400,000	$350,000	$2,750,000	$2,050,000	$[illegible]	$2,400,000					
1921	5,200,000	2,400,000	616,000	3,016,000	2,184,000	17,600,000	400,000	$2,000,000				
1922	5,500,000	2,400,000	882,000	3,282,000	2,218,000	25,200,000	400,000	400,000	$1,[illegible]			
1923	5,800,000	2,400,000	[illegible]	3,548,000	2,252,000	32,800,000	400,000	400,000	[illegible]	[illegible]		
1924	6,000,000	2,400,000	1,414,000	3,814,000	2,186,000	40,000,000	400,000	[illegible]	[illegible]	400,000	[illegible]	
1925	6,000,000	2,400,000	1,680,000	4,080,000	1,920,000	48,000,000	400,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1926	6,000,000	2,400,000	1,596,000	[illegible]	2,004,000	47,600,000	400,000	400,000	[illegible]	[illegible]	[illegible]	[illegible]
1927	6,000,000	2,400,000	1,512,000	[illegible]	2,088,000	45,200,000	400,000	400,000	[illegible]	[illegible]	[illegible]	[illegible]
1928	6,000,000	2,400,000	1,428,000	3,828,000	2,172,000	42,800,000	400,000	[illegible]	400,000	[illegible]	[illegible]	[illegible]
1929	6,000,000	2,400,000	1,344,000	3,744,000	2,256,000	38,400,000	400,000	400,000	400,000	[illegible]	[illegible]	[illegible]
1930	6,000,000	2,400,000	1,260,000	[illegible]	2,340,000	36,000,000	[illegible]	400,000	[illegible]	[illegible]	[illegible]	[illegible]
1931	6,000,000	2,400,000	[illegible]	3,576,000	[illegible]	33,600,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1932	6,000,000	2,400,000	1,092,000	[illegible]	[illegible]	31,200,000	400,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1933	6,000,000	2,400,000	[illegible]	3,408,000	2,592,000	28,800,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1934	6,000,000	2,400,000	924,000	3,324,000	[illegible]	26,400,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1935	6,000,000	2,400,000	[illegible]	3,240,000	[illegible]	24,000,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1936	6,000,000	[illegible]	756,000	[illegible]	[illegible]	21,600,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1937	6,000,000	2,400,000	[illegible]	[illegible]	[illegible]	19,200,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1938	6,000,000	[illegible]	588,000	[illegible]	[illegible]	16,800,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1939	6,000,000	2,400,000	[illegible]	2,904,000	[illegible]	14,400,000	400,000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1940	6,000,000	[illegible]	[illegible]	2,820,000	[illegible]	12,000,000		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1941	6,000,000	2,400,000	[illegible]	2,736,000	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]
1942	6,000,000	[illegible]	[illegible]	2,652,000	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]
1943	6,000,000	[illegible]	[illegible]	2,568,000	[illegible]	[illegible]					[illegible]	[illegible]
1944	6,000,000	2,400,000	[illegible]	2,484,000	[illegible]	2,400,000						[illegible]
Totals....	$147,300,000	[illegible]	$12,650,000	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

NEWS OF THE WEEK

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

Damage to Engineering Structures at Halifax Not Yet Known

On account of the severe storm which delayed communication with Halifax, Nova Scotia, following the disastrous explosion of the "Mont Blanc" in its harbor, no news has been received of the nature or extent of damage to engineering structures in the city. The scene of the explosion, which is said to have resulted from the ignition of benzine on a ship carrying 2800 tons of nitro-glycerine and trinitro-toluol, is some distance from the new ocean terminal being constructed by the Canadian Government, which is reported virutally undamaged. As to the effect of the disaster on the two new reinforced-concrete piers at the northern end of the business section of the city, very close to the explosion, nothing has been reported. One report that a considerable quantity of fill, trackage and rolling stock at the site of a new railroad yard north of the city was washed away by tidal waves following the explosion is unconfirmed. It is believed that the dry dock mentioned in earlier dispatches is a small one built a long time ago.

Office of Public Roads Urges Highway Coöperation

The Office of Public Roads and Rural Engineering has sent a letter to state highway departments urging the adoption of a definite policy in good road matters, with a view to eliminating from next year's construction the non-essential roads and obtaining effective guarantees for the construction of those which are essential. In so doing the office is in harmony with the policy adopted at the Richmond meeting of the American Association of State Highway Officials, detailed elsewhere in these pages. The office, however, asks that state highway departments communicate directly with it, whereas the state highway officials requested that the material be cleared through the executive committee of the association.

Specifically, the office proposes the three following lines of procedure and also asks for expressions of opinion thereon:

1. The selective consideration of all of next year's construction jobs in all of the states and the preparation of a program of road work throughout the nation, in which program each construction job would be listed in the order of its economic importance to the particular territory in which it is located and to the nation as a whole. This arrangement, he points out, would permit of the postponement of relatively less urgent undertakings.

2. A coördination of this selective process with the railway and water transportation facilities, with a view to insuring an adequate number of cars and vessels of suitable types, with proper distribution to transport materials for the construction of the approved jobs.

3. A coördination with the materials industries with a view to insuring supplies of materials in adequate amount, distribution and deliveries to permit the construction program to be carried out.

Selected Engineering Students Will Be Exempt from Draft

Special Order Places High Grade Students Selected by Faculty in Class Exempt as Being in Military Service

As forecast in these columns last week, on Dec. 8 the Secretary of War ordered that the following paragraph be added by the Provost Marshal General to Section 151 of the Selective Service Regulations governing the draft:

"Under such regulations as the Chief of Engineers may prescribe, a proportion of the students pursuing an engineering course in one of the approved technical engineering schools listed in the War Department, as named by the school faculty, may enlist in the Enlisted Reserve Corps of the Engineer Department and thereafter, upon presentation by the registrant to his local board of a certificate of enlistment, such certificate shall be filed with the questionnaire and the registrant shall be placed in Class V on the ground that he is in the military service of the United States."

Following the issuance of this order, the Chief of Engineers established certain regulations limiting the exemption privilege to those students to whom the school issues the following certificate, properly attested by the president of the school:

"I hereby certify that ———— is a regular student of the ——— class in good standing, as a candidate for an engineering degree at ———— and that in the judgment of the faculty of this school, based upon his academic record, supplemented by his relations with fellow students and by observation of his instructors, he may fairly be regarded as deserving a place in the first third qualitatively of the young men graduating from this institution during the past ten years."

The Provost Marshal General's regulation means that the selected students are to be permitted to complete their engineering course as exempts, just as though they were in the military service of the United States, but they will not be dressed in uniform nor will they be put under salary as members of the military forces of the United States. They are, however, members of the Enlisted Reserve Corps of the U. S. Engineer Department, and as such are subject to immediate call to the colors at any time. At the completion of their course, they will become subject to the call of the draft and may be detailed to any service in the jurisdiction of the military authorities. It is probable, however, that a number of the graduates will be permitted to enter civilian engineering work necessary for the conduct of the war. All engineering students not included within the groups selected by the faculty are subject to the regular provisions of the draft law.

As at first projected, the exemption was to apply to a flat one-third of all engineering students of draft age; that is, the upper third to be selected by straight scholastic grading. It was pointed out by a number of technical educators, however, that in the first place it is very difficult, as most engineering schools are conducted, to determine a fixed percentage grading of students, because in many schools such a system of marking is not used. It was further pointed out that the constant reduction in the size of the upper classes in the technical schools would very soon lead to the inclusion within the upper third of any one class of a number of decidedly low-grade engineering students who are specifically

Miami Conservancy Contracts Awarded

At a meeting of the board of directors of the Miami Conservancy District, Dayton, Ohio, Dec. 3, it was decided to award to the McWilliams Northern Dredging Co., contract 41, Dayton Local Protection above Island Park, in accordance with the bid of the company of Nov. 15. The company's proposal on this contract was as follows:

Clearing and grubbing, 120 acres at $175.
Dike excavation, 3,000 cu. yd., at $0.40
Embankment in levees 58,300 yd., at $0.50.
Cleaning at pump sta. $500

All other bids received on Nov. 15 were rejected, and the district will handle the rest of the work with its own forces.

intended to be excluded from exemption by the provisions of the order.

It was to meet this contention that the final part of the Chief of Engineers' ruling was added. Under this ruling each faculty will go back through its record of the past ten years and will endeavor to establish, on the basis of scholastic markings and future professional performance, the grading above which would be classed one-third of the graduates of the school. Having fixed that grading in any way satisfactory to themselves, they will go over the draft-age students in the school and recommend as draft exempts all students who apparently are above that fixed grade. It will be seen that this may include very much more than one-third of the present students, particularly if a number of the students who have already left the college are of the lower grade as far as marks and scholastic performance are concerned.

It is possible, of course, that such a system of determination may include in the draft exempts a smaller numerical proportion than one-third, but in the opinion of the educational advisors to the Chief of Engineers such will not be the fact.

The Chief of Engineers has included in his list of schools every engineering school in the United States giving a degree at the end of at least a four years' course, but he has within his power the exclusion of any school whose exempt students do not appear in future to measure up to a proper standard. It is understood that he will keep a careful watch upon the exemption methods pursued by these various faculties and will either by warning or by exclusion from the list of accredited schools be able to keep control of the management of the exemptions.

General Contractors' Association Holds Annual Dinner

Motion pictures showing the construction of narrow-gage and standard-gage tracks and also of highways behind the French front were shown at the annual dinner of the General Contractors' Association, at the Biltmore Hotel, New York City, on the evening of Dec. 8. Always a purely social function, the dinner and entertainment were interrupted only to propose toasts to the President of the United States and to the members of the organization now in the Army. A considerable sprinkling of uniforms bearing the insignia of the Engineer Corps and the Quartermaster Corps increased the military atmosphere of the gathering. Virtually every member of the association is engaged on emergency construction for the War and Navy Departments.

Oregon Irrigation Congress

The seventh annual convention of the Oregon Irrigation Congress will be be held in Portland, Ore., Jan. 2-5, with Jan. 4 set apart for a joint session at Corvallis, Ore., with the State Drainage Association.

State Highway Officials Take Vigorous Action at Richmond Convention

Men from Forty States Discuss Highway Problems and Federal-Aid Law, and Hear Roy D. Chapin

Forty states were represented through their engineers and highway commissioners at the Richmond, Va., convention of the American Association of State Highway Officials on Tuesday, Wednesday and Thursday of last week. They discussed the place of the highways in war transportation, the construction and maintenance of roads in war times, the interpretation and administration of the Federal-Aid road law, and listened to an encouraging and constructive address by Roy D. Chapin, chairman of the Highways Transport Committee. Despite the rather gloomy outlook for road work, the meeting was decidedly optimistic, the reason being that the officials present were filled with faith in the large function which the highway can play in war transportation. At the close of the session vigorous resolutions were adopted, covering the vital issues raised at the meeting. These will be found at the close of this account.

Principal Actions

The four most important features of the convention can be summarized as follows:

1. The Executive Committee and three additional members of the association were directed to place before the attorney general of the United States and the Secretary of Agriculture the need for a more liberal interpretation of the Federal-Aid road law, to the end that the states in the arid regions may not be deprived of the benefits of the law. In those states the only routes upon which the money can be used are such as are not likely for a considerable period to be used for postal service. Under the present interpretation of the law, therefore, those states cannot take advantage of their Federal-Aid allotment, thus nullifying the law in so far as these states are concerned.

2. A report was adopted in accordance with which the Executive Committee will ask the highway department of each state to furnish it with all information necessary for the formulation of a highway war program. This material when collected will be presented to the Highways Transport Committee and the Priority Board, in order that the necessary authority and railroad cars for carrying out these war projects may be secured.

3. The convention discussed at length the function of roads as a military necessity, furnishing the state highway departments the basis for intelligently judging the relative importance of the roads under their jurisdiction.

4. A committee was authorized for the study of regulatory measures for the operation of motor vehicles on the highways.

At the opening session, the president, G. P. Coleman, state highway engineer of Virginia, called attention to some of the important activities of the year. The executive committee successfully presented to the Secretary of Agriculture the desirability of using convicts on Federal-Aid road work. Later, at the request of the War Department, the association was instrumental in securing from highway engineers and contractors a list of road machinery, tools, teams and their location, accompanied by maps of the states, showing location of quarries, gravel pits and other road materials, together with a statement of the output at each operation. This information has proved of great value to the Government, as is shown by the fact that many public pits and quarries have been taken over by the War Department.

In May the association urged that the War Department permit the use of war prisoners on highway construction and other public works. In the following month the president was in Washington in connection with the Chamberlain-Dent marginal road bill. The measure was not passed but is to come up at this session. In addition, there were numerous conferences with the car service committee of the Council of National Defense and with the Priority Board, in relation to car shortage and its relief, particularly with reference to Priority Order No. 2.

Following the president's address, representatives from various sections of the country recounted briefly the conditions under which their work is being carried on. There was repeated emphasis upon the shortage and inefficiency of labor, which apparently are the most trying of the unfavorable conditions attending highway work.

In the afternoon Charles M. Upham, state highway engineer of Delaware, read a paper on car shortage, and Col. William D. Sohier, chairman of the Massachusetts Highway Commission, a paper on military roads, both of which are reprinted in this issue.

Mr. Chapin's Address

A feature of Monday's sessions was the address of Roy D. Chapin, chairman of the Highways Transport Committee. He sketched the progressive work of this committee in its studies of the use of the highways in general and their use by the Government, and brought good cheer in a direct message from Judge Lovett, of the Priority Board. The judge told Mr. Chapin just before the latter started for Richmond that he would be surprised if on Apr. 1 at the latest he would not be able to wipe out Priority Order No. 2. He had looked, he stated, for opportunity for an early raising of the embargo,

but the coal situation was still so critical that the order could not be abrogated at once. Judge Lovett stated emphatically that he did not consider road-building materials in the same class as musical instruments and theaters, thus intimating that the road materials embargo would be raised sooner than that on materials for pleasure uses.

Mr. Chapin urged the association to appoint a committee to coöperate with the Highways Transport Committee. He referred to the studies which the committee is making of methods of relieving railroad terminal congestion, already reported in *Engineering News-Record*, and closed with the statement that as a result of the present critical transportation situation, the importance of highways will be better understood after the war than ever before.

Federal Aid

The discussion on the Federal-Aid road act was opened by a paper by Logan Waller Page, director of the Office of Public Roads and Rural Engineering, on the first year's experience with the law. The paper will be published in this journal next week.

Following the presentation of the paper, representatives from the far West pointed out that under the present interpretation of the law the states in the arid regions do not take advantage of their allotment. As a result of the discussion, the committee (referred to previously) was authorized to present the case to the Secretary of Agriculture and the Attorney General.

In the discussion Mr. Page made clear one matter that seemed not to be well understood—that after the project agreement is signed, the states are given any reasonable time in which to complete the project. He impressed upon those present that the project agreement is the binding document, and that the preliminary statement is subject to alteration at any time before the project agreement is signed. He said, also, much to the satisfaction of the Western delegates, that the Secretary of Agriculture had been asked to approve the use of a scale of 400 ft. to the inch as well as the present standard of 100 ft. T. H. MacDonald, state highway engineer of Iowa, opened the discussion as to whether the Federal-Aid road law should now be amended. He felt that it should not be, and in that view all of those who spoke to the question agreed.

Thursday was devoted to a discussion of various road topics, including the design and construction of road surfaces, the maintenance of macadam, brick, cement, gravel and earth roads. Some of the papers will be printed in a later issue of this journal.

Business Meeting

At the business meeting it was reported that thirty-eight states directly or through representatives had paid dues last year, twenty states taking state membership.

The dues were raised from $5 to $10 a year for individuals, and from $25 to $50 a year for states.

The election of officers for the ensuing year resulted as follows:

President, W. D. Uhler, Pennsylvania; vice-president, A. R. Hirst, Wisconsin; secretary, Maj. Joseph Hyde Pratt, North Carolina (absent on military service); acting secretary, A. D. Williams, West Virginia; treasurer, Frank F. Rogers, Michigan. Executive committee: One year—Ira R. Browning, Utah, and Col. E. A. Stevens, New Jersey; two years—M. L. Cunningham, Oklahoma; three years—Paul D. Sargent, Maine, and W. S. Keller, Alabama; four years—Charles F. Stern, California; five years—G. F. Coleman, Virginia. The meeting voted to increase the executive committee from five to ten members. With the two hold-over members of the committee, T. H. MacDonald, of Iowa, and H. G. Shirley, Maryland, there is one vacancy, which the executive committee was directed to fill.

Report on Priority Order

Because of their importance there are reprinted here in full the principal resolutions and the report of the committee appointed to consider action with reference to Priority Order No. 2 and the carrying on of road work during the season of 1918. The report of the committee to consider action with reference to the priority order and next season's work was as follows:

"The committee recommends that the work proposed to be done on highways next year, wherever shipment of materials by rail is necessary, be confined as far as possible to the adequate maintenance and construction of important main lines connecting the main centers of population, manufacturing, sources of supply and points of actual military importance.

"That the executive committee request the highway department of each state to furnish to it as promptly as possible the following information:

"A map of the state, showing by colors the location of: First, the main improved roads requiring rail shipments of materials for maintenance; second, the location of the various sections of main roads proposed to be improved during the season of 1918 and for which rail shipments will be required, numbering the same in the order of their importance.

"The state departments shall also furnish a concise statement of the number of cars of material required during each month of the year for the maintenance of the main improved roads indicated on the map. They shall also furnish a statement showing the number of cars of material needed for each section scheduled for improvement and the periods during which they will be required.

"That the executive committee request the coöperation of the Highways Transport Committee of the Council of National Defense in bringing about the modification by the Priority Board of its Order No. 2 at the earliest possible date and the definite release of enough open-top cars to the highway departments of the various states for the maintenance and improvement of the main highways of such states."

Resolutions

The chief resolutions were as follows:

"We believe that while every effort of every industry and occupation must be first directed toward carrying this war to an early and successful end, nevertheless the prosecution of highway work is essential, both as a war measure and as an economic measure and that the adoption by the nation, by the states, or by other municipalities, of a policy of half-hearted prosecution of highway work would be an irreparable blunder. We recommend to the several states, care in the selection of improvements, so that there shall be first improved those roads of the greatest economic value in the present crisis. From developments so far, it seems inevitable that the present means of transportation will become utterly inadequate and must be supplemented by motor transportation over the main arteries, and every step must be taken to put these arteries in condition to take and to withstand this traffic.

"Especially do we commend to all highway officials an intensive program of maintenance. Roads which have been built must be saved, and we trust that the executive committee will use every effort to insure that the national authorities give especial consideration to the movement of all materials to be used in maintenance.

"We recommend that in the present emergency all convicts and other prisoners, the harmlessly insane, war prisoners and alien enemies be used in so far as possible in industry and in road construction, and urge legislation to this end.

"We recommend to all highway departments a campaign of education and publicity so that all the people may be fully informed of the necessity, particularly at this time, of continuing a sane program of road construction and intensified maintenance, and of the important place these matters have in the program of prosecuting the war.

"We reiterate our faith in the Federal-Aid road act, and believe that it has done more for the cause of road improvement than any other one influence has ever done. We do not believe that amendments to it should be urged or made until it has been fully tried out in its present form. We respectfully urge upon the Department of Agriculture a more liberal interpretation of its provisions and that the authority of the district engineers in regard to projects, plans and construction be extended, so that the purposes of the act may be accomplished with the minimum delay.

"We commend the appointment of the Highways Transport Committee by

the National Council of Defense and express our appreciation of the attendance and the address of its chairman, Mr. Roy D. Chapin; and we urge this committee to give immediate consideration to all problems coming up in the present emergency and urge them to give us every help possible in securing for road improvement and maintenance the consideration due these great necessities at this time.

"We call the attention of the executive committee to the fact that road improvement rests in a large measure upon the marketing of state and other municipal bonds, and we suggest that they take such action toward enlarging the salability of such bonds as they may find advisable and necessary.

"We recommend most earnestly uniform legislation regulating motor traffic over public highways in the United States to the end that these highways may be constructed and maintained without unnecessary expense to the public."

Civil Engineers Formally Welcomed to New Home

On Dec. 7 the national societies of mechanical, electrical and mining engineers joined in a formal welcome to the American Society of Civil Engineers, which has recently removed from its former home on Fifty-seventh Street, New York, to new quarters in the Engineering Societies' Building. Charles F. Rand, president of the United Engineering Society, presided.

Gano Dunn, speaking for the American Institute of Electrical Engineers, struck the keynote of the meeting when he said that the union of all the societies under one roof was the symbol of the movement toward unity in the profession which has become general in recent years. He expressed the belief, too, that all of the four national societies could henceforth do greater things because of the strength they would derive from their closer coöperation.

Dr. Ira N. Hollis spoke for the American Society of Mechanical Engineers, emphasizing the responsibility of the engineer for the industrial order of the Twentieth Century and pointing out that it is his task to help make the world safe for democracy, even as his instrumentalities now are adding to the horror of the great war.

Dr. Rossiter W. Raymond represented the American Institute of Mining Engineers, and in a most happy speech gathered unto the mining engineer the glories of all the other branches of the profession, his thesis being that the work of the mining engineer gave to each of the other branches its greatest opportunity for displaying its capacity. Seriously, he saw in the union the consummation of a great project and large opportunities for united action.

William L. Saunders, past president of the American Institute of Mining Engineers, speaking "at large," as the chairman put it, expressed the view that the occasion celebrated not merely a physical union but a spiritual uniting of forces for participation in civic affairs. He related that the district boards for passing upon draft exemptions originally were supposed to have one engineer each, but that when the lists were returned by the governors of the states 90% of the engineers' names had been eliminated. The reason was, he said, that we are not organized for civic service. Real accomplishment in national affairs, he maintained, cannot be expected until we organize on the same basis that our political system is organized—by states, counties, cities and wards.

George H. Pegram, president of the American Society of Civil Engineers, responded on behalf of the civil engineers. He averred that the society moved to the joint house because service to our fellow men, the interests of engineers and of the membership demanded it. The public, in his opinion, had not been informed on the work of the engineer, and not until it is so informed can engineers expect the recognition they deserve. In the closer cooperation of the four great societies he saw an opportunity for placing the engineer in the right position before the public.

Dr. George F. Swain responded to the addresses of welcome on behalf of the members of the American Society of Civil Engineers resident outside of New York. It was his opinion that the society should have been in the union house before, and that it was there now in order that it might pull together with the other societies. In his opinion engineering organizations had heretofore confined themselves to two of four important purposes that they should forward. They have tried to advance engineering knowledge and to erect high standards for professional work and conduct. There remains now the work of making the engineer felt as a member of the community, and of working out plans by which the societies shall do more for the individual member.

Denies Right To Organize Labor for Strike

While Admitting Legality of Unions Supreme Court Rules Coercive Intent Is Unlawful

The Supreme Court ruled on Sept. 10 that while workmen had the legal right to organize for lawful purposes, employers also have the right to operate their plants at any time as "open shops" and in any way to prevent conspiracies which look forward to bringing their nonunion employees into any labor organization. The opinions were rendered in the cases of the Hitchman Coal and Coke Co. and the Eagle Glass Manufacturing Co., of West Virginia, and upheld an injunction issued by Judge A. G. Dayton, which effected a restraint upon the union officials in their attempt to organize the employees of these two companies. Lower courts had held that the United Mine Workers of America and the American Flint Glass Workers' Union were illegal organizations and were, under the Sherman law, indulging in secret conspiracies to restrain trade. However, both of these lower-court rulings were ignored by the Supreme Court. Justices Brandeis, Holmes and Clarke dissented.

In the Hitchman case, the majority of the court held that the officials of the miners' union "deliberately and advisedly selected that method of enlarging the union membership that would inflict injuries upon the company and its loyal employees," and declared that the "conduct in so doing was unlawful and malicious." The court further ruled that it was a mistake to assume that if methods used by unions in their attempt to organize a body of workers were peaceable and stopped short of physical violence they were, therefore, legal. The opinion was in effect a statement that any organization was unlawful which looked forward to precipitating a strike for the purpose of compelling an employer to unionize his mine or shop as the lesser evil. It was held that the plaintiff "was acting within its lawful rights in employing its men upon the terms that they should not be members of the United Mine Workers," and further, that, while this agreement was terminable at the desire of either party, it gave no right to anyone to instigate a strike through an evasion of this agreement.

The contempt proceedings instituted last month by the Hitchman Coal and Coke Co. against Frank J. Hayes, president of the miners' union, and fifteen other officials and members, for alleged violations of the injunctions, are still pending, and, according to the company's counsel, will be pressed. The defendants have been allowed sixty days in which to present their case.

Washington Engineers Dine

The Washington Society of Engineers forestalled possible criticism of its annual dinner this year of economy by having the Food Administrator of the United States at one head table and the Fuel Administrator at another. With the Vice President of the United States present to give official approval to the function and Mr. Hoover and Mr. Garfield to guarantee a proper economy of food, fuel and light, no one present could feel that he was over-indulging, by attendance. Over three hundred of the engineers permanently or temporarily resident at the capital listened with enjoyment to Messrs. Marshall, Hoover and Garfield and to Colonel Martin, of the French Army, a member of his country's military commission here. A. L. Hakkyon, president of the society, was toastmaster, and John C. Hoyt was chairman of the committee which arranged the dinner.

Gen. Goethals on Mechanical Engineers at Panama

Acknowledges Election to Honorary Membership in American Socie.y of Mechanical Engineers

Honorary membership in the American Society of Mechanical Engineers was conferred on Maj. Gen. George W. Goethals at a formal meeting held Tuesday evening, Dec. 4. In responding, General Goethals graphically pictured as follows the importance of the mechanical engineer's part in completing the Panama Canal:

It is generally believed that I built the Panama Canal. That is a mistake. The man who dug it claims to have built it; his successor in office claims to have built it; and I claim to have been one of 50,000 men who built it. I learned exactly where I came in, in a trip that I took across the canal in a Panama R.R. train, when the foreman, describing the canal to a visitor, led the visitor to understand that he was doing pretty much all of it. The visitor finally turned to him and said: 'What is the "Old Man," as you call him, doing?' The foreman replied: 'Oh, he comes around and sees us doing it, jollies us a bit, and then goes back and sits in the office and entertains visitors.'

"Those of you who visited the canal during the construction period must have appreciated the part performed by the mechanical engineers in the constructive machinery that we had for the work, and must have appreciated the mechanical work done in the states in order that we might carry it forward. Those of you who have visited the canal since its completion and have seen the satisfactory working of the machinery of the locks, the dredging equipment used in the removal of the slides, and the various other appliances, must have appreciated the work of the mechanical engineers in the designing and construction of that machinery, and realizing the assistance that they gave in the work, during its constructive period, and appreciating this assistance in its operating period, you may perhaps form some idea of the appreciation I have for the honor that this society has conferred upon me, by electing me an honorary member."

ENGINEERING SOCIETIES

At the annual meeting this evening of the Engineers' Club of Trenton, N. J., Alfred D. Flinn, deputy chief engineer, Board of Water-Supply, New York City, will give an illustrated talk on "New York's Catskill Mountain Water-Supply."

The Engineers' Club of St. Louis' nominating committee has placed the following names on the official ticket: C. S. Ruffner, president; B. L. Brown, G. R. Wadleigh and W. E. Rolfe, vice presidents; P. H. Ichlingman, treasurer; C. L. Howkins, C. W. Martin and J. P. Morrison, directors.

The Colorado Association of Members of the American Society of Civil Engineers, at its meeting Dec. 8, listened to an address by J. M. Gaylord, of the United States Reclamation Service, on "Experiences of the United States Reclamation Service with Large Reservoir Outlets." The address dealt with the operation, both successful and otherwise, of various types of reservoir outlets. A general discussion followed the delivery of the address.

The St. Louis Association of Members of the American Society of Civil Engineers at the meeting on Nov. 26 elected the following officers for 1918: J. A. Ockerson, president; E. E. Wall and W. S. Mitchell, vice presidents; C. M. Daily, secretary-treasurer. Capt. A. A. Poland, Quartermaster Corps, U. S. Reserves, told about the efforts being made by the Government to revive river navigation. H. J. Pfeifer, chief engineer, St. Louis Terminal Railroad Association, spoke on the coöperation of the railways with the Government.

The Albany Society of Civil Engineers will hold its annual meeting at Keeler's Hotel, Dec. 18. Prof. Thomas R. Lawson, of the Rensselaer Polytechnic Institute, will deliver a lecture, illustrated by lantern slides, on "Some Steel Structures." The topic will include steel bridges, and especially the recently constructed Congress St. bridge across the Hudson River at Troy. Officers of the society for the ensuing year will be elected at this meeting.

At the December meeting of the **Providence Engineering Society,** to be held Dec. 18, Thomas C. Atwood, U. S. Navy supervising engineer of the U. S. Emergency Destroyer plant, will give an illustrated lecture on "Emergency Ship Construction." At the Dec. 20 meeting of the municipal engineering section of the society, George A. Carpenter, city engineer, Pawtucket, R. I., will deliver a lecture on the "Rate of Precipitation and Notes on Catch-Basin Maintenance." The December meeting of the efficiency section, Dec. 14, will hear a talk on "Time Study and Its Effect Upon the Workman." The speaker will be C. O. Larson, of the Forbes Lithograph Manufacturing Co., Chelsea, Mass. On Jan. 2 "Hard Pine and the Causes of Dry Rot" will be discussed at the meeting of the structural section of the society.

The Engineers' Club of Seattle, Wash., on Nov. 29 gave a special Thanksgiving luncheon and program, at which Dr. Carter Helm Jones, of Seattle, delivered an address on "The Patriotic Engineer."

The Northwest Society of Highway Engineers will hold a special meeting in Salem, Ore., Dec. 15. The program will be opened by an address by Governor Withycombe, and his talk will be followed by a number of technical papers on engineering subjects.

The junior members of the **Engineers' Club of Philadelphia** have organized a section of their own under the supervision of one of the senior members, Dr. W. M. Boehm. A meeting was held on Dec. 11, at which L. M. Goldsmith presented a paper on "The Measurement of the Flow of Liquids and Gases in Pipes." H. I. Goldstein is chairman of the junior section.

The Illinois Society of Engineers will hold its annual convention, Jan. 24-25, at Quincy. E. E. R. Tratman, Wheaton, Ill., is secretary of the society.

The American Association of Engineers has organized a local chapter in New York City, with headquarters at 220 West 42nd St. Temporarily, meetings are held at the Hotel McAlpin, Broadway and 33rd St. These meetings have been devoted mainly to the work of organization, but the chapter announces that it will shortly be in a position to engage in constructive work along the lines followed by the national association. The next meeting will be held Dec. 17. There will be a short talk on "Sub-Aqueous Piledriving," followed by discussion.

The Association of Iron and Steel Electrical Engineers will hold its regular monthly meeting at the Hotel Chatham (old Hotel Lincoln), Pittsburgh, on Dec. 15. A paper on "Flywheels on Steel Mill Motors" will be read by G. E. Stoltz, of the Westinghouse Electric and Manufacturing Co. The Philadelphia section of the association will hold its meeting on Jan. 5, at which Messrs. J. C. Reed and Merwyn J. Hocker, electrical engineers of the Bethlehem Steel Co., Steelton, Penn., will present a paper, illustrated with lantern slides, on "Electrically

Calendar

Annual Meetings

AMERICAN SOCIETY OF CIVIL ENGINEERS, 29 West 39th St., New York; Jan. 16 and 17, 1918, New York; Charles Warren Hunt, secretary.

AMERICAN INSTITUTE OF CONSULTING ENGINEERS, 35 Nassau St., New York; Jan. 14, New York; F. A. Molitor, secretary.

NEW ENGLAND WATER-WORKS ASSOCIATION; 715 Tremont Temple, Boston; Jan. 9, Boston; Willard Kent, secretary.

AMERICAN WOOD PRESERVERS' ASSOCIATION; Baltimore, Md.; Jan. 22-24, Chicago; F. I. Angier, Baltimore & Ohio R.R., Mount Royal Station, Baltimore, Md., secretary.

CANADIAN SOCIETY OF CIVIL ENGINEERS; Montreal; Jan. 8, Montreal; Fraser S. Keith, 176 Mansfield St., Montreal, Can., secretary.

AMERICAN SOCIETY OF AGRICULTURAL ENGINEERS; Dec. 27-29, Chicago; C. K. Shedd, Ames, Ia., secretary.

AMERICAN CONCRETE INSTITUTE; 27 School St., Boston; Feb. 7-9, Chicago; H. B. Alvord, secretary.

Operated Bridges." The January meeting of the Pittsburgh section will be a joint meeting with the American Institute of Electrical Engineers. Papers will be presented on "Generation, Distribution and Consumption of Power, as Well as Power Factor Correction."

The Louisiana Engineering Society held its regular meeting in New Orleans on Dec. 10. There was an informal talk by First Lieut. Joseph F. Ward, O. R. C., on "His Experience in Training Camp."

PERSONAL NOTES

COL. THOMAS H. REES has been made department engineer for the Territory of Hawaii by the U. S. Engineering Department, according to an announcement recently made in San Francisco. Colonel Rees has served in the Philippines and was for a time ranking officer on rivers and harbor work in the California District.

W. J. HAZELTINE, city engineer of Mansfield, Ohio, resigned Oct. 31 and has accepted a position with the Austin Co., New York.

W. D. LIVESAY, formerly chief engineer on the design of an industrial plant for the Pyrites Company, Ltd., Wilmington, Del., is now assistant bridge engineer with the Seaboard Air Lines Railway Co., with office at Norfolk, Virginia.

GEORGE R. HALPIN, for two years superintendent of the water board of Watervliet, N. Y., has resigned to take a position at the Government arsenal at Watervliet.

HOWARD J. TEAS, formerly junior highway engineer on the East St. Louis Division of the Illinois Highway Department, has been transferred from the 23rd Engineers (Highway Regiment) to the 27th Engineers (Mining Regiment).

W. A. SWALLOW, formerly chief engineer of the Georgia & Florida Ry., at Augusta, Ga., is now captain in the Quartermaster Reserve Corps and has been transferred from Greenville, S. C., to Norfolk, Va., as assistant constructing quartermaster on Pig Point Ordnance Depot.

C. R. BRECK, JR., district engineer at Matanuska, recently left Alaska for his home at Berkeley, Calif. He entered the employ of the Alaska Engineering Commission in 1914. It is his intention to offer his services to the Government for duty with one of the railroad regiments at the front, after a short rest at his home.

EDWARD C. THOMES has resigned his position as city engineer of the City of Poplar Bluff, Mo., and is now a drainage engineer, in the Office of Drainage Investigations, Department of Agriculture, Washington, D. C.

New Chief Engineer of the Erie



GALEN B. OWEN

J. B. CLINGMAN, formerly road engineer of Madison County, North Carolina, has been appointed supervisor of road maintenance for the western district of North Carolina, with headquarters at Asheville.

T. L. WOLFE, sanitary engineer of the J. B. McCrary Co., Atlanta, Ga., has been appointed captain in the Engineer Officers' Reserve Corps.

CALVIN W. HENDRICK, formerly chief engineer of the City of Baltimore and chief engineer of the Sewerage Commission of Baltimore, has been elected president of the West Virginia Coal and Timber Co., organized to develop a tract of 32,000 acres of coal and timber lands in West Virginia. Mr. Hendrick has also been elected president of the American Train Control Co. His headquarters will be in Baltimore.

HOWARD T. VARE, formerly with James Stewart & Co., New York, and V. E. Ware, El Paso, Tex., is now a sergeant in Bakery Co. No. 4, Fort Sam Houston, San Antonio, Texas.

R. C. KELLOGG, formerly with E. W. Bemis, consulting engineer, is now special assistant gas engineer for the Illinois Public Utilities Commission and consulting gas engineer for the Director Iron Co., Chicago.

J. J. JESSUP, for 17 years connected with the engineering department of the City of Berkeley, Calif., has resigned the position of city engineer and superintendent of streets to engage in private practice. In 1900 Mr. Jessup left the position of instructor of engineering at the University of California to become assistant city engineer and nine years later was made city engineer. He has been succeeded by CLYDE C. KENNEDY, his former assistant.

WARREN W. INGLIS has resigned as engineer for the Benson Mines Co., Benson Mines, N. Y., and the Northern Ore Co., Edwards, N. Y., to accept a position in the building division, engineering department of the American Brass Co., Waterbury, New York.

S. LELAND TOLMAN, sanitary engineer, has left the employ of the Casper-Ranger Construction Co., of Holyoke, Mass., and is now superintendent of a new sewage-disposal plant and garbage incinerator, Mason City, Iowa.

R. L. LONGSHORE, formerly deputy county engineer of Adams County, Indiana, is now assistant engineer, maintenance-of-way, Detroit Division of the Wabash Ry., at Montpelier, Ohio.

C. G. YOUNG has entered the organization of Ford, Bacon & Davis, New York. Mr. Young will be particularly engaged on reports and appraisals of public-utility and industrial properties.

W. R. HARRIS, formerly managing director of the Canadian Lock Joint Pipe Co., Ltd., and president of the Harris Engineering Co., Ltd., Regina, Canada, is now engineer of the Cement Products Bureau, Portland Cement Association, Chicago.

D. R. THORNTON, who was with the New York State Highway Department at Watertown, N. Y., for nine years, is now engaged in dock work for the City of Beaumont, Texas.

W. J. MAUER, until recently engineer in charge of the Chicago Commission on Ventilation, is now connected with the American Radiator Company.

FRANK S. PECK has resigned as county engineer of Lawrence, S. D., and is now highway engineer for the State of South Dakota.

DR. THOMAS G. DARLINGTON, former Health Commissioner of New York City, has been retained by the American International Shipbuilding Corporation to have direction of the sanitation at Hog Island, near Philadelphia.

P. S. GARDINER, vice president of the Southern Pine Association and secretary of the Eastman-Gardiner Lumber Co., Laurel, Miss., has been called to go to France on special service connected with the war work of the Young Men's Christian Association.

HENRY W. HODGE, former Public Service Commissioner of the First District of the State of New York, now serving with General Pershing, has been promoted to the rank of lieutenant colonel.

HERBERT H. SUTTON has been appointed chief engineer for the State Fire Insurance Commission of Texas. For the past three years Mr. Sutton has

been electrical engineer for the commission, and his place as such has been filled by A. M. VAUGHN, of San Antonio, who has been connected with the commission several years.

BENJAMIN BROOKS, recently engineer for the International Clay Products Bureau, is now Major Brooks, of the National Army.

H. V. DICKINSON, formerly assistant to the chief engineer of the Palisades Interstate Park, is now a sergeant in the 23rd Engineers, at Camp Meade, Maryland.

FRANK HELM, who was division engineer of the Santa Fé Railway Co., at Slaton, Tex., has been promoted to office engineer at Topeka on the Eastern Lines.

R. J. TORRALBAS, formerly employed in the city engineer's office, Havana, Cuba, is now assistant general manager of the Santa Lucia Sugar Co., Oriente, Cuba.

HERBERT J. GILKEY, formerly with the Pennsylvania R.R. on track-elevation work at Chicago, is now a first lieutenant in the Engineer Officers' Reserve Corps, and has been assigned to military mapping work along the border, under the Director of the United States Geological Survey.

R. HAYES, until recently resident engineer of the Southern Railway System, at Hayne, S. C., is now structural engineer, with headquarters in Washington, D. C., succeeding P. B. LUM, who resigned and is now with the Auto Car Sales and Service Co., Washington, District of Columbia.

OBITUARY

WILLIAM KELLY, 67 years old, of Brooklyn, N. Y., a contractor who did much of the paving of Brooklyn and Manhattan streets with granite blocks and asphalt, died in Brooklyn, Nov. 28.

TRADE PUBLICATIONS

The Blaw-Knox Co., Pittsburgh, is sending out a folder on its locking cableway carriages.

The W. B. Louer Co., 415 South Dearborn St., Chicago, Ill., has issued a new edition of its Red Book, containing list of machinery and supplies for contractors, bridge builders, railroads, etc.

The Link-Belt silent chain, as applied to a clay-working plant, is described in a new bulletin issued by the Link-Belt Co., Chicago, Ill., entitled "The Ideal Drive for Clay-Working Machinery."

Walter A. Zelnicker Supply Co., St. Louis, is sending out Bulletin No. 227, intended for buyers of rails, cars, locomotives, cranes, motor compressors, boilers, hoists, etc.

Automatic pumps and receivers are described in Bulletin D-1301, issued by the Worthington Pump and Machinery Corporation, 115 Broadway, New York.

The E. I. du Pont de Nemours Co., Wilmington, Del., has issued another edition of the Du Pont Products Book, which, in addition to the various explosives made by this company, describes Fabrikoid, a leather substitute, Py-ra-lin, chemicals and paints made by its subsidiaries.

The Westinghouse Electric and Manufacturing Co., East Pittsburgh, Penn., has issued Catalog No. 30 describing industrial motors.

BUSINESS NEWS

Dr. Edward Ewing Pratt, until recently chief of the Bureau of Foreign and Domestic Commerce, Washington, D. C., has been elected to the office of vice president of the Pacific Commercial Co., 11 Broadway, New York.

The C. D. Pruden Co., manufacturer of "Prudential" portable galvanized steel buildings, underwriters' hollow metal windows and other equipment, Baltimore, Md., on Dec. 1 opened a general sales office at 56-58 Pine St., New York. The office is in charge of Leigh Pruden, vice president of the company.

The Terwilliger Equipment Co., until recently at 314 Bulletin Building, Philadelphia, has been incorporated and has removed to 2013 Market St., where it has increased office facilities and also a warehouse for the display of motor trucks, concrete mixers, trailers, tractors, etc. The personnel of the company is as follows: President, E. M. Terwilliger, formerly Philadelphia manager for the Austin-Western Road Machinery Co.; vice president, H. E. Green, formerly district manager for the Browning Crane Co.; secretary, John A. Conboy, for several years in charge of the concrete mixer department of the Standard Supply and Equipment Co.; treasurer, W. George Brooks, until recently sales manager of the Packard Motor Co., Philadelphia.

L. B. Moses, who has been associated with the rail trade since 1903, when he left the position of assistant to the president of the Kansas City Southern Ry., is now connected with Walter A. Zelnicker Supply Co., St. Louis. Since 1911 Mr. Moses has been sales manager of the Kettle River Co., of Minneapolis. He has joined the Zelnicker organization as second vice president in charge of the rail department, with headquarters in St. Louis.

John D. Westbrook, Inc., Norfolk, Va., has been added to the selling force of the Pulsometer Steam Pump Co., Irvington, New Jersey.

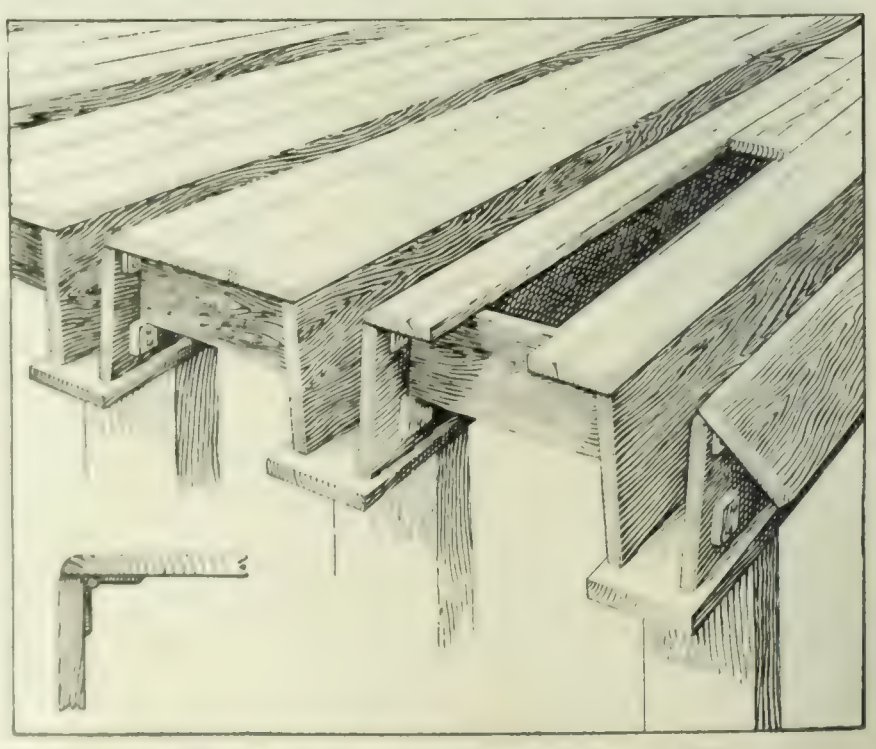
George A. Caldwell, Boston, Mass., and Walter N. Fairfield, Hartford, Conn., formerly connected with the H. Mueller Manufacturing Co., have formed the firm of Caldwell & Fairfield, manufacturers' agents, selling water-works goods in the New England States. They will represent the United Brass Manufacturing Co., of Cleveland, Ohio, manufacturer of brass goods for water, steam and gas, and will also sell Buffalo service and valve boxes, manufactured by Bingham & Taylor, Buffalo, New York.

The Austin Co., Cleveland, Ohio, announces that E. M. Haas has become connected with the company and will represent it in the railroad field. Mr. Haas was recently sales manager of the International Steel Tie Co. and until a year ago was Western editor of the *Electric Railway Journal.*

APPLIANCES AND MATERIALS

Collapsible Wood-Joist Forms for Concrete Beams

The Collapsible Joist Form Co., of Kansas City, Mo., has put on the market a wood form for concrete beams and girders which is hinged so as to be readily collapsible and used over again. It comprises beam sides, hinged to a short width of slab bottom form and provided with cleats on which span short joist which hold the middle section of the slab-bottom form. The detail and operation of the form may be noted from the accompanying view.



COLLAPSIBLE WOOD FORMS CAN BE USED MANY TIMES

A Consolidation of Engineering News and Engineering Record. Published by McGraw-Hill Publishing Company, Inc.

ENGINEERING NEWS-RECORD

A WEEKLY JOURNAL
DEVOTED TO CIVIL ENGINEERING
AND CONTRACTING

Volume 79 NEW YORK, THURSDAY, DECEMBER 20, 1917 Number 25

Short Stretches vs. Through Routes

A RECENT announcement by the Quartermaster General runs to the effect that the decision to send the 30,000 war trucks from Detroit to the Atlantic seaboard under their own power will release some 15,000 freight cars in addition to moving 90,000 tons of war material. There is no doubt but that even the best route available will result in a staggering cost per ton-mile, but since we provided ourselves with a transportation system adequate only to the slack years, we must pay heavily in times of stress. The weight of this may be lightened somewhat by intelligent use of road funds, particularly by a concentration of effort on those short stretches between industrial centers which, by making the trucks commercially possible, can relieve the railroads of the burden of uneconomical and time-wasting short haul.

Chicago Flat-Slab Ruling Result of Experience

WHEN applied to the concrete flat slab, the easily used phrase "standard method of design" signifies little. The taste and fancy of the designer or the building code maker has a wide range of choice whether he attempt his own theory or accept theories already formulated by other authorities. The latest revision of the well-known Chicago ruling, printed on p. 1153, is therefore only one more of the many methods of figuring the girderless floor. It has, however, more standing than most of the other methods because it is the result of four years of actual experience in designing, testing and using flat-slab buildings in a district where there are probably more of this type of structure proportionate to all building than anywhere else in the country. The revised ruling is not radically different from the old, except in certain additions or extensions of field, which would indicate a superiority due to stability in the method. It has not been seriously affected by the differing coefficients adopted by society committees since the original formulation of the Chicago ruling.

Commercial Foresight

QUITE properly our thoughts now are almost wholly occupied with war—with the way in which we can contribute toward its winning. All absorbing as the conflict is, however, some thought must be given—secondarily, of course—to the conditions that will obtain after the armies have disbanded. While we were still spectators of the war there was much discussion of these post-bellum conditions by every class of men. The problem is still important. It has merely become overshadowed with a more tremendous issue. That the commercial interests of the country intend to be prepared for the new order, so far as foreign trade is concerned, is apparent from the advertising pages of this journal. In a recent issue were no less than four great export organizations presenting the advantages of their service in handling oversea trade. Two years ago the manufacturers in fields allied to civil engineering and contracting gave relatively little thought to the export business. Now they see that with tremendously increased productive capacity, a large merchant marine and the great resources of the United States the stage will be set for our participation in the great drama of international trade development. This commercial expansion is important for the engineer and the contractor, because American machinery cannot go to foreign countries without American genius to operate it. There are three factors—the engineer, the builder of machinery, the contractor—and no one of them can be omitted if the work is to be rewarded with a full measure of success.

Army Engineer School a Necessity

AN ENLARGED army enginering school, such as recommended by Secretary Baker in his annual report, would seem to be one of the necessary improvements forced on us by the war. West Point has not been an engineering school for many years—not since the ideals of technical education passed beyond the fundamentals of science. With the admirable basis of general knowledge and mind training gained at the Military Academy, the star graduates became engineers only after an intensive course in an inadequately financed Engineering School at Washington, and subsequent instruction in practical engineering under a higher officer on station. This served in our peaceful days and under our small army, now gone. For many years to come military engineering will probably be a science demanding the thorough and lengthy application of its students and the best of facilities for its instruction. It is to be hoped that in the crushing demand for immediate military force, Congress will not so far forget the early future as to pass over the Secretary's recommendation.

Records of Engineering Thought

WHAT we must absorb and take with us from each great engineering work is perception of the builder's creative thought. Without that creative element the work could not have been great; it would be only routine development of the existing art, refined perhaps by ingenious analysis or design, but yet the mere routine of skill—good craftsmanship, nothing more. And every great work of enginering is something more than this: it is the expression and outgrowth of creative imagination.

But the masters of engineering have been remiss, strangely remiss, in recording for the benefit of their fellows and posterity how they wrought their great works. Structural engineers in particular have failed to leave such records. The art is written in its structures, about as the building art of Egypt is written in the pyramids and obelisks it erected. This is unfortunate, for the sake of future development as well as for the sake of history.

Bridge-builders lack vision, one engineer has said. But that cannot always have been true, in view of the brilliantly original creation manifest in many a historic structure. Nor, do we believe, is it altogether true today. In the last few years alone we can find many a work of boldest precedent-disdaining originality, in the field of bridges. We see represented therein not merely courage, or free fancy, or the mathematician's insight, but a composite which blends all three of these together with solid structural appreciation of strength; and it is this mental composite, clearly, that was the creative faculty.

Just in so far as such facts can be read out of the finished structure—after patient study and comparison with what went before—to that degree can we draw inspiration from the engineer's completed work. We need more, to make the gain reasonably sure. We need a record of the thought processes by which the engineer arrived at his result, if it is possible to get such a record.

An attempt is made, on page 1140, to give an account of how the immense Metropolis Bridge span was planned—one of the five or six boldest structures of the past half dozen years. The account is hardly more than a series of random notes, lacking the story of the chief engineer, who lost his life on the work. But it may help some engineers, and especially some of the younger men, to a better appreciation of the structure.

Two facts about bridge-building come into mind in this connection. One is that few of our notable bridges three or four decades old are well known to the engineers of today; and what is known about them hardly exceeds the limits of descriptive data. How much the builder of a particular bridge advanced the art of his day has long been forgotten. Through lack of a record we have lost much of the possible benefit of his engineering thought. The other fact is that for twenty years or so the art of bridge design has remained nearly stationary, in its larger features at least. With individual exceptions, progress has been in detail, not in broad conception. To say that these two facts are closely related may be unwarranted; but who will assert that they do not have contact somewhere?

The preceding lines, and the Metropolis account, constitute a plea for better recording, in future, of the originating thought embodied in engineering works. Bridges are only one field—and a typical one—to which the plea addresses itself.

Engineering Society Service and Organization

THERE were two particularly significant notes struck in the addresses attendant upon welcoming the American Society of Civil Engineers to the Engineering Societies' Building—Mr. Saunders' plea for an organization of the profession along the lines of our political system, by states, counties, cities and wards, and Professor Swain's advocacy of more service by the societies to the individual members.

Neither suggestion is new. Mr. Saunders has heretofore advocated the organization of an engineering civic federation, and desisted from its advocacy only because there was proposed shortly thereafter the Engineering Council. In a measure some of the elements of Mr. Saunders' plan have long been recognized—in the encouragement given and the place accorded the local engineering societies by progressive students of the engineering society problem. The impossibility of bringing the influence of a national society to bear on a local problem is self-evident. The local organization, however, not being tied down by the necessity of considering points of view dependent upon difference in locality, has a freer hand.

There is question, too, whether the national societies, organized primarily for technical and scientific work, can even on national questions work effectively in so different a field. The question does not deny the need for participation in civic affairs, but asks merely as to the agency through which that participation shall be exercised. There are signs that those in high places in the national societies appreciate keenly this difficulty, for it has been proposed that the Engineering Council, in which the civic activities shall center, will eventually represent not merely the four national engineering societies, but other engineering organizations as well.

Professor Swain's proposal that the societies should do more for the individual members likewise is not new. He has emphasized it repeatedly. The reiteration of it at such an auspicious meeting, however, was significant and well advised. Moreover, the comments on his proposal following the meeting indicated clearly that he had struck a sympathetic note.

It will be remembered that the American Association of Engineers, founded at Chicago some years ago, is based upon that idea—that the first duty of an engineering society is to serve its individual members. That idea was scoffed at. The association was condemned as a movement for the unionization of the profession. Yet the body has grown in strength and has won the support of influential men. Now we find the idea broached at one of the most auspicious meetings the profession has ever known and making such an impression that it is reflected in the corridor talk.

Mr. Saunders and Prof. Swain have in an emphatic way called upon all engineers to give thoughtful consideration to these two important proposals. While there will be much discussion of Mr. Saunders' plan—possi-

bly disagreement—there can be no doubt whatsoever that in Prof. Swain's suggestion will be found an avenue for making the engineering societies of the country a still more vital part of the profession than they have been in the past.

How Shall the War Highways Be Determined?

LAST week the Office of Public Roads endorsed, in effect, the plans for making a highway war program worked out by the American Association of State Highway Officials at Richmond, Va. The office asked state highway departments to express their views on the following program:

1. Selective consideration of next year's work with a listing of each job in the order of its economic importance to the territory in which it is located and to the nation as a whole.

2. Coördination of highways with railway and water transportation facilities with a view to insuring a sufficient number of cars and vessels for the transportation of road materials.

3. Coördination with the materials industries to insure supplies of materials adequate in amount, distribution and deliveries, so that the program determined on may be carried out.

There is no difference between this plan and that adopted at Richmond. However, the state highway officials asked that actual data coming under these heads be cleared through their executive committee while the Office of Public Roads for the present merely invites a discussion of topics.

It is apparent, therefore, that there is unity of plan as between the Office of Public Roads and the American Association of State Highway Officials. Moreover, since the director of the office is a member of the Highways Transport Committee, it is certain that the latter body, also, is in agreement with the proposed procedure. Thus the three highway agencies determinative in the present crisis are working together.

There being agreement as to procedure, the need now is for a plan by which the state highway departments may determine which roads can relieve railroad congestion or otherwise help the nation in this crisis.

Evidently, the plan must be such that information can be secured quickly. Between now and the date for opening construction—let us say Apr. 1—a tremendous amount of work must be done. The war roads must be determined; authority for cars secured, if necessary, and contracts let. In many cases, financial arrangements—the sale of bonds, or the allotment of funds—must be made. Of course, each highway department now has certain information regarding the importance and traffic of some routes. But conditions have changed materially in a few months. Moreover, routes now little used because of this condition may be the very ones that could be made most useful. In any event, exact data will win when and if it becomes necessary to put these plans before the authorities at Washington; and to that end the strongest possible presentation should be prepared.

Evidently, if the information is to be secured at maximum speed, it is necessary to call upon those who are constantly dealing with transportation matters and who, therefore, are informed regarding the relative congestion and importance of various routes. Manifestly, these are the traffic managers of the various industries and the railroads themselves. Before the war it would have been futile to ask the railroads to supply such information. Now, they eagerly welcome any agency which can help them out of their difficulties.

To secure the help of the traffic managers of the industries, the chambers of commerce, boards of trade, and manufacturers' associations throughout the country can be of tremendous assistance. They are organized for work among the manufacturers of their respective communities and can at once secure immediate attention and action. They have the organization machinery for just such work. Moreover, they are seeking opportunities to serve the nation. The call of the state highway department would meet with a ready response. A meeting of traffic experts in each sizable community, working through a committee selected by themselves, could in a very short time report back to the state highway departments the routes whose maintenance or improvements can in that particular district be of greatest service in relieving transportation difficulties. We know of no other agency which can mobilize for action so quickly.

More effective action from these bodies, of course, will be secured if the state highway departments themselves present clearly, as a basis for the activities of the traffic experts, some fundamental ideas regarding highway and motor-truck traffic. Fortunately these were well brought out at the Richmond convention and are pretty distinct in the minds of the heads of each state highway department. Obviously, the highway is of best service for relatively short hauls—60 to 80 miles. It is most economical when the trucks are loaded in both directions. Here again the interest of chambers of commerce and manufacturers' associations will be of very great value, because they are in a position to establish such committees or bureaus as will insure loaded traffic both ways. What that traffic will be will depend, of course, on local conditions. In one case finished products will be carried out, and raw materials in. In other cases, industrial traffic in one direction will be supplemented by foodstuffs in another.

In any event, the initiative and brains that will be brought together by the commercial associations in mobilizing the traffic information in their respective centers will not only produce the information needed to map out a highway war program for the district, but will result as well in ideas for conducting highway transport with the greatest economy.

We, therefore, commend to the consideration of the various state highway departments the plan of calling upon the dominant commercial bodies in the cities of their respective states for assistance in gathering the data for the highway war plan. That they will receive a prompt and effective response is certain.

As regards the very important matter of maintenance it may be noted that the state highway departments may obtain assistance from the state councils of defense, which have been asked to look after the maintenance of routes to the seaboard and to keep the Lincoln highway open.

Designing the 720-Foot Metropolis Span

Simple-Span Type and Special Steel in View from Start—Maximum Use of Eyebars—Silicon Steel—Detailing To Save Weight



THE 720-FOOT SPAN OF THE METROPOLIS BRIDGE LOOKS LIGHT BECAUSE THE TRUSSES ARE MADE OF HIGH-STRENGTH STEEL

THE 720-ft. main span of the new Ohio River bridge at Metropolis, Ill., the world's largest simple-truss span by a margin of 52 ft., constituted an engineering problem of the first magnitude. Eight years' planning formed the background for the final design. Study of the determining ideas in design is important in the present-day state of the bridge constructor's art, but in this case it was rendered difficult by the untimely death of C. H. Cartlidge, bridge engineer of the Chicago, Burlington & Quincy R.R. and chief engineer of the Paducah & Illinois R.R., the company building the Ohio River connection between the Burlington and the Nashville, Chattanooga & St. Louis R.R. However, it proved possible to make such study from the records of the railway, supplemented by information obtained from A. Engh, assistant bridge engineer of the Burlington, who was connected with the Metropolis work throughout the final design, and Ralph Modjeski, consulting engineer, who advised and approved the design.

General drawings of the bridge and many details of the large span were given in *Engineering Record* of July 10, 1915, and Dec. 23, 1916, and in *Engineering News* of July 28, 1915, and Dec. 21, 1916.

The length of channel span was determined by the U. S. War Department's requirement for a 700-ft. channel width. For such a length the cantilever type of bridge has heretofore been regarded as standard. The Burlington's engineers, however, believed that there were favorable possibilities in a simple-truss span, provided steel of higher strength than ordinary 60,000-lb. bridge steel were used.

It has been believed by some that a simple span of this length would be virtually impossible to build of 60,000-lb. steel. This is not the case, though the difficulties of design would have been very seriously increased, especially as to sizes of members and joint-packing. The fact remains that special steel was contemplated from the first, on the ground that in this range of magnitude of span it secures economy of total cost by reducing the dead weight to be carried.

Several of the engineers advised a cantilever span. Comparison of a simple span with a cantilever design was made, and the latter showed materially lower cost, despite the reduced opportunity for using eyebars. The advantage of safety in erection, by dispensing with falsework, weighed even more heavily in favor of the

cantilever. Experienced bridge erectors say that erecting so large a span on falsework in the uncertain flow conditions of the Ohio is inevitably hazardous. The contractors for the bridge were distinctly relieved when, after remarkably rapid and smooth erection, they closed and swung the big span (last December) without high-water troubles.

Mr. Cartlidge favored the simple-span type strongly. The main consideration was rigidity, but belief in the greater wear-resistance of the simple type may have been an additional factor. The pier caissons of the bridge rest on sand, and there is some reason for thinking that rock foundations would have led to more favor for the cantilever; that possible settlement of the piers was thought likely to derange a cantilever structure more than a simple-span bridge.

Full pin-connected construction was also early decided upon. Large joint connections were thus eliminated and the use of eyebars provided for. Through these features much weight was saved; and in the Metropolis span weight-saving was so vitally important that it dominated the detail design, when once the general elements had been fixed.

With respect to eyebars, all the engineers favored extensive use of eyebars in the span. The superior strength and reliability of the eyebar over other forms of tension member is a decisive advantage, supplemented by great saving of weight in dead metal. The disadvantages of eyebars disappear in a span of this size. Mr. Cartlidge carried the preference for eyebars to unusual limits, however, as noted farther on.

After deciding for a simple span, selection of truss type lay between two, the subdivided Pratt truss and the K-truss, both with curved top-chord. The engineers believed the former preferable, but a K-truss design was carried far enough to prove the Pratt truss more advantageous, and therefore the latter was adopted.

The choice of material lay at first between high-carbon steel, Mayari steel and nickel steel. Later a special steel was offered under the name "silicon steel," a carbon steel with its silicon, carbon and manganese raised well above ordinary bridge practice. Comparison among these materials involved both cost estimates and strength tests. A set of large-size column tests was made by the Bureau of Standards for the purpose, abstracts of which were published two or three years ago. Allowable unit-stresses were determined on the basis of these tests.

Silicon steel received the final preference. A comparison with a design using high-carbon steel in top chord and end posts (and ordinary steel elsewhere) showed the latter design to be considerably heavier. The competition of silicon with Mayari and nickel steels seems to have been decided by price.

The adopted material was at first proposed for the compression members of the trusses only. Eyebars of silicon steel were not offered by the makers; instead, nickel-steel eyebars were proposed and used. For the riveted tension members in the end panels of the bottom chord and the diagonals of the four middle panels (where reversing members were adopted instead of using counters) it was planned to use plain carbon steel. The engineers did not trust the tensile reliability of silicon steel in a riveted member. But their convictions on this point changed later, when it became apparent that the material could be worked without injury (in a certain range of thickness). Consequently, the members in question were made of silicon steel, but subjected to lower unit-stresses than the nickel-steel eyebars.

The selected materials made it possible to use a basal unit-stress of 25,000 lb. per sq.in. in tension and 30,000 in compression for the built members of the trusses, and 35,000 in tension for eyebars. As compared with a 20,000-lb. unit-stress, this increase of 20% and over decreased the total steel weight of the span by more than 30%, even with ordinary bridge steel in the floor.

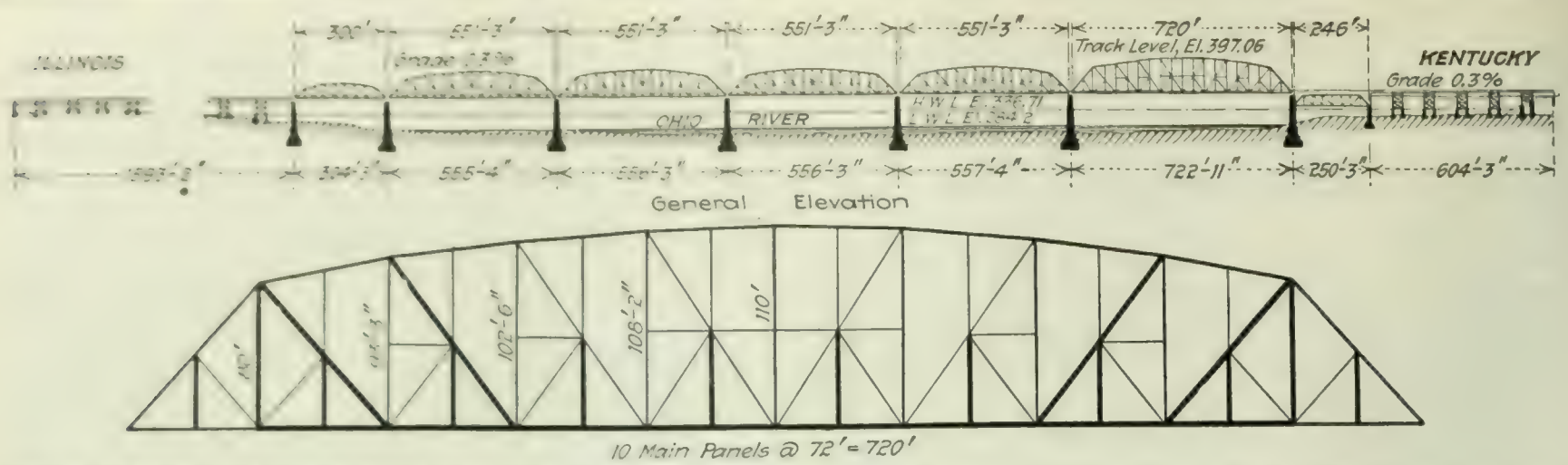
Experience in the shop demonstrated that silicon steel could be punched in thicknesses up to ½ in. with no greater effect than in ordinary bridge steel. The early beliefs of both makers and engineers had, however, been opposed to the practice of punching silicon steel, and for this reason throughout the job the holes were drilled from the solid.

For the floor system it was at no time contemplated to use anything but plain bridge steel. The best expression of the reason for this is that, with the uncertainties of a new material opposed to the recognized punishing qualities of carbon steel, it was believed that the latter could not be dispensed with. Additional factors were the desire to have thick metal in the floor members and the striving for maximum rigidity.

Opinions have changed somewhat since the Metropolis bridge was designed, and two bridges are now under way which use silicon steel in the floor as well as in the trusses. In both cases the floor is double-track, just as at Metropolis. Calculations have shown that with long panels and double track the cost of a floor of silicon steel is no greater than the cost of a carbon-steel floor, and the influence of the reduced floor weight on the trusses of a long-span bridge is therefore a net gain. This has bearing wherever the considerations above



THE SIZE OF THIS EXPANSION-END SHOE GIVES SCALE TO THE VIEW OF THE COMPLETE SPAN



THE RECORD-BREAKING SIMPLE-TRUSS CHANNEL SPAN OF THE METROPOLIS BRIDGE OVER THE OHIO IS OF EXTREME PIN-AND-EYEBAR TYPE. HEAVY LINES IN THE LARGE DIAGRAM INDICATE EYEBARS

quoted as determinative in the Metropolis case are not held to be decisive.

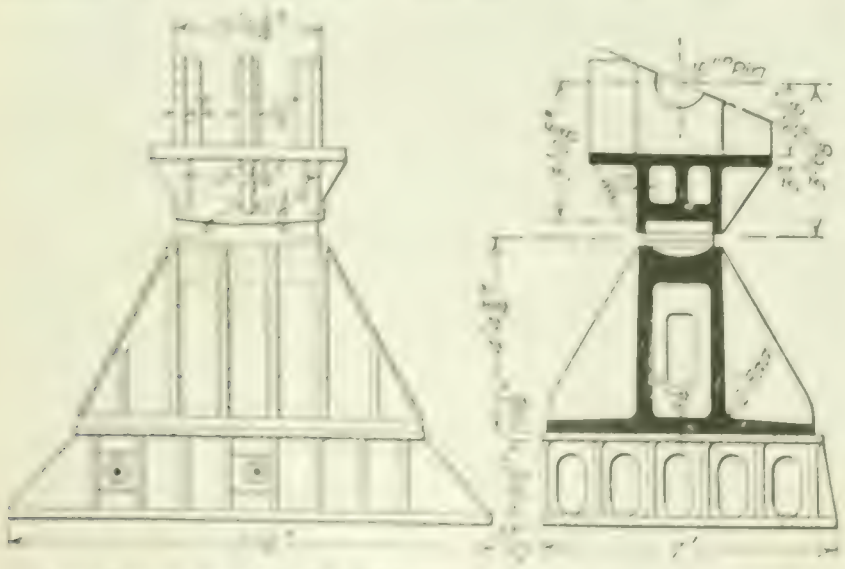
In developing the outlines of the simple span design, the truss depth and the panel-length were studied by comparative estimates.

The calculations of weight for different truss depths led to a decrease of the first-chosen depth (120 ft.) to 110 ft. The panel-length was increased to 36 ft. after comparison with a panel of about 30 ft., the former showing lower weight. None other than a subdivided web-system was in view at any time. The width of bridge (spacing of trusses) was made slightly greater than the traditional specification requirement for width not less than one-twentieth of the span. A spacing of 37 ft. was adopted; earlier, a spacing of 40 ft. had been considered.

To assure long life of bridge, a large future increase of loading was counted on. The train load was assumed at 7500 lb. per foot of track, and the engine driving-axle loads at 90,000 lb. These figures represent a margin of at least 25% over present-day traffic weights. They may be regarded either as regular design loading for normal service stresses or as emergency loading by which to test the design for safety under limiting conditions.

The important problem in the detail designing was to hold down the weight to an absolute minimum.

It was Mr. Cartlidge's strong conviction that all the weight economy obtainable by the use of eyebars as tension members should be obtained. In carrying this into effect, even the sub-hangers, which carry the intermediate floorbeams, were detailed as eyebars. The hip vertical is also made an eyebar member, but for erection service it was given some value as a strut by riveting a transverse plate diaphragm longitudinally between the bars.



Most characteristic of the bridge is the use of long (72-ft.) eyebars in the bottom chord. There is no connection between these bars and the floorbeams at the subpanel points, but a simple stirrup at the end of the floorbeam supports the bars, as shown in one of the drawings. By this arrangement, secondary stresses due to distortion of the subpanel triangle under load are eliminated, while at the same time the weight of a pin and two sets of eyebar heads is saved. A similar arrangement was used years ago in the Bellefontaine bridge of the Burlington, designed by George S. Morison.

At various connections in the web system two pins were used, in order to reduce the size of the joint-connections. At the foot of the hip vertical the connection of hanger to floorbeam is made by a 12-in. pin placed 8 ft. 9 in. above the main 14-in. pin at L2.

The economy secured through use of the eyebars is represented by the sum of 10 to 15% saving of section in rivet holes and details and 5 to 10% increase in unit-stress allowable in eyebars over built members. Thus, about 25% of the weight of tension members in the trusses was saved, comparing with built members of nickel steel, and about 35 to 40% when comparing with members of silicon steel. Because the eyebars were so important for economy, they were used even where serious difficulty was encountered in making room for the end connections. Diagonal U4-L6 was a case where the substitution of a built member would have simplified the joint details considerably, but eyebars were retained.

When the erection problem was worked out by the contractor, the eyebars in the web system and the long bottom-chord eyebars were objected to because of the delay resulting from the awkwardness of handling such long, flexible members. But the engineers adhered to their plans, and as already stated the only use of built members in tension is in the diagonals of the four middle panels and the bottom chord in the end main panel.

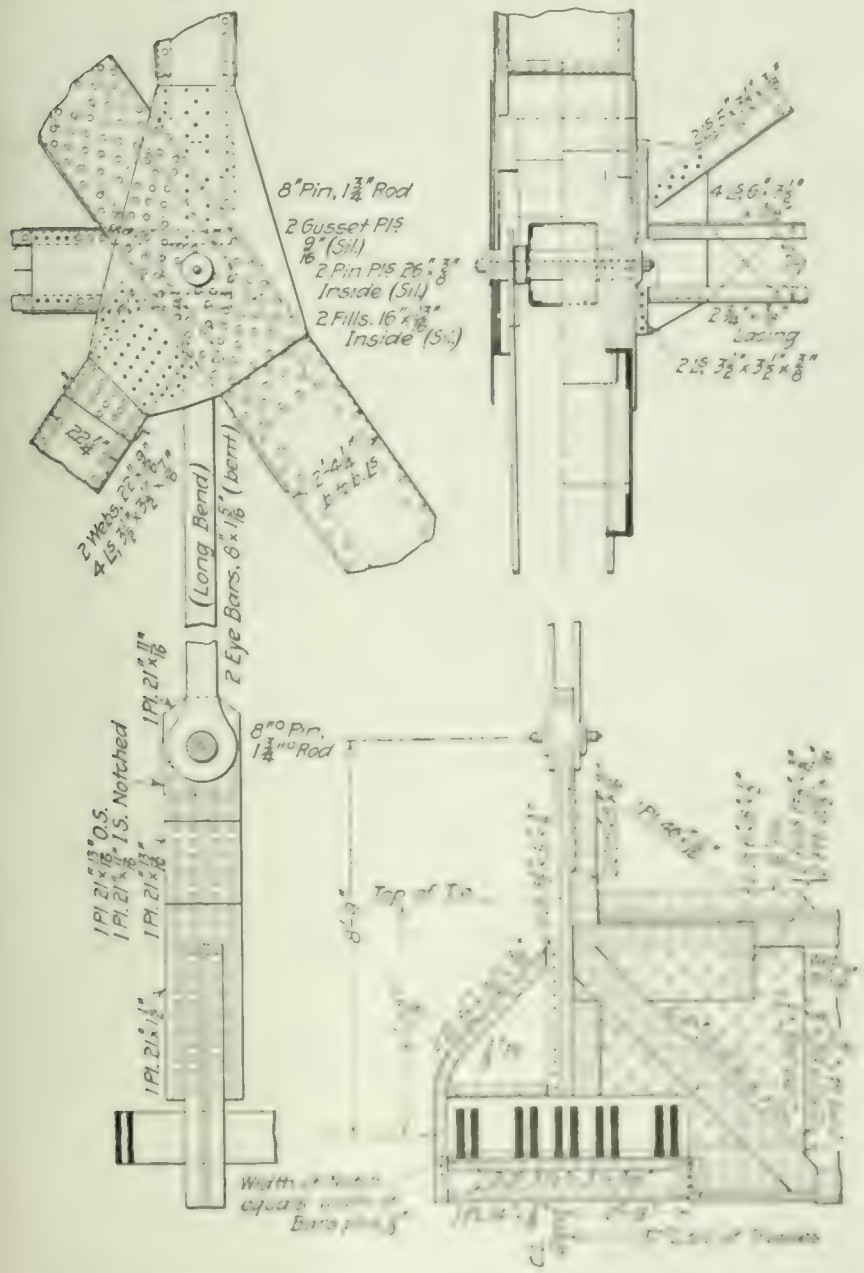
To save weight of lattice and other detail metal in compression members, the top chord and the posts were detailed of H-section, using a central transverse diaphragm. For example, the middle top-chord member consists of two webs 42 x 1¾ in., four angles 8 x 8 x 1⅛

in., four flats 10 x $\frac{13}{16}$ in., and a diaphragm with web 32 x $\frac{3}{4}$ in. and four angles 6 x 6 x $\frac{5}{8}$ in. All of this metal is effective cross-section, and while top and bottom lattice is also used it forms a much smaller proportion of weight than would otherwise be needed.

Partly because of the presence of the diaphragm, very thick plates in the side ribs of the top chord were thought permissible—as, the $1\frac{3}{4}$-in. plates just noted. Some difficulty developed in the shop in securing acceptable plates of these dimensions, especially with regard to straightness, or freedom from waviness at the edges. It is now believed to be better practice to use plates not thicker than 1 in. to $1\frac{1}{4}$ inches.

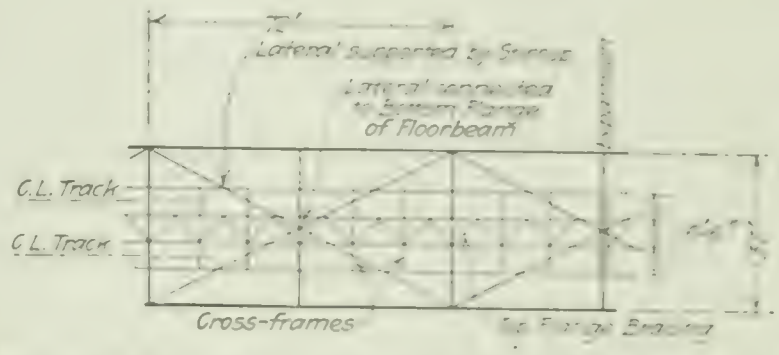
The central diaphragm required special details at the pin joints, as the diaphragm had to be interrupted here. Vertical interior webs carry the stress across the joint.

In the floor occur one or two interesting weight-saving details. There is only one stringer lateral system, placed between the two center stringers; occasional struts in the plane of the upper flange extend over to the outer stringers to brace them. There is no traction bracing. Longitudinal forces pass from the stringers into the subpanel floorbeam and this must transmit them (by bending) to the middle of its length, where the diagonals of the main bottom lateral system are attached to the lower flange. These diagonals clear the lower flanges of the stringers, but are hung from them by stirrups.



SUBHANGER DETAIL—CHORD BARS NOT CONNECTED TO FLOORBEAM

As part of the studies for economical and safe design, secondary stresses in the trusses were analyzed. At two places provision was made to neutralize their effect by distorting the truss members during erection. The end section of the bottom chord was bent up $\frac{11}{16}$ in. at midlength, panel point L1, and the end-post was bent out $1\frac{1}{8}$ in. at its middle, where the subhanger M1-L1 connects. Thus the end-post and the bottom-chord section were put under negative bending moment



FLOOR HAS A SINGLE SYSTEM OF STRINGER LATERALS AND NO TRACTION BRACING

to an amount equal to the positive moment caused by dead-load and half live-load. When the bridge was swung, that is, under full dead-load, these initial deformations reduced to $\frac{1}{4}$ in. and $\frac{7}{16}$ in. respectively, and they are so computed as to become zero under full train-load on one track. The camber diagram for erection was laid out to secure a level bottom chord under half live-load (that is, full live-load on one track). The camber height at midspan was 13 in., not allowing for falsework compression. (See *Engineering Record*, Dec. 23, 1916, p. 774.)

Directly related to the reduction of secondary stress is the use of adjustable end bearings. Phosphor-bronze rockers were placed under the shoes, to allow free adjustment in both longitudinal and transverse planes during erection. Through such adjustment the great load on the shoes is kept near the center of the bearing regardless of errors in pier levels and distortion during erection. After the span was in place, steel wedges were inserted alongside these bearing blocks to limit lateral motion. The upper shoe is fastened to the bridge chord, so that the end pin (at L0) cannot serve as point of adjustment as the bridge deflects under train load, and the rockers therefore are necessary.

Mountain for Water-Front Fill at Rio de Janeiro

Cutting down the Costello Hill at Rio de Janeiro, Brazil, and using the material to reclaim a large area of submerged land on the water-front, is proposed by a syndicate which has applied for a concession from the government. The engineer is Luiz Barretto Filho, of Sao Paulo, Brazil. The present property on the hill would have to be purchased, but the leveled site and the newly filled site would become the property of the syndicate for development purposes. The cost of removing the 4,700,000 cu.yd. and depositing them in the fill is estimated at $10,000,000. The removal of this hill has been proposed at various times for more than 100 years, the object being to improve the ventilation of the city, as cool winds are now obstructed.

What Moving of Civil Engineers to Joint Home Signifies

Organization Along the Lines of Our Political System, Coöperation and Service to Individual Membership Urged at Welcoming Meeting

ON DECEMBER 7 the American Society of Civil Engineers was formally welcomed to its new home in the Engineering Societies' Building, New York. An account of the meeting appeared in the news section of this journal last week. Herewith are presented extracts from the addresses of William L. Saunders, past president, American Institute of Mining Engineers; George H. Pegram, president, American Society of Civil Engineers; Prof. George F. Swain, past president, American Society of Civil Engineers, and Dr. Rossiter W. Raymond, secretary emeritus, American Institute of Mining Engineers.

Extracts from Mr. Saunders' Address

Mr. Saunders spoke in part as follows:

Let us hope that the union that we celebrate tonight is not merely a physical contact, but that it represents the spirit and purpose of engineers to get together for service, a service not alone in scientific fields, but on the broader plains of civic life.

Let me tell you a true story of recent events at Washington. One of the most important laws which a congress ever enacted is the draft law. This law wisely created boards for the purpose of determining exemptions. This is the court of appeals, the court of last resort, except the President. Each state and territory has one or more district boards. Now, as this war is not only a clash of armies, but a combat between industries, it seems plain that there were many men engaged in industrial work who might render greater service at home than in the trenches abroad. So the advisers of the President succeeded in placing an engineer upon the proposed list of members of each district board in each state in the Union. On these lists were representatives of the farmers, the legal profession, business men and labor. Here was the true position for the engineer, the man who is responsible for the creation and operation of our industries. The engineer members were selected from the organization of engineers which had been created by the Naval Consulting Board in each state and territory, and through which the industrial plants had been surveyed and listed for war service. The President, acting in harmony with our system of government, a government by states, sent these lists to the state governors, asking them to revise them and make such changes in the names as each governor might deem wise.

When these lists were returned to the President, more than 90% of the engineers were scratched off to give place to lawyers and others.

Kind of Organization Needed

It is useless for us to fume and protest at such things as this. It serves us right. We are not organized for civic service. We are not organized for any service. Our institutes, societies and our Engineering Council suffer too much from professional megalomania. Such organizations as we have are not framed to suit the kind of government which we live under—a federation of states, counties and wards—a democracy.

Let us hope that we begin tonight the placing of the corner stone in a structure to be reared on the lines of engineering democracy. Let us get together, not in high places only, not in the branches, but at the roots of the tree; not alone as scientific men, but as technical men doing work as citizens, reaching into every village and every ward—a technical, civic federation. Let us organize, for in organization there is the secret of strength, the basis of influence, and the opportunity for power.

Extracts from Mr. Pegram's Address

Mr. Pegram spoke in part as follows:

We join with you because service to our fellow man demanded it, the advancement of the engineering profession demanded it, the proper development of our members through broader acquaintance and better cooperation demanded it; and in coöperation, we are not half-hearted. We are enthusiastic, as the formation of the Engineering Council attests.

There is a great awakening among engineers as to the necessity of coöperative action for service to the country and to the advancement of the profession that will result. The coöperation we are now instituting must meet that demand. The union of the societies in this home is a happy augury, and the engineers of the next generation will approve of this union.

We realize that the education of the engineer in the past has been too one-sided, and we are encouraged at the present tendency to correct this fault by some attention to the humanities. It is not surprising that while all other classes of the community have been organized for concerted action in their several lines, the engineers have been divided into a number of groups determined by the technical differences in the character of their work. While for scientific progress this must go forward in an ever-increasing degree, for economic progress there must be unity of effort.

It is in this direction that we are moving. We are endeavoring to establish or popularize the profession of engineering. The union which we celebrate is not a step to meet a temporary need, nor the result of a happy thought. It is an answer to a nation-wide call on engineers to get together. Engineers feel that they have not received just public recognition.

Two things are necessary for that recognition: First, the public must be informed of their work. We can trust the public's intuition if the public is informed. And, secondly, there must be a responsible body to encourage that recognition.

Extracts from Professor Swain's Address

Professor Swain spoke in part as follows:

The engineering profession is one profession, and not four; and the opportunity is now before us in better form than it ever has been before to see if we can make ourselves felt in this country and in the world. We

have a building devoted to our uses; we are here in close contact with each other; we have the Engineering Council representing in one body all these four engineering societies, and shortly to represent other great technical engineering societies concerned in the advances of applied science. If, with these conditions, we cannot make ourselves felt, I think it will be very strange.

It seems to me that we have confined ourselves too much to two of the purposes of an engineering society: the advancement of knowledge, the preparation of papers, etc., and the making of a high standard for the societies themselves.

We have neglected two other things which are more important: Making the engineering profession felt as a moving force in the community, and, secondly, doing something more than we have done for the individual members of the profession. I hope that in the future we may able to do both of these things.

Results of Coöperation

I am continually impressed with the fact that a small number of people relatively can, by coöperating and pulling together, achieve immense results. I know of several small bodies of men, who, by organization and hard work, have achieved results which would have been considered impossible. So I do not see why 85,000 or 100,000 engineers—and I am told that there are that number in the United States; these four Founder Societies represent some 30,000 and the number is growing fast every year—I do not see why with so many engineers, if we can only coöperate and pull together, we may not make ourselves one of the most important influences in this country. But we have got to do as Mr. Saunders said. We must organize; we must make ourselves felt in the states, in the counties, in the wards perhaps, in the proper way, in order to realize the results which we ought to accomplish.

Extracts from Dr. Raymond's Address

Dr. Raymond, whose address was punctuated frequently with applause and laughter, spoke in part thus:

I seem to begin to be about to feel that the civil engineers have had taffy enough. If you had sat with me at the eloquent luncheon this afternoon—I call it an eloquent luncheon—I understand it was also savory, but I got there too late for the victuals, and I only heard the speeches—and if you could have heard the rapturous terms in which the civil engineers were made welcome then and there, and add to that everything that has been said in the lobbies and in the halls and what has been so well said already here tonight, you might perhaps suppose that they had had enough. At all events, the thought is rather paralyzing to me, when I am called to welcome them once more.

Having been honored tonight with the duty of speaking for the American Institute of Mining Engineers, it is with personal as well as with representative pleasure that I, in their name, resign the title of senior of the Founder Societies to this great and famous organization, worthy senior of us all.

If we were discussing the thing from the standpoint of the antiquarian, perhaps I might claim general, absolute and irrefutable superiority of antiquity for the mining engineers, because you know primal man first lived in a dug-out—the first man was a mining engineer.

But it is useless to dig among the distinctions of antiquity in order to arrange the order of precedence. The mining engineer is simply an engineer engaged in mining, or connected with some of the arts that are associated with mining. The mining engineer is a civil engineer, plus a mechanical engineer, plus an electrical engineer. He has all the problems that torment those engineers, together with a torturing lot of his own that they don't have.

New York a Mining Camp

It is very pleasant to us to have this fact so thoroughly acknowledged as it has been in these latter years. The City of New York, as perhaps you have been told before, has been for the last few years the greatest mining camp on earth. During that period, with its immense system of subways and with its new water-supply from the Catskills and with its deep cellars under its lofty skyscrapers, New York has literally and not figuratively employed more miners and trained more mining engineers than any other mining field on this green globe—and we have made good mining engineers out of civil engineers. I can tell you that there is no such good raw material for a mining engineer as a real, thorough civil engineer. The great engineers that have designed, constructed and conducted the immense public improvements in this municipality within the past 20 years have not only taken up and acquired the art of mining engineering, but they have adorned it with new methods and with new achievements, before which we regular, trained, born mining engineers take off our hats.

At least, that is the opinion of the late Professor Christy, dean of the greatest mining school in the country, I think not even second in numbers to our own great school at Columbia. Christy, after making a pilgrimage around the world, stopping at New York on his way, found more new and novel methods of mining in New York City, in our subways and under our pavements, than he had found elsewhere on the whole globe; and he wrote to me that such civil-mining engineers as Barclay Parsons were teaching us a new science of mining engineering.

He had been underground where the rock was so rotten that it could not be either held up or bored through; and he found that they were squirting cement into the interstices of this rotten, old gneiss and making an artificial stone of it, much superior to the kind the Almighty had made—that is to say, after nature had had its way in weathering it for a few thousand aeons. They had consolidated this rotten mass until it was made into a splendid new mass of rock, and in that rock had made our subway tunnel with safety.

Not only to pierce the crust of the earth, but to create it in order to pierce it, is a double art, for which we mining engineers here and now desire to thank the society of civil engineers for having invented a new thing in our line.

Opportunities Furnished by Mining

You can glance over, I won't say the world—you don't want to cast your eyes around the world in its present disturbed condition—but confine yourselves to our continent and our country, and see how the business of mining engineering, how the art of mining and the

business connected with mining, is breeding great engineers.

Electrical engineering? If you want to see electrical engineering, go with me to Montana and view the River Missouri lighting and pumping, hoisting and driving the machinery in the mines of half a continent. And the whole of the vast, imperial State of Montana, and the still more imperial State of Washington, how they have harnessed into their electrical team the "Father of Waters" himself!

You electrical engineers would cut a small figure if we did not start the mining enterprises that made you necessary, and subsequently made you wealthy and—complacent!

Mechanical engineering? What is the greatest achievement of mechanical engineering that can be seen today by the eye of man? The magnificent system of handling materials by which a ton of iron ore can be taken by the steam shovel out of the mine away in Minnesota, and brought over land and over lake, and landed and relanded and piled and repiled; taken to the blast furnace and hoisted to the tops of the blast furnaces, and melted in the furnaces, and run from the bottom of the furnaces, and carried as pigs into the bessemer converter and out of the bessemer converter into the rolling mill, and out of the rolling mill to the railroads, and from the railroads to the track—from the time it left its mother earth until the time it lay again upon its mother earth, to be the support of the traffic of man—and all without the direct touch of a human hand! A very small figure in the world would you electrical and mechanical engineers have cut if you had not had a chance to do these big things; and who gave you the chance? The mining engineer!

Now, we do not claim, we are not asking for, a greater share of glory than belongs to us. We do not want a bigger share—we want it all. And we want it all because there really is not any line of difference between you and us. We claim Barclay Parsons, for instance, as a great mining engineer. But if you have given us Barclay Parsons, we have given you Arthur Dwight; and if Parsons stands tonight the lieutenant-colonel of the 11th Engineers in France, Arthur Dwight is his next in command.

Soldier Engineers

Oh, it was high time that you civil engineers came to the house where you belonged—it was high time! It is an auspicious omen that this event, symbolizing the greater unity—unity in variety—among American engineers, takes place at the moment when that unity is showing itself in the achievements of patriotic courage, under the flag of many in one.

The old First Engineer Reserve, now the 11th Railway Engineers in the U. S. Army, has covered itself, and us who created it, with glory already. I, who had seen American railway builders lay eight miles of standard-gage track in a day, felt sure that our boys would open the eyes of Europe to the art of laying rails; and I was not surprised when Field Marshal Haig announced the other day that the engineers behind Byng's advancing line deserved as great a share in the credit of his victory as the infantry that made the victorious charge; because the engineers, working under fire, though without weapons of defence, kept up with the advancing troops, performing miracles of rapid construction on the railroad lines of supply.

In fact, the very contretemps of last week is proof of that. How came the American railway engineers to be trapped between two lines of battle? Because they and their tracks and trains were clear up at the front, instead of struggling in the rear to catch up with the army. And as our hearts thrill with the story of the hair-breadth escapes, the dashing rescue, the gallant, loyal courage of those who laid down their picks and shovels to borrow the rifles of the wounded and the dead, we take off our hats to the *Soldier Engineers* of America—a new class, which includes all the rest. If you ask further instances of our patriotic coöperation, let us remind you that we have given to the world Herbert Clark Hoover, the American mining engineer.

All Engineers Simply Engineers

The distinctions and differences between us had crumbled so that there was nothing between us but the distance of a few blocks in New York City, a division that had no meaning whatever. I tell you now that all engineers are simply engineers. The mechanical engineers are engineers dealing with mechanical matters; the electrical engineers are engineers dealing with electrical matters; and the mining engineers are engineers, as I have just now explained to you, covering everything else that all the rest of you do and dealing with mining matters. And we are all engineers.

There is a higher unity still, and that we reached very recently, just about the time we began to build the addition to this building. We are all patriots; we are all Americans; and I want you to notice that while there are special distinctions in the titles of these societies, there is one word that belongs to all. They are the *American* institutes and the *American* societies

Well, we welcome you to the house where you ought to have been before, and we tell you it is a good house to live in. We that have lived in it since the beginning know how good a house it is; and I want to blow the trumpet a little for the good old house. I want you to understand that you have not merely come together with a lot of fine fellows, coöperation with whom will be mutually most advantageous, but I want you to understand that you have come into the most magnificent house that ever was built on earth for engineers.

Shortly after this house in its first form was finished, a great London architect traveled around the world to view the modern architecture of man. He came here, or, rather, he came the other way; he came from Australia here, and he went to Canada, and he came through the United States, and at last he came through New York. Finally he went home, and after he reached London, he delivered before the London Society of Architects an address in which he praised and criticized with equal freedom. He praised thoroughly and he blamed thoroughly. I remember now but one sentence of that lecture. He said that of all the buildings he had seen upon his journey, one only was perfect; in proportion, design, detail and adaptation to its purpose. That perfect building was the gift of Andrew Carnegie to the engineers of America. . . .

Yes, we welcome you to the fellowship of engineers. We welcome you to the brotherhood of patriots. We

welcome you to a happy family that does not have to take opiates to suppress its natural instincts. We live together in comfort.

As far as quarreling is concerned, you know what Whistler said—I was reading it only the other day—one of the witticisms of that great artist: "Quarreling with your enemies is vulgar; quarreling with your friends, that is gentlemanly." That sort of thing we can do in style; but you will find that there is substantial unity—unity in variety. E pluribus unum—many floors, one elevator!

When I was a student in the last century somewhere—somewhere in Italy—our landlord undertook to celebrate Thanksgiving Day for us American boarders. He was very proud of having lived in America; he had been a cook over here; and he had learned how to cook turkey. He procured a turkey and brought it into the banqueting room on Thanksgiving Day. He had it decorated and garlanded and paraded it with all ceremony in a procession round and round the room until it was finally deposited on the table before us, and then we found that he had planted crosswise in the breast of the turkey two American Star Spangled Banners, with a scroll on which he had printed with great care and distinct clearness the words E PLURIS UNIBUM!

Now, that is the sort of company to which we welcome you, a company that is so much like yourselves, as I have said before, that you cannot know the difference.

You are one of the largest fractions of it, and the total is just like the fractions. You cannot add shillings to dollars and cents; you have got to have your coinage all alike before you can count your money. And, therefore, we, who are about to live more happily than ever, salute you.

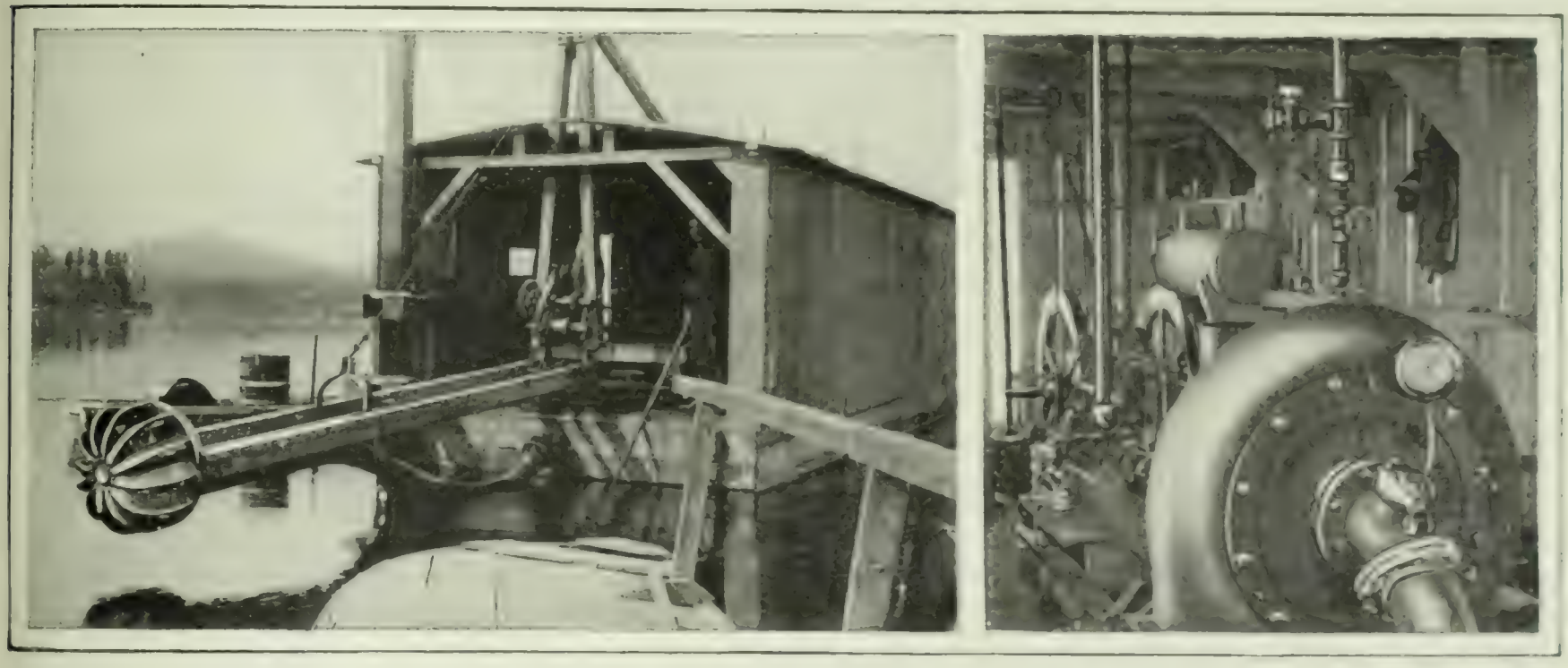
Correction of Concreting Record

The placing of concrete in the foundation of the Felt & Tarrant Building, Chicago, was done at the rate of 275 cu.yd. per 8-hr. day, and not 27.5 cu.yd as stated in *Engineering News-Record* of Dec. 6, p. 1066.

Home-Made Dredge Reduces Cost of Canal Construction

Crew of Two Men Excavates 35 Cubic Yards per Hour with a Small Suction Machine of Unusual Design

IN CONTEMPLATING the construction of several miles of canal near Spokane, Wash., it was found that the use of the ordinary trenching machines was not feasible and that the canal section was hardly large enough to make the use of a floating clamshell dredge economical. The canal was to be 20 ft. wide at water level and 12 ft. wide at the bottom. The excavation required, allowing for a small ditch already built along the route, amounted to about 2 cu.yd. per linear foot of canal.



HOME-MADE SUCTION DREDGE WORKING IN CANAL INTERIOR OF DREDGE WITH CENTRIFUGAL PUMP

It was decided to built a cutter suction dredge small enough to float in the canal and which could be operated at low cost. Accordingly, a 12 x 40-ft. barge was built with sides and ends of 6 x 12-in. Douglas fir timbers drifted together with ½-in. drift bolts. The bottom was made of 4-in plank well spiked to longitudinal beams that constituted the frame. The barge was built bottom side up and then turned over and after being carefully calked was decked with 3-in. plank.

The cutter arm, 22 ft. long, was made of two well braced 6 x 8-in. beams carrying a 1½-in. shaft for driving the rotary head. The suction pipe to the cutter consisted of a flexible armored hose 6 in. in diameter leading to a Byron Jackson Rock pump. This pump was operated at about 350 r.p.m. by a 24 hp., type G, Fairbanks Morse 4-cylinder gasoline engine, geared down from 800 r.p.m. The discharge line, laid along the canal bank, was a 9-in. flanged pipe whose length ranged from 30 to 50 ft. in the course of the job. Owing to dikes along the old ditch, the equipment had to be built to handle material under heads up to 22 feet.

The barge was also equipped with an 8-hp., type N. Fairbanks Morse gasoline engine for driving the cutter head. This was geared down so that the cutter turned at a comparatively low speed. When desired, this 8-hp.

engine could also be used to drive a small Goulds vacuum-pump used for priming the large pump. The suction from the priming pump was led up through the roof to a height of 33 ft. above the deck and thence directly down to the top of the main pump casing. This arrangement made it impossible for the vacuum pump to draw water into it even after the main pump casing was filled with water, and was used simply to safeguard the small pump.

The cutter arm was hung in supports in such a way that it could be raised by a hand-operated crab and could be swung to right or left by a bull wheel driven with belt and gear drive from the 8-hp. engine.

A universal joint in the cutter driving shaft had been provided at the base of the cutter arm so it could operate in any position. The barge was held in position by a single 8 x 8-in. steel chord, spaced on one corner of the front end.

The method of operating the dredge was to swing the cutter head slowly from side to side until the desired depth had been reached. Then the arm would be raised and the slight current flowing from the canal into the small ditch already in use was sufficient to move the barge forward as desired as soon as the speed was raised by a small hand crab provided for that purpose. This system of advancing greatly expedited the progress of the work.

On this plan the dredge advanced an average of about 16 ft. per hour. It is believed that the pump often handled as much as 30% solid matter. The material encountered varied from coarse gravel to hardpan. This progress was greater than that made by a ½-cu.yd. clamshell dredge operated on part of the canal, although the larger dredge had a crew of four and cost much more to operate. With the suction dredge the yardage for a good day's run was 680 cu.yd., handling an average of 20% solids. The wages of the crew of two men amounted to $7.50 and fuel for the engines cost $5.40. Thus the labor and fuel costs were slightly more than 2c. per yard. The dredge was built for a 2½-mile length of canal, but as it was used afterward for maintenance work a salvage value of about 58% was credited to the contract.

The small suction dredge was designed and built by C. L. Wickstrom, consulting engineer, Spokane, Wash., who supplied the foregoing information.

Good Progress Made in Operation of Federal-Aid Road Act

Many Questions Incident to Its Understanding Are Now Settled—Meaning of "Post-Road" Defined—Projects Are Being Approved Rapidly—Some States Must Hurry

WHEN President Wilson signed the Federal-Aid Road Act on July 11, 1916, he rendered effective a measure unique in the annals of American legislation. It involved not merely the granting of financial assistance to the states in the building of their public roads; it went much further and placed on trial a far-reaching policy of coöperation between the Federal Government and each of the 48 states, said Logan Waller Page, director of the Office of Public Roads and Rural Engineering, in an address, delivered before the annual meeting of the American Association of State Highway Officials, which is given here in full.

This measure undertook to lay down the conditions which should govern the coöperation, and it specifically called for affirmative legislation by 48 other legislative bodies than Congress. It placed the administration of the act in the hands of 49 agencies comprising the Secretary of Agriculture and the highway department of each of the states. On the one hand, therefore, we have the manifold difficulties incident to the adjustment and smooth operation of a plan which requires action by so many different agencies, and on the other hand we have all the possibilities for good incident to the powerful cumulative effort which may thus be put forth by all of the forces of the nation working in unison.

Only by broad-minded and generous dealing with each can we accomplish the great work cut out for us by the Federal-Aid Road Act. Only by a disposition on the part of state and Federal officers to overlook the small troubles and difficulties which arise, and to consider whether the plan is working out in a fundamental sense, can a true perspective of the practical results be obtained. The Federal officials are endeavoring to put themselves in your places, and to act as though they were representing the interests of each state in its turn. If you likewise will put yourself in their places and consider your problems from the standpoint of the nation, we shall then have placed ourselves in that frame of mind which will best insure a friendly coöperation.

First, let me call your attention to the fact that the beneficial results of the Federal-aid legislation are not to be measured merely in the miles of improved roads built with the aid of Federal funds. I would consider that secondary. The most important result has already been accomplished in the form of an immense amount of constructive state legislation, establishing and strengthening state highway departments, providing skilled supervision, systematizing road work in the states, establishing maintenance funds, and in many other ways insuring the efficient and economical handling of the nation's road problems. I need not go into detail to convince you not only that these results have been accomplished, but that the Federal-Aid Road Act has been a powerful factor in their accomplishment.

Turning now from the influence of the act upon state legislation, I will deal briefly with what has been done by the Federal Government in the administration of the act. A great many people had the impression that within a few weeks after the measure was placed on the statute books money would begin flowing into the states and the building of Federal-aid roads begun. At the risk of burdening you with details with which most of you are already familiar, I shall set forth some of the preliminary work which the act specifically required before road building could be undertaken. First,

it was necessary that the Secretary of Agriculture certify to the Secretary of the Treasury and to the state highway departments the amounts apportioned to each state, and to do this necessitated the obtainment from the Postmaster General of the mileage of rural delivery and star routes comprising one of the factors of apportionment. Next, it was incumbent upon the Secretary of Agriculture to formulate rules and regulations for carrying out the act. This was no small task, as it was desirable to obtain the views of the various state highway officials, as well as to apply to it the knowledge of the Federal officials. As the act called for coöperation between the Secretary of Agriculture and state highway departments, it became necessary to ascertain by an exhaustive examination of state laws what states were equipped with highway departments within the meaning of the act. This required time and an immense amount of careful and painstaking investigation.

No Highway Departments in 11 States

As a result of the examination it was found that there were eleven states which were without highway departments in the sense contemplated by the Federal act, and that the highway departments of five other states might be considered as in the doubtful class. You are sufficiently familiar with the act to know that it required as a preliminary to coöperation an assent by each of the state legislatures, and that it made certain specific requirements; for example, that the work should be done under the direct supervision of state highway departments, that funds should be provided by or on behalf of the state, and that adequate maintenance provision should be made. Few of the states were in position, when the act was passed, to coöperate.

But you are no doubt more concerned with the specific difficulties which you have encountered in the operation of the act than with any narrative which I might set forth. Touching briefly upon these, it has been made clear that foremost of all the difficult questions that have arisen is that of determining what constitutes a rural post-road.

Almost as soon as the measure became effective widely varying interpretations of the term, "rural post-road," were current. It was asserted by some that it meant only those roads on which the mails were actually carried; by others, any road over which it was physically possible to carry the mails; and by still others, any road on which the mails were actually carried or on which there was a prospect that they soon would be carried. Manifestly, the question was one purely legal in character, and the act could be interpreted authoritatively only by the qualified legal officers of the Federal Government. We went to the Attorney General with our troubles and we asked him to advise us as to the eligibility of certain classes of roads which had been submitted. These classes were (1) where the mails were actually carried over the road (2) where the mails were not carried, but where there existed a reasonable prospect that they would be carried within a reasonable time after the completion of the road (3) where the proposed road was an entirely new location, but there existed a reasonable prospect that mail would be carried within a reasonable time after the completion of the road (4) where the part or parts of a project on which no mails were carried constituted an unsubstantial portion of the whole and it would be uneconomical to build the parts on which the mails were carried without building the other parts, even though no prospect existed that these unsubstantial parts were ever to be used for carrying the mails. The Attorney General decided that all roads in those four classes were eligible as post-roads.

Even then our difficulties were not at an end, for the questions arose as to what constituted a "reasonable prospect" and an "unsubstantial part of the whole." Finally we drew up instructions as detailed, as we felt the regulations and the opinions of the Attorney General would permit, for the use of our district engineers. Merely as a guide and not as a rule, we advised (1) that where the unused portion of a project was comprised in several or a number of short sections, concerning which no prospect of their use by mail routes existed, the project might be worthy of approval if these short unused sections did not aggregate more than approximately 30% (2) that where the entire project was inconsiderable as to mileage, the parts not used and concerning which no prospect could be shown might aggregate as much as 30% (3) that where the unused portion consisted of one or two parts not on the end of the project they might aggregate approximately 2% of the entire project (4) that where the unused portion consisted of one part at each end of the project and connected with a small town or city or an improved road or another post route, such portion might comprise approximately 20% of the entire project (5) that where the unused portion concerning which no prospect existed comprised a stretch at one end of the project connecting with a large city, it might comprise approximately 10% of the total length of the project.

Actual Cases Illustrate Trouble

We have tried in every way possible to find ways and means for making the post-road provision of the act as reasonable as possible within the law. You can hardly blame us if we have had to do this in some measure step by step. The Attorney General and other law officers of the Federal Government do not deal with purely hypothetical questions, and it is necessary therefore that we submit to them genuine cases so that they may see the actual troubles which we are trying to remedy.

I am gratified to be able to say, however, that with all of its troubles the post-road provision has served to disqualify a very small percentage of the projects submitted. This is proven by the fact that out of a total number of 228 projects submitted by the state highway departments to Nov. 30, 1917, inclusive, 168 have been approved and only 6 have been disapproved. You can see, therefore, that the trouble is not so serious as a casual consideration might make it appear.

Questions have arisen in connection with state laws which have been productive of some delay, and I have heard the contention that the Federal Government should take it for granted that the respective state highway departments are complying with the laws of their states, and we should therefore hold the state highway departments only to a compliance with the

provisions of the act. This contention is sound, except insofar as the act itself calls for certain conditions to be met in certain ways by the states. I have already mentioned the fact that the act permits coöperation with the state highway departments only. Now it is necessary, not only that the Secretary of Agriculture determine whether or not a state has a highway department, but who and what constitutes the department. He must assure himself that he is dealing with those persons constituting the highway department, and with no others. If, therefore, a state law prescribes that certain officials, organizations or individuals shall have certain duties and authority in connection with the regular personnel of the recognized highway department, the Federal Government must deal with them according to the provisions of the state law.

I have already mentioned to you that the work must be done under the direct supervision of the state highway department. It follows that the Federal Government cannot deal with the state highway department in matters over which that department has no jurisdiction. It is a simple and reasonable requirement, therefore, that the state highway department gives assurances that it has the supervision contemplated by the Federal act. It is no less a duty of the Federal officials to ascertain how the funds are to be provided by or on behalf of the state, and that the depository is authorized as required by the act to receive state and county funds. This matter has received the most careful study by the Secretary of Agriculture, and I am glad to say that henceforth we shall be able to simplify the steps by which these requirements may be met.

Office Anxious to Start Work

We have had much trouble in the matter of obtaining plans, specifications and estimates promptly following the approval of the project statements, so as to enable the agreements between the Secretary of Agriculture and the state highway departments to be executed without delay. We have had inquiries from time to time from interested parties urging the Government to allow the work to proceed without further delay, when as a matter of fact we were as anxious as the inquirer to have the work start, but we could not authorize the commencement of construction until plans, specifications, and estimates had been submitted and approved. Our requirements are reasonable as to plans, specifications and estimates, and if they are reasonable, certainly there should be no difficulty on the part of the states in supplying the information which we seek. If any of our requirements in this connection are unnecessarily burdensome upon the states, I trust they will be freely and frankly brought to our attention. Our chief engineer, his assistant, and our ten district engineers are all here ready to discuss these questions and to have the benefit of any advice or suggestions that you may have to offer. Incidentally, I may say that of 168 projects approved only 88 sets of plans and specifications have been submitted. Of this latter number, 72 have been passed by our engineers and recommended for approval, so that only 16 sets of plans and specifications submitted are now pending.

You may be interested, however, in knowing the status of the individual projects as of this date. I have had prepared a table showing by states the number of projects submitted, the number approved, the number covered by project agreements, the amounts of state and Federal funds involved in the projects. The balances remaining of the allotments to the respective states may therefore easily be ascertained. I would call your attention to the grand totals showing that 228 projects have been submitted, 168 approved, and 6 disapproved. The amount of Federal aid involved in the projects submitted is $5,664,442.31, the total including state and local funds $13,583,577.98, and that the total approved is $4,052,142.85 Federal funds and $9,770,179.40 Federal, state and local funds. In this connection I would call your attention to the fact that those states which had highway departments at the time the apportionment was made for the fiscal year ending June 30, 1917, must enter into project agreements on or before June 30, 1918, or the amount allotted to them and not covered by project agreement will be reapportioned under the terms of the act to all of the states. I would suggest that you examine into this question very closely as a comparatively short time exists for you to save this first year's apportionment to your state.

FUNDS APPROPRIATED, MILEAGE AND STATUS OF FEDERAL-AID ROAD PROJECTS—COMPLETE TO NOV. 30, 1917

State	Projects Submitted	Projects Approved: Number	Projects Approved: Federal Funds Involved	Projects Approved: Total Funds Involved	Projects Approved: Miles Involved	To Nov. 30, 1917: Project Agreements	To Nov. 30, 1917: Plans, Specifications, Estimates Submitted
Alabama	28	22	$235,012 91	$482,022 22	145 86	8	15
Arizona	1	1	57,899 89	115,799 79	(bridge)	1	1
Arkansas	8	7	102,434 71	251,255 37	33 03	7	7
California	5	2	60,827 20	125,378 06	6 78	2	2
Colorado	7	5	100,982.20	215,426.33	80.53	..	1
Connecticut	2(a)	2	78,400 00	217,969 29	7.8	1	1
Florida	2	2	32,500 00	92,220 60	14 43	..	1
Georgia	5	5	167,798 93	336,545 84	124 03	..	..
Idaho	1	1	75,000 00	190,410 00	57 0	..	..
Iowa	8	4	82,512.60	251,760 88	52.07	1	1
Kentucky	2	1	67,593 82	135,187 65	8 13	..	..
Louisiana	7	5	140,924 02	410,197 49	77 48	..	4
Maine	3(a)	2	158,063 53	335,822 94	15 53	1	1
Maryland	4	4	93,050 21	202,436 98	9 66	3	4
Massachusetts	6	6	114,390.36	257,253.74	12.44	3	5
Michigan	7	5	293,419 75	586,839 50	83 94	1	3
Minnesota	14	13	365,840 52	753,919 36	252 01	2	5
Mississippi	7	5	85,164 28	197,211 46	77 0	..	..
Missouri	3	3	62,556 33	250,225 34	39 7	..	..
Nebraska	2	1	17,847.50	204,683 05	5.5	..	..
Nevada	4	...	...	...	...	..	..
New Hampshire	8	8	58,668 91	117,337 84	12 24	3	6
New Jersey	1	1	59,212 68	164,988 01	9.7	..	..
New Mexico	11	1	5,287 99	10,575 99	3 0	..	..
New York	5	4	227,843 55	455,687.10	22 87	..	..
North Carolina	14	12	93,500 00	286,400 87	96 12	3	3
North Dakota	2	2	13,612 50	27,225 00	32 0	..	..
Ohio	7	7	382,073 00	1,229,579 28	39 01	2	7
Oklahoma	1	1	50,029 37	100,058 75	25 0	..	..
Oregon	4	1	19,032.75	38,065 50	4.8	..	..
Pennsylvania	7	4	195,750 00	528,432 45	19 58	4	4
Rhode Island	1	1	34,997 13	85,444 16	3 66	1	1
South Carolina	5	5	134,610 37	284,229 02	27.06	..	3
Texas	6	...	...	...	...	..	..
Utah	1	1	38,700 00	77,400 00	45 0	..	..
Vermont	9	9	52,442 58	104,885 19	12 56	..	1
Virginia	4	4	57,976 39	133,053 38	19 42	3	3
Washington	7	7	215,652 72	460,843 36	39 94	2	6
West Virginia	1	1	9,246.48	30,912.29	2.53	..	1
Wisconsin	3	...	...	...	...	..	2
Wyoming	5	3	11,287.67	22,575.32	28.72	..	..
	228	168	$4,052,142 85	$9,770,179 40	1,546 12	48	88

(a) Connecticut Project No. 2 and Maine Project No. 2 withdrawn after approval.

Intense Study of Highways Forced by Circumstances

Greater Need of Coöperation in Experimental Work—Changes Induced by Heavier and Speedier Traffic Outlined—Several New Types Described

CONSERVATIVE people may question the need for many of the recent changes in the design and construction of highways. It is even a frequent reproach to highway engineers that they waste good money in futile experiments, yet the roads that exist today afford only too great evidence of the need of improvements that can come only through change, says H. E. Breed, First Deputy Highway Commissioner, New York State, in a paper read before the annual meeting of the American Association of State Highway Officials, from which the following has been condensed.

There are legitimate reasons why so many changes are being made: In the first place, engineers are thinking along different lines. Different experiences and different conditions of soil, climate, weight and density of traffic have to be met. In large measure, each man has had to learn through his own experience, and in this process has often repeated mistakes of others, which might have been easily avoided if there had been a more thorough interchange of information. Lack of this results in much duplication of experiments with the consequent waste of money. One of the great values of such an assembly as this is the interchange of ideas which it effects and the tendency toward standardization of work which it inspires.

Second, the conditions are constantly changing, due chiefly to traffic. The increase in quantity of traffic comprises the natural increase, which each improved road brings to itself, and the further increase that it invites when it becomes a link in a completed system. Today war conditions, military needs, and the lack of adequate railroad facilities forces an even greater traffic upon the highways in many localities.

And as the quantity of traffic increased, its character also has changed. A few years ago the steel-tired horse-drawn vehicle carrying a load of approximately three tons was the greatest destructive factor. Then came the pleasure car, whose rapid movement made necessary a surface which should be dustless and possess high cohesion. Next, the motor truck of 15 to 20 tons required stronger foundations and heavier types of construction, as well as a greater integrity of surface. And now the steel-tired, as well as the rubber-tired trailers, with greater wheel loading even than the motor truck, must be considered in designing.

Heavier Foundations Needed

Such changes as seem uniformly desirable for all types of pavement are primarily those which affect public safety and commercial expediency. These are: First, depth of foundation. This new and heavier traffic has cut through and broken the old 6-in. waterbound macadam, which for years was thought adequate for all needs. The waterbound macadam roads of the French war front have shown astonishing endurance because they have had such splendid foundations. At present they are being built 2 to 3 ft. thick to enable them to carry the concentrated military traffic. This tendency to strengthen foundations can be noticed everywhere, and is unquestionably necessary under the weight and impact of modern high-speed traffic.

Second, more complete drainage. It has been found possible in many cases to render the soil so stable through proper drainage that it is able to withstand the extra loading imposed upon it. In flat country, large ditches as much as a half a mile long have sometimes been dug for this purpose—a number of miles of the Coleman-DuPont roads in Delaware are good examples of this expedient.

Third, banking of curves. Objections are raised to this growing practice on the ground that it encourages people to travel at high speed, but the banking of curves certainly makes the roads safer to the careful person driving under strange conditions. In New York State 16-ft. roads have been widened or "mooned" so that in many cases where the radius is small the actual curve is as much as 24 to 28 ft. wide. Furthermore, this gives an increased range of vision, the super-elevation makes steering easier, and the likelihood of skidding is lessened to a noticeable degree.

Fourth, split curves. Sight distances cannot be secured in some cases where the curve is sharp and dangerous. In order that the traffic might be held to its own side of the road, the curve has been separated and a curbed parking provided.

Fifth, approaches to bridges, to grade crossings, and at intersections. If the grade crossing of a railroad is above the roadway proper, it is safer if the roadway be carried out level for 25 ft. or more on each side of the track, so that it may not be necessary to change gears in so dangerous a place. Bridge approaches should have a level stretch of road before the bridge floor is reached, and this should be as long as is economically possible. Street intersections also should be approached as nearly on the level as is possible. Greater safety is secured by cutting the corners to a longer radius.

Sixth, danger signs. To accomplish their purpose, and not be in themselves a danger, these signs should be visible day and night, and should be placed at standard distances from the conditions to which they call attention. There has been a tendency to a more frequent use of guide signs, which in all cases should be large and legible enough to be read easily at the average speed of travel.

In what I have said above, I have interpreted the subject assigned me rather liberally to mean the finished highway. I come now to a more literal interpretation in considering changes in design and construction of specific types of pavement.

Larger Stone For Waterbound Macadam

There has been a general tendency to increase the size of the stone in waterbound macadam, bituminous macadam, penetration method and concrete pavements, from 1½ in. to 2½ in. A larger amount of the product of the crusher is made available, thereby cheapening the cost

of the top coarse stone as well as producing a better surface containing more stone, and having less tendency toward raveling.

A method used during the past few years in the construction of waterbound macadam has been to form the last puddle with light cold tar, or light cold oil. This has the advantage of strengthening the surface bond, as well as making the road dustless. Maryland has some of this class of road, and from reports it appears very satisfactory.

Another method is to treat all waterbound macadams with calcium chloride, and give it a surface treatment of light cold tar, or light cold oil. All work that has been properly puddled and bound, and has been opened to traffic for three to six months, should be swept clean, given a surface application of bituminous material, and covered lightly with stone chips or coarse sand. This forms a mat or cushion on the surface, preventing it from disintegration or raveling. Those parts of the surface that are not seasoned enough to receive the bituminous material should be treated with 1½ lb. of calcium chloride per yard. Later, if necessary, a second application of 1 lb. per sq.yd. should be applied. This will maintain the integrity of the surface until the following year, when the surface can be treated with tar or oil under maintenance.

Vary Methods on Tar and Asphalt

Until the last three years the penetration type of bituminous macadam was built in many cases under practically the same specifications whether asphalt or tar was used, even though asphalt generally stays near the surface, bleeding up in warm weather, while tar has a tendency to work down, leaving no material to prevent surface disintegration. One experiment made to avoid this consequence was made on a road built by the writer. After the proper thickness of stone had been spread it was lightly rolled once to shape it. It was then filled with No. 1 and No. 2 stone in an amount just sufficient to fill the void. The top course was rolled again after which the tar, heated to a temperature of between 200 and 300 deg. F., was applied. The amount of tar for this application approximated 1¾ gal. per sq.yd. for a compacted top course 3 in. thick. The surface was immediately covered with a layer of clean No. 1 and No. 2 broken stone mixed, after which it was again rolled and additional No. 1 and No. 2 broken stone applied and broomed into the voids until the No. 3 or top course was entirely filled. After this was done, all loose stone was swept from the surface and a seal coat of approximately ¾ gal. of tar per sq.yd. was applied. The road was immediately covered with No. 1 broken stone which was spread and broomed, and again rolled. The rolling was continued and additional No. 1 stone added until a smooth, uniform, and thoroughly compacted surface was produced. The first road on which this was tried is now two years old and has been under average heavy traffic. The results are exceptionally good, so that all of our penetration work done with tar will be constructed according to the same specifications.

Another good method of lower first cost where the local stone is not of good enough quality for top surfacing, is to place a veneer top of 1 in. trap rock, or some other stone of high quality, on the ordinary top course after the first pour of bituminous material is completed This course should be from ¾ in. to 1 in. thick and poured and finished with the usual squeegee course.

There have been two changes in the mixed surface type of bituminous macadam recently. Where there is to be a large amount of motor traffic less asphalt is used because of the large amount of oil dropped over the pavement by motor vehicles. Another method which has been used to some extent is that of rolling hot stone varying in size from ½ in. to ¾ in. into the surface of a Topeka pavement.

Belt Finish for Concrete

In finishing concrete pavement surfaces the belt has largely taken the place of floating and also of the finishing machine. It is cheaper than either of the other methods and at the same time gives a good, smooth, easy riding surface. The advocates of the roller method claim that, on account of the importance of a proper water content, the roller, if properly used, will not only give a good finish but also greater strength, taking out the excess water and result in a satisfactorily stiff mixture which it is impossible to use in most concrete road construction.

A tendency in brick surfacing that, from an economic standpoint has many advantages, is the use of 3½- or 3-in. brick in place of the ordinary 4-in. paver. In the use of the 3-in. brick there is a saving of ¼ in the freight charges and a consequent saving in handling. This type of work in a number of instances has given every indication of being satisfactory. Some work under consideration may use 2½-in. and even 2-in. brick, and if successful the resulting economies will make brick pavements feasible in many localities where now they are uneconomical.

In even this cursory review of recent changes I cannot conclude without reference to the development of laboratory work in relation to road surfacing. There should be laboratory control in connection with every piece of highway work. To insure good work all materials should be up to a standard which has proven its adequacy in service. Field tests by men in charge of the work should be made in parallel with laboratory tests to keep a constant check upon the materials going into the work.

As a matter of cost it may not be entirely practical for every department in its early stages of development to have a fully equipped laboratory, but if there is a sufficient demand for laboratory work, the commercial laboratory in existence would certainly be willing to equip themselves to render this service at a nominal charge. This would stabilize all work, and the amount expended would be the cheapest kind of insurances.

Ownership of Austin Water-Supply Springs

In the article entitled "Water-Supply 'Gift' May Prove Expensive to Austin," in *Engineering News-Record* of Dec. 6, p. 1056, it was stated that the springs mentioned in the article "are owned by a defeated candidate for the office of mayor of Austin." This should have read that the "springs are owned by a party who is very much opposed to the present city administration—so much so, in fact, that at the last election he got out candidates in opposition to the present incumbents."

Chicago Reinforced-Concrete Flat-Slab Ruling Amended

New Ordinance Changes Certain Features in Standard Method of Figuring Girderless Floors—Comment on Ruling by Building Department Engineer

THREE years ago, on Aug. 18, 1914, the commissioner of buildings of Chicago signed a ruling on the design of the reinforced-concrete flat-slab floor, which has been most widely used under the name of the "Chicago Ruling" as a standard method of computing for this type of construction. In the three years of its use the need for some modifications, mainly in form or in enlargement of scope, has become apparent, so the Department of Buildings has now revised the ruling to include the later information. The new ruling. issued by Charles Bostrom, commissioner of buildings, is to become effective Jan. 1, 1918. It is printed in full herewith, followed by an explanation of the revisions, by John Krippner, bridge and structural engineer in the Building Department. The first ruling was printed in *Engineering News*, of Sept. 24, 1914, p. 632.

Definitions

(1) Flat slabs as understood by this ruling are reinforced-concrete slabs, supported directly on reinforced columns with or without plates or capitals at the top, the whole construction being hingeless and monolithic without any visible beams or girders. The construction may be such as to admit the use of hollow panels in the ceiling or smooth ceiling with depressed panels in the floor.

(2) The column capital shall be defined as the gradual flaring out of the top of the column without any marked offset.

(3) The drop panel shall be defined as a square or rectangular depression around the column capital extending below the slab adjacent to it.

(4) The panel length shall be defined as the distance c. to c. of columns of the side of a square panel, or the average distance c. to c. of columns of the long and short sides of a rectangular panel.

Columns

(5) The least dimension of any concrete column shall be not less than one-twelfth the panel length, nor one-twelfth the clear height of the column.

Slab Thickness

(6) The minimum total thickness of the slab in inches shall be determined by the formula: $t = W^{\frac{1}{2}}/44$ (= square root of W divided by 44), where t = total thickness of slab in inches, W = total live load and dead load in pounds on the panel, measured c. to c. of columns.

(7) In no case shall the thickness be less than $^1/_{32}$ of the panel length ($L/32$) for floors, nor $^1/_{40}$ of the panel length ($L/40$) for roofs (L being the distance c. to c. of columns).

(8) In no case shall the thickness of slab be less than 6 in. for floors or roofs.

Column Capital

(9) When used the diameter of the column capital shall be measured where its vertical thickness is at least 1½ in. and shall be at least 0.225 of the panel length.

The slope of the column capital shall nowhere make an angle with the vertical of more than 45°. Special attention shall be given to the design of the column capital in considering eccentric loads, and the effect of wind upon the structure.

Drop Panel

(10) When used, the drop panel shall be square or circular for square panels and rectangular or elliptical for oblong panels.

(11) The length of the drop shall not be less than one-third of the panel length ($L/3$) if square, and not less than one-third of the long or short side of the panel respectively, if rectangular.

(12) The depth of the drop panel shall be determined by computing it as a beam, using the negative moment over the column capital specified elsewhere in this ruling.

(13) In no case, however, shall the dimensions of the drop panel be less than required for punching shear along its perimeter, using the allowable unit shearing stresses specified below.

Shearing Stresses

(14) The allowable unit punching shear on the perimeter of the column capital shall be $^3/_{80}$ of the ultimate compressive strength of the concrete as given in section 533 of the building ordinance. The allowable unit shear on the perimeter of the drop panel shall be 0.03 of the ultimate compressive strength of the concrete. In computing shearing stress for the purpose of determining the resistance to diagonal tension the method specified by the ordinance shall be used.

Panel Strips

(15) For the purpose of establishing the bending moments and the resisting moments of a square panel, the panel shall be divided into strips known as strip A and strip B. Strip A shall include the reinforcement and slab in a width extending from the center line of the columns for a distance each side of this center line equal to one-quarter of the panel length. Strip B shall include the reinforcement and slab in the half width remaining in the center of the panel. At right angles to these strips, the panel shall be divided into similar strips A and B, having the same widths and relations to the center line of the columns as the above strips. These strips shall be for designing purposes only, and are not intended as the boundary lines of any bands of steel used.

(16) These strips shall apply to the system of reinforcement in which the reinforcing bars are placed parallel and at right angles to the center line of the columns, hereinafter known as the two-way system, and also to the system of reinforcement in which the reinforcing bars are placed parallel, at right angles to and diagonal to the center line of the columns hereinafter known as the four-way system.

(17) Any other system of reinforcement in which the reinforcing bars are placed in circular, concentric rings and radial bars, or systems with steel rods arranged in any manner whatsoever, shall comply with the requirements of either the two-way or the four-way system herein specified

Bending Moment Coefficients, Interior Panel, Two-Way System

(18) In panels where standard drops and column capitals are used as above specified, the negative bending moment, taken at a cross-section of each strip A at the edge of the column capital or over it, shall be taken as $WL/30$.

(19) The positive bending moment taken at a cross-section of each strip A midway between column centers shall be taken as $WL/60$.

(20) The positive bending moment taken at a cross-section of each strip B in the middle of the panel shall be taken as $WL/120$.

(21) The negative bending moment taken at a cross-section of each strip B on the center line of the columns shall be taken as $WL/120$.

(22) In the formulas hereinabove given W = total live and dead load on the whole panel in pounds, L = panel length, c. to c. of columns.

Bending Moment Coefficients, Interior Panel, Four-Way System

(23) In panels where standard drops and column capitals are used as above specified, the negative bending moment, taken at a cross-section of each strip A at the edge of column capital or over it, shall be taken as $WL/30$.

(24) The positive bending moment taken at a cross-section of each strip A, midway between column centers, shall be taken as $WL/80$.

(25) The positive bending moment, taken at a cross-section of each strip B, taken in the middle of the panel, shall be taken as $WL/120$.

(26) The negative bending moment, taken at a cross-section of each strip B on the center line of the columns, shall be taken as $WL/120$.

Bending Moment Coefficients, Wall Panels

(27) Where wall panels with standard drops and capitals

are carried by columns and girders built in walls, as in skeleton construction, the same coefficients shall be used as for an interior panel, except as follows: The positive bending moments on strips *A* and *B* midway between wall and first line of columns shall be increased 25 per cent.

(28) Where wall panels are carried on new brick walls, these shall be laid in portland cement mortar and shall be stiffened with pilasters as follows: If a 16-in. wall is used, it shall have a 4-in. pilaster. If a 12-in. wall is used, it shall have an 8-in. pilaster. The length of pilasters shall be not less than the diameter of the column, nor less than one-eighth of the distance between pilasters. The pilasters shall be located opposite the columns as nearly as practicable, and shall be corbeled out 4 in. at the top, starting at the level of the base of the column capital. Not less than 8-in. bearing shall be provided for the slab, the full length of wall.

The coefficients of bending moments required for these panels shall be the same as those for the interior panels except as provided herewith: The positive bending moments on strips *A* and *B* midway between the wall and first line of columns shall be increased 50 per cent.

(29) Where wall panels are supported on old brick walls, there shall be columns with standard drops and capitals built against the wall, which shall be tied to the same in an approved manner, and at least an 8-in. bearing provided for the slab, the full length. Where this is impracticable, there shall be built a beam on the underside of slab adjacent to the wall between columns, strong enough to carry 25% of the panel load.

The coefficients of bending moments for the two cases of slab support herein described shall be the same as those specified in Sec. 27 and Sec. 28 for skeleton and wall bearing condition, respectively.

(30) Nothing specified above shall be construed as applying to a case of slabs merely resting on walls or ledges, without any condition of restraint. These shall be figured as in ordinary beam-and-girder construction specified in the ordinances.

Bending Moment Coefficients, Wall and Interior Columns

(31) Wall columns in skeleton construction shall be designed to resist a bending moment of $WL/60$ at floors and WL 30 at roof. The amount of steel required for this moment shall be independent of that required to carry the direct load. It shall be placed as near the surfaces of the column as practicable on the tension sides, and the rods shall be continuous in crossing from one side to another. The length of rods below the base of the capital and above the floor line shall be sufficient to develop their strength through bond, but not less than 40 diameters, nor less than one-third the clear height between the floor line and the base of the column capital.

(32) The interior columns must be analyzed for the worst condition of unbalanced loading. It is the intention of this ruling to cover ordinary cases of eccentric loads on the columns by the requirement of Sec. 5. Where the minimum size of column therein specified is found insufficient, however, the effect of the resulting bending moment shall be properly divided between the adjoining slab and the columns above and below according to best principles of engineering, and the columns enlarged sufficiently to carry the load safely.

Bending Moment Coefficients, Panels Without Drops, or Capitals, or Both

(33) In square panels where no column capital or no depressions are used, the sum total of positive and negative bending moments shall be equal to that computed by the following formula:

$$B.M. = (WL/8)(L - 2/3 \times 4.18h)$$

where

B.M. = Numerical sum of positive and negative bending moments, regardless of algebraic signs;

W = Total live and dead load on the whole panel;

L = Length of side of a square panel, c. to c. of columns;

h = Ratio of the radius of the column or column capital to panel length, *L*.

This total bending moment shall be divided between the positive and the negative moments in the same proportion as in the typical square panels for two-way or four-way systems specified above for interior and wall panels respectively.

Point of Inflection

(34) For the purpose of making the calculations of the bending moment at the sections away from the column capital, the point of inflection shall be considered as being one-quarter the distance c. to c. of columns, both crosswise and diagonally, from the center of the column.

Tensile Stress in Steel and Compressive Stress in Concrete

(35) The tensile stress in steel and the compressive stress in the concrete to resist the bending moment shall be calculated on the basis of the reinforcement and slab in the width included in a given strip, and according to the assumptions and requirements given in sections 532-535 inclusive of the building ordinance. The steel shall be considered as being concentrated at the center of gravity of all the bands of steel in a given strip.

(36) For the four-way system of reinforcement the amount of steel to resist the negative bending moment over the support in each strip *A* shall be taken as the sum of the areas of steel in one cross band and one diagonal band. The amount of steel to resist the positive bending moment of each strip *B* shall be considered as the area of the steel in a diagonal band. The amount of steel to resist the positive bending moment in each strip *A* shall be considered as the area of the steel in a cross band, and the amount of steel to resist the negative moment in each strip *B* shall be the steel included in the width of strip *B*.

(37) For the two-way system of reinforcement the amount of steel to resist the bending moment in any strip shall be considered as the area of steel included in the width of the strip.

(38) In both systems of reinforcement the compresssive stress in the concrete in any strip shall be calculated by taking the area of steel considered for each strip and applying it in a beam formula based on the principles of section 535 of the building ordinance.

(39) Where drop panels are used, the width of beam assumed to resist the compressive stresses over the column capital shall be the width of the drop.

(40) The width of beam, where no drop panels are used, shall be the width of steel bands. Where this is found insufficient, the area shall be increased by introducing compression steel in the bottom of slab.

Rectangular Panels

(41) When the length of panel in either two-way or four-way system does not exceed the breadth by more than 5%, all computations shall be based on a square panel whose side equals the mean of the length and breadth, and the steel equally distributed among the strips according to the coefficients above specified.

(42) In no rectangular panel shall the length exceed the breadth by more than one-third of the latter.

Rectangular Panels, Four-Way System

(43) In the four-way system of reinforcement, where length exceeds breadth by more than 5%, the amount of steel required in strip *A*, long direction, both positive and negative, shall be the same as that required for the same strip in a square panel whose length is equal to the long side of the rectangular panel.

(44) The amount of steel, strip *A*, short direction, positive and negative, shall be the same as that required for the same strip in a square panel, whose length is equal to the short side of the rectangular panel.

(45) The amount of steel in strip *B*, positive and negative, shall be the same as that required for similar strip in a square panel whose length is equal to the mean of the long and the short side of the rectangular panel.

(46) In no case shall the amount of steel in the short side be less than two-thirds of that required for the long side.

Rectangular Panels, Two-Way System

(47) In the two-way system of reinforcement the amount of steel required for the positive and the negative moment of each strip *A* shall be determined in the same manner as indicated for the four-way system above.

(48) The amount of steel in strip *B*, positive and negative, running in short direction, shall be equal to that required for the same strip in a square panel whose length equals the long side of the rectangular panel.

(49) The amount of steel in strip *B*, long direction, positive and negative, shall be equal to that required for the same strip in a square panel, whose length equals the short side of the rectangular panel.

(50) In no case shall the amount of steel in strip *B*, long direction, be less than two-thirds of that in the short direction.

Walls and Openings

(51) Girders and beams shall be constructed under walls, around openings and to carry concentrated loads.

REQUIREMENTS OF DIFFERENT BUILDING REGULATIONS AND AUTHORITIES REGARDING GIRDERLESS CONCRETE FLOOR CONSTRUCTION

For Typical Interior—Square Panel Only

Name of City or Authority	Min. Size of Col.	Slab Thickness	Column Capital	Drop Panel	Bend Mom. Coefficients 2-Way System: Strip A +	Strip A −	Strip B +	Strip B −	Bend Mom. Coefficients 4-Way System: Strip A +	Strip A −	Strip B +	Strip B −	Σ B.M. Pos. and Neg. Less Panel 2-Way	Σ B.M. Pos. and Neg. Less Panel 4-Way	Ratio of Pos. B.M. 2-Way	Ratio of Pos. B.M. 4-Way	Theoretical Total B.M.	Bend Mom. on Wall-Col.
Joint Committee		$\frac{L}{32}$ or $\frac{W^{\frac{2}{3}}}{50}$ +1″	$\frac{L}{5}$	$\frac{L}{2.5}$	$\frac{WL}{55.5}$	$\frac{WL}{25}$	$\frac{WL}{133}$	$\frac{WL}{100}$	$\frac{WL}{55.5}$	$\frac{WL}{25}$	$\frac{WL}{133}$	$\frac{WL}{100}$	$\frac{WL}{6.62}$	$\frac{WL}{6.62}$	1:2	1:2	$\frac{WL}{7.05}$	
Am. Concrete Inst.		$\frac{L}{32}$ or $\frac{W^{\frac{2}{3}}}{50}$ +1″	$\frac{L^*}{5}$	$\frac{L}{3.33}$	$\frac{WL}{82.2}$	$\frac{WL}{29.6}$	$\frac{WL}{123}$	$\frac{WL}{148}$	$\frac{WL}{82.2}$	$\frac{WL}{29.6}$	$\frac{WL}{123}$	$\frac{WL}{148}$	$\frac{WL}{8.2}$	$\frac{WL}{8.2}$	1:2	1:2	$\frac{WL}{7.05}$	
Taylor & Thompson		$\frac{L}{34}$ or $\frac{W^{\frac{1}{2}}}{43.5}$	$\frac{L}{4.44}$	$\frac{L}{2.5}$	$\frac{WL}{69.3}$	$\frac{WL}{27.7}$	$\frac{WL}{104}$	$\frac{WL}{157}$	$\frac{WL}{69.3}$	$\frac{WL}{27.7}$	$\frac{WL}{104}$	$\frac{WL}{157}$	$\frac{WL}{7.53}$	$\frac{WL}{7.53}$	1:1½	1:1½	$\frac{WL}{7.36}$	
Indianapolis		$\frac{L}{30}$	$\frac{L}{4.44}$		$\frac{WL}{120}$	$\frac{WL}{30}$	$\frac{WL}{120}$		$\frac{WL}{120}$	$\frac{WL}{30}$	$\frac{WL}{120}$		$\frac{WL}{10}$	$\frac{WL}{10}$	1:2	1:2	$\frac{WL}{7.36}$	
Chicago	$\frac{L}{12}$	$\frac{L}{32}$ 6″ or $\frac{W^{\frac{1}{2}}}{44}$	$\frac{L}{4.44}$	$\frac{L}{3}$	$\frac{WL}{60}$	$\frac{WL}{30}$	$\frac{WL}{120}$	$\frac{WL}{120}$	$\frac{WL}{80}$	$\frac{WL}{30}$	$\frac{WL}{120}$	$\frac{WL}{120}$	$\frac{WL}{7.5}$	$\frac{WL}{8}$	3.5	1:2	$\frac{WL}{7.36}$	$\frac{WL}{60}$
Detroit		$\frac{L}{32}$	$\frac{L}{4.44}$	$\frac{L}{2.67}$	$\frac{WL}{62}$	$\frac{WL}{30.5}$	$\frac{WL}{116}$	$\frac{WL}{116}$	$\frac{WL}{100}$	$\frac{WL}{50}$	$\frac{WL}{100}$		$\frac{WL}{7.6}$	$\frac{WL}{9.4}$	3:5	3:5	$\frac{WL}{7.36}$	
Philadelphia			$\frac{L}{5}$	$\frac{L}{2.63}$	$\frac{WL}{77.5}$	$\frac{WL}{31}$	$\frac{WL}{124}$	$\frac{WL}{124}$	$\frac{WL}{94}$	$\frac{WL}{28.4}$	$\frac{WL}{144}$	$\frac{WL}{155}$	$\frac{WL}{8.15}$	$\frac{WL}{8.43}$	10.19	1:2†	$\frac{WL}{7.05}$	$\frac{WL}{77.5}$
St. Louis	$\frac{L}{15}$	$\frac{L}{32}$ 6″ or $\frac{W^{\frac{1}{3}}}{40}$			$\frac{WL}{66.7}$	$\frac{WL}{33.3}$	$\frac{WL}{133.3}$	$\frac{WL}{133.3}$	$\frac{WL}{100}$	$\frac{WL}{50}$	$\frac{WL}{100}$	$\frac{WL}{100}$	$\frac{WL}{8.33}$	$\frac{WL}{10}$	3:5	2:3		
Pittsburgh			$\frac{L^*}{4.44}$		$\frac{WL}{64}$	$\frac{WL}{29.5}$	$\frac{WL}{64}$		$\frac{WL}{64}$	$\frac{WL}{29.5}$	$\frac{WL}{64}$		$\frac{WL}{7.7}$	$\frac{WL}{7.7}$	10:11	10:11	$\frac{WL}{7.36}$	
Cincinnati	$\frac{L}{12}$	6″ or $\frac{L}{32}$	$\frac{L}{4.44}$	$\frac{L}{3.33}$	$\frac{WL}{60}$	$\frac{WL}{30}$	$\frac{WL}{120}$	$\frac{WL}{120}$	$\frac{WL}{80}$	$\frac{WL}{30}$	$\frac{WL}{120}$	$\frac{WL}{120}$	$\frac{WL}{7.5}$	$\frac{WL}{8}$	3:5	1:2	$\frac{WL}{7.36}$	$\frac{WL}{75}$

* Assumed special case. † According to formula given in ruling.
NOTE:—"W" = Total live and dead load on panel. "L" = Length of square panel, c. to c. of columns.

Spandrel Beams

(52) The spandrel beams or girders shall, in addition to their own weight and the weight of the spandrel wall, be assumed to carry 20% of the wall panel load uniformly distributed upon them.

Placing of Steel

(53) In order that the slab bars shall be maintained in the position shown in the design during the work of pouring the slab, spacers and supports shall be provided satisfactory to the Commissioner of Buildings. All bars shall be secured in place at intersections by wire or other metal fastenings. In no case shall the spacing of the bars exceed 9 in. The steel to resist the negative moment in each strip *B* shall extend one-quarter of the panel length beyond the center line of the columns in both directions.

(54) Splices in bars may be made wherever convenient, but preferably at points of minimum stress. The length of splice beyond the center point, in each direction, shall not be less than 40 diameters of the bars, nor less than 2 ft. The splicing of adjacent bars shall be avoided as far as possible.

(55) Slab bars which are lapped over the column, the sectional area of both being included in the calculations for negative moment, shall extend not less than 0.25 of the panel length for cross bands and 0.35 of the panel length for diagonal bands, beyond the column center.

Computations

(56) Complete computations of interior and wall panels and such other portions of the building as may be required by the Commissioner of Buildings shall be left in the office of the Commissioner of Buildings when plans are presented for approval.

Test of Workmanship

(57) The Commissioner of Buildings or his representative may choose any two adjacent panels in the building for the purpose of ascertaining the character of workmanship. The test shall not be made sooner than the time required for the cement to set thoroughly, nor less than six weeks after the concrete had been poured.

(58) All deflections under test load shall be taken at the center of the slab, and shall be measured from the normal unloaded position of the slab. The two panels selected shall be uniformly loaded over their entire area with a load equal to the dead load plus twice the live load, thus obtaining twice the total design load. The load shall remain in place not less than 24 hours. If the total deflection in the center of the panel under the test load does not exceed $^1/_{300}$ of the panel length, the slab may be placarded to carry the full design live load. If it exceeds this amount of deflection, and recovers not less than 80% of the total deflection within seven days after the load is removed, the slab may be placarded to carry the full design live load. If the deflection exceeds the allowable amount above specified, and the recovery is less than 80% in seven days after the removal of the test load, other tests shall be made on the same or other panels, the results of which will determine the amount of live load the slabs will be permitted to carry.

General

(59) The design and the execution of the work shall conform to the general provisions and the spirit of the Chicago Building Ordinances in points not covered by this Ruling and to the best engineering practice in general.

Enforcement

(60) This Ruling shall go into effect on and after Jan. 1, 1918. All previous rulings on flat slabs are hereby rescinded.

Why the Chicago Flat-Slab Ruling Was Revised

By John Krippner

Bridge and Structural Engineer, Department of Buildings, City of Chicago

THIS revised flat-slab ruling for the city of Chicago has been issued with the intention of making it more general in scope, more simple and more accessible to the engineers less familiar with this kind of construction, as well as with a view to improving on some of the details and remedying minor omissions to which attention has been drawn.

It has been thought advisable to express the bending moments in terms of *W*, the total live and dead load on the panel in pounds, and *L*, the length of a side of a square panel, in feet, as these two terms are mostly used in the design.

The old formula for the thickness of slab, $t = 0.023L\sqrt{w}$ has been retained, though somewhat changed for the following reason: In the new formula, $t = W^{\frac{1}{2}}/44$, in which $W = wL^2$ of the old, which upon eliminating *w* and *L*, takes on the new form, which is more readily applied. The formula, though empirical, is based upon actual experience and has given satisfactory results heretofore, as attested by a large number of load tests upon finished structures.

The minimum length of drop panel is specified as $L/3$, which is based upon a line of reasoning, shown in Fig. 2, which with a parabolic distribution of bending moment due to uniform load assumes that the drop must extend to the point where the bending moment is

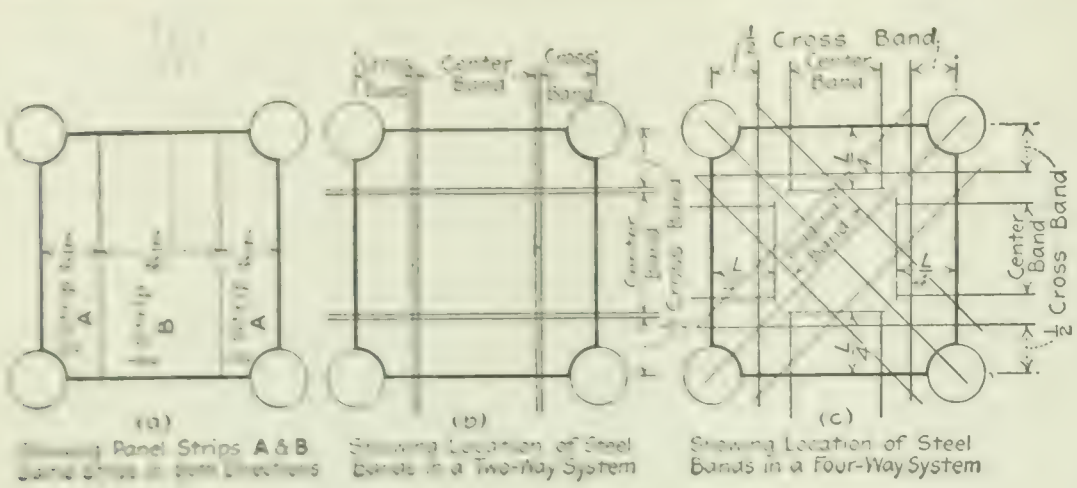


FIG. 1. DISTRIBUTION OF PANELS FOR CHICAGO METHOD OF COMPUTING FLAT SLABS

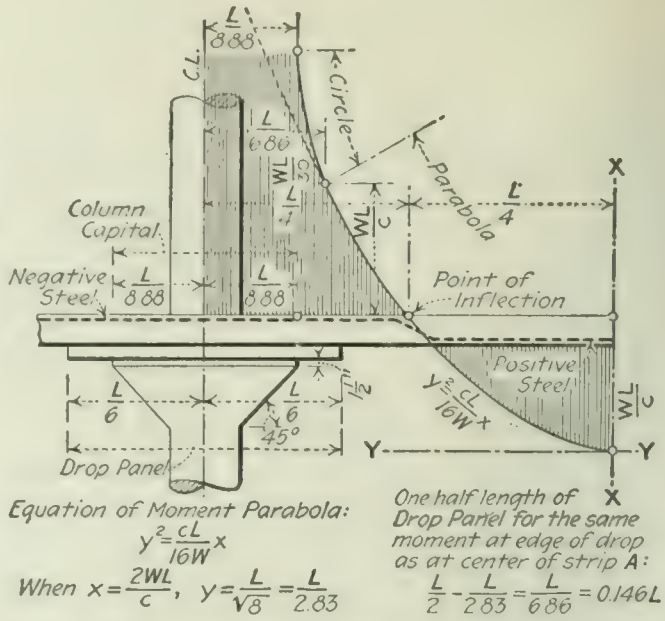


FIG. 2. BENDING MOMENTS IN TYPICAL FLAT-SLAB PANEL

opposite in sign but equal to the bending moment at the middle of the slab, which is the maximum moment for which the slab is designed. This condition gives the theoretical length of drop as $0.292L$. For the most common live loads used, up to 300 lb. per sq.ft., the specified length will be found sufficient, but for heavier loads the punching shear stresses will be found to govern.

The depth of the drop is altogether dependent upon the shearing stresses at the edge of the capital and upon the beam action of the slab, as well as the requirements of light and clearance, which will vary according to the judgment of the designers.

In Fig. 1a are shown the panel strips A and B into which the standard panel is divided for the purpose of establishing the various bending moments on the panel. Figs. 1b and 1c indicate the location of steel bands designed to resist these bending moments.

The derivation of the general formula for the total bending moment to be used in designing the panels without drops or capitals is based upon a method discussed in *Engineering Record*, June 27, 1914, p. 731; July 25, 1914, p. 116, and Aug. 21, 1914, p. 258.

For the present use two calculus derivations have reached the same concluding formula. In one the total moment is derived by a summation of the moments of differential triangles extending out from the column center; in the other by a summation of the moments of concentric rings in the same panel.

While this formula is based upon purely statical methods of slab analysis, it gives the maximum possible sum of the applied bending moments acting upon a square panel. The distribution of this total between the positive and the negative moments resisting the applied moments depends, more or less, upon the rigidity of the slab and the column capital, as well as upon the interaction of the elementary particles in the slab, the sum of all of which together may be less, but cannot exceed the limit given by the formula. It has been thought sufficiently accurate to specify this distribution of positive and negative moments in the ratio of 1:2 and 3:5 in the four-way and the two-way types, respectively, a conclusion which is well borne out by theory as well as practice.

In the accompanying table is given a comparison of the various requirements of different authorities and building codes as regards the flat-slab construction, and it is interesting to note how the results, which have been obtained by more or less independent investigations, agree with the Chicago ruling and the theory of flat slab herein given. Minneapolis uses the old Chicago Ruling; Baltimore, the same as Philadelphia and Washington and Boston, the same as the Joint Committee. Other interesting conclusions may be drawn from the study of this table, one being the fact that the Joint Committee report recommends a sum of bending moments which is greater than that given by the theoretical formula.

Fig. 3 shows a tentative arrangement of steel required to resist the applied bending moment upon the wall column at roof and floor line. The bending moment on wall column has been specified $WL/60$ so as to balance the negative moment on strip A, which equals $WL/30$ on an interior panel. Since this moment must be resisted by one column above and one below the floor

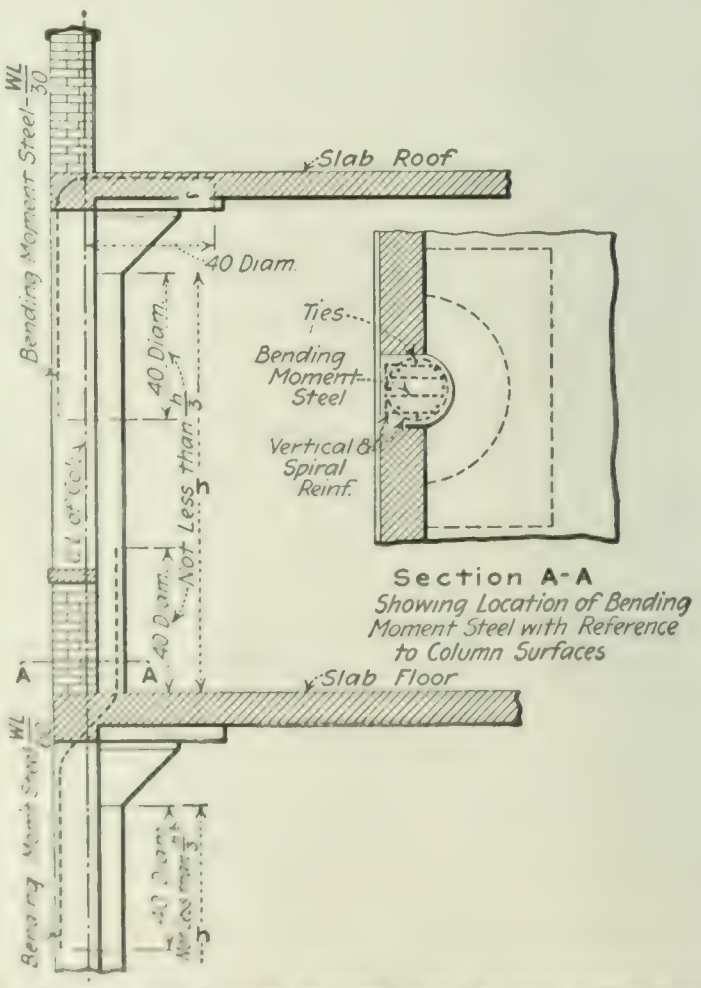


FIG. 3. LOCATION AND LENGTH OF REINFORCEMENT ON WALL COLUMNS BY CHICAGO RULING

line, the moment on each will be only one-half the total. For similar reasons the applied moment on roof column will be $WL/30$, as there is only one column to resist it.

As regards the distribution of bending moments in rectangular panels the principle of the inverse ratio of the cubes of the lengths has been adhered to. For, as in the old ruling it was specified that computations be based on an assumed square panel whose length of side is equal to the mean length and breadth of the rectangular panel, and further that the amount of steel thus found for strip A, long direction, be multiplied by the cube of the ratio of the long side of the rectangular panel to the side of assumed square panel, the same result is obtained as follows:

Let w = Dead and live load per square foot.
L_l = Long side of the rectangular panel.
L_s = Short side of the rectangular panel.
W_l = Total load on a square panel, whose side equals L_l.

Then the bending moment on strip A of the assumed square panel is equal to

$$M_{SA} = w\left(\frac{L_l + L_s}{2}\right)^3 \cdot c$$

where c = a constant. Now, in order to get the moment on the long strip A of the rectangular panel, this moment must be multiplied by

$$\left(\frac{L_l}{\frac{L_l + L_s}{2}}\right)^3, \text{ or } M_{RA} = wL_l^3 c$$

But since $W_l = wL_l^2$, $M_{RA} = W_l L_l c$, that is, the required moment, and consequently the area of steel, is the same as though the strip were located in a square panel whose side equals that of the long side of the rectangular panel.

In a similar way it may be shown that the area of steel required for short strip A is the same as though the strip were situated in a square panel, whose side equals the short side of the rectangular panel.

As regards the increase of bending moments in wall panels, it has been thought sufficient to increase only the positive moments on strips running toward the wall or wall girder, as the bending moment now being required on wall columns will tend to offset the effect of the unbalanced loading on the negative moments. The moments on wall panels resting on walls have been specified larger than on those of skeleton construction, so as to offset the difference in the restraint upon the slab, for it was generally found in tests that wall panels merely supported on walls had a greater deflection than those monolithic with spandrel beams and columns and that both had larger deflections than the interior panels.

In general, the new ruling combines the experience of the past four years, during which period buildings and other structures were built according to the old ruling and all of which passed the load test more or less satisfactorily. In order to gain an idea of the importance of flat-slab type of construction in this city, suffice it to say that in 1916 alone there were 24 flat-slab buildings completed, representing about 39% of the value of concrete buildings of all types and about 3.9% of the aggregate value of all buildings built in that year.

Interurban Line Hauls Material for Concrete Road

Cars Spotted Along Work for Unloading—Different Aggregates Used in Two-Course Paving—Grader Scrapes Concrete

NO RAILWAY equipment was tied up last summer in hauling aggregate for the 5-mile Belleville portion of the 10-mile boulevard connecting that city with East St. Louis, Ill. A double-track electric interurban line occupying the 21-ft. central space of the 60-ft. road was utilized to deliver the materials, which were shoveled from the cars directly onto the subgrade.

Two concrete roadways with a double-track electric interurban railway between them is the arrangement adopted for this boulevard. Each roadway has a curb on the outer side, but no sidewalks are provided, as the width of the property allowance for sidewalks varies from 2½ ft. to 20 ft. The separation of vehicle traffic,



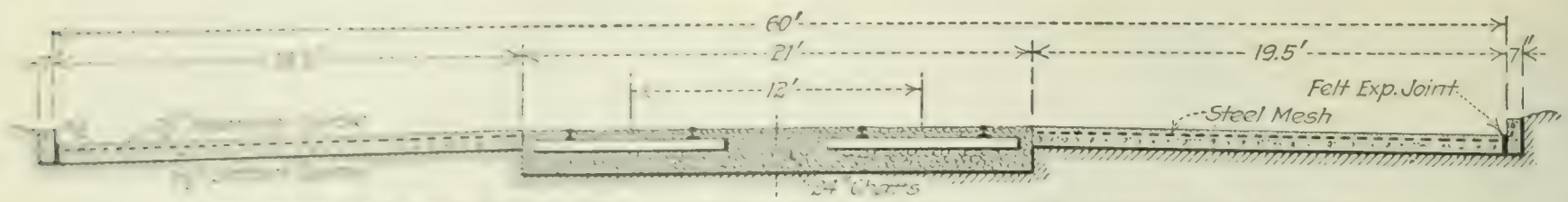
COMPLETED PORTION OF INTERURBAN BOULEVARD HAVING TWO CONCRETE ROADWAYS SEPARATED BY ELECTRIC LINE

however, by the use of two roadways for movements in opposite directions conduces to the safety of pedestrians as well as of vehicles.

After the old roadbed was graded the curbs were built on the subgrade. These are 7 x 16 in., with the top 7 in. above the gutter. The concrete for these was a 1:2½:4 mix, made with ¾-in. to 1¼-in. crushed limestone as the coarse aggregate. The curbs are made with joints 8 ft. apart. The catch-basin castings are of L-shape, with grated openings in the roadway and the face of the curb.

The 9-in. roadway paving is laid in two courses. The 6½-in. bottom course is a 1:2½:4 mix, with crushed limestone graded from ¾- to 1½-in. The 2½-in. top course is a 1:2¼ mix, the aggregate being composed of a 1 part sand and 2¼ parts crushed red granite of ¼- to ¾-in. size. On the bottom course are laid sheets of expanded-metal reinforcement. It was specified that the top should be placed not more than 40 min. after the bottom course.

Transverse expansion joints are placed 35 ft. apart, but are kept clear of alleys and cross streets. They are of the Trus-Con type, having a ½-in. strip of tarred felt 9 in. deep secured between a pair of light 2½-in.



CROSS-SECTION OF INTERURBAN BOULEVARD COMBINED WITH ELECTRIC RAILWAY

steel channels which are flush with the concrete surface. A longitudinal joint along each curb is formed by a ½-in. felt strip 9 in. deep.

One roadway was kept open to traffic while concreting was being done on the other side. The finished concrete was left for two weeks before traffic was allowed upon it, and during this time it was covered with about two inches of clay and earth as a protection against the sun. This covering was applied the day following the concreting and was kept damp. It was afterward removed by means of a road grader and team, with which one man could clean 1500 lin.ft. of 19½-ft. roadway in four hours.

The contractor worked from one to four concreting gangs, which were composed largely of negroes. For the curbing, the gang consisted of nine men with a mixer of 7 cu.ft. capacity (wet materials). For the paving, the gang consisted of about 17 to 21 men, with a ½-yd. Koehring mixer, operated by steam. A gang of 17 men could lay 315 ft. of 19½-ft. roadway in nine hours.

Concrete materials were handled in an unusual manner, owing to the existence of the double-track electric interurban line in the middle of the boulevard, and the fact that the railway operates an extensive freight traffic. The stone and sand were delivered in trains of large gondola cars hauled by electric locomotives. A stretch of one track adjacent to the paving about to be done was given up to this work train service, passenger traffic in both directions being handled temporarily on the other track. Temporary crossovers were put in at each end of this section, and car movements on the single track were controlled by operators at each end, with telephone communications and electric lamp signals.

The cars were set out or spotted by the railway at the desired spacing to afford the approximate quantities of concrete material along the work. The unloading was done by hand shoveling. Ballast for the tracks was delivered and unloaded in the same way and then shoveled into place by the railway track gangs.



CONCRETE MIXER IN PLACING THE RECENTLY LAID FOOT ROADWAY OF 84-FOOT INTERURBAN BOULEVARD

Between the two 19½-ft. driveways is a 21-ft. space for the electric line. The tracks are spaced 12 ft. c. to c. and are of ordinary construction, with T-rails on cross ties. There is no paving, but the ties are laid on a 24-in. bed of chatts (zinc-tailings), and the same material is filled in between the ties and rails. One special advantage of the material is that it is substantially dustless, even under high-speed cars. At street intersections, brick paving is laid across the track space for a width of 25 feet.

This arrangement is very convenient for the railway. It is inexpensive and requires no special construction, and it enables surfacing and track-repair work to be done without interfering with paving or street traffic. It also permits the putting in of crossovers as they are required.

This work in Belleville is known as the West Main Street improvement, and has a length of 5.33 miles within the city limits. It was begun in 1916 and completed in 1917. The paving is paid for by special assessment, and the track work was done by the East St. Louis & Suburban Ry. at its own expense. The contractors for the paving were Reeb Brothers, Belleville. The work was done under the direction of W. C. Wolf, the city engineer, and C. A. Heinzelman, the assistant city engineer.

Somewhat different construction has been adopted for the 3.67 miles within the city limits of East St. Louis. The arrangement of tracks and roadways will be the same, but the paving will be of brick on concrete and two 18-ft. sidewalks will make a total width of 96 ft. The track space is to be left unpaved (except at street intersections) for five years, but crushed stone will be filled in level with the roadways.

The assessments for this work have been confirmed by the court, but during the time occupied by the legal proceedings the prices of materials have increased to such an extent that the cost will be far in excess of the estimate. As the assessments will not cover the increased cost, the construction is necessarily postponed. This part of the work is under the direction of E. E. Harper, city engineer of East St. Louis.

Illinois Cities Favor Waterways

Representatives of 33 Illinois cities at a Waterway Conference held in Peoria, Nov. 27, adopted a resolution in favor of completing a navigable waterway between Lake Michigan and the Illinois River. The resolution favored the plan provided for in the act passed by the legislature in July, 1915, and urged the enforcement of this law, as consideration of other plans at this time would require new legislation and further action by the War Department. Governor Lowden was requested to ask the U. S. Government to coöperate by improving that part of the waterway over which it has jurisdiction.

Camp Warehouses Are Largely of Plank Construction

One-Story Five-Acre Timber Buildings with Concrete Floors Have Driveways and Railway Tracks—Tanks and Sprinklers for Fire Protection

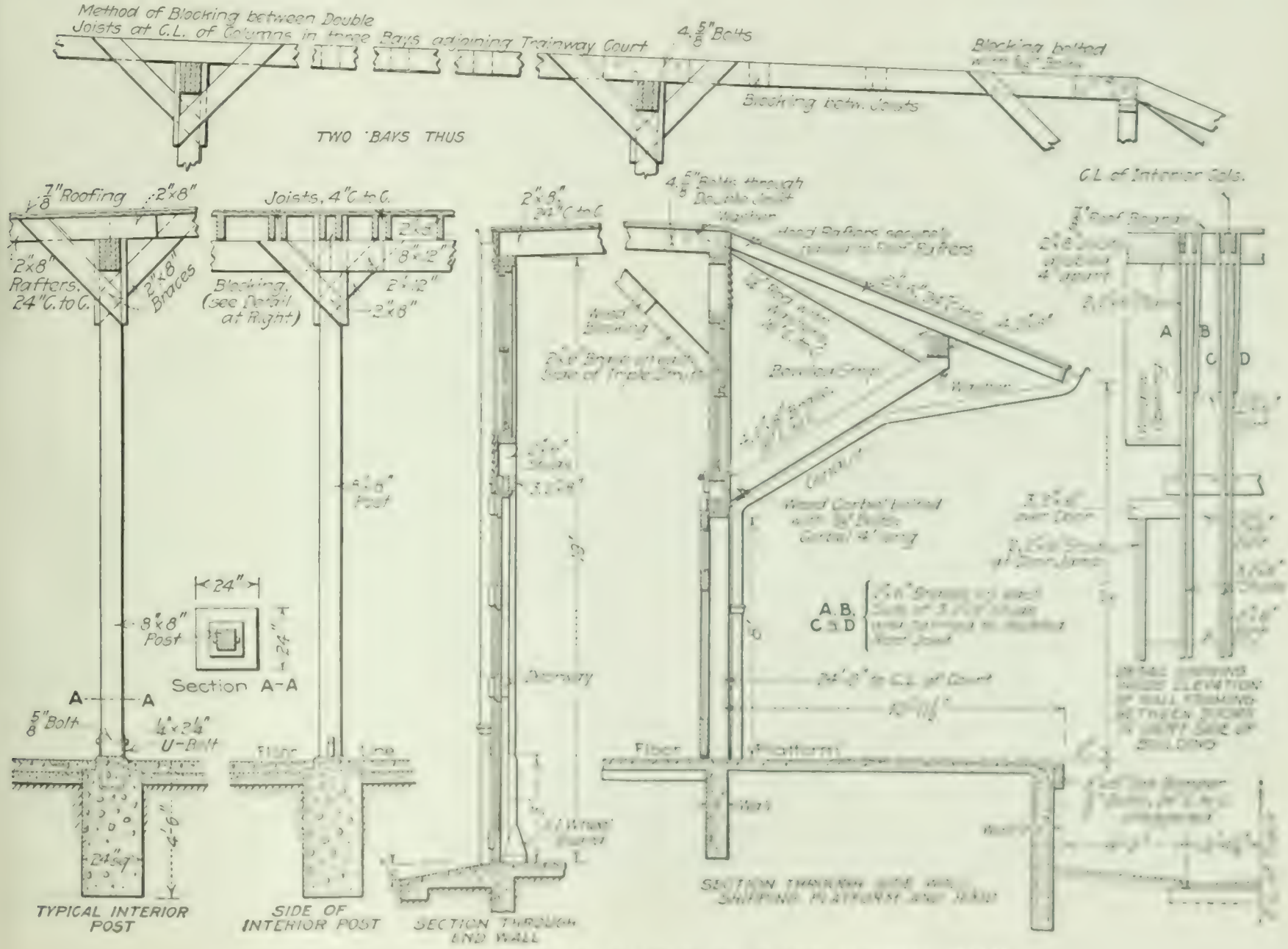
BUILT-UP structural members are used extensively in the frame warehouses at the U. S. Signal Corps camp near Middletown, Penn., which are typical of similar structures to be built at several other army camps. The reason for using such members in place of solid timbers is the greater ease and rapidity of assembling and erection.

The building is a one-story structure, U-shaped in plan, 832 ft. long over all. The two legs or sheds are each 112 ft. wide and are connected at one end by a structure of the same width. The height of each shed is 16 ft. at the sides and 18 ft. at the center. In the 48-ft. court are two stub-tracks spaced 13 ft. c. to c. and two 11-ft. platforms, the latter connected at the inner end. The floors and platforms are of concrete, and concrete walls extending to the floor level carry the outer walls of the building. The interior columns rest upon concrete pedestals.

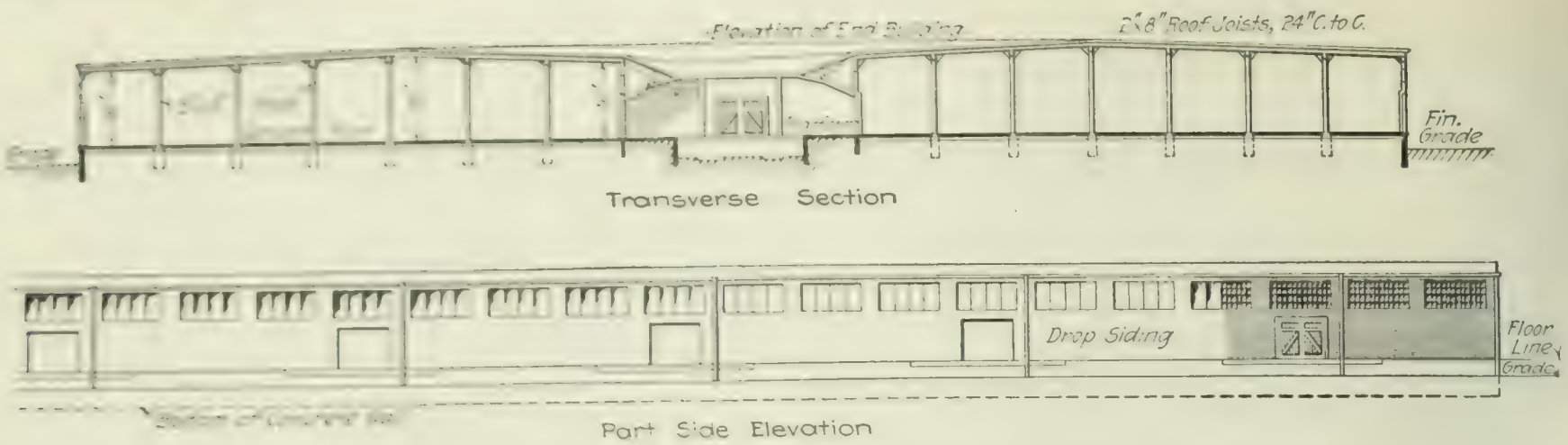
Plank construction is used almost exclusively, beams and other large members being built up of planks, and the posts being the only large solid timbers. The posts, spaced 16 ft. in both directions, are 8 x 8 in. except that those in the end walls are 6 x 8 in. These carry longitudinal girders 8 x 12 in., built up of four 2-in. planks, and formed in lengths of 16 ft. Across these are the plank rafters or roof joists, spaced 2 ft. c. to c.; these are doubled over the posts. Upon the rafters is the sheathing of ⅞-in. plank, laid longitudinally and covered with composition roofing.

Rigidity of the structure is insured by securely attaching the posts to the foundations and the roof framing. Each post is anchored to its pedestal by a U-shaped stirrup, having its sides bolted to the post and its lower portion embedded in the concrete. At the head of the post, kneebraces are provided in both directions, two braces connecting the post with the longitudinal girder and the others connecting it with the transverse roof joists. Single kneebraces at 16-ft. spacing connect the wall posts with the rafters. Additional kneebraces are used along the walls next to the railway siding to resist the thrust of the canopy roof over the loading platforms. The studs in this side wall and the roof joists in the first bay on this side are doubled for the same purpose.

The canopy roof is carried by inclined braces framed against corbels on the wall posts, and each having its



THIS CAMP WAREHOUSE IS MAINLY OF PLANK CONSTRUCTION



STRUCTURAL DETAILS OF TIMBER WAREHOUSE FOR ARMY CAMPS

outer end held by a tie-rod anchored to the double joists of the roof. Upon these braces rests a longitudinal girder built up of four 2 x 8-in. planks, and having a wedge-shaped strip to support the ends of the rafters. These are spaced 24 in. c. to c., and have their upper ends spiked to the roof rafters. The canopy has a sheathing of 1-in. plank covered with composition roofing.

The walls have studding of pairs of planks, spaced 24 in. c. to c., and carrying a wall-plate upon which the roof rafters rest. The studs on either side of each doorway carry a built-up lintel. The outer covering is a single course of drop siding spiked to the studs.

Doorways 10 x 8 ft., spaced 32 ft. and 64 ft. c. to c. are placed in the side walls. These are fitted with sliding doors carried by barn-door hangers running on a bar attached to the inside of the lintel. Between and over the doorways there are large window openings. The upper windows have stationary sash, but with one pivoted sash in each bay for ventilation. The pivoted sash are connected and operated in groups. The door transoms are pivoted. For the offices, the windows have vertically sliding sash and are covered with wire screens. The exterior of the walls is given two coats of paint.

Around the building extends a 40-ft. concrete driveway, having a high wire-mesh fence on the outer side. The fencing is attached to 3½-in. iron posts, 10 ft. apart, and triangular caps on these carry lines of barbed wire forming a ridge that effectually prevents fence climbing. Entrances to the driveways and track space are fitted with steel-frame gates covered with wire mesh and topped with barbed wire. The driveway is dished or concave, and drains to cesspools having sewer connections.

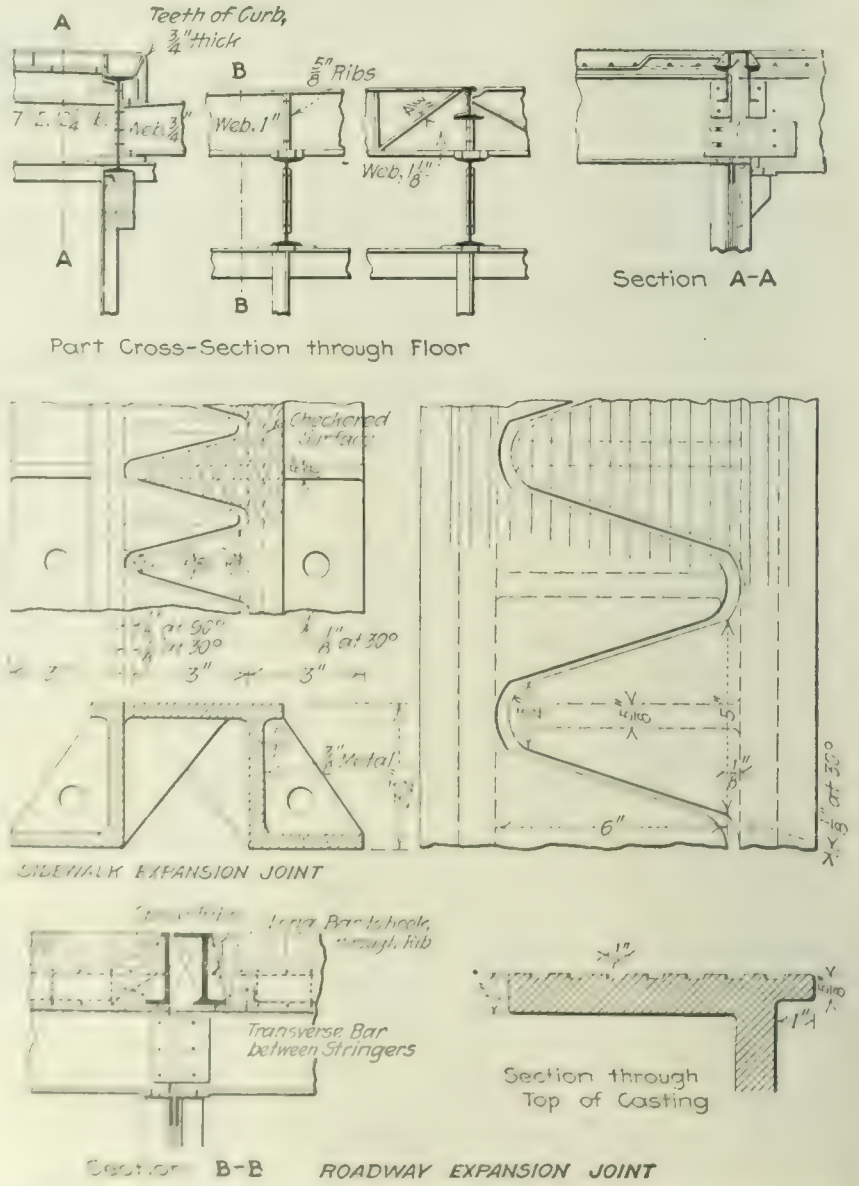
For fire protection the Middletown warehouse has a 75,000-gal. steel tank on a 75-ft. tower, with an 8-in. connection to the city water mains. An 8-in. main extends under each side driveway, the two being connected by cross-lines of the same size. Laterals of 6-in. pipe serve hydrants inside the building.

Yellow-pine is used for these warehouses, and the assumed maximum fiber stress for this is 1800 lb. per sq.in. The assumed live-load on the roof and canopy is 25 lb. per sq.ft. In the hangars at the aviation camps, provision is made for suspending the aëroplanes from the 65-ft. roof trusses, described in *Engineering News-Record* of Sept. 6, p. 447, and in such case the trusses are designed to carry an additional load of 2000 pounds.

These warehouse buildings were designed by Albert Kahn, architect, Detroit, and the plans were made so complete as to framing and details that they furnished sufficient information for the cutting and assembling of the lumber. The warehouses at Middletown were built under the direction of R. H. Hinman, construction superintendent for the U. S. Signal Corps. The contractor was James L. Stuart, Pittsburgh. It required about 60 days to erect the buildings complete.

Successful Roadway Expansion Joint on Cleveland Bridges

THE numerous troubles experienced with roadway expansion joints on bridges have been eliminated on some of the city bridges of Cleveland, Ohio, by the



SAWTOOTH EXPANSION JOINT USED ON CLARK AVENUE VIADUCT, CLEVELAND

use of a non-overlapping expansion joint in which the gap at the joint is of sawtooth form. It is illustrated in the accompanying drawing. The body of each half of the joint is a ribbed pavement-curb casting having the full depth of the pavement—in the case shown 15 in. A triangular rib supports each one of the sawteeth. The upper surface is grooved transversely or—as in the case of the sidewalk joint—is checkered.

This joint gives a roadway surface free from all bumps or gaps. Trouble from dirt packing in the joint is avoided. In a year or more of use of these joints on the Clark Ave. viaduct there has been no complaint from users, but on the other hand much favorable comment, while the use of other forms of joint on other Cleveland bridges brings frequent complaints from citizens. Although trouble might be expected from occasional breaking of the sawteeth, no case of such breakage has occurred.

This form of joint was designed by F. D. Richards, bridge engineer, and Howard Brocklebank, assistant bridge engineer, of the city of Cleveland. It was first used about two years ago, being applied experimentally on Central Viaduct. Later the new Clark Ave. viaduct was equipped with this joint throughout.

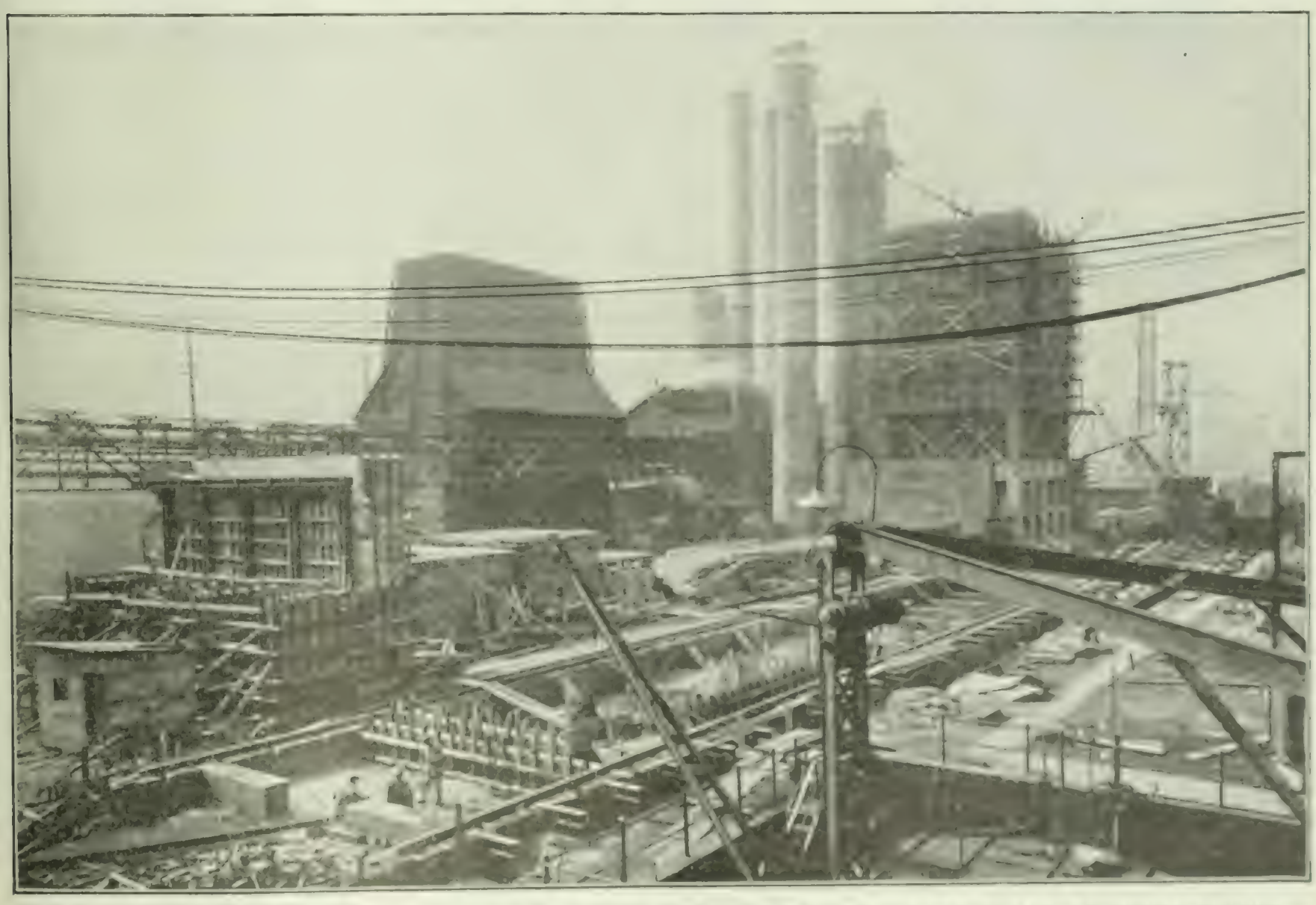
Concrete Coal Bunker Built at New Coke Ovens

Bins Hold 1800 Tons, Finished in 60 Days—Foundation Mat on Piles Five Feet Above Original Ground—Deep Footings for New Plate Mills

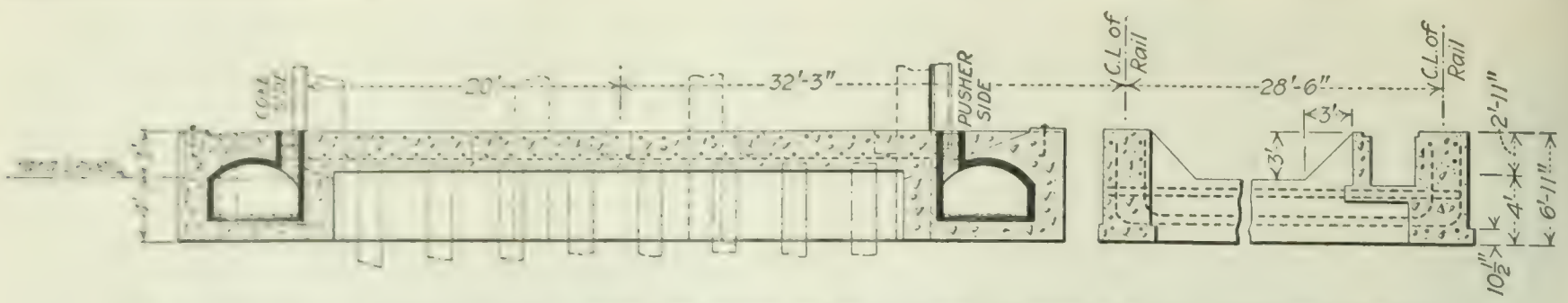
STEEL and other materials were economized in the design of two batteries of Koppers coke ovens being completed at the plant of The Youngstown Sheet & Tube Co., near Youngstown, Ohio. The coal bunker and stacks are of reinforced-concrete construction instead of steel. The company is also constructing a new plate mill, the deep foundations for which are being completed as fast as working drawings for them can be made.

The new coke plant consists of two batteries of 51 ovens each, between which is located the reinforced-concrete coal bunker. This bunker is divided into two bins of 900 tons capacity each, the coal being supplied to these bins by means of an extension of the overhead belt conveyor from the receiving track of the existing ovens. The interior vertical walls of the bins are of concrete, and the slopes at the bottom leading to the discharging hoppers are formed by a slag-concrete fill upon which is placed a layer of ½-in. ribbed wire glass bedded in plaster of paris. The general design of the coal bunker is shown in the accompanying plans and sections.

On the south side of the bunker a pair of stacks, one for each battery of ovens, is being erected. These stacks



BINS ARE IN CENTER OF OVEN STRUCTURE—TOWER BEHIND TRACK CONCRETE PLANT AT RIGHT PLACED ALL FOUNDATION CONCRETE

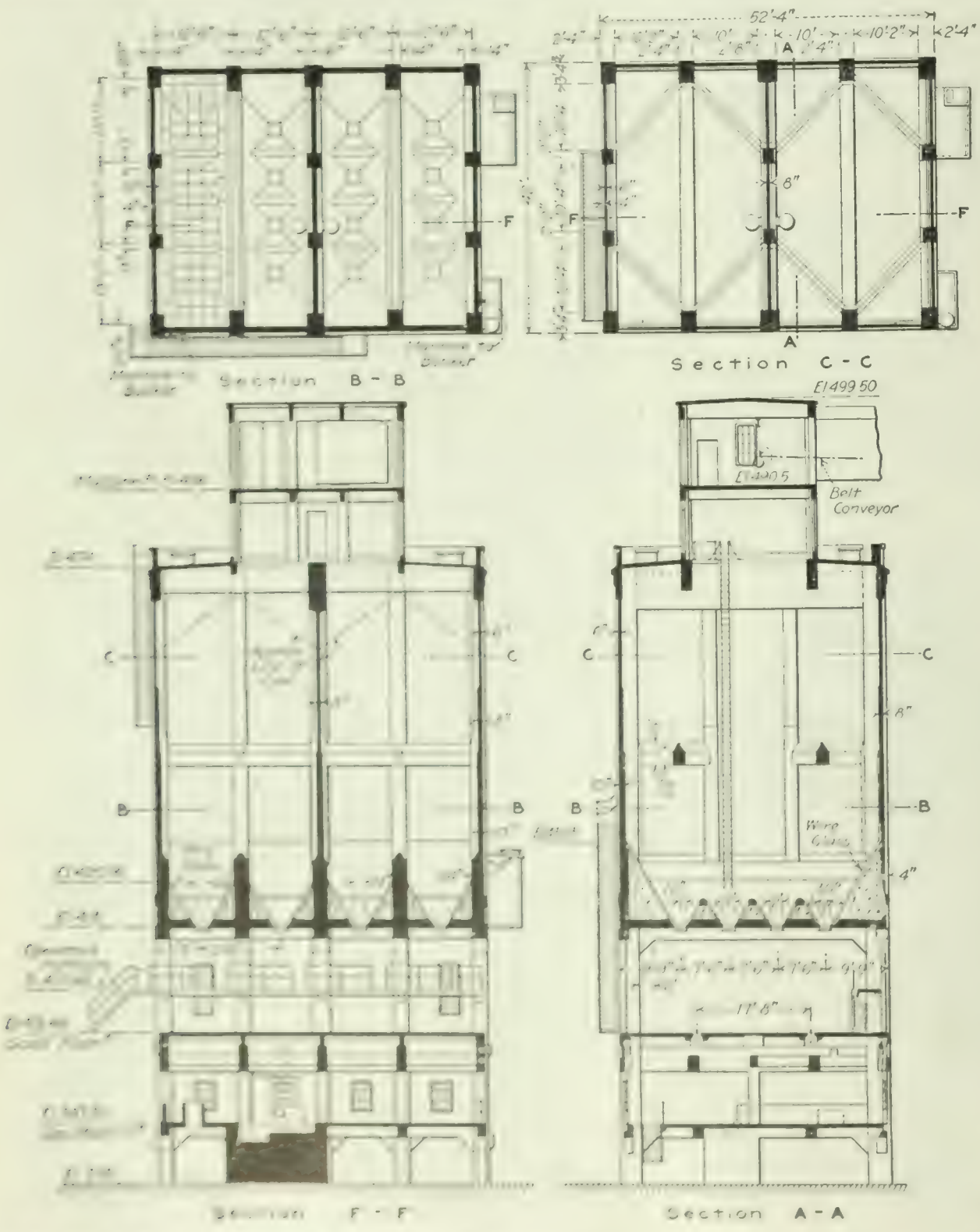


FILL BETWEEN FLUES, MADE AFTER DRIVING PILES, SAVED THICKNESS OF CONCRETE DECK

are 225 ft. high and are constructed of reinforced concrete to avoid the necessity for using steel plates. On this side is also located the quenching track upon which is operated the car for handling the coke immediately after it has been removed from the ovens. On the north side is located the track on which the pusher for shoving the coke from the ovens into the car on the quenching track is operated. This track consists of two rails, each securely anchored to a concrete wall, these walls being tied together by cross reinforced-concrete girders to distribute the thrust of the pusher.

The ground at the site of the ovens had previously been filled in with refuse material, so that it was necessary to drive concrete piles for both the coke oven and coal bunker foundations. In the construction of the coke oven foundations 1500 concrete piles, which averaged 22 ft. in length, were first driven and their tops left 5 ft. above the existing ground level. The bottom and side walls of the gas and air flue tunnels, which run under each side of the oven foundations, were then built, and the space under the oven mat and between the tunnel walls was filled in with granular slag to the top of the piles. After this fill had been allowed to settle for three weeks the 2½-ft.-thick reinforced-concrete oven mat was poured over the entire area under the ovens, the roof of the tunnel being formed in this slab.

For the entire job approximately 9000 yd. of concrete was placed, and 75% of the coarse aggregate used was ¾-in. slag crushed at the steel plant. Sand, slag, gravel and cement were received in carloads on sidings at the site of the ovens and the sand, slag and gravel were unloaded by a locomotive crane and a stiff-leg derrick with clamshell buckets. The derrick unloaded material from cars directly into a slag and sand storage bin. This bin was located at the mixing plant used for the oven and bunker foundations. At the bottom of this bin a hopper holding the proper amount of sand and slag required for each batch of concrete was placed and the material was dumped from this hopper into a skip car which was hauled up an incline track by a cable attached to the second drum of the hoisting engine and dumped automatically into the charging hopper of the mixer. The skip car then returned to the material hopper by gravity. A ¾-yd. steam-driven concrete mixer was used and the hoisting



BUNKER FOUNDATIONS ON BOTTOM OF CONCRETE COAL BUNKER, DESIGNED TO ELIMINATE STRUCTURAL STEEL

tower was 115 ft. high, the concrete being hoisted in a ¾-yd. bucket, dumped into a hopper and from there deposited in place by chutes.

For concreting the pusher track foundations a mixing plant mounted on a flat car was used. This plant consisted of a timber storage bin for slag and sand erected on one end of the car, a 1-yd. concrete mixer mounted on the other end and a steel tower fastened to the end of the car in front of the mixer. The materials were delivered to the bin by a locomotive crane.

At the mixing plant used for the coal bunkers the materials were unloaded from the cars by a locomotive crane into storage piles near the mixer. As the space around this mixer was limited, it was necessary to use wheelbarrows for handling the material between the storage piles and the mixer. A ¾-yd. mixer was used and the concrete was hoisted in a ¾-yd. bucket and placed in the forms by chutes.

Work was started on the ovens on July 14, and by Oct. 6 the foundations for the ovens proper, the coal bin and half of the pusher track had been completed, the work being considerably ahead of schedule. The coal bunker structure was begun Sept. 1 and finished by Nov. 1, in the remarkable time of 60 days. Although progress has exceeded expectations, three weeks were lost during this time by delays in receiving materials.

Building Under Construction

The company has also under construction a large mill and warehouse building, which will accommodate two plate mills. The mills themselves are situated in the center of the main building, the warehouse being at a right angle across the west end of the mill building. The entire structure requires 1800 concrete piles, of which 400 are under the mills. Except at this point, where the ground was excavated to a depth of 16 ft. below the original surface and 4000 yd. of concrete placed in foundations for the mills, a fill of 10 ft. of granulated slag was made over the entire site. Two piledrivers were used in placing the 1800 piles mentioned, one of which drove all those on the east end of the main building and then was carried down into the pit on an incline and used to complete the piledriving for the mill foundations. The other rig drove the west end of the main building and the piles for the warehouse building. The piledriving was started Aug. 15, as soon as possible after the decision to construct the mill was reached. A track concrete plant, without a tower, is being used to pour directly the footings on the south side of the structure, while a stationary mixer on the north side has placed the concrete in the lower part of the footings for the mills. This concrete was placed by spouting to a side-gate hopper on the floor of the excavation and wheeling the concrete to the place in buggies. A 150-ft. tower, however, has been erected on the north side of the structure near the center, and will be used to distribute concrete over the entire middle third of the mill building.

Because of the speed with which work was started after a decision to build had been reached, it was necessary to place the footings for the building itself first, and then, after this had been designed, to go back and put in the piers for the machinery to be installed.

The construction work is being carried out by Stone & Webster, for whom George Chamberlin is superintendent of work in the Youngstown district. The piles were driven by the Raymond Concrete Pile Co. The concrete stacks for the coke ovens are being built by The Rust Engineering Co., which also designed them. The coke plant has been designed by The H. Koppers Co., with the exception of the coal bins, designed by Stone & Webster. The design of the plate mills and supervision of construction are in charge of the engineering force of the Youngstown Sheet & Tube Company.

Minnesota Plans $7,500,000 Road Work for 1918

State-Aid and Federal-Aid Funds to 86 Counties—Hard Surface to Replace Gravel on Main Roads

GREATER attention to road maintenance, increasing use of machinery in road construction, growth of motor-truck and automobile traffic, and the consequent necessity of hard paving instead of graveling for the main roads, are important points touched upon in an advance copy of the report of the Minnesota State Highway Department.

Construction and maintenance of state-aid roads during 1917 cost about $4,430,000, and it is estimated that about 75% of the state-aid work contemplated last spring will have been completed by the end of the year. The three counties of Hennepin, Ramsey and St. Louis, in which are the three principal cities, St. Paul, Minneapolis and Duluth, are not included in the jurisdiction of the department, and the expenditures in these are estimated at about $1,200,000. For the remainder of the state the cost for state-aid road construction is classified as follows: 1166 miles of grading to final grade, $1,646,777; 344 miles of graveling, $527,136; 202 bridges, $605,000. In addition, the maintenance of 11,000 miles cost approximately $450,000, or an average of $41 per mile. The funds available for all the work in the State in 1917 included $3,237,300 from county road and bridge levies, and $1,432,150 for state-aid allotments. From the total must be deducted $1,169,450 for the three counties noted, leaving a net total of $3,500,000 for work under the direction of the State Highway Department.

For the state-aid road construction and maintenance work in 1918 there is available the approximate amount of $7,520,000, made up as follows:

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
Total	[illegible]

Prospective Road Work

Carrying on road improvement work in 1917 has been a rather difficult problem, the labor situation being very uncertain and material not only of high cost but difficult to obtain. This year's experience indicates the necessity for more intensive maintenance and for a greater use of machinery in construction work. The latter will necessitate changes in layout of construction plans, and in the end will result in lower cost of work. It is thought that the present condition therefore may advance road building, by leading to more efficient and economical methods of handling the work.

Road maintenance, however, is the important problem, and even if road building should be restricted, an intensive system of maintenance would result in better road conditions. For this reason the Highway Department will devote particular attention to that branch of the work during 1918. On both construction and maintenance, this year's work is marked by a much greater use of tractors and other motive power, which has released teams and men for agricultural work. Until recently, the grading and some of the construction work were considered a source of income for the farmers, and the introduction of outside machinery and equipment was somewhat resented, but now it is often the case that farmers will use their equipment on road work solely as an aid to the good-roads movement.

Federal-aid work was not started during 1917, as had been expected, except on the portion of the Twin Cities-Duluth highway through Chicago county. It is expected that with the available funds for next year most of the main lines of travel will be connected with surfaced roads. This includes the completion of the Twin Cities-Duluth highway; the extension of the Jefferson highway to the Iowa state line; the construction of the scenic highway from the Twin Cities to the Cass Lake and Leech Lake region; the National Parks highway connection to Winona and from St. Cloud to Fergus Falls; the Glacier Park highway as far west as Willmar; the Yellowstone Trail to Granite Falls, and the Chicago, Black Hills and Yellowstone Park trail from Winona to the Dakota line. This last will probably be the first complete surfaced road across the state of Minnesota.

A small amount of work in Cook County will give a first-class road from the Twin Cities to Port Arthur, Ontario. It was only this year that the connection was made between the Ontario and the Minnesota portions of this road, so as to open it for traffic. This road has opened up a new recreation district, and similar districts will be opened up by some of the other new routes mentioned.

Tourist, Auto-Bus and Freight Traffic on Roads

Tourist traffic is increasing and is expected to be a large factor in 1918. A week's traffic census taken this year on state road No. 1, Dakota County, which is the main road leading from Iowa to the Twin Cities, showed an average of 1129 automobiles per day. The National Parks highway in Sherburne County averaged 433 per day, while other main roads leading to recreation districts averaged from 250 to 600 automobiles per day. With the contemplated improvement of the main roads it is assumed that the main arterial highways from the south will carry an average of 1000 machines per day, while the main lines to the recreation districts will average about 600 machines per day. A careful count shows an average of 3½ passengers per automobile, which gives an indication of volume of traffic and probable expenditures by tourists.

Interurban auto-bus service is increasing and is a special feature of road development in Minnesota. This is particularly the case in the northern part of the state, where it was not expected that such service would be patronized to any great extent. There are a number of such lines in operation, and one in particular, 160 miles long, runs on a schedule requiring a speed of over 20 miles per hour. Freight haulage by highways has not developed to any great extent, due partly to the fact that main lines of travel have not been connected up. But it is expected that this traffic will come in great volume next year on account of car shortage and congestion of railway traffic.

Building gravel-surfaced roads is the policy which has been adopted and will be carried forward next year, but the State Highway Department considers that in a short time the main lines of highways must be surfaced with a more durable material to withstand the increasing traffic of heavy motor trucks and rapid passenger vehicles.

Road Funds and Road Administration

State-aid funds are distributed to the 86 counties, with not less than 1% nor more than 3% allotted to any one county. This makes a nearly even distribution, for only 14% of the total fund is to be distributed at the discretion of the Board of Apportionment, which is composed of the commissioner of highways, the state auditor and the state treasurer.

Distribution of state-aid paid to the several counties is based upon their valuation. The rate is 80% of the cost of the work for counties having a valuation of less than $5,000,000, 70% for those with a taxable valuation of $5,000,000 and less than $10,000,000, 60% for those over $10,000,000 and not exceeding $15,000,000, and 50% in all other counties.

Additional maintenance funds were provided by the revision of the state-aid road law at the last session of the legislature. Prior to this year, 20% of the state road and bridge fund, with a due proportion of county funds, was to be set aside for the maintenance of state roads. Under the revision a county may have not less than 20% nor more than 30% set aside for this purpose, and the commissioner of highways is given authority to enforce maintenance by doing such work as the counties neglect and charging the cost to the county's state-aid account.

The system of control of the road work was also changed in the above revision. Formerly there was a non-paid State Highway Commission (which met monthly) and also a state engineer. These officers have been abolished, and there is now a Commissioner of Highways who is appointed for a term of six years and takes over the functions of the commission. He is not required to be a technical man, but the law gives him authority to employ a deputy commissioner to take charge of the engineering work. Charles M. Babcock is commissioner of highways, and John H. Mullen is engineer and deputy commissioner. Carl E. Nagel is chief bridge engineer.

Freight Cars Once Junk Help Road Work

While the embargo on the use of open freight cars for hauling material needed for highway construction is hindering work of this kind it is not completely stopping road construction in California. The Board of Supervisors of Tulare County has overcome the difficulty by taking over two hundred freight cars discarded by the Southern Pacific Co. as junk and putting them in shape to transport sand, gravel and other materials needed. Federal officials have sanctioned the use of these cars and most of them are now in use.

Creosoted Block Can Be Laid on Hardened Pitch Cheaper Than on Dry Mortar

If Base Is Proportioned To Provide Slight Excess of Mortar It Can Be Finished with Wood Floats to a Sufficiently Even Surface—Inspection of Block After Laying Is Made with Comparative Ease

By Walter Buehler
Engineer, Wood Preservation and Paving, The Barrett Co., New York

POSSIBLY the general opinion as to the costliness of laying wood block on a pitch layer has arisen from lack of actual experience with this type of construction, and perhaps also because of the erroneous idea that it is necessary to give the concrete base a "side-walk" finish. Furthermore, there has been the opinion that the block had to be set in hot pitch, or that each block must be dipped in pitch before laying. Naturally, details of this nature would work very much toward producing a pavement of excessive cost per square yard; but experience has shown that these details are unnecessary.

In the past, specifications for this construction have called for a mortar bed to be laid on the concrete base and then trowelled to a smooth surface. But it is not necessary that the surface be smooth, although it should be made at least as even as the sand-bed of the more usual constructions. If the specifications for the concrete base are so drawn as to provide for a slight excess of mortar—say a 1:3:5 mix instead of the usual 1:3:6 mix—it will be found perfectly possible and indeed easy to secure a satisfactory surface with wooden floats. After the concrete has hardened the top can be painted with a thin coat of pitch, which should be allowed to harden before the blocks are laid. After the blocks have been placed in position and inspected, they can be rolled with a light tandem-roller, which will be found sufficient to set the blocks in the pitch so that they will adhere firmly to it.

Comparing the cost of this form of construction with that of the dry-mortar cushion specifications, it will be noticed that the cost of evening up the concrete plus the pitch and labor of painting it on the concrete base is offset by the saving of about one inch of grading, due to the elimination of the cushion, plus the cost of sand and cement and the labor of spreading it.

The superiority of the paint-coat over the dry mortar-bed or the usual sand-bed is that the bottom of the block, as well as the sides, are sealed. From a construction viewpoint there are still other advantages. For example, during the period of construction it often happens that a sudden heavy rain will wash out the sand or mortar cushion from under blocks that have not been filled with bitumen. An accident of this sort will necessitate relaying both cushion and block. This cannot occur with the bituminous paint-coat construction. Furthermore, even though a rain occurs after the pitch has been spread, work can proceed immediately.

The usual specification for blocks, grading, compacting the subgrade, etc., can be employed, but the writer would recommend that certain changes be made in other parts of the document. For instance, in describing the concrete the clause might be written as follows:

"On the subgrade prepared as above shall be laid the concrete base consisting of 1 part cement, 3 parts fine aggregate, and 5 parts coarse aggregate, mixed with sufficient water to produce a mass that can be readily floated. The surface shall be finished in one operation by means of a long-handled wooden float provided with up-turned ends to prevent ridging. The operation of finishing shall result in a surface which, when tested by a metal-shod straight-edge 5 ft. long laid upon it in a direction parallel to the curb, shall show no departure from this straight-edge greater than $\frac{1}{4}$ in. Projections greater than $\frac{1}{4}$ in. shall be trimmed down and all depressions shall be flushed even with a mortar consisting of 1 part of cement to 3 parts of sand."

When the foundation has hardened for the usual time and is thoroughly dry, it should be painted with a coat of pitch not more than $\frac{1}{8}$ in. thick. This should be applied at a temperature of not less than 250 nor greater than 300 deg. F. and should be allowed to cool before laying the blocks. The writer wishes to call particular attention to the fact that pitch is specified both for the paint-coat and for the block-filler. Experience has shown that pitch adheres more firmly to both concrete and creosoted blocks, and is less affected by the action of the creosote oil than is asphalt. A specification which will insure proper material and which at the same time



CONCRETE MUST BE DRY BEFORE PITCH IS SPREAD, AND PITCH SHOULD BE HARD BEFORE BLOCKS ARE LAID

can be obtained from a number of different manufacturers could be written as follows:

"The pitch shall be the residue from the distillation of coal tar without admixture of any foreign substance and shall exhibit the following characteristics:

(a) Specific gravity at 77 deg. F., not less than 1.22 nor more than 1.34.

(b) Free carbon, not less than 18% nor more than 27%.

(c) Melting point determined by the "½-in. cube" method, not lower than 140 nor higher than 150 deg. Fahrenheit.

(d) When 100 g. are distilled at 670 deg. F. in an 8-oz. retort, the specific gravity of the distillate shall not be less than 1.07 at 100 deg. Fahrenheit.

When this pitch is used as a filler it is vitally necessary that it be used between the limits of temperatures specified above. It is not only not necessary to fill completely the joints between the blocks, but it is desirable that only enough filler should be used to fill about the bottom half of the joint. To secure this last result the heated pitch should be poured on the pavement and immediately and rapidly squeegeed in one direction. It has been found to be very poor practice to sweep sand into the joint before the filler is applied, as the sand fills the joints very unevenly and hinders the free flow of the pitch. The result is that when expansion occurs the pitch is squeezed to the surface of the pavement, failing to perform its function and, in addition, creating a decided nuisance. The practice of attempting to apply a second application by mopping a mass of pitch back and forth is to be condemned, as it often results in a residue of pitch being left on the surface.

A very good practice is to wet down the final sand covering and keep it wet for a short period after the pavement has been opened to traffic. This will keep the sand in place and allow the traffic to grind it into the joints and the wearing surface of the blocks. If a coarse sand is used this treatment will in a large measure prevent slipperiness.

Construction Details More Important than Specifications for Materials—Whenever the question of specifications for creosoted wood-block pavements comes before a technical gathering, the discussion is almost always limited to the character of preservative and to the method of treatment. There is no question that these elements are of much importance, but it is the writer's opinion that they are not of prime importance. No matter how carefully the blocks may be treated, nor how definitely the character of oil might meet the requirement best fitting it for service, nor how particular is the care taken to assure that the treatment has been properly carried out, the roadway will prove a failure if proper methods of construction are not followed. Experience has demonstrated the truth of this statement, and it seems strange, therefore, that there should be such a wide divergence of opinion as to what constitutes proper construction. As an example, note that the specifications recently adopted by the American Society of Municipal Improvements name three types of cushion and three materials satisfactory as fillers. This is purely a compromise, and as long as this attitude toward the question is held by engineers, no definite progress will be made. So much good paving-block is destroyed



A CONCRETE RICH IN MORTAR ALLOWS FINISHING WITH LONG-HANDLED WOOD FLOAT

on account of poor construction, and so much inferior block gives a partially satisfactory service because of proper methods of construction, that the three principal objections to a creosoted wood-block pavement are worthy of brief review.

It has been demonstrated absolutely that bleeding can be controlled by proper method of treatment, and that expansion, although sometimes resulting from the improper handling of seasoned timber, is generally due to faulty construction. It is common knowledge, also, that wood shrinks when it dries out and swells when it reabsorbs water. As long as the moisture content of a block remains slightly above the fiber saturation point of the timber from which the block is manufactured, it is at its maximum size and no shrinkage takes place until the moisture content falls. If the moisture content of a block is below the fiber saturation point, a very slight moisture addition greatly affects the size of the block. It is important, therefore, that blocks be so treated that the moisture content remains above the saturation point during the time precedent to laying, and that they be laid, if possible, in such a way that they will retain that degree of saturation. Unfortunately, too much dependence has been placed on the character and quantity of oil used in treating the block to obtain this result. No kind or quantity of oil will keep the water in or out of the block. It will greatly retard the absorption of water or drying out, and, therefore, the waterproofing quality of the oil must be taken into consideration.

But of equal, if not greater importance, is the detail of laying the blocks so as to prevent a change in their moisture content. The bituminous paint-coat will be found to effect an approach to this ideal more closely than any other detail.

It cannot be denied that sand-cushions or mortar-cushions with bituminous filler have resulted in many successful pavements, but a careful analysis of any construction job will reveal the fact that there have been a great many failures—many more, in fact, than would have resulted if the bituminous paint-coat method had been followed. Washington Ave., Olive St. and Pine St., downtown streets in St. Louis, Mo., which carry heavy

traffic, were paved about eight years ago with creosoted blocks on sand-cushions and with a sand-filler. In all cases the sand-cushion shifted badly, with the result that extensive repairs were necessary. But subsequent experience with a mortar cushion and bituminous-filler specifications has convinced the authorities that the paint-coat and pitch-filled specification is superior, and contracts have recently been let for this construction.

As far back as 1907 the city of St. Boniface, Manitoba, paved one mile of a country road outside of the city limits with a 16-lb. creosote block laid directly on a pitch-painted concrete base. The joints were filled with pitch and the surface was covered with a thin layer of sand. Although this road has been subjected to a range of temperature from 40 deg. below zero to 110 above zero, has no shade, receives no sprinkling, is neither swept nor cleaned, it is still, after ten years of use, in almost perfect condition. No shrinkage nor bulging has been noticed, and as far as can be learned, there have been no expenditures for repairs.

Many other instances of the failure of sand or mortar beds or cushions could be given, as well as many cases where the pitch paint-coat and bituminous-filler specifications have resulted in satisfactory service. But it seems sufficient to the writer to cite the above few instances to show the superiority of the method.

In conclusion, attention is directed to the possibility of using a shallower block on this type of construction than is considered possible with the sand-cushion or mortar-bed type of construction. Experiments made with blocks of 2¼ to 2½ in. depth indicate that satisfactory results can be obtained with this cheaper block. The lack of necessity for the lateral stability of the deeper block which was demanded by a non-rigid support, is in itself an adequate justification for the use of the shallower block.

Rapid Driving of a Short Tunnel in Black Hills Limestone

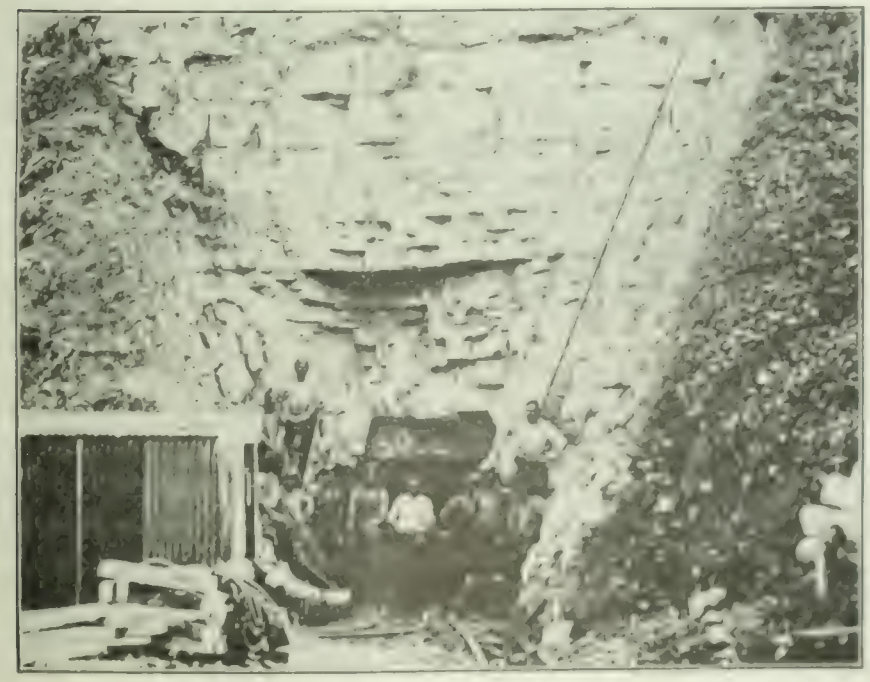
By H. L. Hicks
Ingersoll-Rand Co., New York

IN DRIVING the Homestake hydroelectric tunnel in the Black Hills of South Dakota, from Apr. 14 to Aug. 31 of this year, fast progress rates and low repair costs were realized.

The development consists of two tunnels, Iron Creek, 1096.7 ft. in length, and Long Tunnel, 3931.4 ft. With a 16.5-ft. adit these totaled 5044.6 ft. The work was contracted for by William B. Arndt.

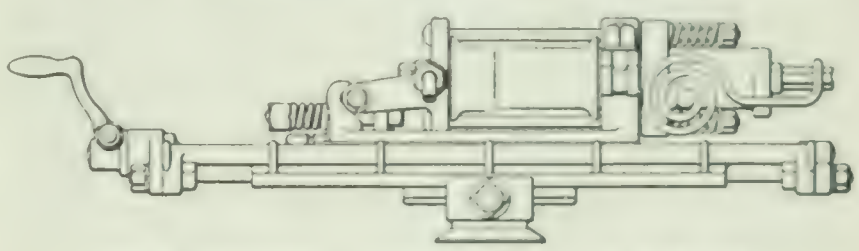
The ground was a medium hard limestone for almost the entire distance, the exception being 200 ft. of very hard flint. The tunnel measures 7 x 7½ ft., but overbreakage would make the average dimensions greater than 7 x 8 ft. Work was conducted from six headings, compressed air for all being supplied by a 537-cu.ft. steam-driven compressor. The air pressure at the compressor ranged from 115 to 120 lb. and the lowest pressure at any of the drills was 90 pounds.

All the drilling was done with "Jackhamers," four of the wet type and six of the dry type. Nine drills were operated and the tenth held as a spare. The four water-feed machines were clamped in feed shell mountings of a new type (see sketch) and used with 3-in. single-screw columns. The other drills were, by the operators' preference, hand-held to save time, as the drillers could get back to work as soon as the heading had been shot.



CHARACTER OF ROCK SHOWN BY FACE AT TUNNEL PORTAL

The drilling round consisted of 14 to 20 holes, the usual layout being four 7-ft. cuts and ten 6-ft. side holes. Cross bits on ⅞-in. hexagon steel and ⅞-in. 60% powder were used throughout. Machine-sharpened steels were supplied from a central blacksmith shop.



NEW MOUNTING USED ON COLUMN PROVED CONVENIENT FOR WATER DRILLS

The progress record is incomplete, due to periods when labor shortage made it necessary to halt work at one or another of the headings. The individual heading records are, however, rather remarkable. For instance, over a period of 41 days ending May 26, one heading was driven 8 ft. per shift or 24 ft. per day, the total being slightly over 1000 ft. Another heading, started May 2, was driven 350 ft. in 23 days of 3-shift work, running ten men per shift, using two drills. Still another case of consistent progress was that a third heading, where 1543 ft. were driven in 86 working days between May 3 and Aug. 10, with 14 men per shift handling two drills. During this run the round was shot seven times every two days while at the other headings they shot but three times each day.

As to the last-mentioned heading, the contractors comment that "the men never saw the inside of these machines and I never had one of them in the shop until the heading was in 1400 ft." indicates that little drilling time was lost and explains the excellent average of 17.9 ft. per day at this heading.

Summing it up, the Homestake tunnel was driven fast when a full crew made it possible. It is also to be noted that the drills set a good mark in low upkeep cost, the contractor recording a total repair expense of $289.85 or $0.057 per foot of tunnel.

ENGINEERING LITERATURE

A REVIEW OF BOOKS AND A LISTING OF NEW PUBLICATIONS

British Cast-Iron Pipe Specifications

Reviewed by JOHN H. GREGORY
Consulting Engineer and Sanitary Expert, New York City

BRITISH STANDARD SPECIFICATION FOR CAST-IRON PIPES AND SPECIAL CASTINGS FOR WATER, GAS AND SEWAGE. British Engineering Standards Committee—London: Published for the Committee by Crosby Lockwood & Son. Paper, 8 x 13 in.; pp. 35; illustrated. 1s. 4d postpaid.

From the preface it would appear that these specifications for cast-iron pipe and special castings are the result of nearly fourteen years' consideration and deliberation, as the first committee appointed to consider the subject was named in October, 1903, and as it was not until July, 1917, that the final report was approved. As might be expected, the specifications will be found to be of greatest value to English water-works engineers, but some of their features are of especial interest to the American water-works engineer.

The text comprises 31 clauses covering the requirements for cast-iron pipe and special castings most frequently met with in practice. While space will not permit of reviewing these in detail, attention will be called to a few features not often seen in such specifications. Thus, in addition to those for straight spigot and socket pipes with plain sockets there are included also requirements for straight spigot-and-socket pipes with half turned and bored joints, as well as for straight flange pipes.

In the sections treating of the testing of the material by means of sample bars, it is provided that tensile tests shall be made as well as transverse tests. And for insuring the proper entry of the spigots into the sockets the specifications state that "the manufacturer shall provide and use iron templates of suitable dimensions which shall be passed to the bottom of every socket, and circular iron rings of suitable dimensions shall be passed over every spigot."

Further, in addition to the usual marking, each pipe is to have cast upon it the brand (a sketch of which is shown) indicating that the pipe purports to have been manufactured in conformity with the British standard specifications; in case of rejection of the pipe, the brand is to be immediately clipped off. And in addition to requiring a hydraulic test for each pipe, the engineer is given the power to have such a test applied to any special castings he may designate. The final clause provides for arbitration in case of dispute.

Following the text are 14 tables of weights and dimensions. Weights are given for four classes of spigot-and-socket pipe from 3 to 48 in. inclusive; but for flange pipe only up to and including 24 in. Weights for odd sizes, such as 5, 7, 9, 15, 21, 26 in., etc., are given.

No dimensions of flange special castings are included, and no weights whatsoever for any special castings are given. A note in the text, however, states that it is hoped to give such weights in a subsequent edition.

The specifications are well printed on good paper, on one side of the sheet only; but the size, 8 x 13 in., although bound on the long side, not only makes the pamphlet very inconvenient for a designing engineer or draftsman to handle but also to file. The arrangement of the dimensions in some of the tables could be very materially improved. For example, the inside diameter of the socket for any given size of pipe cannot be obtained directly, but must be obtained by addition. Again, the weights of the pipes are given in "cwts., qrs. and lbs." They could just as well have been given in pounds, as in all American specifications, and then it would be possible quickly to compare the two tables of weights.

Railway Engineers' Handbook in Spanish

Reviewed by DR. J. A. L. WADDELL
Consulting Engineer, New York City

INGENIERIA DE FERROCARRILES: La Teoria y Practica Fundemental De Ferrocarriles, Desde la Concepcion Del Idea Hasta la Terminacion Del Trazo—By Verne Leroy Havens, M. Am. Soc. C. E. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited. Leather; 4 x 7 in.; pp. 357; illustrated. $3.50.

In issuing a technical book in the Spanish language the publishers have inaugurated a movement which it is hoped will have a far-reaching effect; because anything that can be done to bring our great republic into closer touch with the Latin-American republics is a step in the right direction. It would certainly be greatly to the benefit of the United States if close business relations were established between it and all the Latin-American republics; and this desideratum must necessarily be accomplished primarily by the efforts of American engineers. In writing "Ingenieria de Ferrocarriles" Mr. Havens has certainly done his share of such good work; and it is to be hoped that other American engineers will soon follow his lead.

The text of the book appears to pursue the same sequence as does the work in the field. This is a logical arrangement and one which will appeal to most users of the treatise—which, by the way, is gotten out in pocket-book form—another very commendable feature.

The opening chapter, on "Commercial Considerations," contains much that may rightly be termed "horse sense." The second chapter is entitled "The Appreciation of Property by the Construction of Railways." Its opening paragraph reads: "We do not forget that engineering is more than a study of materials and a measuring of lands, that those studies are not the desired end, but only a fundamental aid which facilitates for us the solution of important problems. Treating only of professional works, it can be said that engineering is the science or art of investing money in such a manner that the interest rendered shall be the greatest possible, under given conditions; hence it is clear that the investing of funds in a project which produces nothing would be the acme of error." This is sound sense; and that commendable characteristic for engineering literature permeates the whole book.

The third chapter, "Reconnaissance for Route," contains a mass of sound, practical information of great value to those engineers upon whom falls the task of making reconnaissances. Succeeding chapters deal with "Organization and Equipment," the "Preliminary Survey or Study," "Topography and the Topographer," and a well-written description is headed "Work of the Office." The last-named is important enough to have been placed in a chapter by itself. Chapter VI, "Economic Problems," occupies 68 pages and contains a large inset diagram. The problems treated are practical and pertinent, including on p. 210 an interesting itemized distribution of cost percentages for certain South American railways. Chapter VII deals with "The Final Location," and is followed by a discussion of "The Adjustment and Care of Instruments." Various formula and tables complete the book.

The author's remarks in Chapter II concerning the increase in land values and tax returns due to the advent of a railway should be of great assistance to those who combine land development with railway building, and to those government officers who consider the advisability of subsidies or interest guarantees.

The inset diagram includes any combination of steam pressure, tractive power, cylinder dimension, driver diameter, piston speed, train speed, and coëfficients for speed factor and horsepower efficiency for simple locomotives. This does away with the usual cumbersome traction tables.

Curve resistance is considered analytically; and the resultant formulas indicate that the well-known classical experiments agree in virtually every instance with the analytical formulas, although they do not agree with many of the empirical formulas in common use. The author's method of dealing with vertical curves is new. Under the old methods of analysis it was apparent that vertical curves had to be of impossible lengths in order that their purpose might be fulfilled. Common practice has long since shown the fallacy of the old methods, and vertical curves are now introduced by empirical rules. The proper analysis, however, shows that the so-called empirical curves of standard practice are correct, and that the error lay in the old analysis. The metric curve system is used throughout the book, including complete tables for spirals or tapers for all ordinary curves.

This pocket manual should prove useful to any student of the Spanish language who desires to accumulate a vocabulary of technical terms employed in railroading; and for the engineer who contemplates working in Latin-American countries there is much of interest regarding the requirements of their various departments of public works.

Water Filtration and Chlorination

Pamphlets dealing with "Water Filtration" and "Water Chlorination" have been issued as Engineering Bulletins Nos. 9 and 10 of the Michigan State Board of Health. No. 9 is by Edward D. Rich, state sanitary engineer, and No. 10 by Mr. Rich and Earle L. Waterman. Each bulletin describes the process to which it is devoted. No. 10 also contains notes on 23 chlorinating plants in Michigan.

Elementary Textbook on Graphic Statics

Reviewed by J. P. J. WILLIAMS

First Assistant Engineer, Concrete-Steel Engineering Company, New York City

GRAPHICS—By H. W. Spangler. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Limited. Cloth; 6 x 9 in., pp. 95; illustrated. $1.25.

One of the chief characteristics of this textbook, written for mechanical and electrical engineering students, is its clear descriptive explanations of the graphical constructions, aided by the use of bold-faced type in giving references to lines or points in the well-drawn diagrams.

The book is really a collection of notes of lectures as presented for many years by the late Dr. Spangler to his students at the University of Pennsylvania. There are no chapter headings, nor are the articles numbered. A logical order of presentation for the particular purpose is followed, the object being simply to cover the fundamental principles of graphics as applied to simple truss frames and to parts of machines. Both fixed and moving loads are considered, the familiar "free-body" method being adopted.

The descriptive explanations are sometimes too elementary, or confused by too great detail, while on the other hand in the later articles the tendency is to give graphic methods without sufficient emphasis upon the general principles upon which the construction is based; that is, the principles are buried under the verbal explanation of methods. Better paragraphing would have aided in preventing this tendency, and would have given the book better balance.

No table of contents is given by the publishers, but the subject matter includes the following—fundamental principles of equilibrium, force polygons and funicular polygons, simple truss frames with fixed and moving loads, deflections of trusses (Williot diagram), friction in machines, wedge and screw action, analysis of bell crank, horizontal engine, grasshopper engine, gears, chain and sprocket wheels, pulleys, belt friction, secondary beams, forces not in one plane, shafts, counterbalancing two cranks, three cranks and overhung cranks, crank arms perpendicular to shaft, etc., treated for combined bending, torsion and direct stresses.

The book is well presented by the publishers and should meet with approval in the limited field of its application to the needs of students.

The Control of Cast Iron

THE PRINCIPLES OF IRON FOUNDING—By Richard Moldenke, E. M., Ph. D. New York: McGraw-Hill Book Co., Inc. London: Hill Publishing Co., Ltd. Cloth; 6 x 9 in.; pp. 517. $4.

Dr. Moldenke probably aimed to produce a practical exposition of the science and art of iron founding that would benefit foundrymen principally. But he has done much more than that, for he has produced a one-volume library on cast iron. This text will be of immediate service to all engineers who are concerned in one way or another with the purchase of cast-iron products, or with the writing of specifications for cast iron, or with the foundry and shop inspection of these articles. From this volume the engineer can learn what foundry practices tend to prevent his getting what he desires in the way of physical qualities or chemical constitution, and it shows what practices should be employed to insure given ends. Cast-iron products have so broad a field of

service that it is difficult to find a class of engineers who may not profit sooner or later by turning to these pages.

The author first gives a brief, interesting commercial history of iron founding—here and abroad. Next he describes the effect of silicon, manganese, sulphur, oxygen, chromium, copper, nickel, vanadium, titanium, aluminum and magnesium. In connection with the notes on changes in physical properties induced by these reactions, Dr. Moldenke admits the possibility of curing some troubles by alloy additions to the ladles of hot iron, but he invariably recommends as better the blending in the cupola charge of high-grade pig and scrap, and maximum care in melting—his object being the prevention of trouble rather than the cure.

The next step is to outline iron and steel-making processes, giving briefly and simply the leading metallurgical reactions with comments on the similarity or divergence of foundry cupola practice, and the lessons the foundryman may learn from the experience of the steel makers. The author's thesis here is that simple melting is all that is desired, for the temperatures in the foundry are too low to attempt the chemical manipulations that are successful in steelmaking.

Engineers who desire to specify the kind of iron they are to obtain will appreciate the section in which castings are classified by their service—as acid-resisting, agricultural, engine-cylinder, car-wheel, chilled, electrical, flywheel, gun, stove, white, and more, in scores—with typical analyses, physical properties and a brief word on the foundry treatments earlier discussed at more length. There are large and important sections on raw materials, combustion processes and furnace construction, but these naturally will have less interest for most engineers.

In the appendices are a glossary of foundry terms and standard specifications for gray-iron castings, for sampling and analyzing iron, coke and refractories.

One of the most striking characteristics of the book is the prophetic nature of paragraph after paragraph; Dr. Moldenke continually points out new foundry practices that are, thanks to his skillful finger, so obviously improvements that they must earn extended acceptance. For many years to come the book will be in advance of the general state of the art and remain a guide to the developing industry.

Compensation Insurance

[illegible] York and London: D.

The author goes into the history of industrial accident compensation, outlines the theory of insurance of this risk, and deals with the state compensation acts, and the stock company, mutual and state fund methods of insuring the payment of such compensation. He concludes that, because of insufficient data, a choice among these three methods cannot be made at present.

The author misses the determining factor in such a choice. This is, that the most desirable method of taking care of industrial accident losses is that which does most to prevent such losses. Of course, the private stock companies have done most in this direction, because accident prevention means more stability and larger profits to them. In spite of the fact that excellent work in this direction has also been done by state funds, these results are traceable to public-spirited and humanitarian motives on the part of individual office holders. In the present state of politics such motives cannot be relied on always to influence the conduct of every state fund so as to reduce accidents—at least in the same sense that their own financial advantage can be relied on to compel private companies to work for accident prevention.

To the book are appended the New York compensation act and an outline liability insurance contract.

Elementary Mechanical Drawing

Reviewed by ALTON L. SMITH

Professor of Machine Design, Worcester Polytechnic Institute, Worcester, Mass.

MECHANICAL DRAWING PROBLEMS—By Charles William Weick, B. Sc., Assistant Professor of Drawing and Design, Teachers College, Columbia University in the City of New York. New York: McGraw-Hill Book Co., Inc. London: Hill Publishing Co., Ltd. Cloth; 6 x 9 in.; pp. 153; illustrated; $1.25.

Of the three parts into which this book is divided, the first part (21 pages) describes drawing instruments and their uses, gives directions for lettering, outlines the general process of making a drawing, and explains useful geometric constructions for drawing tangencies and dividing angles.

Part 2 devotes 31 pages and 60 problems to elements of projection; 42 pages and 96 problems to the development and intersection of surfaces of simple geometric models; 22 pages and 44 problems to the methods of isometric and oblique drawings; and, finally, 24 pages and 70 problems introduce the young draftsman to the mysteries of machine details and the art of dimensioning.

The last ten pages contain tables of bolts, nuts, keys, pipe and other standardized material used in construction.

The book is well made and illustrated, but has no striking feature to distinguish it from other books of similar character. The exercises or problems are varied in nature and in degree of difficulty, so that the instructor can adjust a course selected from them to his particular needs. They are hardly up to the level of the work of the technical high schools, but should be useful for classes in the rural high schools and in evening schools, for which they are doubtless intended. The only portion which would interest the engineering student is the section on development of surfaces, and that because of its relation to sheet metal work.

Malingering by Workmen

MALINGERING AND FEIGNED SICKNESS: With Notes on the Workmen's Compensation Act, 1906, and Compensation for Injury, Including the Leading Cases Thereon—By Sir John Collie, M. D., J. P. New York: Longmans, Green & Co. London: Edward Arnold. Cloth; 6 x 9 in.; pp. 664; illustrated $4.50.

For all employers subject to workmen's compensation acts this volume contains many useful suggestions while for the medical examiners for such employers and for state or company agencies which insure against accident or sickness it would seem to be of great value. It promises to be useful to employers who endeavor through a medical staff to keep their working force from being depleted through feigned sickness or injury—either of which is malingering. The volume also con-

tains valuable information for the medical branches of the army and navy. The larger part of the book is devoted to medical examinations and tests for the many kinds of ills to which mankind is subject and which may more or less successfully be feigned. The author states in his preface that the volume has been almost entirely rewritten. The first edition appeared in 1913.

Miami Flood Protection Studies

Five reports on important technical studies made in connection with the Miami Conservancy District flood-protection work are to be published shortly, according to an announcement just issued. Further reports in the same series will follow, so as to make available to all engineers the details of the many theoretical and experimental investigations required in connection with the work. The reports will be in 6x9-in. size, paper bound, and will be sold at 50 cents each.

The five reports about ready for publication are: Part I, The Miami Valley and the 1913 Flood; Part II, History of the Miami Flood Control Project; Part III, The Hydraulic Jump and Backwater Curves; Part IV, Calculation of Flow in Open Channels; Part V, Storm Rainfall of Eastern United States. They range from 120 to 320 pages in length. Part III contains the detailed results of very extensive experiments on the hydraulic jump and how the discharge channels must be shaped to take advantage of the jump, so as to produce harmless velocities at the point of final discharge of the water. Parts IV and V will include elaborate theoretical studies.

As the editions of the several volumes will be limited to the probable demand, engineers concerned with hydraulics, flood problems and hydrological questions are asked to subscribe or send notice of their desire to subscribe to the Miami Conservancy District, Dayton, Ohio.

Engineering Work of E. D. Leavitt

Those interested in the development of water-works pumping engines and other kinds of steam engines will welcome "An Account of the Engineering Work of E. D. Leavitt," by F. W. Dean, Boston, Mass., presented before the American Society of Mechanical Engineers at its annual meeting, Dec. 4 to 7, 1917. The paper has been printed by the Society (29 West 39th St., New York City) as a pamphlet of 47 pp. It contains a portrait of Leavitt and line drawings of his various engines.

More About "Phoenixiana"

Sir—The note concerning "Phoenixiana" on p. 936 of your issue of Nov. 15 recalls another incident, related in the report of that memorable survey, which the writer has frequently used as an illustration when remonstrating with some conscientious but misguided youth who has, for instance, computed the weight of a lattice bar to the thousandth of a pound. I refer to that occasion when the transit mentioned in your note was transported on the back of a mule, and when again it was desired to ascertain the exact time, the mule was "backed up into the plane of the meridian," the observation taken, and the time computed to the nearest second.

W. L. COWLES.

Oak Park, Ill.

PUBLICATIONS RECEIVED

[So far as possible the name of each publisher of books or pamphlets listed in these columns is given in each entry. If the book or pamphlet is for sale and the price is known by the editor, the price is stated in each entry. Where no price is given it does not necessarily follow that the book or pamphlet can be obtained without cost. Many, but not all, of the pamphlets, however, can be secured without cost, at least by inclosing postage. Persons who are in doubt as to the means to be pursued to obtain copies of the publications listed in these columns should apply for information to the stated publisher, or in case of books or papers privately printed, then to the author or other person indicated in the notice.]

AMERICAN SOCIETY FOR TESTING MATERIALS: Affiliated with the International Association for Testing Materials. Proceedings of the Twentieth Annual Meeting held at Atlantic City, New Jersey, June 26-29, 1917. Part 1. Committee Reports, Tentative Standards; Part 2. Technical Papers. Edited by the Secretary-Treasurer, under the regulations governing publications. Philadelphia, Penn.: The Secretary, University of Pennsylvania. Cloth; 6 x 9 in.; pp. Part 1—875; Part 2—675; illustrated.

APPLIED MOTION STUDY: A Collection of Papers on the Efficient Method to Industrial Preparedness—By Frank B. Gilbreth, Consulting Management Engineer, Member Franklin Institute; M. Am. Soc. M.E.; Society for the Promotion of Engineering Education, and L. M. Gilbreth, Ph.D., New York: Sturgis & Walton Co. Cloth; 5 x 8 in.; pp. 220; illustrated. $1.50.

ASPHALT, RELATED BITUMENS, AND BITUMINOUS ROCK IN 1916: By John D. Northrop. Mineral Resources of the United States, 1916—Part II. (Pages 263-281.) Washington, D. C.: United States Geological Survey, Department of the Interior. Paper; 6 x 9 in.; pp. 18.

CITY AND COUNTY ADMINISTRATION IN SPRINGFIELD, ILLINOIS: A Survey by the Department of Surveys and Exhibits, Russell Sage Foundation. D. O. Decker, Shelby M. Harrison. The Springfield Survey, Government Efficiency Section. New York City: Department of Surveys and Exhibits, Russell Sage Foundation. Paper; 6 x 9 in.; pp. 152; illustrated. 25c.

THE EFFECTS OF EXPOSURE ON SOME FLUID BITUMENS By Charles S. Reeve and Richard H. Lewis. Reprinted from the Journal of Industrial and Engineering Chemistry, Vol. 9, No. 8, page 743. August, 1917. Paper; 6 x 9 in.; pp. 11.

BENGAL SMOKE-NUISANCES COMMISSION: Report for 1916-1917. Calcutta, India: The Bengal Secretariat Book Depot. Paper; 8 x 13 in.; pp. 4. 3d.

EVAPORATION FROM THE SURFACES OF WATER AND RIVER-BED MATERIALS: By R. B. Sleight. Reprinted from Journal of Agricultural Research. Vol. X, No. 5. Washington, D. C., July 30, 1917. Published by authority of the Secretary of Agriculture, with the cooperation of the Association of American Agricultural Colleges and Experiment Stations. Washington, D. C.: The Author, United States Department of Agriculture. Paper; 7 x 10 in.; pp. 52; illustrated.

INFLUENCE OF GRADING ON THE VALUE OF FINE AGGREGATE USED IN PORTLAND CEMENT CONCRETE ROAD CONSTRUCTION By F. H. Jackson, Jr. Reprinted from Journal of Agricultural Research. Vol. X, No. 5. Washington, D. C., July 30, 1917. Published by authority of the Secretary of Agriculture, with the cooperation of the Association of American Agricultural Colleges and Experiment Stations. Washington, D. C.: The Author, United States Department of Agriculture. Paper; 7 x 10 in.; pp. 12; illustrated.

IOWA ENGINEERING SOCIETY: Proceedings of the Twenty-Ninth Annual Meeting, held at Ames, Iowa, February 21-23, 1917. Iowa City, Iowa: The Society. Paper; 6 x 9 in.; pp. 183; illustrated.

KING'S SEGMENTAL CONSTANTS FOR CIRCLES AND SPHERES Copyrighted 1917 by Leon T. King C. E. [illegible] N. Y.: The Author. Paper; 4 x 7 in.; pp. 11. [illegible] 3 for $1.

STATE HOUSING MANUAL Containing the State Tenement House Act, State Hotel and Lodging House Act, State Dwelling House Act—Annotated—San Francisco, California: Commission of Immigration and Housing of California. Paper; 6 x 9 in.; pp. 118; illustrated.

GEOLOGY OF MASSACHUSETTS AND RHODE ISLAND By B. K. Emerson. Washington, D. C.: United States Geological Survey, Department of the Interior. Paper; 6 x 9 in.; pp. 289; illustrated; folding map.

TECHNIC OF SURVEYING INSTRUMENTS AND METHODS Including General and Detailed Instructions for Field and Office Work, of Extended Students' Exercises—By Walter Loring Webb, C. E., M. Am. Soc. C. E., and John Charles Tracy, Ph.D., C. E., M. Am. Soc. C. E. New York: John Wiley & Sons, Inc.; London: Chapman & Hall, Ltd. Leather; 4 x 6 in.; pp. 316; illustrated. $2.

TOUGHNESS OF BITUMINOUS AGGREGATES By Charles S. Reeve and Richard H. Lewis. Reprinted from Journal of Agricultural Research, Vol. X, No. 5, Washington, D. C., August 13, 1917. Published by authority of the Secretary of Agriculture, with the Cooperation of the Association of American Agricultural Colleges and Experiment Stations. Paper; 7 x 10 in.; pp. 14; illustrated.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Cut Tanks in Two To Get Them by Drawbridge on Scow

BY E. DAUENHAUER
John H. Eichleay, Jr., Co., Pittsburgh

IN MOVING two dozen tanks a distance of 15 miles from South Chicago across the lakes and up the Chicago River to West 36th St., the John H. Eichleay, Jr., Co., in charge of the work, discovered that several of them were too large to pass through the channel. The tanks whose diameter exceeded the clearance between piers of the drawbridges were cut in halves, and the open side of each half was braced with timber falsework.

Each half was braced with a top and bottom chord and five posts, all made of 6 x 8-in. timbers. The knee-braces shown in the photographs were of 3 x 8's, well spiked to the horizontal timbers and posts. To make the bracing effective the tank was drawn against it by stretching horizontally across the open end of each half four ¾-in. wire ropes spaced equally from top to bottom. These cables were clipped to eye-bolts through rivet holes and drawn taut with turnbuckles.

The tanks which had been cut in two were successfully reassembled by moving the halves together and adjusting them with jacks until the rivet holes matched.



TANKS WERE BRACED WHERE CUT WITH SIX- BY EIGHT-INCH TIMBERS

Fuel Committee's Coal-Saving Pointers Apply to Contractors' Firemen

THE cooperation of firemen is the most important part of the plan to save 50,000,000 tons or more of coal this winter, according to the Committee on Coal Conservation of the Chamber of Commerce of the United States. This amount of coal, it is said, represents but one-third of the quantity that is usually wasted each year. Contractors are large users of coal fired by hand in locomotive boilers, and even in normal times a little coal conservation brought about by some intensive work directed at the firemen by the master mechanic would be very much worth while.

The committee mentioned calls attention to the well-known fact that fires kept up by putting in small quantities of coal frequently and covering only the thin spots are the most economical. It recommends that with a 6 x 9-ft. grate (which is rather big for a portable boiler) 100 lb. every 10 min. or less is sufficient. The thickness of fire recommended is from 4 to 8 in., according to the size of coal and the force of draft.

The fireman can be much more efficient, says the committee, if he will take small shovelfuls, stand directly in front of the door where he can see where to throw the coal, and fire quickly and rapidly. Of course, the ashpit should be kept clear and the flues should be cleaned regularly if anything is to be accomplished in the way of saving coal.

The committee cites an instance of one boiler installation where a bonus was offered to firemen using less than a certain amount of coal to keep up the required head of steam. In the first month of operation the bonuses amounted to a raise of 10% in the firemen's wages. Even if the bonus offered should be equal to the value of the coal saved, the employer is not a loser; and if contractors generally would try some such system, the total saving of coal would be considerable.

Inexpensive Iron Roller Guides Cables

AN ELABORATE system of cableways is in use in the work of raising three dams, which the Southern California Edison Co. is carrying out at Huntington Lake, Calif. Where these cables pass around bends, an inexpensive type of idler is used which has been found so satisfactory that it has been made standard for this service. These idlers are made up of short lengths of 4-in. pipe, to the ends of which are threaded 4-in. to 1-in. reducers. In the small ends of these reducers 1-in. steel bolts run free as axle in bearing. These steel bolts, projecting 2 or 3 in. from the bushing, constitute inexpensive bearings which are easily mounted on post or tie. Thus the advantage of a large diameter idler is obtained with slight expense and inconvenience in the matter of bearings.

The work of raising the dams was described in *Engineering News-Record* of Dec. 6, p. 1044.

Make Use of Mixer Engine to "Load Up"

By H. F. Van Scoyoc
Chief Engineer, Toronto & Hamilton Highway Commission

THE drum of a concrete paving mixer, a gin pole, some blocks, a piece of cable and a skidway doubled the output of a gang of six men engaged in laying sections of industrial railway track of the Toronto and Hamilton Highway Commission at its yard at Oakville, Ontario.

A similar rigging with the addition of a suitable runway and two 1½-yd. dump cars enabled the same crew to reload from a stock pile a 50-ton sand car in the short time of 2 hours and 20 minutes.



PAVING MACHINE WITH SIMPLE RIGGING ENABLES GANG TO LOAD INDUSTRIAL TRACK ON RAILWAY CARS TWICE AS FAST AS BEFORE

Track-Pit and Bucket Elevator for Handling Stone on Road Job

By William Halvembergh
New York City

CONFRONTED with the problem of unloading cheaply 5000 tons of broken stone for a concrete road, Mascetti & Holley, contractors of Torrington, Conn., assembled some second-hand machinery and set up a track-pit and elevator installation similar to those becoming popular with reinforced-concrete building contractors. A bucket elevator was taken from an old stone-crushing plant owned by the firm and mounted so as to dig stone from the pit into which it was dumped from the railroad cars. The elevator raised the stone about 10 ft. and dumped it into bins from which it could be drawn through gates into industrial cars.



BUILDING-WORK METHOD SAVES ON ROAD CONSTRUCTION

A small gasoline engine was first used to run the bucket elevator, but did not develop sufficient horsepower. In consequence a 12-hp. electric motor was substituted. This plant cost little besides the labor required to put it up, but several cents per ton on the cost of handling the stone were saved by it.

Speaking Campaign To Increase Lumber Output

A corps of speakers has been organized and sent out among the Southern lumber towns by the Southern Pine Association, to address men employed in lumber mills at logging camps, in order to bring the war home to them and arouse them to greater efforts in the production of timbers for wooden ships.

NEWS OF THE WEEK

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

Harris Resigns as Manager of Fleet Corporation

Admiral Asks To Be Relieved and Piez Becomes Head of Merchant Shipbuilding Work

Rear Admiral Frederick R. Harris, U. S. N., who on Dec. 1 assumed the position of general manager of the Emergency Fleet Corporation, on his own request was relieved of that position on Dec. 17. No official reasons are given for this unexpected move and his future assignment has not been made public.

Charles A. Piez, who was made vice president of the Emergency Fleet Corporation about a month ago, has been named as general manager of the corporation to succeed Admiral Harris. Mr. Piez is a mechanical engineer, whose whole professional experience since his graduation from the Colorado School of Mines in 1889 has been with the Link-Belt Engineering Co. and the affiliated Link-Belt Co. For many years he was chief engineer of the former concern, and at the time of his appointment to the Fleet Corporation he was president of the Link-Belt Co. in Chicago. He is 57 years of age.

Mr. Piez is the fourth general manager of the corporation in its short life of less than one year, his predecessors being Maj. Gen. G. W. Goethals, U. S. A., Rear Admiral W. L. Capps, U. S. N., and Rear Admiral F. R. Harris, U. S. N. All of the major officers of the corporation and the present Shipping Board are now civilians.

Civil Engineer Parks Named Head of Yards and Docks

On Dec. 18 the President sent to the Senate for confirmation as chief of the Bureau of Yards and Docks of the Navy, the name of Charles Wellman Parks, civil engineer, U. S. N. Mr. Parks stands No. 5 on the list of civil engineers in the corps and has for a year or two past been in charge of the Pearl Harbor drydock in Hawaii.

Boulder Wants a City Manager

Applications for the position of city manager are wanted by Boulder, Colo., a city of 12,000, in which a new charter will take effect on Jan. 1. To attract good men it is announced that there are "big problems in water-supply, paving, parks and drainage" for the city manager to tackle, and that the salary to be paid will depend upon the man. Applications should be made to O. P. Clark, city clerk.

News-Record Sends R. K. Tomlin, Jr., to Front as Correspondent

Robert K. Tomlin, Jr., managing editor of *Engineering News-Record*, sailed recently for France to serve *Engineering News-Record* and the other papers of the McGraw-Hill Publishing Co., Inc., as special war correspondent.

Mr. Tomlin was graduated from Harvard University in 1907. During his college course he served for two summers as assistant in the surveying and railroad field engineering of the Harvard Engineering Camp at Squam Lake, New Hampshire.



ROBERT K. TOMLIN, JR.

Shortly after graduation he entered the employ of the Pennsylvania R.R. on the tunnel work in connection with the Pennsylvania Station in New York City. He left this work to go to the New York Board of Water-Supply, and was stationed with the Northern Aqueduct Department at Poughkeepsie, New York.

His journalistic experience dates from March, 1909, when he became assistant to the editor of the *Engineering Record*. He was subsequently made associate editor, in charge of the municipal and sanitary field, and in 1913 was promoted to the position of managing editor.

When *Engineering News-Record* was formed last April by the consolidation of *Engineering News* and the *Engineering Record*, Mr. Tomlin was made managing editor.

Engineers' Conduct in Battle Wins Tribute from Haig

Letter of Thanks to Pershing Speaks Warmly of Their Gallant Action in Fight at Gouzeaucourt

In Field Marshal Haig's letter of thanks to General Pershing for the assistance given by American Army engineers in the fight at Gouzeaucourt, when the Americans dropped their other work, seized rifles and helped to repel a German attack, the British commander paid a high tribute to the engineers. His letter reads:

General Headquarters,
British Armies in France,
Dec. 6, 1917.

My Dear General Pershing:

I have much pleasure in forwarding herewith for your information a copy of a report submitted to me by General Byng, commanding the Third British Army, on the gallant conduct of companies of railway engineers of the United States Army in and near Gouzeaucourt on the 30th of November.

I desire to express to you my thanks and those of the British forces engaged for the prompt and valuable assistance rendered, and I trust that you will be good enough to convey to these gallant men how much we all appreciate their prompt and soldierly readiness to assist in what was for a time a difficult situation.

I much regret the losses suffered by these companies.

Yours very truly,
D. HAIG.

Atlanta Incinerator Steam May Be Used

A written proposition to buy all electric current that could be generated by utilizing steam produced at the city refuse incinerator, Atlanta, Ga., has been made by the Georgia Railway and Power Co. The company would transmit to the city water-works pumping station all current generated by the city at the incinerator and pay the city the same rate (0.6c. per kw.) as the city is now paying the company for the pumping-station service. The incinerator steam has been wasted since the incinerator was put into use some four years ago. The incinerator was built to burn 250 tons of refuse a day, which it was estamited would produce 1500 kw. of current. Owing to war-time economy the refuse going to the incinerator has fallen to 150 tons a day. It is expected that the 1918 city budget will contain an item of $40,000 to $60,000 for an electric generating plant at the incinerator, in accordance with a recommendation adopted Dec. 17 by the outgoing City Council.

American and Canadian Societies To Coöperate

In answer to a letter apprising it of the resolutions passed by the American Society of Civil Engineers, the Council of the Canadian Society of Civil Engineers passed and forwarded the following resolutions:

"Whereas, the Council of the Canadian Society of Civil Engineers has received a copy of the resolutions adopted by the Board of Direction of the American Society of Civil Engineers at a meeting held on Oct. 9, 1917, expressing the desirability of the closest coöperation and cordial relationship between the American Society of Civil Engineers and the Canadian Society of Civil Engineers, and

"Whereas, the Council of the Canadian Society of Civil Engineers is in full accord with the sentiments and principles so clearly enunciated in the said resolutions, therefore be it

"Resolved, that the Council of the Canadian Society of Civil Engineers cooperate with the Board of Direction of the American Society of Civil Engineers to the end that the terms of the said resolutions may be carried into effect, and that the Council reciprocate the action of the Board by inviting the members of the American Society of Civil Engineers to take advantage of the facilities offered by the Canadian Society of Civil Engineers and make themselves at home in its rooms and attend its meetings whenever they may visit Montreal.

"Be it further resolved, that a committee of the Canadian Society of Civil Engineers consisting of the president, a past president and two members of Council be requested to communicate with the Board of Direction of the American Society of Civil Engineers with a view to making arrangements for giving effect to the terms of the said resolutions."

Erie Flood Prevention Work To Be Relet

Gannett, Seelye & Fleming, engineers, of Harrisburg, Penn., took over the Mill Creek improvement at Erie, Penn., from the contractors, the Metz & Roth Construction Co., and expect to let it, under the Metz & Roth contract, on a cost plus percentage basis.

This action was taken after the Metz & Roth Construction Co. had served notice on the Erie City Council that it would not complete the work, asserting that the contract had not been certified and therefore was not binding upon the company.

Gen. Goethals To Have Charge of Army Supplies

In the organization of the new War Council, announced Dec. 17, Maj. Gen. George W. Goethals was recalled to active duty and was appointed acting quartermaster general in place of Major General Sharpe.

Storage at Seaboard and Interior Necessary To Prevent Freight Congestion

F. L. Stuart of War Industries Board Storage Committee Outlines Method of Getting Supplies to War

Sufficient and properly distributed storage areas for the rapidly increasing mass of freight rushing toward France is the solution of the Atlantic seaboard freight congestion problem, according to Francis Lee Stuart, consulting engineer, New York. Mr. Stuart, as is well known to engineers, has been chief engineer of both the Erie and the Baltimore & Ohio R.R., and is chairman of the Terminal Ports Facilities Committee, which is part of the Storage Committee of the War Industries Board. Since early summer this subcommittee has been engaged in the terminal problem as it relates to the transport of military supplies in France, and a number of its recommendations to the War Department are now in process of execution. Mr. Stuart outlined some of these recommendations in an address on Dec. 14, before the annual meeting, in New York, of the Acadamy of Political Science. In part, he said:

Military Control of Resources

"The resources of the country will produce the needed military supplies, and it therefore is absolutely essential that such supplies should be so distributed that they will finally be in actual military control, so that there is a dependable quantity for use when and as needed. The Terminal Ports Facilities Committee and the Storage Committee of the War Industries Board have recommended to the Depot Board of the War Department that (a) storage areas and port facilities be created abroad for holding ——— months' supplies; (b) that storage areas under military control be created at Atlantic ports to hold in storage several months' supplies, and that a number of ports be used instead of two or three; (c) that interior storage areas be provided near the source of production for the collection of carload or trainload shipments to the terminal ports.

To Keep Supplies Moving

"In operation, as the storage reserve abroad is drawn on for use at the front it is replenished by requisition from Atlantic terminal ports, which in turn are kept up to a fixed reserve by moving up supplies in an orderly manner from the source of production.

"Speaking as an individual, as an engineer, and not as a member of any committee, I want to explain some of the logic involved in such an obviously simple recommendation and its bearings on the present transportation congestion.

"The ports selected were selected because the export and import shipment business of the United States for the past 20 years has built up interior transportation facilities in proportion to the business of the various ports, and in this emergency there is no time or man power to create greater railroad facilities than now exist, and the entire country's rails, north, east, south and west, should be used to an economical advantage.

"Engineering students of transportation know that the present methods of export transportation in trying to have cars meet ships or cars held to load direct to ships should be abandoned as inefficient and uncertain; that the priority orders cannot be depended upon for any continuous effort, as they will disrupt and break down any organization, be it for transportation or for commercial purposes, so that storage areas at the ports to unload cars into immediately upon their arrival, and capable of holding several months' supplies available by lighters, truck or car for loading quickly any ship offered without delay, are essential.

Must Provide for Expansion

"The storage areas require size for expansion, as the uncertainties of the war are such that no man can foresee whether we will have to furnish military material for 2,000,000 or 4,000,000 men, or even a greater number. It is wise in planning for such a movement that the areas selected should be large enough easily to take care of a storage which can be expanded as required to meet the varying emergencies which may arise, without having to create new organizations or educate large forces in new methods.

"It is necessary to build storage areas, for there are no suitable storage areas available which are unoccupied by industries. The necessities of war will have a disastrous enough effect on the economic wealth of the country, even with well-thought-out endeavors to conserve the earning power of the community without tearing down or disrupting going concerns, which in their indirect way, if not in a direct way, are necessary for the sake of our continuing strength.

Safety from Fire

"Warehouses and layouts of the storage areas are designed for the purpose of safety from fire or other risks, quickness of dispatch to ships, efficiency and simplicity of operation, and while they are close enough to rail facilities which serve the ports, they are segregated and their operation should not greatly interfere with the other efforts of the country.

"Piers and berthing spaces for ships are available at every port, and it is recommended that we conserve man power and materials by using such facilities as loading places for ships with materials from the nearby storage areas.

"In 1913, had the business of the country been normally progressive, the railroads would have been unable to avoid congestion, as their improvements were not abreast with their needs Without new facilities being added the congestion of today was a certainty from every angle. Such congestion has been added to by the abuses which have been permitted by the Government, such as priority orders and unrelated efforts which result in use of cars for storage.

MUST RELEASE FREIGHT CARS

"What can we do to avoid such congestion? In my opinion, the greatest useful relief that can come in this crisis is the physical coördination of the railroads, and from a public opinion which demands a change in our business methods and which will coerce an immediate unloading and release of a car. This will require readjustment of business sites in the end, but the methods which will be most intensively used to accomplish such a result are the establishment of a storage place as a part of a business policy in every plant, and a greater use of the already prepared roads, such as a city street, for distribution by trucks and other means which do not require special tracks.

"The war is an epoch in our history, not an emergency. Such an inefficient and disorganizing tool as priority orders should not be used except in a national emergency. Restraining or non-essential orders could be tried with less risk."

To Connect Imperial Valley Canal System with Laguna Dam

Press reports from Washington announce that the delegation from Imperial Valley appearing before Franklin K. Lane, Secretary of the Interior, has received permission to connect the canal system with the Laguna dam, provided the Imperial District bears the expense. Great difficulty is experienced, the delegation explained, in obtaining sufficient water to irrigate the valley, and connection with the Laguna dam would solve this problem and make possible the future construction of a canal that shall be entirely within the United States.

In granting permission for the connection, Secretary Lane suggested that before the construction was undertaken the people of the district should be allowed to vote on the plan of building a series of storage dams in the Colorado River and its tributaries, which would increase the water-supply during low water. These dams would require Congressional action in granting permits and appropriating funds for construction, the funds to be repaid after a period of years by the water users.

The delegation, consisting of C. E. Grunsky, consulting engineer for the district, and several prominent irrigationists of Imperial Valley, agreed to submit both matters to the people of the valley and report results.

Chicago Paving Report Once More in the Limelight

Officially, the controversy in Chicago over a report made in 1916 by Prof. Ira O. Baker, consulting engineer, on pavements laid by the Board of Local Improvements, has probably been given final attention. On Dec. 10, the finance committee presented to the City Council a report by the committee's engineering staff covering four of the most serious conclusions drawn by the consulting engineer, in which the latter alleged, by inference at least, extensive losses to the city on account of deficiencies in the thickness of concrete foundations, asphalt binder course and asphalt wearing surface, and in the percentage of bitumen in asphalt mixtures.

The staff report concludes that the consulting engineer was in error in assuming that deficiencies existed in the thickness of pavements all over Chicago, when data furnished to him by the staff reported a deficiency in only five foundation jobs out of 63 inspected, five binder jobs out of 10 inspected and six wearing surfaces out of 20 inspected.

CONSULTING ENGINEER CRITICIZED

As to the question of the low percentage of bitumen, the staff report holds that it was supplied with erroneous information, which in turn was supplied to the consulting engineer. Further, it questions the propriety of his assuming a deficiency in the percentage of bitumen in any large quantity of paving based on one inspection and no analysis.

Much acrimonious discussion of the report has taken place. Eight inspectors of the Board of Local Improvements had charges preferred against them, alleging dereliction of duty in permitting the alleged skimping, their cases being tried by the Civil Service Board. They were exonerated (see *Engineering News-Record* of Apr. 19, p. 173). Last summer the president of the Board of Local Improvements preferred charges against the finance sub-committee's staff, which is virtually the former efficiency division of the Civil Service Commission. These alleged that erroneous information had been furnished to the consulting engineer. The present report by the staff to the sub-committee grew out of these charges, which have recently been dismissed.

Comments upon the original report, submitted by C. D. Hill, engineer of the Board of Local Improvements, Prof. F. H. Newell and Prof. Baker, will be found in *Engineering Record* of Jan. 20, p. 115, and March 3, p. 357; and in *Engineering News* of Jan. 4, p. 39, and Feb. 15, p. 288.

None of the committees of engineering societies which took up the matter has yet reported back to its respective society. The original report was abstracted in *Engineering Record*, Dec. 9, 1916, p. 702.

A Most Appropriate Holiday Gift

You can hit upon no finer expression of your good will to your responsible men than to make them a gift of a year's subscription to the paper that is published to help them to improved and economical results in their work.

Most holiday gifts are outworn and forgotten in a few months; but here is one that lives and grows with each week—one that will be a constant reminder to your men of your interest in them.

We have prepared an appropriate card announcing your gift. This will be mailed to each recipient, together with the Christmas number of *Engineering News-Record*, which will be complimentary, his subscription being entered as paid up to Jan. 1, 1919.

The time is growing short—so let us have your list without delay.

Locher Engaged as Contractor for Miami Conservancy District

The Miami Conservancy District has entered into an agreement with Charles H. Locher, an experienced contractor, and will coöperate with him in constructing the flood-prevention works of the district. Mr. Locher was formerly engaged as contractor on the construction of the Shoshone dam, in underwater rock excavation at the Soo, on the Wachusett dam, the New York barge canal and the Catskill aqueduct.

The district and Mr. Locher are now working together to build up an effective construction organization. It is expected to have the construction in full progress by late spring. The first issue of the bonds of the district, amounting to $10,000,000, was placed on the market last week, and it was reported that they were about two-thirds sold. The work consists of the construction of five earth dams, from 70 ft. to 130 ft. high, and the improvement of the Miami River channel through the various cities of the valley. The work will include the moving of about 20,000,000 yd. of earth, the placing of about 300,000 yd. of concrete, and a large amount of miscellaneous construction.

Will Clear Up Halifax Wreckage

Col. Robert Smith Low, of Ottawa, Ont., has been placed in charge of the work of clearing up the wreckage caused by the Halifax explosion, preparatory to rebuilding. He was born at East Saginaw, Mich., in 1874, and after some years' experience in connection with his father's contracting business became a partner in the firm of McManus, Low & McManus, general contractors, of Sydney, N. S., in 1900, and shortly afterward head of the R. S. Low Contracting Company.

In 1912 he became associated with Bate, McMahon & Co., of Ottawa. Colonel Low has supervised a number of important contracts, including that for the plant of the Dominion Iron and Steel Co.

Army Engineers Praised by the Secretary of War

In Annual Report He Tells of Their Work and Recommends Enlarged Engineer School

In the annual report for the fiscal year 1916-17, Newton D. Baker, Secretary of War, gives a slight idea of what the engineer troops have so far done and what lies before them. The paragraphs are as follows:

THE ENGINEER DEPARTMENT IN WAR

This great division of the War Department in times of peace devotes the major part of its energy to works of internal improvements and to the supervision of, improvement, and maintenance of navigable waters; but in time of war it immediately becomes a fundamental part of the Military Establishment. It was, therefore, called upon not only to render assistance of an engineering kind in the establishment of training camps, but had to establish camps for the rapid training in military engineering of large additions to its own personnel, and to undertake the rapid mobilization and training of additional engineer troops, of which at the beginning of the war there were but two regiments.

One of the earliest opportunities for actual assistance to the countries associated with us in this war was presented to this department. In the war against Germany transportation, and particularly railroad transportation, is of the utmost importance. It was easily foreseen that our own army in France would require large railroad facilities both in the operation of permanent railroads for the handling of our equipment and supplies and in the construction and operation of temporary roads behind our army. In the meantime regiments of engineer troops, if speedily organized and dispatched to Europe, could both render valuable assistance to the British and French armies and acquire the training and experience which would make them valuable at a later stage to us. Accordingly nine such regiments were organized and have for some months been rendering active and important service along the actual battle front. In addition to these, a tenth regiment, composed of men skilled in forestry and lumbering, was organized and sent abroad, and is now operating in a foreign forest cutting out lumber supplies for the use of our associates and ourselves.

Concurrently with the formation of these special engineer troops the department undertook the collection of material for the establishment and operation of our own lines of supply abroad. The railways of France have been maintained in a state of high efficiency by the French people, and they are performing the tremendous transportation task imposed upon them by the French and English military operations with complete success; but in order not to impose a burden which they were not designed to meet, by asking them to expand to the accommodation of our services, it has been found necessary for us ourselves to undertake the accumulation of railroad material for our own use in the theater of war. This work is on a large and comprehensive scale. Any detailed description of it would be inappropriate at this time, but it involves the creation of entire transportation systems and the actual construction and operation of railroads with the elaborate terminal facilities needed for the rapid unloading and dispatch of supplies, equipment and troops.

In my annual report of last year I pointed out the inadequacy of the engineer school maintained at the Washington Barracks and expressed the hope that the intention of Congress could at some suitable time be called to the wisdom of providing facilities for original research and continuous and fundamental training for our body of engineers. The experience of this war emphasizes the suggestion then made. The engineer is the bridge over which discoveries of science pass into the practical uses of everyday life. There should, therefore, be a school for army engineers which would keep constantly engaged upon research and as constantly engaged in devising modes and appliances for the application of scientific discoveries in military matters. In the present war, as doubtless in all wars, the inventive faculty is aroused to unwonted activity; not only do our own scientists and inventors produce discovies and inventions which can be adapted to immediate military use, but our adversaries are likewise fertile and appear on the battlefield with new agencies and appliances which must be met defensively and surpassed offensively. These observations, of course, are equally applicable to the work of the Ordnance Department, and beginnings have been made in that department at the proving ground which will doubtless some day result in ordnance schools of a higher kind which will continue the practical education received by the young ordnance officer in his tour through the arsenals and proving grounds, and will select out for special duty men endowed with research ability and special inventive skill.

RECOMMENDS BIGGER ENGINEER SCHOOL

The Engineer School has, however, already a fair start and by relatively small appropriations it could be expanded into a great scientific agency, valuable to the country in times of peace and of the highest value under the stress of war. I beg leave, however, to urge that when Congress does address itself to this problem its plans be conceived in a broad and generous spirit. The education system of the Army, beginning with the Military Academy at West Point and following through the service school and the War College, should be rounded up by the construction of a scientific institution with laboratory facilities and experimental resources, to which the Regular Army officers could have recourse for the final training of their special talents. It should be an institution working in the closest coöperation with the great educational institutions of the country and so officered that the military value of the great research output of civilian educational and scientific laboratories would be constantly discovered and made available. In the present war the laboratories and facilities of the colleges and universities of the country have been placed at the disposal of the Government. The Bureau of Standards, under the generous direction of the Secretary of Commerce, has placed its services unreservedly at the disposal of the technical branches of the Army, and by this coöperation the department has been able to effect many standardizations and the simplification of many processes of great value both in production and speed.

ENGINEERING DEVELOPMENT NECESSARY

This sort of coöperation, of course, can always be relied upon, but the purpose of a great military scientific school is wider than this. Savages fight with bludgeons; civilized men with their wits. A civilized country should, therefore, keep its wits so ordered as to be able rapidly to use them to the greatest advantage, and so long as it is necessary for our country to maintain a military establishment as a protection against the sudden and unavoidable emergency of war, the counsels of prudence and forethought bid us take such steps as will enable us to afford surprises to our enemy, rather than to lag inquiringly and defensively behind the surprises which he prepares for us. Nothing is more striking in the present war than its development and applications of science. The submarine and airplane are the most spectacular scientific novelties, but there are many others. Instruments of extreme delicacy, applying old principles in new ways, and familiar devices put to unfamiliar uses all count for success in military operations.

It may well be that such a scientific or engineer school as I am here suggesting should be conceived as a part of the plan for a wider reorganization of the system of military education, but in the midst of war and the instant activities which it entails it would not be seasonable to ask attention to the details of such a system, nor can we see clearly what those details ought to be in view of the fact that this experience has caused a widespread interest in military training as an adjunct to the ordinary curriculum of colleges and scientific and technical schools, and it may therefore well be that when we have advanced out of the present struggle the essential associations of science in supreme national emergencies will so far have been realized as to make of civilian academic and scientific educational enterprises the natural laboratories for military study, leaving only the highly specialized research and coordination of invention and discovery to be performed in a distinctively national and higher military school.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

AMERICAN SOCIETY OF CIVIL ENGINEERS. 29 West 39th St., New York; Jan. 16 and 17, 1918, New York. Charles Warren Hunt, secretary.

AMERICAN INSTITUTE OF CONSULTING ENGINEERS. 35 Nassau St., New York. Jan. 14, New York. F. A. Molitor, secretary.

NEW ENGLAND WATER-WORKS ASSOCIATION; 715 Tremont Temple, Boston; Jan. 9, Boston; Willard Kent, secretary.

AMERICAN WOOD PRESERVERS' ASSOCIATION. Baltimore, Md.; Jan. 22-24, Chicago. F. J. Angier, Baltimore & Ohio R.R., Mount Royal Station, Baltimore, Md., secretary.

CANADIAN SOCIETY OF CIVIL ENGINEERS; Montreal; Jan. 8, Montreal. Fraser S. Keith, 176 Mansfield St., Montreal, Can., secretary.

AMERICAN SOCIETY OF AGRICULTURAL ENGINEERS. Dec. 27-29, Chicago; C. K. Shedd, Ames, Ia., secretary.

AMERICAN CONCRETE INSTITUTE. 27 School St., Boston; Feb. 7-8, Chicago; H. B. Alvord, secretary.

At the meeting this evening of the **Canadian Society of Civil Engineers**, Montreal, the speaker will be Phelps Johnson, past president of the Society and president of the St. Lawrence Bridge Co. His subject will be "Quebec Bridge, Some Views of the Shop Work." This will be the third of a series of illustrated lectures on the bridge, and will deal with the more important phases of the shop work and the fabrication of the superstructure.

At the regular bi-monthly meeting of **The San Francisco Association of Members of the American Society of Civil Engineers**, held Dec. 18, there was a new feature, consisting of several short talks by members of the association on the subject, "Why Engineers Have Not Achieved a Higher Rank Among Professions."

The Boston Society of Civil Engineers met on Dec. 19 and listened to an address by Charles T. Main, who was recently elected to the presidency of the American Society of Mechanical Engineers, on "The Foundations of the New Technology Buildings." On Dec. 18 the society, with the Society of Printers, was entertained by the Massachusetts Institute of Technology.

The Northwest Society of Highway Engineers, membership of which is composed of engineers of Oregon, Washington and Idaho, met in Salem, Ore., Dec. 15. O. Laurgaard, city engineer of Portland, is president of the society.

After the regular meeting of The Engineers' Society of Milwaukee, which is the Milwaukee section of all national engineering societies, on Dec. 12, there was a talk by Henry Freeman on forgings, and a talk by R. S. MacPherran on the structure of ingots, billets, forgings, etc., illustrated by micrographs projected on the screen. The society also paid a visit during the evening to the Allis-Chalmers forging plant.

The Yakima Engineers' Club was formed Nov. 24 by the engineers of the Yakima Valley, Washington. R. K. Tiffany, project manager, U. S. Reclamation Service, was elected president. J. O. Greenway, drainage engineer, Yakima County, vice president, and J. E. Forman, formerly city engineer of Yakima, Wash., secretary-treasurer. N. H. Gilman, present city engineer, D. R. Redman, designing engineer, U. S. Indian Irrigation Service, and C. E. Crownover, construction engineer, U. S. Reclamation Service, are the directors. The club was formed for the purpose of promoting social relations among the engineers of the valley and exercising a beneficial influence on public affairs. Membership includes civil, mining, electrical and mechanical engineers.

The Illinois Association of Members of the American Society of Civil Engineers, with 10 present at the annual meeting, Dec. 10, elected the following officers for the ensuing year: President, A. S. Baldwin; vice president, C. L. Strobel and A. F. Reichmann; secretary-treasurer, Edgar S. Nethercut. On account of the favorable condition of the treasury, dues for 1917 were ordered remitted. The organization still holds to its original single purpose, that of obtaining representation of Illinois members in the administration of the society. The executive committee reported informally against anything beyond this political activity.

At a combined meeting of the **Engineers' Club** and the **Cincinnati Section, American Society of Mechanical Engineers**, this evening, the annual meeting and election of officers of the club will be held, and there will be an address by the president of the club, Prof. A. M. Wilson.

The regular annual meeting of the **Florida Engineering Society** will take place Jan. 7, at Jacksonville, in the assembly room of the Seminole Hotel. The chairman of the local committee on arrangements is C. S. Hammatt, 20 Ocean St., Jacksonville.

The Detroit Engineering Society held a meeting on Dec. 13, in the conference room of the Detroit Board of Commerce, at which R. E. Conder, of the Boston Woven Hose and Rubber Co., delivered a lecture, illustrated with motion pictures, on "The Story of Rubber—What It Is and What It Does." On Dec. 21 W. R. Mott, of the National Carbon Co., Cleveland, Ohio, will address the society on "The Flaming Carbon Arc," and on Jan. 5 the speaker will be H. M. Brinckerhoff, engineer with Barclay, Parsons & Klapp. His subject will be "The Detroit Traffic Situation."

The Engineers' Club of Dayton, Ohio, held its regular monthly meeting Dec. 4, the program of the evening being a discussion of the principal features of the Liberty motor for airplanes. Maj. J. G. Vincent, of the Aircraft Engineering Department, Signal Corps, U. S. Army, who took a prominent part in the design of the motor, was the principal speaker. Capt. H. B. Marmon, of that department, and C. F. Kettering, of Dayton, participated in the discussion. Major Vincent and Captain Marmon have established permanent headquarters in Dayton.

The Engineers' Society of Western Pennsylvania, at its regular monthly meeting, Dec. 18, listened to an address on the "Design and Progress of the Floating Frame Reduction Gear," by John H. McAlpine, member of the Institute of Naval Architects, Pittsburgh, Pennsylvania.

The Associated Engineering Societies of St. Louis held a joint meeting, Dec. 12, under the auspices of the American Society of Civil Engineers, at which W. J. Knight, consulting engineer, spoke on "The Design and Construction of the Bevo Plant."

PERSONAL NOTES

FRED G. WHALEY, former city engineer and water superintendent of Chehalis, Wash., who resigned recently, has accepted a position with the State of Washington as valuation engineer, working in coöperation with the state examiner's department on water and light utilities. His work will cover the whole State of Washington.

H. GORDON HINKLE, Altoona, Penn., county engineer, has been appointed city manager by the city commissioners-elect. Mr. Hinkle was born in Germantown, Philadelphia, in 1874. For years he was division manager of the Union Traction Co., Philadelphia.

W. R. ELLIOTT, chief engineer for the Salt River Valley Water Users' Association, has been appointed project manager by the board of governors of that association, which took over the Salt River Valley Irrigation Project from the United States Reclamation Service on Nov. 1. Mr. Elliott was formerly employed as supervising engineer by the Reclamation Service. He was appointed engineer for the Water Users' Association in 1913, and is the first project manager to be appointed by the water users themselves on any project in the United States.

MAJ. WALTER E. WINN, Engineer Officers' Reserve Corps, who has been on duty with the 114th Engineers at Camp Beauregard, Louisiana, has been promoted to be lieutenant colonel of Engineers, R. C., and assigned to the 114th Engineers. Colonel Winn is a native of Alabama, an alumnus of the University of Virginia and a graduate of the Ft. Leavenworth engineers' training camp of August, 1917. He has

spent the greater portion of the past 15 years in the Mississippi Valley in the practice of engineering.

A. E. HANSEN and W. S. COULTER, New York City, have terminated their partnership, except for the conclusion of certain engineering works. Mr. Hansen will continue in the practice of hydraulic and sanitary engineering at the office heretofore occupied by Hansen & Coulter, at 2 Rector Street.

G. R. HAWES, formerly designer on pulp and paper-mill work for the Colonial Lumber and Paper Mills, Ltd., B. C., under V. D. Simons, industrial engineer, Vancouver, B. C., is now in private practice at Tacoma, Washington.

MAURY NICHOLSON has resigned as assistant city engineer of Birmingham, Ala., after serving in the city's engineering department for the past 17 years. Mr. Nicholson will be connected after Jan. 1 with the Chickasaw Shipbuilding Co., Mobile, Ala., where he will have charge of the laying out of two towns.

LEONARD S. CAIRNS, assistant general manager of the Manila Electric Railroad and Light Co., Manila, P. I., has been appointed general manager of the Eastern Pennsylvania Railways Co., Pottsville, Penn., by the J. G. White Management Corporation, New York City, the operating managers of both companies. Mr. Cairns succeeds L. H. PALMER, who recently became assistant to the president of the United Railways and Electric Co., Baltimore, Maryland.

BURNSIDE & BENNETT, Grove City, Penn., have disposed of their practice and equipment to FRANK P. GRAHAM, of Detroit, who will continue the business at Grove City. The change is due to the fact that Lewis E. Burnside has been commissioned first lieutenant of engineers in the National Army, and Neal A. Bennett will be called into service in the near future.

F. RINGER, chief engineer, Missouri, Kansas & Texas lines, formerly at Parsons, Kan., is now at Dallas, Texas.

WILLIAM W. BURDEN, formerly city engineer in the Board of Public Utilities, Department of Streets and Sewers, St. Louis, has been commissioned captain in the 12th Engineers (Railway Regiment) and is regimental adjutant.

LEWIS H. DELANY has left the employ of Frank L. Wilcox, consulting engineer, St. Louis, and has accepted a position with the J. G. White Engineering Corporation, in the construction of a nitrate plant on the Tennessee River at Muscle Shoals, Alabama.

W. A. KELLY, with the United States Department of Agriculture as drainage engineer for irrigated lands since 1910, and since 1913 in charge of drainage investigations in Washington, northern Idaho and Wyoming, has accepted a position with the Federal Land Bank, of Omaha, Neb., as engineer appraiser, with headquarters at Omaha.

H. G. COUTTS, formerly superintendent for Thompson-Starrett Co., on the hotel which the company is erecting in Cleveland, is now connected with the construction division of the United States Signal Corps, and is at Langley Field, Virginia.

R. F. MACDOWELL, principal assistant engineer for R. Winthrop Pratt, consulting engineer, Cleveland, Ohio, has finished his work at Camp Sherman, Chillicothe, Ohio, where he represented Mr. Pratt during the past six months on the construction of the National Army cantonment, and has returned to the Cleveland office. He will in the future give two days each week for Mr. Pratt at Camp Sherman, in an advisory capacity, on the operation of the camp utilities.

E. T. COLTON has left the city engineering department of Kansas City, Mo., where he had charge of the field work of the structural division, to become connected with the construction of the emergency wooden fleet. He is stationed at Morgan City, La., for the Union Bridge and Construction Company.

HERMAN F. DOELEMAN, consulting engineer, Baltimore, Md., has closed his office and with his employees has joined the Quartermaster Engineers' Department.

CARL P. HOFF, who resigned as city engineer of St. Joseph, Mo., has accepted a position as assistant to H. M. Stone, resident engineer at St. Joseph of the Grand Island Railroad.

FRANK P. LARMON, until recently chief engineer for the Consolidated Water Co., Utica, N. Y., is now resident engineer for the Cienfuegos, Palmira & Cruces Electric Railway and Power Co., Cienfuegos, Cuba.

J. J. GAILLARD, for many years city engineer of Macon, Ga., but who failed of reëlection recently, has become division engineer for the Portland Cement Association, with headquarters in Macon.

HALE JUDSON, formerly an assistant city engineer of St. Joseph, Mo., has become city engineer, succeeding CARL P. HOFF, resigned. RICHARD E. WACHTER, who has been first assistant city engineer, has left the city service, his office having been abolished.

ROYAL A. MEEKER, of Plainfield, N. J., has resigned as highway engineer of the State of New Jersey. WILLIAM G. THOMPSON, who was associated with Major-General George W. Goethals in the building of the Panama Canal, has been named by the latter to succeed Mr. Meeker. Mr. Thompson was assistant state highway engineer of New Jersey since last April.

F. M. SIEFER, formerly of Portland, Ore., has been appointed division engineer of the Sacramento, Calif., division of the Southern Pacific company, succeeding W. H. KIRKBRIDE.

ELBERT M. CHANDLER, Burbank, Wash., consulting engineer for the Noches Selah Irrigation District, was elected President of the Washington Irrigation Institute at its fifth annual meeting in Yakima, Wash., Dec. 4-5. E. S. Benson, commissioner of agriculture of the State of Washington, who has been president during all the previous sessions, declined reëlection because of the pressure of public affairs, but will continue as an active worker in the position of vice-president.

J. A. BIRON, who was engaged in construction work for the Casper Ranger Construction Co., at Pittsfield, Mass., is now at Holyoke, Massachusetts.

L. DREW GODDARD, Detroit, Mich., is now a captain in the Engineer Officers' Reserve Corps.

PAUL N. COATES, St. Paul, Minn., is now a sergeant in the 23rd Engineers, at Camp Meade, Maryland.

EBERHARDT MUELLER, who was with the Concrete Steel Engineering Co., Massena, N. Y., is now at Camp Hill, Pennsylvania.

G. R. BASCOM, professor of sanitary engineering in the University of Wisconsin extension division, has been called to Chicago by the national food administration to study the problem of turning waste into pork by feeding garbage to hogs. He has been working for some time on a plan to carry out the project in Wisconsin cities.

JOHN F. RICHARDSON has been made project manager of the United States Reclamation Service Truckee-Carson Project, Fallon, Nev., vice JOHN T. WHISTLER, made consulting engineer, with offices in Berkeley, California.

COLEMAN MERIWETHER, inventor of the Meriwether system of reinforced-concrete pipe for sewers and pressure lines, and president of the Lock Joint Pipe Co. for the past 13 years, has terminated his connection with that company, and has been appointed manager of the Cement Products Bureau of the Portland Cement Association, with office in Chicago.

W. H. HARTEL, with the Pennsylvania lines west of Pittsburgh, formerly at Logansport, Ind., is now at Pittsburgh.

L. W. ARMSTRONG has completed his work as supervising engineer for the War Department at Camp Kearny, Calif., and has returned to his duties as assistant engineer, City of Los Angeles, California.

S. FRANK BUTLER, district engineer of the Portland Cement Asso-

ciation at New York, has resigned to become district contract manager of the Turner Construction Co., of New York. He will be in charge of the New England district, with headquarters in Boston. Mr. Butler was graduated from Swarthmore College in 1908 and was in general construction work before going to the Portland Cement Association four years ago. He was district engineer in New York for a year and a half.

N. H. CHOATE, recently engaged on the construction of a power house and ice plant and two machine shops for the Schoellkopf A. & C. Co., at Forks, N. Y., constructed by the John W. Cowper Co., Buffalo, is now engaged on work being done for the New York Central R.R. at Gardenville, N. Y., by the same company.

S. D. WILLIAMS, JR., special engineer with the Michigan Central Railroad Co., until recently at St. Thomas, Ont., is now at Detroit.

THOMAS R. KING has left the University of Nevada, at Reno, and is now first lieutenant in the Engineer Officers' Reserve Corps, as assistant to department engineer, Western States.

R. A. HOLLENBECK, assistant engineer with the Union Pacific System, who was until recently in San Francisco, is now at Portland, Oregon.

WILLIAM P. PUTNAM has resigned as president of the Detroit Engineering Society, having taken up work in the inspection section, Gun Division, Ordnance Department, U. S. Army. The executive committee of the society nominated L. R. HOFFMAN, first vice president, to serve as president during the remainder of the year; C. W. HUBBELL, second vice president, to be first vice president; R. C. FOWLER, member of the executive committee at large, to be second vice president; and H. S. MORSE, chairman of the civics committee, to be member of the executive committee at large.

JOHN S. BATES, of Selma, Calif., has been appointed city engineer to succeed WILLIAM H. SHAFER, resigned.

HOWARD CHESTNUT has been selected for the post of city engineer of Bloomington, Ind., and will take office on Jan. 1. He was formerly connected with Schmidt & Seaman, Indianapolis.

OBITUARY

THOMAS MOONEY, for 17 years a designing engineer in the John Roach Shipyards, New York, died Dec. 11 at his home at Douglaston, L. I., in his 70th year. He was president of the Acorn Engineering Company.

GEORGE WASHINGTON DYE, formerly general road-master and consulting engineer for the Chicago, Rock Island & Pacific Railroad Co., died at his home in Eugene, Ore., Dec. 2, aged 81. He was prominent in the early history of the Rock Island lines and built the Oskaloosa branch of that system.

JOSEPH MORGAN, JR., chief draftsman of the Phoenix Iron Co., Phoenixville, Penn., and chief engineer of the Edgemoor Iron Co., died at his home in Johnstown, Penn., Dec. 9. He was a native of Philadelphia, but had lived in Johnstown since 1879. As consulting engineer of the Cambria Steel Co. and as a member of several mechanical and mining societies and the United States Naval Institute, he was widely known. Mr. Morgan served in the United States Navy in the Civil War, under Admiral Farragut.

BUSINESS NEWS

B. F. Affleck, Chicago, was reëlected president of the Portland Cement Association at its annual meeting in New York, Dec. 12. Mr. Affleck is president of the Universal Portland Cement Co. F. W. Kelley, president of the Helderberg Cement Co., Albany, N. Y., was elected first vice president, and Richard Hardy, president of the Dixie Portland Cement Co., Chattanooga, second vice president. G. S. Brown, president of the Alpha Portland Cement Co., Easton, Penn., was elected treasurer.

N. B. Payne has opened an office in the Havemeyer Building, 25 Church St., New York, as an electric crane specialist. He was formerly associated with Manning, Maxwell & Moore, Inc., New York.

D. S. Hays, manager of the Philadelphia office of the Haynes Stellite Co., has been commissioned captain in the Engineer Officers' Reserve Corps.

The paint and wood finishing business of the Bridgeport Wood Finishing Co., Still River, Conn., has been purchased by E. I. du Pont de Nemours & Co. The Bridgeport Wood Finishing Co. was incorporated in 1876.

G. A. Schneider, formerly of the San Francisco sales organization of the Western Electric Co., has been appointed manager of the Buffalo branch, succeeding J. W. Tabb, who has been transferred to New York.

J. C. Bannister has been made a vice president of the Walworth Manufacturing Co., Boston, Mass., manufacturer of iron pipe fittings, valves, Stillson wrenches, etc. Mr. Bannister has been connected with the manufacture of this type of product for 26 years, starting as foreman at the tapping department of Haxtun Steam Heater Co., Kewanee, Ill., in 1891. His headquarters will be at Kewanee, Illinois.

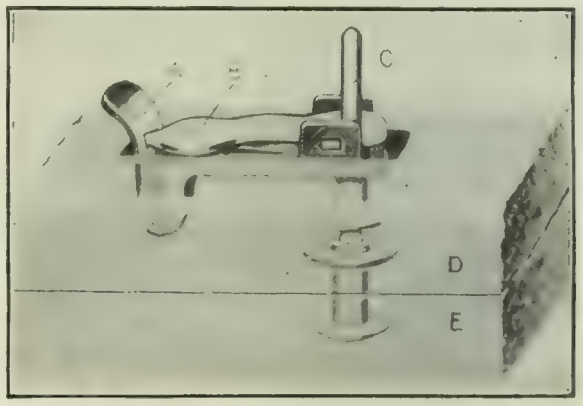
TRADE PUBLICATIONS

Peavey-Byrnes Lumber Co. has issued a 24-page, 3¾ x 6¼-in. "Handbook for Engineers' Use." It refers to longleaf pine structural timbers and gives specifications, results of tests, properties of beams and columns based on actual sizes.

APPLIANCES AND MATERIALS

Holder for Blueprints, Charts, Etc.

The Presto holder, manufactured by the National Company, engineers and manufacturers, Boston, Mass., affords a means of temporarily binding blueprints, records, charts, drawings, newspapers, etc., for ready reference. The distinguishing feature of the device is the quick-acting and positive lock shown in the illustration. Pressing *A* locks the binder, and pressing on *B* releases it. The stud *C* is securely fastened into the lower strip of the oak binder *E*, and all the locking device is self-contained in the upper half of oak-wood binder strip *D*. The holder is intended for use in engineering and architectural offices, drawing rooms, machine shops, on construction jobs, in ship yards, libraries, etc., and is designed to prevent the loss, tearing, soiling and mislaying of prints and papers.



QUICK ACTING AND POSITIVE LOCK

Civil Service Examination, New York

Inspector, Board of Water-Supply—Salary $120 and $130 per month. Candidates must be between the ages of 21 and 50 and have had at least three years' experience as inspector or engineer. They must be familiar with materials of construction, with contracts and specifications and with the methods and appliances for prosecuting public works. Subjects and weights: Experience, 4; technical, 6. Applications received at Room 1400, Municipal Building, Manhattan, until Dec. 21, 4 p.m.

For further particulars see *City Record* or apply to the Municipal Civil Service Commission.

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A Clear Note on Society Service

ON page 1206 of this issue will be found an extract from an address by Fraser S. Keith, secretary of the Canadian Society of Civil Engineers. We have not read anywhere so clear an expression of the ideal of society service as is contained in the first paragraph of his address. The development of his ideas, too, shows a very clear vision of a society program, one that will cleave close to the membership and ensure their constant and enthusiastic support. It will be noted that he places service to the individual members on a high plane, by showing how such service is a necessary precedent to recognition by the public "of the engineer's real place in national affairs," which includes, Mr. Keith adds, "status, remuneration and opportunity of service." But Mr. Keith's address is interesting not only because of its intrinsic merit, but because it shows that the trend in professional thought in Canada is in the same direction as that here. In other words there is not merely a national unity of thought on either side of the boundary line. There is an international unity—which gives still greater validity to the society currents that are setting in both here and in Canada.

Work To Be Done on River Transportation

THE government's farseeing decision of last Spring to stimulate waterway transportation has produced disappointingly small results. In this issue is given a brief account, based on official information, of what has been done on the Mississippi, our greatest potential waterway. The sum total is nothing more than promises for 1918, and even these must fail unless the Shipping Board redeems the government's semi-official promises that barges will be furnished. The great purpose of relieving the overstrain on the railways by utilizing the rivers has so far failed of accomplishment. If more tangible results are to be obtained next season, enthusiasm and the utmost resolve must be brought to bear on the subject by all the river interests in a united spirit. Nothing is harder to change than established traffic routes, but the change must surely be made. Packet and barge routes must be organized, public terminals must be provided, and traffic must be forced rather than solicited to seek the river. The casehardened skepticism of the local business people toward river transportation—based on long-time causes—can be transformed into energetic coöperation if the government will but speak in convincing earnestness. Only a few short months are left for preparation.

Conference of Transportation Agencies

IT IS reported from Washington that a meeting will shortly be called for interchange of ideas as to methods of correlating the four chief transportation agencies —the railroads, the electric lines, the highways and the waterways. Commendation of such a proposal would, in the present situation, be gratuitous. The need stands out so strongly that one wonders how such a conference can be avoided and efficiency nevertheless secured. The real difficulty lies in breaking down the barriers to constructive thinking which competition has erected between the various agencies. Such a meeting as is proposed would materially help in breaking down the barriers. One prominent railroad man, devoting his energies to the government at Washington, has recently admitted that not until the present crises was he able to see clearly the possibilities of coördination between the railways and the highways. He had looked on the highway as a competitor. Others, without doubt, also emerging from their previous prejudices, need the help which a conference of the four agencies could give.

Is This Where the Cars Are Going?

ONE hears in Washington on the authority of men thoroughly conversant with the industry, that it will not be possible to transport across the Atlantic, by the time they are delivered, one-half of the motor trucks for which the U. S. Government has already contracted. One hears, on equally good authority, that supplies of the most vital character—those which must be in France before this country can hope to place an army on the Western front, or feed it, or supply it with arms and munitions—are held in staggering quantities along the Atlantic seaboard awaiting shipment. It is freely admitted by official and unofficial Washington that the shipping situation is the key to the present emergency. Granted these conditions, is it possible that, through lack of coördination or appreciation of the ocean transport situation, each branch and department of the Government has gone ahead buying and shipping to the seaboard the goods and munitions which it finds necessary; and that the fact that present water transport facilities cannot begin to take this flow of materials away has more than a little to do with the lack of cars and the failure of our railroads to move such essential commodities as coal? When private interests were dumping commodities at the ports of the Atlantic seaboard faster than they could be removed, the railroads were able to protect themselves by declaring embargoes. Should there be a condition in which de-

partments of the U. S. Government were doing the same thing, and each department at the same time insisting that its freight was more important than anyone else's, the railroads would be defenseless. While Congress is investigating the railroad situation, inquiry in this direction might be productive of inestimable benefit. Should it develop that the Government departments might be better informed of ocean shipping conditions and better served thereby, or that better coördination in the time of delivery for supplies required by different departments might be secured, great improvement in the domestic railroad situation might be brought about.

A Great Step Toward Professional Solidarity

THE election of Alfred D. Flinn to the secretaryships of the Engineering Council, the Engineering Foundation and the United Engineering Society, announced in this issue, is the first great fruit of the removal of the American Society of Civil Engineers to the Engineering Societies Building. It is evidence of the determination of the four great organizations to work as one when their problems meet. On technical matters their functions will be as distinct as before. But where engineering and engineers touch the public weal or when a question concerns the whole body of the profession the distinction between the societies are to disappear. The joining of the secretaryships, therefore, important as it is for what is actually accomplished, is even more important because of its significance as a forward step toward coöperation of all engineers.

If any doubt remained as to the advisability of the civil engineers joining with the other societies in the common home, the uniting of the secretaryships in one man effectively dispels it. It bears out the prediction freely made by *Engineering News* and *Engineering Record* when the removal project was under discussion that housing under one roof would inevitably bring the societies into very close spiritual union and lead to effective coöperation.

One cannot help enthusing over the prospects that this step opens up. One feels that we are measurably close to that long-sought-for professional solidarity. Heretofore it has seemed far distant. Hope appeared when the civil engineers voted to go to Thirty-ninth Street. Now there has been such a step that even the most skeptical must admit progress, must know that the desired day cannot be long delayed. All the more hopeful is the outlook since the Engineering Council has voted to amend its rules so that other societies than the four founders may be represented thereon. The amendment is now before the governing bodies of the founder societies for consideration.

Mr. Flinn has indeed a rare opportunity. But the position will not be an easy one. Responsibility and opportunity are commensurate. At present the council is unwieldy. It has not won from the societies that freedom of action which is necessary if it is to be responsive to the profession at large; and it must be responsive if it is to have the support and enthusiasm of engineers generally. Such support and enthusiasm are a sine qua non of success.

Mr. Flinn comes well prepared for the tasks ahead. He deserves the full confidence of the profession and the hearty support of its members.

Steel Ships Are Being Built

THE resignation of Admiral Harris as general manager of the Emergency Fleet Corporation marks the final submergence of that body in the Shipping Board. Such submergence was a legal fact from the very start, for the corporation is but a creature of the board, formed to build ships under the less restrictive administration of a private corporation. But the public was led by the President's appointment of General Goethals to the managership of the corporation to consider that position of more importance than the chairmanship of the board. This public magnification of the place of the corporation was only increased when the President, not once more but twice, repeated the appointment of a general manager over the heads of the board, which successively showed its legal power by reducing that manager to a routine executive of the board's desires. Not until the third manager had resigned rather than accept an anomalous position was the board permitted to select its own manager. This journal considers that the building of ships—under appropriations now reaching a billion dollars—is not fit business for a government board, particularly when that board is amply busy with such activities as the chartering, licensing and manning of merchant vessels, the recruiting and training of men and the numerous judicial duties of a peace time organization. It would prefer to see the building program centered in one man, free of the Shipping Board. But lacking that the present development with a strong man like Mr. Hurley in command is the next best thing. Very evidently the chairman of the board is in the saddle, with a power and a disposition to take full responsibility for the shipbuilding progress of the next year and a half. This being a fact, this journal does not share some of the current pessimism regarding the building of ships. In spite of the friction between board and corporation, ships have been speeded up since July, at least. Of the other functions of the Shipping Board, the facts are not so clear nor the outlook so bright, but steel ships of large tonnage—the main necessity of the present time—are being built and will continue to be built at a speed far beyond the expectations of peaceful times and almost equal to that so easily demanded by the casual and ignorant critics of press and Congress.

Safe Building with Timber

DETAIL drawings are sometimes strikingly inferior to descriptive words in defining the essentials of a construction method. That is why Mr. Dean makes virtually a pioneer contribution to the literature of building by his article in this issue expounding the defining characteristics of timber "mill construction." This valuable building type—its brilliant success in the New England textile mills entitles it to highest appreciation—has unfortunately remained a localism, little known outside of the Down-East provinces; and mainly because too often drawings haye been depended upon to set forth a method that in reality is the expression of an attitude of mind.

A clearly outlined word-picture is now presented of just what the method is, the objects which the designer must accomplish and various means by which he may

do so. The full definition, it is true, is scattered in separate phrases through the article, but to the structural engineers they nevertheless stand out distinctly enough to coalesce into an integral statement. "The smallest practicable number of heavy beams covered with heavy smooth plank in turn covered with a top floor"; "reached by the smallest number of automatic sprinklers"; "entire absence of concealed spaces"; "the beams continuous ties to the sides of the building"; "metal deeply buried within the wood";—these are some of the elements of Mr. Dean's definition.

It is profitable to consider further a few of the points involved. Rigidity, which the article dwells on, has an intimate relation to strength, and the great strength provided in "mill construction" is a prime factor in securing rigidity. The plank-and-beam floors possess a carrying capacity of well over 500 lb. per square foot distributed loading, which is far in excess of ordinary manufacturing-floor needs. This solidity of construction has unquestionably helped to establish the type; and when we reflect on what is common practice in other forms of building, paring the loadings down to a minimum and designing to bear this minimum without excess, it is easy to see in the generous provision of strength something to be emulated.

Sprinklers find mention in Mr. Dean's exposition. Doubtless they are to be considered a vital characteristic of the type of construction. Without sprinklers and firewall subdivision probably no such history of success would have been recorded as "mill construction" actually can show.

Great structural strength, minimum opportunity for attack by fire, means for extinguishing or checking a fire starting in the contents, an arrangement that will confine a fire to a small section, rigidity, and stability not only when completed but also when partly fire-wrecked—these elements secured by the use of timber framing in a quickly-erected, economical form are comprehended in "mill construction." The type is worth far more attention than it has received in the recent past. We have neglected timber construction unduly and invested many a dollar in buildings of more costly type that can show no record of superior strength, permanence, or fire-resistance. In the days to come of more urgently imperative economy, "mill construction" and other ways of utilizing timber will again claim close attention.

Uncoördinated State Engineering Sets a Problem

WHILE every engineering organization in the land is straining for increased efficiency to meet the demands of the times, state engineering work continues in the formless, haphazard condition that has characterized it for years past. The inefficient scattering of engineering work among many separate state bureaus has long been in need of reform. But today the mobilization of the country's engineering resources calls for immediate action to change this condition—by emergency methods, if needful.

A well-known engineer who is in close daily touch with the technical bureaus of one of our richest states makes a significant remark about them. He says that not only are the several engineering offices totally uninformed about each other's problems and working methods but even the men are strangers; the engineers of one bureau are not acquainted with those of other bureaus. This remark, however surprising, will be found equally applicable t many other states.

A dozen or more large engineering departments represent the sovereign authority of a great commonwealth in relation to a multitude of public-welfare questions; and these numerous bodies act just as if each one existed alone, as if their work had no interrelation or points of mutual contact.

No need to ask whether real efficiency is secured when such a condition exists. The state is in precisely the same position as any private corporation in regard to the necessity for centralized administration. It cannot secure reasonable over-all efficiency in its engineering work when this is split up among many autonomous offices. Waste, duplication of effort, imperfect utilization of experience, are inevitable consequences.

The existing state of affairs is not to be blamed on engineers. It came about through no fault of theirs, during the rapid growth of state engineering within the past ten or fifteen years, when legislatures created department after department to care for new needs; looking at the subject from the administrative side only, the lawmakers disregarded the essential engineering unity of the work involved. Engineers on the contrary have done their part to achieve a good result even under the conditions thus forced upon them. They have labored in their several departments efficiently and conscientiously. But this could not make headway against the inherent lack of coördination.

While engineers, therefore, are not responsible for low efficiency and lack of system in state engineering, yet the burden of the present obligation to reform lies mainly upon them. They alone are able to perceive the present compulsion toward immediate coördination, and therefore, from them must come the initiative.

The problems of next year's work are already presenting themselves. They demand coördination as a prerequisite to their solution. The selection of urgent construction and the elimination of the non-urgent; the allotment of money and labor to either maintenance or construction, whichever shall be found to be more productive; the adjustment of administrative and regulatory activities to the special needs of the times—such questions must be subjected to fullest study. Engineering analysis is required, and all the experience and knowledge of the state's departments must be joined in the study.

The situation calls for early coördination of the engineering departments, or at least of their engineering thought, within the government of each state. If it can be secured quickly enough through legislative or executive action, official coördination gives the best promise of success. Failing this, however, the engineers themselves can bring about a result sufficient for the moment's needs.

Let representatives of separate departments come together of their own motion, unofficially, and as a technical association discuss the state's technical problems. If their study is thorough, and their conclusions clear and courageous, they are sure to have the people's support.

What Is Mill Building Construction?

An Exposition of the Essentials Governing This Type of Fire-Resisting Building and of the Details That Distinguish It

By F. W. Dean
Mill Architect and Engineer, Boston

SLOW-BURNING mill construction is the name applied to a long-used type of fire-resisting timber building common in New England, especially in textile mills. The name represents a very definite idea in design and construction, and one well understood by those accustomed to building this type of structure. It seems to the writer, however, that many architects and engineers are not sufficiently familiar with the fundamental requirements of mill construction and are apt to consider it merely the use of plank floors resting on widely separated beams. In fact, the technical press has of late published designs of so-called mill construction which not only violate the rules of that construction but which may cause the very trouble it is intended to avert. It seems desirable, therefore, to state as briefly as possible how a mill construction building should be designed, giving the reasons, with illustrations, for the methods described.

In the design of factory buildings, certain principles should be clearly kept in view. In a general way, it can be stated that these are minimum opportunity for the occurrence, travel and wrecking effect of fires—with a resultant low cost of insurance—rigidity, and great admission of light. These conditions are realized to the maximum by two types of construction, the older being mill construction, and the newer reinforced concrete. As fire risks, both are considered by the mutual insurance companies as first-class, and their relative values as such in the estimation of these companies is shown by the net rates which they make, which are about 5.5c. per $100 for mill construction and 4.8c. for reinforced concrete.

New England Leads in Mill Construction

Regular mill construction originated in New England and is, or has been, carried out to the greatest perfection in that part of the country, and chiefly in textile mills. As now designed by the best mill engineers, it consists of brick walls, with heavy transverse wood beams, on top of which, for floors, are spiked thick planks at right angles to the beams, and these planks are covered with a top floor at right angles to the planks. The planks are grooved on both edges and so-called wood splines are tightly driven into the grooves of adjoining planks so that one plank will assist in the support of the next, thus stiffening the floor for isolated loads and preventing one plank from moving vertically relatively to the next (Fig. 1). The spaces between the beams or the "bays" should not be so wide as to require beams at right angles to the main beams, or any subdivision of the bays. A maximum bay width of 10 ft., except to accomplish a special object, is advisable. Wherever any metal is used it should always be deeply buried within the wood so that fire cannot reach it at first.

From the above it will be seen that real mill construction contemplates the smallest practicable number of heavy smooth beams covered with heavy smooth plank in turn covered with a top floor. The mass of such construction, the small amount of surface and the smoothness of the surfaces are fire resisting, and merit the name which is often applied to it, of being "slow-burning." Compared with this, the floor and roof construction consisting of planks on edge for beams and a foot or two apart are kindling wood. Mill construction also contemplates the entire absence of concealed spaces and the use of such spaces as can readily be reached by the spray from the smallest number of automatic sprinklers. It will readily be seen that the spaces between the beams of mill construction can be reached by a few sprinklers, while with the older construction many times as many sprinkler pipes and heads are required to give protection, as every part must be reached by the spray.

The beams of mill construction afford opportunity for supporting shaft hangers, and the spaces between them give room for pulleys and belts. If short countershafts are to be put up the wide flat surfaces between the beams afford an opportunity for attaching them.

Pintles Over Columns Are Fundamental to Type

Reference has been made to rigidity. The method of fastening the beams to each other where they butt together, and to the walls, is of great importance in securing this end. This must be considered in connection with the columns, and it is with respect to these and connecting the beams together that architects unversed in this type invariably fail. It is well understood that columns should rest end to end upon each other from top to bottom of buildings, but the columns themselves should not pass through the floors and between the ends of the beams, as is often done. Proceeding upward they should stop at the bottoms of the beams, and begin again at the tops. Between the top of one column and the bottom of the one above it there should be a short separate cast-iron column known as a "pintle" (Fig. 1). Being of cast iron, which is a material of great compressive resistance, it may be very small in diameter, and requires only a small hole through the beam to accommodate it, half of the hole being in the end of one beam and half in the other. The lower end of the pintle rests on the cap of the lower column and the top of the pintle receives the lower end of the column above.

There are several advantages in this construction. In consequence of it, the beams actually butt against each other, and having only a small hole through them (not much over 4 in. in diameter) the ends of the beams are actually over the body of the column and are not supported by the overhanging ends of the column cap.

If a cap end is burnt off or breaks off the beam is held as securely as ever. It is a common thing for architects to carry the lower end of a column to the top of the one below, and sometimes both columns are of the same size. The result is that the beams are supported by the overhanging ends of the column caps. This is dangerous construction, in respect to both strength and fire resistance. The end may break if of cast iron, bend if of steel, become soft in a fire and cause the floor to fall. In this construction most of the cap, and the whole of the part which supports the beam, are exposed to the fire.

The pintle construction, as before stated, permits the beams to butt against each other and thus become perfect struts to transmit pressure from one side of the building to the other, and it also gives room to put two iron dogs, or ties in the tops of the beams, one on each side of the pintle, to tie the beams together. Thus the beams become not only struts but rigid and continuous ties to keep the sides of the building in their proper relative positions. At the same time the pintles and dogs fulfill the necessary conditions before mentioned of being surrounded by heavy wood, for the pintles are within the beams and the dogs are embedded in grooves in the tops of the beams and covered by the floor planks. Moreover, the dogs cannot work out because they are beneath the planks (Fig. 1).

Where the pintles enlarge at the top to take the upper column only the top edges should be exposed to fire and can scarcely be injured. It should not be overlooked that when the beams and planks shrink the pintle tops become more exposed than at first, and allowance should be made for this. It should be observed also that the enlarged hole for the top of the pintle is in the plank and not in the beam (Fig. 2).

Still another advantage of pintle construction is that if a floor falls and a column below is knocked over by the falling floor or a heavy piece of machinery, it simply tips over on top of the pintle. A column which goes down between the beams if knocked over would pry the beams apart, punch a hole through the wall, possibly push it over, and cause the beam to drop off the column and fall. Thus the building might be wrecked on account of the absence of pintle construction.

Rigidity of Connection Is Necessary

The beams must be connected to the wall in such a way that the walls will not be pushed or pulled until after this connection is made, such effort only coming from wind pressure or manufacturing strain. The beam ends should rest in cast-iron boxes with side wings firmly built into the walls (Fig. 2). The beams should then be made to butt firmly over the columns and be drawn together by driving in the dogs which for this purpose have their ends inclined where entering the wood. When this is done one or two lag screws should be screwed into the beams through holes in projecting lips of the beam boxes, which completes the connection across the building. After this is done the lips of the column caps are lag-screwed to the beams, thus making

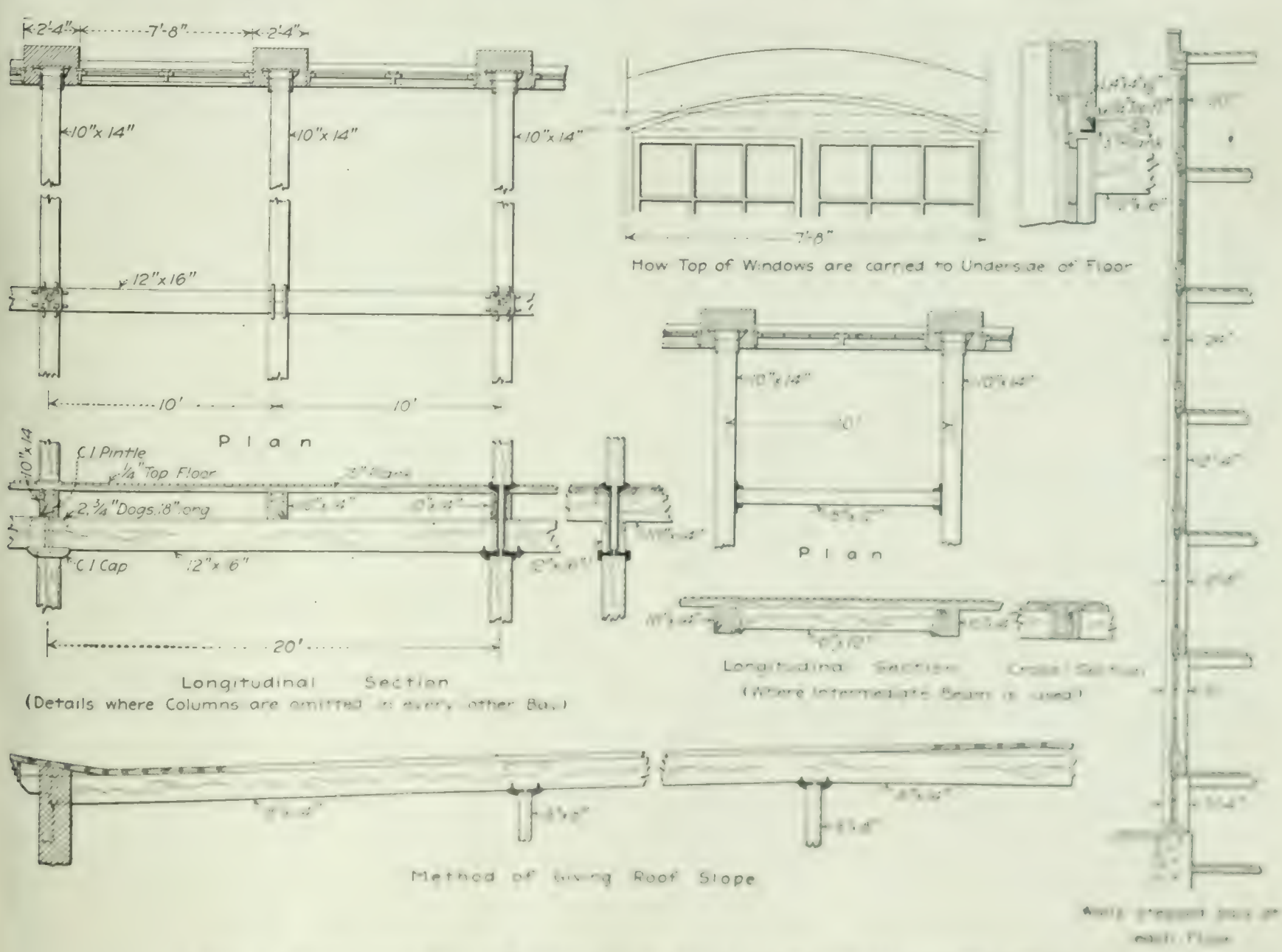


FIG. 1. WALL, COLUMN AND FLOOR DETAILS OF TYPICAL MILL CONSTRUCTION

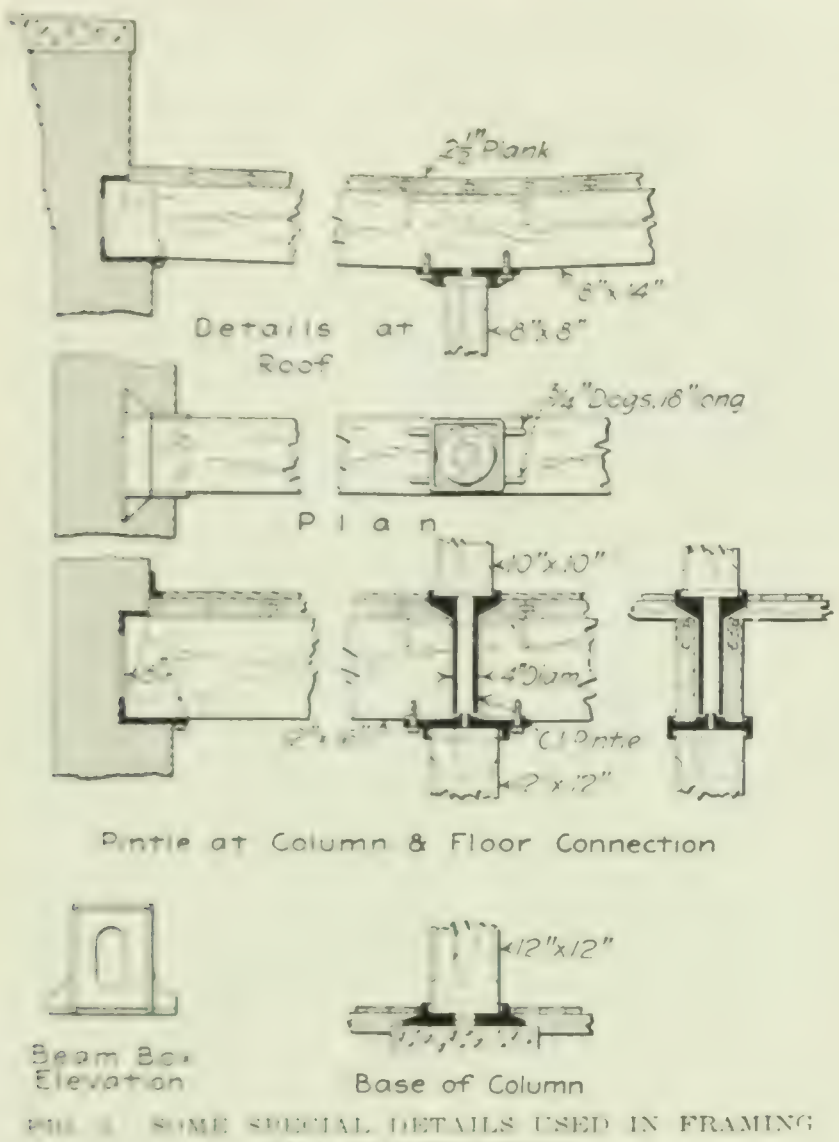


FIG. 2. SOME SPECIAL DETAILS USED IN FRAMING MILL CONSTRUCTION

the columns stable and preventing the beams from pressing against the pintles. Thus the column caps as well as the dogs hold the beams firmly together. No attempt should be made to have the pintle fit the hole, as it should be free to maintain its position as the beams are moved slightly when the dogs are driven. In fact the hole for the pintle should be at least ½ in. larger in diameter than the pintle (Fig. 2).

Beams usually end over columns, but if they do not, a hole is bored through for the pintle, and dogs are not required.

Floor-beams when double should have no space between them as was formerly provided in order to permit air to circulate between, as these spaces hold fire tenaciously.

There is a very pernicious practice of supporting intermediate cross-beams so that their upper surfaces are level with those of the beams which they join. This is effected by the use of forged stirrups or commercial beam-hangers. When a fire occurs they are easily softened and give way if they support any material weight, which they often do. Beams should never be supported in this way if it is possible to avoid such construction, and if they are, heavy cast-iron beam-sockets should be used lag-screwed to the beams Fig. 2). The commercial beam-hanger is a great menace to the safety of buildings.

Roofs are framed, supported and planked after the manner of floors, using dogs, and the latter should be driven before the brickwork is built around the anchors in the walls (Fig. 2). When there is not a row of columns in the center of the room, the roof beams should not be carried on the slant to the center of the building and there fastened together, with the expectation that a stable roof will result. Horizontal beams should run between the two rows of columns next to the center and the roof slant given by wedge-shaped pieces spiked to the beams (Fig. 1). Roof beams are not usually secured to the walls by means of beam-boxes, but they might be advantageously employed, especially if parapet walls are used. Wrought-iron anchors spiked or screwed to the beams are generally used (Fig. 1).

Special Beam Arrangements Possible

Sometimes it is desired to have columns omitted in every other bay, and the beams that do not rest on columns must be supported by longitudinal stringers resting on top of the columns that are used. Many architects in this case yield to the temptation to use the beam-hangers disapproved of above, but instead of this the stringers should be lower than the transverse beams by the depth of the latter, and the intermediate transverse beams should rest on top of them, and be fastened thereto (Fig. 1). Thus slow-burning construction is fully realized in this detail. The stringers are separated from the floor by the depth of the transverse beams, and the space thus provided is very convenient for the upper strands of belting. In this construction vertical shrinkage of the beams is considerable, and the pintles, which are long enough to go through both longitudinal and transverse beams, should be rather short, so that after the shrinkage the top will not appear materially above the floor.

Floor planks are usually 2½ in. to 5 in. thick and in widths not exceeding 10 in. They should be at least two bays long, but there must be enough one-bay lengths to cause breaking of joints. It is not necessary to have every other plank break joints; four or five planks of the same length can be laid side by side and the next set can break joints with these. Where floor planks are interrupted by pintles they should be fitted under the pintle to some extent, so that their ends will rest on the beams. This with the splines and top floors will support them. Otherwise they should rest on a stick secured to the adjoining planks by lag screws.

Beams Wrongly Placed

It is inadvisable to have beams at right angles to the main transverse beams in a factory—that is, parallel to the sides of the mill. One objection to this is, that if they are not at or near the center of the building they cut off the top light. Some architects wrongly place such beams against the sides of the building above the windows, and thereby prevent the tops of the windows from being as high as they might be, and close to the underside of the floor. These beams are hung to the transverse beams by means of the objectionable hangers already commented upon, and even intermediate transverse beams are sometimes hung to them. If the bays are not too wide intermediate beams are unnecessary, but architects often make the bays so wide that they are compelled to use intermediate beams, and this causes them to run the planks the wrong way.

The tops of the windows can be brought to the underside of the floor by building the arch in the next story above. The opening which would thus be made above the upper floor is closed by not carrying the arch clear through the wall. One course of brick carried down to the springing of the arch is sufficient to close the open-

ing, and this is supported by an angle iron spanning the window opening (Fig. 1). If a straight arch is used this is supported by angles or other forms of structural material.

The beams are usually made of long-leaf Southern pine, which formerly came chiefly from Georgia, but the name "Georgia pine" is now chiefly a name, as such pine comes from any state south of North Carolina, and even from Cuba. In Canada, British Columbia fir is largely used and since the Panama Canal was opened this kind of wood from Washington and Oregon has come East in considerable quantities. It can be obtained of any desired dimensions and although not quite so strong as Southern pine is a better wood in other respects. It is clearer, freer from sap, more uniform throughout its texture, and less likely to crack, than Southern pine. On account of its good qualities, it is, practically speaking, as strong as Southern pine. Beams should be chamfered on the lower edges between bearings, for the sake of appearance, and, some persons have stated, to do away with corners which readily ignite.

Floor Details Are of Fixed Type

Floor planks are made of spruce or pine, planed on three sides, grooved for splines, and for appearance slightly beveled or beaded on the bottom edges. The splines are made of clear yellow pine and are always ¾ in. x 1½ in. and, as already stated, should fit tight enough to require driving in. The planks should end on the centers of the beams, and be nailed on each beam with two nails of such lengths that two to three inches should penetrate the beams.

On each side of a room a plank should be left out until the building is well dried, as the planks sometimes swell enough to push out the walls.

On the planks there should be one or two layers of tarred paper, or, better, a paper covered with an elastic material which will fit around the nails securing the top floor, in order to make the floor waterproof. Such a

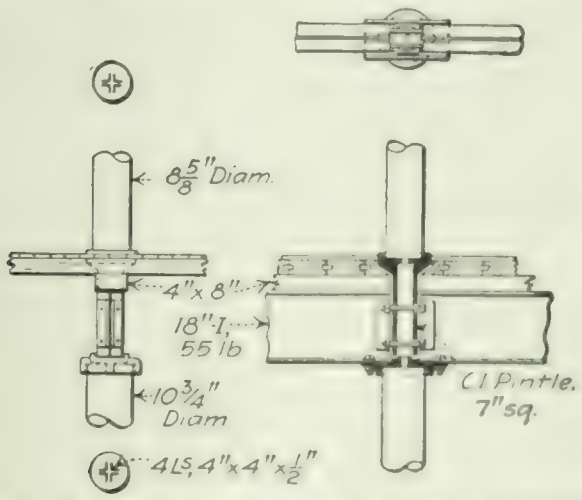


FIG. 3 PINTLE DESIGN FOR METAL COLUMNS

lining is intended to continue to be tight around nails after the floors shrink.

In Canada, and to some extent in this country, it is the practice to use for floors planks on edge nailed together horizontally. It is not customary to end these strips over the beams, but anywhere. This weakens the floor seriously and should not be permitted. Sometimes, if such floors are very thick, they are not fastened to the beams.

Top floors are usually of square-edged maple of ⅞ in. nominal thickness, but sometimes thicker. The boards are commonly 5 in. wide and should not be less than 6 ft. long. They should be kiln dried, wedged together when laid, nailed with two nails 16 in. apart on diagonal lines, with two nails at the end of each board independent of the diagonal nailing. Sometimes top floors are laid diagonally, but little or nothing is gained by this and the cost is a little more. All nails should be set and the floor planed if it is not smooth enough without it.

Steel beams are used somewhat in mill construction buildings, but are not liked by the insurance companies as well as wood. They tolerate them, however, trusting to sprinklers to keep them cool in case of fire, and consider that a fire will be confined to one story. Their advantages are that piers are not cut away by their use as in the case of wood and can therefore be narrower, thus increasing the window width, and columns can be farther apart. The beams should be laid on the walls as the work proceeds, with one brick course fitted around them in the face of the wall, and the pocket thus formed filled with cement grout. The brickwork can then proceed and the wall is not reduced in cross-section where the beam enters. If steel beams are used pintles should not be omitted, and beam boxes might be used.

Anchoring of Steel Beams

The anchoring of steel beams in walls is not quite so desirably accomplished as with wood. The common way is to have a couple of short pieces of steel angle riveted vertically to the web near the end of the beam to anchor it, and build the beam in as described above. The beam can be drawn up to the pintle before this is done. If the beam falls in a fire it will pry out some of the brickwork. A beam-box could be used, as in the case of wood beams, and bolted to the lower flange of the beam before the box is built into the brickwork. The beam and box could then be slid as the beam is drawn up to the pintle.

Square or rectangular pintles look better with steel beams than round ones, as the beam ends fit against them better. Sometimes the lower flange is bolted to a bracket cast on the bottom of the pintle and sometimes the web is bolted to an appropriate projection on the pintle. The best way is to rivet angles to the web, and bolt the beams together by means of bolts passing through oblong holes cast in the pintle, as in Fig. 3. Care must be taken to have the beam rest over the top of the column and avoid transverse stress in the pintle brackets.

The remarks on floors will apply to roofs, except that spruce sometimes warps and turns up its edges so that it may injure the roof paper. The standard slope of mill roofs is ½ in. per foot.

Concerning roof coverings, there are many different makes, any of which will be furnished with a guaranty of five or ten years. Tar and gravel are very satisfactory and should be five or six ply thick. Thick roof coverings of this kind are important in some places on account of their heat insulating qualities, which assist in preventing condensation of humid atmosphere on the underside in cold weather.

The undersides of roofs and floors are sometimes painted white, but the cracks between the planks makes them look bad, although the lighting effect is good. Likewise, brick walls can be painted, but the natural

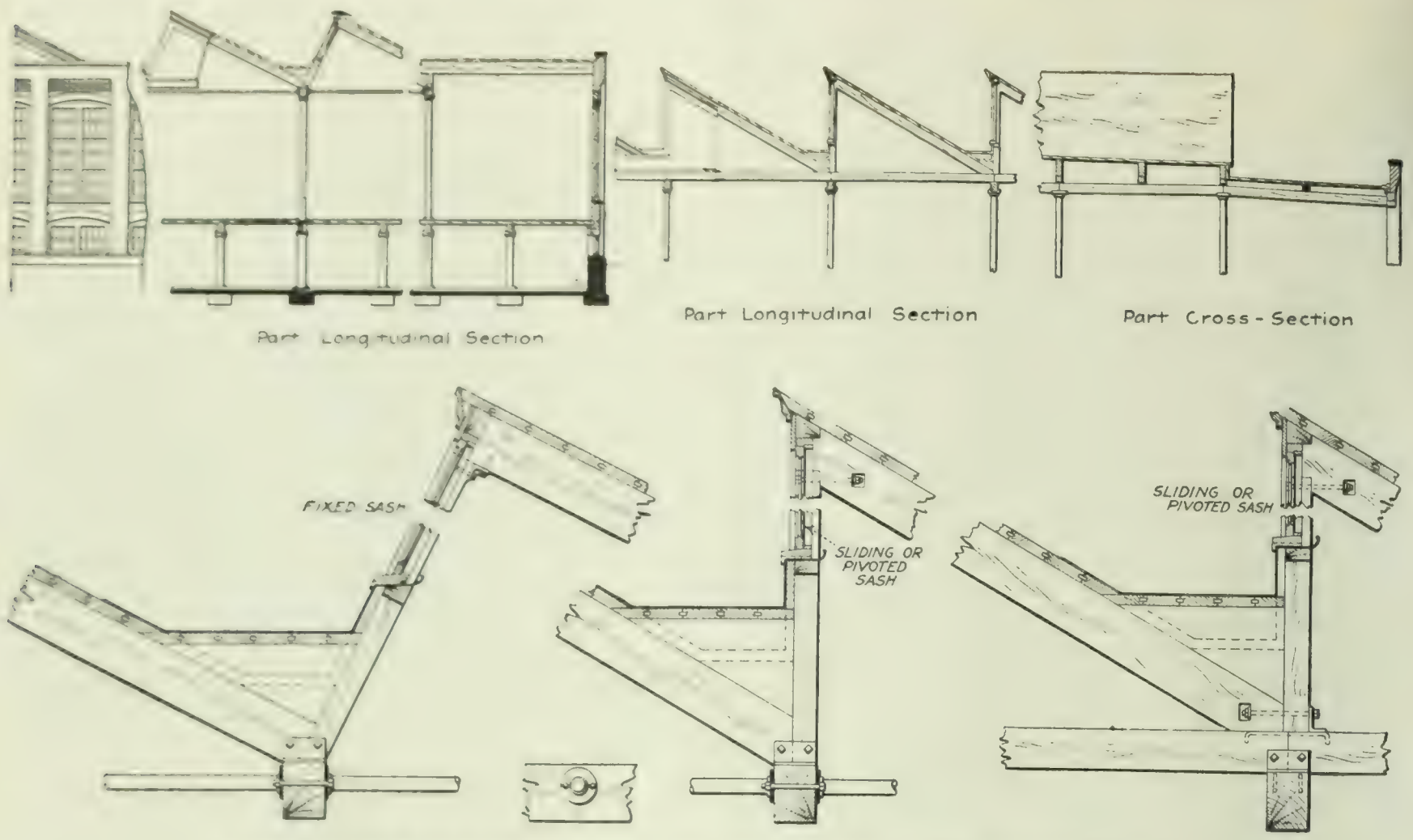


FIG. 4. HOW SAW-TOOTH ROOFS ARE DETAILED IN MILL CONSTRUCTION

brick looks better. Brick looks best when washed down with acid and oiled.

COLUMNS AND WALLS HAVE SOME VARIATIONS

Columns are usually made of long-leaf Southern pine and should be carefully selected for straightness of grain and freedom from defects. It is very important that the ends should be square with the axis, and when the columns are round this is easily accomplished in the lathe. Wood columns are often made as small as 6 in. square, but they are very apt to spring and in hot factories this is true of columns of any size. Practically, it is better to have 8 in. the minimum size. Pipe columns filled with concrete are used, but the mutual insurance companies consider wood columns a better fire risk, and where the pipe concrete columns are used they prefer to have a reinforcement placed inside, this being strong enough to support the load. The stock companies do not require this. This type of column without interior reinforcement went through the Salem fire successfully. Even with these columns, or those of cast iron, pintles should be used. Both ends of pintles should be faced off square and likewise the surfaces with which they come in contact, and pintles for square columns should have a circular face on which the column rests so that it can be faced in a lathe or boring mill (Fig. 2).

Wood columns were formerly bored and ventilating holes made at top and bottom. The benefit of this cannot be ascertained and the practice has been generally abandoned.

The upper and lower ends of wood columns should be treated with a preservative, especially the lower ends, as they are frequently wet from washing the floors.

In building such a factory some designers have slanted the piers between windows inward on the outside of the building. This is expensive and useless, and it should be kept in mind that the center of pressure coming from the weights should be as near the center of the foundation as possible. By stepping the walls back 4 in. or more at each floor on the inside of the building, or at every other floor, this is partly accomplished and the outside of the pier can be kept vertical (Fig. 1). If the pier is inclined or made like a stepped buttress on the outside, the result is that the foundation will be eccentrically loaded. These inclined or buttressed pieces accomplish nothing desirable.

If a wood floor is desired in the basement the best way is to make a tar concrete and wood floor, as follows: The earth should be filled-in layers 6 in. thick and rammed level. On top of this there is to be a layer 3 in. thick of hot tar concrete laid and rolled firmly and level, the upper ½ in. being of fine material laid hot and well rolled to prevent moisture from coming through. On this there is to be a layer of unplaned square-edged plank 2½ in. to 4 in. thick, laid close. The plank should be kyanized or treated with other preservative to prevent decay. A top floor is then laid at right angles to the plank and well nailed. The plank need not be splined, because there is no chance for vertical movement.

It is not well to use sleepers, as it is difficult to surround them properly with tar concrete and difficult to get them level, and they accomplish nothing useful. A floor as above described is a heavy solid mass and is bound together by the top floor. Experience shows that it is satisfactory without being fastened to anything and is suitable for holding any machinery that does not require foundations. It is good where wet processes are carried on.

The top story of a factory is often surmounted by a monitor roof which adds to the light in that story,

but saw-sooth roofs give the best light. They should face the north, or as near it as the location of the factory will permit. If they face the north, the light on a cloudy day is about as good as on a bright day, and it is difficult in such rooms to tell whether the sun is shining or not. The details of saw-tooth roofs are something of a problem. One of the difficulties is devising proper draining of the valleys between the saw-teeth. If the buildings are narrow, the valleys may slope from the middle to the sides of the roof, but if they are wide there should be several such slopes, and drainage should be provided at several points. Sometimes the whole saw-tooth is highest in the middle of the roof and slopes toward each side, even in wide buildings. Such construction produces awkward looking roofs, and causes the windows in the faces to be stepped. The writer prefers to keep the ridge of the saw-tooth level and slope the valley planking from high points to low, which presents no difficulty. The roof beams can have different slopes, the high ends being on the same level and the lower ends at different levels, the planking forming a warped surface. However it is done, it is almost necessary to plank the valleys over to provide a wide flat space next to the window face, but care must be taken to avoid concealed spaces in this detail.

The horizontal beams below the saw-teeth, when used, and the beams between the ends of the saw-teeth and the sides of building, are usually supported from the main transvers beams by means of exposed metal hangers, such as have been elsewhere condemned, even in designs by the best mill architects. This construction, of course, should not be made, on account of its poor fire resistance.

Faces of Sawtooth Roofs

Saw-tooth roofs are built with either inclined or vertical faces. The former are generally used, but vertical faces are easier to construct and permit the use of swinging or sliding sashes, while inclined faces must have glass reaching to the bottom of the windows, or water will stand on the horizontal mullions and finally leak through. Furthermore, condensation on the inner surface of inclined glass will drop on the floor and goods in process, while it will run to the bottom of vertical glass, where it can be caught. In either case, the flashing should run under the window stool and be formed into a drip pan, with ends stopped up, from which it can run out through grooves in the underside of the stool. Which form of saw-tooth should be used depends more upon the feelings of the designer than anything else. Inclined faces probably let in more light than the others, but it would require careful observation to detect any difference.

If shafting is to be overhead in a saw-tooth building wood stringers are used overhead for supports, and they serve to tie the saw-teeth together. If the shafting is located below the floor, the overhead stringers are omitted and tie rods are used. These rods sometimes run through pipes which serve as struts and obscure the sag of the rods, but the pipes only should be used, and if properly secured at the ends serve both as ties and struts.

In Fig. 4 is shown how the principles of slow-burning mill construction can be applied to saw-tooth roofs. To avoid metal beam-hangers the longitudinal beams rest on top of the transverse beams and may be secured to them as shown or by spikes or other means which may occur to the designer. He should have in mind that what metal he uses should be buried in wood if possible, and if not it should be above the beams.

Resting the saw-tooth beams on top of the main transverse beams, which secures maximum fire resistance, causes the valleys to be narrower than most designers like, but by planking over high enough, sufficient width can be obtained.

Persons interested in the quality of hard pine for mill construction are referred to a pamphlet issued by the Inspection Department of the Associated Factory Mutual Fire Insurance Companies, 31 Milk St., Boston, Mass., entitled "Dry Rot in Factory Timbers," and to matter published by the Southern Pine Association, New Orleans, and the National Lumber Manufacturers' Association, Chicago, Illinois.

Philippine City's Lowland Raised by Harbor Dredging

Valuable River Front Property in Iloilo Developed by Selling Fill to Private Owners and by Creating Public Areas

By W. C. A. Palmer
Supervising Engineer, Western Visayas, Iloilo, P. I.

MAKING river-front fills from dredged material is no new thing, but as a rule it is either a casual disposal of earth which has to be removed in channel improvement or else it is a scheme for reclaiming land. In the city and harbor of Iloilo, P. I., there has been a combination of the two, with the added factor of the sale of the filling material to private owners who wished to raise their low ground.

The location of the city is such that a great deal of lowland lies adjacent to the Iloilo River, a tidal delta stream. Virtually, the entire city is delta land, built up by river and sea deposits. The Island of Guimaras lies about two kilometers, across Guimaras Straits, from the mouth of the Iloilo River. There is a range of tide of about two meters and the river is constantly silting up, both from the straits and from the upper reaches of the river. This has made it necessary to expend from $15,000 to $20,000 annually in keeping the river channel free for the uses of navigation.

The first dredging operations for the benefit of navigation in the river were made in 1906, about the time of the construction of the Philippine Railway Co.'s terminals at the mouth of the river. At this time two jetties of riprap and fascine wall were constructed by the J. G. White Co. and its suction dredge filled in all that part of Iloilo now occupied by the railway company's shops and administrative offices. In 1909-10, the Atlantic, Gulf and Pacific Co.'s dredge "Manila" was brought to Iloilo, and lowlands were filled from the spoil dredged out of the river. At this time the lowlands from the lower reach up to about the center of the town were filled, this land belonging in the main to large property owners. For several years after 1910 no fill was attempted. An elevator dredge from Manila was

sent down each year and spoil was loaded into scows alongside of the dredge, carried out into the bay and dumped. For the past few years, this work has been done by the Philippine Government's steamship "Dredger," a sea-going self-propelling suction dredge of the hopper type.

In the past it has been the custom to remove from the river about 250,000 to 300,000 cu.m. of deposit, carrying it out into the deep channel, and letting it go to waste. In 1916, the district engineer of Iloilo made an attempt to use the discharge apparatus of the steamship "Dredger" and filled certain of the lowlands abutting the Iloilo river, notably the Iloilo Custom House site, where a new $150,000 structure has just been completed. This work resulted so satisfactorily and caused so much favorable comment that when arrangements were made for the annual dredging of the river the property owners, as well as the provincial governor and health officials, requested that the Government follow the same procedure for general land filling in 1917. Therefore, by an act of the Philippine Legislature, an arrangement was made whereby property owners could contract with the proper authorities for the delivery of such spoil as was incident to the harbor improvements, the same to be delivered upon their lands at the actual cost of such delivery. These contracts are made to cover a period of five years, payment to be made in five equal instalments and the first instalment falling due one year from the date of execution of the contract.

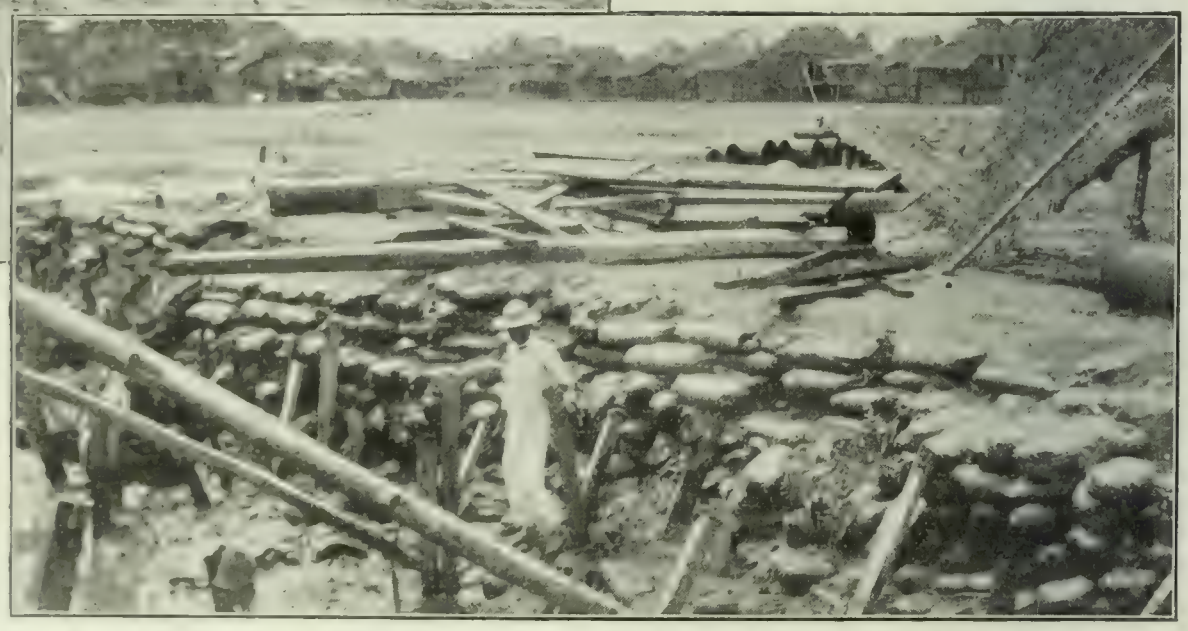
Meanwhile, Curtiss dredge No. 3, a modern 15-in. dredge, having a capacity of about 2000 cu.m. daily, was sent to Iloilo to clean out the river. Inasmuch as experience has taught that the river silts from the reaches above the town and from the bay both, it was decided that by dredging the upper reaches of the river in such a way as to create an eddy much of the silt would be deposited before coming into those areas ordinarily filled with silt.

The lower reaches of the river fill up from the action of the monsoons and a strong 8-mile current that flows both ways, forming an eddy in the mouth of the river. The jetties built only partially keep the river clear, so it is always necessary to dredge the bar annually.

The first land to be filled was the site of the new public market, an area of 10,000 sq.m. (about two and one-half acres) filled to an average depth of slightly over one meter. To reach this location, it was necessary to pump through a pipe line over 450 m. in length. Work was slow, owing to the fact that the dredge had received severe buffeting on its voyage to Iloilo, and from time to time repairs were necessary. However, the fill was so good that construction work on the La Paz market was started. This fill was a pure sand, mixed with gravel, there being very little mud. Indeed, the fill was so hard that it was possible to drive around the end of the discharge pipe in an automobile even when the material was being pumped in.



RETAINING WALL OF SAND AND MUD-FILLED GRASS SACKS HOLDS DREDGED FILL



DELIVERING HYDRAULIC FILL AROUND RIVERSIDE HUTS IN ILOILO, P. I.

It has been found possible to build dikes with the dredge where the material is hard sand or sand mixed with gravel and carrying a small proportion of mud. The pipe is carried on shear legs along the line where a dike is to be built, and the joints of the pipe are opened sufficiently to allow the material to fall through as it passes the joints. In this way, it has been possible in the beginning to run up a pipe line along the outside of a lot, build a dike to the required height and to retain all of the lighter material and mud which comes later, and which, without an exceptionally good dike, floats away and is lost. Inasmuch as this light material is a considerable percentage of the whole, it is well worth saving.

Those owners who abut upon the river were obliged to build a riprap wall which, when covered with "sawali" (woven bamboo mats), proved to be an excellent type of retaining wall. These pieces of property which have been filled by the dredge have come, from worthless property, to be about the most valuable land in the City of Iloilo, being river frontage available for wharfage.

It is also close to the new market and railroad station, and is valuable both for warehouse and store property. In addition, this district, from being a low, unsanitary spot which was a constant menace to the health of the community and a breeding place for mosquitoes, has been changed into a high, pleasant and very sanitary section of town.

The cost to date of this work has been high, even higher than anticipated, owing to the fact that it was about a month before the dredge was working properly; also, due to the high cost of fuel, coal being $18 per ton. Coal at this price cost at the rate of $140 per day. An economy was found possible in the use of wood "rajas," selling from $16 to $23 per thousand according to size, and costing from $68 to $90 per day. It is necessary to use some coal, however, so fuel amounts to about $75 to $80 daily on an average. Other economies have resulted in a marked decrease in the use of oil and babbitt metal, so the dredge daily costs less to run and increases in efficiency.

About 45,000 cu.m. of fill have been handled at a gross cost of approximately $10,000, or an average of 22c. per cu.m. of fill in place. This is the total cost, and includes the expense of bringing the dredge from Manila, a sea voyage of 365 miles, and rather expensive repairs which were made in the beginning and which must necessarily be prorated to the whole project. Also much of this cost is directly chargeable to maintenance, so that the final cost of this fill to the property owners should be approximately 15c. per cubic meter.

The more fill made the lower the resulting cost to the property owners, and, as a consequence, the officials were very desirous of doing as much of this work as possible. Applications for fill have increased beyond the possibility of handling, and the excessive cost of pipe line, under the present freight condition, is such that it is prohibitive to buy more pipe, costing as it does $7.50 per foot. This necessarily limits the distance to which fill can be delivered. The response in Iloilo has been very gratifying indeed, and the dredge will be worked as long as conditions will permit.

Building Frame Houses for Miners As a Contract Job

Several Hundred Just Completed for West Virginia Company Model Single House Designed Field Methods Used

By C. S. Rindsfoos
Jarrett-Chambers Co., Inc., New York City

A GROWING field for the contracting organization, and one which the labor conditions of the future promise to increase in size and scope, is the construction of large groups of workmen's dwellings. The company with which the writer is connected has been building a large number of such houses, mainly of wood frame, in the coal mine districts of West Virginia. A description of some of the work will indicate the nature of the operations.



STREET IN WEST VIRGINIA MINE HOUSING DEVELOPMENT, SHOWING CLEARING TO BE DONE

The principal group of dwellings comprises the single-family four-room houses for the West Virginia Coal & Coke Co., of Elkins, W. Va., and for the McCaa Coal Co., of Gilmer, W. Va., which are illustrated herewith. They are of a type developed by the former of the two companies, of semi-bungalow style, with plain gable roof, ample window openings and of box-like form which entails the least waste of space.

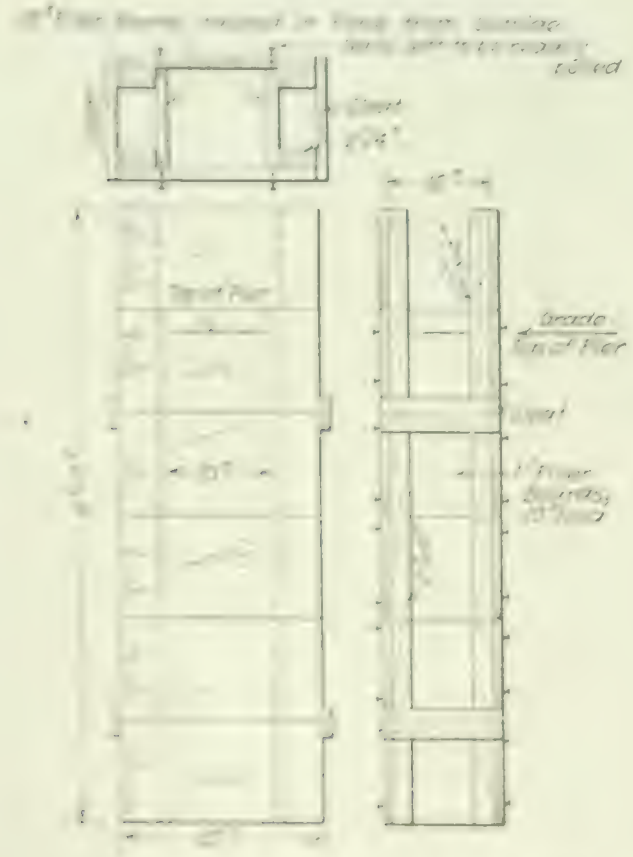
These houses cost about $1200 each, which is not great when consideration is taken of the character of the houses and the current war prices. Briefly described, they contain one living room, two bedrooms, and a kitchen, each 11 ft. 4 in. x 13 ft. 4 in. A small room, 6 x 10 ft., off the kitchen provides pantry space, and there is a 6 x 10-ft. "commode" adjacent to one of the bed rooms. A central flue, consisting of two columns of 8 x 10-in. tile encased in brick, takes care of the four rooms—that is to say, provision is made for a range in the kitchen, stove in one bedroom and open fireplaces in the living room and front bedroom. The house is plastered throughout with one coat of wood fiber plaster finished off smooth. This is cheaper than two or three

coat plaster work and just as good. The walls are left unpainted when new and painted after soiled from occupancy.

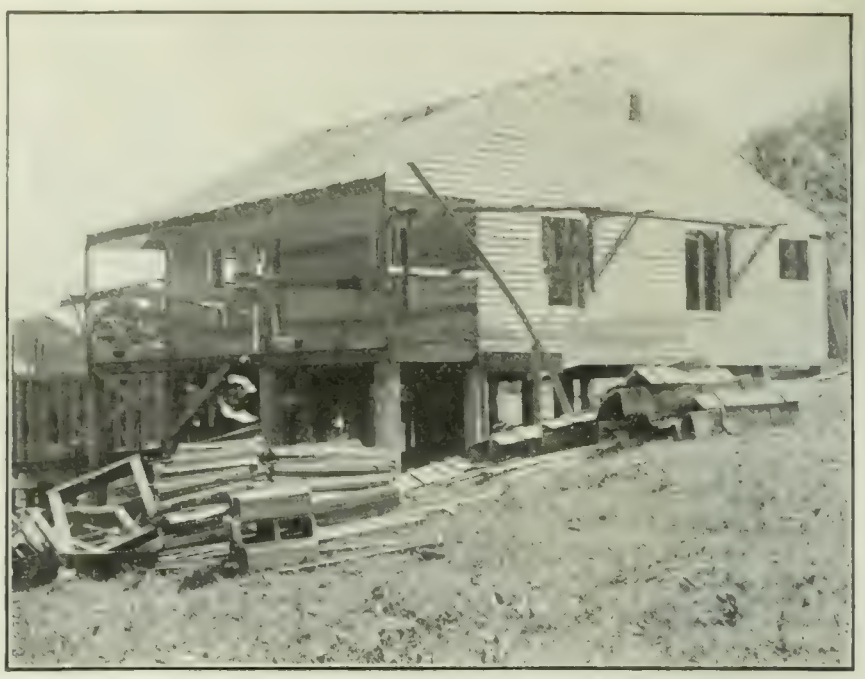
The house is of frame construction throughout, with yellow-pine novelty siding, double floors of either yellow pine or native hardwood and paper between, redwood doors, and concrete or native stone foundation posts The frame is of hemlock and the roof sheathing of native hardwood covered with Carey Ready roofing, or asbestos shingles. All of the houses are painted forest green with buff trim.

From a construction standpoint, the only difficulties were those entailed by the scarcity of labor and shortage of materials. One man was continually employed in searching for and shipping in laborers of all classes, and as a further aid in this direction particular attention was paid to the proper housing and feeding of the employees. Board and lodging was supplied at $5.95 per week, which was below cost, but the loss on the camps was considered good policy and productive of better results than would be obtained by the expenditure of a like sum in higher wages.

An average of 100 men was employed at each of the three sites, Roaring Creek Junction, Bower and Gilmer, and an average of two houses was constructed per day. A considerable portion of this force was employed in cleaning, grubbing, road grading and ditching. The men were organized into gangs for different purposes, one gang at each site cleaning and grubbing, one building roads, one installing foundations, one erecting the house frames, one on siding, sheathing, etc., one lathing, one plastering, one installing trim, one painting, one installing sewers and water lines, and so on. In effect, each gang was of such size and so spaced with reference to the one following that several days' work intervened and there was little overlapping or interference, and yet a healthy rivalry existed. The same sort of rivalry was established between the work at Roaring Creek Junction and Bower; these two groups of houses



DETAILS OF FORMS USED FOR 18-IN. CONCRETE PIERS



FRAME "COMPANY HOUSE" UNDER CONSTRUCTION

being of about the same size and having been started on virtually the same day. The superintendent of each site knew daily the progress at the other and each endeavored to excel.

To maintain further a definite schedule, a chart was devised before beginning operations, which chart showed the projected schedule of time of beginning and time of finishing each class of work. On this chart was plotted daily the actual work accomplished, thereby showing at a glance which classes of work were ahead or behind the class of work preceding or following. The various gangs could readily be augmented or diminished so as to make the whole work progress uniformly and without friction between the various gangs.

One thing which contributed to the speed was the use of a central sawmill where every piece of timber was cut to template to standard and exact size. These pieces were marked and piled according to size. From these piles the material was transferred to the house sites and erected by labor less skilled than would be necessary otherwise, and in less time.

Another detail which saved time and material was the design of the foundation concrete forms. The accompanying drawing shows this design, which permitted of the minimum number of forms being required, and also was readily adjustable to the variations in pier height. The concrete could be stripped while comparatively green, no wire or rods being used in the forms and virtually no nails to hold the short cross-boards. The forms were made up in standard lengths of 2, 4 and 6 ft. The side pieces were tacked on, with projecting nails to facilitate drawing, to the required pier height. Concrete was then poured and when set the forms were stripped by pulling nails and releasing side pieces, after which the cleats could be knocked off and the forms would fall away. Each set of forms was used about 15 times and were still good at the end of the work.

The large increase in industrial activity in the United States since the beginning of the war and the attendant shortage of labor have directed the attention of owners and operators to the better housing of their employees. With labor rates increasing rapidly and with competition in the obtaining of labor on the part of employers reaching a point where all sorts of unprecedented induce-

ments are being offered to obtain and to *hold* help, many operators have deemed it economical to gain greater control over their employees through the establishment of "company houses." In many cases, the rapid expansion of industrial enterprises has been such that the available supply of privately owned houses has not been sufficient to meet the demand, and no choice has been left the operators but to build houses of their own. In other cases, the building of new plants, and the opening of new mines in locations where no housing facilities previously existed, made the same course necessary.

This was the situation which led to the building of the houses described. But in many other cases the underlying reason which impelled the owners to establish their own groups of houses has been the desire to provide housing facilities which would be designed for and suited precisely to the particular class of labor employed; to provide houses which would attract labor; to provide houses at rentals which would be lower than possible under any other system; and in some cases to induce the employees to buy their homes under the installment plan—but at all events the ultimate object was the assurance of a steady source of labor, content because comfortable and under control because situated adjacent to the plant. Another consideration, of course, has been the elmination of objectionable institutions in these colonies, the forms of amusement and the educational facilities being under control; the result being an improvement in the work done through improvement in the morale of the men themselves. Whatever have been the reasons leading to the growth of the custom of building "company houses," the fact is that such growth has reached proportions which lend wide interest to the study of the design and construction of such houses.

One of the present tendencies in manufacturing plants is toward the multi-family house, the two family and four-family types being popular. Where manufacturing plants are situated near cities of some size, and where land is costly, the multi-family house is cheaper in first cost per family, both as regards the cost of the land and also as regards the cost of the house. In other words, more families can be housed per acre in two- and four-family houses than in single houses. Also, the cost of a two-family house is not double that of a single house. At the same time, these multi-family houses can be made very comfortable as well as attractive in appearance, and they have some advantages in the cost of maintenance, heat being cheaper per family, for example.

However, the single house has certain decided advantages. Where the topography is rough, as was the case with the single-type houses illustrated, the single house is more flexible and can be fitted to the ground more easily than can the multi-family house. Where it is desired to sell the house to the tenants, transfer of title can be arranged more simply with the single house. The question of gardens and yard space arises when building multi-family houses, particularly in the case of four-family houses, the two upper families being without these desirable adjuncts to a home. The same question arises in the matter of cellar space. But of greatest importance of all is the fact that friction often develops among the families in multi-family houses, and the quarrels which occur among two or more families living under the same roof considerably discounts the benefits of the entire "company-house" system. Wherever practicable, the single house should be built, with the idea of encouraging each family to take pride in the neatness and appearance of its own surroundings.

The work at Roaring Creek Junction and Bower was done under the general direction of G. B. Southward, chief engineer of the West Virginia Coal & Coke Co. and under the supervision of A. E. Finley, superintendent of the McCaa Coal Co., at Gilmer. R. H. Chambers, vice-president, had general charge and L. E. Frissell was local manager for the contractor, the Jarrett-Chambers Co., Inc., New York City.

Two Methods of Maintaining Gravel Roads in Maine

Density of Traffic Is Criterion—Chief Reliance Is Placed on Annual Tar Treatment—Frost Is Worst Enemy

IN ORDER to illustrate the two general methods of maintenance of gravel roads employed by the Highway Commission of the State of Maine, I have selected two state highways which may be considered typical with respect to the amount of traffic carried and the methods followed, said Paul D. Sargent, chief engineer of the commission, in a paper read before the recent meeting of the American Association of State Highway Officials, from which the following has been abstracted.

It should be understood that the methods to be described have application to first-class gravel roads on which the subgrade has been carefully built in accordance with the highest type of specifications, and subdrainage and surface drainage provided at every place where the need seemed apparent. The surface is constructed in two courses very much in the manner of a a waterbound macadam road, except for the substitution of gravel for the crushed stone. The maximum diameter of stone in the bottom course is 3 in., varying from that size down to ¼ in. This course after rolling is 3 in. thick. The top course is constructed of material varying in size from 2 in. to ¼ in., the layer being 4 in. in thickness after rolling. While this specification has been slightly modified since 1914, the remarks which follow would apply equally well to either this or the more recent type of construction.

On State Highway "A" Kennebunk, the traffic for the four summer months amounts to an average of over 1200 vehicles per day, and on Sundays and holidays this is increased to between 3000 and 3500. This stretch of road has been maintained for the past three years by early patching and dragging, and shaping with gravel—the work beginning as soon as the snow has left the ground, and about the middle of April the surface of the road has softened up so that this can be done satisfactorily. About May 20 the road, prepared by sweeping with a horse sweeper and hand broom to remove any loose particles of dirt or dust, receives an application of Tarvia-B at the rate of about $\frac{4}{10}$ of a gal. per sq. yd. of surface. While formerly the tar was allowed to penetrate undisturbed for about half a day, now the traffic is so heavy that it has become necessary immediately to follow the application of the tar with a light

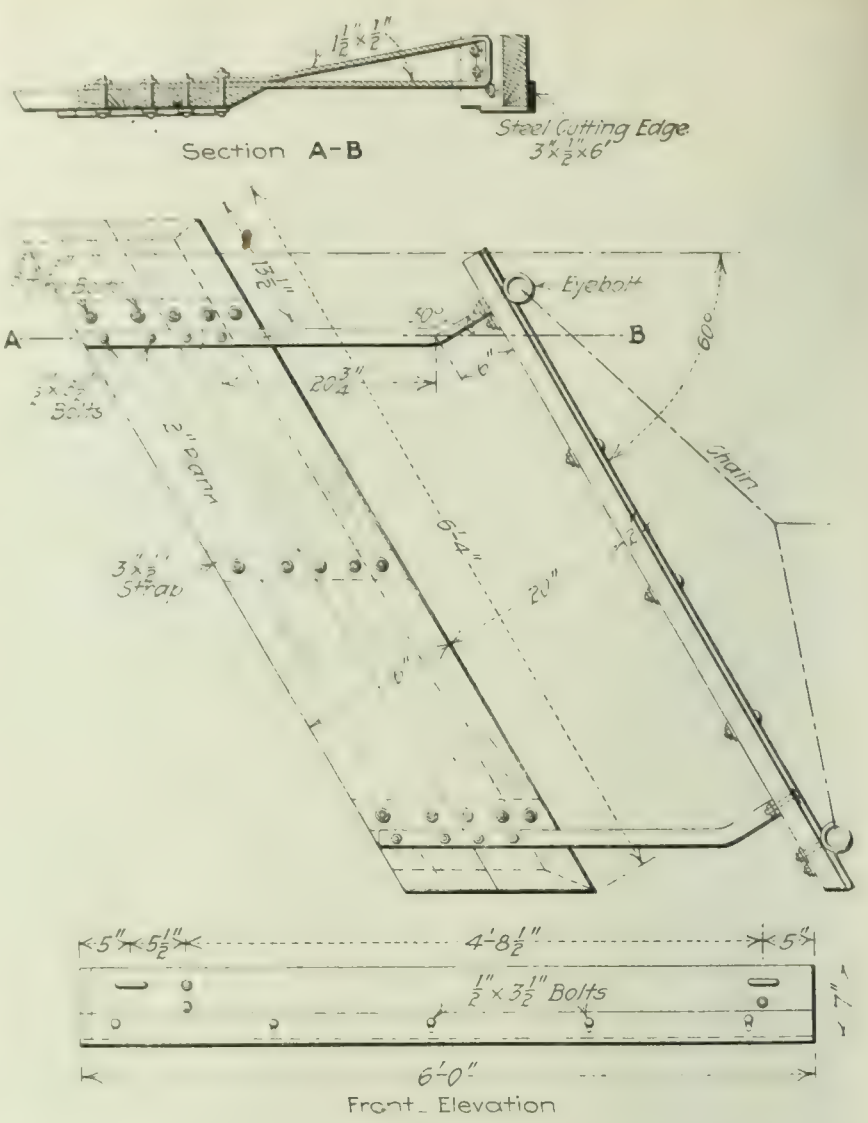
covering of sand spread at the rate of 1 cu.yd. to about 100 sq.yd. of treated surface.

This method of surface treatment was originally used in 1915, the first application amounting to about $\frac{3}{10}$ of a gal. per sq.yd., being made between May 20 and June 30. This was followed with a second application about the middle of August which amounted to about $\frac{3}{10}$ of a gal. per sq.yd. Since the first year the treatment has been confined to one application of Tarvia-B spread at the rate of $\frac{4}{10}$ of a gal. per sq.yd. as soon after May 20 as weather conditions will permit.

The work of preparing the surface for this treatment, as well as the delivery and application of the sand, is carried out by labor employed by the commission. The superintendent of maintenance controls the amount of tar used, varying it from section to section of the road as circumstances demand—though, until this year, the tar has been applied by the concern from which it has been purchased. This control over the rate of application is very important, since in places where the drainage and surface conditions are perfect the continuity of the surface remains unbroken throughout the winter, and in the spring requires sometimes as little as $\frac{1}{8}$ or $\frac{1}{8}$ of a gal. per sq.yd. This condition is unusual, however, since most of the surface begins to break up soon after freezing and thawing begins in the fall, and is completed soon after the snow leaves the ground in the spring—the tar crust breaking up into scales of perhaps $\frac{1}{4}$ to $\frac{1}{2}$ in. in thickness, and from 1 in. to 1 ft. sq. in area.

This factor comprises the really difficult part of gravel road maintenance. Experience has shown that frequent dragging, undertaken as early as is possible and while there is still more or less moisture in the scales, produces the best results. Several miles of gravel surface carried through three successive seasons in the above manner have proven it satisfactory.

While in general the surface begins to iron out in three or four days, though of course this is dependent upon weather conditions, any pockets of dust or soft places in the gravel surface will precipitate immediate disintegration and call for attention from the patrolman. If this condition is noticed as soon as it becomes manifest, a slight amount of tar applied with an old broom will prove a sufficient remedy, but if it is allowed to continue for even a little while, the patrolman will



MAINE HIGHWAY COMMISSION HAS DEVELOPED LIGHT ROAD DRAG TO HIGH EFFICIENCY

find it necessary to fill the hole with a mixture composed of 1 gal. of tar to a cu.ft. of sand.

A similar type of disintegration is frequently noticed at the side of the road, where, on account of traffic turning out, the mat will often crumble and require patching with the mixture of sand and tar referred to above.

Where gravel roads carry a traffic of from 200 to 500 vehicles per day during five or six months in the year, and where the maximum traffic amounts to about 650 per day, no bituminous material is used in maintenance—entire reliance being placed on the work of a patrolman, who, with one horse, a drop-axle wagon, a light drag and ordinary small tools, is expected to take

WEIGHT OF TRAFFIC IS REFLECTED IN COST OF MAINTENANCE

	STATE HIGHWAY "A" KENNEBUNK			STATE HIGHWAY "D" WALDOBORO		
	2.74 Miles of Gravel Surface Treated with Tar			7.09 Miles of Gravel Surface		
	1915	1916	1917	1915	1916	1917
	$209 81	$329 16	$417 53	$546 98	$529 17	$627 69
	91 28	624 57	450.59	89 19	463 25	1,227.56
	1,036 99	1,309 49	1,250.68	00 00	51.42	180 94
	$1,338 08	$2,263 22	$2,118 80	$636 17	$1,043 84	$2,036.19
	25 10	182 03	175 00	7 67	18 57	30 00
	$1,363 18	$2,445 25	$2,293 80	$643 84	$1,062 41	$2,066.19
	053	095	088	0096	016	03064
	497 51	892 43	837 15	90 80	149 84	291 42
DISTRIBUTION OF COST						
	$99 99	$26 82			$5.76	
	112 28	67 54		$208 74	153 15	
	16 58	21 70		180 77	75.11	
	43 66	24 67		177 86	39.93	
	8 12	82 10				
	0 00	7 59				
	23 19	534 91		68 80	767 01	
	1,154 11	1,494 89				
	0 00	3 00			2 88	
	$1,338 08	$2,263 22		$636 17	$1,043 84	

Date not distributed

care of from six to eight miles. As soon as the snow has left the ground the patrolman begins dragging the softened surface, raking off loose rocks and patching depressions with gravel which has been distributed along the sections at about every 1000 to 1500 ft. This patrolman must also keep ditches and culverts clear, make necessary repairs to end-walls and guard rails, and keep the weeds trimmed off the shoulders and the sides of the road.

Roads maintained in this manner require resurfacing about every two years. Gravel passing a 1⅜-in. screen, and which is similar in every respect to maintenance gravel, is spread at the rate of 1 cu.yd. per 100 sq.ft. This work is not undertaken until traffic has begun to lessen after Labor Day, and it is generally completed before Nov. 15. No roller is used on this work, dependence being placed on traffic and the attention of the patrolman who constantly uses his drag to shape the new layer while it is consolidating. Very frequently consolidation is not effected until after the first frost and the section has been dragged a few times in the spring. After this the new material has become thoroughly bonded to the old surface and to all intents forms a new gravel road.

Quite extensive resurfacing operations were undertaken during the winter of 1916-1917. Men and teams are more available at that season of the year, and it was also found that teams could haul from 2 to 3 yd. of gravel at a load, as against 1¼ to 1½ yd. if wagons were used instead of sleds. The gravel was delivered in windrows on one shoulder of the road and, as soon as the snow left, it was dragged to the roadway with a road machine. Taken as a whole, this method of handling the surfacing has proven very satisfactory, and it is planned to repeat the use of the method during the present winter.

During the coming season we expect to combine three or four patrol sections and furnish the men with a 1-ton tractor, five of which have been purchased. This rearrangement will result in a gang of three or four men who will have charge of from 18 to 25 miles of road. It is believed that this arrangement will prove more economical than our present plan of employing four men, four horses, and four sets of equipment for a similar length of road.

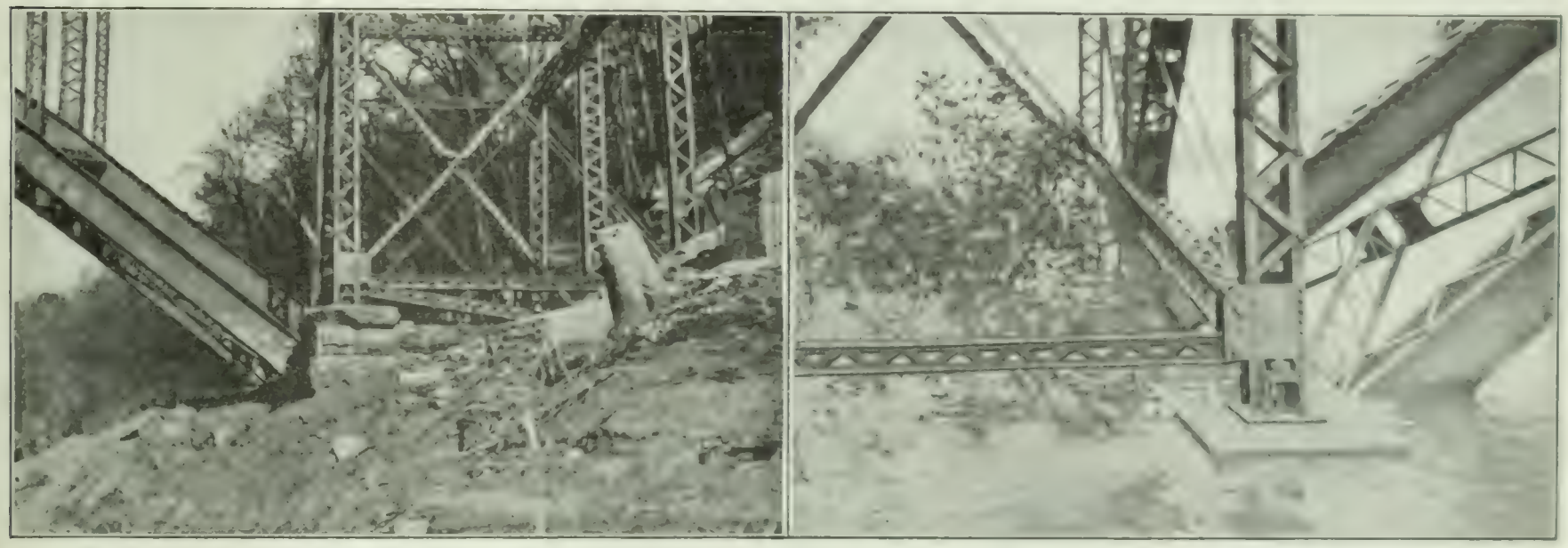
Protecting Submerged Steelwork of Arch Bridge

Ends of Steel Arches Submerged by Government Dam To Be Protected by Enclosure Wall and Encasement with Pitch

THE building of the government dam between St. Paul and Minneapolis, described in *Engineering News-Record* of Oct. 4, p. 628, has raised the water in the Mississippi River over the tops of the piers of the Marshall Ave.-Lake St. bridge. The steel of the arches will be submerged about 5 ft.; in extreme high water the submergence will be at least 12 ft. This bridge is a two-span pin-connected arch bridge having 456 ft. three-hinged steel arches, flanked by short shore truss spans. It connects two arterial streets in Minneapolis and St. Paul and carries one of the interurban car lines between the two cities.

The submerged steel is to be protected by building concrete protection walls around the shore abutments and the center pier to a point 1 ft. above the estimated high water. Within and partially supported by these walls there will be a reinforced-concrete slab built over the top of the present masonry, just above normal stage of water due to the dam, with pockets built of concrete for the arch ribs and laterals. These pockets will be filled with a bituminous putty of such consistency that the arches will remain free to adjust themselves under different loadings or temperature stresses without cracking the bond between the steel and the protecting putty. The slab floor will be finished with a 1-in. mortar surface sloping away from the steel toward the outlet valve.

The retaining wall will be about 7 ft. higher than the slab floor and will act as a protection to the arches from floating drift and ice in high water. Rainwater caught in the inclosure will drain off through weep holes and valves, as will also water coming into the inclosure during periods of high water. It is the intention to allow the water to rise in the basin to the same height as outside, depending on paint to protect the steel above the sealed pockets. If this is not satisfactory, the valves may be closed during high-water periods and the inside of the basin waterproofed. Also, the valves may be



END OF ARCH FORMERLY WELL ABOVE WATER IS NOW SUBMERGED

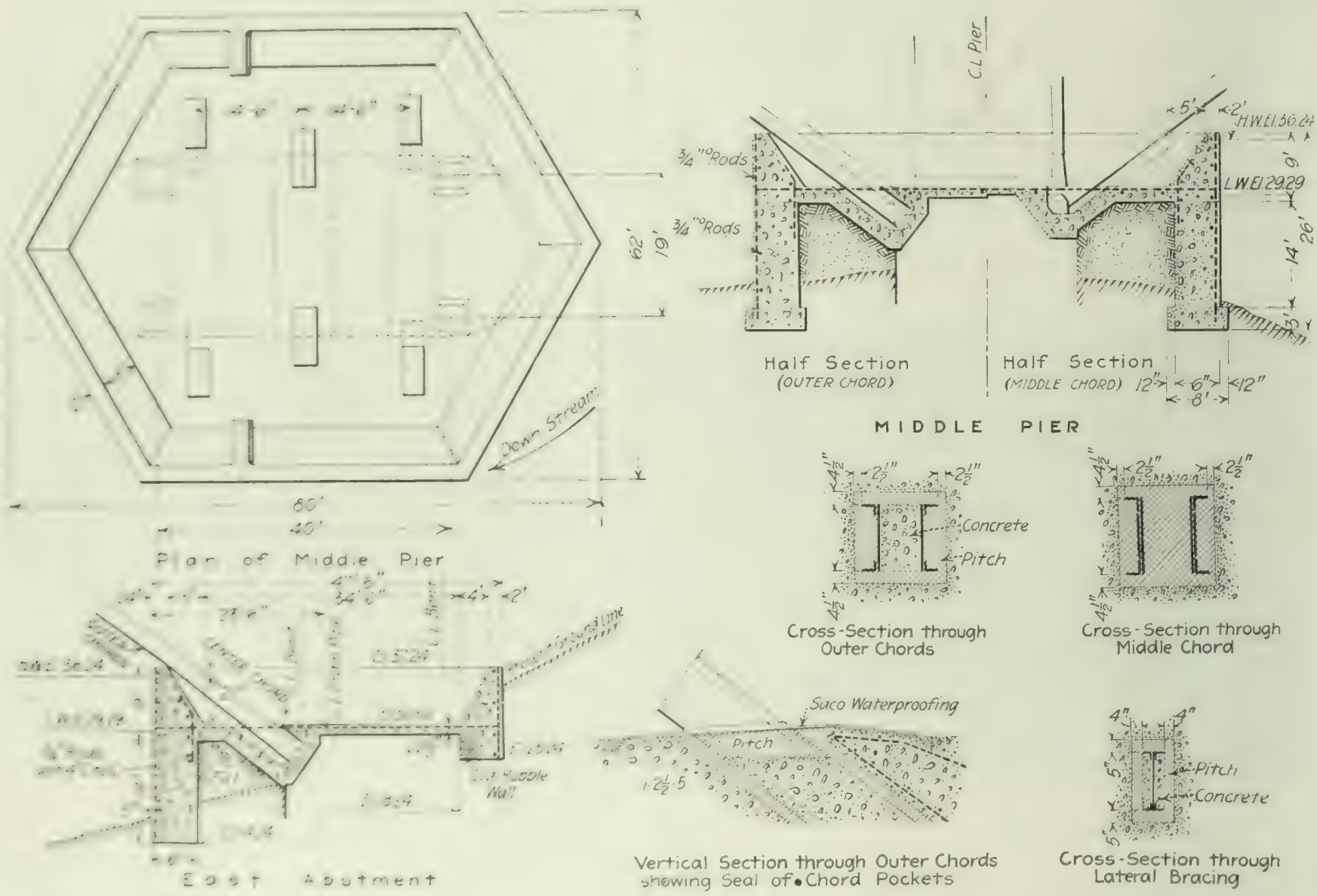
closed at any time during a high-water period and the water pumped out if it is found necessary to inspect or repair the steel.

All steel below 4 ft. above high water is to be cleaned by sandblast and painted with Sarco metal primer and then with Sarco mineral-rubber pipe coating No. 6. The inside of the concrete pockets will be painted with Sarco concrete primer, and after the bituminous putty is placed (hot) the top of the pockets and the surrounding concrete is to be sealed with waterproofing compound. Rod or wire-mesh reinforcing will be used in the thin concrete sections forming the pockets. The space to be filled with putty will be decreased by filling in the interior of the steel arch chords and around the shoes with concrete where it is practicable to use this method.

At the center pier this protection will form an island basin 62 ft. wide and 80 ft. in extreme length. The abutment structures will be 60 x 47½ feet.

The dam is now unwatered to allow the construction of the protection work to proceed. The contract for the east pier has been let to Thornton Bros.., of St. Paul, for $9873. Specifications are now being prepared for a joint contract to be let by the two cities for the work on the center pier.

This work was designed and is being executed, under the supervision of Oscar Claussen, chief engineer of St. Paul, by M. S. Grytbak, bridge engineer. M. N. Goss is Commissioner of Public Works of St. Paul. Frederick W. Cappelen is city engineer of Minneapolis.



MAIN DETAILS OF PROTECTION OF SUBMERGED STEELWORK, MARSHALL AVE.-LAKE ST. ARCH BRIDGE

Motor Trucks Beat Trains in Troop Movement

The recent army truck test over the Dixie Highway between the cantonments at Atlanta and Chattanooga, to determine the speed with which troops can be moved in an emergency by motor truck, in comparison with the known rate of travel by cavalry or railroad, proved to be a revelation in showing the higher speed of motor trucks as compared even with express train service.

Army officers were greatly interested in the White truck with a special "Col. Gallagher" troop transport body. Six trucks of other types, carrying regimental supplies, participated in the test and the whole demonstration was closely watched by several French and American army officers, among whom was Lieut. Col. Hugh J. Gallagher, depot quartermaster at Atlanta and designer of the Gallagher body.

The transport covered the route in 5 hr. 30 min. on the outbound trip and 5 hr. 2 min. returning, beating the time of the fastest railroad train between the two points. The six supply trucks required eight hours or more. At times the speed of the transport was as high as 49 miles an hour. Colonel Pierce said the test showed that a whole regiment could be moved over the route in seven hours. The Gallagher body design seats the soldiers back to back lengthwise of the body. The rifles may be stored in rifle chests built between the backs of the seats.

The new transport is expected to eliminate baggage wagons to a large extent inasmuch as lockers under the seats carry equipment and ammunition.

Five Million Yards Moved To Dam Three Rivers

Structure for Bridgewater (N. C.) Development Built by Hydraulic Filling Between Outside Embankments — Flow of Two Watersheds Diverted on Third

THREE large earth dams and two diversion channels, to store water on three rivers for operating a power house near Bridgewater, N. C., are being built by washing the central portion of the fill to place between outside embankments formed by dumping dry material from trestles. All of the earth is dug by steam shovels, the material for filling the center portion of each dam being dumped by train and washed to place with hydraulic giants supplied with water by pumps mounted on a float in a pool between the outside embankments. The level of the pool is raised as the filling progresses, the barge having to be dismantled at the top of the dam. The spillway structure, located in the southerly dam, requires 200,000 yd. of concrete, for which a crushing and mixing plant using local rock has been set up. The work is being handled in two sections, each with its own plant and organization, one including the southerly dam with a spillway, and the larger diversion channel, and the other including the second and third dams, the power house and a 700-ft. rock tunnel supplying it from the northerly reservoir. The plant for handling 5,850,000 yd. of fill required includes 25 locomotives, 150 to 180 dump cars and 10 steam shovels.



MATERIAL DUMPED INWARD FROM FLANKING TRESTLES IS SLUICED TO PLACE AT BOTTOM OF POND BY PUMPS ON RAFT

As will be seen from the map, the three dams under construction will store water in a very irregular area comprising parts of the basins of the Catawba River, Paddy Creek and the Linville River, a few miles above the point where these three streams join. Paddy Creek is to be entirely cut off. The water going over the main spillway will pass down the present bed of the Catawba River. Although the site of the development is in the mountains, it was possible to cut through the low divides separating the three basins at this point, and throw them into one reservoir. The principal cut required is for the diversion channel between the Catawba and Paddy Creek water sheds, and involves about 500,000 yd. of excavation, while only 50,000 yd. will have to be removed between the Paddy Creek and Linville River basins.

In addition to the Catawba River structure, a small concrete dam just north of that river valley, two similar structures between the Linville River and Paddy Creek, and a fourth low dam north of the Linville River, will provide additional spillway capacity, wasting into the Catawba and Linville Rivers. These dams, all of small height and ranging in length from 100 to 200 ft., have not yet been started.

The spillway of the Catawba dam will be about 165 ft. high at the highest point, about 175 ft. thick at the base and 300 ft. long, with a long wing wall on each end. There will be a steel bridge to span this spillway 20 ft. above the crest of the dam and a reinforced-concrete bridge connecting with earth fill on the north end. A surfaced dirt road will be built across all the dams and around the reservoir connecting with Bridgewater and Nebo.

The Catawba River dam, including 150,000 yd. of fill in a notch through the valley wall at one end, will require 2,300,000 yd. of material, and is the largest of the



START OF WORK ON BIG SPILLWAY

main earth dams. Its top elevation will be 1220 ft. above sea level, the average elevation of the present ground surface along the river being 1090 ft. The Paddy Creek dam will contain 1,600,000 yd. of fill, and 1,800,000 yd. of material will be required for the structure across the Linville River. These figures do not include 10% extra material which the contractor is required to place to allow for shrinkage.

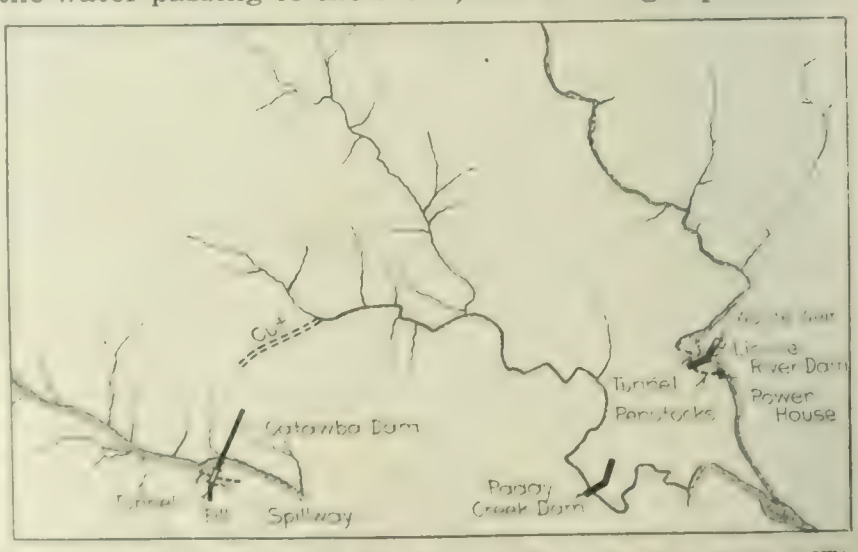
Each of the three large earth-fill dams is being made in 7 lifts, each about 20 ft. high. These lifts are made by dumping material to form an embankment along each side of the dam from dirt trains run out on trestles. The trestles for each successive lift are stepped in to give the required slope on the outside of the fill. These external embankments are about 50 or 60 ft. wide on top. After the central portion of the dam is inclosed to make a pond by these fills, material is dumped from one of these embankments at any point where it is convenient for the floating pump in this pond to work. This pump rehandles the material, distributing it by washing over the central area. The ponds are kept full by pumping from the rivers across which the dams extend. Sufficient water is supplied to keep the barge afloat and to prevent too wide a beach forming at the base of the dikes. This water varies in depth, being sometimes 30 ft. deep at the deepest point.

The equipment used to sluice the fine material to the middle third of the dam consists of three-stage centrifugal pumps driven by 300-hp. motors. These pumps, which furnish 2000 gal. per min. with a nozzle pressure of 175 lb., are situated on barges within the pond inclosed by the dikes. This pond water is used over and over again. Electric current is carried to the barges by means of a three-ply insulated cable supported by barrel pontoons, thus making it possible to move and anchor the barges at any desired position in the pond. The fine material thus washed to the middle third forms an impervious core and leaves an outer skin on both slopes of the dam, of coarse earth and rock. The fill deposited in this way is more thoroughly segregated, it is asserted, than by any other process. As the material used is clay and sand, a very dense and impervious center is being secured. The upper slope of each earth dam is to be 1 on 3, the lower slope 1 on 2½, and the slopes are to be riprapped from 1 to 3 ft. thick with stone.

Even at the Catawba River dam, where the excavation from the diversion channel into the Paddy Creek basin was available, most of the fill for the dams had to be borrowed. At the Catawba River dam, three steam shovels, 11 locomotives and 75 dump cars are required in excavating the diversion channel, borrowing material and making fill for the dam. In addition, a fourth shovel is at work on the foundation for the spillway, and an American crane shovel has been employed in grading for the railroad tracks. The track system connects with the Southern Railway near Bridgewater.

At all three of the dams central cut-off trenches are carried down to rock. These trenches extend across the river bed and up the hillside on both banks of the stream. Owing to the steepness of the banks, they were excavated by sluicing the material from the hillsides down into the bed of the river, whence the material was moved by steam shovels. The Catawba dam is located where the bed of the river is very broad and flat, and the rock is overlain by a bed of large gravel to a depth of about 5 ft., above which is a stratum of soil about 20 ft. in depth. This soil was too boggy to hold up a steam shovel and was removed by digging a small sump hole, pumping it full of water and then floating a dredge boat therein. Water was supplied to the dredge by two centrifugal pumps from the river. This dredge with a centrifugal pump and cutter head removed substantially all of the soil stratum, discharging through a pipe line into the river. The gravel was taken out by a steam shovel after the dredge had been removed and the trench excavated by it drained into the river.

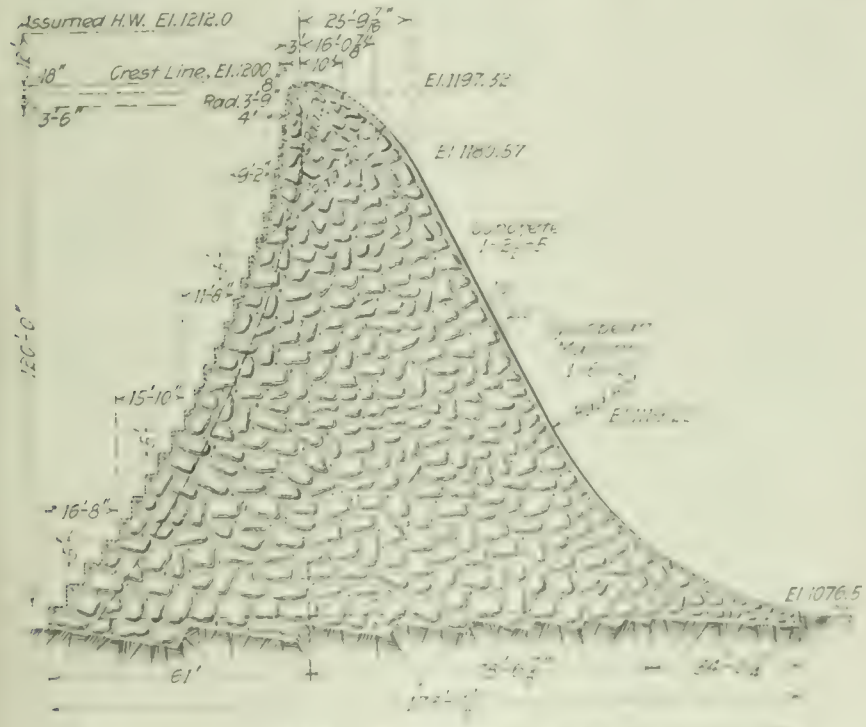
In addition, the bed of the river is to be unwatered at the Catawba River dam in two successive crib cofferdams, and a concrete spillway structure containing 200,000 yd. erected on solid rock. A bend in the river was first partially cut off by a straight crib cofferdam, the water passing to the south, and the larger portion of



THREE VALLEYS WILL BE FLOODED AND THROWN INTO ONE RESERVOIR BY DAMS AND CHANNELS

the spillway foundation to the north being pumped dry. A steam shovel was carried into this hole on a spur track, and used to load the excavated material. It is assisted by a number of large steel guy derricks of the type used by the same contractor on the Yadkin River development. These derricks, of which 17 will be set up at one time on the Catawba dam, will be used to handle all the concrete placed in the spillway section. These derricks have 115-ft. masts and 100-ft. booms and are of 20 tons capacity. The dam is so high above the foundation that two set-ups of the derricks will be necessary to complete it. The dam will be built up as high as the derricks will reach from their first set-up, recesses being left in the downstream slope to erect timber bents on which to set the derrick for the second stage of the work. The concrete will be delivered along the downstream face of the dam in 2-yd. buckets on flat cars.

The plant for mixing this spillway concrete, located downstream from the dam on the north side of the river valley, will employ sand and stone obtained locally, the stone being quarried upstream from the dam on the south side of the river. The plant consists of a pair of 2-yd. mixers surmounted by loading bins for stone



MAIN SPILLWAY REQUIRES LARGE YARDAGE OF MASONRY

and sand. These mixers discharge in buckets on flat-cars on a track extending past the south side of the plant. Across this track, above the level of the trains the cement is carried to the charging platform on a belt conveyor. With this arrangement it is not necessary for the cement cars to be switched onto or across the tracks which are used for handling the concrete. Behind this mixing plant are four secondary crushers, to the north of which in turn is the primary crusher, supplied with stone brought by rail from the quarries. The large crusher is a 21K Allis-Chalmers gyratory, and the smaller ones are No. 5 McCullys.

The Paddy Creek dam, not requiring any concrete structures, was constructed rapidly and will soon be completed. The Catawba River structure, on the other hand, could not be carried above the first lift until the spillway was well started. While making the flanking fills for this lift and constructing the cofferdam for unwatering the major portion of the spillway site, the



STEAM SHOVEL DIGS CUTOFF TRENCH AT PADDY CREEK

small dam to the south of this structure was completed. At the same time a start was made on excavating the diversion channel north of the dam. At the Linville River site it was necessary to complete the power house and the tunnel in order to by-pass the river, before the main fill could be carried very far. This tunnel, which is partly in solid, partly in disintegrated rock, is 25 ft. in diameter and 700 ft. long. It is lined with concrete through the solid rock portion and with reinforced concrete through the disintegrated rock. A steel penstock of 1-in. thick metal and 20 ft. in diameter extends from the power house back into the tunnel for about 300 ft. through the disintegrated rock. The concrete in this tunnel was poured from a car for the floor and part of the side walls, and with a pneumatic mixer for the roof, and for the entire section in that part of the tunnel through which the steel penstock extended. Exceedingly good results were realized in spite of the many obstacles encountered.

The power house is a reinforced-concrete structure. It will contain two turbines operating under 140 ft. head, and will have a capacity of 26,400 hp. The power house structure is virtually completed, and the tunnel was finished in July. This made it possible early in October to divert the Linville River and begin construction of the dam proper.

The concrete work and a major portion of the earth work is being carried out by the Hardaway Contracting Co. for the Western Carolina Power Co., which owns and will operate the development. The diversion channel between the Catawba River and Paddy Creek basins is being excavated under subcontract by A. J. Twiggs & Sons. The entire work employs about 2000 men, 1200 of which are in Camp No. 1 on the Linville River, and 800 in Camp No. 2 on the Catawba River. Both camps are in charge of S. T. Jones, general superintendent for the Hardaway Co. The Western Carolina Power Co., of which W. S. Lee is vice president and chief engineer, is represented by F. H. Cothran, resident engineer.

Speed in Locomotive Building

The Baldwin Locomotive Works, Philadelphia, recently announced the completion of a locomotive built in 20 working days. The engine was one of a number ordered by the U. S. Government for foreign service July 18, and the first one was completed Aug. 9.

Activity in River Transportation Developed in 1917

Work of Waterways Committee Begins To Tell—Barge Lines Starting on Mississippi—Attention to Terminals

MARKED increase of interest in river transportation was created during the past season by the efforts of a water transportation committee of the Council of National Defense. Active river shipping is in prospect for next season. The coöperation of the Shipping Board in the construction of steel barges, and the formation of local corporations to develop river terminals, give assurance with respect to two of the main factors on which river transportation will depend. Full coöperation by railways to develop the freight-carrying capacity of rivers is also counted on. This, however, will depend in part on rate adjustment.

The principal growth of interest has been in the Mississippi Valley. Capt. A. A. Poland, of the Quartermaster's Reserve Corps, has been assigned to the U. S. Engineer Office at St. Louis as representative of the water transportation committee. This provides a central point for contact between business men, capitalists and the interests concerned with barge lines and river terminals, on the one hand, and manufacturing interests dependent on regular and quick transportation service, on the other.

Some Mississippi River Developments

To develop the possibilities of shipping pig iron from Alabama to Illinois, the Keystone Steel & Wire Co., Peoria, shipped by water from Florence, Ala., to Peoria during part of the summer. Barges were borrowed from the Pittsburgh coal fleet, and an 80-ft. canal, a mile long, was dug from the Illinois river to the company's plant. Pig iron was diverted from the all-rail route to Florence, and thence taken by barge down the Tennessee River and the Ohio, and up the Mississippi and Illinois. Two trips were made and a very distinct economy in transportation cost was shown, as compared with all-rail costs. The company is preparing to build boats and barges for next season.

A line of twelve barges, served by three towboats, is carrying bauxite from West Memphis to East St. Louis for the Aluminum Ore Co. The material is handled by a car dumper at West Memphis and loaded to cars by clamshell at East St. Louis. This service employs steel barges originally constructed for the American Steel & Wire Co. Return cargoes (partial) are secured through the Memphis Barge Line, which ships package freight downstream from St. Louis to Memphis, loading at the O'Fallon St. municipal dock by chutes and a locomotive crane.

Bulk-freight transportation by barge from St. Louis to St. Paul and return has recently been given a thorough tryout on a large scale, as reported in our news columns. The basis of this service is the movement of coal from the southern Illinois fields to St. Paul, and shipment of Lake Superior iron ore from St. Paul to East St. Louis. E. F. Goltra, of the Mississippi Valley Iron Co., and W. K. Kavanaugh, of the Southern Coal Mining Co., St. Louis, are actively engaged in the enterprise. The ore chute in the floor of the Terminal Railway bridge at St. Paul, described in *Engineering News-Record* of Oct. 4, p. 638, was constructed for the transfer of ore from railway cars to the barges.

For this barge service experiment, six barges were lent by the Mississippi River Commission. The trip north was made in two weeks, in the early part of August. Some delay was incurred in loading and unloading, but the return trip was started in the latter part of August. Overloading of the barges and low water in the river combined to create many delays; the trip down occupied six weeks. The tow picked up five additional wooden barges on the way, however.

The Kansas City-Missouri River Navigation Co., which has been operating nine barges and two towboats between St. Louis and Kansas City for seven years, had a very active season. This line operates on a five-day schedule, between a municipal dock in Kansas City and a private dock at East St. Louis. The terminals are equipped with conveyor and telpher. Steel double-hull barges are used in this service. Freight claims amount to less than ½%. The company offers through rates with railroads and can issue foreign and domestic bills of lading. Its rates are materially below rail rates. The docks have rail connections. No bulk freight is carried. Package freight—the most costly class to handle—is loaded and unloaded for $1.10 per ton, which with switching charges makes a terminal cost of $1.40 per ton. Unusually low water stopped this traffic late in October, a few weeks earlier than in normal years. The barges are expected to go into service between St. Louis and New Orleans.

An Illinois River barge line is to be formed, through the activity of business men in the Illinois valley. There is a big downstream business available along the river, including large tonnages of sand. The Illinois Valley Manufacturers' Association, with headquarters at La Salle, Ill., is active in promoting the enterprise.

Terminals To Be Built or Building

The St. Louis municipal dock, a reinforced-concrete wharf with elevators and conveyors to handle freight at all stages of the river, is under construction and is likely to be well along toward completion next season.

Memphis, Tenn., has issued $500,000 bonds for the erection of a river terminal. The city's engineers are now actively engaged in planning this terminal and expect to begin building at once, so that the structure will be completed by next spring.

A terminal is being built at Alton, Ill., by the Illinois Terminal Ry. for Mississippi and Missouri River freight traffic. The city of Davenport, Iowa, is also developing a terminal. It has built a seawall on the harbor line in front of the city, and by filling in behind the wall has reclaimed 40 acres of valuable land, which will be utilized to build up an industrial district with a river terminal along its edge. Loading and unloading devices are to be installed. The first unit is about completed, including a concrete and brick freight warehouse. (See *Engineering News-Record*, June 7, 1917, page 481).

A similar terminal is being completed at Muscatine, Iowa. Here an electric conveyor, an electric crane, and a marine leg for loading and unloading bulk grains will be installed, making this one of the most complete terminals on the Mississippi River.

At Moline, Rock Island, Quincy, Clinton and Hannibal committees are at work selecting sites and planning water terminals, Dubuque has spent $5000, and Keokuk has plans for a terminal, with every prospect that work on these will go ahead.

The cities of St. Paul and Minneapolis, each of which has constructed a municipal dock, are planning for the installation of freight-handling machinery. The Minneapolis dock at present has no equipment, while the St. Paul dock uses a derrick in place of the locomotive crane it was originally intended to use.

On the Illinois River, Peoria and La Salle are entering upon the construction of terminals. Peoria is likely to undertake terminal construction as a municipal enterprise, for which bonds are to be issued by the city. The La Salle project will probably be undertaken by local business men.

All these terminals will have direct railroad connection, this coördinating rail and water transportation.

The present activities on the Mississippi are largely concerned with bulk-freight transportation. There is associated interest in package-freight service, however, similar to that operated by the Kansas City-St. Louis line and by the returning ore barges from St. Louis to Memphis. As such service depends on the general interest and participation of shippers of package-freight in the river cities, work is now centering on creating such interest.

Close consideration is being given also to the subject of freight insurance. It is considered satisfactorily demonstrated that river freight in steel barges is entitled to low insurance rates, especially because the Great Lakes shipping, which is much more hazardous, receives moderate rates. If the steel barges that will be available next season do not receive low rates from the existing insurance companies, it is probable that means for providing this insurance in river cities will be found.

As announced a month ago, the U. S. Shipping Board has undertaken the construction of some 36 steel barges for Mississippi River traffic. This action assures priority for the material required. The barges will be 48 x 300 ft. in size, with a capacity of 900 tons on 4-ft. draft.

American Export Cement Skillfully Packed

Grosvenor M. Jones, special agent of the United States at Santiago, Chile, has forwarded a report to Washington, stating that American cement deserves a high place on the honor roll on account of its good export packing. During a tour of the west coast of South America hundreds of barrels of American cement were seen, and with comparatively few exceptions they were in excellent condition when they arrived. Photographs which were taken recently at Santiago, Chile, of cement shipments, one lot from the United States and the other from Europe, furnished a contrast which was favorable to our shippers. The European lot was on a lighter alongside the dock. The heads of several of the barrels were broken in. The American lot seen on one of the docks revealed no such defects in packing. The barrels had a strip of board across each head, a protection which is always found on American cement packages but not on other barrels.

Syracuse Tests Two Methods of Sewage Treatment

Activated-Sludge Process Being Studied Alongside Dortmund Tanks Combined with Aerated Continuous Gravel Filters

IN SEPTEMBER, Syracuse, N. Y., added its name to the long list of cities which have installed experimental sewage-treatment plants. The activated-sludge process is being tested, as is also a combination of Dortmund settling tanks and artificially aërated continuous gravel filters, similar to those tested at New Rochelle, N. Y., in 1916, by James C. Harding, consulting engineer, New York City.

Before these two processes came to the front Imhoff tanks and sprinkling filters had been favorably considered for the treatment of the sewage of Syracuse. That method would have required a force main about four miles long and a relatively high pumping head. If one of the two processes now being tested proves satisfactory, the four-mile force main will be unnecessary, as it is believed that either of these processes could be operated near the terminus of the intercepting sewer.

Grit Chamber, Screens and Dortmund Tanks

At the testing station, crude sewage is pumped to a grit chamber consisting of a long narrow box divided into two compartments to give a total channel length of 30 ft. The sewage then passes through a coarse screen of inclined bars, $\frac{3}{4}$ in. clear spacing, to an orifice chamber. Through one orifice the activated-sludge tank is supplied, and through two others the sewage passes to two Dortmund tanks. One Dortmund tank supplies settled effluent to a horizontal-flow and the other to a vertical-flow aërated gravel filter.

The activated-sludge installation embraces an aërating tank 4 ft. wide, 12 ft. long and 10 ft. sewage depth. Perforated diffusers extend transversely across the aërating tank in the bottom of V-shaped troughs. These pipes are 24 in. on centers, 1 in. in diameter, with $\frac{1}{16}$-in. perforations, 3 in. c. to c. The aërated sewage goes to a settling tank 4 ft. square, with a maximum water depth of about 15 ft., the bottom being hopper shaped, with slopes of 4 on 1. From this tank an air lift delivers the sludge back to the aërating tank or, if desired, to a reaëration tank, 4 ft. square, with a water depth of about 11 feet.

The two Dortmund tanks are each 3 ft. 7 in. square and 12 ft. deep.

Horizontal- and Vertical-Flow Filters

Each aërated filter is 4 ft. wide and 8 ft. long, and is filled with gravel which has passed a $\frac{3}{4}$-in. screen and has been retained on a $\frac{1}{2}$-in. mesh screen. The depth of gravel is 4 ft. in the horizontal-flow and 5 ft. in the vertical-flow tank.

In the horizontal-flow tank the sewage is discharged through a manifold of 1 in. pipe perforated with $\frac{1}{4}$-in. holes. The sewage then flows longitudinally through the tank. The air pipes in this tank are laid in transverse ridges, 12 in. c. to c., having 1 to 1 slopes. These pipes are perforated with $\frac{1}{16}$-in. holes, 3 in. center to center.

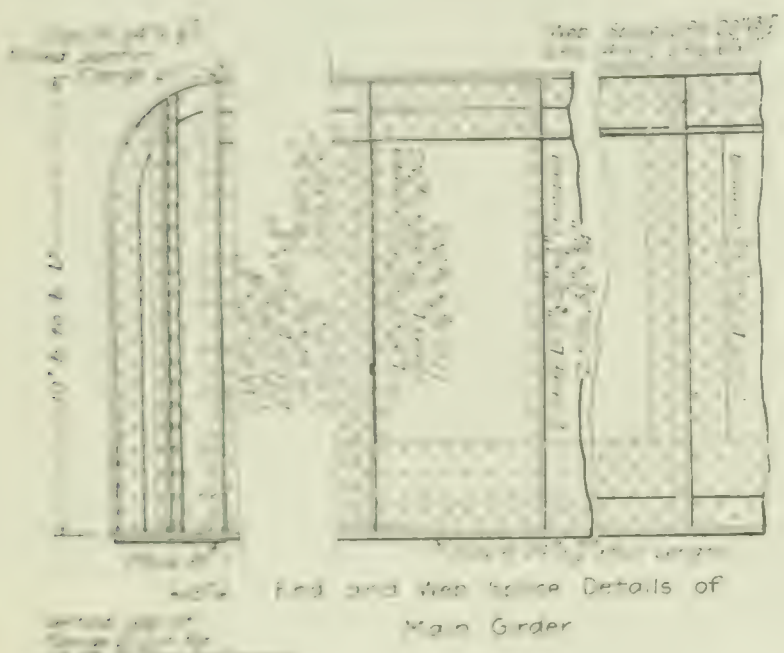
The vertical-flow tank has 5 ft. depth of gravel. The

troughs in the bottom are 6 in. c. to c., 3 in. deep, run transversely and contain, alternately, an air-supply and an effluent pipe. The air-supply pipes have $\frac{1}{16}$-in. and the effluent pipes ¼-in. perforations, all 3 in. center to center.

Both the horizontal- and the vertical-flow tanks are back-washed every eight hours with air, supplied from a storage tank. The pressure starts at about 50 lb. and diminishes until the air is used up. Air-washing takes about 2 to 4 minutes.

A low-pressure blower supplies air at from 6 to 8 lb. pressure for both the activated-sludge process and the aerated filters. Various rates of air supply are being tried in each process. It is too early to give comparative results. In general, both processes show promising results, but whether the gravel filters can be kept clean remains to be seen.

Glenn D. Holmes is chief engineer of the Syracuse Intercepting Sewer Board, and Jacob Cohen is engineer in charge of the testing station.



End and Web Stiffener Details of Main Girder

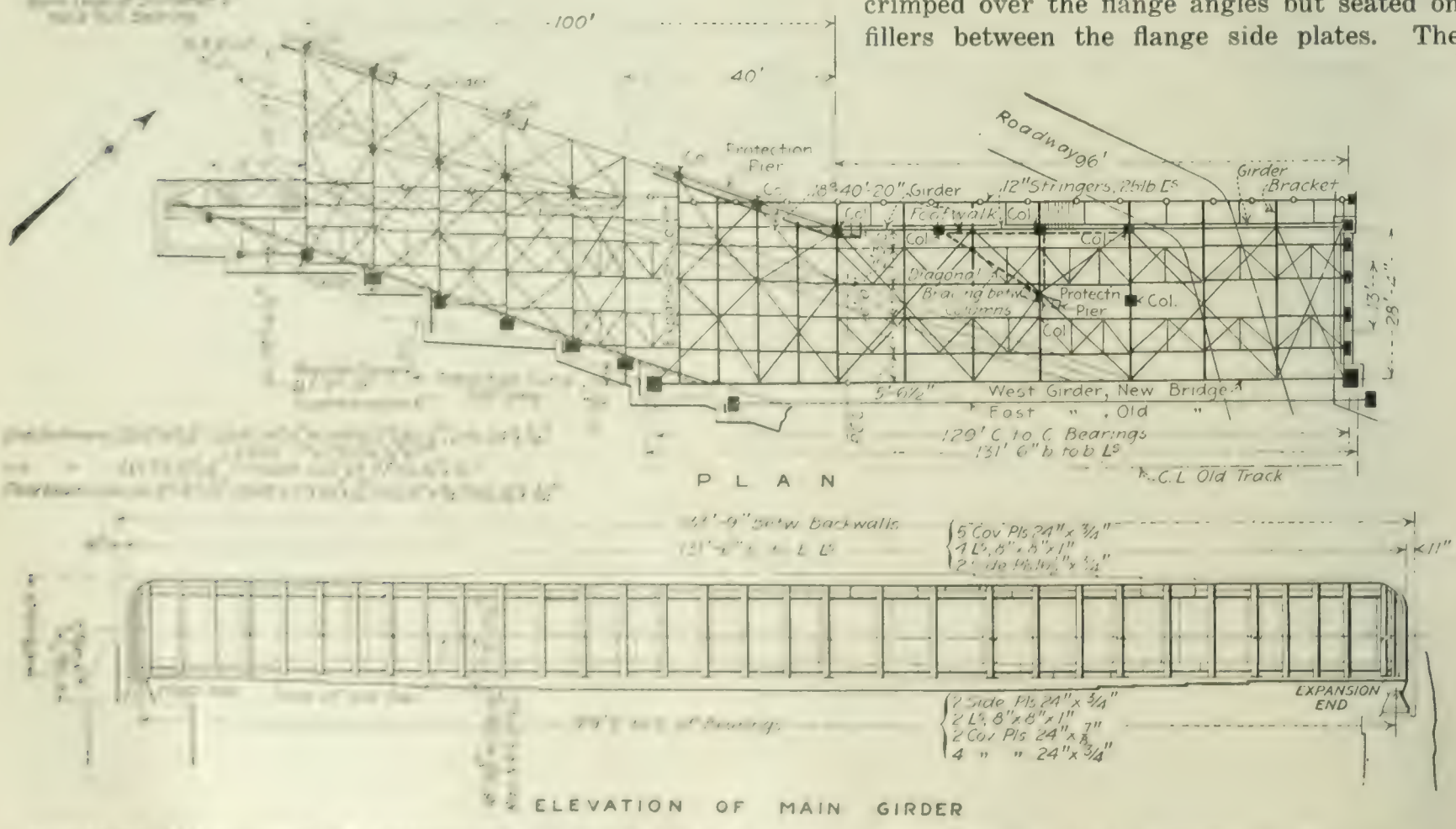
New York Central Sets Long Plate Girder in Bridge

Two Wrecking Cranes Place 105-Ton Member, 131½ Feet Long and 10 Feet Deep, in Complicated West Shore Crossing

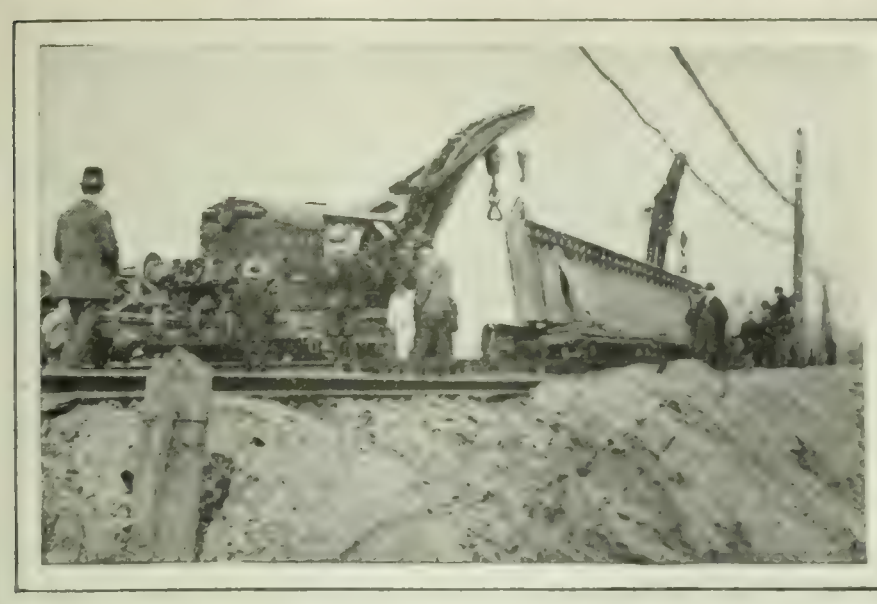
THE New York Central R.R. now has on its West Shore line one of the longest bridge plate girders in existence. This is a girder 131½ ft. long over all, weighing 105 tons, which forms part of a complicated crossing over the Northern R.R. of New Jersey (an Erie line) near New Durham, N. J. It was set in place Nov. 11; two heavy railroad wrecking cranes handled the operation in simple and rapid style.

The West Shore Railroad now has under construction a short stretch of third- and fourth-tracking between the westerly end of their yard at New Durham, N. J., and the southerly end of the yard south of Little Ferry, a distance of approximately 1.6 miles. This involves duplicating most of the existing structures. The crossing over the Northern is on a very long skew, and is complicated by a highway at the lower level, which interrupts the line of the abutment and makes the new structure different from the old. The new structure, which lies west of the old, is carried on one side by a girder 129 ft. long c. to c. bearings, and on the other side by columns set outside the clearance width of the Northern tracks.

In design, the long girder is substantially normal, except for size. The web is 120 in. deep. The top flange is of four-angle section, but the bottom flange, where an extra line of angles would have interfered with the floor-beam connections, has only the usual angle pair of flange angles, but is fitted with six cover plates instead of five as on the top flange. The web stiffeners are 7 x 3½-in. angles (floor-beam connections 8 x 6-in), crimped over the flange angles but seated on fillers between the flange side plates. The



COMPLEX CONDITIONS AT CROSSINGS OF WEST SHORE BRIDGE 4 REQUIRING PLATE GIRDER 129 FEET LONG. (KEY TO CENTER—PLAN OF BRIDGE AND ELEVATION OF GIRDER)



WRECKING CRANES READY TO LIFT 105-TON GIRDER OFF CARS



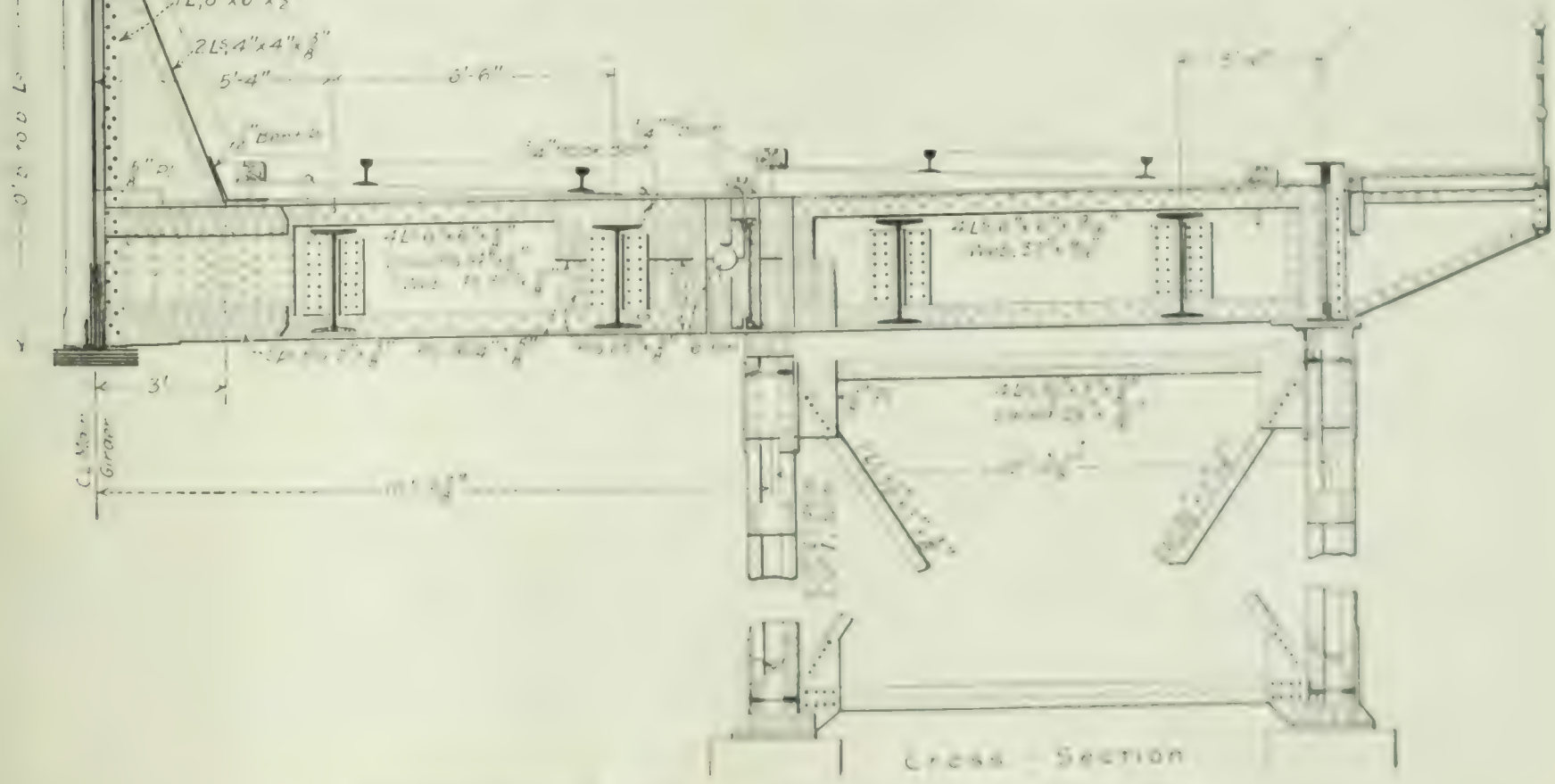
LIFTING GIRDER OVER WEST GIRDER OF EXISTING BRIDGE, READY TO SET ON SHOES

flange cover plates are each about 5 ft. longer than the theoretical length, the extra length being utilized to splice the cover plates lying below.

In the floor construction the support of floor-beams at certain points involved some novelty. Columns support the west girders (the long girder is on the east side), and for lateral stability these are braced as a tower with columns placed under the middle points of two floor-beams to reduce the load on the long girder. The short floor-beam extending inward from the long girder to column has a pin connection to the floor-beam seated on a tower column, as sketched in the drawing. This detail was considered necessary to avoid excessive bending in the floor-beam as the long girder deflects.

The floor was made as shallow as possible because the bridge is situated at the summit of a grade in the West Shore tracks, with an 0.8% gradient northbound and a 0.5% gradient southbound. Setting the heavy girder in place was done on a Sunday to minimize traffic interruption. The girder had been received from the Steelton plant of the Bethlehem Bridge Co. some time before, being unloaded and held in yard storage for about a month while the masonry was being completed. For erection it was set on three flat cars and these were run out on the west track of the old bridge. Two heavy railroad wrecking cranes were brought up to the ends of the girder, on temporary tracks turning off the permanent track, in such a way as to bring the booms directly over the final position of the girder. One of the cranes was a new 150-ton Bay City wrecker, the other a 120-ton machine. The cranes had to lift the girder off the car, swing it outward and over the west girder of the old bridge, lower it and move it 4 ft. longitudinally. The skew of the abutments made it impossible to place the cranes where they could set the girder directly to place without longitudinal shift.

The girder was picked up by pairs of simple girder hooks engaging the top flange angles near either end, which, though putting 50 tons pull on the upper flange at each point, did no damage. When swung over the side of the old bridge the girder was simultaneously lowered and shifted longitudinally by booming up on one



CROSS-SECTION OF NEW BRIDGE—FIX JOINT IN FLOOR-BEAM

of the cranes and booming down on the other. When landed on the end shoes the turned anchor bolts went in easily, showing that the 3-ton shoes had been placed very precisely as to longitudinal spacing. The track was out of service for a little less than two hours.

The bridge was designed in the office of H. T. Welty, engineer of structures, New York Central R.R. R. E. Dougherty, district engineer, directed the erection for the railroad, and Louis Chevalier, chief engineer of the Stillman-Delehanty-Ferris Co., contractor for the steel erection, was in charge for the contractor. The entire work was under the general supervision of J. W. Pfau, engineer of construction, and G. W. Kittredge, chief engineer, New York Central R.R.

What Are the Limitations of Wood Pipe Under Fills?

Failure Under 10-Foot Backfill Emphasizes Need for Careful Soil Examination Before Specifying Pipe Strength

A THIRTY-SIX-INCH wood-stave pipe recently collapsed under a 10-ft fill—an unusual occurrence, but worthy of examination in order that other accidents from similar causes may be avoided. The collapse occurred simply because unusual conditions put a loading upon the pipe greater than it was designed to withstand.

The pipe was 36 in. in diameter, with 1⅝-in. redwood staves held in place by ½-in. iron bands, 12 in. apart, except at joints where the spacing was 6 in. The depth of the trench in which the pipe was laid ranged from 10 to 15 ft., with an average of about 13 ft., so that the average depth of backfill above the top of the pipe was about 10 ft. The bottom of the trench was about 5½ ft. in width. In the service for which the pipe was laid there would be no internal pressure, whereas wood-stave pipe is commonly used for pressure lines.

Because of the rapid seepage of ground water into the trench, pumps had to be used continually during construction. The use of the pumps was discontinued of course when backfilling commenced, and the water level then immediately rose to the normal level, 5 or 6 ft. above the top of the pipe. After placing the backfill in several hundred feet of the trench it was found that the pipe had collapsed.

A section of the pipe laid in trench but not backfilled was then selected as a trial section, and determined efforts were made to complete the work as originally planned. The bands were cinched up carefully and uniformly and as tightly as possible, and the backfill was tamped very thoroughly around the pipe. Even under these conditions, however, when the fill had reached a depth of 4 or 5 ft. above the top the horizontal diameter had increased 1 to 1½ in. and complete failure appeared to be certain if the fill were continued.

The manufacturers of the pipe made shop experiments, using staves 2½ in. thick, as a result of which it was found that even with 2½-in. staves the pipe would not have had enough strength to support the weight brought upon it by the backfill under the conditions that obtained where the failure occurred.

Along this section of the line the top four or five feet of the soil are a heavy blue or black clay or adobe, apparently containing considerable organic material. Below this there is a very fine-grained sandy or silty clay. This is very hard and compact in place but when loosened and pulverized in water it loses all cohesion and becomes liquid.

An independent engineer, called in to report upon the pipe failure, said: "The manner in which the clay used for backfill decomposes in water might leave the extremities of the horizontal diameter of the pipe with little lateral support. The observed lengthening of the horizontal diameter of the pipe would seem to verfy this theoretical deduction. Without lateral support the wood staves can furnish very little resistance to external vertical loads. If ordinary dry material, or material which would compact by tamping, were available for backfill, it would furnish the necessary lateral support. Lacking this, the sides of the pipe must either be in close contact with the walls of the trench, or the intervening space must be filled with some unyielding material. If the sides were thus supported, the wood staves would form an arch capable of sustaining, a portion of the backfill. If the staves were thick enough they would support the entire fill. Otherwise, the balance of the fill must be supported by some other form of construction."

The engineer also included in his report an opinion to the effect that "where the sides of redwood pipe can be held firmly in place so that the horizontal diameter cannot increase, then 1½-in. redwood staves are capable of safely supporting under the most severe assumed condition of loading a mud fill slightly more than 2 ft. in depth over the top of the pipe. If the staves are 2½ in. in thickness this depth of fill can be safely increased to about 6 feet."

Method of Repair Adopted

In the section of the trench in which the pipe had already been constructed, but on which the backfill had not yet been placed, the trench was backfilled to the level of the pipe center with concrete and a reinforced-concrete arch 4 in. in thickness at the crown was constructed over the pipe. In order that the concrete should not be affected by swelling of the pipe which might take place during setting of the cement, the concrete was placed in layers and a wedge-shaped key at the crown of the arch was poured after the balance of the arch had secured an initial set. No backfill was permitted for two weeks after the last concrete was poured. Meantime, the trench was allowed to fill with water to the ground level, the backfill finally being made in water. Concrete reinforcing was used on about 700 ft. of the 36-in. pipe.

Lumber Production Less Than Last Year

For the year that ended Oct. 31 the 713 mills reporting to the National Lumber Manufacturers' Association cut 15,573,900,000 ft. of lumber and shipped 2½% more than the production. For the 10-month period that ended the same time the production was 4% less than during the same period in 1916, but shipments were 5% more. During October 1,417,700,000 ft. were cut, 5% less than in the same month last year. Shipments were 1,234,800,000 ft., 7% less than in October, 1916.

Kankakee River Is Improved for Drainage of Marshes

Channel Straightened and Deepened Will Reclaim Large Area—Dipper-Dredge Excavation Employed

TWENTY-EIGHT miles of the Kankakee River in Indiana are being improved to facilitate the drainage of swamp and overflow lands. The improvement extends from the west line of Starke County southwest to within seven miles of the Indiana-Illinois state line. At a cost of about $310,000 this will reclaim a large area of swamp or marsh land which will be valuable for truck farms and general farming purposes. The river channel, improved ten years ago to the starting point of the present work, is known in the court records as the Marble ditch.

The new work includes the straightening and deepening of the river by a channel which has a bottom width of 70 ft. for 16 miles and 100 ft. for the last 12 miles. The increase in width is made at the outlets of tributary streams. The average depth, including the portions which cross and follow the old channel, is 10 ft. The banks have a slope of 1:1. The grade is 0.02%, which gives a velocity of about 3 ft. per sec. The capacity of the channel will be about 2400 sec.-ft. at the upper end and 3370 sec.-ft. at the lower end.

The soil is mainly a black sandy loam, but in some cases it is almost entirely sand. The first three miles are in clay, but further down there is sandy subsoil with some layers of clay. The completed (upper) part of the channel maintains itself in good condition, and there is no tendency to filling of the channel or caving of the banks. Along this part of the work, therefore, land that was formerly overflowed is now farmed. The channel is crossed by four railways and five public highways. These have plate-girder bridges 120 ft. long, on concrete piers and abutments. Provision is made for lifting the spans to allow dredges to pass for future cleaning of the channel.

This is a dipper-dredge job and the contractors are operating three machines. A dredge with 1½-yd. bucket is used to excavate the laterals or small tributaries. It also works ahead of the large dredge, partially excavating the cut along the sides of the channel. This leaves a portion in the center which a dredge with a 3½-yd. dipper finishes to the specified grade. This dredge is shown in the picture printed herewith. A third dredge, with a 3-yd. dipper was placed in construction at about Mile 14. This machine partly constructs the channel to a depth of about 8 ft. and leaves the bottom to be leveled and finished by the large machine.

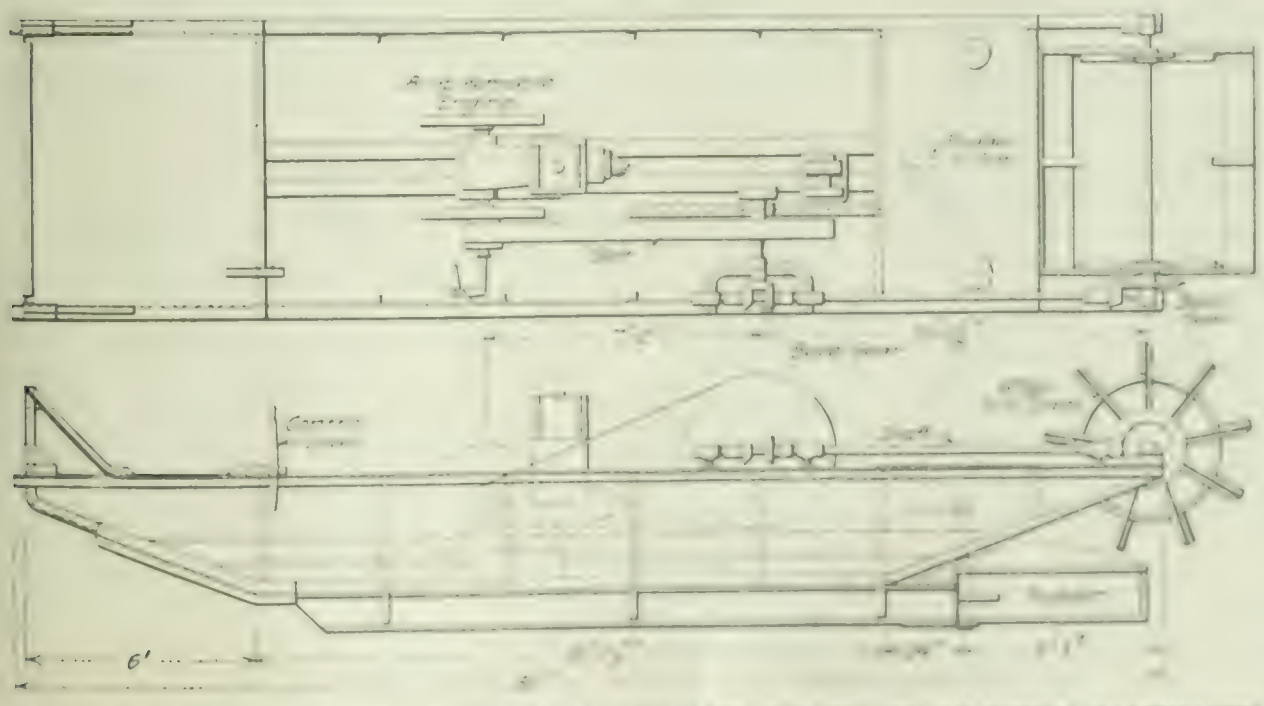
The smaller machines have short booms and can work more rapidly than the large machine. They are used to excavate the short-haul work. The largest machine,



A 3½-YARD DIPPER DREDGE IS USED ON THE KANKAKEE RIVER

which has a hull 110 x 46 ft., carries its 3½-yd. bucket on a 90-ft. boom, so that it can operate from the center and place material over the spoil bank made by the other machines. However, it is not possible for this dredge to complete the entire work of each section without moving from one side to the other as it works downstream. This machine averages about 60,000 yd. per month. The total excavation is more than 5,000,000 cubic yards.

Coal supply for the dredges is provided under favorable conditions, as railways cross the work at frequent intervals. On the greater part of the work it has been possible to dump the coal from cars on the trestle over the ditch directly into the barges, which are hauled to the dredges by small gasoline towboats shown in the drawing.



STERN-WHEEL OIL-ENGINE TUG HAULS SUPPLIES ON DRAINAGE DITCH CONTRACT

The boats have 8-hp. kerosene engine belted to bevel gears for driving the wheels in either direction. Longitudinal shafts from this gearing carry bevel pinions which engaged larger bevel gears on the wheel shafts. The ends of the hulls are inclined, and at the sterns large rudders are fitted beneath and in front of the paddle wheels.

It is estimated that the total cost of unloading and handling coal by means of this boat is 75c. per ton. This co-

cludes the hauling of a small portion of the coal by teams. The contractors are R. H. & G. A. McWilliams, Chicago. The bridges will be built by the county. The work is under the direction of Clifton J. Hobbs, of Rensselaer, Ind., who is drainage commissioner of Jasper County and also superintendent of construction of the Kankakee River improvement in Indiana.

Awakening Recognition of the Engineer

A Canadian View Which Accords with Progressive Thought on This Side of the International Line

"HERE we are, a powerful legion with all the potential attributes of mind, heart and soul to carry us to undreamed heights of eminence, and how far we shall rise as a profession is only limited by the minimum amount of effort which each and every one of us is prepared to give in conjunction with his fellows to make what is reasonably possible a living reality."

With these words, Fraser S. Keith, secretary of the Canadian Society of Civil Engineers, closed a review of the status and future of the engineering profession in an address recently before the Ottawa branch of the society. He stated briefly the recommendations of a report which will democratize the society, placed emphasis on the need of greater service to the individual and maintained that increased recognition and remuneration were within easy grasp if the members of the profession coöperated.

Extracts from his address follow:

At the last meeting of the Council, held on Oct. 30, the report of the committee on society affairs was accepted and approved. . . . The distinctive feature of this report is the increased sense of responsibility of our society, which means the profession, in its relation to the individual member, and of greater importance still, in its relation to its service to the public at large. We have, therefore, apparently reached a point where we know that our former objects were limited and our activities circumscribed, and it is now possible, with that knowledge, to go further, believing that the future of the profession lies largely in how far it is willing to assist the individual member and to what extent he may cooperate with the profession in dealing with all public matters, whereby our interests are affected, using this newly awakened sense in making our combined influence felt outside of the society. It would then appear that (and let me emphasize) *the awakening of the engineering profession involves, in the first instance, the increased recognition of the profession's responsibility to the individual, and the individual's responsibility to the profession, and in the second place their collective responsibility to the public, and in turn an acknowledgment from the public of the engineer's real place in national affairs, which includes status, remuneration and opportunity of service.*

We have been criticized in the past, not only because we were accused of being narrow in our objects, but also it was stated we were collectively without a soul or heart. Be that as it may, if the heart of the profession were a composite heart of the individuals therein it would leave nothing to be desired, but, we must admit there has been some coldness and to some extent indifference, and we should therefore to the greatest possible extent cultivate a fraternal spirit that will develop a heart in our organization, a pulsating, personal heart throbbing with human emotions, and cause that heart to beat warmly and sympathetically not only for our own members, but in our relations with the outside world.

Public Questions

It is possible for a branch to include in its discussions public matters of local interest, even where the branch is not directly concerned. In fact, as a profession we will make greater strides if we give fuller discussion to public questions and less to technical subjects than we have in the past. The branch should be more than a mere unit of the local members of the profession. It should be a fraternal organization meeting in a spirit of good-fellowship. It should encourage the younger members in every way and give them an opportunity of learning public speaking, as well as absorbing the ideas of the older men in the profession. It should be ever and always on the lookout for opportunities for service. The branch should be the technical centre in any community and could possibly take an active part in the technical education of the district, or at least give advice thereon.

The proposed changes in the by-laws, as well as the change in name, will to some extent increase the prestige and standing of our various branches. Each branch will elect its own councilors and will consequently be more directly represented at the headquarters of the society than at present. It is intended to hold an annual meeting of the society once a year in every province. This meeting will be directed by council, will have representatives present from headquarters, and the official report of the meeting will be published in the annual report. These changes are based on the admitted necessity of greater fraternity and closer coöperation, and will enable the individual member to come to a better appreciation of his fellow members, together with a personal responsibility to the society and to the profession. The object of our organization in the future will be of a broad enough nature to enable the society both at headquarters and from its branches to engage in useful public service.

Remuneration

Some of you may have asked yourselves the question, where does all this lead to and how does it affect our earning capacity? Two definite factors in increased earning capacity are—additional usefulness and added recognition. . . . Let me ask you, what position would the government of Canada be in to-day in carrying out the nation's work without the services of the men in the engineering profession. The majority of the departments of the government would be unable to operate without our help. Do the political members of the government realize that this is true? It is certain that they do not. Why? Because we of the engineering profession have in the past taken no corporate action to insure that they should. Instead we have to some

extent acted like dumb driven creatures, accepting the crumbs that have fallen by the wayside, content to sell superior qualities of mind and training for a mess of pottage; for despite your capacity, such in general is your reward in comparison with your true worth. As individuals, it may not be possible to force the recognition needed, but as a body we are a mighty power capable of securing any reward within reason upon which we set our minds and hearts. It is not only in the government service that engineers receive inadequate reward, but throughout the entire profession, and particularly those employed at railway work.

There is one active full member of our society who is a resident engineer on one of the transcontinent railways and his salary is $100 a month. He has a wife and family. Whose fault is it that such is true? Yours and mine. How much longer is the engineering profession going to continue to be underpaid? Just as long as we permit it, gentlemen, and no longer. We have it in our hands to bring about a different state of affairs, but action is required, not words. We have talked in the past a great deal about inadequate rewards and we may continue to talk, but nothing will be accomplished until we secure a higher standard of reward, and we shall find the accomplishment so easy that the wonder will be why we had not thought of doing so sooner. We are to-day exactly in the position of the man staying out all night on his own doorstep because he thought he could not get in, only to find out in the morning that he had the key in his pocket.

The government and railway officials and the general public have only a vague conception of what they owe to the engineering profession for their material welfare, and they will continue in ignorance until we have educated them. In the meantime, gentlemen, it is we who are culpable, not they.

Recognition

The newspapers in this country are the great moulders of public opinion, and it is to them we must look, to some extent at least, for coöperation and assistance. For, once we have convinced the editors that in doing this they are assisting in the public weal, the natural patriotism that characterizes the editorial body would prompt them to act and give their hearty support.

The lawyer and the politician have admittedly failed to solve the industrial relations of man to man and the relations between capital and labor. The very qualifications of mind and training that have enabled the engineer to so successfully grasp and solve any problem set before him will be called upon and required to solve and to deal with what will be, after the war, the greatest problem which we have to face.

We find already many of the executives of large industrial concerns being chosen from our own profession and more and more will the men who have received a thorough training in technical matters be called to the high positions in industrial affairs. This will mean the opening up of a scope for the profession, giving rise to a future that will place the technical man in control of the industrial life of the nation. Coincident with that is arriving a condition whereby the engineer must, besides drawing plans and specifications, give his advice in connection with financing of any industrial or engineering undertaking, so that the time is coming, and very soon, that the engineer instead of receiving the reward that capital is willing to offer will walk hand in hand with the capitalist, on an equal footing, and will share in the rewards that the other has heretofore enjoyed.

In view of such enticing prospects and possibilities for the individual, what limit is there to our development as a profession by acting in unison? Here we are, a powerful legion with all the potential attributes of mind, heart and soul to carry us to undreamed-of heights of eminence, and how far we shall rise as a profession is only limited by the minimum amount of effort which each and every one of us is prepared to give in conjunction with his fellows to make what is reasonably possible a living reality.

Panama Canal Slides Under Control

THE present status of the notorious Culebra slides on the Panama Canal is noted as follows in the annual report for the fiscal year 1916-17, by Governor Chester Harding of the Canal:

"An important part of the work of the dredging division has again been the removal of material from the sliding areas in the Culebra section of Gaillard Cut. Aside from the fact that during the year there was an easily navigable channel available, with but two interruptions of a total of 10 days, as compared with the entire closure of the canal from October, 1915, to Apr. 15, 1916, perhaps the best indication of the improved condition is that the removal of 6,834,072 cu.yd. from the Culebra slides during the year has resulted in a prism of full depth and the full width of 300 ft. throughout, with increased widths of from 200 to 500 ft. at the points of former maximum activity. During the year ended June 30, 1916, 11,210,141 cu.yd. were removed from the same section of the canal. In July, 1916, 1,073,675 cu.yd. were removed, and in June, 1917, 341,568 cu.yd. The West Culebra slide has been quiescent throughout the year, the volume between the peripheral break and the canal having settled to such an extent as to give indications of having reached a condition of stability.

East Culebra Slide Still Moves

"The East Culebra slide is still in motion, with occasional periods of increased activity and intervals of comparative rest. Each active period results in a settlement of the entire mass within the limiting break and a horizontal motion toward the center of the bowl-shaped area. Since the dredges have succeeded in excavating the east bank several hundred feet outside of the limits of the canal prism, recent movements of the mass have no longer produced upheaval of the bottom within the prism, or shoals within the canal by the flow of material from the bank, and after every movement the dredges, working outside the limits of the prism, have had no difficulty in excavating the material before it reached the channel. The ultimate condition of stability will evidently be reached when the broken mass has settled to a surface not far from horizontal with a nearly vertical bluff at the limiting break.

"All told, 23,259,909 cu.yd. of material have been re-

moved by dredges from the Culebra slides (east and west), and it is estimated that 3,600,000 cu.yd. yet in motion will have to be removed. The points established last year, at the request of the Chairman of the Slide Committee of the National Academy of Sciences, on Gold, Zion, Contractors, and Purple Hills and at the bases of Gold and Contractors Hills, have been checked from time to time. No indication of movement of the points has been detected. Extension of the peripheral breaks of the east bank have occurred, so as to increase the area of the east slide by 3 acres. The amount of material involved in these extensions is relatively insignificant, and on account of the distance from the canal it is improbable that any of it will reach the prism.

"Cucaracha slide has given no further trouble since the large movement that blocked the canal in August, 1916. To reduce the chances of interruptions to traffic due to future similar movements if they occur, the material in the slide was removed for a distance of 100 ft. outside the canal prism.

"It is believed that in the future the great slides of the canal will be of historic interest only."

Purchasing Officers for the Government

A list of officers making purchases for the Army and Navy and the United States Shipping Board has been received by the Bureau of Foreign and Domestic Commerce and may be consulted at its district offices.

Derrick Wrecks Concrete Building with Heavy Ball

Roof and Floors Shattered Successively—Fire and Torches Help in Breaking Columns—Fire Tried Also on Floors

A DROP weight, acetylene torches, fire and chains were the principal means employed in wrecking the eight-story reinforced-concrete Western Newspaper Union Building, in Chicago, to clear the site for the new Union Station. Prior to the destruction loading tests were made on one of the flat-slab floors, as described in *Engineering News-Record* of Sept. 27, p. 597.

Designed for floor loads of 300 lb. and 250 lb. per sq.ft., the building was of heavy construction and heavily reinforced. The flat-slab type of floor was used for the lighter load and beam-and-girder type for the heavier load. The building was erected in 1909-10.

Smashing the concrete by dropping an 1800-lb. cast-iron weight upon the floor slabs and girders was the principal method employed. For this purpose an electrically operated stiff-leg derrick with 20-ft. mast and 40-ft. boom was employed. This gave a 30-ft. vertical drop. The cable overhauled the drum, and was not detached from the drop. The ball or weight was somewhat pear shaped, and with a rounded bottom. On the roof and then on each floor in succession the derrick was



THIS DERRICK WITH DROP WEIGHT SMASHES HEAVY CONCRETE FLOORS



REINFORCED-CONCRETE COLUMNS AND GIRDERS ARE PULLED OVER ON THE FLOOR, WHERE RODS ARE CUT AND CONCRETE IS BROKEN UP

moved along the rollers until it had covered the entire area. It was then lowered to the floor below by means of an inclined skidway.

Repeated blows shattered the concrete slabs, so that the pieces fell through the network of reinforcing steel. A gang of about 40 men broke up the larger pieces with sledges. They also pulled out the steel bars and threw them into an adjacent lot which had been already cleared. The débris was hauled by a slip scraper to a chute near the middle of the building, delivering it to a bin from which it was discharged into motor trucks standing on the first floor.

Girders and beams were broken up in the same way. In some cases the girders fell in large masses but remained suspended by the steel reinforcing bars, which were then cut by acetylene torches. Interior columns were broken partly by dropping the ball on their heads. Wood fires at their bases were used to heat the concrete, which cracked and spalled when water was thrown upon it by a hose. The exposed vertical rods were then cut with torches and the columns and girders were pulled over. With these small open-air fires the heating and chilling of the concrete had no great effect, but it sufficed to expose the rods.

Exterior columns could not be broken by the drop weight, as this would have resulted in throwing material into the street. .The concrete at the base was partly broken away with sledges, and some of the bars were cut with torches. Chains were hooked around the column heads and the spandrel girders, and attached to the cable of the derrick standing on the floor level with the base of the columns. In this way the columns and girders were pulled over upon the floor, where the remaining rods could be cut and the concrete broken up conveniently.

Disintegration or softening of the floor concrete by oil and fire was tried. Oil was poured over it and a fire then lighted on the slab. The penetration of the oil was so slight that this method assisted the drop weight only to a small extent, and it was found that the results did not justify the extra time and expense. Wrecking the floors by an upward pull was suggested, but it would have been difficult to get a rig suitable for pulling. Derricks are not adapted for such stresses, and in fact the boom of the derrick used on this work was broken when an attempt was made to tear out some of the reinforcing steel.

Removal of window sash and frames, piping and other fixtures preceded the wrecking. The demolishing of the structure was commenced in August, with the derrick mounted on the roof. It will be completed before the end of year. The W. J. Newman Co., Chicago, has the contract for this heavy wrecking job. All work is under Thomas Rodd, chief engineer of the Chicago Union Station Co., J. D'Esposito is assistant chief engineer and A. J. Hammond is principal assistant engineer.

City Management Does Not Mean Municipal Ownership

H. M. Waite, City Manager, Dayton, Lays Down Reasons for Coöperation Between Utilities and Municipalities

COÖPERATION between cities and utilities will solve the difficulties the former have in getting service, and the latter in making a living, according to H. M. Waite, city manager of Dayton, Ohio, who discussed the subject at the recent convention of the City Managers' Association at Detroit. His remarks are abstracted below:

Undoubtedly many have got the idea that city management means municipal ownership. There is just one thing in which communities are interested jointly with utilities, and that is service. By this I mean, broadly, everything that service implies, gives and requires—proper service to the community and a fair return to the utility on a fair valuation. Public ownership of utilities is a long way off, though ultimately it may be the answer. Our municipal governments are too uncertain yet to think seriously of municipal ownership.

Cities all over the United States are spending a great deal of money in laying out a program for everything but utility service. Money is being spent on sewers, water and streets, but how many cities are spending money on future service from their utilities? If your utilities have not a sufficient return to give service the community suffers. If your transportation utilities cannot automatically expand to meet the transportation of your community, your community suffers.

Financially, today the utilities are struggling. It isn't a question of war times—their securities started to shrink long before the war began. What is the trouble? Too often there is not enough coöperation between the municipality and the utility. There seems to be a feeling of antagonism toward public utilities. Is it because the utility is not giving the service that the public demands, or thinks it needs? Does the public know what service it does need? Those two questions demand investigation. As long as public antagonism exists there is a corresponding shrinkage of securities, and naturally there follows a shrinkage in the service rendered by the utility. Everything points to the necessity of coöperation between the utility and the people.

Having followed this line of thought in Dayton we went to the transportation utilities and asked: "Where

are you heading?" They did not know. The operating man has no time to think about the future of his property 10 to 20 years hence, but he knows that he is being pinched now. The city employed a man to go over the properties and make a preliminary report as to where they were heading.

You never can get coöperative feeling between the public and the utilities with the indeterminate franchise. You cannot interest the public in any utility if the public has not a direct interest in that utility. I believe we shall see, and that very quickly, an abandonment of the indeterminate franchise, giving to the public a direct benefit by making possible a liberal, fair program of expansion to meet the requirement of service.

If your utilities cannot expand automatically, freely, fairly and economically, to meet the demands of your community, then your community will suffer. Therefore, I believe in comprehensive agreements between cities and utilities, based on thorough local investigations. I also believe in a determinate franchise, with a fair valuation of the property, with fair fluctuations in the cost of service to meet the changing requirements of the time, and with a payment to the city of all over a certain fair return on a fair valuation.

Exhibit Board Educates Students in Current News

Substantial, Expensive Construction Made Part of Building to Impress Observers with Importance of Subjects

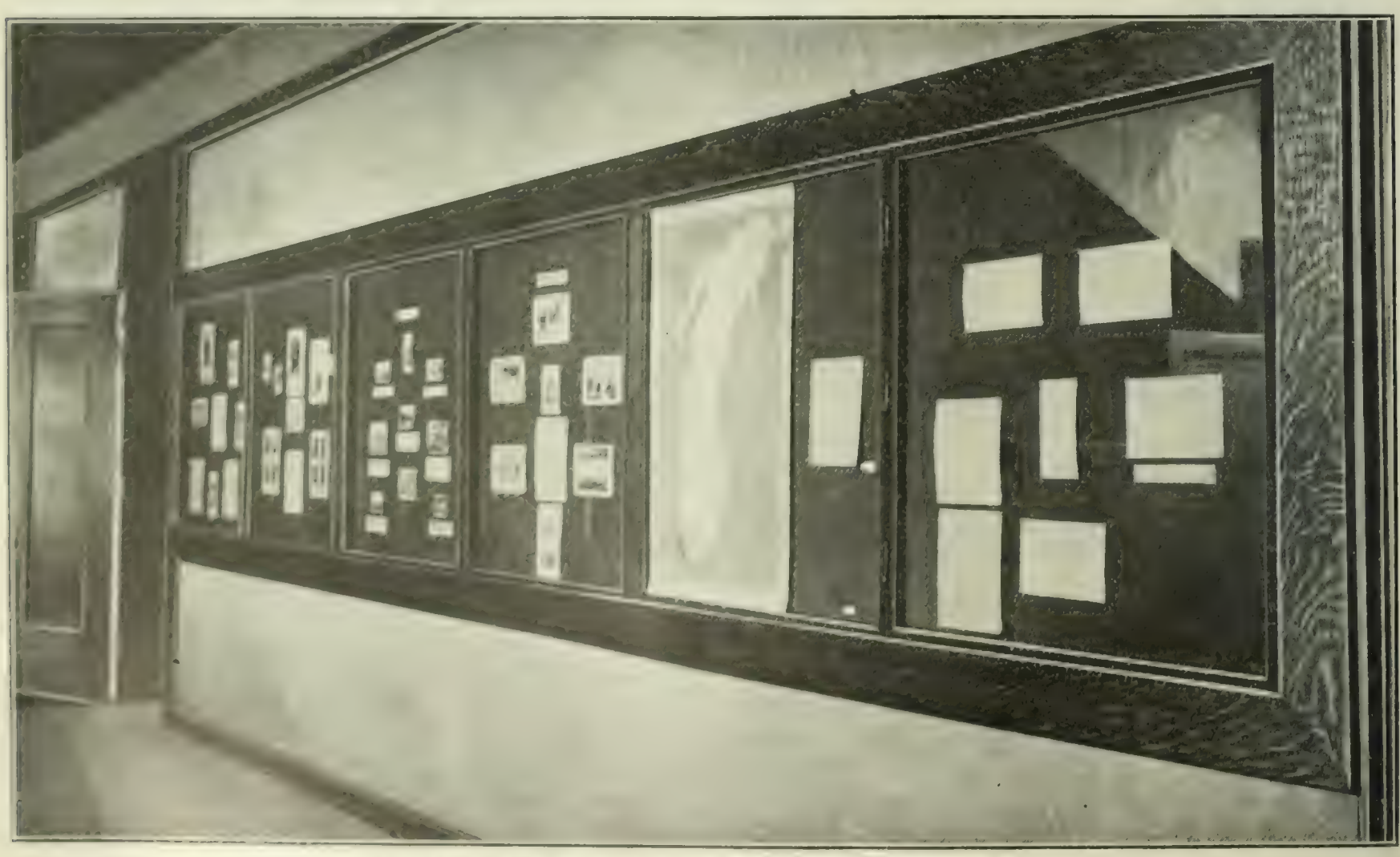
INTEREST in current events in the engineering world is fostered among the engineering students at Northwestern University, Evanston, Ill., by means of an elaborate, permanent exhibition board. Since some engineering societies have under consideration the exhibition of photographs, maps and other material illustrating enginering topics of the day, a description is given of this board, which has created among the students a desire to keep up with the times.

It has been the policy at Northwestern to have one central educational idea around which the exhibit centered, but in each case one or two panels were taken up with a special exhibit calling attention to particular engineers and engineering achievements having special "news value." This part of the exhibit is changed more often than the remainder.

Recently the main exhibit was on the National Bureau of Standards, the central panel containing a large blueprint of announcement and having on either side photographs of the buildings, testing machines and specimens. All are properly labeled with well-written paragraphs designed to give enough information to tell what the pictures are about. Something is left to the imagination, with the idea of leading the observer to investigate the subject further.

Some of the educational exhibits are as follows: Great bridges; severe survey conditions and general information about Chicago weather; electrical development in power plants; wireless telegraphy and remote control; uses of terra cotta; automobile construction; landslides at Panama; work of the U. S. Coast and Geodetic Survey.

On the single board which the students call "Engineers and their stunts" have been shown photographs of the builders of the Catskill Aqueduct and of the Que-



[illegible] SHOWN ON SUBSTANTIAL BOARD

bec Bridge, with short extracts from recent articles of appreciation in *Engineering News-Record.*

In design, the idea was to make the board appear as a part of the building. It is situated on the second floor, where virtually all students must pass it frequently. A 25-ft. stretch of wall was available, and the height was selected so that the eye of the average person would come near the center of the 4-ft. panel and ordinary type could be read at the top. The 4-ft. width was chosen so as to obtain plenty of room for large maps. The doors of the panels are ¼-in. plate glass set in pressed-steel hinged frames.

The wood framework is of oak veneer, to harmonize with the trim of the building, 9 in. wide and 2¼ in. thick. At the back is a sheet of soft cork-board into which thumb tacks press easily. To permit the exhibition of books the space between the glass and board in the two central panels is 1⅝ in. In the others it is 1 in. The whole frame is permanently anchored by bolts to the wall. The entire cost was about two hundred dollars.

The exhibition board was suggested by John F. Hayford, director of the College of Engineering, and the design and execution were carried out by the architects for the university.

LETTERS TO THE EDITOR

Comment on Matters of Interest to Engineers and Contractors Will Be Welcome

Should Engineering Students Be Drafted?

Sir—In reply to the inquiry of Dr. Palmer C. Ricketts, president of the Rensselaer Polytechnic Institute, as to the wisdom of drafting students of engineering schools, I beg to give as my opinion that it is wrong to do so. It is wrong because all of those of military age and red blood have volunteered, and those that have not would be useless if drafted. F. J. MACISAAC,

Smith, Hauser & MacIsaac, Inc., Contractors.

New York.

Are Values for Nailed Joints Too High?

Sir—The writer has read with interest the article "Tests on Nailed Joints in Fir and Hemlock Timber," published in *Engineering News-Record,* Nov. 8, 1917, p. 871. Outside of one other set of tests (*Engineering Record,* Jan. 13) the tests of the Bureau of Buildings of Portland comprise the only published record on the lateral strength of wire nails in conjunction with Douglas fir.

The writer has made a careful study of a number of tests on nailed joints [Mr. Dewell notes particularly the items Nos. 5 to 9 in the appended bibliography of tests. —Ed.] The results of his investigations from these data are embodied in his book "Timber Framing." Without having recourse to direct tests on Douglas fir he has considered that for all practical purposes the lateral strength of nails in yellow pine and Douglas fir may be regarded as equal, and he has proposed that the safe working strength for a wire nail in either of these timbers, when such nails are driven normal to the fibers of the timber, may be expressed by the formula $S = 4000\ d^2$, where S = safe lateral resistance of one nail in pounds; d, diameter of nail in inches.

This formula is given after study of all the tests made, the values for the different timbers, as white pine, Norway pine, oak, yellow pine, etc., being considered in accordance with their physical properties, and special attention being paid to the elastic limits.

The statement made in your article that Professor Hatt suggests that the safe resistance of a nail for resisting lateral forces be taken as 9.6 times the pennyweight of the nail is hardly correct, nor is the line "Safe loads suggested by Hatt" in your figure in accordance with Professor Hatt's recommendation. Professor Hatt advises the formula $S = 9.5\ D$, where S = safe lateral resistance in pounds of one nail in yellow pine, and D, pennyweight of the nail; but he states that this formula should be taken only for nails up to and including 20d nails. For nails above this size, the formula will give too high values. Furthermore, the values given by the foregoing formula represent a safety factor of five on the ultimate strength of the joint, and a safety factor of three on the elastic limit of the joint, for the tests under discussion, that is, those of Darrow and Buchannan.

It appears that the recommended working values of the Portland Building Department are about a mean between those values representing a safety factor of three on the ultimate strength of their tests and the safe values according to Professor Hatt's formula, erroneously applied, and the writer believes that virtually all these recommended values are higher than is warranted.

In the table given herewith, there is presented the ultimate strength of one nail in "single shear" in a timber joint of yellow pine or Douglas fir, for the various sizes of wire nails, as determined by previous tests. The table also gives the average of all these results for each size nail, and the safe working strength as determined by the writer's formula, $S = 4000d^2$, with the corresponding safety factor in the average ultimate strength shown by all the tests.

The results of these various tests differ widely. This variation is due largely to the differences in strength in the timber blocks used, as different specimens of the same kind of timber will show different compressive strengths, due to moisture conditions, density, etc. It will be realized that the factor of density must exercise a considerable influence on the strength of a nailed joint in many instances, due to the large proportion that the thickness of the annular rings bears to the diameter of nail. The strength of such nailed joints is a function of the bending strength of the nail, and also, in every case, a function of the compressive strength of the timber, both in end bearing and bearing across the fibers.

The tests of Walker and Cross, since made on Norway pine, are not directly comparable with the later tests on yellow pine and Douglas fir. The numerical values for the ultimate strengths were low as compared with those found by the other tests. It was found that the strength of the nails at the elastic limit followed with

remarkable closeness the formula $Se = 5500d^2$. This series of tests comprised some 300 joints.

Your article states that an effort was made to determine the elastic limit of the joints, but this could not be established. The tests of Walker and Cross, Darrow and Buchannan, Morgan and Marish found, according to the published reports, that the elastic limit of the joints occurred at a load of about 60% of the ultimate load, and at a slip of the joint of approximately $\frac{1}{16}$ in. Wilson, in the Forest Service tests, states that the elastic limit was well defined, and occurred at a comparatively small deformation, namely, with a slip of from 0.018 to 0.039 in. and at a load of from one-third to one-half the ultimate load.

In this connection the writer would remark that in all these tests, with the single exception of the Forest Service tests, the methods adopted in measuring the slips were apparently quite rough. In at least two of the series of tests, the slip of the joint was noted only for $\frac{1}{8}$-in. deformations, and was measured on one side of the joint alone. This rough method cannot be expected to give the true value of the slip of the joint, and any load-slip curve plotted from such results will very probably give an uneven or angular curve. The writer's experience in testing timber joints has been that whenever the true deformation of the center of the joint is determined, the resulting load-slip curve is remarkably smooth.

With regard to the elastic limit, a full description of all such tests should define what is meant by the elastic limit, that is, whether that point is meant at which no permanent set in the joint occurs, or whether the elastic limit is used in place of the better term yield-point. In the case of timber joints, the writer believes that this latter point is best determined, by the method of the late Prof. J. B. Johnson, as that point on the load deformation curve at which the tangent to the curve has 3 2 the inclination of the tangent at the origin of the curve. Furthermore, the writer believes that this point should always be determined, and the working values should always be based on corresponding loads.

In conclusion, the writer believes that the working values as established by the Portland Building Department are too high for general use in a building ordinance. The engineer will usually use his own judgment in such matters, based on the published data of tests. On the other hand, the average architect generally belives that all working values established by engineers carry a safety factor of from four to five, and designs accordingly. In addition, such considerations as impact, or relation of probable live load to actual dead load, seldom enter his head. Consequently, it is the writer's opinion that any values established for a building ordinance should be conservative rather than high.

San Francisco. H. D. DEWELL.

[In justification of the Building Department of the City of Portland it should be stated that its report did not contain the curve ascribed to Professor Hatt. That was added in the office of *Engineering News-Record* and was extended — Mr. Dewell points out, beyond the limits intended by its originator. The original report, which is quite extensive, contained a considerable discussion on the elastic limit, which was not included in the abstract in this journal.

There is appended herewith a bibliography of the subject made up from references gathered by the Portland department and by Mr. Dewell.—Editor.] .....

BIBLIOGRAPHY OF TESTS OF HOLDING POWER OF NAILS

(1) "Tests of Metal," 1884. Tests of the adhesive resistance of nails in timber, made at the Watertown Arsenal on white pine, yellow pine, white oak and chestnut.

(2) *Engineering News*, Jan. 11, 1894. "Experiments to Determine the Holding Power of Nails and Drift Bolts," by F. W. Clay. Red oak.

(3) Transactions of the American Society of Mechanical Engineers. Vol. 16, 1895. By W. E. Barnes and R. O. Stillwell, to determine work required for driving and pulling out nails. Recorded by R. C. Carpenter. Southern pine.

(4) Association of Engineering Societies, February, 1896. Experiments made by Frank Soulé on the resistance offered by nails to pulling from Douglas fir and redwood.

(5) Association of Engineering Societies, December, 1897. Tests of the lateral resistance of nails in Norway white pine and oak, by F. B. Walker and C. H. Cross.

(6) Proceedings of the Indiana Engineering Society, 1900. Tests by H. D. Darrow and D. W. Buchannan at Purdue University in 1898. Described by Prof. W. K. Hatt. Yellow pine and oak.

(7) Bulletin No. 2, Vol. IV of the Experiment Station of Iowa State College. Tests by C. K. Morgan and F. Marish at Iowa State College in 1907. Described by M. I. Evinger. Nails ranging from 8d to 60d and lumber white pine, yellow pine, spruce, fir and oak.

(8) *Engineering Record*, Jan. 13, 1917. Test by J. C. Stevens on Douglas fir.

(9) *Engineering Record*, Feb. 24, 1917. Tests by the Forest Service at Madison, Wis., described by T. R. C. Wilson. Yellow pine.

ULTIMATE STRENGTH OF ONE NAIL IN "SINGLE SHEAR," AS DETERMINED BY VARIOUS EXPERIMENTERS, FOR YELLOW PINE OR DOUGLAS FIR

(1) Size of Nail in Penny-weight	(2) Darrow and Buchannan	(3) Morgan and Marish	(4) Forest Service Wilson	(5) Bureau of Buildings Portland	(6) Average Ultimate Strength	(7) Working Values According to Formula $S = 4{,}000d^2$	(8) Safety Factor on Av. Ult. Strength Col. 6
6	240				240	53	4.5
8	361	294			328	62	5.3
10	724	324		525	524	88	5.9
12		625			625	88	7.2
16	855	494		600	650	110	5.9
20	930	746	779	749	808	165	4.9
30		1,221	783	922	926	194	4.8
40	1,450	1,067	845				
			1,125	1,183	1,134	226	5.0
50	2,000	1,425	1,261		1,575		5.9
			1,615			268	
60		1,783	1,144		1,593		
			1,644	800	...	322	4.9
80			...	...	....	364	
Average safety factor							5.4

Does Waterproofed Concrete Resist Sea Water?

Sir—We have noted with considerable surprise the statement made in the article of Messrs. Wig and Ferguson on the "Selection of Materials for Sea-Water Concrete," in your issue of Oct. 18, that concrete containing our Toxement integral waterproofing compound showed the same "defects and deterioration" as structures not containing it.

We have thought we had some good evidence to the contrary, but assume that Messrs. Wig and Ferguson can back their general statement with specific instances.

New York City. TOCH BROS.

[This letter was submitted to Messrs. Wig and Ferguson who replied as follows:—Editor.]

Sir—The statement we make in reference to the use of waterproofing compounds that "the same defects and deterioration are present in the treated structures as in those untreated" is substantiated by the examination of marine concrete in which such ingredients were used.

Referring specifically to Toxement, we found three structures where this material had been mixed with the concrete. These are all in New York harbor. One of these is a reinforced-concrete pier. In this case the same cracking of beams and kneebraces has occurred as was found in many other reinforced-concrete structures along our coasts. In one of the dry docks in New York harbor Toxement was added to the concrete. Most of the concrete in the walls of this dock is covered with a brick veneer and the condition of the concrete back of the brick could not be determined. At the bow end of the dock, however, the concrete wall is exposed, as the brick facing was omitted. Here the concrete has deteriorated considerably and shows typical sea-water effect. In making repairs in 1912 to one of the quay walls at the New York Navy Yard Toxement was used in the concrete. This section is at present in very good condition, but not any better than a number of others of considerably greater age in which no waterproofing compounds were added to the concrete.

In making an investigation of the effect of waterproofing compounds on concrete the Los Angeles Harbor Department experimented with a number of compounds, among others Toxement. As far as this compound was concerned, the tests showed that it reduced the compressive strength of the concrete about 12% at the age of one month and about 40% at the age of three months.

Experiments made at the Bureau of Standards indicate that the addition of Toxement to concrete decreases not only the strength of the concrete but also decreases the density, which quality is so essential for concrete subjected to sea-water action.

RUDOLPH J. WIG,
LEWIS R. FERGUSON.

Washington, D. C.

[To this answer Toch Bros. replied as follows:—Editor.]

Sir—In the explanation by Messrs. Wig and Ferguson of their statement, the first instance cited is said to be a reinforced-concrete pier, though no name is given for identification, and it is stated that "in this case the same cracking of beams and kneebraces has occurred as was found in many other reinforced-concrete structures." Cracking of this sort in exposed beams and kneebraces occurs in many localities other than along the seacoast and is due to stress from temperature variation, and has nothing to do with imperviousness of the concrete. We do not claim that Toxement increases the tensile strength of concrete. We note that any reference to disintegration in the substructure or portion in contact with the water has been carefully omitted.

As to the statement that the exposed concrete in the dry dock in New York harbor "has deteriorated considerably and shows typical sea-water effect," we will say that we have just inspected this dock and cannot agree with the statement. The entire surface is unusually hard, smooth and sound except for a patch about one foot square which has been broken off and may or may not be due to salt water corrosion.

As to the tests in the Los Angeles harbor, we have no knowledge of any such experiment, beyond the statement made here, and have no means therefore of refuting it specifically. We can, however, refute it in general by quoting from Technologic Paper No. 3 of the Bureau of Standards which gives on p. 126 a comparison of the tensile and compressive strengths of mortars waterproofed and unwaterproofed and for a 1:6 mix; the figures are as below. The number of Toxement in these tests was 28.

	Compressive Strength, Age in Weeks						Tensile Strength, Age in Weeks					
	1	2	4	13	26	52	1	2	4	13	26	52
No waterproofing	559	612	733	1,056	1,326	1,673	96	115	183	207	248	259
Toxement	353	552	596	1,021	1,210	1,775	78	113	140	187	229	287

The last statement that "experiments made at the Bureau of Standards indicate that the addition of Toxement to concrete decreases not only the strength of the concrete but also the density," is apt to be misleading. In one such test two specimens of a given mix to which 2% of Toxement had been added were photographed and compared with two specimens of the same mix without Toxement. It was found in the Toxemented specimens that the stones appeared to be spaced further than in the specimens without Toxement, and in the sense that the proportion of mortar to stone was greater in the former than in the latter cases the density was decreased. This is exactly the result, however, that would have been obtained if a mix richer in cement had been used, and simply showed that hydration of the cement had been promoted and its swelling action brought into play in the Toxemented specimen. The statement, however, fails to mention the fact that the Toxemented specimens were found to be less porous than the others.

We believe that porosity is the primal cause of disintegration of concrete by sea water and that Toxement decreases this disintegration by decreasing the porosity.

New York City. TOCH BROS.

Variations in Transit Needles

Sir—I have read with interest the communication of Mr. Newbrough in your issue of Dec. 13, p. 119, in regard to the difference in needles. Of course, the existence of such difference has been known at least from the time of Rittenhouse, but the amount given by Mr. Newbrough is in one instance much more than I have ever seen—30 in. being as much as is found except in rare instances. Those interested in the subject might turn to page 544 of *Engineering News* of June 28, 1894, and see the call down I received from the editor for venturing to suggest that such difference existed at all.

Rockland, Maine. O. H. TRIPP.

Profiteering and Industrial Unrest

Sir—I was much interested in the editorial entitled, "Profiteering and the Industrial Unrest," in your issue of Nov. 22, and also in the one entitled, "Whither Are We Going?", in the issue of Nov. 29. These are timely discussions, and I am glad to see a journal of your standing and influence taking such advanced ground in a field too much neglected by engineers.

I have believed for some time that we have not realized the extent to which the business of the country has been subject to sinister manipulation on account of the fact that "credit power has been in private hands." In your first paragraph you point out that "tremendous changes have occurred since April in our economic and political structure." So too has public opinion changed in its attitude toward big business, as is clearly indi-

cated by this excerpt from your editorial, "It (the credit control) has been the bulwark of privilege and the undoing of those who had the vision, the organizing ability, the inventive genius, but were unable to tap credit resources." Credit is based on faith, and *control of credits* will, in the future, be as objectionable as the control of individual initiative.

In a paper recently presented to the Engineers' Club of St. Louis, I pointed out, in discussing the relation of engineers to modern business systems, that the fundamental principle of modern business is credit, which has its foundation in *confidence;* but since the prime motive in the organization of business systems is *that incomes may be secured for investors* and since the control of such organizations lies in the hands of *men who live by their incomes and who are in business solely to make money,* it appears to be a plan admirably calculated to undermine confidence and to defeat its own ends.

You do well to raise the question as to what shall be our attitude when the world conflict ceases. It appears quite probable that industrial chaos will follow the close of the war unless the great and long-suffering public insists upon coöperation with its interests by big business and the representatives of labor alike.

I commend you on the timeliness of this editorial and would urge upon all engineers careful attention to the last line of your closing paragraph, where you refer to those interesting and important questions which "engineers should have a part in answering."

E. J. McCAUSTLAND,
Dean, Faculty of Engineering, University of Missouri.
Columbia, Mo.

Easy Method of Obtaining Squares

Sir—Referring to an article entitled "Rapid Methods for Rapid Calculations," by Mr. H. S. Jacoby, in your issue of Dec. 6, I would suggest an accurate and short method of obtaining squares, which I often use to advantage.

For instance, let the square of 48 be required. It is a simple matter to add mentally 2 to 48 and to deduct 2 from 48, which equals 50 and 46 respectively, and by multiplying the sum and difference (46×50), and adding the square of the number which we have added and subtracted, 2, obtain the result, 2304, very rapidly.

Another example: Required, 494^2

$$6^2 = 36$$

$$244.036$$

Boston. LOUIS A. HORNEL.

Engineers and the War

Sir—In the Nov. 22 issue of *Engineering News-Record* there appeared a short but timely editorial concerning the lack of discussion by engineering societies of the industrial and engineering problems that have a direct bearing on the prosecution of the war.

As the Engineers' Society of Western Pennsylvania is not to be numbered among those not alive to the present conditions, we wish to call your attention to a paper on "Industrial Housing," presented to the Society on Nov. 13 by H. Walter Forster, general manager of the Independence Bureau, Philadelphia.

Industrial housing is considered by those familiar with the situation as one of the most pressing subjects correlated with the manufacture of Government supplies. The paper read by Mr. Forster was interesting and instructive. His statements were substantiated by statistics gathered by Government commissions in this country and Great Britain. He concluded that relief must be immediate; furthermore, that the Government and large manufacturers must take an active part in providing new and substantial houses.

The 80 concrete houses recently completed by the American Steel and Wire Co. at Donora, Penn., furnished an excellent example of work being done by the large corporation to relieve the housing shortage. On the Saturday following Mr. Forster's talk, the Engineers' Society of Western Pennsylvania conducted a trip to Donora to inspect these houses.

K. F. TRESCHOW,
Secretary, Engineers' Society of Western Pennsylvania.
Pittsburgh.

Pinned Floorbeams Not New in Holland

Sir—In *Engineering News-Record* of Nov. 29, p. 1007, you describe briefly a flexible connection of floorbeam to truss in a bridge recently built by the Dutch State Railways.

I would like to call your attention that this is not a new type of construction, but has been in use in Holland for some years in large railway bridges, with success. This construction gives the advantage of eliminating the floor beam bending effect in the vertical truss members, which always occurs when the floorbeam connection is rigid. When, as engineer of the Holland Railroad Co., I investigated the large span over the Rhine near Rhenen, built about 1890, I could not detect any secondary stress in the vertical compression members.

The end floorbeams are always rigidly connected to the truss, in order to get a stiff end portal to bring the wind pressure from upper chord to bridge supports. A little more steel is necessary for the lower wind bracing than in the rigid connection, but the extra cost cannot be compared with the saving of steel in the vertical compression members. H. B. J. AIKEMA.
Bartlesville, Okla.

Steam vs. Gasoline

Sir—Regarding the item, "Electric or Oil Engine for Railway," on page 1019 of your issue of Nov. 29.

Like everybody else, my company is also facing the problem of lower operating costs. We propose the use of a steam-driven motor car, in preference to gasoline, for reasons quite similar to those of old "Hook 'Er to the Biler"—— when there's steam there's power. A number of successful steam-driven automobiles are now on the market. The type of power plant used in these can be enlarged to the size of an engine capable of driving a railway car.

The steam plant is preferable because of its simplicity, dependability and uniform starting torque. The gasoline motor cars are complicated, for the engine itself must have many moving parts, and must be connected to the drive wheels through a clutch and chains

or train or gear wheels, or, in the gas-electric plant, to a dynamo, then to controller and motors; it must also have self-starter and numerous other devices. The more contraptions on a machine, the more grief for the operator, and much of this can be eliminated by the use of steam.

But granting that simplification of plant is impossible, steam is more readily adapted to starting a heavy car. The gas engine will not "take hold" of an overload, and must be going at a great rate to deliver its power at the time when that is most needed. A loaded car starts slowly. A steam engine would settle itself to the business of starting that car—no jerking or fussing, no pausing for the governor to open the mixer valve to admit more gas to make more power that should have been there in the first place to start that car, and then maybe flooding the motor down and having to try all over again.

A steam power plant would use kerosene or fuel oil with less trouble to all concerned than an internal-combustion motor.

R. F. MIRICK,
Chief Engineer, Gulf, Plainville & Northern R.R.
Great Bend, Kan.

"A Highway for Anything in Reason"

Sir—Your timely editorial on highways in your issue of Dec. 6, is very interesting to an onlooker, but it would not have hurt if you had made it stronger.

There is no body of men of my acquaintance so prone to use the expression "It can't be done" as the highway engineers and their workers.

Years ago Melvil Dewey, probably the greatest librarian of our time, was asked when a public library should be open. His reply was: "Whenever the public would use it; 24 hours in the day if it were used." Why would it not be a good idea for the highway engineers and their assistants to "buck up" and adopt a similar plan of action with a slogan, "A highway for anything in reason to travel?"

The metalling of highways has reached a very high point, but it will not hold up the traffic, unless the foundation is good, any more than the rails of a railroad will hold up its traffic if laid on rotten cross-ties.

Jewett City, Conn. A. A. YOUNG.

Enrollment in Engineering Schools and Engineers' Salaries

Sir—In several recent numbers of *Engineering News-Record* appear letters deploring the fact that the enrollment of students in the engineering schools has decreased, and there seems to be a fear on the part of certain engineers that there will be a shortage of engineering talent in the very near future.

It is generally conceded that the price of an article is governed by the relation of supply to demand, and that conversely the available supply in its relation to demand may be judged by the price obtainable. If this be true of engineering service—as it probably is—it would seem that there is an oversupply of engineers. An examination of the "Searchlight Section" of your paper shows a constantly decreasing space devoted to positions vacant, and a constantly increasing space devoted to positions wanted. A study of the salaries offered, taken in conjunction with the experience and education demanded, indicates that the employer is still very far from the point where he must shut up shop for lack of engineering help. A careful reading of the "position wanted" advertisements shows very clearly that in the majority of cases the advertiser is a man of experience and ability whose employer does not believe in the socalled shortage of engineers, nor in the increased cost of living.

My own experience is necessarily local, and my observations may not be of universal application, but it is a fact that among my acquaintances there has not been any general advance in salary, and that in the few cases where a small increase was granted to retain a man's services the increase was far less than the increased cost of living. It is also a fact that there is no demand for engineers except at the same old salary or at most a 10% increase. These remarks apply to men of $125 to $175 grade, and not merely to the failures, so that the writer for one does not feel any anxiety about the supply of engineers in the near future.

When we see an advance of from 25% to 50% in the salary of the average engineer, we may begin to take some steps to increase the number of engineering students, and offer to them an actual reason—expressed in dollars per month—why they should stay in the game. So long as the man with a grammar school education can make just as much money in the shop as the engineer with his expensive education can make in the office or on the job, there is not much reason to increase the supply of engineers. When the salary of the engineer increases in the same proportion as the wage of the laborer or of the mechanic, or even keeps step with the cost of bread and butter, he will be more favorably inclined toward the swelling of the ranks.

JOHN F. JOHNSON.

Keeping Abreast with the Times

Sir—Last New Year's, I made a resolution to add something every day in the year to my notes on engineering. That resolution I have kept faithfully, allowing myself no holidays whatsoever.

The result has been that in less than a year I have written more notes than in six years of desultory work. In fact, the practice has been so beneficial to me that I wish to recommend it to all recent graduates, and to others who like myself have done little systematic work. Something written down in permanent form every day is the plan.

F. W. MULDOON.
Detroit.

Garbage Adds Pound a Day to Weight of Hogs

In anticipation of feeding cantonment garbage to hogs, Prof. John M. Evvard, of the Iowa Experiment Station, made observations on eight pigs. At the start, these pigs weighed 53 lb. each. They were offered an average of 23.6 lb. of garbage daily for 70 days. Of this they ate an average of 19.6 lb. each, and added 67 lb. to their average weight, which was thus brought up to 120 lb. For the next 30 days one group of the hogs received garbage alone, as before, while another group were "self-fed" with middlings, in addition to the garbage. These hogs gave preference to the middlings and ate less garbage than the others, but took on no more weight than the hogs fed on garbage alone.

HINTS FOR THE CONTRACTOR

DETAILS WHICH SAVE TIME AND LABOR ON CONSTRUCTION WORK

Serviceable Unloading Box for Highway Work Cost Ten Dollars Complete

By E. Earl Glass

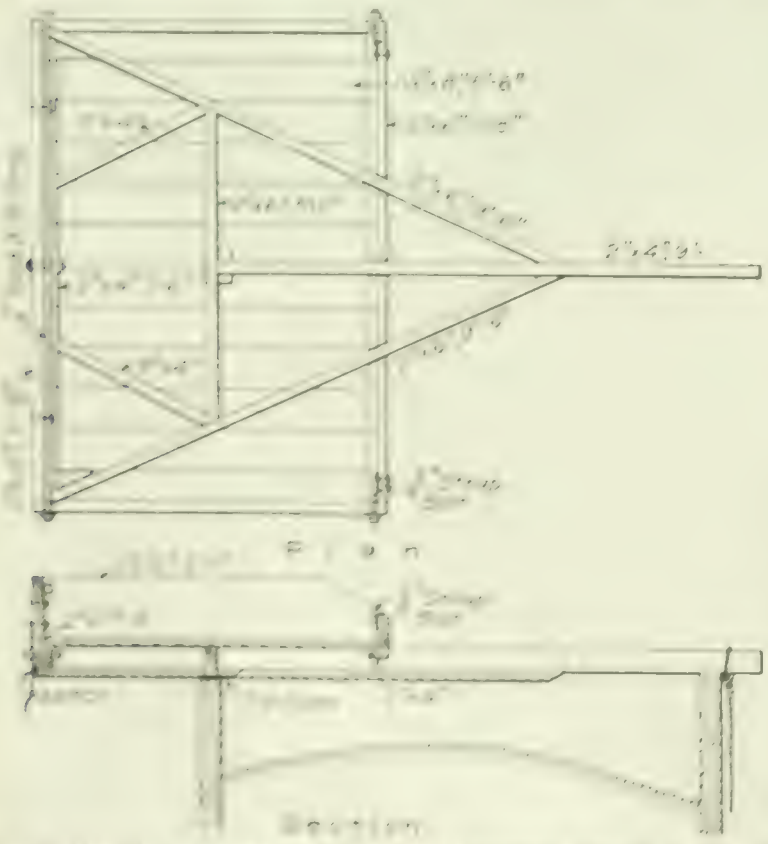
Monrovia, Calif

AN UNLOADING box designed and used successfully in handling highway materials by the writer is shown in the illustrations. The box cost but $10 for material and labor, and contains only 145 ft. B. M. of



BOX CONTAINS ONLY 145 BOARD FEET OF LUMBER

lumber. The hardware for it was easily made. It has a hinged door at the front edge and revolves around the near edge of the car on a tie plate as shown in the drawing. This plate keeps it from slipping when tilted.



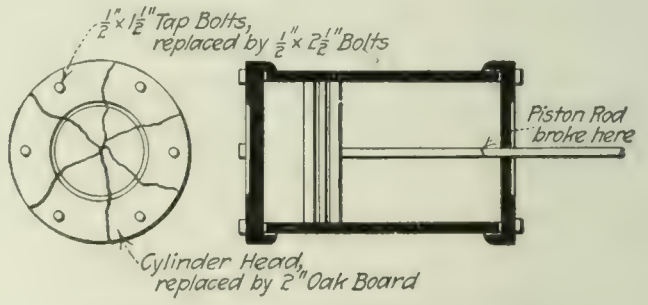
For security against shoveling too much of the material along the front edge, the pole reaching across the car is tied down by a rope to the truss rods below. The box is so light that one man can easily move it along the edge of the car as the stone is removed, by lifting it and putting a small pipe blower under the middle sill. The frame weighs 140 lb. and is the heaviest part of the box when dismantled. On this account it is a simple matter for one to move the box from car to car, which operation does not occupy more than 20 minutes.

Oak Cylinder Head Enables Hoist to Run Until Repair Parts Come

By John G. Sullivan

Civil Engineer, Roos Bros., Cincinnati, Ohio

A CONCRETE hoist on one of the groups of buildings of the East Side High School at Cincinnati was recently delayed but 35 min. as a result of a broken piston rod and smashed cylinder head. The rod broke on a return stroke of the engine, the momentum forcing the piston through the cylinder head. No spare parts were obtainable in Cincinnati, and as a matter of fact



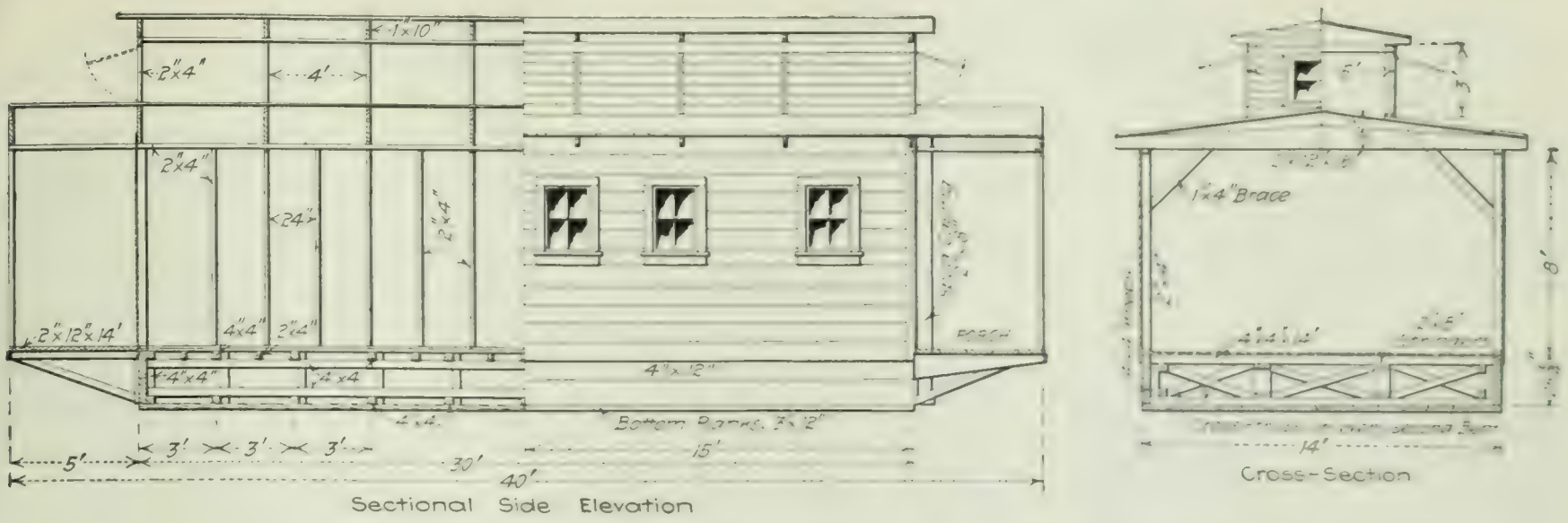
OAK HEAD RAN THIRTY DAYS

it required a week to get a new cylinder head and rod. The broken piston, however, was at once welded, and while this was being done the pieces of the cylinder head were put together and used as a template to make another one out of oak. The circle of bolt holes was laid out on a 2 x 10-in. oak plank, which was secured to the cylinder by using a new set of tap bolts one inch longer than the old ones.

The welded rod was replaced, and the oak cylinder head bolted on, so that the engine was again hoisting concrete within 35 min. of the accident. Although the new parts, which were ordered by wire, came within a week, they were not put on until a month later, when the welded piston rod broke again. In the meantime the makeshift cylinder head and the welded rod had raised something more than 1000 yd. of concrete.

House-Boats with Steel Bunks Used for Dredge Crews on Ditch Work

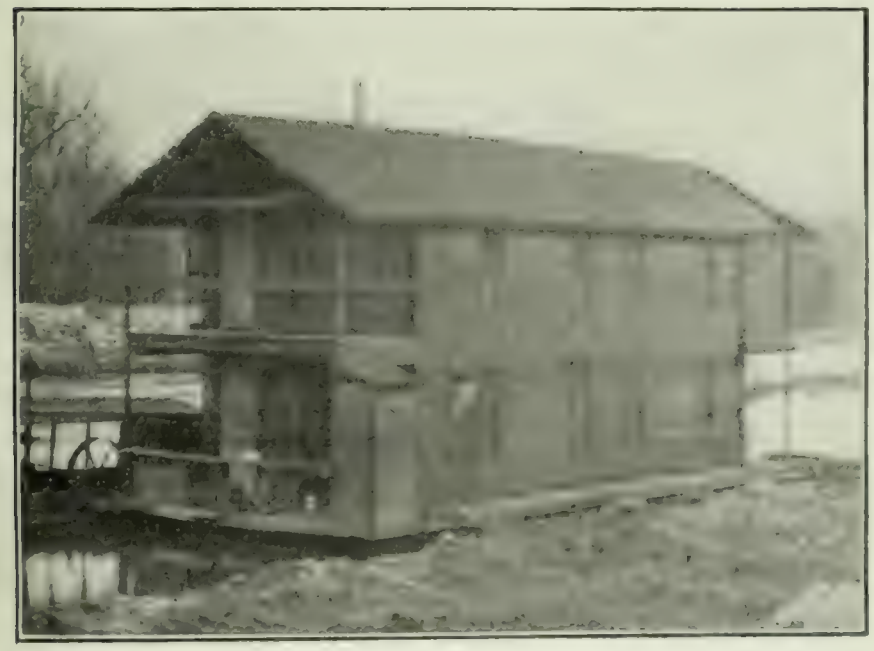
HOUSE-BOATS used as quarters for dredge crews by R. H. & G. A. McWilliams, of Chicago, on many of their contracts for drainage ditch excavations, are shown in the accompanying drawing. The force for a dredge consists ordinarily of a foreman, two dredge



SINGLE-DECK QUARTER BOAT FOR DREDGE CREWS ON DRAINAGE WORK

operators, two cranesmen, two firemen, a launchman and from two to four coal men and extra men.

The house-boats are built with either a one-story or two-story superstructure. In the former case, two boats are used, one for the crew's quarters and the other for the galley, mess room and cook's quarters. The one-story quarter-boat generally contains three rooms; a combined office and sleeping room for the foreman, a



DOUBLE-DECK QUARTER-BOAT

sleeping room for the two dredge operators, and a large room for the rest of the crew. In a two-story boat, the first floor contains the galley and mess room and the upper floor is for the crew's quarters. The bunks are of steel, of the double-deck type.

The Kankakee River improvement on which this type of house-boat was used is described in this issue of *Engineering News-Record*, p. 1205.

Motor Truck Dumps Five Batches in Succession Into Mixer Skip

MOTOR truck bodies designed to hold sand and gravel for five 3-sack batches of concrete are being used in Thurston County, Washington, to supply the paving mixer on the concrete road work being done by the Independent Asphalt Paving Co., Seattle. The truck backs up to the loading skip of the mixer, dumps the first batch by opening the tailgate, and stands there while this batch is mixed. The hinged bottom door of the next partition is then released by pulling out a latch, which permits the second batch to slide into the skip of the mixer. When the second batch has been mixed the third is dumped, and so on, until the truck is empty. The sides of the body and of the partitions are built up 6 in. higher than is necessary to contain the sand and gravel in each batch, so that the measured charges cannot run from one compartment into the other while the body is standing in the dumping position. Each batch contains 6 cu.ft. of sand and 9 cu.ft. of gravel. The trucks in use are 3-yd. size, and are accurately loaded at charging bins at a central gravel-handling station.

Each truck takes from 9 to 10 min. to discharge all five of its batches at the mixer, which represents about 25% of the working time. The mixer crew, however, is so greatly reduced that this rather expensive method of unloading the trucks is much more than compensated, the contractor figuring that the wages saved are more than double the rental value of the truck for the idle time.

Moreover, none of the concrete material touches the subgrade, and in addition to the elimination of labor required for shoveling the sand and gravel up again, no material is wasted by being mixed with clay. According to the *Concrete Highway Magazine*, the total net saving in wages and material is estimated at $30 per day, or a little more than 5c. per sq.yd. of 6 to 8 in. concrete.

Roads a National Not a Local Question

The only way we shall ever secure a proper road system will be by organizing a comprehensive and nation-wide system of building, according to a statement by Major P. S. Bond in *Motor Life*. For this there must be a centralized Federal bureau, whose duty shall be to block out the location of roads and standardize details of construction with a view to national usefulness, both military and economic. Building the roads of the United States is a full-size undertaking, and should be undertaken on a full-size scale. It is too big a matter to be left to the judgment of ill-informed local authorities and the juggling of politicians, and it is too national in its importance to be a subject for local consideration only.

NEWS OF THE WEEK

CURRENT EVENTS IN THE CIVIL ENGINEERING AND CONTRACTING FIELDS

New Chief of Yards and Docks in Service Twenty Years

On Dec. 18, 1917, the President forwarded to the Senate the nomination of Charles Wellman Parks, a captain in the Corps of Civil Engineers, U. S. Navy, as Chief of the Bureau of Yards and Docks of the Navy, which position carries with it the rank of rear admiral. Rear Admiral Parks will succeed Rear Admiral Harris, who recently resigned as Chief of the Bureau of Yards and Docks to assume the duties of general manager of the Shipping Board, Emergency Fleet Corporation, from which position he resigned after about two weeks of service.



REAR ADMIRAL C. W. PARKS

Admiral Parks is 54 years of age, a native of Massachusetts. He is a graduate of the Rensselaer Polytechnic Institute, a school which has furnished the Navy with many of its civil engineers. He entered the Navy as a civil engineer July 19, 1897. His career in the Navy has been one of widely varied activity and increasing responsibility.

On Jan. 16, 1915, Admiral Parks was selected by the department as engineer in charge of the construction of the large naval station at Pearl Harbor, Hawaii, and in this position his chief responsibility has been the supervision of the construction of the large dry dock at that point, which has been regarded as the Navy's most difficult and important single piece of public works construction. Admiral Parks has had the satisfaction of virtually completing this work.

As chief of the Bureau of Yards and Docks, Admiral Parks will be in charge of the design and construction of the public works of the Navy, which include not only the upbuilding and maintenance of the diversified shore construction of the various navy yards and stations, but which also embrace the construction of barracks, hospitals, fuel oil stations, etc. His appointment is a recognition of his capacity as an engineer as well as an administrator.

Defense Council Reorganizes Coöperative Work

Committees of Industries Replaced by Specially Qualified Individuals

The Council of National Defense issued recently a statement which indicates that the Coöperative Committees of Industry, formed at the time war broke out, will be replaced by highly qualified individuals who will serve as Government employees and expert advisers and will ask the various industries to assist the Government by representative committees, created not by the Government but by the industries themselves.

While the Coöperative Committees of Industry have given faithful, patriotic and invaluable assistance to their country, many of the individuals serving on them have done so only at great personal and financial sacrifice, and were placed before the public in a position unfair both to themselves and to the Government, since they were called upon to act both as Government advisers and at the same time as representatives of the industry.

In dissolving the present Coöperative Committees of Industry, which were appointed by and under the direction of the National Defense Council, the action is taken with only the highest praise and thanks for the splendid, indispensable work of the various members and with the expressed hope that representative committees of the industries will be formed by the industries themselves at the earliest possible moment. The establishment of fresh committees, formed so as to entitle them to speak for their entire industries, will render immediately available valuable sources of information upon which the Government can draw in connection with the countless business and industrial problems attendant upon the conduct of the work necessary for the speedy and successful prosecution of the war.

The new arrangement will be far more workable from an administrative viewpoint than the old arrangement. It should prove a means for making permanent the mobilization of industry in a democracy at war. The type of organization which disappears on the issuance of this new order of the Council of National Defense is felt to have been perfectly satisafctory and adequate to the circumstances which arose when war was first declared and the country had to be taken over from a condition of peace to that of hostility.

To Study Stream Pollution

Bad tastes and odors in the water-supply of Charleston, W. Va., have led to the appointment of a committee, which will investigate the pollution of the Elk River and perhaps lead to a state-wide investigation of West Virginia streams. Two engineers are members of the committee: A. M. Scott, chairman, and Mayo Tolman, secretary. Mr. Tolman is also chief engineer of the State Department of Health. Since its appointment the committee has organized as the Kanawha Basin Sanitary Commission and has appointed subcommittees on engineering, education and legislation. It is expected that a full-time secretary, an engineer, will be appointed, his compensation to be paid by public subscriptions.

Cincinnati Increases Water Rates

Water rates in Cincinnati will be increased 25% beginning Jan. 1, 1918. The meter charge will be raised to 10c. instead of 8c. per 100 cu.ft., and the minimum charge of 30c. per month will be increased to 40c. The unmetered service will pay a straight 25% increase. For consumers outside of the city in unincorporated villages the meter rate will be 11c. per 100 cu.ft., with a 50c. minimum charge per month, and in incorporated villages the rate will be 12½c. per 100 cu.ft. J. A. Hiller, general superintendent of the waterworks department, estimates that the increases will produce additional revenue of about $120,000 per year.

Ordnance Department Wants One Hundred Draftsmen

One hundred draftsmen to fill positions in the Ordnance Department, paying from $800 to $1800 per year, are needed quickly. Civil service examinations for these positions will be held in Chicago, Jan. 8, 9 and 10. Positions will be permanent. Applications should be filed with Milward Adams, secretary of the Civilian Personnel Committee, Ordnance Department, at offices of the State Council of Defense, Chicago, Illinois.

Women To Supply Comforts to Engineer Regiments

An organization known as the Woman's Committee for Engineer Soldiers has been formed in Washington, D. C. Mrs. William M. Black, wife of Major General Black, Chief of Engineers, is president; Mrs. Charles Keller, vice president and chairman; Mrs. W. W. Harts, secretary, and Mrs. Ulysses Grant, 3rd, treasurer.

The object of the woman's committee is to see that no engineer soldier leaves this country without the proper knitted garments and to send garments to those already "over there." The national committee in Washington is to be headquarters for units all over the country and by purchasing yarn in large wholesale quantities should be able to get better prices and deliveries.

The dues are one dollar a year, and a very earnest appeal is made to every man and woman interested in the engineers of the Regular Army, National Army, the railroad, forestry, camouflage or labor regiments to join this organization or to send contributions of money for wool, or finished garments, to supply these hundred thousand men.

Address Mrs. William M. Black, 1730 I St., N. W., or Mrs. Ulysses Grant, 3rd, 2204 R St., N. W., Washington, District of Columbia.

Favor Retention of State Highway Engineer of New Jersey

Hearing that Robert A. Meeker, state highway engineer of New Jersey, had been asked to resign, the New Jersey State Association of Highway Engineers, at a meeting held on Dec. 12, unanimously adopted a resolution requesting the state highway engineer to retain Mr. Meeker in office. The arguments advanced for Mr. Meeker's retention were expressed as follows:

"Mr. Meeker has acted as state highway engineer for the past 17 years or more, making it practically his life work. In this time the state has passed through many phases of road building in experimentation and construction work, due to changing traffic conditions, and in this time Mr. Meeker has acquired a statewide knowledge of the roads and their needs, traffic conditions, local engineering problems and other phases of road building which is held by no other engineer, and which could only be acquired through similar long experience and many experiments.

"During past years the road department has been handicapped by poor legislation and lack of funds, in spite of which difficulties Mr. Meeker's work has been highly efficient, and it is our belief that under the present highway act Mr. Meeker will have unlimited opportunities to show his fine worth to the people of this state.

"In view of the great road building program now planned by the state, this association feels that Mr. Meeker's ability and knowledge render him peculiarly fitted to act as state highway engineer."

Secretary for Joint Activities of Big Societies

Alfred D. Flinn Selected—Has Had Broad Engineering, Executive and Organizing Experience

For economy of administration and the furtherance of coöperation among organizations representing the profession, the United Engineering Society, the Engineering Foundation and the Engineering Council recently decided to join in one suite of offices in the Engineering Societies' Building, New York City, and engage a joint secretary. For this position the engineer selected is Alfred Douglas Flinn, now deputy chief engineer of the Board of Water-Supply of the City of New York. This combination of the secretaryships of these three central bodies is looked upon as the first large fruit of the removal of the American Society of Civil Engineers to the Engineering Societies' Building, thus verifying the prediction made when that removal was proposed —that if accomplished it would lead to close coöperation of the leading engineering bodies.

Activities Joined

The United Engineering Society was formed some years ago by the National Societies of Civil, Mining, Mechanical and Electrical Engineers to coördinate joint activities and provide for holding property in common. This body acts as the holding company for the four founder societies and is landlord of the Engineering Societies' Building in New York, in which the founder societies have headquarters. In it also is vested the title to the library housed in the same building, which, with the recent addition of the collection of the American Society of Civil Engineers, is now the most important engineering library in the country.

The Engineering Foundation Board was created, as a department of the United Engineering Society, to administer the endowment made by Ambrose Swasey three years ago for the support of engineering research for the benefit of the profession and of humanity. The large sum of money he gave will form, it is hoped, the nucleus to which other gifts will be added.

The last of the three organizations which are to have a joint secretary is the Engineering Council. For years it has been recognized that there were certain activities affecting engineers which could not be properly handled by any one of the individual engineering professional societies. To meet this need there was created during the past summer the Engineering Council "for the proper consideration of questions of general interest to engineers and to the public, and to provide the means for united action upon questions of common concern to engineeers."

Mr. Flinn's Career

Mr. Flinn, in whom these secretaryships will be joined, was born in New Berlin, Penn., in 1869, and was graduated from Worcester Polytechnic Institute in 1892. In August, 1895, he became a member of the engineering staff of the Metropolitan Water-Works, Boston, and remained with that organization until 1902. He rose steadily until he became principal office assistant under the chief engineer, Frederic P. Stearns, in charge of designs on the Wachusett dam, Weston aqueduct and other structures coming under the authority of the Metropolitan system. During the latter years with this organization, he lectured on water-works and sewerage in Lawrence Scientific School, Harvard University.



ALFRED D. FLINN

On leaving the Metropolitan Water and Sewerage Board, he became managing editor of the *Engineering Record* and continued in that capacity until August, 1904, when the position of general inspector of the Croton aqueduct commissioners was offered to him. He remained in that position for about a year, and upon the organization of the Board of Water-Supply of the City of New York, which was established in 1905 to build the new Catskill aqueduct and its appurtenant structures, he became department engineer in charge of the headquarters department. The magnitude of this assignment will be apparent when it is remembered that to that department were entrusted the design, preparation of contracts and specifications, inspection of materials, the researches and investigations for all of the structures of this $177,000,000 enterprise. Moreover, it involved the organization and equipment of the engineering forces of the board and the handling of a tremendous amount of detail connected with an enterprise of that magnitude.

He continued as department engineer until August, 1914, when he was made deputy chief engineer. He has continued in that capacity until his election

to the secretaryships referred to in this article.

Mr. Flinn brings to the position a broad executive and organizing experience, as this brief biography indicates. He is especially successful in laying out large problems and in securing for their execution the hearty coöperation of his co-workers. The positions on which he enters require those qualities in a high degree, and this was the determining factor in Mr. Flinn's selection.

Mr. Flinn is a member of the board of direction of the American Society of Civil Engineers and chairman of its committee on library.

Vehicle Tunnel Under Hudson Favored by Commissions

Construction of a large size vehicle tunnel under the Hudson River connecting New York and Jersey City is recommended by special commissions of the States of New York and New Jersey, which have been considering the problem jointly and have just submitted reports to Governors Whitman and Edge respectively. Interstate commissions on bridges and tunnels have existed in both states for a number of years, but the New Jersey commission was put on a new footing last year by legislative action following a study of the Hudson River vehicle-tunnel project by the Public Service Corporation of New Jersey. The report of this study, known as the McCarter report, adopted a tunnel location from the prior report of Jacobs & Davies, who were consulting engineers for the Interstate Bridge and Tunnel Commission and some years ago reported a project for two parallel shield-driven tunnels each carrying one roadway. The McCarter report, however, abandoned the shield-tunnel method and recommended building the tunnel in a dredge trench in the river bottom by sinking separate sections built on the surface and joining them in place. Maj. Gen. George W. Goethals was appointed consulting engineer to the new joint commission and was directed to consider the tunnel plans previously submitted. In a report submitted to the commission recently, he uses the same location, a line from Canal and Varick Sts., New York, to 10th and Henderson Sts., Jersey City, but he rejects the trench method of tunnel construction as impracticable on account of the softness of the silt in the bottom of the Hudson River. He says: "The Hudson River silt overlies the rock as an unstable mass, affected by tidal fluctuations and temperature changes. It can be handled easily by dredges, but the very character of the material precludes the possibility of securing a trench of the dimensions required within a reasonable time and at a reasonable cost. The upper strata, in close proximity to the water, are in such a liquid state as to be apt to motion by the passage of deep-draft vessels. To cut a deep trench across the tidal currents through material which reduces to a practically fluid state when water has access to it becomes a serious and difficult task." He therefore recommends the adoption of the shield method. As between a single tunnel or a pair of tunnels he advocates the single tunnel "made large enough to provide for slow trucking below and the faster, lighter motor cars above." The cost can be reduced by using concrete blocks molded as voussoirs of an arch or ring, properly keyed, in lieu of steel or cast iron. It is estimated that such a tunnel can be constructed at present market prices for material and labor for a sum not exceeding $12,000,000." With the submission of this report to the two commissions, an offer of John F. O'Rourke and associates to build the tunnel complete for $12,000,000 was submitted. It is understood that this proposal contemplates a tunnel of 42 ft. outside and 36 ft. inside diameter, driven by shield, formed of a concrete-block shell, and divided by a middle floor into upper and lower roadways, with ventilating chambers in narrow segments at each side.

The joint commissions last week adopted General Goethals' report and recommendations, and laid their conclusions before the governors.

Water Users Get Salt River Reclamation Project

Without celebration or even newspaper heralding, the Salt River Project of the United States Reclamation Service has been turned over to the Salt River Valley Water Users' Association. As the December *Reclamation Record* says, "Evidently the exchange of a property valued at $15,000,000 is not news in the valley, for nothing was printed about it." The event took place Nov. 1. A force of 400 engineers and other employees, under the immediate charge of W. S. Cone, project manager, were turned over in a body to John P. Orme, president of the association.

The project system as planned has been practically completed for some time, and on Jan. 18 Secretary of the Interior Lane issued the public notice announcing construction charges, irrigable lands, etc., in accordance with section 4 of the Reclamation Act. Negotiations between the Government and the association resulted in a contract, Sept. 6, by which the association assumes full management of the project works, including outstanding obligations and contracts, and repays the construction cost in 20 annual installments of 2, 4 and 6%. The first payment was due Dec. 1.

The association receives all income arising from operation and agrees to maintain the works in as good and efficient condition as when taken over, excepting only the depletion of storage capacity by natural silting and injury by public enemies or by the United States as a war measure, which shall suspend or postpone repayments. To secure proper maintenance the works are subject to inspection under the direction of the Secretary of the Interior, and his prior written consent is necessary before making any substantial change in the works. The association holds the United States harmless as to damages arising from operation and maintenance. It must operate in accordance with the requirements of law as well as the rules and regulations, past and future, issued thereunder by the Secretary of the Interior, and will use its powers to enforce these.

The association may terminate the agreement on Mar. 1 of any year by written notice a year before. The Secretary of the Interior may terminate it at any time if the association fails to carry it out, or if he reasonably believes the security for the Government's investment is being impaired.

When national reclamation began the association had 1000 farmers; now there are 3500. Some years 80,000 acres were watered before the construction of the famous Roosevelt dam storing 1,300,000 acre-feet, now bumper crops are raised on 200,000 acres, valued at $13,700,000. The net cost of the works as of June 30, 1917, was about $10,500,000.

Western Society Issues News Bulletin

"To serve as a medium of current thought and a chronicler of events worth while to its members" is the announced reason for the 8-page monthly bulletin recently started by the Western Society of Engineers. Another avowed purpose is "to knit together the engineers of this vast community into a forceful whole."

War has stirred the organization to its foundation, for 10% of its members and five of its 15 directors are in service. At a recent board meeting instructions were given to the program committee to book no addresses or papers that did not have to do with the war. After devoting the whole of a special meeting to the question of engineering students completing their courses, resolutions directed to the Secretary of War were passed, agreeing substantially with the ideas set forth in the editorial in *Engineering News-Record* of Nov. 29, p. 995.

Subjects having to do with the war, scheduled for the five weekly meetings beginning Dec. 3, are as follows: "Symposium on Cantonment Construction," C. B. Burdick, consulting engineer; Profs. N. B. Garver and A. C. Willard, University of Illinois; "What the War News Means," S. Duncan-Clark, *Chicago Evening Post;* "What the War Means to the Engineer," E. J. Mehren, vice president and editorial director, McGraw-Hill Publishing Co., Inc.; "The Relation of Science and Engineering to the War," Maj. Robt. A. Milliken, vice chairman and executive officer, National Research Council. At the annual meeting in January some phases of war's effect on railway valuation will be handled by Pierce Butler, general counsel for the Western carriers.

Chicago Engineers Help Ordnance Recruiting Committee

To expedite recruiting of Chicago's quota of the 9000 men required in the Ordnance Base Depot in France, an Ordnance Recruiting Committee of the Military Training Camps Association, made up largely of engineers, has been formed. From the Chicago district 2000 men are expected. The division will be a military organization, but at present men who are exempt from the National Army under the provisions of the selective service draft cannot be accepted. Men from 18 to 40, over or under draft age, or men of draft age not yet ordered into camp, may be accepted. Wives or other dependents are provided for—the wife receives one-half of husband's pay, plus $15 a month, plus $10 a month for one child, plus $5 a month for each additional child.

Men of almost every vocation are needed, particularly automobile repairmen, cooks, gunmakers, harness makers, machinists, millwrights, optical instrument repairers, painters, steel polishers, plumbers, etc. These men will be stationed back of the fighting front of the American Army in France in warehouses and repair shops.

Pay ranges from $30 to $61.20 per month. Enlistment is for the duration of the war as privates, but there is opportunity for promotion. A special recruiting station has been opened at 435 S. Dearborn St.

Short Intensive Course Offered in Naval Architecture

The Massachusetts Institute of Technology will have, from Feb. 4 to May 24, a special intensive course in naval architecture, open to the graduates of technical schools and other persons having the same preparation. The course is under Professor Peabody, and is stated to give a good training in theoretical principles and in ship design. Students already registered at the Massachusetts Institute of Technology will pay for the special term $25 in addition to the regular tuition fee for the second term. Those who register for the interim course only will pay full tuition for a term, namely, $150. Further information on the course can be obtained from Prof. C. H. Peabody, department of naval architecture and marine engineering, Massachusetts Institute of Technology, Cambridge, Massachusetts.

Movement to Coördinate Ohio Engineering Societies

A conference to promote the coördination of all the engineering organizations of Ohio will be held at Columbus on Jan. 29, in Brown Hall, Ohio State University, with Prof. Clyde T. Morris as chairman. All the engineering societies of the state, including local sections of national organizations, are invited to send delegates. It is expected that a permanent organization will be formed, the business of which will be transacted by the Engineers' Club of Columbus. The date named was chosen because it is just before the opening of the annual meeting of the Ohio Engineering Society, at Columbus, Jan. 30, 31, and Feb. 1, thus saving a year's delay on the part of the society in the endorsement of the project. Officials of nearly all the engineering societies of Ohio have given evidence of hearty support of the movement.

Alfred Noble Memorial Fountain Nears Completion

Accompanying is a view of the Alfred Noble Memorial erected by the American Society of Civil Engineers in Rawlins Square, Washington, south of the building of the Department of the Interior.



ALFRED NOBLE MEMORIAL SYMBOLIZES THE CHARACTER OF THE ENGINEER TO WHOM IT IS DEDICATED

A progress report on the work is presented by the memorial committee in the November "Proceedings of the society. Quoting from the report, which was written before the work was so far advanced:

"After studying and discarding many compositions based on the above ideas, the models shown have been selected as combining best the features desired—a fountain befitting the site, and a memorial to an eminent engineer, symbolizing by its form and sculpture the character of the man and his life.

"The dominant architectural element is the large elliptical bowl, set on a solid base and flanked by the dominant sculptural element, two strong seated figures. The memorial will rise from a large basin of water, 37 ft. wide and 63 ft. long, surrounded by a wide stone coping.

"The sculptural figures are intended to show the strong elements in Alfred Noble's character—thought in preparation, force in execution. Each figure will hold a scroll upon which will be carved an example of the work by which Alfred Noble is so well known and appreciated."

Paul Bartlett is the sculptor for the memorial, Glenn Brown and Bedford Brown serving as his architectural advisers. The committee consists of Onward Bates, chairman; Maj. Hugh L. Cooper, Samuel Rea, Samuel H. Hedges, F. H. Newell, W. W. Harts and Charles Warren Hunt. Major Cooper succeeded Robert Moore, resigned.

Engineering Council Broadens Its Scope

At the meeting of the Engineering Council on Dec. 6, a report was adopted providing a method for electing to its membership engineering and technical societies other than the four national organizations to which representation is now restricted. The new rules go to the governing bodies of the four founder societies for their consideration.

Pittsburgh Transit Bureau Continued Another Month

The expected report on rapid transit in Pittsburgh is to be completed about Jan. 15, 1918, and in order to finish the work the Transit Bureau will be continued during January, according to a recent resolution by the city council. The bureau, headed by E. K. Morse, was formed a year ago for the purpose of studying Pittsburgh transit and reporting on it by 1918. A recent statement by Mr. Morse to the council's finance committee indicates that he will recommend immediate construction of rapid transit lines.

New England Water-Works Association Election

At the annual meeting of the New England Water-Works Association, to be held in Boston, Jan. 9, there will be an election of officers. The polls will close Jan. 9, at 2 p.m.

Confer on Garbage Piggeries at Chicago

Discuss Sanitary and Economic Phases of Garbage Feeding To Utilize Wastes

Realizing that the public is now in a receptive mood for education in the utilization of garbage to the full extent possible and that one of the means to that end now being proposed to city officials is to add to the municipal garbage piggeries now in existence, I. S. Osborn, in charge of the division of wastes disposal of the Federal Food Administration, held a conference on the subject in Chicago, Dec. 7. There were present twenty-five sanitary engineers, health officers, superintendents of piggeries, both municipal and private, meat packers and officials of the Department of Agriculture, Bureau of Animal Husbandry.

Mr. Osborn explained that it was his purpose to obtain for Mr. Hoover the best information on feeding garbage to hogs as an economical and practical method of waste utilization. The hoped-for result would be to increase the meat and fat supply and to decrease the cost of garbage disposal. Feeding has had a checkered career, due, in his estimation, to mismanagement and lack of knowledge. The Food Administration is desirous of educating the public and promoting only what will prove to be a success.

Thomas Horne, Worcester, Mass., explained the conditions of feeding on the Worcester farm (see *Engineering News-Record*, Aug. 30, p. 398). The 1917 figures of operation are now available, as his year ended Nov. 30. There was sold $51,300 worth of pork raised on 65,014 tons of garbage. The cost (after collection) at the farm was $2.30 per ton, leaving a net pork value of $5.66 per ton for the garbage delivered at the farm. Mr. Horne values the equipment at $67,000, itemized as of Nov. 30, as follows: 40 acres land, at $100, $4000; buildings and platforms, $20,000; 2096 hogs, $42,000; miscellaneous, $1000.

The garbage of Grand Rapids is collected and loaded on cars by the city. Alvah H. Brown ships it every day 27 miles to his 80-acre farm in an isolated section, located on sandy soil. He pays 45c. per ton for freight and 25c. in the city. He feeds inside a long building, on concrete platforms, onto which garbage is dumped directly from the cars. Glass from electric-light bulbs are the worst "foreign" matter in garbage. Sheep and cattle have also been fed garbage in winter, but not in summer. Corn silage is fed on Sundays and a sheep "fire sale" grain is usually part of the bill of fare. Platforms are cleaned daily of manure, which is composted nearby.

Mr. Brown believes that hogs could be fed without nuisance in a building within the city limits if proper attention were given to ventilation. One ton will feed 100 pigs. He employs 12 men to care for 6000 hogs. Hotel garbage is worth ten times as much as household garbage, in his estimation. Cooking is not desirable, as it reduces the garbage to a slop in which the pig gets no chance to discard grapefruit and things which do not agree with his digestion. All feeders agreed that cooking is a mistake for household garbage. For hotel wastes, rich in recoverable fats, it is practical. Mr. Brown gets daily 500 lb. of bones worth 1c. a pound. In October 1015 tons of garbage were fed.

Peter Gibson, St. Louis, collects from 600 houses and gets coöperation by telling the householder something of the feeding business and, therefore, the desirability of separating the glass, cans and coffee grounds from the garbage. Letters on the subject left by the collectors aided in eliminating 75% of the difficulties from these causes.

Dr. Charles V. Chapin, health commissioner, Providence, said that garbage handling, as ordinarily practiced in Northern cities, was not a sanitary problem, but one of economics and convenience.

Dr. E. A. Cahill, Massachusetts Bureau of Animal Industries, was emphatic in his warnings to go slow in promoting feeding until plenty of safeguards against disease and its spread were known and observed. In his opinion, there were serious doubts as to whether the food values salvaged in this way would not result ultimately in a decreased meat supply due to increased cholera and other diseases disseminated by this means. The garbage-fed hog eats infected material (uncooked pork scraps from uninspected animals) all the time, while the grain-fed hogs are rarely exposed. A piggery can be kept immune, but it is a difficult and scientific problem to do it continually.

Doctor Wells, of the C. O. Bartlett & Snow Co., indicated that experiments are under way to produce a dessicated garbage for stock food. A firm in Pasadena now dries garbage to 18% moisture by the old Anderson process and sells the product as chicken feed.

The results of the conference and other information will be digested by Mr. Osborn's bureau and then made available.

Production of Bituminous Coal Reaches High Rate

The November production of bituminous coal was, with one exception, the largest in any month in the history of bituminous coal mining in America. A preliminary estimate placed the output at 47,747,000 net tons. January, 1917, recorded 47,788,000 tons, but in 26 working days as against 25, or 25.5, for November.

The average production per working day during the month was 1,872,432 tons. The November rate has been exceeded only once in the last two years, when in February, 1916, the average production per working day rose to 1,882,771 tons.

Index to This Volume

The index to the present volume (Vol. 79) of *Engineering News-Record* will be published with the issue of Jan. 10. Subscribers who bind their copies should make a point of detaching the index from that issue.

City-Manager Plan Upheld by New York Court

The optional city government statute of 1914, under which Niagara Falls and Watertown, N. Y., adopted the city-manager plan, was declared constitutional by the New York State Court of Appeals on Dec. 21, reversing the decision of the lower court.

ENGINEERING SOCIETIES

Calendar

Annual Meetings

AMERICAN SOCIETY OF CIVIL ENGINEERS, 29 West 39th St., New York; Jan. 16 and 17, 1918, New York; Charles Warren Hunt, secretary.

AMERICAN INSTITUTE OF CONSULTING ENGINEERS, 35 Nassau St., New York; Jan. 14, New York; F. A. Molitor, secretary.

NEW ENGLAND WATER-WORKS ASSOCIATION; 715 Tremont Temple, Boston; Jan. 9, Boston; Willard Kent, secretary.

AMERICAN WOOD PRESERVERS' ASSOCIATION; Baltimore, Md.; Jan. 22-24, Chicago; F. I. Angier, Baltimore & Ohio R.R., Mount Royal Station, Baltimore, Md., secretary.

CANADIAN SOCIETY OF CIVIL ENGINEERS; Montreal; Jan. 21-23, Montreal; Fraser S. Keith, 176 Mansfield St., Montreal, Can., secretary.

AMERICAN SOCIETY OF AGRICULTURAL ENGINEERS; Dec. 27-29, Chicago; C. K. Shedd, Ames, Ia., secretary.

AMERICAN CONCRETE INSTITUTE; 27 School St., Boston; Feb. 7-9, Chicago; H. B. Alvord, secretary.

The Engineers' Club of Dayton held its regular midmonthly meeting Dec. 18, the lecturer of the evening being Prof. A. W. Smith, of the Ohio State University, Columbus. His subject was "Modern Conceptions of Electricity and Heat," and brought out the latest phases developed by laboratory research.

The Kansas City Chapter of the American Society of Heating and Ventilating Engineers, at its November meeting, discussed the subject of "Wind Leakage and Its Effect on Heating and Ventilating," as presented by H. W. Whitten. Suggestions on fuel conservation were made by P. W. Thomas, fuel engineer of the Central Coal and Coke Company.

The eleventh annual meeting of the **Kansas Engineering Society** will be held at Lawrence, Jan. 15-16. While

the society has lost a good many active members, who have joined the army, the new highway law has furnished it with a good many county engineers. The program has not yet been completed, but there will be a paper from one of the instructors from the engineer officers' training school at Ft. Leavenworth; one from one of the cantonment construction force from Camp Funston; one from a member of the engineering force of one of the large oil companies and one from the Cement Gun Company.

The Engineers' Subdivision of the Chicago Association of Commerce on Dec. 19 elected the following officers: Chairman, G. R. Brandon; vice chairman, W. W. DeBerard; members of executive committe, J. N. Hatch, E. T. Perkins and W. M. Kinney.

The newly formed Washington, D. C., Chapter of the American Association of Engineers elected Dec. 14 the following officers: President, F. R. Weller, consulting engineer; vice presidents, A. S. Grossberg, chief designer, Bureau of Yards and Docks, and Harry Stevens, consulting engineer; corresponding secretary, Capt. D. S. Hays; recording secretary, A. P. Connor; treasurer, O. M. Sutherland. Major Zimmerman, of the Engineers' Depot, addressed the chapter on the foreign experiences of engineers. This meeting was attended by 150 engineers, including Admiral F. R. Harris, then chief of the Emergency Fleet, Admiral Baird and Major Harrison. The chapter numbers more than 100 and has headquarters at 502 Hibbs Building.

The Engineers' Club of Oakland, Calif., at an election held Dec. 12 elected the following officers: President, R. S. Chew; vice president, R. M. Henningsen; secretary, Romaine Myers.

The Municipal Engineers of the City of New York held a meeting Dec. 26, at which a paper on "Architectural Design of Subway and Elevated Stations" was presented by F. J. Vickers, designing architect, Public Service Commission. The paper was illustrated by lantern slides.

At the annual meeting of the **Engineering Society of York, Penn.,** held recently, the following officers were elected for the ensuing year: President, James Rudisill; vice president, Chauncey D. Bond; secretary, M. Haller Frey; treasurer, Harold A. Russell; directors, George A. Jessop, Charles L. Berger, Howard J. Longenecker.

The Ohio Engineering Society will hold its annual meeting at Columbus Jan. 30 to Feb. 1. Part of the time will be devoted to a joint meeting with the Ohio Good Road Federation and the County Commissioners' Association.

A Reorganization of the Waco, Tex., Society of Architects and Engineers has been effected, and the following officers have been elected for the year: President, E. M. Ross; first vice president, R. J. Potts; second vice president, F. L. Booth; secretary-treasurer, Roy E. Lane.

At the annual meeting of the **Brooklyn Engineers' Club,** held Dec. 20, the following officers were elected for the coming year: President, G. Laurence Knight; secretary, Joseph Strachan; treasurer, Carroll S. Dunphe; directors, Calvin C. Hough and H. P. Quick; auditing committee, J. Barth Cronin, Andrew Nicola and E. M. Van Norden.

PERSONAL NOTES

J. D'ESPOSITO, principal assistant engineer of the Pennsylvania Lines, at Chicago, has gone to the Emergency Fleet Corporation at Washington, being assigned to help Mr. Heyworth, who is in charge of the program for construction of wooden ships.

D. S. BENNETT, structural engineer in reinforced concrete, Wausau, Wis., and the only engineer member of the last Wisconsin legislature, has received a commission as first lieutenant in the Signal Corps. Lieutenant Bennett is a veteran of the Spanish-American war, having served as sergeant major in the First Squadron, Third United States Cavalry.

N. D. BRAINARD, superintendent for the Austin Co., industrial engineers and builders, who was formerly at Baltimore, is now at Buffalo, New York.

J. G. SCRUGHAM, state engineer of Nevada, has been commissioned a major in the Ordnance Department of the National Army, and will resign his position as state engineer.

G. T. MCCLEAN, city engineer of Astoria, Ore., recently received a leave of absence for 100 days, granted by the City Council, so that he may attend an engineers' training camp.

WALDO S. COULTER, until recently of the firm of Hansen & Coulter, New York, which was dissolved, has opened offices in the Engineering Building, New York, as a consulting, designing and supervising engineer.

E. L. HILL, recently appointed assistant to the general manager of the Erie R.R., with headquarters at New York, was formerly assistant in the engineering department of the Erie at New York.

CHARLES H. EWING, who has been appointed vice president of the Philadelphia & Reading Ry., with headquarters at Philadelphia, was the general manager of the railway before his recent appointment. He was born in Chester County, Pennsylvania, May 26, 1866, and entered railway service in August, 1883, as rodman with the engineer corps construction department of the Philadelphia & Reading. After serving the road as transitman, assistant engineer in charge of construction and maintenance, roadmaster and division engineer, he went to the Central New England Ry. as chief engineer in 1893. He returned to the Philadelphia & Reading Ry. in July, 1902, as division engineer of the Reading & Lebanon Division, and in June, 1905, he became engineer, maintenance-of-way, with headquarters at Reading. In 1910 Mr. Ewing became superintendent of the Atlantic City R.R., and on Jan. 1, 1913, general superintendent of the Philadelphia & Reading. In March, 1916, he was promoted to the position of general manager.

PAUL KIRCHER, until recently connected with the Universal Portland Cement Co., as engineer in the promotion bureau, is now office engineer of the C. F. Massey Co., Chicago.

CHARLES A. CLARK, recently assistant superintending engineer of Vermilion County, Illinois, bond issue roads, is now with the Kansas City division of the Portland Cement Association.

GEORGE G. ANDERSON, consulting civil engineer, Los Angeles, recently resigned from the advisory board of consulting engineers for the Imperial Irrigation District, California.

NATHAN C. ROCKWOOD, formerly assistant editor of *Engineering News*, has been appointed editor of *Rock Products*, published in Chicago. Mr. Rockwood has been engaged for several months in compiling an index to *Engineering News*, from 1910 to 1917.

WILLIAM A. ROYCE, who was city engineer of Traverse City, Mich., until recently, resigned and is now mining engineer for the Round Valley Tungsten Co., Bishop, California.

GEORGE C. LOVE has moved his office and residence from Pineola, N. C., to Newland, N. C., and will continue in the practice of civil engineering at the latter place.

J. DUNCAN JACQUES has resigned his position as assistant chief of construction with the New Jersey Zinc Co., of Pennsylvania, and has been appointed division engineer with the Department of City Transit, Philadelphia, in charge of subway construction.

OBITUARY

A. J. LA TORNELL, formerly city engineer at Edmonton, Alberta, is dead of wounds received while fighting in France recently.

H. D. LANGWORTHY, superintendent of the water-works of Macon, Ga., died at his home there, Dec. 11. Mr. Langworthy went to Macon six years ago from Kansas City. He designed Macon's new water plant and supervised the construction of the water mains to Camp Wheeler. He was thirty three years of age.

BUSINESS NEWS

Byers Auto-Crane Builds Ships

In the accompanying view is shown a typical example of how the material is handled on wooden ship construction in several of the new yards now being operated to capacity. The crane is a model C "Auto-Crane" made by the John F. Byers Machine Co., Ravenna, Ohio, equipped for the work with a 40-ft. boom. Such a machine is self-driven, runs on a standard-gage track alongside the shipways and can handle seven tons on an 18-ft. boom length. This particular machine is in use at the Bagdad Shipbuilding Co., Pensacola.



SELF-RAISING CRANE ON WOOD SHIP CONSTRUCTION

The Contractors' and Builders' Show, successor of the former annual cement show, planned to be held in Chicago, Feb. 6 to 13, has been postponed on account of the unsettled conditions in the building field.

The Belmont Iron Works, 22nd St. and Washington Ave., Philadelphia, Penn., is preparing a calendar for 1918, which gives illustrations of the Belmont Iron Works products, and which is sent free to anyone interested.

D. M. Ferguson, formerly of the National Transit Co., Oil City, Penn., is now director of publicity for the American Steel Exports Co., New York.

George H. Tefft, for 15 years secretary and sales manager for the W. S. Dickey Clay Manufacturing Co., has been made secretary and general manager of the Clay Products Association, Chicago, which is the successor of the International Clay Products Bureau, Kansas City. Mr. Tefft was secretary of the latter organization, in addition to his company duties. The Clay Products organization is composed of 30 leading manufacturers of clay products, including sewer pipe and blocks, wall coping, drain tiles, fireplace flumes and chimney pipes. The association has opened offices in the Chamber of Commerce Building, Chicago. Besides Mr. Tefft the officers are L. G. Blackmer, president, and W. D. Gerber, consulting engineer. The purpose of the association is to promote the use of clay products and to maintain high standards of manufacture. It will maintain physical and chemical laboratories and will cooperate with the American Society for Testing Materials in work relative to clay products.

The Southern Canada Power Co., Montreal, which supplies light and power to 47 cities and municipalities in western Quebec and controls five developed and six undeveloped sources of water power, has elected W. C. Hawkins as president. Mr. Hawkins is well known in the United States in connection with public utilities. He went to Canada in 1903 to manage the Dominion Power and Tramways Co., Hamilton, Ontario.

William L. Guenther, vice president of J. Jacob Shannon & Co., Philadelphia, died Dec. 15, in his 47th year. He was connected with the company for about 27 years.

Notes from

MAKERS OF PLANT AND EQUIPMENT

The Universal Motor Co., Oshkosh, Wis., has just completed a two-story addition to its plant, 40 x 180 ft. in plan. This new edition, of reinforced concrete, contains a department for testing marine motors and generating sets. The call for these generating sets by the Government has been so urgent that the works are pretty nearly filled up with the task of supplying 4-kw. units powered with a 4-cycle, 4-cylinder, 2⅝ x 4-in. gasoline motor.

The Pulsometer Steam Pump Co. has established new executive offices in the Candler Building, 220 West 42nd St., New York City. The company is enlarging its factory at Irvington, N. J., approximately 125 per cent.

The Dry Milling Engineering Co., Denver, Colo., which was recently incorporated, has been appointed Western agent for the Raymond Bros. Impact Pulverizer Co., Chicago. The head of the former concern is William B. Senseman. This company represents also the Buckeye Dryer Co., London, Ohio; the Dust Recovering and Conveying Co., Cleveland, Ohio, and the Quigley Furnace Specialties Co., New York.

The George W. Ziegler Machinery Co., Pittsburgh, has become the active representative of the Ransome Concrete Machinery Co., in Pittsburgh, succeeding George W. Ziegler.

D. S. Bright has become district sales manager for the Concrete Steel Co., Cleveland, Ohio. He has been connected with the company for about three years, and before that was connected with the Pittsburgh Construction Co. and the Concrete Products Co., both of Pittsburgh.

The Asbestos Protected Metal Co., of Pittsburgh, is now represented in Georgia by J. F. Schofield's Sons Co., with offices at Macon.

APPLIANCES AND MATERIALS

Leaks Automatically Close with This Non-Calked Pipe-Joint Filler

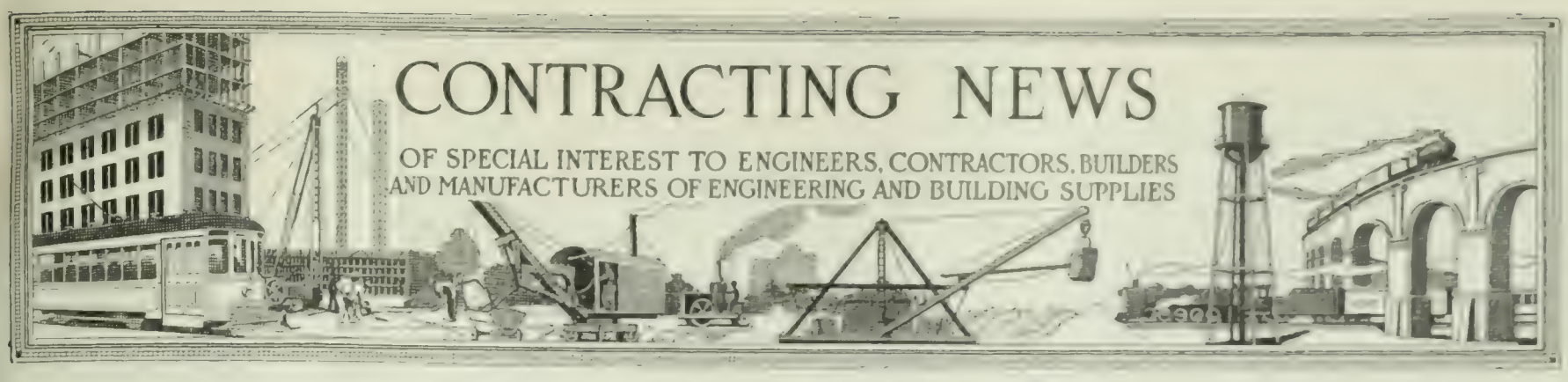
Metalium as a substitute for lead in joints of water mains is used by the Metropolitan Water District of Omaha, Neb. It is a metalloidal composition or alloy, which is melted and poured in the usual way. When ready to pour it is a thin, black, oily-looking liquid, but if made too hot it thickens and does not pour readily. A special furnace has been designed for melting it, but the ordinary lead furnace may be used if the grate area is reduced by firebrick and clay.

It is very important to have the bell and spigot of the joint thoroughly clean and free from oil or grease. For this reason nothing but unoiled jute yarn should be used for packing. At Omaha all lumps and blisters in the pipe coating of the bell and spigot are removed by a putty knife, and after the joint is yarned a loose strand of yarn is inserted to prevent the entrance of dirt before the filler is poured.

The joint runner may be of any form, and is smeared with wet clay before placing it around the pipe. The clay gate must be larger than for lead, and should be 6 or 8 in. high above the spigot. It is made by the aid of a conical wooden gate-peg 10 in. long, 2 in. in diameter at the bottom and 3 in. at the top. The bottom of this is inserted between the ends of the joint runner and clay is built up around it. The peg is then turned two or three times and withdrawn, leaving a well-formed gate of the proper weight. The metalium gate buttons can be remelted after being thoroughly cleaned and broken up.

The advantages claimed for metalium as compared with lead are low cost, a low melting temperature (about one-third that of lead), relatively high specific heat, a specific gravity about one-fifth that of lead, and the elimination of calking. Automatic closing of leaks by a self-calking property of this filler offsets its one disadvantage of liability to initial leaks. With lead at 13c. per lb. the saving per mile of pipe is given as $565 for 6-in. to $5160 for 48-in. pipe.

This joint filler has been used on about 50 miles of pipe from 3 in. to 48 in. in diameter and subject to pressures as high as 115 lb. For pipe over 24 in. in diameter a bestolyte lining is inserted before the filler is poured. The metalium is the invention of Homer V. Krouse, constructing engineer for the Metropolitan Water District of Omaha.



Price advances are indicated by **heavy type**; declines by *italics*

IRON AND STEEL

PIG IRON—Below are the present quotations, with a comparison of a month and a year ago:

CINCINNATI	June 29, 1917	One Month Ago	One Year Ago
No. 2 Southern foundry....	**$47.90**	$42.90	$16.90 to 17.90
No. 2 Northern foundry....	....	43.00	19.76 to 20.76
NEW YORK			
No. 2X Northern foundry..	**50.25**	45.75 to 46.25	19.75 to 20.25
No. 2 plain Northern foundry	**49.25**	45.25 to 45.75	19.50 to 20.00
No. 2 Southern foundry†...	**49.25**	44.25	19.50 to 20.00
BIRMINGHAM			
No. Southern foundry....	**45.00**	39.00 to 41.00	14.00
CHICAGO			
No. 2 Northern foundry....	**55.00**	46.00	19.00
PITTSBURGH			
Bessemer iron*	**55.95**	45.95	21.95
Basic iron*	**50.00**	42.00	18.95

*These prices include the freight charge from the valley to the Pittsburgh district. †Delivered Tidewater, New York.

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh, as per basing card of May 1, 1917:

BUTT WELD

Steel Inches	Black	Galvanized	Iron Inches	Black	Galvanized
¾ to 3.....	49%	35½%	¾ to 1½.....	38%	22%
LAP WELD					
2	42%	29½%	1¼	23%	8%
2½ to 6.....	45%	32½%	1½	30%	16%
7 to 12.....	42%	28½%	2	31%	17%
13 and 14.....	32½%	....	2½ to 4.....	33%	20%
15	30%	....	4½ to 6.....	33%	20%
			7 to 12.....	32%	19%
BUTT WELD, EXTRA STRONG PLAIN ENDS					
¾ to 1½.....	47%	34½%	¾ to 1½	38%	23%
2 to 3.....	48%	35½%			
LAP WELD, EXTRA STRONG PLAIN ENDS					
2	40%	28½%	1¼	24%	9%
2½ to 4.....	43%	31½%	1½	30%	16%
4½ to 6.....	42%	30½%	2	32%	19%
7 to 8.....	38%	24½%	2¼ to 4.....	34%	22%
9 to 12.....	33%	19½%	4½ to 6.....	33%	21%
			7 to 8.....	27%	15%
			9 to 12.....	32%	19%

From warehouses at the places named the following discounts hold for steel pipe:

	Black — New York June 29, 1917	Black — New York One Year Ago	Black Chicago	Black St. Louis
¾ to 3 in. butt welded..	38%	61%	43%	41.27%
3½ to 6 in. lap welded..	28%	64%	39%	37.27%
	Galvanized — New York June 29, 1917	**Galvanized — New York One Year Ago**	**Galvanized Chicago**	**Galvanized St. Louis**
¾ to 3 in. butt welded..	22%	36%	28%	26.27%
3½ to 6 in. lap welded..	10%	42%	25%	23.27%

Malleable fittings, Class B and C, from New York stock sell at 5 and 5% from list prices. Cast iron standard sizes 34 and 5%.

BARS, CONCRETE REINFORCING—The following quotations are per 100 lb.:

ROLLED FROM BILLETS

In.	Mill Shipment	New York June 29, 1917	New York One Year Ago	St. Louis	Chicago	San Francisco	Dallas
¾ and larger. ...*		**$5.10**	$3.10	**$4.10**	$4.50	**$5.00**	**$4.75**
⅝ ....*		5.15	3.20	4.54	4.55	5.05	4.80
½ ....*		5.20	3.30	4.59	4.60	5.10	4.85
⅜ ....*		5.35	3.45	4.74	4.75	5.25	5.00
¼ ....*		5.60	3.85	4.99	5.00	5.50	5.25

*Mill quotations on actual specifications.

ROLLED FROM RAILS

	St. Louis	Dallas		St. Louis	Dallas
¾ in and larger...	**$4.00**	**$4.75**	⅞	**$4.25**	**$5.00**
⅝	4.05	4.80	1	5.00	5.25
½	4.10	4.85			

RIVETS—The following quotations are per 100 lb.

STRUCTURAL

	Mill Pittsburgh	New York June 29, 1917	New York One Year Ago	Chicago	St. Louis	Dallas
¾ in and larger....	$5.25	**$4.00**	**$4.00**	$5.10	**$4.00**	
CONCRETE BARS						
¾ in and larger....	5.35	4.10	4.10	5.30	4.10	**$4.75**
⅝ and ¼	5.50	4.25	4.25	5.45	4.25	4.90
½ and ⅜	5.85	4.60	4.50	6.00	4.40	5.15

Lengths shorter than 1 in. take an extra of 10c. Lengths between 1 in. and 2 in. take an extra of 5c.

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotation from mill:

Blue Annealed	Large Lots, Pittsburgh	St. Louis	Chicago	San Francisco	New York June 29, 1917	New York One Yr Ago
No. 10	7.85	9.55	9.50	10.50	9.50	4.25
No. 12	8.10	9.60	9.55	10.55	9.55	4.30
No. 14	8.35	9.65	9.60	10.60	9.60	4.35
Black						
Nos. 18 and 20..	8.05	9.15	9.30	10.80	9.80	3.45
Nos. 22 and 24..	8.10	9.20	9.35	10.83	9.85	3.50
No. 26	8.15	9.25	9.40	10.88	9.90	3.55
No. 28	8.25	9.35	9.50	10.98	10.00	3.65
Galvanized						
No. 10	9.00	Premium	9.75	....	....	4.50
No. 12	9.10	Premium	9.85	12.15	....	4.50
No. 14	9.25	Premium	10.00	12.15	11.85	4.50
Nos. 18 and 20..	9.40	Premium	10.15	12.45	11.65	4.80
Nos. 22 and 24..	9.80	Premium	10.55	12.62	12.55	4.95
No. 26	9.95	Premium	10.20	12.77	12.70	5.10
No. 28	10.25	Premium	10.50	13.06	13.00	5.40

STEEL RAILS—The following quotations are per ton f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh June 29, 1917	Pittsburgh One Year Ago	Chicago June 29, 1917	Chicago One Year Ago
Standard bessemer rails....	$38.00	$33.00	$38.00	$33.00
Standard openhearth rails.	40.00	35.00	40.00	35.00
Light rails, 8 to 10 lb....	63.00	50.00	**68.00**	43.00
Light rails, 12 to 14 lb...	62.00	49.00	**67.00**	47.00
Light rails, 25 to 45 lb....	60.00	47.00	**65.00**	40.00

Note—Rerolled rails sell for same price as new light rails.

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh June 29, 1917	Pittsburgh One Year Ago	Chicago	St. Louis	San Francisco
Standard railroad spikes..	**$4.50**	$2.65	$5.00	$4.85	$5.75
Track bolts	**6.25**	3.75	6.25	5.00	7.50
Standard section angle bars	....	2.00	4.00	Premium	....

NAILS—The following quotations are per keg from warehouse.

	Pittsburgh	St. Louis	San Francisco	Dallas
Wire	**$4.00**	**$4.50**	$4.60	$4.75
Cut	4.65	**5.00**	5.15	....

STRUCTURAL MATERIAL—The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Pittsburgh	New York June 29, 1917	New York 1 Yr Ago	St. Louis	Chicago	San Francisco	Dallas
Beams, 3 to 15 in ..	$4 to **$5.25**	$4.75	$3.75	$4.00	$4.75	$4.75	**$4.00**
Channels, 3 to 15 in	4.65	5.25	4.25	4.90	5.05	5.25	4.90
Angles, 3 to 6 in., ¼ in. thick	4.65	5.25	3.25	5.05	4.90	5.25	4.90
Tees, 3 in. and larger	4.65	5.30	3.30	5.05	4.90	7.75	5.00
Plates	**9.00***	9.00	4.00	5.00	4.90	10.00	6.00

*Price running wild. For prompt delivery from warehouse $10.

New York extras on other shapes and sizes per lb. are as follows:

Beams over 15 in.	$0.10
Angles over 6 in. on one or both legs	10
Angles, 3 in. on one or both legs less than ¼ in. thick	10
Channels, 15 in.	10
Channels, 12 in.	10
Channels, 10 in.	10
Channels, 9 in.	10
Channels, 8 in.	10
Channels, 7 in.	10
Channels, 6 in.	10
Channels, 5 in.	10
Channels, 4 in.	10
Channels, 3 in.	10
Zees, 6 in.	10
Zees, 5 in.	10
Zees, 4 in.	10
Zees, 3 in.	10
Tees, 6 in.	10
Tees, 5 in.	10
Tees, 4 in.	10
Tees, 3 in.	10
Plates, over 100 in. wide	10
Plates, over 72 in. to 100 in. wide	10
Plates, over 60 in. to 72 in. wide	10
Plates, over 48 in. to 60 in. wide	10
Plates, over 42 in. to 48 in. wide	10
Plates, over 36 in. to 42 in. wide	10
Plates, over 30 in. to 36 in. wide	10
Plates, over 24 in. to 30 in. wide	10
Plates, over 18 in. to 24 in. wide	10
Plates, over 12 in. to 18 in. wide	10
Plates, over 10 in. to 12 in. wide	10
Plates, over 8 in. to 10 in. wide	10
Plates, over 6 in. to 8 in. wide	10
Plates, over 4 in. to 6 in. wide	10
Plates, over 3 in. to 4 in. wide	10
Plates, over 2 in. to 3 in. wide	10
Plates, over 1 in. to 2 in. wide	10
Plates, over ½ in. to 1 in. wide	10
Plates, over ⅜ in. to ½ in. wide	10
Plates, over ¼ in. to ⅜ in. wide	10
Plates, over No. 8 to ¼ in. wide	10
Plates, over No. 10 to No. 8 in. wide	10
Plates, over No. 12 to No. 10 in. wide	10
Plates, over No. 14 to No. 12 in. wide	10
Plates, No. 14 and lighter	10

No charge is made for cutting to lengths 2 ft. and over.

WIRE ROPE—Discounts from list prices on regular grades of bright and galvanized are as follows:

	New York June 29, 1917	New York 1 Yr Ago	St. Louis	Chicago
Galvanized	10	10	10	10
Bright ...	10	10	10	10 & 5

EXPANDED METAL LATH—Prices per 100 yd. for painted are as follows:

Gage	Width	New York June 29, 1917	New York 1 Yr Ago	St. Louis	Chicago
26	27 in.	$11.00	$10.00	$9.00	$10.00
26	20 in.	8.00	7.00	6.00	
26	18 in.	7.20	6.30	5.40	
26	15 in.	6.00	5.25	4.50	
26	12 in.	4.80	4.20	3.60	
26	9 in.	3.60	3.15	2.70	
26	6 in.	2.40	2.10	1.80	
28	27 in.	10.00	9.00	8.00	
28	20 in.	7.40	6.50	5.60	
28	18 in.	6.60	5.85	5.00	
28	15 in.	5.50	4.90	4.20	
28	12 in.	4.40	3.90	3.40	
28	9 in.	3.30	2.95	2.50	
28	6 in.	2.20	1.95	1.70	

Above list is prepared for smaller quantities.

MANILA ROPE—For rope smaller than ¾-in. the price is ½ to ¾c. extra, except for quantities amounting to less than 600 ft. There is an extra charge of ½c. The number of feet per pound for the various sizes is as follows: [illegible] ft.; ¾-in., 4½; [illegible] 11-in., 1.91 lb. to 11-in., 1.91 [illegible] Following is price per pound for ¾-in. and larger in 1,000-ft. coils:

[illegible]	$0.42½	[illegible]	$0.31½
New York	.31½	[illegible]	.31
[illegible]	.[illegible]	Los Angeles	.31½
[illegible]	.34	St. Paul	.31½

CLAY DRAIN TILE—The following prices are per 1000 lin.ft.:

Size In	New York June 29, 1917	New York One Year Ago	St. Louis	Chicago	San Francisco	Dallas
[illegible]	$[illegible]	$[illegible]	$18.40	$15.00	$24.00	$19.80
[illegible]	[illegible]	[illegible]	[illegible]	18.00	31.50	28.10
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	45.50	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	63.00	45.95
[illegible]	[illegible]	[illegible]	[illegible]	55.00	105.00	82.75

WATER TREATMENT CHEMICALS—Prices per lb. in New York are as follows:

[illegible]	$0.045 (in 400-lb. bbl.)
[illegible]	.04 (in 700-lb. drums)
[illegible]	.04 (in 400-lb. bbl.)
[illegible]	.175 f.o.b. Niagara Falls

Lime is quoted separately, on next page.

ASPHALTUM—Price per ton in packages and bulk in carload lots:

	Brand	Package	Bulk
New York	Texas	**$30.00**	....
New York	Mexican	19.00	**$14.00**
Chicago	Mexican	24.00	20.00
St. Louis	Texas or Mexican	22.50	19.50
San Francisco	California	14.50	12.00
Dallas	Texas and Mexican	**22.00**	....
Denver	Trinidad	45.00	....
Denver	California	27.00	....
St. Paul	Trinidad	25.40	....

SEWER PIPE—The following prices are in cents per foot for carload lots:

Size In	New York June 29, 1917	New York One Year Ago	St. Louis	New Orleans	Denver	Los Angeles	Dallas
3	111	07		0448	.075	.055	.096
4	111	07		....	....	....	.096
5	[illegible]	112		.07	.16	.09	.144
6	[illegible]	143	.12	....	....	....	144
8	[illegible]	154	.165	.1305	.225	.16	.2125
10	[illegible]	[illegible]	.23	....	....	....	.2975
12	4005	28	.32	.2465	.375	.265	.3825
15	[illegible]	248	.50	....	....	....	.5525
18	[illegible]	322	.75	....	....	....	.7225
20	1 11	[illegible]	.90	....	....	....	.85
24	1 [illegible]	[illegible]	1.13	....	....	....	1 105
27	[illegible]	[illegible]	[illegible]	....	....	....	....
30	[illegible]	[illegible]	[illegible]	....	....	....	....
33	3 00	[illegible]	[illegible]	....	....	....	....
36	4 10	2 87	[illegible]	....	2.50	....	....

Size In	Kansas City	Cincinnati	Boston	St. Paul
[illegible]	[illegible]	[illegible]	.114	.085
[illegible]	[illegible]	14	.171	.1325
[illegible]	[illegible]	.2325	.266	.1325
[illegible]	[illegible]	44	.513	.32
[illegible]	1 35	1.88	1.71	1.15
[illegible]	3 25		4.2025	3.00

HOLLOW TILE—Hollow building tile price per block in cents:

Size In	New York June 29, 1917	New York One Year Ago	St. Louis	Dallas	New Orleans	Los Angeles
4x[illegible]	$0.[illegible]	$0.[illegible]	$0.054	$0.07	$0.085	$0.055
[illegible]	[illegible]	[illegible]	[illegible]	.066	.09	[illegible]
[illegible]	[illegible]	[illegible]	.0725	.11	.09	12
[illegible]	[illegible]	[illegible]	[illegible]	.14	15	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	1625	.18	.18

Size In	St. Paul	Kansas City	Cincinnati	Boston
[illegible]	$0.056	$0.0595	$0.058	$0.0[illegible]
[illegible]	[illegible]	104	.1125	.104
[illegible]	[illegible]	14	.1575	.145

*Flat.

EXPLOSIVES—Price per pound in small lots at cities named:

	Low Freezing	Ordinary	Gelatin	Powder	Fuse
New York	[illegible]	$0.[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

*Per net lb. 1000-ft.

ROAD OILS—Following are prices in tank car lots f.o.b. [illegible]

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

Note—Barrel, 40 gal. [illegible]

WOOD BLOCK PAVING—

	Size of Block	Treatment	Per Sq.Yd.
New York	3½	16	$2.00
New York	4	16	2.25
Chicago	4	16	**1.90**
Chicago	City specifications		2.10
St. Louis	3½	16	**1.83**
Boston	4	20	1.92
Cincinnati	4	16	1.65
Kansas City	4	16	**1.95**
St. Paul	Minneapolis specifications		**2.00**

LINSEED OIL—These prices are per gallon:

	New York June 29, 1917	New York One Year Ago	Cleveland June 29, 1917	Cleveland One Year Ago	Chicago June 29, 1917	Chicago One Year Ago
Raw in barrels	*$1.26*	$0.71	*$1.28*	$0.73	*$1.29*	$0.73
5-gal. cans	*1.36*	.81	*1.38*	.83	*1.34*	.83

WHITE AND RED LEAD in 500-lb. lots sell as follows in cents per pound:

	Red June 29, 1917		Red 1 Year Ago		White June 29, 1917	White 1 Yr. Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100-lb. keg	**13.25**	**13.50**	10.50	11.00	**13.00**	10.50
25- and 50-lb. kegs	**13.50**	**13.50**	10.75	11.25	**13.25**	10.75
12½-lb. keg	**13.75**	**14.00**	11.00	11.50	**13.50**	11.00
1- to 5-lb. cans	**15.25**	**15.50**	12.50	12.50	**15.50**	12.50

ROOFING MATERIALS—Prices per ton f.o.b. New York or Chicago:

	Carload Lots	Less Than Carload Lots
Tar felt (14 lb. per square of 100 sq.ft.)	$59.00	$60.00
Tar pitch (in 400-lb. bbl.)	**15.00**	**17.00**
Asphalt pitch (in barrels)	29.00	**30.50**
Asphalt felt	60.00	**62.00**

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York and Chicago:

	1-Ply c.l.	1-Ply l.c.l.	2-Ply c.l.	2-Ply l.c.l.	3-Ply c.l.	3-Ply l.c.l.
No. 1 grade	$1.15	$1.30	$1.45	$1.60	$1.75	$1.90
No. 2 grade	1.00	1.15	1.25	1.40	1.50	1.65

Asbestos asphalt-saturated felt (14 lb. per square) costs **$6.50** per 100 lb.

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $1.85 per roll in carload lots and $2.10 for smaller quantities.

Shingles, red and green slate finish, cost $4.75 per square in carloads, $5 in smaller quanties, in Philadelphia.

LUMBER—Price per M in carload lots:

Square Edge and Sound Green

Timbers 5 x 5

	Southern Pine New York 20 Ft. and Under	Southern Pine New York 22- 24 Ft.	Southern Pine Chicago 20 Ft. and Under	Southern Pine Chicago 22- 24 Ft.	Yellow Pine St. Louis 20 Ft. and Under	Yellow Pine St. Louis 22- 24 Ft.
3x 4 to 8x 8	$35.75	$36.75	$33.75	$34.75	$30.75	$31.75
3x10 to 10x10	36.75	37.75	34.75	35.75	31.75	32.75
3x12 to 12x12	39.75	40.75	37.75	38.75	34.75	35.75
3x14 to 14x14	41.75	42.75	39.75	40.75	36.75	37.75
3x16 to 16x16	44.75	45.75	42.75	43.75	39.75	40.75
3x18 to 18x18	51.75	52.75	49.75	50.75	46.75	47.75
4x20 to 20x20	56.75	57.75	54.75	55.75	51.75	52.75

Over 32 ft.—Add $1 for each additional 2 ft. in length up to 40 ft. for sizes 12 x 12 and under; for sizes over 12 x 12 add $2. For merchantable add $2 to sizes 10 x 10 and under. For prime add $2 to the price of merchantable for all sizes.

Prices from Lumberman's Bureau.

Yellow Pine—Dallas. Price per M:

2x4 to 2x12—12 to 16 ft. long	$32.50
2x4 to 2x12—10, 18 and 20 ft. long	35.00
2x4 to 2x12—22 and 24 ft. long	37.50
4x4, 4x6, 6x6, 8x8, 3x8	37.50
8x10, 10x10, 3x10	40.00
12x12, 3x12	40.00

Rough Douglas Fir, No. 1 Common—More than carload lots in San Francisco:

Size in Inches	15 Ft. and Under	16 to 24 Ft.	25 to 32 Ft.
3 and 4x4	**$20.00**	**$21.50**	**$22.50**
3 and 4x6 and 8	**20.00**	**20.50**	**21.50**
6x6 to 8x8	**20.50**	**21.50**	**21.50**
3 and 4x10	**20.00**	**21.50**	**22.50**
6 and 8x10	**21.00**	**22.00**	**22.00**
10x10	**21.00**	**21.00**	**23.00**
3 and 4x12	**20.00**	**21.50**	**22.50**
6 and 8x12	**21.50**	**22.50**	**22.50**
10 and 12x12	**21.00**	**21.00**	**23.00**
3 and 4x14	**21.00**	**23.00**	**24.00**
6 and 8x14	**22.50**	**23.50**	**23.50**
7 and 9x14	**23.50**	**24.50**	**24.50**
10 and 12x14	**22.00**	**22.00**	**24.50**

	1-In. Rough, 10 In. x 16 Ft. and Under Y.P.	1-In. Rough, 10 In. x 16 Ft. and Under Fir	1-In. Rough, 10 In. x 16 Ft. and Under Hemlock	2-In. T. and G. 10 In. x 16 Ft. Y.P.	2-In. T. and G. 10 In. x 16 Ft. Fir
Cincinnati	**$38.00**	....	....	**$36.00**	....
[illegible] City	43.25	$44.50	$43.50	48.00	....
Denver	....	34.00	....	....	$39.00
New Orleans	**38.00**	....	....	*30.00*	
St. Paul	....	*51.00*	*33.50*	*59.00*	37.50

	8 x 8 In. x 20 Ft. and Under Y.P.	Fir	Hemlock	Spruce	12 x 12-In., 20 Ft. and Under Y.P.	Fir
Cincinnati	**$36.00**	....	....	....	**$40.00**	....
[illegible] City	38.00	$35.00	$35.00	....	42.50	$35.00
[illegible]	....	40.00	....	36.00	....	44.00
New Orleans	*26.00*	....	....	....	*35.00*	....
St. Paul	....	**40.00**	**31.50**	**32.00**	....	**45.00**

STEEL SHEET PILING—The following price is base per 100 lb. f.o.b. Pittsburgh, with a comparison of a month and a year ago:

June 29, 1917	One Month Ago	One Year Ago
$3.60 to 4.00	$3.60 to 4.00	$2.50

CAST-IRON PIPE—The following are prices per net ton for carload lots:

	New York							
	June 29, 1917	1 Mo. Ago	One Yr Ago	Birmingham	Chicago	St. Louis	San Francisco	Dallas
4 in.	$68.50	$58.50	$34.00	$58.00	$68.50	$67.00	$72.60	$68.00
6 in. and over	65.60	55.50	31.00	55.00	65.50	64.00	69.30	65.00

Gas pipe and 16-ft. lengths are $1 per ton extra

OLD MATERIAL—The prices following are per gross ton paid to dealers and producers in New York. In Chicago and vicinity, the quotations are per net ton and cover delivery at the buyer's works, including freight transfer charges:

	New York	
	June 29, 1917	One Month Ago
Heavy melting steel scrap	$29.00	$23.00 to 23.50
No. 1 railroad wrought	50.00	40.50 to 41.50
Stove plate	22.00	17.50 to 18.00
No. 1 machinery cast	35.00	29.00 to 30.00
Machine shop turnings	21.50	12.50 to 13.00
Cast borings	22.00	13.50 to 14.00
Railroad malleable cast	32.00	24.00 to 24.50

	Chicago	
	June 29, 1917	One Month Ago
No. 1 railroad wrought	$44.00	$36.00 to 37.00
Stove plate	24.50	18.00 to 19.00
No. 1 machinery cast	32.00	26.00 to 27.00
Machine shop turnings	20.00	14.50 to 15.00
Cast borings	19.50	14.00 to 14.50
Railroad malleable cast	35.00	26.50 to 27.00

	St. Louis	
	June 29, 1917	One Month Ago
Heavy melting steel scrap	$14.00 to 16.00*	$29.00 to 30.00*
No. 1 railroad wrought	40.00 to 41.00	31.50 to 32.00
Stove plate	22.00 to 23.00	15.00 to 15.50
No. 1 machinery cast	20.00 to 31.00	21.50 to 22.00
Machine shop turnings	18.50 to 19.00	12.50 to 13.00
Cast borings	16.50 to 17.00	12.00 to 12.50
Railroad malleable cast	27.00 to 28.00	21.00 to 21.50

*Per gross ton.

TRIANGLE MESH REINFORCEMENT—Price per 100 sq.ft. in carload lots:

PLAIN 4-IN. x 4-IN. MESH

Style Number	Sectional Area Square Inches per Foot Width	Pittsburgh	New York	Chicago	St. Louis	Dallas	San Francisco
032	0.032	$0.89	$0.92	$0.93	$0.94	$1.06	$1.20
049	0.049	1.13	1.18	1.18	1.20	1.34	1.55
068	0.068	1.42	1.47	1.49	1.50	1.68	1.97
093	0.093	1.82	1.89	1.91	1.92	2.17	2.47
126	0.126	2.31	2.39	2.42	2.44	2.74	3.15
153	0.153	2.75	2.86	2.88	2.91	3.27	3.75
180	0.180	3.16	3.27	3.31	3.34	3.76	
245	0.245	4.17	4.33	4.36	4.41	4.96	6.12
287	0.287	4.82	5.00	5.04	5.10	5.72	
336	0.336	5.59	5.80	5.85	5.92	6.66	
395	0.395	6.48	6.72	6.78	6.86	7.73	

PLAIN 4-IN. x 8-IN. MESH

036P	0.036	.69	.71	.72	.73	.82	
053P	0.053	.97	1.01	1.02	1.03	1.16	
072P	0.072	1.26	1.30	1.32	1.33	1.50	
097P	0.097	1.62	1.68	1.70	1.71	1.93	
049R	0.049	.97	1.01	1.02	1.03	1.15	1.97
067R	0.067	1.26	1.30	1.32	1.33	1.50	
089R	0.089	1.62	1.68	1.70	1.71	1.93	

Made in 16-, 20-, 24-, 28-, 32-, 36-, 40-, 44-, 48-, 52- and 56-in. width in rolls 150-, 200- and 300-ft. lengths.
Galvanized runs about 10% higher than plain.

FREIGHT RATES—On finished steel products in the Pittsburgh district, including plates, structural shapes, merchant steel, bars, pipe fittings, plain and galvanized wire nails, rivets, spikes, bolts, flat sheets (except planished), chains, etc., the following freight rates are effective in cents per 100 lb.:

Baltimore	19.4	Minneapolis	37.9
Boston	18.9	New Orleans	30.7
Buffalo	11.6	New York	16.9
Chicago	18.9	Pacific Coast (all rails)	70.0
Cincinnati	15.8	Philadelphia	15.9
Cleveland	10.4	St. Louis	24.6
Denver	68.6	St. Paul	37.9
Kansas City	45.5		

CEMENT, BRICK AND STONE

PAVING STONE

		June 29, 1917
New York	Macadam	$
	Other	
Chicago	Asphalt	
	Other	1
San Francisco	Basalt block 4x7x8	
Boston		
Kansas City		
Cincinnati		
St. Paul		

FLAGGING—

		June 29, 1917
New York	Flagstone	$0.42
Chicago		75 lin ft.

CURBING—Prices per linear foot are as follows:

		June 29, 1917
New York	15 x 10	$0.40
	15 x 20	.45
Chicago	6 x 18	.60
St. Louis	6 x 16 sawed edge	.54
	6 x 16 bush edge	.80
San Francisco	15 x 12	.75
	15 x 20	.85

SAND AND GRAVEL—Price for cargo or carload lots is as follows, per cu.yd.:

	Gravel						Sand	
		1½ In.		¾ In.				
	Paving	June 29, 1917	One Yr. Ago	June 29, 1917	One Yr. Ago	June 29, 1917	One Yr. Ago
New York	$1.25	$1.25	$0.90	$1.35	$1.00	$0.50	$0.50
Chicago	1.40	1.40	.85	1.40	.85	1.00	.85
St. Louis		1.08	.70	1.08	.70	1.08	.60
Dallas		1.50	....	1.50	....	1.10	....
San Francisco		....	.75	....	....	....	.75
New Orleans		1.85		2.00		1.25	
Los Angeles		.85		.85		.45	
Denver		1.40		1.40		.95	
Kansas City		2.00		2.25		.60	
Boston		1.50		1.55		.80	
Cincinnati		.90		.90		.90	
St. Paul		1.00		1.10		.50	

*Per ton.

Fine White Sand—St. Louis Pacific.....$5.00 per ton Ottawa.. $7.00 per ton

CRUSHED STONE—Price for cargo or carload lots is as follows, per cu.yd.:

	1½ In.		¾ In.	
	June 29, 1917	One Year Ago	June 29, 1917	One Year Ago
New York	$1.10	$0.85	$1.25	$0.95
Chicago	1.40	1.10	1.40	1.10
St. Louis	1.35	1.00	1.35	1.00
Dallas	1.75	....	....	....
New Orleans	2.75	....	4.00	....
Los Angeles	.95	....	1.00	....
Denver	1.40	....	1.40	....
Kansas City	1.50	....	1.60	....
Boston	1.40	....	1.50	....
Cincinnati	1.05	....	1.05	....
St. Paul	.80	....	1.00	....

LIME—Warehouse prices:

	Hydrated per Ton	
	Finishing	Common
New York	$16.50	$13.25
Chicago	15.00	12.00
St. Louis	12.00	10.75
Dallas	20.00	15.00

PORTLAND CEMENT—These prices are for barrels in carload lots, including bags:

	June 29, 1917	One Month Ago	One Year Ago
New York	$2.00	$1.90	$1.72
Jersey City	2.16	2.16	1.95
Boston	2.37	2.37	1.97
Chicago	2.31	2.31	1.81
Pittsburgh	2.31	2.31	1.81
Cleveland	2.44	2.44	1.94
Detroit	2.40	2.40	1.90
Indianapolis	2.44	2.44	1.94
Toledo	2.44	2.44	1.94
Milwaukee	2.43	2.43	1.93
Minneapolis	2.58	2.58	2.08
Duluth	2.51	2.51	1.96
Peoria	2.43	2.43	1.89
Cedar Rapids	2.54	2.54	2.00
Davenport	2.49	2.49	1.90
St. Louis	2.45	2.45	1.86
Denver	2.90	....	....
Dallas	2.65	2.15	....
Los Angeles	2.40	2.40	....
New Orleans	2.50	2.50	....
Kansas City	2.29	2.29	....
Cincinnati	2.70	2.70	....
St. Paul	2.63	2.63	....

ROSENDALE NATURAL CEMENT—Price to dealers for 200 bbl. or over, f.o.b., including bags:

New York	$1.15

30c. allowed for bags.

BRICK—The price per 1000 in carload lots is as follows:

	Common			Face	
	June 29, 1917	One Month Ago	One Year Ago	Wire Cut	Stock
New York	$9.00 to 9.50	$10.00	$8.00	$25.00	$35.00
Chicago	8.00	8.00	6.50	16.00	14.00
St. Louis, average	7.00	7.00	6.00		18.00
St. Louis, selected	10.00	10.00	9.00		
Dallas	8.50	8.50			
New Orleans	9.00	9.00			
Kansas City	11.00	10.00			
Los Angeles	7.50	7.50			
Boston	13.25	11.50			25.00
Denver	8.00				
Cincinnati	13.50	9.50			18.50

MISCELLANEOUS

RAILWAY TIES—For delivery during the following prices per tie hold:

	Material			
New York	Douglas Fir	$0.39 to 0.41	$1.25	
St. Louis	White Oak	1.00		
Chicago		.93		
San Francisco	Creosoted	1.18	1.60	

CORRUGATED SHEETS—Price of [illegible] in carload lots, in cents per pound:

18	Flat	$4.00	$4.00	$4.10
20	Flat			
18	Corrugated	$4.15		
28	Galvanized		4.45	4.55

*Price per square of 100 sq.ft.

Proposals

For Proposals Advertised See Pages 54 to 71 Inclusive

WATER-WORKS

Bids Close		See Eng. News-Record
July 15.	Pulaski, Miss.	June 14
July 16.	New York, N. Y.	June 21
	Adv. June 14 and Adv. 19.	
July 18.	Neenah, Wis.	July 5
July 19.	Pine City, Wis.	June 28
	Adv. June 14 to 28 and July 5.	
July 17.	Casper, Wyo.	July 5
July 17.	Port Clinton, O.	June 14
	Adv. June 7 to 28 and July 5.	

SEWERS

Bids Close		See Eng. News-Record
July 4.	Brooklyn, N. Y.	June 28
July 4.	St. Paul, Minn.	July 5
July 5.	Nashville, Tenn.	July 5
July 10.	Beloit, Wis.	June 28
July 10.	Spirit Lake, Ia.	June 28
July 11.	Fleming, W. Va.	July 5
July 11.	Macon, Mo.	July 5
July 12.	Bridgeport, Conn.	June 14
	Adv. June 14 to 28.	
July 14.	Neenah, Wis.	June 28
July 17.	Cuyahoga, O.	July 5
	Adv. June 28.	
July 23.	Wingdale, N. Y.	June 28
	Adv. June 28 and July 5.	
July 31.	Linndale, O.	July 5

STRUCTURAL STEEL WORK

Bids Close		See Eng. News-Record
July 9.	Salem, N. J.	June 28
July 9.	Olympia, Wash.	June 28
July 12.	La Grange, Tex.	June 7
July 13.	Vincennes, Ind.	June 14
July 14.	Lansing, Mich.	June 28
July 15.	Orange, Tex.	June 7
	Adv. June 7 to 21	
July 17.	West Palm Beach, Fla.	June 21
	Adv. June 14	
[illegible]	Miami, Fla.	June 28
	Adv. June 28 and July 5.	

REINFORCED CONCRETE

Bids Close		See Eng. News-Record
July 4.	Bloomdale, Miss.	June 28
July 9.	Rochester, [illegible]	June 14
July 9.	[illegible]	June 28
	Adv. June 14 and July 5	
July 9.	Concord, Mich.	July 5
July 10.	Montezuma, Ala.	June 14
July 10.	[illegible]	July 5
July 11.	[illegible], Tex.	July 5
July 11.	[illegible]	July 5
July 12.	[illegible]	July 5
July 13.	[illegible]	July 5
July 14.	Quincy, Ill.	July 5
July 15.	[illegible]	June 28
July 15.	[illegible], W. Va.	June 28
July 17.	[illegible]	July 5
	Adv. June 21 and July 5.	
July 19.	[illegible]	June 28

STREETS AND ROADS

Bids Close		See Eng. News-Record
July 7.	Selma, Ala.	June 21
July 8.	Wright, W. Va.	June 21
	Adv. June 14.	
July 8.	Albany, N. Y.	June 21
	Adv. June 21 and 28 and July 5.	
July 8.	Rock Island, Ill.	July 5
July 8.	Fairmont, W. Va.	July 5
July 8.	Chelsea, Mass.	July 5
July 9.	Casper, Wyo.	July 5
July 9.	Carroll, Minn.	July 5
July 9.	Chesapeake, Del.	July 5
July 9.	Cocalico, Penn.	July 5
July 9.	Cincinnati, O.	July 5
July 9.	Yuba City, Cal.	July 5
July 9.	Madison, Wis.	July 5
July 9.	Newark, O.	July 5
July 9.	Louisville, Ky.	July 5
July 10.	Putnam, Va.	June 21
	Adv. June 28 and July 5.	
July 10.	Erwin, Tenn.	June 21
July 10.	Aberdeen, Miss.	June 21
July 10.	West New York, N. J.	June 28
July 10.	Rockville, Md.	June 28
	Adv. June 21 and 28 and July 5.	
July 10.	Uniontown, Pa.	July 5
July 10.	Jersey City, N. J.	July 5
July 10.	Massachusetts	July 5
July 10.	La Grange, Tex.	July 5
July 11.	Washington, Pa.	June 28
July 11.	Mt. Holly, N. J.	June 28
	Adv. June 28.	
July 11.	Huntington, W. Va.	July 5
July 12.	Olean, N. Y.	June 28
	Adv. June 28.	
July 12.	Newark, N. J.	June 28
July 12.	Cedar Grove, N. J.	July 5
July 12.	Elizabeth, N. J.	July 5
July 13.	Walla Walla, Wash.	July 5
July 13.	Cincinnati, O.	July 28
July 13.	Cincinnati, O.	July 5
July 14.	Indiana	June 14
July 14.	Pine Bluff, Ark.	June 28
July 14.	Lincoln, Neb.	July 5
July 14.	Rochester, Ind.	July 5
July 16.	California	June 28
July 18.	Belvidere, N. J.	June 28
	Adv. June 28 and July 5.	
July 16.	Everett, Wash.	July 5
July 16.	Port Orchard, Wash.	July 5
July 18.	Hawthorne, N. J.	July 5
July 19.	Flemington, N. J.	June 28
July 21.	Wauseon, O.	July 5
July 24.	Pennsylvania	June 28
July 25.	Idaho	July 5
Aug. 13.	Lewiston, Idaho	May 24

INDUSTRIAL WORKS

Bids Close		See Eng. News-Record
Aug. 1.	St. Petersburg, Fla.	July 5

EXCAVATION AND DREDGING

Bids Close		See Eng. News-Record
July 7.	Wadena, Minn.	July 5
July 10.	Fowler, Ind.	July 5
July 10.	Indianola, Ia.	July 5
July 10.	Spencer, Ia.	July 5
July 10.	Jefferson, Ia.	July 5
July 10.	Redwood Falls, Minn.	July 5
July 12.	Madison, S. D.	June 28
July 12.	Boone, Ia.	June 28
July 12.	Redwood Falls, Minn.	June 28
July 14.	Cambridge, Minn.	July 5
July 14.	Huntington, Tenn.	July 5
July 14.	Mankato, Minn.	July 5
July 16.	Hanna, Ill.	June 28
	Adv. June 28 and July 5.	
July 16.	Lake Shore (Spanish Fork Post Office)	July 5
July 18.	Glenwood, Ia.	June 21
	Adv. June 21 and 28 and July 5.	
July 19.	Greenville, Miss.	June 28
	Adv. June 21 and 28.	
July 19.	St. Cloud, Minn.	June 21
July 21.	Kankakee, Ill.	July 5
July 24.	Slayton, Minn.	July 5
July 27.	Detroit, Mich.	July 5

BUILDINGS

Bids Close		See Eng. News-Record
July 3.	Cleveland, O.	June 14
July 5.	Arlington, O.	July 5
July 5.	[illegible], Minn.	July 5
July 10.	[illegible]	June 28
July 10.	Rocky River, O.	June 28
July 10.	[illegible]	June 21
July 10.	[illegible], Ia.	July 5
July 10.	[illegible]	July 5
July 11.	Terre Haute, Ind.	July 5
July 12.	Philadelphia, Pa.	June 28
	Adv. June 21 and 28 and July 5.	
July 15.	Great Bend, Kan.	June 28
July 16.	[illegible]	July 5
July 16.	[illegible], Kan.	June 28
July 16.	Abbottstown, Pa.	June 28
July 16.	Akron, O.	July 5
July 16.	Martins Ferry, O.	July 5
July 21.	Livingston, Mont.	July 5
July 21.	[illegible]	June 28
July 21.	[illegible], Ind.	June 28
July 21.	Ft. Wayne, Ind.	July 5

FEDERAL GOVERNMENT WORK

Bids Close		See Eng. News-Record
July 9.	Glenwood, Ia.	June 28
	Adv. June 21 and 28.	
July 9.	Annapolis, Md.	June 28
Aug. 9.	Du Bois, Pa.	June 28
	Adv. June 28 and July 5.	
July 9.	New London, Conn.	July 5
July 10.	Buffalo, N. Y.	June 14
	Adv. June 14 to 28.	
July 10.	Buffalo, N. Y.	June 21
	Adv. June 28 and July 5.	
July 10.	Washington, D. C.	June 28
	Adv. June 21 and 28 and July 5.	
July 11.	Vicksburg, Miss.	June 21
	Adv. June 21 and 28 and July 5.	
July 12.	Hoopeston, Ill.	June 7
July 13.	Columbus, S. C.	July 5
July 16.	Newburyport, Mass.	June 14
July 16.	Charleston, W. Va.	June 28
July 16.	Dover, N. J.	July 5
July 16.	St. Louis, Mo.	July 5
July 18.	St. Ignatius, Mont.	June 21
	Adv. June 21.	
July 20.	Ft. Fairfield, Me.	June 21
July 23.	Cincinnati, O.	June 28
	Adv. June 21 and 28 and July 5.	
July 25.	Cherokee, Okla.	July 5
July 26.	Gallatin, Tenn.	June 28
	Adv. June 21 and 28.	
July 27.	Vernon, Tex.	June 28
July 31.	Chardon, Neb.	July 5
Aug. 3.	Winchester, Mass.	July 5
Aug. 6.	Globe, Ariz.	July 5

MISCELLANEOUS

Bids Close		See Eng. News-Record
July 9.	Marble Wainscoating—Media, Pa.	June 28
July 12.	Refrigerating Equipment—Thiells, N. Y.	June 21
	Adv. June 21 and 28.	
July 13.	Freight Conveyors—Albany, N. Y.	June 21
	Adv. June 21 and 28 and July 5.	
July 13.	Fire Towers, Trenton, N. J.	July 5
	Adv. July 5.	
July 18.	Incinerator, Outremont, Que.	July 5

Where name of official is not given, inquiries should be addressed to City Clerk,, County Clerk or corresponding official.

WATER-WORKS

Proposed Work

N. Y., Westfield—Boro. plans rebuilding water system. About $80,000. C. C. Westfield, boro. and des. engr. Gannet, Seelye & Fleming, 204 Locust St., Harrisburg, cons. engrs. Noted Apr. 12.

N. J., Summit — City plans to install storm water system involving about 4 mi. 10- to 54-in. pipe. R. C. Wheeler, city engr.

Va., Petersburg—City will install filtration plant and pump made necessary by cantonment camp to be built here. About $25,000. R. D. Budd, city engr.

W. Va., Martinsburg—City extending water mains and installing electric pumps. J. H. Zicker, recdr.

O., Canton—City plans to issue $80,000 bonds to improve water system. L. B. Ohliger, supt.

O., Greenville—City plans new waterworks system. G. A. Johnson, 150 Nassau St., New York, cons. engr. Noted May 24.

Ill., Chicago—Plans being prepared by Engr. Dept. for new pumping station and 3 mi. water tunnel to connect with present Roseland tunnel at State St. in southwest section of city. About $3,000,000. J. Ericson, city engr.

Ia., Arlington—City voted $18,000 bonds to install water system. J. T. Wiltsie, supt.

Neb., Mitchell—City voted $11,000 bonds for water works improvements. Address City Clk.

Water-Works (Continued)

Neb., Scottsbluff—City will hold election to vote on $22,000 bonds for water works extensions. O. F. Finley, city engr. Noted Apr. 12.

Tex., Port Arthur—City soon lets contract extending water and sewerage systems. About $180,000. D. K. Miller, supt. and engr.

Okla., Bartlesville—City will issue $50,000 bonds for water works improvements. A. C. Easter, mayor.

Okla., Okmulgee—City plans election to vote on $53,000 bonds for water-works. Address City Clk.

Cal., McKittrick—Producers' Transportation Co., Union Bldg., Los Angeles, plans to lay 30 mi. of 4- and 6-in. water mains.

BIDS DESIRED

N. J., Newark—Until July 10, by Passaic Valley Sewerage Comrs. for foundations and connections for Wallington pumping station.

Kan., Chanute—(Official)—Until July 17, by G. G. Wood, city clk., for improving water-works. Black & Veatch, 507 Inter-State Bldg., Kansas City, Mo., cons. engrs.

Kan., Pittsburg—Until July 11, by L. Boyd, clk., for 1 6,000,000-gal. turbine-driven centrifugal pump and 1 4,000,000-gal. crank and flywheel pump.

Wyo., Casper—Until July 12, by C. M. Bryan, city clk., for 9900 ft. 12-in., 4800 ft. 8-in., 5400 ft. 6-in. and 900 ft. 4-in. water mains, also valves, hydrants, etc. L. S. Worthington, city engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Wis., Osceola**—City let contract water-works and sewerage systems to W. C. Frazer, 507 Germania Bldg., about $30,000; reservoir to Johnson & Drake, 705 Plymouth Bldg., Minneapolis, $4426.

Minn., Ely—See "Sewers."

★**Kan., Garden City**—(Official)—City let contract distribution system to Wheeler, Kelcher & Co., Garden City, transmission system to H. W. Otto, Garden City, pumps to American Mill Wks., 112 North Broadway, Aurora, Ill. Noted May 10.

Ark., Fayetteville—Water Comn. let contract filtration plant to Blodgett Constr. Co., Shreveport, La. About $34,000. Noted Apr. 10.

★**Ark., Stuttgart**—City let contract storm water brick conduit to carry off surface water to J. McCoppin, 2400 Arch St. About $29,700.

SEWERS

N. Y., Lancaster — City voted $35,000 bonds for sewer and water extensions. Address City Clk.

N. J., Summit—City plans to extend and enlarge storm water sewerage system, including repaving of temporary and semi-permanent pavements with permanent pavements, to cover a period of about 4 years. R. C. Wheeler, city engr.

Ky., Owensboro—City will issue $250,000 bonds for sewer construction. H. Talbother, city engr. Noted May 24.

O., Lorain—City plans sanitary sewer in portions of East 27th St. C. M. Osborne, city engr.

O., Sidney—City will issue $[illegible] bonds for constructing sewers in various streets. A. F. Johnston, city engr.

Ind., Muncie—(Official)—City let contract 6927 ft. 72-in. cement sewer, 1754 ft. 48-in. brick sewer, 2412 ft. 36-in. cement pipe and 1818 ft. 15- and 20-in. tile. B. F. Beardsley, city engr.

Ind., South Bend—Bd. Pub. Wks. plans to install pipe sewer system. Engrs. Garst, Kendall, Lee and [illegible], also Catalpa Ave. F. J. Anderson, city engr.

Mich., Lansing — City plans to install sewer in portion of Clayton St. H. W. Sparks, city engr.

Ill., Evanston—Bd. Local Improv. plans to spend $80,000 to install sewer from Williamette to Sanitary Dist. Canal. J. J. Bromer, pres.

Minn., Dodge Center—City will install sewerage system. J. F. Druar, 312 Commercial Bldg., St. Paul, preparing plans.

Kan., Wichita—City plans sewerage system in northern section. About $250,000. B. C. Wells, city engr.

Tex., Port Arthur—City soon lets contract for 56,000 ft. 8-in. vit. sewer pipe, 13,000 ft. of 10-in., 7000 ft. 12-in., 6000 ft. 15-in., 5000-ft. c.-i. force mains, 80 manholes, 125 clean-outs, 1 ejector station, 1 pump and collector well.

Okla., Sand Springs—See "Streets and Roads."

BIDS DESIRED

W. Va., Huntington—Until July 11 by City Comrs. for constructing 2 mi. 10- and 12-in. sewers. A. B. Mupin, city engr.

O., Cleveland—(Official)—Until July 12, by E. Shattuck, comr. purchases and supplies, building submerged outfall pipe, channel, etc., at sewage treatment works, etc.; advertised in this issue.

O., Linndale—(Official)—Until July 31, by A. L. Wurstner, clk., for sewers in Grand, Peeler and Snow Aves., and Park and Columbia Sts. J. B. Davis & Son, 876 The Arcade, Cleveland, village engrs. Noted June 28.

Minn., St. Paul—Until July 9, by H. W. Austin, purch. agt. for sewers in portion of Palace and Clarence Sts. and Berkeley Ave. O. Claussen, city engr.

Kan., Neodesha—Until July 9, by J. J. Carroll, city clk., for installing storm sewers.

Mo., Mexico—Until July 11, by city for installing sewage disposal plant. No bids received June 20. W. Dearing, city clk.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. J., Newark**—Passaic Valley Sewerage Comn. let contract generating sets at Newark Bay pumping station to J. W. Hooley, New York City, $22,579. Noted May 31.

N. J., Newark—Passaic Valley Sewerage Comn. received low bids, June 19, connections, etc., at Yantacaw pumping station, from J. F. Shanley Co., 26 Exchange Pl., Jersey City, $93,675; L. L. Brom Co., New York City, $93,914; O'Gara Constr. Co., 127 Frelinghuysen Ave., $96,720. Noted May 24.

N. J., Newark—Passaic Valley Sewerage Comrs. received lowest bid outfall pressure tunnel under Jersey City and New York Bay from C. A. Haskin, Boston. About $2,391,000. Noted May 10.

★**N. J., Newark**—Passaic Valley Sewerage Comrs. let contract Kearney-Harrison branch intercepting sewer to Harrison & Craig, 1837 Broad St. About $104,662. Noted June 28.

Tenn., Cleveland — See "Streets and Roads."

★**O., Cincinnati**—(Official)—City let contract installing sewers from Baltimore and Carl St. to Yoast St. to M. J. Connelly & Co., 636 West 8th St., $25,894.

★**Ill., Cambridge**—Town let contract sewage disposal plant to P. Schlachter, 609 East Hickory St., Streator, $10,000.

★**Ill., Lombard**—(Official)—Bd. Local Improv. let contract installing sewers and sewage treatment plant to Gedney & Murphy, 614 Globe Bldg., Minneapolis, $172,397. Noted June 7.

Mich., Ann Arbor—(Official)—City received low bid storm and sanitary sewers from W. Eddy & Son, M. Osgood, city engr.

★**Ill., Rock Island** — See "Streets and Roads."

★**Wis., Hillsboro** — Village let contract furnishing and laying vit. [illegible] sewers to Hinman & Burns, Green Bay, $12,490. Noted June 14.

★**Wis., Osceola**—See "Waterworks."

★**Ia., Cedar Rapids**—Mount Vernon Road Paving Co. let contract 6- and 10-in. sewers to J. H. Ford & Son.

★**Ia., Creston**—City let contract sewage disposal plant to Mercantile Construction Co., 116 Hubbell St., Des Moines; outfall sewer extension to Ahm & Flatter, Corning, $4.15 per ft. Noted June 14.

★**Ia., Early**—City let contract installing sewers to C. A. Dobson Co., Lincoln, Neb. About $25,311.

★**Ia., Marshalltown** — City let contract for storm sewer to A. Carlson, Marshalltown. About $29,000. Noted Apr. 5.

Minn., Ely—City received low bid installing storm and sanitary sewers and water mains from Pastoret Constr. Co., 511 Lyceum Bldg., Duluth, about $30,000.

★**Neb., Omaha**—City let contract storm sewer in portions of 37th St. to Nebraska Constr. Co., $57,000.

★**S. D., Sioux Falls**—City let contract West Morningside sewer to Cady & Savonell. $30,000.

★**Ark., Stuttgart**—City let contract brick storm water sewer to J. McCoppin, 2400 Arch St., Little Rock, $29,700. Noted June 28.

★**Ariz., Yuma**—City let contract sewers Dist. No. 2 to C. H. Julian, San Diego, Cal. About $37,058.

STRUCTURAL STEEL WORK

Proposed Work

Pa., Pittsburgh—Supervs. Allegheny and Beaver Cos. rejected bids opened June 22, extending inter-county bridge No. 1 over Sewickley Creek, Fair Oaks Sta. Noted June 14.

Va., Metomkin — Washington-Newport News Short Line will build bridge over Potomac River from Metomkin to Riverside, Md.; double leaf bascule drawbridge, draw 300 ft. wide, truss and girder approaches. F. S. Gannon, 55 Liberty St., New York City, pres.

Ind., Brazil—County appropriated $35,000 for new bridge over Eel River to replace one destroyed by flood. A. Graeser, co. aud.

Wis., Madison—See "Streets and Roads."

Ia., Grundy Center—Bd. Superv. will spend about $20,000 for bridge work during year. Address co. engr.

Tex., Dallas — (South Dallas) — City Comrs. appropriated $29,000 to complete approach to Forest Ave. bridge. County will appropriate $8000 toward work. Address O. H. Land, comr.

Okla., Coalgate — See "Streets and Roads."

Wash., South Bend—See "Streets and Roads."

BIDS DESIRED

La., Amite—See "Streets and Roads."

Ind., Vincennes—Until July 10 by Co. Comrs. rebuilding and repairing following bridges, Martha Utt, William Kyle, G. W. Hill, Roll Horn, William Menk, William Theriac, Taylor Moran, Toney Frey, Nugent, Enmeier and Gayhart box culvert. J. I. Milentzer, Aud.

O., Miamisburg—(Official)—Until July 16 by W. H. Ayling, co. clk., Dayton, for steel superstructure for bridge No. 348 over Great Miami River.

Cal., Red Bluff—See "Reinforced Concrete."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Miss., Yazoo City**—Bd. Supervs. let contract steel and concrete bridges in Beat No. 3 to [illegible] Co. of Atalanta, about $[illegible]. Noted Apr. 26.

Minn., Detroit—See "Excavation and Dredging."

★**Minn., New Ulm**—Supervs. Brown and Pocahontas Cos. let contract to build two steel bridges over Minnesota River to connect state road between 2 counties to Wedges & Hessing, Minneapolis. Noted May 14.

Mont., Roxford — County let contract [illegible] to Case Bridge Co. Re Ex. Bldg., Portland. About $[illegible].

★**Wash., Olympia**—State Highway Dept. let contract building Chehalis River bridge to Hansen Constr. Co., Everett, $18,417. Noted June 7.

★**Cal., Nicolaus** — County let contract superstructure bridge over Feather River to [illegible] Co., Elk and Trest Sts., San Francisco, $14,[illegible]. Noted June 14.

REINFORCED CONCRETE

Proposed Work

Mass., Boston—St. Marys Trust plans [illegible] Ave. and St. Marys St. About [illegible] Huntington Ave.

N. J., Newark—Children's Advisory Com. plans [illegible] Schools Nos. 1 and 2. Bd. Educ. [illegible] Co. Engr.

Pa., Montgomery — County will build [illegible] bridge over Perkiomen Creek, near 2nd St. M. C. Evans, co. engr.

Pa., Phila.—[illegible] Wharton, Darby and Passyunk Aves. and [illegible] Broadwater St., about 150 ft. long and [illegible] wide. A. S. Webster, Bldg. Dir. Noted May 1.

Fla., Bradentown—County will hold election Aug. 4 to vote on $85,000 bonds for rein.-con. bridge over Manatee River between Bradentown and Palmetto.

Ill., Rock Island—Illinois Oil Co., 1317 2nd Ave., plans 2-story reinforced, [illegible] 24th St. and 4th Ave. About $40,000.

Wis., Kenosha—Winther Motor Co. plans [illegible] reinforced, and steel piers. About $160,000. M. P. Winther, Pres.

Wis., Milwaukee — Store and Office — Office Investment Co. plans office, store and shop, Grand Ave., between West Water and 2nd Sts. About $[illegible]. Kirkhoff & Feiner, Majestic Bldg., archts.

Kan., Parsons—County will build bridge over Labette Creek on Main St., 2 con. arches about 75 ft. long with roadway from [illegible] ft. wide. About $[illegible]. W. J. Long, co. engr.

Tex., Huntsville — See "Streets and Roads."

Cal., San Francisco—Pacific Coast Pipe Co., plans 4-story, 123 x 130-ft. rein.-con. factory, 2nd and Harrison Sts. About $[illegible].

BIDS DESIRED

Pa., Watsontown—(Official)—Until July 15 by [illegible] Treasurer, Sunbury, for [illegible] bridge over North Susquehanna River between Watsontown and [illegible] Island. M. J. Flynn, co. engr.

N. C., Wilmington—Until July 11 by Cape Fear Packing Co. for 1 story, 60 x 160-ft. rein.-con. packing plant. G. H. Smith, pres. Wilson & Sompayrac, Columbia, S. C., archts. Noted May 31.

Ill., Elgin—(Official)—Until July 14, by M. H. Leightenger, city supt., concrete slab bridge over Fox River on Kimball St. C. F. Turner, Walker Bldg., Minneapolis, archt. engr. Noted June 14 under structural steel.

Ill., Quincy — (Official) — Until July 14, by L. L. Boyer, co. supt. highways, for 14 reinforcement bridges. About $12,500. Noted June 21 under structural steel.

Ia., Spencer — See "Excavation and Dredging."

Cal., Red Bluff—Until July [illegible] by H. G. Wilson, co. clk., building reinforcement subway under Southern Pacific tracks on state Highway. Also bridge over Red Bank Creek.

Ont., Cornwall—Until July 12 by M. MacDonnell, co. clk., building 14 rein.-con. bridges on Highway system of United counties of Stormont, Dundas and Glengarry. L. Monteith, engr.

Sask., Regina—Until July 15 by H. E. Cooper, county engineer of Lipheyton, building 3 rein.-con. arch bridges over Arm and [illegible] Rivers.

PRICES AND CONTRACTS AWARDED

(★Indicates initial [illegible])

★**S. I., Castleton Corners**—Staten Island Rapid Transit Co. let contract for [illegible] subway under railroad tracks at Bard Ave. to Wallace & Sompayrac, Columbia Bldg., S. C., archts.

★**Pa., Johnstown**—T. J. Flynn, [illegible] and Lehigh Portland Cement Co. let contract for [illegible] Bridge over Conemaugh River, [illegible] Noted June 14.

★**Pa., Phila.**—Pennsylvania R.R. let contract for [illegible] Noted June 14.

★**O., New Phila.**—Co. Comrs. let contract rein.-con. beam bridge over Beaverdam Creek, Beaver Ave., to F. McClain, $5000; rein.-con. arch bridge over Little Stillwater Creek, East Center St. to A. Wardell, $18,600. Noted May 24.

★**Mich., Detroit**—Detroit Pressed Steel Co. let contract 4-story rein.-con. factory, 1800 Mt. Elliott Ave. to A. A. Albrecht Co., 1130 Penobscot Blvd.

★**Mich., Monroe** — (Official) — Co. Rd. Comrs. let contract concrete girder bridge over Swan Creek, Berling Twp., to Nolan & Gans, Edenville, about $10,000. Noted June 7.

★**S. D., Sioux Falls**—(Official)—County let contract rein.-con. outlet spillway for D. D. No. 1 and 2 to Sioux Falls Constr. Co., Sioux Falls. About $65,000.

★**Wash., Spokane**—Great Northern Ry. let contract concrete piers for several bridges to W. T. Butler Contr. Co., Central Bldg., Seattle. About $50,000.

★**Cal., Los Angeles**—L. Phillips let contract 3-story, 92 x 128-ft., rein.-con. store building to Kubach Co., Merchants Natl. Bank Bldg. About $107,500.

STREETS AND ROADS

Proposed Work

N. J., Ocean City—Bd. Freeholders plan new road from North Wildwood to Shore Rd. About $50,000. L. M. Rice, Wildwood, co. engr.

N. J., Rahway—City plans to pave Maple Terrace, asphalt. H. Lambert, clk.

Pa., Phila.—Council passed ordinance to pave portion Rising Sun, Etting, 7th, Lebanon, 59th, 57th, Jefferson, 64th and Warring Sts., grading and opening Grape, Rex, Litchfield, Frankford, Mifflin and Beaumont Sts. C. A. Albright, city engr.

Md., Takoma Park—Wash., D. C. Post Office—Council plans to pave Carroll Ave. About $30,000. S. W. Williams, mayor.

Va., Hillsville—County election Aug. 23 to vote on $300,000 bonds to build roads.

Ga., West Point—City plans to streets, business section, brick, concrete and asphalt block. About $60,000.

Fla., Rockledge — City voted $20,000 bonds to improve streets.

Ala., Russellville—City plans to improve streets. About $10,000.

Miss., Ellisville—County to sell $200,000 bonds to build roads.

Miss., Marshfield—Bd. Supervs. plan to issue $50,000 bonds to build sand clay roads, Dist. No. 1 and $4000 for sand clay roads, Dist. No. 2.

Miss., Pontotoc—Bd. of Co. Supervs. plan to issue bonds to build and improve highways, 5th Dist.

La., Lake Charles—City plans to pave portion Ford St.

O., Ashland—Council passed ordinance to pave, grade and curb Cleveland Ave. R. H. Conn, city engr.

O., Canton—State Highway Dept. received no bids paving 1.17 mi. Canton-New Franklin Rd. About $38,000. New bids.

O., Cincinnati—Council passed resolution to improve and pave Dryden, Mapleleaf and Arch Sts. F. Krug, city engr.

O., Cincinnati—Council passed ordinance to issue $20,400 bonds to improve and pave Rice, Cora, Collegevue, Larkspur and Hakill Sts. F. Krug, city engr.

O., Cincinnati—Co. Comrs. soon lets contract improving Hamilton Pike from North Bend Rd. to north corporation line of Mt. Healthy. About $175,000.

O., Cincinnati—County plans to pave portion [illegible] Rd., concrete, cost, $30,300; Canal Rd., concrete, $50,500, macadam, [illegible].

O., Cincinnati—City plans to pave portion Arrow Ave., con. F. Krug, city engr.

O., Cleveland—Council approved plans paving Broadway Hill, dressed block stone, cost, $32,090; portion 105th St., $12,500; West 44th St., $7100; East 73rd St., $10,593. R. Hoffman, city engr. Noted June 28.

O., Cleveland—City and county plan to repave and widen portion Cedar Ave. and [illegible]. About $[illegible]. County to appropriate $[illegible] toward cost.

O., Cleveland—City plans to improve and pave portion East [illegible], East 104th, East 116th Sts. R. Hoffman, city engr.

O., Columbus—County Co. will sell $15,000 bonds to improve Jones Corners Highway [illegible] Scott, clk.

O., Dayton—Co. making surveys for paving Salem and Dayton Pikes from [illegible] county line to West Milton corporation line. A. Knoop, co. engr.

O., Defiance—Council having plans prepared estimating cost improving portion Summit, Hopkins and 5th Sts.

O., East Liverpool—City plans to pave, grade and curb, etc., portion Bradshaw Ave., hard burned vitr. brick. J. C. Kelly, city engr.

O., East Liverpool—County voted $38,000 bond issue to improve 6 mi. interstate highway from Beaver to Ohio state line.

O., Ironton—City council received plans and estimates for paving various streets. About $95,000. L. G. Howell, city engr.

O., Lorain—Council plans to pave various streets. About $87,600. C. M. Osborne, city engr.

O., Marion—City plans to issue $60,000 to build sidewalks and pave streets. H. H. Noyes, city engr.

O., Newark—Council passed ordinance to pave portion Evans St. C. B. Keller, pres.

O., Portsmouth — Council passed ordinance to improve portion 21st St. P. G. Harper, city engr.

O., Youngstown—City preparing plans for estimating cost, widening East Rayen Ave. F. M. Lillie, city engr.

O., Youngstown—Council passed ordinance to pave portion Queen St., Florida and Overland Aves. F. M. Lillie, city engr.

Ind., Greenfield—Co. comrs. plan to pave 3 mi. National Rd., brick. C. Boone, co. engr.

Ind., Indianapolis—County Comrs. issued $200,000 bonds to improve roads leading into post and to build new road to Ft. Benjamin Harrison.

Ind., Indianapolis—County sold $28,679 bonds to build 3 gravel roads.

Ind., Lafayette—City plans to sell $20,000 bonds to pave streets. Plans include improving portion Sheetz St. H. B. Overesch, city engr.

Ind., Logansport—Bd. Pub. Wks. plans to macadamize Seybold and Helm Sts. H. H. Thompson, city engr.

Mich., Bay City—Bd. Pub. Wks. soon lets contract paving Lincoln Ave. and Saginaw St. H. C. Thompson, city engr.

Illinois — State Legislature, Springfield, appropriated $3,800,000 to build roads during next 2 years.

Ill., Belleville—Bd. Supervs. voted $400,000 bonds to build hard surfaced roads.

Ill., Chicago—City plans to pave portion South Chicago Ave., creosoted block. About $143,000. J. Ericson, city engr.

Ill., Chicago — County Court approved plans to widen 1 mi. East 71st St., 66 to 110 ft. wide. About $80,000. J. Ericson, city engr.

Ill., Lebanon—Bd. Supervs. voted to issue $400,000 bonds to build roads. D. O. Thomas, co. supt.

Ill., Moline—City rejected bids repaving 5th Ave. Noted June 28.

Ill., Springfield—City plans to pave 66 blocks. W. D. Seeley, city engr.

Wis., Ashland—City plans to grade, repair and macadamize several streets. About $10,000. J. Phillips, city engr.

Wis., Beloit—City plans to pave portion Park Ave. G. E. Heebink, city engr.

Wis., Madison—A. R. Hirst, State Highway Comr. plans to build 300-mi. road and 350 bridges. About $4,200,000.

Ia., Clinton—J. G. Thorne, city engr., preparing plans paving portion Main St.

Ia., Clinton—City plans to pave 2nd Ave. involving 7300 sq.yd. bricking paving, 100 cu.yd. rock excavation, 6500 cu.yd. earth excavation, etc. About $20,000. J. G. Thorne, city engr.

Ia., Des Moines—Co. supervs. plan to build 5 mi. highway from Des Moines to Camp Dodge. About $132,000.

Ia., Mason City—Council plans to pave portion Division St. F. P. Wilson, city engr.

Ia., Marshalltown—City soon lets contract paving 27,000 sq.yd. Broad St. W. H. Steiner, city engr.

Ia., Sioux City—County plans to build 2 or 3 roads. About $70,000. Federal Government to appropriate toward cost.

Ia., Sioux City—Council plans to pave 25th and Aubin Sts. T. J. Johnson, city engr.

Minn., Barnesville—City plans to pave 7th Ave. S. E. Aamodt, clk.

Kan., Kansas City—City passed resolution to pave and curb Ann Ave., 26 ft. wide. W. M. Barclay, city engr.

Streets and Roads (Continued)

Neb., Kearney—Council passed ordinance to pave portion 23rd and 24th Sts., and 1st, 2nd and 5th Aves. E. H. Morey, city engr.

N. D., Bowman — Co. Comrs. voted to spend $10,000 on Yellowstone Highway and trunk line roads. F. Huff, aud. P. W. Thomas, engr.

Mont., Butte—City plans to pave portion Broadway; cost, $20,694, Granite St., $11,-592. J. J. Armstrong, city engr.

Mo., Benton — County voted $800,000 bonds to build roads. Noted Apr. 19.

Mo., Charleston—City having plans prepared paving 48 blocks, asphaltic concrete, 32-, 36- and 44-ft. wide. Berthe Eng. Co., city engrs.

Mo., Joplin—Carthage, Webb City, Joplin, Mo., Galena, Baxter Springs, Kansas, Commerce, Miami and Oklahoma plan to build 60 mi. concrete highway from Carthage, Mo. to Miami, Okla. Address J. M. Malany, supt. Joplin Spl. Rd. Dist.

Mo., Kingston—County preparing plans building 132-mi. hard roads, 16 ft. wide, brick and concrete or concrete.

Mo., Nevada—City plans to pave portion Commercial and Austin Sts. S. L. Higgins, clk.

Mo., New Madrid—County plans election to vote on $28,000 bonds to build roads.

Mo., St. Joseph—Council passed ordinance to pave portion Missouri and Mitchell Aves. and Lowell St., also establishing grades portion Lowell St. C. P. Hoff, city engr.

Mo., St. Joseph—Bd. Pub. Wks. plans to pave portion 2nd St., also Duncan St., asphaltic concrete, Renick St., refined tar binder and oiling portion 2nd and Robidoux Sts. C. R. Hoff, city engr.

Mo., Sikeston—County election July 15 to vote on $800,000 bonds to build roads. Noted June 21.

Ark., Arkadelphia—C. C. Burkett and W. A. Garner, state highway engrs., making surveys building Arkadelphia-Hot Springs turnpike.

Ark., Little Rock—H. R. Carter, state highway engr. made surveys building 130-mi. Little Rock-Batesman Rd. from Little Rock through Argenta, Jacksonville, Cabot, Austin, Beebe, Searcy, Judsonia, Bald Knob, Newport and Batesville.

Tex., Houston—County voted $1,100,000 bonds to build and improve roads. C. H. Bryan, co. judge. Noted June 7.

Tex., Huntsville—County voted $12,000 and $25,000 bonds to build roads, Goshen Rd. and Bodias Dists. W. J. Kelly, co. engr.

Tex., Huntsville—County preparing plans building 50-mi. road, 40 ft. wide, sand, clay, gravel, macadam and concrete, also building wooden bridges, concrete culverts. W. J. Kelly, engr. Noted May 31.

Okla., Cement—Cement Twp. votes July 14 on $25,000 bonds to build roads.

Okla., Clinton—Bd. Comrs. plan to pave 2 additional paving dists., with sheet asphalt. About $100,000. Benham Eng. Co., Colcord Bldg., Oklahoma, engrs.

Okla., Coalgate—Co. comrs. rejected bids grading and surfacing 20-mi. road and bridges, Phillips Twp. New bids. Hess & Skinner & Peckham & Wilkins, Dallas, engrs. Noted May 24.

Okla., Kingfisher — City plans to pave Main and other streets.

Okla., Marlow—City soon receives bids paving streets, business section. About $60,000. Benham Eng. Co., Colcord Bldg., Oklahoma, engrs.

Okla., Nowata — County voted $800,000 bonds to build roads.

Okla., Sand Springs—Council plans to pave streets, Dist. No. 2, asphaltic concrete; also install Sanitary Sewer Dist. No. 5. About $90,000. Benham Eng. Co., Colcord Bldg., Oklahoma, engrs.

Colo., Denver—State Highway Comn. soon lets contract grading and paving [illegible] between Denver and Littleton. J. E. Maloney, engr.

Wash., Colfax—Co. Comrs. passed resolution to create Improv. Dist. to build 23 mi. hard-surface road between [illegible] and Ewan. About $160,000. [illegible] engr.

Wash., Seattle—Bd. Pub. Wks. approved plans grading 20th Ave. South at. About $20,000. C. B. Bailey [illegible]

Wash., Seattle—A. D. Dimmick, city engr., submitted report to Bd. Pub. Wks. estimating cost paving [illegible] at $11,337; Valley St., $7,[illegible]

Wash., South Bend—County voted $250,-000 bonds to build [illegible] Bend highways and 3 bridges. C. S. Henry, [illegible]

Wash., Spokane—Co. Comrs. soon receive bids paving 4 mi. permanent road, east from Fairfield to Palouse Highway. About $40,000.

Wash., Vancouver—State Highway Comn. approved plans Co. Comrs. for paving 4th Plain Rd. About $28,000.

Ore., Pendleton—City soon receives bids paving portion Webb St., gravel bitulithic. About $16,671.

Ore., Roseburg—County to sell $550,000 bonds July 28 to improve roads.

Cal., Modesto—City election July 30 to vote on $40,000 bonds to pave streets. Noted May 24.

Cal., Redding—County plans election to vote on $60,000 bonds to build roads, Inwood Rd. Dist.

Que., Hull—City plans to pave streets and build concrete sidewalks. About $32,-500. J. P. Laforest, city engr.

Que., Quebec—Provincial Highway Dept. plans to macadamize 20-mi. road from Chicoutimi to Jonquieres and Bagotville. J. A. Tessier, minister of roads.

Ont., Galt—Council plans to pave 1½ mi. streets.

Man., St. Boniface—Dept. Pub. Wks. soon lets contract paving Marion and Hill St., also building concrete sidewalks Berry St. J. B. Cote, clk.

BIDS DESIRED

Massachusetts—(Official)—Until July 10 by State Highway Comn., Boston, building section highway, Uxbridge Twp. R. H. Newell, selectman, Uxbridge Twp.

N. J., Cedar Grove—Until July 12 by Bd. Freeholders, Newark, paving Little Falls Rd. About $57,600. F. A. Reimer, Newark, co. engr. Noted June 28.

N. J., Elizabeth—Until July 12 by Bd. Pub. Wks. paving 1694 sq.yd. Mellon Pl., shale brick, 6-in. concrete foundation, blue stone curb. T. E. Collins, city engr.

N. J., Jersey City—(Official)—Until July 10 by Bd. Comrs. improving portion St. Paul's Ave. C. S. Van Kewien, city engr.

N. J., Hawthorne—(Official)—Until July 18 by Bd. Freeholders, Paterson, for improving Goffle Rd. J. MacDonald, dir.

W. Va., Huntington—Until July 11 by city comrs. paving portion 6th St. A. B. Maupin, city engr.

La., Amita—(Official)—Until July 9 by Bd. Supervs. Rd. Dist. No. 4, grading, graveling, bridging 3.3 mi. Kentwood east and west Rd., grading and bridging 4.36 mi. Tangipahoa east and west Rd., also graveling 3.86 mi. same. G. A. Kennon, Kentwood, secy. J. M. Fourmy, Hammond, engr.

Ky., Louisville—Until July 9 by Bd. Pub. Wks. building portion Stephenson Ave., vitr. brick. D. R. Lyman, city engr.

O., Cincinnati—(Official)—Until July 13 by C. F. Hornberger, dir. pub. ser., for grading, setting granite curbs, paving roadway with brick and installing necessary drains, etc., portion Scioto St. Noted May 31.

O., Newark—(Official)—Until July 9 by Co. Comrs. building 1.91 mi. Rd. No. 3, Hartford Twp., water-bound macadam. J. W. Hursey, aud.

O., Wauseon—Until July 21 by J. C. King, village clk., paving Beach St.

Ind., Indianapolis—Until July 9 by Bd. Pub. Wks. paving portion Winthrop St. J. T. Jeup, city engr.

Ind., Rochester—Until July 14 by Co. Comrs. building gravel road on line Fulton and Marshall counties. E. A. Smith, aud.

Wis., Madison—Until July 9 by city paving portion King St. asphaltic concrete. H. V. Tanant, city engr.

Minn., Carlton—Until July 9 by A. E. Norman, co. aud., building 2⅞ mi. state roads.

Minn., Chaska—Until July 9 by Co. Comrs. building 2½-mi. state roads. J. B. Connolly, aud.

Minn., Duluth—Until July 9 by O. Halcen re-aid, [illegible] and improving 1½ mi. Harvest Rd., 1½ mi. La Vasse Rd., 2½ mi. Ireh Rd., 2 mi. Skyline Drive Rd.

Neb., Lincoln—Until July 16 by County [illegible] grading Dist. No. 16, asphaltic concrete, vertical fiber brick and concrete. About $15,000. A. F. Sutherland, Jr.

Wyo., Casper—(Official)—Until July 9 by C. H. Hoge, elk., paving and grading [illegible] Wyoming, 1st and 4th Sts., [illegible] Noted June 14.

Tex., La Grange—Until July 16 by [illegible] and graveling [illegible] Colorado River bridge, [illegible] roadways.

Idaho—Until July 25 by State Highway Comm., Boise, building [illegible] from Washington county line to [illegible] About $110,000.

Wash., Everett — Until July 16 by co. comrs., hardsurfacing Bond Issue Proposition No. 26 and 29; building Permanent Highway, No. 11-B, Auburn-Enumclaw Rd., concrete, cost, $100,000; building Juanita Kirkland Rd., Permanent Highway No. 2-F, concrete, $100,000. S. J. Humes, co. engr.

Wash., Port Orchard—Until July 16 by co. comrs. building and improving Permanent Highway No. 1-C. F. D. Gore, co. engr.

Wash., Walla Walla—Until July 13 by co. comrs. building Permanent Highway No. 16. G. Cookerly, co. engr.

Cal., Yuba City—Until July 9 by City paving portion 2nd and Bridge Sts.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Massachusetts — State Highway Comn., Boston, received low bids building section highway, Washington and Hindsdale Twps. from L. Suzio Constr. Co., State and Brooks Aves., Meriden, $109,889; Crowe & Walsh, Pittsfield, $116,202; Perini Constr. Co., Ashland, $130,361.

★**Mass., Boston**—City let contract road oil to A. Speare's Sons Co., 156 6th St., Cambridge, $23,850.

★**Mass., Brookline** — Town let contract paving 4600 sq.yd. grooved wood block pavement Harvard St. to Simpson Bros., 166 Devonshire St., Boston, $24,512.

★**N. Y., Binghamton**—City let contract paving Tompkins St., bitulithic, to Warren Bros., 142 Berkley St., Boston, $2.44 sq.yd.

★**N. Y., Little Valley**—Town let contract paving Main St., brick to J. Morrisey, Dunkirk, $13,532.

★**N. Y., Long Island City**—M. E. Connolly, boro. pres. let contract improving portion Van Alst Ave. to Hastings Pavement Co., 25 Broad St. About $10,000. Noted June 21.

★**N. J., Hackensack** — (Official) — Bd. Freeholders let contract paving 2nd Sect. Ft. Lee Turnpike to Ufheil Constr. Co., Peetzburg, $21,423. Noted June 21.

Pennsylvania—G. H. Biles, 2d Deputy State Highway Comrs., received low bids building 4836 ft. concrete road, Center Twp., from J. W. Hallam, Washington, $28,732; Reed, Yoders & Moore, Waynesburg, $32,301; R. Swan, Jr., Co., Jenkins Arcade, Pittsburgh, $48,816.

★**Pa., Eddystone**—Council let contract paving Essington Ave. to Union Paving Co., 30th and Locust Sts., Philadelphia. $52,000.

Pa., Phila.—City received low bids paving portion Delaware Ave. also all street intersections between Reed and Snyder Ave. from McNichol Paving Co., 1723 Cherry St., $149,176 and $44,005 respectively.

★**W. Va., Huntington**—County let contract paving Kanawha and Jarvis River Rd. to Harrison & Dean, $[illegible]

★**Ga., Atlanta**—City let contract paving Lakewood Park Driveway to Hudson County Co. Comrs. W. Va. $1.37 per sq.yd. Gordon [illegible] and Ashby St. to Hillman Constr. Co., $1.57½ per sq.yd. Noted May 31.

★**Ga., Griffin** — Mayor and Council let contract grading, curbing, draining and paving various streets, city [illegible] to Atlanta Paving & Shale Brick Co., $[illegible] Noted June 14.

★**Miss., Greenville**—Co. Comrs. let contract grading Greenville-Leland Rd. to Healy County Co., Montana, $[illegible]

★**Miss., Hattiesburg**—County let contract building [illegible] mi. Jefferson Davis and Covington Highway to Central Alabama Constr. Co., Montgomery, Ala., $[illegible]

★**Miss., Vicksburg**—[illegible] let contract paving [illegible] and Ave. to Southern Paving Co., [illegible] Noted June 14.

Tenn., Cleveland—[illegible] bids paving [illegible] and installing [illegible] Noted May 24.

★**Tenn., Knoxville**—(Official)—Co. [illegible] Pub. Wks. let contract paving [illegible] to Maple Court by Maple Court Paving Co., [illegible] Noted June 21.

★**Tenn., Lawrenceville**—County let contract building [illegible] Rd. to [illegible] Noted June 21.

★**Ky., Louisville**—[illegible] let contract paving [illegible] Noted May 31.

★**O., Canton**—Council let contract paving [illegible] to Wm. Urschel, $[illegible]

★O., Canton—County let contract paving [illegible] to H. Corl, Canton, [illegible]

★O., Cleveland—[illegible] let contract paving Detroit Rd. to Cleveland Trinidad Paving Co., 1.0 Lakeside Ave., $[illegible]

★O., East Youngstown—Village let contract [illegible] Rd. to W. H. [illegible], East Youngstown.

★O., Napoleon—[illegible] let contract [illegible] to J. Wyatt[illegible], $[illegible]

★O., Newark—[illegible] let contract [illegible] to Federal Paving Co., Hamilton, $[illegible]

O., Springfield—[illegible] received low bids paving West High St. from M. J. Hannah and [illegible] McHugh, East Main St., each bidding $[illegible]

★O., Toledo—County let contract building [illegible] to Warner & Muskelunge, $[illegible]

★O., Toledo—[illegible] let contract paving Avondale Ave. and Swan Lane to Peters Bros.; alley between Erie and Ontario St. to McKesson Bros.

★O., Warren—County let contract building [illegible] Youngstown-Canfield Rd., Brookfield Twp., to Strass Bros. Constr. Co., Hubbard, $[illegible]

★O., Waverly—County let contract building [illegible] road on Columbus and Portsmouth Highway to Bolts & Wilt, Washington, C. H., $30,535.

★O., Youngstown—Bd. Control let contract paving Lincoln Ave. asphaltic concrete to Keller & Meyer, $2.00 per yd., Glenwood Ave., concrete to Lee Tiberic, installing sewers in several streets to Miller & Tate.

★Ind., Anderson—[illegible] let contract building Williams P. Cox Rd. to W. J. Neldhardt & Co., $[illegible]; Harlan Thomas and Charles Wright [illegible] to J. F. Beason & Co., $[illegible] and $[illegible] respectively.

★Ind., Galesburg—Co. Comrs. let contract building Main St. Rd., medora vitri. [illegible] to S. R. Alberts & Co., Princeton, $[illegible]

★Ind., Goshen—County let contract building 6500 ft. brick road to E. Crip, Goshen, $[illegible]

★Ind., Indianapolis—Bd. Comrs. let contract building [illegible] road from Millersville to Ft. Harrison to Northern Constr. Co., [illegible], $[illegible]

★Ind., Newcastle—City let contract paving [illegible] streets to J. Gurley, Newcastle, $[illegible]

Ind., South Bend—Bd. Pub. Wks. received bids for [illegible] Main St. from Williams Construction Co., Western Constr. Co., [illegible], Iowa City; W. B. Brady Contracting Co., $[illegible] and M. S. [illegible]

Ill., Joliet—City received low bid paving [illegible] Ave. and [illegible] St. from R. H. Conway Co.

★Ill., Monmouth—County let contract building [illegible] to replace concrete highway to E. A. Reed Construction Co., $[illegible]

★Ill., Pekin—City let contract paving [illegible] to Grand Gradient Co., Peoria, $[illegible]

★Ill., Rockford—County let contract building [illegible] road from Rockford to Rockton to military camp to E. E. Rutledge [illegible]

★Ill., Rock Island—City let contract building [illegible] to McCarthy Improvement Co. and [illegible] Co., Davenport, Ia., [illegible] brick with [illegible] base, $[illegible] brick with [illegible] base, $[illegible] brick with [illegible] base, $[

Excavation and Dredging (Continued)

Ia., Spencer—Ditch—Until July 10, by A. W. Chamberlain, co. aud., for constructing main open ditch and 2 concrete bulkheads on D.D. No. 37.

Minn., Cambridge—Ditches—Until July 14, by G. C. Smith, co. aud., for County Ditch No. 16, cost, $14,846; No. 17, $11,609; No. 14, $8243. Noted June 28.

Minn., Detroit—(Official)—Ditch—Until July 27, by J. A. Narmun, co. aud., for building extension of branch No. 7 on Co. Ditch No. 15, about 88, 383 cu.yd. excava.; Co. Ditch No. 9, 105, 138 cu.yd. excava. and 2 50-ft. span steel beam pile bridges of creeks.

Minn., Mankato—Ditch—Until July 14, by C. L. Kennedy, co. aud., for Ditch No. 52, about $19,671.

Minn., Redwood Falls—Ditch—Until July 10, by L. P. Larson, co. aud., for County Ditch No. 121. About $10,444.

Minn., Slayton—(Official)—Until July 24, by E. V. O'Brien, co. aud., for repairing Co. Ditch No. 6, about $15,316, and Judicial Ditch No. 19, $35,401.

Minn., Wadena—Ditch—Until July 7, by E. Boss, co. aud., for County Ditch No. 11, requiring 21,283 cu.yd. excavation to cost 12c. per cu.yd. and 16,112 cu.yd. at 15c.

Utah, Lake Shore—(Spanish Fork Post Office)—Official—Drainage—Until July 16, by Superv. Lake Shore & Benjamin D. D., Meeting House, for open drains and covers, tile drains and levee work. J. S. Huff, secy. Caldwell & Richards, Vermont Bldg., Salt Lake City, engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★La., Opelousas — (Official)—Drainage—Bayou Mallet and Plaquemine D. D. let contract system involving 42.2 mi. ditch excavation to H. S. Clark, Abbeville, $53,500. Noted May 3.

★Minn., Chaska—Ditch—County let contract Ditch No. 22 to Central Constr. Co., 1450 West Lake St., Minneapolis. About $14,481.

★Minn., Redwood Falls—(Official)—Co. let contract Ditch No. 38 to G. McAllister, Glencoe, 10.85c. per yd. Noted June 21.

★Minn., Waconia — Ditch — County let contract Ditch No. 3 requiring 14,200 ft. 8 to 18-in. tile to N. J. Jensen, Hutchinson.

★S. D., Sioux Falls—Drainage—See "Reinforced Concrete."

★Mo., Puxico—Drainage—Superv. Mingo D. D. let contract system involving 5,000,000 cu.yd. excavation, 53 mi. lateral ditches, etc., to reclaim 32,000 acres to Bartson & Millard, Mayer Bldg., Peoria, and Traut & Osner, Beardstown. About $600,000.

Ont., Hullett — (Official) — Drainage—J. F. Fingland, clk., Londesboro, let contract Kinburn Swamp Brain and river improvement to A. Guhrm Seaforth, about $23,765. Noted June 14.

INDUSTRIAL WORKS

Proposed Work

Mass., Boston—J. J. Johnston, 261 Brookline Ave., Brookline, plans 1-story, 80 x 300-ft. brick garage, Brainerd Rd. and Griggs St. About $160,000. H. F. Bryant, 334 Washington St., archt.

Mass., Boston — See "Reinforced Concrete."

N. J., Bayonne—Babcock & Wilcox Co. plans new brick machine shop, 1st St. and Hobart Ave. About $150,000.

N. J., Harrison—The General Electric Co. had plans prepared by R. H. Canfield, archt., 22 West 4th St., Corning, for 2-story, 135 x 255-ft. glass bulb factory. E. R. Scales, engr., Edison Lamp Wks., Harrison, soon receives bids. About $250,000.

N. J., Jersey City—Armour & Co., Union Stock Yards, Chicago, plans new packing plant, Monmouth and 17th Sts. About $1,000,000.

N. J., Kingsland—(Rutherford Post Office)—(Official) — Bridgeman Smith Co., Kent and Division Aves., Brooklyn does not plan to build factory as stated in our issue of June 21.

N. J., Linden—Linden Tanning Co., 40 Spruce St., New York City, plans plant on 4-acre site recently purchased here. About $250,000.

N. J., Newark—W. Ball Co. plans 3-story, 90 x 188-ft. factory, St. Francis and Kossuth Sts. About $50,000. J. Greene, 27 Clinton St., archt.

Pa., Palmerton—(Official)—New Jersey Zinc Co., 55 Wall St., New York City, plans 3-story, 60 x 130-ft. laboratory. Cost $200,000. Donn & Deming, archts., 808 17th St., N.W., Wash., D. C., receiving bids about July 30th. Noted June 21.

Pa., Phila.—Fairmount Storage Co., plans 5-story storage factory, 23rd and Brown Sts.

Pa., Pittsburgh—Pittsburgh Electric Mfg. Co., 614 Station St., plans 210 x 220-ft. brick and concrete warehouse, Penn and Lexington Sts. About $50,000.

Md., Baltimore — Baltimore Buggy Top Co., 107 West Mt. Royal Ave., plans 3-story, 75 x 152-ft. factory.

N. C., Wilmington—International Navigation Co., 204 Franklin St., New York, plans new shipbuilding plant, cost, $5,000,000; also steel rolling mills, ship berths, machine shops, etc. W. H. Garland, pres.

N. C., Wilmington—Metal Stamping Co., recently organized with $200,000 capital stock, plans to build 2 factories.

Ga., Brunswick—United States Maritime Constr. Co. plans shipbuilding plant here. About $2,000,000.

Fla., Pensacola—P. H. Brock of Pensacola Feed Co., and others, plan to build meat packing and storage plant here. About $50,000.

Ala., Fairfield—Finance Com. of U. S. Steel Corp., appropriated $11,000,000 to Tennessee Coal, Iron & R.R. Co., a subsidiary, for immediate development here.

La., New Orleans—Dixie Steel Co., recently incorporated with $500,000 capital stock, plans rolling mill. B. W. Seidell of Seidell-Grosz Mfg. Co., 1052 Magazine St., pres.

Tenn., Chattanooga—De Camp Glass Casket Mfg. Co., Memphis, plans to build plant. About $225,000. J. B. Witherington, pres.

Tenn., Chattanooga — Tennessee Paper Mill, recently incorporated with $200,000 capital stock, plans to build mill. J. Stagmaier interested.

O., Cleveland—Baltimore & Ohio R.R. submitted plans to City Council for freight terminal here. About $2,500,000. H. Lane, Baltimore and Charles Sts., Baltimore, ch. engr.

O., Cleveland—Kilby Mfg. Co., 4623 Lakeside Ave., N. E., plans 70 x 135-ft. addition, 49th St. and Lakeside Ave. About $50,000. W. S. Ferguson, 1900 Euclid Bldg., archt.

O., Cleveland—W. M. Lanesman, 1310 Schofield Bldg., plans garage and service plant, Cedar Ave. and Stearns Rd. About $75,000 to $100,000.

O., Cleveland—Standard Steel Co., 3311 West 73rd St., having plans prepared for an addition to provide 15,000 additional square feet floor space; also another steel foundry to be erected in 5 units.

O., Toledo—Toledo Furnace Co. soon lets contract for 6 brick, steel and concrete factories. About $100,000. F. C. Warner, 767 Hipp. Annex Bldg., Cleveland, engr.

O., Youngstown—Liberty Steel Co., increased capital stock from $600,000 to $750,000 and plans to build additions.

Mich., Detroit—Great Lakes Engr. Co., East Atwater St., plans addition to plant. About $75,000. Smith, Hinchman & Grylls, Washington Arcade, engrs.

Mich., Grand Rapids—Furniture Mfg. Assn., 216 Lyon St. N. W., plans warehouse on Fulton St., N. About $100,000.

Ill., Chicago—Gibson Motor Car Co., 923-30 East 47th St., had plans prepared by H. L. Newhouse, archt., 4630 Prairie Ave., for 1-story, brick garage. About $50,000.

Ill., Chicago — Kellogg Switchboard & Supply Co. plans plant on West Adams St. About $200,000.

Ill., Chicago—(East Chicago)—Mark Mfg. Co., Dempster and Dodge Sts., Evanston, plans new plant at East Chicago. About $14,500,000.

Ill., Chicago—H. G. Seal Co., 1410 Ravenswood Ave., plans 2-story, 150 x 175-ft. factory on Ravenswood Ave. About $100,000. W. T. Branitzky, 54 West Randolph St., archt.

Ill., Rock Island—See "Reinforced Concrete."

Wis., Kenosha—See "Reinforced Concrete."

Kan., Wichita — Cumberland Pipe Line Co., subsidiary of Standard Oil Co., plans 5000-bbl. oil refinery, North Lawrence Ave.

S. D., Sioux Falls—International Harvester Co., 656 South Minnesota Ave., Chicago, plans to rebuild factory recently destroyed by fire. About $75,000. A. E. Doering, local mgr.

Mo., Joplin — City defeated $[illegible] bonds to build light plant. H. Phillips, clk. Noted May 31.

Mo., Kansas City—Steelair Building Co., plans storage tanks and buildings at 811-31 Harrison St. About $[illegible]

Tex., Houston—Rio Grande Ice Assn., Harlingen and San Benito, plans ice plant here. About $150,000.

Tex., Orange—National Shipbuilding Co., recently incorporated, plans to build shipbuilding plant here. About $100,000. J. M. Dullahan, stockholder.

Ore., Portland—Hesse-Martin Iron Wks., 434 Belmont St., is having plans prepared for additions to its plant, including foundry, forge shop, etc. About $100,000.

Cal., Los Angeles—C. A. Watson, Alexandria Hotel, plans to build dye works. About $250,000.

Cal., Martinez—Kullman & Salz Tanning Co., had plans prepared for 5-story, 85 x 115-ft. addition to plant.

Cal., San Diego—J. B. Mitchell and L. Figheira of Los Angeles, plan to construct shipbuilding plant on tidelands between 28th and 30th Sts. About $1,500,000.

Cal., San Francisco — See "Reinforced Concrete."

Ont., London — Beatty Bros., York St., plan factory and boiler house. About $50,000.

Ont., London — Interurban Motors, Ltd., plans garage. About $50,000. G. W. Barburton, 183 Horton St., mgr.

Ont., Springfield — Springfield Milk Co. having plans prepared for addition. About $50,000. A. Ball, mgr.

BIDS DESIRED

N. C., Wilmington—See "Reinforced Concrete."

Fla., St. Petersburg—Until Aug. 1st by Universal By-Products Co. for new plant. About $250,000 to $300,000. J. F. Lavarne, 314 Ferguson Bldg., Pittsburgh, pres. R. Irvin, Union Bank Bldg., archt.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Vt., Springfield—Jones & Lamson Machine Co. let contract brick and rein.-con. addition to L. L. Hall, $100,000.

★Mass., Holyoke—Valley Paper Co. let contract power house, Water St. to P. J. Kennedy & Co., Inc., $50,000.

★Conn., New Britain—Stanley Wks., Hill and Lake Sts., let contract factory on Myrtle St. to Aberthaw Constr. Co., 27 School St., Boston. About $130,000.

★Conn., Waterbury — (Official)—Scovill Mfg. Co., 99 Mill St. let contract 4-story, 63 x 216-ft. pattern building, East Main St. to Turner Constr. Co., 244 Madison Ave., New York City.

N. J., Camden — See "Reinforced Concrete."

★N. J., Gloucester City — New Jersey Shipbuliding Co., let contract 4 factories to G. F. Pawling & Co., 1400 Vine St., Phila., $1,000,000.

★Pa., Phila. — See "Reinforced Concrete."

★Pa., Phila.—American Stores Co. let contract 3-story, 80 x 120-ft. warehouse, 969-75 North 2nd St. to H. Gill, Jr., 2513 Germantown Ave., $75,000.

★Pa., Phila.—George B. Newton Coal Co., 1527 Chestnut St., let contract 341 x 375-ft. coal storage plant 19th and Locust Sts. to Armstrong & Co., New Land Title Bldg. About $100,000.

★Pa., Phila. — Phila. Electric Co. 24th and Christian Sts., let contract 1-story, 54 x 64-ft. addition to the plant to J. R. Wiggins Co., 1515 Filbert St. About $60,000.

★Pa., Phila.—Twentieth Century Storage Warehouse Co. let contract 7-story, 40 x 120-ft. warehouse, 3120-30 Market St. to George & Borst, 777 South 11th St. About $150,000.

★O., Cleveland—Euclid Dairy Co., East 105th and Euclid St., let contract 145 x 150-ft. warehouse to Crowell-Lundell-Little Constr. Co., 1937 East 51st St. About $112,000.

★O., Cleveland—Tabor Ice Cream Co., Wayne Ave., let contract 2-story garage and stable to the Hassel Constr. Co., American Trust Bldg. About $14,000.

★O., Cleveland—Warner & Swasey Co., 580 Carnegie Ave., let contract machine shop to Crowell, Lundell, Little Constr. Co., 1901 East 51st St. About $[illegible]

★Mich., Detroit—See "Reinforced Concrete."

★Wis., Madison — Pennsylvania Paper Co. let contract 1-story [illegible] to J. P. McMahon, Black River Falls, $500,000.

★Mont., Bowdoin—Great Northern R. R., 14th St. and Hennepin Ave., Minneapolis, let contract engine terminal to Grant-Smith & Co., 1001 Kasota Bldg., St. Paul, $[illegible]

★Ont., Toronto—Dalton Iron Wks. let contract boiler house to McKinnon & McIntyre, 1181 Yonge St. About $[illegible]

BUILDINGS

Proposed Work

Conn., Hartford—School—City plans addition to grade school. About $125,000. I. Allen, Jr., 964 Main St., archt.

N. J., Jersey City—Hospital—City plans to improve and enlarge. About $700,000. M. M. Pagan, mayor. J. T. Rowland, 98 Sip Ave., archt.

Pa., Ardmore—School—Lower Merion School Bd., will soon let contract, 1-story, brick, at Ashland Heights. About $75,000. E. H. Yardley, 1713 Sansom St., Phila., archt.

Pa., Coatesville—Club House—Loyal Order of Moose plans 4-story, 45 x 140-ft. brick and stone. Kerns & Carroll, 67 South 6th St., owners.

Pa., Tamaqua—Temple—Tamaqua Lodge, F. and A. M., having plans prepared by B. Stevens, archt., 4-story, 40 x 150-ft., stone and terra cotta.

Pa., Tarentum—Hospital—Hospital Aid Assn. of Tarentum, retained P. C. Dowler, archt., Arrot Bldg., to prepare plans 2-story. About $100,000.

Del., Wilmington—Bank—(Official)—Security Trust Co., 6th and Market Sts., had plans prepared, 2-story, 50 x 52-ft. brick and marble addition. E. C. May, Du Pont Bldg., archt., will receive bids in about 2 months. Noted June 14.

Del., Wilmington—Club—B. P. O. E. plans 4-story, 45 x 140-ft. brick and stone. J. C. Trumbauer, Jr., Ford Bldg., archt.

Wash., D. C.—Office and Business—A. C. Mather, Commercial Bldg., Chicago, has had plans prepared by C. L. Harding, archt., 729 15th St., N. W. About $150,000.

W. Va., Adamston—High School—Bd. Educ. plans. About $85,000. E. C. Holmboe, Empire Bldg., Clarksburg, archt.

Tenn., Memphis—High School—Bd. Educ. having plans prepared by McGee & Lester, archts., Tenn. Trust Bldg., for Barrister High School.

O., Cleveland—School—School Bd. having plans prepared by F. C. Warner, archt., 767 Higbee Annex. About $240,000.

O., Cleveland—High School—St. Johns Church, 1008 Superior Ave., plans 3-story, brick and concrete, Euclid Ave. and East 107th St. About $700,000. E. T. P. Grabske, 70 Bowler St., Boston, archt.

O., Columbus—Y. M. C. A. will build 5-story factory building. O. C. Darst, archt., 1109 Brunson Bldg., receiving bids about July 15. Cost $150,000.

O., Greenville—Hospital—Greenville Hospital Co. plans, 2-story. About $62,000. E. J. Mountstephen, 803 U. B. Bldg., archt.

O., Plymouth—(Official)—High and grade school—Town will vote July 10 on proposition to construct high and grade school. Alliance & Jones, Marcy Bldg., Mansfield, archts. Noted June 21.

Ind., Indianapolis—School—Indian University had plans estimated by R. F. Daggett, grade [illegible] Annex, for new manual school building.

Ind., West Terre Haute—High and Grade School—T. Concannon, trustee, 317 West 6th St., has plans prepared by D. B. Edwards, archt., 724 Terminal Bldg., Terre Haute, 2-story. About $55,000.

Mich., Benton Harbor—Church—Methodist Congregation plans. About $50,000.

Mich., Chesaning—High School—Grade School Bd. plans [illegible] 2-story, 152 x 184-ft. About $[illegible]. J. D. Towle, 105 North Dearborn St., Chicago, archt.

Mich., Detroit—Store—E. J. Hudson Co. purchased site at Woodward and Grand River Aves. and had plans prepared by Smith, Hinchman & Grylls, archts., and Wm. Washington, Jr., Ford Bldg., for theatre and store building.

Mich., Lansing—Armory—Agricultural College, Col. Charles Pratt Mullett, Bd. had plans prepared by C. [illegible] Hathaway, archt., Bowling Bldg., for 2-story, 112 x 219-ft. Armory. About $40,000.

Mich., Muskegon—Armory—Muskegon Company, Col. C. McGlynn retained by Bd. of Trustees, archt. Mack Bldg., Grand Rapids, plans 2-story, 100 x 200-ft. Armory. About $75,000.

Mich., Muskegon—Armory—Thacker Company may erect store. About $40,000.

Ill., East Moline—Y. M. C. A. had plans prepared by Whitsitt & Schulzek, archts., Peoples Bank Bldg., Moline, 4-story, 82 x 101-ft. building. About $100,000. W. E. Mack, Ross Bldg., secy.

Wis., Ashland—High School—Bd. Educ. plans to rebuild school recently destroyed by fire. About $250,000.

Wis., Madison—Grade School—Bd. Educ. had plans prepared by F. L. Kronenberg, archt., 127 North Hancock St., Madison, 60 x 112-ft., brick and hollow tile. About $50,000.

Wis., Manitowoc—Club—Elks' Clubhouse Co. soon receives bids, 2-story, 60 x 90-ft. brick. About $70,000. E. F. Miller, Dempsey Bldg., archt.

Wis., Niagara—High School—Bd. Educ. receiving bids about July 7, 2-story, 56 x 138-ft., brick. Cost, $50,000. D. Hubert, Menominee, archt. Noted May 31.

Wis., Wanwatosa—Sunday School and Church—1st Congregational Church plans. About $50,000. Charlton & Kuenzli, archts., Camp Bldg., Milwaukee, soon receives bids.

Ia., LeMars—College—LeMars Commercial Club conducting campaign to raise $60,000 towards 2 buildings for Western Union College.

Ia., Sioux City—Church—Trinity Lutheran Church receiving bids about Aug. 15, 1-story, 60 x 100-ft., cost, $75,000. Beuttler & Arnold, 609 Security Bldg., archts.

Ia., Sioux City—Hotel—North American Hotel Co. plans. About $750,000. W. B. Nation, mgr.

Minn., Chisholm—Auditorium—City retained A. Puck, archt., 617 Torrey Bldg., Duluth, to prepare plans for large auditorium.

Minn., Duluth—High School—Bd. Educ. receiving bids about Sept. 1. Cost, $375,000. C. E. Nystrom, Palldio Bldg., archt.

Minn., Minneapolis—Store and Office—Abbey Holding Co., plans 90 x 115-ft. brick, 800-08 Mary Pl., about $54,000. V. C. De Brauwere, 824 Plymouth Bldg., archt.

Minn., St. Paul—Church—St. Mark's Congregation will construct. About $100,000.

Kan., Abilene—High School—Bd. Educ. receiving bids about Aug. 1, 2-story, 98 x 150-ft. About $90,000. W. H. Sayler, 606 Gumbel Bldg., Kansas City, Mo., archt. Noted Apr. 26.

Neb., Randolph—Church—Francis De Chantal Congregation had plans prepared by W. L. Steele, archt., 502 Northern Bank Bldg., Sioux City, Ia. About $60,000.

S. D., Sioux Falls—Coliseum—City had plans prepared by J. Schwartz, archt., Pettigrew Bl., 132 x 150 ft. About $100,000.

S. D., Spearfish—Gymnasium—Bd. Educ. having plans prepared by F. H. Ellerbe, archt., 692 Endicott Bldg., St. Paul; 2-story, 100 x 100. F. A. Cook, pres.

Wyo., Casper—City Hall—City voted $270,000 bonds to construct city hall and improve water and sewerage systems.

Mont., Butte—Surgical Building—Deaconess Hospital had plans prepared by F. Hamill, archt., Henessy Bldg. About $150,000.

Mo., Kansas City—Club—Kansas City Club plans, 13th St. and Baltimore Ave. About $750,000. Smith, Rea, & Leavitt, 601 Finance Bldg., archts.

Mo., St. Louis—Church—St. Mary's Episcola Congregation had plans prepared by Nolte & Nauman, archts, Fullerton Bldg., for group buildings at Hamilton and Ridge Aves. About $200,000. L. H. White, rector.

Ore., Portland—Medical School—University of Oregon having plans prepared by Lawrence & Holford, archts., and Whitehouse & Fouilhoux, assoc. archts. About $[illegible].

Cal., Norwalk—Hospital—State having plans prepared by R. C. McDougal, state [illegible] Bldg., Sacramento, brick and concrete. About $132,000.

Cal., Palo Alto—High School—See "Reinforced Concrete."

BIDS DESIRED

Conn., Hartford—Dining Hall, etc.—Until July 13, by State Comptroller, Capitol, for infirmary, dining hall, etc., for Storrs Agricultural College. About $75,000

N. Y., Yonkers—(Official)—Sschool—Until July 10, by Secy. Bd. Educ., for P. S. No. 23. About $200,000. C. H. Chamberlin, 18 South Bway., archt. Noted June 21.

O., Akron—(Official)—School—Until July 20, by J. F. Barnhart, clk., bd. educ. for annex to Jennings School, East Talmadge Ave. and Dayton St. T. H. Ridley, Cottage Pl., superv. archt.

O., Alliance—Until July 9 by W. H. Morgan, clk. bd. hospital comrs., for alteration and additions to old city hospital. W. W. Matchett, archt.

O., Martins Ferry—(Official)—School—Until July 21, by Bd. Educ. for Elms School. C. W. Bates, Natl. Bank Bldg., Wheeling, W. Va., archt.

Ind., Anderson—Lodge—Until July 10 by C. D. McLane, archt., 301 Robinson Bldg., 2-story, 70 x 100-ft. for B. P. O. E. About $100,000. Noted June 21.

Ind., Ft. Wayne—Until July 31 by A. Hamilton, trustee, Wayne Twp., for building new school and altering 2 others.

Ind., Terre Haute—School—Until July 11 by T. Concannon, trustee, Sugar Creek Twp.

Ia., Bronson—(Official)—School—Until July 10, by Bd. Educ. About $50,000. Buettler & Arnold, 609 Security Bldg., Sioux City, archts. Noted June 21.

Ia., Cresco—School—Until July 16 by B. F. Davis, secy. bd. educ. G. L. Lockhart, 391 Endicott Bldg., St. Paul, archt.

Minn., St. Peter—Court House—Until July 9 by W. H. Holtz, co. aud., for addition. G. Pass & Son, Manakota, archt.

Kan., Great Bend—Court House—Until July 19, by W. E. Beardsley, co. clk., 4-story, 95 x 114 ft. About $150,000. W. E. Hulse & Co., 1st Natl. Bank Bldg., Hutchinson, archts.

Mont., Livingston—High School—Until July 21, by Bd. Trustees Park Co. High School for addition. About $60,000. G. H. Carsley, Power Blk., Helena, archt. Noted June 21.

Cal., Palo Alto—Until July 13, by Union High School Dist., for high school to consist of 7 buildings. About $200,000. Allison & Allison, 1405 Hibernian Bldg., Los Angeles, archts. Noted June 14.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Gardner—School—Town received low bid school on Coleman St., from Allen Bros., Amherst. About $60,000. Noted May 17.

★Mass., Norwood—School—Bd. Educ. let contract, 3-story, 97 x 210-ft., Hoyle, Washington and Bond Sts., to C. S. Cunninham & Sons, 7 Water St., Boston. Noted May 31.

★Pa., Phila.—Library—City let contract 1-story brick and stone, on Old York Rd. to Wark-Yardley Co., 1737 Filbert St., $68,555.

★O., Canton—School—City let contract to R. H. Evans & Co., Columbus Saving Bank Bldg., for addition to Clarendon Ave. School. About $58,531.

★Ia., College Springs—School—Bd. Educ. let contract 3-story, 72 x 134-ft., brick, stone and concrete, to S. Hotchkiss, 18th St. and Penn Court, St. Joseph, Mo., $65,000. Noted May 24.

★Minn., Minneapolis—Exchange Northwestern Telephone Exchange Co., 816 21st Ave., N., let contract, 3-story, brick, steel and tile, Highland Park, to J. H. Brous Co. About $82,000.

★S. D., Sioux Falls—Bank—Sioux Falls Natl. Bank let contract 9-story, 44 x 106-ft. brick and terra cotta, to Pike & Cook, 416 South 6th St., Minneapolis.

★N. D., Drake—School—Bd. Educ., let contract, 3-story, to R. B. Marschke, Lucca, $68,855.

★N. D., Fargo—Office—North Dakota Realty Co. let contract 8-story, 75 x 118-ft., to T. Powers & Co., Fargo. About $100,000.

★Mo., Mexico—Academy—Missouri Military Academy let contract addition to Ray & Son Constr. Co., Louisiana, $50,000. Noted May 24.

★Mo., St. Louis—Hotel—Roe Estate let contract remodelling and improving building for hotel to H. Horowitz, 521 Boatmen's Bank Bldg. About $100,000.

★Tex., Victoria—High School—Victoria Independent School Dist. let contract, 3-story, brick, to S. M. Bailey, Victoria. About $54,487.

Buildings (Continued)

★**Okla., Tulsa**—Freight House—St. Louis & San Francisco Ry. let contract, 40 x 330-ft., to C. Cunliff, Title Guarantee & Trust Bldg., St. Louis, $100,000.

★**Cal., Los Angeles**—Store—See "Reinforced Concrete."

FEDERAL GOVERNMENT WORK

Proposed Work

Pa., State College — Post Office — J. A. Wetmore, superv. archt., treas. dept., rejected only bid received June 12. Noted June 21.

Wash., D. C.—Repair Shop—Bureau of Yards and Docks, Navy Dept., rejected only bid received June 25 for addition to Nautical Instrument Repair Shop at Naval Observatory. Noted June 14.

N. C., Chapel Hill—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., rejected only bid received June 15. Noted June 28.

BIDS DESIRED

Mass., Winchester—Post Office—Until Aug. 3, by J. A. Wetmore, superv. archt., treas. dept., Wash.

Conn., New London—Storehouse—Until July 9, by Bureau of Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., at Naval Sta.

N. J., Dover—Buildings—Until July 16, by Bureau of Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., addition to 8 magazine buildings.

S. C., Columbia—Post Office—Until July 31 by J. A. Wetmore, superv. archt., treas. dept., Wash.

Neb., Chadron—Post Office—Until July 31 by J. A. Wetmore, superv. archt., treas. dept., Wash.

Mo., St. Louis—Levee Work—Until July 16, by Mississippi River Comn., 1311 International Life Bldg., constructing about 80,000 cu.yd. earth work in Henderson Co. D. D. No. 1, Ill.

Okla., Cherokee — Power Plant — Until July 25, at office of Indian Affairs, Interior Dept., Wash., electric power plant, wire fixtures, etc., at Cherokee Orphan Training School.

Ariz., Globe—Post Office and Court House—Until Aug. 6 by J. A. Wetmore, superv. archt., treas. dept., Wash.

Wash., D. C.—Portland Cement—Until July 10 by U. S. Engr. Office, Room 305, Southern Bldg., furnishing and delivering at foot of 35th St., 15,000 bbls., more or less.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. H., Portsmouth—Office Building—Bureau of Yards and Docks, Navy Dept., Wash., received bids, June 25 from F. W. Cunningham, 430 Congress St., Portland, Me., $32,423; C. H. Mead, 15 Beacon St., Boston, $41,664; C. M. Leach, Boston, cost plus 10%.

Mass., Ft. Andrews—Reservoir—Constr. Quartermaster, Ft. Warren, received bids, June 23, as follows: R. L. Whipple Co., Worcester, cost plus 10%; Hallett-Grant Constr. Co., 138 Federal St., Boston, $16,-987, alternate bid, actual cost plus $1400; Hampshire Constr. Co., 108 South St., Boston, $16,900.

N. J., Vineland—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., received low bids, June 27, (a) limestone, (b) sandstone, as follows: Werner-Huberty Co., 657 Vanderbilt Ave., Brooklyn, N. Y., (a) $55,497; W. H. Fissell & Co., 1328 Bway., New York City, (a) $62,700, (b) $65,700; Metzger & Fisher Co., Denckla Bldg., Phila., (a) $64,614, (b) $64,614. Noted June 7.

Pa., Monessen—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., received only bid, June 26, from W. H. Fissell & Co., 1328 Bway., New York City, limestone, $57,000, sandstone, $58,000. Noted May 31.

Pa., Phila.—Storehouse—Bureau of Yards and Docks, Navy Dept., Wash., received bids, June 25, advance base storehouse as follows: (a) Net price and time for work, complete, in accordance with drawings and specifications, and based on use of solid brick for exterior walls. This item does not include heating, trolley, trolley beams and fittings. (b) Amount and time to be added to price and time stated under item (a) if trolley, trolley beams and fittings as specified in paragraphs 119 to 123, inclusive, be installed; E. Baton, 12th and Sansom Sts., Phila., (a) $86,000, 110 days; (b) $3100, 10 days; McCloskey & Bahler, Phila., (a) $83,748, 150 days; (b) $3415; Turner Concrete Steel Co., 1713 Sansom St., Phila., (a) $89,750, 120 days.

Md., Annapolis—Artesian Well—Bureau of Yards and Docks, Navy Dept., Wash., opened bids June 25, artesian well at Naval Academy, from Sydnor Pump & Well Co., Inc., 1301 East Main St., Richmond, $8 per ft., 60 days, alternate bid, cost plus 10%; bid not in accordance with specification. E. Christmann, Massillon, O., $13,668, 60 days. Noted June 14.

★**Md., Cambridge**—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to T. H. Mitchell, 207 Lake St., Salisbury, $49,089. Noted May 17.

★**Wash., D. C.** — Buildings — Bureau of Yards and Docks, Navy Dept., let contracts mine storage buildings as follows: 6 at St. Juliens Creek, Va., to Boyle-Robertson Constr. Co., Evans Bldg., $205,828; 3 at Newport, R. I., M. F. Kelly, 51 East 42nd St., New York City, $154,425; 2 at Hingham, Mass., Howard Bros., 412 Dorchester Ave., Boston, $73,863; 2 at Iona Island, N. Y., Guarantee Constr. Co., 140 Cedar St., New York City, $93,550; 1 at Guantanomo, Cuba, Stewart Eng. Corp., 61 Bway., New York City, $57,600. Noted May 31.

Wash., D. C.—Bridges—Dist. Comrs. received bids, June 16, 2 bridges on line of 61st St. from: E. G. Gumel, 36 P St., 10%; W. H. Allen Constr. Co., 12%; L. N. Johnson, Arlington, Va., 18%; C. H. Tompkins, Wash., 18%, cost plus percentage. Noted June 14.

★**Fla., Pensacola**—Storehouse and Magazine Building—Bureau of Yards and Docks let contract to Wise Granite & Constr. Co., American Natl. Bank, Richmond, $99,800. Noted June 21.

★**Fla., Pensacola**—Testing Shed—Bureau of Yards and Docks, Navy Dept., Wash., let contract testing shed for seaplane motors at Navy Aeronautic Sta. to Turner Constr. Co., Pensacola, $23,600, time 90 days.

S. C., Beaufort—Post Office—J. A. Wetmore, superv. archt., treas. dept., received bids June 20, from Wise Granite & Constr. Co., American Natl. Bank, Richmond, $40,-990, and W. H. Fissell & Co., 1328 Bway., New York City, $47,900. Noted May 17.

S. C., Port Royal—Buildings—Bureau of Yards and Docks, Navy Dept., Wash., received bids, June 25, 8 buildings for officers' quarters (work complete), from W. T. Hadlow, 831 Park St., Jacksonville, $46,-735, time, 100 days; Newport Contr. & Engr. Co., Newport News, Va., $54,063; 100 days; Simons-Mayrant Co., Charleston, $56,197, 100 days; Riggs, Distler & Stringer, 23-25 Light St., Baltimore, $9981, 100 days (partial bid).

★**Ill., Aledo**—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to Northern Constr. Co., 421 Milwaukee St., Milwaukee, $42,675. Noted June 28.

★**Ill., Olney**—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to Michie Constr. Co., 300 Camp Bldg., Milwaukee, $44,970; time, 1 year. Noted June 14.

★**Kan., Cherryvale**—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to C. Weitz Sons, 713 Mulberry St., Des Moines, $38,300. Noted June 28.

★**Mo., Butler**—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to C. Weitz Sons, 713 Mulberry St., Des Moines, $42,400. Noted June 28.

★**Ark., Fordyce**—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to W. O'Neil & Sons Co., Fairbault, Minn., $31,979. Noted June 28.

★**Wash., Bremerton** — Dock — Bureau of Yards and Docks, Navy Dept., Wash., let contract shipbuilding dock at Puget Sound Navy Yard to Sound Constr. & Eng. Co., 72 Union St., Seattle, about $566,000. Noted June 7.

Cal., San Francisco—Pipe Line—Bureau of Yards and Docks, Navy Dept., Wash., received only bid, June 25, for flexible pilot submerged pipe line at Naval Training Sta. (a) work complete (b) work complete pipe to be extra strong galvanized, joints reinforced with malleable iron reinforcing steels (c) deduct from (b) for substituting 6-in pipe line from Hooker-Tobitt Constr. Co., 9 Main St., San Francisco, (b) $49,749, time, 110 days; (c) $6650. Noted June 21.

★**Cal., San Pedro**—Buildings—Constr. Quartermaster, 12th and Pacific Aves., let contract officers' quarters, barracks and other buildings at Ft. MacArthur to J. F. Athinson, 610 South Bway., Los Angeles, about $249,000. Noted Apr. 26.

MISCELLANEOUS

Proposed Work

Port Terminal — Bayonne, N. J. — City Comrs. will hold election July 24 to vote on $10,000,000 bonds for port terminal along New York Bay. Address Terminal Com., Bergoff Bldg., Bway. and 22nd St. Noted May 31.

Elevated Railway—East Orange, N. J.—Delaware, Lackawanna & Western R.R. will elevate lines through city. G. J. Ray, Hoboken, ch. engr.

Pier—Phila., Pa.—See "Reinforced Concrete."

Transmission Line—Mosinee, Wis.—Wisconsin Valley Electric Co. plans, from Mosinee to Stevens Point. M. E. Ewing, Wausau, mgr.

Transmission Lines—Grinnell, Ia.—Iowa Light, Heat & Power Co. plans to extend lines from Grinnell to Newburg, about 7 mi. L. E. Caldwell, Iowa City, mgr.

Transmission Line—Hamilton, Ia.—Keokuk Electric Co. will reconstruct its transmission line from Hamilton to Warsaw, 5 mi. J. P. Ingle, Keokuk, mgr.

Transmission Line — Lexington, Neb.—Lexington Mill & Elevator Co., owners of local electric-light plant, applied to State Ry. Comn. for permission to build, from Lexington to Cozard, about 18½ mi. A. C. LeFlang, Lexington, mgr.

Park Improvements—Beaumont, Tex.—City will hold election Aug. 7 to vote on $100,000 bonds for park improvements. J. G. Sutton, clk.

BIDS DESIRED

Fire Towers—Trenton, N. J.—(Official)—Until July 13th by New Jersey State Hospital, building fire tower, fire escapes, etc. F. H. Bent, state archt.; advertised in this issue.

Subway—Red Bluff, Cal.—See "Reinforced Concrete."

Incinerator—Outremont, Que.—Until July 18 by E. T. Thompson, city clk., building incinerator.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Dam—Albany, N. Y.—(Official)—W. W. Wotherspoon, supt. pub. wks., received bids, June 26, new movable dam to replace existing dam No. 14 at Herkimer, Barge Canal Contr. No. 146, from Lupfer & Remick, Ellicott Sq., Buffalo, $80,335; Chesley, Earl & Heimbach, Inc., 20 Breckenridge St., Buffalo, $90,043; Mohawk Dredge & Dock Co., Inc., Herkimer, $101,981. Noted May 31.

★**Boilers, etc.—Newark, N. Y.**—(Official)—A. W. Beaven, pres. bd. mgrs., New York State Custodial Asylum for Feeble-Minded Women, let contract 2 boilers to W. B. Armstrong Co., $14,378; heating work, etc., W. F. Devendorf & Co., $13,398. Noted June 14.

★**Piers—Wash., Spokane** — See "Reinforced-Concrete."

★**Boardwalk—Newport Beach, Cal.**—City let contract, on Surf Ave., to G. Helms, Newport Beach, about $14,091.

George L. Dresser, representing the Jennsion-Wright Co., Toledo, O., has moved his offices from DeGraaf Bldg., Albany, N. Y., to 2632 Whitehall Bldg., New York City.

Rolph Mills & Co., Colman Bldg., Seattle, have been appointed general agents for the U. S. Cast Iron Pipe & Fdry. Co., Burlington, N. J., in Oregon and Washington.

L. H. Boydston has been appointed sales manager for the Smith Form-A Tractor Co., Chicago, Ill.

The Blaw Steel Constr. Co. and the **Knox Pressed & Welded Steel Co.** have been consolidated under the name of the Blaw-Knox Co. with executive offices at Hoboken, N. J., general offices in the Farmers Bank Bldg., Pittsburgh, Pa., branch offices at New York, Chicago, Boston and San Francisco and works at Hoboken and Wheatland, Pa.

TRADE CATALOGS

Concrete Construction Appliances. Cowan Mfg. Co., Milwaukee, Wis. Descriptive catalog, pp. 11, 8½ x 8½ in. Illustrated. Includes adjustable sheet, corbel hangers, form and trench braces, column clamps, etc.

Concrete Mixers and Mixing. Kensington Machine Co., Milwaukee, Wis. Catalog No. 21, pp. 248, 7½ x 10½ in. Illustrated. Includes descriptions of various concrete mixers and mixing (including two pages on deals with the proper time of mixing), the automatic measuring of water, and the use of the Kensington batch meter to ensure the mixing of each batch for a standard time.

SEARCHLIGHT SECTION

Contracts To Be Let

PROPOSALS

Bids received until July 16, 1917.

Barge Canal Terminals

STATE OF NEW YORK, OFFICE OF SUPERINTENDENT OF PUBLIC WORKS

Albany, N. Y., June 15th, 1917.

Sealed proposals will be received by the undersigned at his office in the Capitol at Albany, N. Y., until twelve o'clock noon of Friday, July 13th, 1917, at which place and hour they will be publicly opened and read, for the construction of Barge canal terminals pursuant to the provisions of Chapter 746 of the Laws of 1911, and of the acts amendatory thereof, as follows:

TERMINAL CONTRACT NO. 103.

For furnishing, installing and testing portable package freight conveyors for terminals at Rochester, Utica and Schenectady.

Contract plans sheets 1 and 2.

Plans may be seen and detailed specifications, engineers' estimate of quantities, proposal blanks, form of contract and bonds required and other information for proposers may be had at the office of the Superintendent of Public Works at Albany, N. Y., at the office of the Assistant Superintendent of Public Works for the Middle Division at Syracuse, N. Y.; at the office of the Assistant Superintendent of Public Works for the Western Division at Rochester, N. Y., and at the canal office, Spaulding's Exchange, Buffalo, N. Y.

Copies of detailed plans of drawings may be obtained from the State Engineer and Surveyor at Albany, N. Y., upon payment to him of the cost of producing them.

Monthly estimates will be paid of ninety per centum (90 per cent.) of the work done at the contract price. Every proposal for said work must be accompanied by a money deposit in the form of a draft or certified check upon some good banking institution in the City of Albany or New York issued by a national or State bank, in good credit within the State and payable at sight to the Superintendent of Public Works for five per centum (5 per cent.) of the amount of the proposal.

The person whose proposal shall be accepted will be required to execute a contract and furnish bonds within ten days from the date of notice of award delivered to him or them in person or mailed to the address given in the proposal.

Upon execution of the contract and approval of bonds the certified check or draft will be returned to the proposer unless the same shall have been proceeded for collection prior to such time, in which case the amount of the deposit will be refunded by the Superintendent of Public Works.

The deposits of bidders other than the one to whom the award of contract shall be made will be returned immediately after the award has been made.

The bond required for the faithful performance of each contract shall be in such sum as shall be fixed by the Superintendent of Public Works, which sum shall not be less than twenty per centum (20 per cent.) of the estimated cost of the work according to the contract price, and an additional bond, known as the labor bond, in the sum of ten per centum (10 per cent.) of the amount of the estimated cost of the work according to the contract price, will be required as security that the contractor will pay in full at least once in each month all laborers employed by him upon the work specified to be done in the contract.

In the event that more than one surety company is offered as surety on said bonds co-insurance only will be accepted.

Each proposal must be addressed to the Superintendent of Public Works, Albany, N. Y., and must be endorsed on the envelope with the name of the construction for which the proposal is made.

Award, if made, will be made to the person or persons whose proposal shall be lowest in cost to the State for doing the work and which shall comply with all provisions required to render it formal. Before any award shall be made the lowest bidder will be required to satisfy the Superintendent of Public Works of his ability to provide suitable equipment and materials for the proper performance of the work.

The right is reserved to reject all proposals and readvertise and award the contract in the regular manner if, in the judgment of the undersigned, the interests of the State will be enhanced thereby. W. W. WOTHERSPOON,
Superintendent of Public Works.

Official Proposals

Price, $3.60 an inch—Copy can be received until Wednesday, 10 a. m. for issue mailed the next day

PROPOSALS

Bids received until July 12, 1917.

Deep Well Pump and Motor

Cuba City, Wis.

Sealed proposals will be received at the office of the Village Clerk, Cuba City, Wisconsin, at eight (8) o'clock P. M. on the 12th day of July, 1917, for drilling a deep well and installing a new pump and motor, consisting of the following approximate quantities:

250 lin.ft.—12 in. well cased complete.
500 lin.ft.—10 in. hole.
Deep well pump and pump head in place.
Motor in place.

Payment to be made in cash. Certified check on Cuba City bank for $500. Plans and specifications and forms on file with the Village Clerk or Engineer.

WALTER BREWER,
Village Clerk.
J. G. Thorne & Company, Engineer,
317 Howes Block,
Clinton, Iowa.

UNITED STATES ENGINEER OFFICE, Room 710, Army Building, 39 Whitehall Street, New York, N. Y.—Sealed proposals for dredging in Wappinger Creek, N. Y., and in harbors at Tarrytown and Peekskill, N. Y., will be received here until 12 M., July 30, 1917, and then opened. Further information on application.

PROPOSALS

Bids received until July 9, 1917.

OFFICE OF THE STATE COMMISSION OF HIGHWAYS

Albany, N. Y.

Sealed proposals will be received by the undersigned at their office, No. 55 Lancaster Street, Albany, N. Y., at one o'clock p. m. on Monday, the 9th day of July, 1917, for the repair of highways in the following counties:

Albany (two contracts—resurfacing and reconstruction).
Broome (two contracts—resurfacing)
Cattaraugus (one contract—resurfacing).
Chautauqua (one contract—reconstruction).
Columbia (one contract—reconstruction).
Erie (one contract—resurfacing).
Essex (one contract—resurfacing).
Greene (one contract—surface treatment).
Herkimer (one contract—surface treatment).
Jefferson (one contract—resurfacing).
Livingston (two contracts—resurfacing).
Monroe (one contract—resurfacing).
Oneida (two contracts—resurfacing and surface treatment).
Ontario (one contract—resurfacing).
Orange (one contract—reconstruction).
Oswego (two contracts—surface treatment).
Otsego (one contract—reconstruction).
Saratoga (one contract—resurfacing).
Seneca (one contract—resurfacing).
Steuben (one contract—resurfacing).
Washington (one contract—surface treatment).

Also broken stone contract No. 74, Erie County, on Road 1038 for No. 1 Stone 450 tons.
No. 2 Stone 375 tons.
No. 3 Stone 3200 tons.

Maps, plans, specifications and estimates may be seen and proposal forms obtained at the office of the Commission in Albany, N. Y., and also at the office of the Division Engineers in whose division the roads are to be improved. The addresses of the Division Engineer and the counties in which they are in charge will be furnished on request.

The especial attention of bidders is called to "General Information for Bidders" on the itemized proposal, specifications and contract agreement.

EDWIN DUFFEY, Commissioner.
I. J. MORRIS, Secretary.

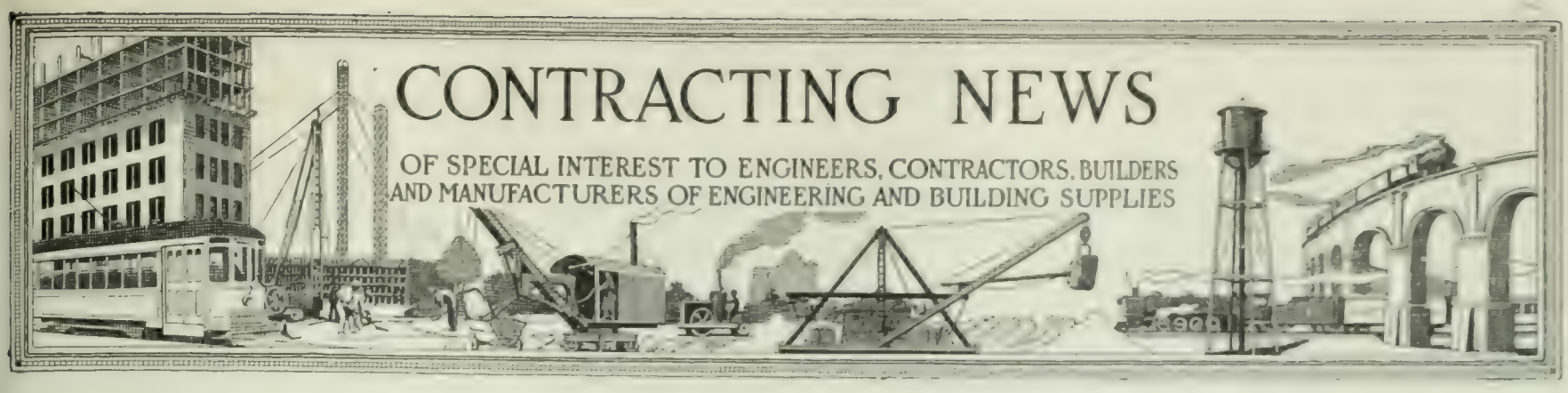
Bids received until July 10, 1917.

Log Road Construction

Putnam, Va.

Bids will be received by the undersigned for the grading of 6 miles of standard gauge log road in Russell and Buchanan Counties, Virginia, according to Plans and Specifications, which can be seen at the office of the undersigned at Putnam, Va., or at the office of J. P. Williams, Jr., Chief Engineer, Tazewell, Va.

WHITE OAK LUMBER CO.
Bids close July 10th, 1917.



Proposals

For Proposals Advertised See Pages 53 to 59 Inclusive

WATER-WORKS

Bids Close		See Eng. News-Record
July 16.	Belle Plaine, Minn.	July 12
July 17.	New York, N. Y.	June 14
	Adv. June 7 to 28 and July 5.	
July 17.	Brooklyn, N. Y.	July 12
July 19.	Newark, N. J.	July 12
July 25.	Waverly, Ia.	July 12
Sept. 11.	New York, N. Y.	July 12

SEWERS

July 16.	Camden, N. J.	July 12
July 17.	Davenport, Ia.	July 12
July 17.	Hamilton, O.	July 12
July 17.	Toronto, Ont.	July 12
July 18.	Phila., Pa.	July 12
July 19.	Cleveland, O.	July 12
July 21.	Hagerstown, Md.	July 12
July 23.	Wingdale, N. Y.	June 28
	Adv. June 28 to July 12.	
July 24.	Crosby, Minn.	July 12
July 31.	Linndale, O.	July 5
July 31.	Glenwood, Minn.	July 12
Aug. 1.	Atwater, Minn.	July 12
Aug. 1.	Hazeltown, Md.	July 12

STRUCTURAL STEEL WORK

July 15.	Orange, Tex.	June 7
	Adv. June 7 to 21.	
July 17.	West Palm Beach, Fla.	June 21
	Adv. June 21.	
July 17.	Quincy, Ill.	July 12
July 19.	Virginia City, Mont.	July 12
July 25.	Warren, O.	July 12
July 30.	New York, N. Y.	July 12
Aug. 2.	Miami, Fla.	June 28
	Adv. June 28 and July 5.	
Aug. 14.	Brazil, Ind.	July 12
Aug. 16.	Hamlin, W. Va.	July 12

REINFORCED CONCRETE

July 14.	Quincy, Ill.	July 5
July 15.	Kansas City, Kan.	June 28
July 16.	Berkeley Springs, W. Va.	June 28
July 16.	Colfax, Wash.	July 12
July 17.	Geneva, Neb.	June 28
July 17.	New Brunswick, N. J.	June 28
	Adv. June 28 and July 5.	
July 17.	Owantonna, Minn.	July 12
July 19.	Marion, Ind.	July 12
July 27.	Somerville, N. J.	July 12
July 28.	Sullivan, Ind.	July 12
July 30.	Watsontown, Pa.	July 5
Aug. 6.	Greenville, Miss.	July 12

STREETS AND ROADS

July 14.	Medina, O.	July 12
July 14.	Richmond, Va.	July 12
July 14.	Indiana	June 14
July 14.	Pine Bluff, Ark.	June 28
July 14.	Lincoln, Neb.	July 5
July 14.	Rochester, Ind.	July 5
July 14.	Hightstown, N. J.	July 12
July 16.	California	June 28
July 16.	Victoria, Tex.	July 12
July 16.	Union, N. J.	July 12
July 16.	Elizabeth, N. J.	July 12
July 16.	Ashland, O.	July 12
July 16.	Grayville, Ill.	July 12
July 16.	Westfield, N. J.	July 12
July 17.	Seattle, Wash.	July 5
July 17.	Princeton, N. J.	July 12
July 17.	Henderson, Ky.	July 12
July 17.	Baltimore, Md.	July 12
July 18.	Zanesville, O.	July 5
July 18.	Belvidere, N. J.	June 28
	Adv. June 28 to July 12	

Bids Close		See Eng. News-Record
July 16.	Port Orchard, Wash.	July 5
July 18.	Hawthorne, N. J.	July 5
July 18.	Davenport, Ia.	July 12
July 19.	Flemington, N. J.	June 28
July 19.	McCormick, S. C.	July 12
July 20.	Cincinnati, O.	July 12
July 20.	Walla Walla, Wash.	July 12
July 21.	Wauseon, O.	July 5
July 23.	Indiana	July 12
July 24.	Pennsylvania	July 12
July 24.	Pennsylvania	June 28
July 24.	Pottstown, Pa.	July 12
July 25.	Warsaw, Ind.	July 12
July 25.	Indiana	July 12
July 25.	Idaho	July 5
Aug. 6.	Clifton, Ariz.	July 12
Aug. 7.	Indiana	July 12
Aug. 13.	Lewiston, Idaho	May 24
Aug. 16.	Hamlin, W. Va.	July 12

INDUSTRIAL WORKS

July 25.	Brooklyn, N. Y.	July 12
Aug. 1.	St. Petersburg, Fla.	July 5

EXCAVATION AND DREDGING

July 14.	Cambridge, Minn.	July 5
July 14.	Huntington, Tenn.	July 5
July 14.	Mankato, Minn.	July 5
July 16.	Hanna, Ill.	June 28
	Adv. June 28 to July 12.	
July 16.	Lake Shore (Spanish Fork Post Office)	July 5
July 16.	Mason City, Ia.	July 12
July 16.	Canyon City, Ore.	July 12
July 18.	Glenwood, Ia.	June 21
	Adv. June 21 and 28 and July 5.	
July 18.	Des Moines, Ia.	July 12
July 18.	Calhoun, Ky.	July 12
July 19.	Morris, Minn.	July 12
July 19.	Greenville, Miss.	June 28
	Adv. June 21 and 28.	
July 20.	St. Cloud, Minn.	June 21
July 20.	Nevada, Ia.	July 12
July 21.	Kankakee, Ill.	July 5
July 23.	Marshall, Minn.	July 12
July 24.	Slayton, Minn.	July 5
July 25.	Dyersburg, Tenn.	July 12
July 27.	Detroit, Mich.	July 5
July 30.	Walker, Minn.	July 12
July 31.	Susanville, Cal.	July 12
Aug. 1.	Sac City, Ia.	July 12

BUILDINGS

July 16.	Great Bend, Kan.	June 28
July 16.	Crosco, Ia.	July 5
July 16.	Blue Hill, N. D.	July 12
July 16.	Mapleton, Ia.	July 12
July 16.	Monte Vista, Colo.	July 12
July 18.	Concordia, Kan.	June 28
July 18.	Randolph, Minn.	July 12
July 19.	Shenandoah, Ia.	June 28
July 20.	Akron, O.	July 5
July 21.	Greencastle, Ind.	July 12
July 21.	Jacksonville, Fla.	July 12
July 21.	Martins Ferry, O.	July 5
July 21.	Livingston, Mont.	July 5
July 23.	Hoisington, Kan.	July 12
July 23.	Cincinnati, O.	June 28
	Adv. June 21 to July 12.	
July 25.	Cherokee, Okla.	July 5
July 25.	Mare Island (Vallejo P. O.), Cal.	July 12
July 25.	Puget Sound (Bremerton P. O.), Wash.	July 12
July 26.	Key West, Fla.	July 12
July 26.	Gallatin, Tenn.	June 28
	Adv. June 21 and 28.	
July 27.	Vernon, Tex.	June 28
July 30.	New York, N. Y.	July 12
July 30.	Keyport, Wash.	July 12
July 30.	San Antonio, Tex.	July 12
July 30.	Newport, R. I.	July 12
July 31.	Chardon, Neb.	July 5
Aug. 3.	Winchester, Mass.	July 5
Aug. 6.	Globe, Ariz.	July 5
Aug. 14.	West Point, Ga.	July 12
Aug. 17.	Wash., D. C.	July 12

MISCELLANEOUS

July 16.	Street Signs, Camden, N. J.	July 12
July 18.	Incinerator, Outremont, Que.	July 5

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official

WATER-WORKS

Proposed Work

N. Y., Olean—Ed. Water Comrs. asked City Council to issue $17,000 bonds to install filtration plant. W. Sheehan, supt.

N. J., South Orange—See Sewerage.

Pa., Mt. Joy—City having plans prepared by Gannett, Seelye & Fleming, engrs., 204 Locust St., Harrisburg, for filter plant. About $15,000. H. M. Stauffer, chn.

Fla., Appalachicola—City plans water-works extension involving 4000 ft. 6-in. and 2000 ft. 8-in. piping and [illegible]. About $15,000. Address Chas. Fox, Wis.

Fla., St. Augustine—City having [illegible] prepared for water-works improvement. A. J. Peller, supt.

O., Greenville—City will sell $40,000 bonds July 25 for water-works improvements. G. A. Johnson, 150 Nassau St., New York City, engr. Noted July 5.

Ind., Lawrenceburg—City having plans prepared by [illegible] engr. for water-works. About $40,000. J. M. Preston, clk.

Wis., Superior—Council plans to install 15-in. water main with [illegible]. About $75,000. A. Lemmery, supt.

Minn., Duluth—City will appropriate $40,000 for installing electric power in Lakewood pumping station. W. Palmer, ch. engr.

Minn., Ogilvie—Village having plans prepared by J. F. Hosier, [illegible] Bldg., St. Paul, for plant. [illegible] Noted July 5.

Minn., St. James—City [illegible] bonds for water-works [illegible]. Noted June 7.

Kan., Altoona—Council [illegible] to enlarge water and electric plants. W. B. Hutton & Co., [illegible], Kansas City, Mo., engrs. Noted June 7.

Kan., Clearwater—City [illegible] for water-works improvements and [illegible]. W. B. Hutton & Co., [illegible], Kansas City, Mo., engrs.

(Water-Works Continued)

N. D., Dickinson—City plans to extend water and sewerage systems, about 10,000 ft. Address City Clk.

N. D., Towner—(Official)—City rejected bids for reinforced reservoir. Noted June 28.

Mo., East Alton—See "Sewers."

Mo., Kansas City—City plans laying 41 mi. of 12-in. water along south side of Kaw River. F. Lowther, supt.

Tex., Abilene—City election Aug. 15 to vote on $45,000 bonds for constructing storage reservoir to have capacity of 5,000,000 gal. Noted June 14.

Tex., Abilene—City plans to install pumping plant and improve present water system. About $40,000. W. A. Riney, city engr.

Okla., Ada—City having plans prepared for increasing water supply, including sewer with 48-in. pipe in 30-in. plank at Byrds Mill, new intake laying new water mains and 50,000-gal capacity, elevated tank, etc.

Okla., Enid—City voted $50,000 bonds to extend water works. F. N. Illmon, supt.

Okla., Waurika—City election soon to vote on $15,000 bonds for improving water system. Address City Clk.

Utah, Salt Lake City—See "Sewers."

Wash., Seattle—City having plans prepared for water mains in Alki Ave. About $45,000. A. H. Dimock, city engr.

Wash., Walla Walla—City having plans prepared for reservoir and improving water-works system. About $80,000. R. F. Mclean, supt.

Wash., Wenatchee—City plans pipe line to the Squilchuck filter plant at Okanogan St. reservoir and other improvements to water-works. Bids to be received. C. T. White, engr.

Cal., Vallejo—City plans additional dam on Green Valley Creek to increase water supply. About $85,000. G. Von Geldern, Hobart Bldg., San Francisco, engr.

N. B., Edmunston—Town plans addition to sewerage and sanitary systems. About $15,000.

Ont., Weston—See "Reinforced Concrete."

BIDS DESIRED

N. Y., Brooklyn—Until July 17, by W. Williams, comr. water supply, Gas and Electricity, Municipal Bldg., New York City, for furnishing, delivering, installing and testing 24-in. special and valve box castings, valves and double-nozzle fire hydrants.

N. Y., New York—(Official)—Until Sept. 13 estimates of water for the Water Supply, 22 Municipal Bldg., from Esopus, Centre and Chestnut Sts. for Shaughnessy tunnel, be part of Schoharie watershed section for New York City water supply, advertised in this issue.

N. J., Newark—Until July 18, by Bd. of Sewer and Water Comrs. for 2,500 ft. pipe sewer in M. St. Bertrand, city engr.

Ia., Waverly—(Official)—Until July 22 by City for constructing 2½ mi. and 1½ mi. rein.-con. pipe and appurtenances to connect into the Former plan especially. F. A. Lee, city clk. C. P. Chase, Clinton, engr. Noted June 16.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—City let contract laying water pipe and appurtenances for high pressure fire protection system to M. O. Rose, 131 Saginaw St., Roxbury. About $94,247.

★**O., Cleveland**—City let contract for 12-in. and 16-in. water mains on Broadway to Bradley Bridge Co., Cleveland, engr. Noted June 14.

O., East Liverpool—City received bids for water-works improvements, as follows: Pittsburgh Filter Co., Farmers Bank Bldg., Pittsburgh, general construction, $53,500; filter equipment, $2,850; McLaughlin & O'Neil, pipe distributing system, $26,693; Merkle Heinz Machinery Co., 508 Interstate Bldg., Kansas City, Mo., pumping machinery, $6755, hydrants and valves, $7326; American Cast Iron Pipe Co., 1 Bway., New York City, c.i. pipe, $85,445.

Ind., Kendallville—City let contract for 16-in. water main to Indiana Bridge Co., Cleveland, engr. Noted June 7.

★**Minn., Eveleth**—City let contract for water-works improvements to Pittsburgh Filter Co., Farmers Bank Bldg., Pittsburgh, general construction, $53,500; filter equipment, $2,850; McLaughlin & O'Neil, pipe distributing system, $26,693; Merkle Heinz Machinery Co., 508 Interstate Bldg., Kansas City, Mo., pumping machinery, $6755, hydrants and valves, $7326; American Cast Iron Pipe Co., 1 Bway., New York City, c.i. pipe, $85,445.

Neb., Unadilla—City received bids June 11 for water system from Katz Constr. Co., 618 Brandeis Bldg., Omaha, $10,194; Intermountain Constr. Co., Tecumseh, $15,552. Noted June 7.

★**N. D., Anamoose**—See "Sewers."

★**Mont., Livingston**—City let contract water system as follows: Pittsburgh Filter Co., Farmers Bank Bldg., Pittsburgh, general construction, $53,500, filter equipment, $2,850; McLaughlin & O'Neil, pipe distributing system, $26,693; Merkle Heinz Machinery Co., 508 Interstate Bldg., Kansas City, Mo., pumping machinery, $6755, hydrants and valves, $7326; American Cast Iron Pipe Co., 1 Bway., New York City, c.i. pipe, $85,445.

★**Que., St. Johns**—City let contract building filter, water tank and replacing several mains at water-works to Laurin & Leitch, 5 Beaver Hall Sq., Montreal, $195,975.

SEWERS

Proposed Work

Mass., Fitchburg—City soon lets contract installing one unit Starr sewage disposal system. About $25,000.

Mass., Leomister—City having plans prepared by Green Starr Eng. Co., 16th and Chestnut Sts., sewage disposal plant. About $15,000.

R. I., Providence—City passed resolution to issue $100,000 bonds to install sewers. M. H. Brondson, city engr.

N. Y., Schenectady—Council appropriated $40,000 to install sewers in various streets, including Rugby Rd. and Eastern Ave. T. Wooley, city engr.

N. J., South Orange—Village will sell $35,000 bonds July 16 for sewer improvements; $19,000 for water-works improvement; $12,000 street improvement; $23,000 for eliminating grade crossing. F. Fenner, village treas.

N. J., Trenton—City plans to install sewers Cain, Louis and Centennial Aves., Trent St., Greeley and Peake Alley. L. D. Hirsch, clk.

Ga., Atlanta—City plans improvements to sewerage system. About $22,000. H. N. Hurt, city engr.

O., Cincinnati—City plans sewer in California Ave., also paving portion of Central Ave. F. Krug, city engr.

O., Cincinnati—City will issue $800,000 bonds for acquiring easements for sewers through properties. F. Krug, city engr.

O., Cleveland Heights—(Warrensville P. O.)—Village to sell $10,000 bonds July 16 to install sewers. H. H. Canfield, clk.

O., Dover—City plans sanitary sewer on west side of North Wooster Ave. E. Arnold, city engr.

O., Marion—City plans constructing sanitary and storm sewer in portion of Spencer St. H. H. Noyes, city engr.

O., Newark—City plans sewer in portion of Arlington Ave. C. H. Wells, city engr.

O., Toledo—City plans storm sewer neighborhood Stickney Ave., Mulberry St. and section beyond Forest Cemetery to relieve flood conditions. About $150,000. W. Harmon, city sanitary expert.

Mich., Escanaba—City having plans prepared for 2 mi. concrete sewer. M. J. Hodson, city engr.

Ill., Rock Island—City had plans prepared 2 sewers in portions of 9th, 11th and 18th Sts. and 15th Ave. About $10,645. W. Treichler, city engr.

Wis., Milwaukee—City will issue $400,000 bonds to install for sewerage system. G. Stall, city engr.

Ia., Primghar—City plans installing sewerage system and paving streets. About $[illegible] meeting city clk.

Minn., Caledonia—Village soon lets contract for sewerage system. O. Merlo, clk. J. B. Dunn, 311 Commercial Bldg., St. Paul, engr. Noted May 14.

Minn., Comfrey—City plans to install complete sewerage system. C. A. Stenson, clk.

Minn., Fairmont—City plans addition to sanitary sewerage system. About $60,000. A. [illegible] engr.

Minn., St. Paul—City had plans prepared for sewers in portions of Iowa, Isabel and other streets. O. Clausen, city engr.

Minn., Waseca—City election July 16 to vote on $25,000 bonds for constructing sewers. J. Madigan, city clk.

Kan., Hutchinson—City plans 32-in. drain to care for storm waters of northeastern part of city. About $30,000. G. L. McLane, city engr.

N. D., Dickinson—See "Water-Works."

Mo., East Alton—City plans extending water-works and sewerage systems. Address City Clk.

Tex., Lampasas—City plans to install sewerage system. Address City Clk.

Okla., Commerce—City voted $25,000 bonds for sewerage system. Benham Engr. Co., Colcord Bldg., Oklahoma, engrs. Noted June 7.

Okla., Oklahoma—City plans to install activated sludge plant for treating sewage. About $70,000. G. V. McClure, city engr.

Okla., Okmulgee—City election soon to vote on $145,000 bonds for sewer improvements. Benham Engineering Co., Colcord Bldg., Oklahoma, engrs. Noted Apr. 17.

Okla., Sentinel—City election soon to vote on $15,000 bonds for improving sewerage and light systems. W. B. Rollins & Co., 209 Ry. Ex. Bldg., Kansas City, Mo., engrs.

N. M., Las Vegas—City soon receives bids storm sewer and paving on 7th Ave. Address City Clk.

Idaho, Moscow—City plans to construct pipe line to locate sewerage-disposal plant. A. Smith, city engr., estimates cost between $7300 and $21,500.

Idaho, Pocatello—City plans sewers in Lateral Sewer Dist. No. 12. About $25,290. A. R. Dawson, city clk.

Utah, Salt Lake City—(Official)—City defeated $176,000 bonds to install storm sewers; $100,000 to build bridges; $316,000 to improve streets; $808,500 to improve, extend and enlarge water system; $200,000 to improve parks and build bath house. S. Q. Cannon, city engr. Noted June 14.

Ariz., Jerome—City will soon sell $40,000 bonds for sewers. Olmstead & Gillelen, Hollingsworth Bldg., Los Angeles, engrs.

Wash., Seattle—See "Streets and Roads."

Wash., Seattle—City having plans prepared for sewerage system and purification plant. About $1,025,000. A. H. Dimock, city engr.

Ore., Pendleton—City to sell $20,000 bonds for constructing septic tank. Address City Clk.

N. B., Edmunston—See "Water-Works."

Ont., Toronto—City plans to install sewers portion Don Esplanada, west side. About $20,500. W. A. Littlejohn, city clk.

Ont., Toronto—City plans sewers in Landsowne Ave. About $36,670. R. Harris, wks. comr.

BIDS DESIRED

N. J., Camden—Until July 16 by Council for sewers in Carman and Lewis Sts., and retopping sewer on Federal St. F. S. Vanhart, chn. st. comn. Noted June 21.

Pa., Phila.—Until July 18, by G. E. Datesman, dir. pub. ser., for further work on northeast sewage treatment plant, O and Lycoming Sts.

Md., Hagerstown—Until Aug. 1, by Sewerage Comn., for sewers in southeast section. About $100,000. J. B. Ferguson, 43 North Jonathan St., engr.

O., Cleveland—Until July 19, by City, for installing sewers in portions of East 116th, East 171st and Corlett Sts. R. Hoffman, city engr.

O., Hamilton—(Official)—Until July 17, by Dept. Pub. Ser., for furnishing following materials: About 47,500 ft. of from ¾- to 4-in. standard black pipe; 500 curb boxes; 1400 gas cocks; 600 1- to 1¼-in. black long screws and 400 1¼ x 1-in. black beaded ells. H. R. Garver, dir.

O., Toledo—See "Streets and Roads."

Ill., Grayville—See "Streets and Roads."

Ia., Davenport—Until July 17, by Sewer Com., for sewer drains in Rock Island Dist., Valley and other streets. About $100,000. A. R. Boudinot, city engr. Noted June 7.

Min., Atwater—Until Aug. 1 by Village for installing sewerage system involving 24,000 ft. of from 8- to 15-in. pipe. C. A. Swenson, clk.

Sewers (Continued)

Minn., Crosby—Until July 24, by City, for installing sanitary trunk sewer and lateral sewers. H. L. Nicholson, clk. C. S. Scheuer, engr.

Minn., Glenwood—Until July 31, by A. Igrens, city clk., for sewer in Franklin St., and 9000 ft. in branches.

Ont., Toronto—Until July 17, by T. L. Church, chn. bd. control, for sewers in portions of Younge St., Rosedale Creek, and Lawton Ave.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★N. Y., New York—City let contract tunnel relief sewer and appurtenances in portion of West 46th St. to Melrose Constr. Co., 147 East 125th St., $83,630.

★N. J., Cliffside Park—City let contract lateral sewers in several streets to Bergen Contr. Co. About $15,665.

★La., New Iberia—City let contract sewerage system to Hamilton Constr. Co., Shreveport. About $95,000. Noted May 17.

★Tenn., Fayetteville—See "Streets and Roads."

★O., Dayton—City let contract Vernon Pl. storm sewer to W. S. Kerchner & Son, $24,400.

★Mich., Muskegon Heights—(Official)—City let contract screen house, 2 sedimentation tanks, sludge drainage bed, etc., to G. B. Clark, Ludington, $590,000.

★Ill., Warsaw—(Official)—City let contract installing sanitary sewers, etc., to Harness Bros., Ottumwa, Ia., $21,336. Noted June 21.

★Ill., West Frankfort—(Official)—City let contract sewerage system to Craine Bros., Murphysboro, $81,933.

★Ia., Sioux City—City let contract West Morningside sewer, about 6 mi. long, to Cady & Savonell, $30,000.

★Minn., Virginia—City let contract installing tile storm sewers, Rooney's addition to C. Christopherson, 512 2nd St., $11,000.

★Tex., Port Arthur—City let contract sewers and pumping station to Caldwell Constr. Co., Texarkana, $70,097. Noted Apr. 12.

★Okla., Oklahoma City—City let contract sewers to Burkham Constr. Co., St. Louis. About $183,343. Noted Apr. 19.

★Cal., Daly City—See "Streets and Roads."

★Cal., Los Angeles—City let contract sewage disposal plant at County Farm, to M. Matic, $10,070.

★B. C., Trail—City let contract sewerage system to J. A. Broley & Co., Fernie, $24,650. Noted May 31.

STRUCTURAL STEEL WORK

Proposed Work

N. J., Ocean City—City plans bridge over Great Egg Harbor Bay from Beesley's Point to Somers Point. A. Champaion, mayor.

N. C., Charlotte—County sold $100,000 bonds to build bridges.

Wis., Prairie du Chien—(Official)—Prairie du Chien & Wyalusing Bridge Co. retained J. H. A. Brahtz, engr., St. Paul and Mankato, Minn., to prepare plans 700-ft. toll highway bridge over Wisconsin River. Noted May 31

Minn., Virginia—Duluth, Missak & Northern Ry. plans to construct viaduct over Gilbert Rd. to carry street traffic. About $100,000. H. L. Dresser, Duluth, ch. engr.

Kan., Topeka—City having plans prepared rebuilding Kansas Ave. Bridge over Soldier Creek, 140 ft. long. About $25,000. A. R. Young, city engr.

Kan., Topeka—Missouri Pacific R.R. plans bridge over Kaw River to replace present bridge to be removed and new steel truss span 250 ft. long to replace same. E. A. Hadley, 1 Ry. Exchange Bldg., St. Louis, Mo., ch. engr.

Mont., Lewiston—Great Northern Ry. plans 1600-ft. bridge over Musselshell River. A. H. Hogeland, 4th and Jackson Sts., St. Paul, ch. engr.

Mo., Moberly—City, Wabash and Missouri, Kansas & Texas Railroads will build viaduct over Robins St. About $14,700 cost to pay $11,695, Wabash, $18,[illegible] and Missouri, Kansas & Texas, $14,7[illegible]. E. F. Lonnbladh, Dallas, ch. engr. Adv. and

Okla., New Castle—Oklahoma City-New Castle Bridge Co., incorporated with $150,000 capital stock, will build bridge over South Canadian River between Oklahoma and Grady Cos. C. A. Schweinle, F. Thompson and M. D. Scott, Oklahoma, incorporators. Noted June 21.

Okla., Poteau—See "Streets and Roads."

Utah, Salt Lake City—See "Sewers."

Utah, Salt Lake City—(Official)—Citizens defeated bonds to build bridge over Jordan River at 4th S. and 5th S. Sts. and surplus canal at Redwood Rd. About $22,500. S. Q. Cannon, city engr. Noted June 14.

Ont., Markham—County plans 80- to 100-ft. bridge over stream on Locust Hill. E. A. James, Excelsior Life Bldg., Toronto, comr.

Ont., Toronto—Toronto-Hamilton Highway Comn. plans bridge over Etobicoke Creek, York Co. About $13,270. H. S. Van Scoyoc, Toronto, engr.

BIDS DESIRED

N. Y., New York—Until July 30, by M. M. Marks, boro. pres., building Park Ave. viaduct from 40th St. to Grand Central Station.

W. Va., Hamlin—Until Aug. 16, by County, building bridges over 2-Mile Creek and Upper 2-Mile Creek at West Hamlin; also 4 small bridges and culverts. J. M. Oliver, Huntington, engr.

O., Warren—(Official)—Until July 25, by Bd. Co. Comrs., for Huston Bridge on Rd. No. 101, Sect. "A," Newton Twp. M. H. Evans, clk. Noted June 21.

Ind., Brazil—Until Aug. 14, by Co. Comrs., for Brunswick Bridge over Eel River. About $35,000. A. Graeser, co. audr. Noted July 5.

Ill., Quincy—Until July 17, by Co. Comrs., for 12 bridges.

Mont., Virginia City—Until July 19 by State Highway Comn., for 1 130-ft. span combination highway bridge across Saline Spring Creek and 1 65-ft. combination highway bridge across Odell Creek, Madison Co. D. A. Noble, co. clk. C. C. Adams, co. engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Boston—Metropolitan Park Comn. received low bids building bridge over Neponsit River between Boston and Quincy, from Bay State Dredging and Constr. Co., 247 Atlantic Ave., $360,000; Holbrook, Cabot & Rollins, 6 Beacon St., $381,074; Hugh Nawn Contr. Co., 82 Saven St., $427,000. Noted June 28.

★O., Columbus—(Official)—City let contract extension to Rich St. bridge to Capitol Constr. Co., Ruggery Bldg., $89,000. Noted June 28.

★Wis., Superior—Co. let contract installing culverts and grading on South Superior and Olive Rd. to M. Peterson, 1201 13th St., about $18,772. Noted June 14.

★Ia., Eldora—County let contract 2 bridges to Welden Constr. Co., about $14,114.

★Wash., Montesano—Co. Comrs. let contract 200-ft. span over Chehalis River to Tweeden & Mills, California Bldg., Tacoma, $12,587.

★Wash., Seattle—Co. Comrs. let contract 180-ft. steel bridge with 175-ft. approach to Monson Constr. Co., Portland, $34,829. Noted June 21.

REINFORCED CONCRETE

Proposed Work

Pa., Ardmore—Atlantic Co. having plans prepared for 5-story rein.-con. and steel addition to plant here.

Pa., Phila.—De Long Hook & Pew Co. having plans prepared for 4-story, 80x[illegible]-ft. rein.-con. plant on 21st St. W. Steele & Sons Co., 1610 Arch St., archts.

Ala., Montgomery—Louisville & Nashville R.R. plans rein.-con. bridge on Bell St. Alexr. Shand, W. H. Courtenay, Louisville, engr.

Ill., Chicago—Ohio Match Co., 11 North Dearborn St., plans 8-story, rein.-con. office building on Ohio St. Cost between $[illegible] and $[illegible].

Minn., Rochester—(Official)—City engr. J. H. A. Brahtz, engr., Minneapolis, to prepare plans for concrete bridge.

Kan., Independence—Atchison, Topeka & Santa Fe R.R. (Hastings, Gilsey) receives bids for rein.-con. viaduct. About $[illegible]. H. A. Rutledge, Topeka, ch. engr.

Neb., Omaha—Waterloo Creamery Co., 16th and Pierce Sts., soon lets contract 2-story, 50x140-ft., rein.-con. and steel creamery here. About $225,000. C. A. Berger, 811 Sykes Bldg., Minneapolis, archt.

Mont., Butte—City plans to build concrete sewage-disposal plant. W. C. Matthews, city engr.

Ark., Little Rock—Bd. Comrs. will build rein.-con. bridge over Arkansas River a site of present free bridge. About $450,000. M. Wright, chf. Harrington, Howard & Ash, Orear Leslie Bldg., Kansas City, Mo.

Wash., Bellingham—Council plans new concrete bridge over Whatsom Creek at Dupont and Prospect Sts. About $11,000. C. Lindberg, city engr.

Ore., Portland—City and Oregon-Washington R.R. & Navigation Co. plan rein.-con. viaduct over tracks on East 33rd St. P. H. Dater, city engr. S. Murray, Portland, ch. engr. R.R.

Cal., Oceanside—Bd. Supervs. will build concrete bridge over Santa Margarita River on state highway north Oceanside. About $40,000.

Ont., Weston—City having plans prepared by James, Loudon & Hertzberg, engrs., for rein.-con. intake crib, concrete dividing wall sedimentation basin and lining basin with concrete. J. H. Taylor, supt.

BIDS DESIRED

N. J., Somerville—Until July 27, by Bd. Freeholders, for concrete arch bridge on Chimney Rd. J. Dougherty, co. engr.

Pa., Phila.—(Official)—Until July 24, by W. S. Twining, dir. pub. serv., for Contract No. 526, concrete track floor, c.i. floor drains and rein.-con. slab footwalks from Callowhill St. to Indiana St., involving 15,630 lin.ft. structure, Contract No. 527, concrete track floor c.i. floor drains and rein.-con. slab footwalks from Indiana to Dyre Sts., involving 15,000 lin.ft. structure, Contract No. 528, alternate proposal, grouping Contracts Nos. 526 and 527. W. S. Twining, dir.

Pa., Sunbury—(Official)—Until July 30, by A. Raker, co. controller, building 2000-ft. rein.-con. inter-county bridge over Susquehanna River between Watsontown, Northcumberland Co. and White Deer, Union Co. Adv. in this issue.

Pa., Uniontown—Until Aug. 3, by H. Kisinger, co. controller, building rein.-con. bridge over Georges Creek, Fairchance Boro. and over Meadow Run, Ohiopyle Boro.

W. Va., Fairmont—Until July 20, by Bd. Affairs, building rein.-con. bridge near Coal Run. A. J. Kerr, clk. Concrete-Steel Eng. Co., Park Row Bldg., New York City, engrs. Adv. in this issue.

Miss., Greenville—(Official)—Until Aug. 6, by Bd. Supervs., for rein.-con. bridge over Granicus Bayou. Bids opened July 2 for steel structure rejected. J. S. Allen, co. engr. Noted June 21.

Ind., Marion—Until July 19, by Co. Comrs., for rein.-con. bridge over Mississinwa River. M. McRae, aud.

Ind., Sullivan—Until July 28, by Co. Comrs. for 5 rein.-con. bridges. P. M. Daniels, aud.

Ill., Danville—(Official)—Until July 17, by County building rein.-con. arch bridge over Sugar Creek near Georgetown. Engr. W. S. Fellows, or asst. Indianola.

Ia., Waverly—[illegible] Water Works.

Minn., Owatonna—Until July 17, by County building rein.-con. state bridge No. 1161, 56-ft. span 15-ft. roadway. M. J. Parcher, aud.

Wash., Colfax—Until July 18, by Co. Comrs., building 3 rein.-con. and steel bridges over Union Flat Creek near La Crosse. J. M. McRae, co. engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★N. Y., Brooklyn—(Official)—Contract Construction Co., Manhattan, [illegible] Ave., New York City.

★N. Y., Scarsdale—(Official)—[illegible] contract rein.-con. and steel bridge over Bronx River, Central Ave., to Fullerton Engineering Co., 14 Murray Ave., New York City.

★Pa., Phila.—(Official)—[illegible] Fairmount Park Comn., for rein.-con. bridge over Wissahickon Creek, [illegible] Ave., to Campbell Construction Co., [illegible] Ave., Phila. Noted June 7.

★O., Cleveland—[illegible] Ave. bridge to [illegible] Co., [illegible] Bldg., Cleveland. Noted June 14.

Ind., Bedford—[illegible] contract for rein.-con. bridge over [illegible] to [illegible] Co., Indianapolis, at $49,000.

Residential Contracts (Continued)

★**Minn., Minneapolis**—N. P. Lee Hotel Security Bldg. of contract & specs. 100x[illegible]-ft. apts., [illegible] 1st Ave. N. to J. Lee & Co., 110 South 7th St. Cost $[illegible].

★**Minn., Rochester**—City let contract concrete dam 30 ft. high and [illegible] reservoir to Lunda Bridge & Steel Structural Co. of Nebraska. Cost $[illegible].

★**Tex., El Paso**—Y. M. C. A. let contract 3-story 70x90-ft. rein.-con. building to McGregor & Hough. About $[illegible].

★**Tex., Galveston**—Bd. Co. Comrs. and [illegible] entering Galveston let contract [illegible] constructing concrete portion of Galveston to Lubbin & Sarasohn, Inc., Marine Bldg., Buffalo. Cost about $1,725,- [illegible] will be letter or county and railway [illegible]. Work involves 2 concrete arch [illegible] extensions to be built at both ends of present structure on mainland and there will be 28 new arches on island of Galveston and 51 arches making total of 72 arches each having span of 40 ft.

Ont., Toronto—Swift Canadian Co. let contract [illegible] with [illegible] and cooling plant to Architect & Builders Exchange Lite Bldg. About $[illegible].

STREETS AND ROADS

Proposed Work

N. C., Asheville—City Comrs. and State Highway Comrs. passed resolution to build highway from Asheville to Knoxville.

N. Y., Syracuse—[illegible] Supvr. plans paving Watervale Rd., Pompey Twp.; also road [illegible] in Lysander and Manlius Twps. H. A. Allen, co. engr.

N. Y., Syracuse—City plans to resurface portion South Ave. H. A. Allen, city engr.

N. J., Bayonne—City plans paving Prospect Ave. and West 54th St., asphalt. W. F. Lee, city clk., W. L. Clarkson, engr.

N. J., Cape May—[illegible] Freeholders plans to rebuild 3400-mi. seashore road, bituminous concrete surface and 40,000 sq.yd. foundation. F. W. Fowkes, clk.

N. J., Jersey City—[illegible] Freeholders soon received bids improving portion Newark and Bergen Turnpike, [illegible] base. W. J. Wagner, co. engr. Noted May 4.

N. J., Jersey City—Bd. Comrs. received no bids paving Germania Ave., Belgian block. G. A. Van Keuren, city engr. Noted June 28.

N. J., Jersey City—City received no bids improving Tonnell Ave., wood block. Will readvertise. C. A. Van Keuren, city engr.

N. J., Newark—[illegible] Pub. Wks. approved paving Clinton Ave., granite block and asphalt, 6-in. concrete foundation; portion [illegible] [illegible] asphalt. M. R. Sherrard, city engr.

N. J., Newark—[illegible] Freeholders to sell [illegible] bonds July 21 to build and rebuild [illegible] highways and widen pavements. W. Cardwell, clk. Noted May 24.

N. J., Paterson—[illegible] Freeholders plans to sell [illegible] bonds to improve roads in [illegible] twp.

N. J., Paterson—City plans new portion Dale Ave. granite block. H. J. Hardes, city engr.

N. J., Paterson—[illegible] Board plant paving [illegible] Godwin, Madison, Lexington, Temple, North 19th and Lyons Sts. and Belmont and Graham Aves. H. J. Hardes, city engr. Noted June 14.

N. J., South Orange—See "Sewers."

N. J., White House Station—[illegible] Freeholders plan to improve road from White-house Sta. to Lebanon, [illegible].

Pa., Carbondale—[illegible] City will [illegible] bonds to improve streets. H. T. Likely, clk.

Pa., Dubois—City plans to repave South [illegible] St. with [illegible] of concrete, [illegible] and [illegible] feet wide. J. Pollock, city engr.

Pa., Pittsburgh—Council passed ordinance to [illegible] and curb portions Chartiers and Ogilvie Aves. About $[illegible] and $[illegible] respectively. H. Swain, city engr.

Va., Hampton—[illegible] Comrs. issued $[illegible] bonds to improve roads. H. H. Holt, clk.

Va., Martinsburg—Bd. Supvrs. plan to build highway from point on South River to [illegible].

W. Va., Fairmont—City plans election to vote on $[illegible] bond issue for improving streets.

N. C., Salisbury—City sold $75,000 bonds to pave streets. W. H. Woodson, mayor.

Ga., Alma—County voted $60,000 bonds to build roads.

Fla., Dade City—County voted $10,000 bonds to build Natl. Highway in Special Rd. Dist. No. 4.

Fla., Ft. Pierce—County voted $80,000 bonds to build roads in Fellsmere Rd. Dist.

Fla., Kissimmee—County voted $100,000 bonds to build road from Kissimmee to Loughman, Dists. Nos. 1 and 2. Noted May 24.

Fla., Perry—City voted $75,000 bonds to pave streets.

Miss., Biloxi—City plans to spend between $30,000 to $40,000 to pave streets. J. V. Hagan, city engr.

Miss., Hernando—County voted $75,000 bonds to build link in Yazoo Delta Highway.

Miss., Vicksburg—City plans to lay concrete sidewalks on Main, 1st N, Washington, Farmer, Catherine, Dabney and Drummond Sts. C. R. Tuis, city enrg.

La., Edgard—County to sell $180,000 bonds, July 19, to build roads. W. Lasseigne, clk. Noted June 28.

Tenn., Knoxville—City Comrs. authorized $800,000 bond issue to improve streets. J. B. McCalls, city engr.

Tenn., Springfield—County voted $150,- 000 bonds to build roads. Noted May 24.

O., Bryan—City plans improving portions of Butler and Portland Sts. J. A. Neil, clk.

O., Canton—City plans to repave portion South Erie Ave. About $10,000. W. E. Sarver, city engr.

O., Cincinnati—Co. Comrs. plan to improve Clough Pike from Batavia Pike to Bogart Rd., concrete. About $30,300.

O., Cincinnati—See "Sewers."

O., Cleveland—City plans to issue $280,- 000 bonds to improve portion Clifton and Crawford Rds. Hough, Madison and St. Clair Aves., East 55th, East 71st, West 25th and other streets. R. Hoffman, city engr.

O., Columbus—City voted $25,000 bond issue for improving streets. Noted June 21.

O., Dayton—City approved plans for paving Norwood Ave. F. O. Eichelberger, city engr.

O., Lakewood—City to sell $24,760 bonds, July 23, to improve portion Merle and Jackson Sts. E. A. Fisher, city engr.

O., Massillon—City plans to pave portion South Erie St. H. McYost, city engr. About $10,000.

O., Port Clinton—County to sell $104,000 bonds. July 23, for constructing roads.

O., Ravenna—County to sell $30,000 bonds, July 30, for improving I. C. H. No. 18, Edinburg Twp. M. J. Kelley, co. aud.

O., Willoughby—County to sell $36,000 bonds, July 21, to improve portion Lost Nation-Plains Rd., Willoughby Twp. C. C. Jenkins, clk.

Ind., Gary—City plans to pave 10 mi. of 5th Ave., concrete. W. J. Fulton, city engr.

Ind., Greenfield—(Official)—County soon receives bids building Alonzo Tyner et al. Rd. [illegible] and cushion brick. About $68,000.

Ind., Wabash—County sold $10,000 bonds to improve road.

Mich., Lansing—City voted to issue $75,- 500 bonds to pave streets. E. Eddy, city engr.

Ill., Belleville—County soon lets contract improving roads. About $400,000. D. O. Thomas, [illegible] highways.

Ill., Springfield—City plans repaving Monroe St. W. D. Seeley, city engr.

Wis., Green Bay—City plans asphalt [illegible] on portion South Bway. and rein.- [illegible] pavement on 10th St. to approaches to Mason St. Bridge. F. A. Torkelson, engr.

Wis., Superior—City plans paving with [illegible] portions of Brick Ave. E. B. Danks, city engr.

Ia., Manchester—County plans 15-mi. [illegible] road. About $75,000.

La., Primghar—See "Sewers."

Arkansas State Highway Comn., Little Rock, plans [illegible] roads with asphalt surface to Ft. Roots and new army canton- [illegible]. About $[illegible].

Ark., Heber Springs—County plans 16-mi. highway. About $48,000.

Ark., Pine Bluff—County plans to extend Dollarway Pike now running from Pine Bluff to Pulaski into Little Rock, about 27 mi. H. I. Engtrom, co. engr. Lund & Hill, 527 Southern Trust Bldg., cons. engrs.

Tex., Angleton—Attorney General approved $20,000 bond issue to build roads in Brazoria Co., Rd. Dist. No. 10.

Tex., Houston Heights—City election July 28 to vote on $150,000 bonds to pave streets. C. E. Butzer, clk.

Tex., Linden—County voted $40,000 bonds to build roads.

Tex., Pittsburg—County voted $30,000 bonds to build roads in Nales and Omaha Rd. Dists.

Tex., Vernon—City plans to pave portion West Wilbarger, West Paradise, South Main, East Wilbarger, West Pease, West and East Texas and other streets. About $80,000.

Okla., Ada—County election July 21 to vote on $650,000 bonds to build hard surfaced roads. I. R. Gilmore, comr. Noted May 10.

Okla., Hewitt—Town voted $70,000 bonds to improve and build roads. Noted June 7.

Okla., Poteau—County voted $30,000 bonds to build roads and bridges in Heavener Twp.

Okla., Sayre—County voted $15,000 bonds to build roads, Rd. Dist. No. 3.

Okla., Tishomingo—Co. Comrs. adopted resolution to issue $28,500 bonds to build roads in Garrett Twp., and $14,000 for Hains Twp.

Okla., Wellston—County voted $16,000 bonds to build roads.

Idaho, Grangeville—Grangeville Highway Dist. voted $35,000 bonds to build roads. Noted June 21.

Utah, Logan—City plans to pave portion Main St. About $64,000. State to appropriate $15,000 toward cost.

Utah, Ogden—City had plans prepared for paving South Washington Ave. About $35,000. J. M. Tracey, city engr.

Wash., Seattle—County had plans prepared paving 5 mi. permanent Highway No. 11-B from Auburn to Enumclaw., 1 course concrete, 20-ft. wide. S. Humes, co. engr.

Wash., Seattle—Bd. Pub. Wks. approved plans to pave and install sewers in 43rd Ave. N. E. A. H. Dimack, city engr.

Wash., Seattle—City had plans prepared for paving 15th Ave. N. W. bridge approach, asphaltic concrete. A. H. Dimock, city engr.

Ore., Salem—State Highway Comn. has authorized road work in Oregon to amount of $1,073,000. The commission has available for appropriation this year $1,866,000; of this, $1,000,000 is available from $6,000,- 000 bond issue. The Government has approved of all commission's applications for forest road money expenditures. The sum of $880,000 was appropriated by commission for Pacific and Columbia River Highways. Appropriations made were: Pacific Highway, Douglas and Josephine Cos., $380,000; Columbia River Highway, The Dalles to Astoria, grading, $500,000; Ft. Rock to Lakeview, $15,000; Bend to La Pine $17,000; Sherman Co., macadamizing, $15,000; Wasco Co., graveling $10,000; Wasco Co.'s money to match forest fund, $135,000.

On Pacific Highway, the money to be used consists of $75,000 from Government, $75,000 from State, and $200,000 of Douglas Co. bond money, to be expended under direction of commission; with $25,000 alloted for next year. For Columbia River Highway, the Commission set aside $500,- 000, to take care of grading from The Dalles to Astoria. It is expected that the hard surface mileage allowed will be completed this year, owing to weather conditions. It will be a month before bids can be advertised for and contracts let.

Cal., Lemoore—City rejected bids improving streets and installing electrolier lighting system. New Bids. About $140,000.

Cal., Los Angeles—Council adopted ordinance to improve Wall and Soto Sts. H. Hamlin, city engr.

Cal., Tulare—Council passed resolution to pave 3¼ mi. streets. About $35,000. G. F. Leckner, clk. Noted Apr. 26.

Ont., Amherstburg—Town soon receives bids paving Apsley and Sandwich Sts., rein.-con. A. Newman, Fleming Blk., Windsor, engr.

Ont., Aylmer—Town plans to lay cement sidewalks on Warren St. D. A. Davis, clk.

Streets and Roads (Continued)

Ont., New Hamburg—Council plans to pave streets, concrete. About $16,000. H C. Edgar, clk.

B. C., Victoria—Council plans to resurface and grade Oak Bay Ave. About $30,000.

BIDS DESIRED

N. J., Elizabeth—Until July 16, by County, repairing portion Terrill Rd., involving 1248 tons bituminous concrete, 306 lin.ft. trench underdrain, grading 9359 lin.ft. gutter and shoulders. J. L. Bauer, co. engr.

N. J., Hightstown—Until July 14, by Boro. Council, for laying 1500 lin.ft. cement curb and 6000-ft. gutter. J. W. Perrine, clk.

N. J., Jersey City—Until July 17, by City Comrs. paving portion Hopkins Ave., belgian block, Siedler St., asphalt. About $30,000. C. A. Van Keuren, city engr.

N. J., Princeton—Until July 17, by Boro Council, rebuilding 11,273 sq.yd. Stockton St., warrenite surface, 6-in. concrete foundation. V. B. Cook, clk.

N. J., Somerville—Until July 27, by Bd. Freeholders, improving 2.838 mi. Belle Mead-Griggstown Rd., macadam. J. Dougherty, engr.

N. J., Union—Until July 16, by Bd. Council, paving New York Ave., block, new bluestone curb also repaving Gardner St., bituminous concrete, 5-in. concrete foundation. About $30,000. E. Bautz, clk.

N. J., West Orange—Until July 17, by Town Council, grading and paving Amos St., asphalt. G. W. Foster, clk.

N. J., Westfield—Until July 16, by Town Council for improving New York Ave., 2600 lin.ft. concrete curb, 5200 sq.yd. 6-in. macadam; culverts and sewer inlets. C. Clark, clk.

Pennsylvania—Until July 24 by State Highway Comn., Harrisburg, paving 9300 lin.ft. road, Moon and Hopewell Twps., vitr. block and waterbound macadam; grading and draining 20,109 ft. road Summit Twp., completing 9,299 lin.ft. Monaca-Aliquippa Rd., vitr. block and waterbound macadam. F. H. Black, state highway engr.

Pa., Pottstown—(Official)—Until July 24, by City Council paving portion North and South Centre St., wood block, vitr. brick or concrete. J. H. Strauch, city engr., advertised in this issue.

Md., Baltimore—(Official)—Until July 17, by State Rds. Comn., 601 Garrett Bldg., building section state highway. F. A. Zouck, chn.; advertised in this issue.

Md., Hagerstown—(Official)—Until July 21 by Sewerage Comn., installing mains and lateral sewers various streets. E. E. Heard, secy.; advertised in this issue.

Va., Richmond—Until July 14, by State Highway Dept., for reconstructing gravel road, about 1½ mi. long. G. P. Coleman, comr.

W. Va., Hamlin—Until Aug. 16, by A. F. Black, co. clk., for 6 mi. of roads. Noted June 7.

W. Va., Williamson—Until Aug. 4 by County building and improving 35 mi. earth road. E. Boggs, clk. Noted May 24.

S. C., McCormick—(Official)—Until July 19, by Co. Comn., grading and building drainage structures on 70 mi. highways. J. J. Dorn, chn. M. E. Worrell, co. highway engr.

Ky., Henderson—(Official)—Until July 17, by J. G. Adams, clk., concrete curb and gutter on portions of Alves, Madison, Dixon and 2nd Sts.

O., Ashland—Until July 26, by City, for improving and paving portions of Virginia Ave. R. R. Comn., city engr. Noted June 7.

O., Cincinnati—Until July 20 by County improving portion Cin-Hamilton I. C. H. No. 39, Springfield Twp., under Spec. No. 1057. F. E. Wesselman, clk.

O., Medina—(Official)—Until July 14, by Council, for improving West Main St. with bituminous macadam. F. C. Hassall, engr.

O., Springfield—Until July 16, by C. E. Ashburger, city mgr., improving and paving portion Sherman St.

O., Toledo—Until July 17, by City, improving and paving portions of 19 different streets, constructing sewers in Main Sewer Dist. No. 23. D. H. Constable, dir. of serv.

O., Zanesville—Until July 18, by Co. Comrs. paving 10 mi. Allanson Rd. Improv. from end of State Aid improvement to south corporation line of Adamsville. F. C. Werner, clk.

Indiana—By Co. Comrs. for building roads as follows:

July 23: Terra Houte; road. Harrison Twp. T. Ferguson, aud.

July 25: Warsaw; gravel road. Plain Twp. V. D. Mock(aud.

Aug. 7: Salem; road in Posey and Washington and Madison Twps. E. E. Batt, aud.

Ill., Grayville—(Official)—Until July 16, by P. R. Blood, engr., for 15,813 sq.yd. brick paving, 25,483 sq.yd. tar macadam paving, 30,107 ft. curb and gutter and 7918-ft. storm sewers.

Ia., Davenport—Until July 18, by Bd. Local Improv. paving portion of 2nd and other streets. About $50,000. R. E. Sawistowsky, city engr.

Ark., Pine Bluff—Until July 16, by Comrs. Rd. Improvement Dist. No. 21, building 5 mi. gravel road, bituminous carpet cover. W. T. Simpson, comr.

Tex., Victoria—Until July 16, by C. A. Wertheimer, city secy., for paving 8 streets, asphaltic concrete, bitulithic, sheet asphalt, Uvalde rock asphalt, vertical fiber brick, portland cement concrete and 2 course concrete pavement. J. A. Block, engr.

Wash., Seattle—Until July 17, by Co Comrs., grading and graveling 2½-mi. permanent highway No. 2-F. About $50,000.

Wash., Spokane—Until July 29, by Co. Comrs., paving 2.65 mi. permanent highway No. 7-D, 1 course concrete, asphaltic concrete on cement concrete base, asphaltic concrete, bituminous base, warrenite, bituminous base. About $50,000.

Wash., Walla Walla—Until July 20, by Co. Comrs. building Permanent Highway No. 17. G. Cookerly, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Maine—(Official)—State Highway Comn., Augusta, received low bids (a) gravel surfacing 6.16 mi. road, Pittsfield Twp., (b) 6.05 mi. bituminous macadam road, Bowdoinham Sect., (c) gravel surfacing 1.06 mi. Edgecomb Twp., (d) gravel surfacing 2.85 mi. Newcastle Twp. from D. Susi, Pittsfield, (a) $49,484; Noyes & Campbell Co., 191 Water St., Augusta, (a) $64,372, (c) $9866, (d) $27,147; W. M. Fellows, Farmington, (a) $65,376; A. D. Bridges, Hazardville, Conn., (b) $90,686; H. A. Day, Bangor, (c) $8,297; J. Arborio, 36 Ward St., Hartford, (c) $10,111, (d) $25,602.

★**Mass., Boston**—City let contract paving Turner, Parkland, South, North Beacon, Brighton Sts., and Waldo Terrace to Coleman Bros., Pearl St., Chelsea, $75,063.

Mass., Dorchester—City received low bid paving Nevada St., and Wilmington Ave., sheet asphalt or bitulithic, from Central Constr. Co., 228 Southampton St., Roxbury, $10,785.

N. Y., Albany—(Official)—State Highway Comn., 55 Lancaster St., received bids improving highways in various counties as follows: Repair Contract No. 1130, Rd. No. 193, Albany Co., Kennedy Constr. Co., Albany, $40,908; Repair Contract No. 1112, Rd. No. 508, Albany Co., H. Miller, Albany, $34,266; Kennedy Contr. Co., Albany, $35,-975; Repair Contract No. 1129, Rd. No. 5022, Broome Co., J. Walker, Albany, $33,-362, Edgecomb Bros., Inc., Binghamton, $33,506; Repair Contract No. 1124, Rd. No. 126, Broome Co., J. Walker, Albany, $21,-588, T. L. Ryan, Binghamton, $21,667, Edgecomb Bros., Inc., Binghamton, $22,230; Repair Contract No. 1126, Rd. No. 601, Cattaraugus Co., no proposals received; Repair Contract No. 1132, Rd. No. 698, Chautauqua Co., no proposals received; Repair Contract No. 1117, Rds. Nos. 5031 and 5074, Columbia Co., S. Beskin, Beacon, $54,424; Repair Contract No. 1120, Rd. No. 584, Erie Co., E. Hopkins, Troy, $14,749; Repair Contract No. 1046, Rd. No. 744, Essex Co., The Lane Construction Co., Meriden, Conn., [illegible] W. L. Lamps, Glens Falls, N. Y., [illegible]; Repair Contract No. 1068, Rds. Nos. 186, 481, 189, 183, 486, 471, 846, 5466 and 5644, Herkimer Co., Fallsburg Constr. Co., Fulton, $20,649, Defiance Corp., Utica, $20,845; W. Page, Johnstown, $19,852, Montgomery County Co., Hopkins, $21,136; Repair Contract No. 1050, Rd. No. 758, Jefferson Co., A. F. McConville, Ogdensburg, $19,198, Peterson, Watertown, $14,241; Repair Contract No. 1135, Rd. No. 5001, Livingston Co., E. W. Roberts Co., Utica, $15,940; Repair Contract No. 1111, Rd. No. 5166, Lafayette Co., Greenfield Constr. Co., Hornell, $6424, McGraw & Wall, Mt. Morris, $19,911, F. T. Murray, Rochester, $10,500, Repair Contract No. 1121, Rd. No. 253, Monroe Co., Whitmore-Rauber & Vicinius, Rochester, $20,939, Ribstein-Holter Co., Rochester, $22,260, T. Holerhan, Rochester, $22,938; Repair Contract No. 1122, Rd. No. 5406, Oneida Co., Griffin & Griffin, Norwich, $1199, Repair Contract No. 1131, Road No. 438, Oneida Co., H. W. Roberts Co., Utica, $44,946, Repair Contract No. 1089, Rd. No. 5576, Ontario Co., P. H. Murray, Rochester, $40,896, Dale Engineering Co., Utica, $43,-730, Repair Contract No. 1118, Rd. No. 65, Orange Co., Schunnemunk Cons. Co., Highland Mills, $35,015; Repair Contract No. 1128, Rd. No. 450, Oswego Co., Kennedy Cons. Co., Albany, $15,394.; Repair Contract No. 1045, Rd. No. 5205, Saratoga Co., R. Hopkins, Troy, $37,890; Repair Contract No. 1034, Rd. No. 5282, Seneca Co., D. W. Robbins, Inc., New York City, $9403, General Cross Stone Co., Easton, Pa., $9453, Pathfinder Constr. Co., Fulton, $9495, Kennedy Constr. Co., Albany, $10,220; Repair Contract No. 1133, Rd. No. 906, Steuben Co., Greenfield Constr. Co., Hornell, $24,-582, Kennedy Constr. Co., Albany, $24,675; Repair Contract No. 1018, Rds. Nos. 85, 720, 720-A, 1080, 1224, Washington Co., H. W. Fearl, Potsdam, $3945, D. H. Noonan & Son, Saratoga Spgs., $4359; Broken Stone Contract No. 74, Highway No. 1038, Erie Co., W. K. Frank, Buffalo, $10,263, S. K. Johnson, Norwich, $10,863, C. E. Wells, Savannah, $10,890, R. Hopkins, Troy, $11,-447, G. W. Moore, Buffalo, $11,551, G. C. Hill, Fulton, $11,677.

★**N. Y., Fredonia**—City let contract paving Orchard St. to Dunkirk Constr. Co., 112 Eagle St., Dunkirk.

★**N. Y., Niagara Falls**—City let contract paving portion 20th St., conneaut block, to Pub. Ser. Contr. Co., E. & H. Bldg., $32,080.

★**N. Y., Norwich**—City let contract paving 2900 ft. streets, concrete, to Paddleford & King, $11,423.

★**N. Y., Rochester**—Bd. Contract and Supply let contract laying sidewalks on Clinton Ave. to J. Petrossi Co., $9906; asphalt pavements Ethel St. and Woodbine Ave., Whitmore, Rauber & Vicinus, 279 South Ave., $4085 and $7517 respectively.

N. Y., Rochester—City received low bids paving Genesee Blvd. from Whitmore, Rauber & Vicinus, 279 South Ave., $104,-106; Rochester Viaduct Co. Exchange & Bldg., $106,000; F. V. Brotsch Co., E. & B. Bldg., $112,000.

★**N. Y., Troy**—City let contract paving, grading and curbing portion Lake Ave. to J. Davitt, Troy, $18,000.

★**N. J., Camden**—Bd. Freeholders let contract resurfacing Browning Rd. from Marlton and Blackwood Pike to Manwaring & Cummings, 26 East Church Lane and J. E. Shanley Co., Commercial Trust Bldg., both of Phila. About $18,000. Noted May 31.

★**N. J., Lamington**—Bd. Freeholders, Somerville, let contract building road from Lamington to New Germantown, macadam, to M. I. Demarest, Sewaren.

★**N. J., Morristown**—Bd. Freeholders let contract rebuilding Madison Ave. to Gary Constr. Co., Morristown, $27,635. Noted June 28.

★**N. J., Newton**—County let contract paving Spring St., concrete, to Sothman Corp., Newton, $12,000.

★**N. J., Orange**—(Official)—Bd. Freeholders, Newark, let contract paving Central Ave. involving [illegible] sq.yd. "Hastings" asphalt blocks to Hastings Pave. Co., 25 Broad St., New York City, $78,953.

★**N. J., Orange**—Town let contract improving Harvard Terrace involving [illegible] sq.yd. asphalt bound macadam, $1.98 per sq.yd., 1144 sq.ft. concrete gutter, 176-1896 lin.ft. concrete curb, 58c., 4134 cu.yd. excavation, 84c., to J. F. Chapman, Newark.

★**N. J., Trenton**—City let contract paving [illegible] curbs and [illegible] sq.yd. limit asphalt paving to C. A. Reed & Co., 473 Monmouth St.

★**Pa., Canonsburg**—Boro. let contract paving, grading and curbing Englewood Ave. to Hardy & [illegible], $46,000.

★**Pa., Charleroi**—Boro. let contract paving, grading and curbing streets to Hastings & Pipes, $24,818.

★**Pa., Dormont**—City let contract paving Dalton Ave., to H. Carpenter, 110 Main St., Carnegie.

★**Pa., Edwardsville**—City let contract paving Union St., vitr. brick to Dove Creek Co., Bennett Bldg., Wilkes-Barre, $11,552.

Street and Roads (Continued)

★**Pa., Newport**—(Official)—Town let contract paving 11,200 sq.yd. with Hastings asphalt binder to villages of Alvin Wagner and Olive Lynn to C. H. Nauman, $40,000.

★**Pa., Parnassus**—Boro. let contract paving 1,000 sq.yd. brick, 2,800 lin.ft. concrete curb and gutter, and 2,000 sq.yd. concrete sidewalk to L. H. Hoffman, New Kensington, $24,000.

★**Pa., Phila.**—City let contract building pathway from Broad to 14th St. and 14 pathway from 14th St. and 14½ to embankment to South East Blvd. to McClellan Paving and Quarry Co., 1923 Cherry St., $88,521 and $2,766 respectively.

★**Pa., Phila.**—City let contract paving Dauphin Ave. to McClellan Paving & Contr. Co., 1923 Cherry St., About $194,000. Noted June 7.

★**Pa., Pittsburgh**—City Comr. let contract [illegible] roads as follows: T. Crehan Co., South 17th St., Bridge, $44,755; Woodbridge Pipe No. 1, $42,741; Tree Hill Rd., $40,744; Columbia Asphalt Paving Co., Pittsburgh, Broughton and Chartiers Mills Rd., $17,850, Banks Street Rd., $15,744; Steubenville Pike, $52,467, Steubenville Pike and Mayer Cliff mines, $48,750, Broughton and [illegible] connecting Rd., $44,470. McCann Bridge Rd., $28,543; Booth & Flynn, Fifth Avenue to Lincoln Park Rd., $27,813, Library Rd., $22,517, Lincoln extension Rd., $18,197; Pittsburgh Ambosite Co., Jenkins Bldg., Lovedale Rd., $63,284; G. B. Jenkins Bldg., Long Run Rd., $17,853.

★**W. Va., Fairmont**—County let contract to pave 2 mi. to Floyd & Vanvoort, Hudson Bldg., N. Y., 5 mi. to T. S. Rhodes & Son., McKeesport, Pa. Noted Apr. 12.

★**Miss., New Augusta**—City let contract for public highways to Dabbs & Myers, Meridian. About $200,000. Noted May 31.

★**La., Lake Charles**—County let contract [illegible] roadways to Ritchie Bros., Topeka, $85,668.

★**Tenn., Fayette**—(Official)—City let contract paving 12,500 sq.yd. and installing [illegible] in Court Sq. to Leftwich & Co., Nashville. Noted June 21.

★**Ky., Henderson**—(Official)—City let contract improving State Aid Road No. 81-2 to T. H. Bennett Co., Mt. Vernon, Ind., $30,000.

★**Ky., Paducah**—County let contract [illegible] to R. L. Figg Co., Louisville, $111,000.

Ohio—State Highway Comr., Columbus, [illegible] bridges and grading roads in various counties as follows:

Brown Co., Bent Mill Rd., Village of Georgetown, Union Twp., grading and paving with brick, 1.11 mi., W. H. Miller & Sons, Inc., Cincinnati, $21,-[illegible]; Champaign Co., Urbana-West Jefferson Rd., Union Twp., 2.88 mi., O'Brien & Gere, Marysville, [illegible]; Clinton Co., Wilmington-Midland Rd., 1.11 mi., Wright & Lane, Lancaster, $11,[illegible]; Fairfield Co., Lancaster-Pickerington Rd., 1.11 mi., Wright & Lane, Lancaster, $11,[illegible]; Franklin Co., Broad St., Columbus, [illegible]; Hamilton Co., Reading Rd., 1.11 mi., Wright & Lane, Lancaster, $11,[illegible]; Hocking Co., Logan-Nelsonville Rd., 1.11 mi., Wright & Lane, Lancaster, $11,[illegible]; Lucas Co., Toledo-Maumee Rd., 1.11 mi., Wright & Lane, Lancaster, $11,[illegible]; Miami Co., Troy-Piqua Rd., 1.11 mi., Wright & Lane, Lancaster, $11,[illegible]; Montgomery Co., Dayton-Germantown Rd., 1.11 mi., Wright & Lane, Lancaster, $11,[illegible]; Pickaway Co., Circleville-Lancaster Rd., 1.11 mi., Wright & Lane, Lancaster, $11,[illegible]; Ross Co., Chillicothe-Lancaster Rd., 1.11 mi., Wright & Lane, Lancaster, $11,[illegible]; Scioto Co., Portsmouth-Wheelersburg Rd., 1.11 mi., Wright & Lane, Lancaster, $11,[illegible]; Summit Co., Akron-Cleveland Rd., 1.11 mi., Wright & Lane, Lancaster, $11,[illegible]; Trumbull Co., Warren-Youngstown Rd., 1.11 mi., Wright & Lane, Lancaster, $11,[illegible]; Union Co., Urbana-Marysville Rd., 1.11 mi., Wright & Lane, Lancaster, $11,[illegible]; Warren Co., Lebanon-Middletown Rd., 1.11 mi., Wright & Lane, Lancaster, $11,[illegible]; Wayne Co., Wooster-Orrville Rd., 1.11 mi., Wright & Lane, Lancaster, $11,[illegible]; Williams Co., Bryan-Montpelier Rd., 1.11 mi., Wright & Lane, Lancaster, $11,[illegible]; Wood Co., Bowling Green-Perrysburg Rd., 1.11 mi., Wright & Lane, Lancaster, $11,[illegible]; Wyandot Co., Upper Sandusky-Marion Rd., 1.11 mi., Wright & Lane, Lancaster, $11,[illegible].

Bridges: Clinton Co., Wilmington-Midland Rd., Village of Martinsville, Union Twp., grading and paving with brick, 1.11 mi., W. H. Miller & Sons, Inc., Cincinnati, $21,416; Champaign Co., Urbana-West Jefferson Rd., Union Twp., 2.88 mi., O'Brien & Gere, Marysville, $21,-[illegible]; Franklin Co., Broad St., Columbus, [illegible]; Hamilton Co., Reading

Railways—Steam and Electric (Continued)

army cantonments, near Annapolis Jct.; also to connect with Washington, Baltimore & Annapolis Ry., which runs through camp site. H. Lane, Baltimore, ch. engr., former line, and A. C. Shand, Broad St. Sta., Phila., ch. engr. latter.

North Carolina—Atlantic & Western Ry. plans extension from Lillington to Swansboro, about 100 mi. H. P. Edwards, Sanford, gen. mgr. and purch. agt.

Georgia—Western & Atlantic R.R. plans branch line from Graysville to Ft. Oglethorp, right-of-way now being secured. J. A. Baldwin, Atlanta, supt.

Tennessee—Illinois Central R.R. plans new line from Nashville to Chattanooga, through Rutherford, Cannon, Warren, Grundy and Marion Cos. A. S. Baldwin, Chicago, ch. engr.

Ohio—Hillsboro, Cynthiana, Bainbridge & Chillicothe Traction Co. will issue $400,000 bonds, proceeds to be used to construct line from Hillsboro to Chillicothe. J. C. Anderson, Chillicothe, secy.

Arkansas—Missouri Pacific R.R. will build 4 mi. spur from Dalhoff to army cantonment north of Argenta. E. A. Hadley, St. Louis, ch. engr.

Utah—Denver & Rio Grande R.R. plans to extend Park City branch to Ft. Douglas to take care of increased freight demands. About $150,000. C. A. Blake, Salt Lake City, div. engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Maryland**—Baltimore & Ohio R.R. let contract branch line from Baltimore to Sparrows Point, about 8 mi., to H. S. Kerbaugh, Inc., Munsey Bldg., Baltimore. Noted Apr. 5.

★**Michigan**—(Official)—Pennsylvania-Detroit R.R. let contract 90 mi. track inbound and classification yards on western outskirts of Detroit to W. S. Newkall Co., 60 Lafayette Blvd., Detroit.

★**Kansas**—Miami Mineral Belt R.R. let contract line from Quapaw, Okla., to Baxter Springs, Kan., about 12 mi., with 8 mi. sidings, to Allhands-Hedges Constr. Co., Springfield, Neb.

EXCAVATION AND DREDGING

Proposed Work

N. J., Jersey City—Dredging—City Comrs. plan to dredge Hudson River, foot of Morgan St. C. A. Van Keuren, city engr.

Fla., Ft. Lauderdale—Drainage—Napoleon B. Broward D. D., recently organized, will drain 528,000 acres in Everglades. A. L. Joiner, secy.

Ark., Marianna—Drainage—Phillips D. D. plans to build drainage system to reclaim Cypress and Flat Fork Sects., involving 45,000 acres cotton land, also 2 canals, combined length 23 mi. W. S. McClintock and M. H. Ford, Marianna, C. Jones, Lexa, comrs.

Ark., Pine Bluff—Drainage—Flat Bayou D.D. plans to build drainage system to reclaim 18,000 acres between Altheimer and Sherrill. About $70,000. J. F. Quattlebaum, pres. Parkes Engr. Co., Pine Bluff, engrs.

BIDS DESIRED

S. C., McCormick—See "Streets and Roads."

Tenn., Dyersburg—Drainage—Until July 25, by Bd. Dir. Lewis Creek D. D., building 8 mi. ditch 8- to 10-ft. bottom width, involving 271,773 cu.yd. excava. and 48.86 acres clearing; also removing 1 building from right of way. L. T. Berthe, Charleston, Mo., dist. engr.

Tenn., Dyersburg—Drainage—Until July 25 by Bd. Dir. North Fork D. D., building 12½ mi. main ditch, 60- to 80-ft. bottom, involving 2,291,610 cu.yd. excava. and 408.5 acres clearing; also building 8 lateral ditches about 8 mi. in length involving 88.5 acres clearing and 184,494 cu.yd. excava. L. T. Berthe, Charleston, Mo., dist. engr.

Ky., Calhoun—Drainage—Until July 18 by Bd. Drainage Comrs., work on D. D. No. 7, involving 148,189.8 cu.yd. earth removal. B. F. Landrum, pres.

Ia., Des Moines—Drainage—Until July 18, by J. M. Wells, engr., for Joint Dist. No. 1, Polk and Story Cos., Nevada, for system involving 16,6[illegible] ft. 18-, 30- and 34-in. tile. About $36,40[illegible]. F. [illegible] clk. Polk Co. F. E. King, clk. Story Co.

Ia., Mason City—Drainage—Until July 16, by G. E. Frost, co. aud., for constructing D. D. No. 51.

Ia., Nevada—Drainage—Until July [illegible] by F. E. King, co. aud., building ditches and drains, Richland Twp. D. D. No. 51, (a) open ditch work, involving part of main open ditch 9775 ft. long requiring 49,976 cu.yd. excava.; (b) all tile work involving 13,758 ft. of 10-, 12-, 15-, 22-, 24-, 26-, 34-, 36- and 39-in. tile, inlets and abutments.

Ia., Sac City—Drainage—Until Aug. 1, by E. W. Moyer, aud. Sac Co., building open drainage ditches, Big Cedar D. D. No. 181 of Sac, Buena Vista, Pocahontas and Calhoun Cos. requiring follow excava.; Sect. 1, 546,266 cu.yd.; Sect. 2, 1,513,000 cu.yd.; Sect. 3, 1,797,000 cu.yd.; Sect. 4, 644,397 cu.yd.; Sect. 5, 827,760 cu.yd.; Sect. 6, 7270 cu.yd.; Sect. 7, 8000 cu.yd.; Sect. 8, 66,400 cu.yd.; Sect. 9, 49,100 cu.yd.; Sect. 10, 660 cu.yd.; Sect. 12, 98,766 cu.yd.; Sect. 13, 7297 cu.yd.; Sect. 14, 190,575 cu.yd.; Sect. 15, 2700 cu.yd.

Minn., Marshall—Ditches—Until July 23, by County, building Co. Ditch No. 33, involving 27,365 ft. 5-, 6-, 7-, 8-, 9-, 10-, 12-, 14-, 16-in. tile, cost $5785; Ditch No. 34, 30,691 ft. 5-, 6-, 7-, 9-, 12-, 14-, 15-, 18- and 20-in. tile, $10,433; Ditch No. 35, 21,224 ft. 5-, 6-, 7-, 9-, 10-, 12-, 15-, 16- and 18-in. tile, $8071.

Minn., Morris—Ditch—Until July 19, by County, building Co. Ditch No. 30, involving 46,288 ft. tile of various sizes. C. R. Wollthan, co. aud.

Minn., Walker—Ditch—Until July 30, by C. D. Bacon, co. aud., for Co. Ditch No. 10, 17,265 cu.yd. excava. and 6374 acres clearing.

Ore., Canyon City—Ditch—Until July 16, by Blue Mt. Ditch Co. of Mt. Vernon at office of J. E. Marks, Canyon City, for water ditch 4.75 mi. long, 7 ft. wide on top and 5 ft. wide at bottom, carrying 1½ ft. water.

Cal., Susanville—Irrigation—Until July 31, Bd. Dir. Baxter Creek Irrigation Dist., buiding storage and canal systems except gates; plans involve earth dam 300,000-yd outlet tunnel and spillways, canals, 2 mains total length 15 mi. About $250,000. H. S. Martin, ch. engr. Noted June 21.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. J., Orange**—See "Streets and Roads."

★**Ia., Spirit Lake**—Drainage—County let contract Drain No. 19 to Clark Constr. Co., Clinton, and Cement Products Co., Spencer.

★**Minn., Chaska**—Ditch—County let contract Co. Ditch No. 6 to Central Contr. Co., Minneapolis. Noted May 31.

★**Minn., Ortonville**—Ditches—County let contract Co. Ditches No. 16 and 17 to Van Lohn & Schabot, Graceville; Ditch No. 19 to G. Swenson, Milbank, S. D.

★**S. D., Madison**—(Official)—Ditches—Co. Comrs. let contract Lake Co. Drainage Ditch No. 5 to W. R. Larson, Sioux Falls, $5996; No. 6, labor, to Myren Bros., $13,975, tile to Sioux City Concrete Pipe Co., Sioux City, $18,390. Noted June 14.

INDUSTRIAL WORKS

Proposed Work

N. Y., Greensboro—Swift & Co., 76 West Monroe St., Chicago, plans fertilizer factory here. About $60,000.

N. Y., New York—Fifth Avenue Coach Co., 10 East 102nd St., plans 4-story factory, 133rd St. and Bway. About $1,000,000. R. W. Meade, pres.

N. Y., New York—New York Butchers Dressed Meat Co., 11th Ave. and 39th St., plans 7-story, 100x125-ft. cold storage plant, 11th Ave. and 40th St. About $250,000.

N. J., Atlantic City—Atlantic City Steamship & Terminal Co., recently incorporated with capital stock of $[illegible] plans shipyards here. Address L. D. Algar, 135 Jackson St.

N. J., Kearney—(Arlington P. O.)—Ford Motor Co., Highland Park, Mich., plans plant here. About $225,000.

Pa., Ardmore—See "Reinforced Concrete."

Pa., Phila.—See "Reinforced-Concrete."

Pa., Pittsburgh—[illegible] Printing Co., [illegible] Ave., plans 4-story brick and steel addition to factory at Forbes and 4th Aves.

Ga., Savannah—J. C. Lewis Motor Co., [illegible] Bull St., having plans prepared for 3-story [illegible]-ft. garage. About $[illegible].

Ala., Mobile—Gulf, Mobile & Northern R.R. plans terminal improvements here. About $1,000,000. E. V. Wright, Laurel, Miss., ch. engr.

Miss., Meridian—City having plans prepared for [illegible] plant. About $[illegible]. J. W. Parker, mayor.

O., Cincinnati—Worthington Pump and Machinery Co., 1504 1st Natl. Bank Bldg., had plans prepared for factory addition. About $100,000.

O., Columbus—Pennsylvania Lines West of Pittsburgh (Southwest System), will build new shops here. About $100,000. W. Cushing, Pittsburgh, ch. engr. M. W.

Ill., Chicago—See "Reinforced Concrete."

Ill., Chicago—Continental Can Co., 72 West Adams St., having plans prepared large can factory at West 65th St. and South 54th Ave. About $[illegible].

Ill., Chicago—O. Heineman Co., 2701 Armitage Ave., plans 5-story mill on Fairfield Ave. About $100,000.

Wis., Milwaukee—W. G. Kellogg and C. Petit, 108-373 Bway., plan 500,000-bushel capacity elevator here. About $200,000.

Wis., Milwaukee—Globe Seamless Tubes Co., Burnham St., plans addition to plant in West Milwaukee. About $[illegible].

Wis., Rosendale—Libby, McNeil & Libby, Union Stock Yards, Chicago, having plans prepared for condensary at Rosendale. About $50,000.

Ia., Sioux City—Sioux City Gas & Electric Co., 509-511 Pierce St., plans steel and frame addition to power plant. About $200,000. O. W. Harrod, engr.

Minn., Duluth—Duluth Bedding Co., 409 Lake Ave., plans new factory. About $65,000. C. Lavick, pres.

Neb., Omaha—See "Reinforced Concrete."

Mont., Great Falls—Anaconda Co. plans rod and wire mill at Boston & Montana smelting works here. About $500,000.

Mont., Great Falls—E. K. Cherington, Great Falls, plans warehouse and store here. About $70,000.

Tex., Temple—Atchison, Topeka & Santa Fe Ry. (Western Lines), plans brick freight depot and large warehouse here. About $85,000. F. M. Bisbee, Amarillo, ch. engr.

Ore., Medford—R. H. Parsons, Hillcrest Orchards, Seattle, plans cold storage warehouse here. About $60,000.

Ore., Oroville—Great Western Power Co., 14 Sonsome St., San Francisco, plans plant here. About $6,000,000. E. W. Beardsley, San Francisco, supt.

Ont., Hamilton—Canada Screw Co., Wellington St., W., plans brick addition to factory. About $100,000.

BIDS DESIRED

N. Y., Brooklyn—(Official)—Until July 25, by State Hospital Comn., Albany, for refrigeration equipment for storehouse and cold-storage building, Brooklyn State Hospital. E. S. Ellwood, [illegible], advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Brooklyn**—See "Reinforced Concrete."

★**Md., Baltimore**—Baltimore Dry Dock & Shipbuilding Co., 1720 Thames St., let contract for plant at Locust Point to Raymond Concrete Pile Co., 30 West St., New York City. About $[illegible]. Noted June 28.

★**O., Cincinnati**—[illegible] Co. recently organized, let contract 1-story brick, concrete and steel plant, 10th Ave. and Cleveland, Cincinnati, Chicago & St. Louis R.R. and Carthage Ave., to Ohio Bldg. & Constr. Co., Burnett near McMillan St., Mt. Auburn. About $[illegible].

★**O., Cleveland**—See "Reinforced Concrete."

★**Ill., Chicago**—[illegible] Steel Co., [illegible] South La Salle St., let contract for steel mill 80th and Manistee Sts., to L. O. C. Holmboe, Chicago. About $[illegible].

★**Minn., Minneapolis**—See "Reinforced Concrete."

★**Tex., Houston**—[illegible] & Co., [illegible] Main St., Chicago, let contract [illegible] and oil sheds at Houston Heights to Heaton & Hutton, Mobile, and Yellow Sts., $25[illegible].

★**Wash., Seattle**—Ford Weir Co. let contract to overhaul to Burrard-Mason Co., Hoge Bldg. About $[illegible].

★**Ont., Toronto**—See "Reinforced Concrete."

BUILDINGS

Proposed Work

N. H., Laconia—Contract—State hospital plans prepared by C. B. Whitcomb, [illegible] Bldg., Manchester, [illegible] Co. Bldg., Concord, [illegible] Co. Bldg., Laconia, [illegible] Co. Bldg., Franklin, [illegible] Co. Bldg., Littleton, [illegible] Co. Bldg., Berlin, [illegible] Co. Bldg., Colebrook. About $[illegible].

Buildings (Continued)

Mass., Lowell—School—Lowell Training School plans [illegible]-ft brick addition. Estimated cost about $[illegible]. [illegible] Hildreth Bldg., owners.

Conn., Waterbury—High School—Bd. Educ. plans 2-story, 116-ft. brick and masonry addition. Estimated cost about $[illegible]. Wesley M. Dougherty, 14 Leavenworth St., archt. About [illegible]

N. Y., Brooklyn—[illegible]—New York Tunnel Co., 15 Dey St., New York City, having plans prepared by Mahoney, Voorhees & Smith, archts., 101 Park Ave., New York, for [illegible]-story, brick and [illegible], Liberty Ave. and Milford St. About $[illegible]

N. Y., Brooklyn—Seaside Sanitarium—Flatbush Dutch Reformed Church, 930 Flatbush Ave., plans [illegible] story addition on east side of Church Ave. About $[illegible].

N. Y., Buffalo—Terminal—New York Central R.R. plans [illegible]. Estimated cost $[illegible]. G. K. Sutherland, Grand Central Terminal, New York City, engr.

N. Y., Central Islip—Acute Patients' Building—Central Islip State Hospital soon to be erected. About $200,000. L. F. [illegible], state archt.

N. Y., Long Island City—Loft—Huddleston & Morgan Mahogany Co., 33 West 42nd St., New York City, had plans prepared, [illegible]-story brick at Riker and [illegible] Sts. About $[illegible]. E. Hahn, Queens Bldg., archt.

N. Y., Mt. Pleasant—Hospital—Westchester County having plans prepared for [illegible] Pelz, archt., 18 East 41st St., and Shaw, McMullen & Riley, engrs., 101 Park Ave., both of New York. About [illegible]

N. Y., Newton (Flushing P. O.)—High School—Bd. Educ. plans, 4-story brick addition on Chicago Ave. About $850,000. B. Suydam, Elmhurst, school comr.

N. Y., New York—Hospital—Volunteer Hospital plans [illegible]-ft. addition. About $[illegible]. Gallagher, Booth, Boardman and Paton, Bay [illegible] Borough Martin, 34 West [illegible] St., archts.

N. Y., New York—Theater—Felix Isman, [illegible] Ave. and others, having plans prepared for 49th Ave. between 48th and 49th Sts., Broadway & Vanderbilt Ave. 4 West 37th St., archts.

N. Y., New York—Club House—Y. M. H. A. of Franklin Ave. and [illegible] St., Brooklyn, plans [illegible]-story addition. About $50,000. [illegible] 129 7th Ave., archt.

N. Y., New York—Hospital—St. Lukes Hospital [illegible] war hospital on Amsterdam Ave. between 113th and 114th Sts. Estimated cost about $[illegible]. W. A. Boring, [illegible] Columbia University Building, Architecture archt.

N. Y., Oswego—School—Bd. Educ. having plans prepared, [illegible]-story, brick and [illegible] addition. M. F. Cummings, jr., 1 Union Sq., New York City, archt.

N. Y., Riverdale—School—Bd. Educ. [illegible] building. About $[illegible].

N. Y., Syracuse—[illegible]—Bd. Educ. having plans prepared 2- or 3-story, brick and [illegible]. About $[illegible]. [illegible] Crouch & Wright, [illegible] Bldg., archts.

N. Y., Syracuse—Temple—Labor Temple Assn., [illegible] factory, brick and [illegible]. About $[illegible]. [illegible], 101 West Onondaga Ave., archt.

N. J., Camden—Bank—Merchants' Trust Co., [illegible] and Cooper sts., had plans prepared by [illegible] for [illegible]-story addition. About $[illegible]. C. A. Post, archt.

N. J., Elizabeth—Hospital—Elizabeth General Dispensary plans [illegible]-story addition. J. [illegible], [illegible] Bldg., Union Sq., New York City, archt.

N. J., Jersey City—Theater—Plans for [illegible] Opera House, Journal Square, [illegible] Bldg., archt.

N. J., [illegible]—[illegible]—Plans [illegible] Bldg., archt.

N. J., Newark—[illegible]—Plans [illegible] Bldg., archt.

Pa., Philadelphia—[illegible]—Plans [illegible] Bldg., archt.

Pa., Catasauqua—Church—[illegible] Church plans [illegible]-story addition. About $[illegible]. [illegible], archt., Allentown, Pa.

Wash., D. C.—Church—First Reformed Church, 13th and Monroe Sts., N. W., having plans prepared. About $50,000. J. D. Buhrer, 13th and Monroe Sts., pastor.

Va., Ft. Royal—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., rejected bids opened June 20. Noted May 31.

S. C., Columbia—School—City had plans prepared for new buildings at Industrial Training School. About $100,000. X. A. Kramer, Magnolia, Miss., archt.

Fla., Key West—Hotel—Florida & East Coast Ry. plan About $250,000. Address W. A. Blount, Florida & East Coast Ry.

Ala., Flint Ridge—Hospital—Tennessee Coal, Iron & R.R. Co., 1016 Union Trust Bldg., Cincinnati, having plans prepared, 3-story, with 2 wings. About $425,000.

La., Alexandria—Leland University having plans prepared by Favrot Livaudais, archts., Title Guarantee Bldg., New Orleans. About $100,000.

La., Lafayette—School—City voted $75,000 bonds to build school. Address the Mayor.

La., New Orleans—Church—Grace Episcopal Congregation plans to build. About $50,000. A. R. Edbrooks, 923 North Solomon St., pastor.

Tenn., Bartlett—High School—Bd. Educ. of Shelby Co. having plans prepared by McGee & Lester, archts. Scimitar Bldg., Memphis. About $50,000.

Tenn., Chattanooga—High School—Bd. Educ. having plans prepared by R. H. Hunt, archt., James Bldg. About $200,000.

Tenn., Cumberland Gap—Memorial—Lincoln Memorial University had plans prepared by A. L. Fechleimer, archt., 153 Union Trust Bldg., Cincinnati, 2- or 3-story. About $60,000.

Tenn., Kingsport—School—City approved $150,000 bond issue for new school and street improvements. W. M. Pouder, city mgr.

Tenn., Memphis—Hospital—Tri-State Baptist Hospital rejected bids. New bids. About $175,000. C. O. Pfiel, Tenn. Trust Bldg., archt. Noted May 10.

Ky., Ashland—School—City authorized sale of $100,000 bonds for new building.

O., Akron—School—Bd. Educ. having plans prepared by F. L. Packard, 1212 Haydon Bldg., Columbus, and T. R. Ridley, Akron Savings and Loan Bldg., archts., 2- or 3-story. About $500,000.

O., Ashland—Hotel—Otter Hotel—Main St. soon lets contract 5-story, 32 x 80-ft. addition. About $50,000. V. Redding, Bird Bldg., Mansfield, archt. Noted Apr. 26.

O., Carey—Hotel—Shrine of Our Lady of Consolation plans, 3-story, 65 x 80-ft. T. Huber, 750 Spitzer Bldg., Toledo, archt., soon receives bids.

O., Cincinnati—School—Bd. Educ. having plans prepared by Garber & Woodward, archts., Union Central Bldg., 3-story. About $500,000.

O., Cleveland—Welfare Bldg.—Hydraulic Pressed Steel Co., 3152 East 61st St., soon receives bids, 2-story, 45 x 165-ft. brick, steel and rein. con. About $50,000. W. S. Ferguson Co., 1900 Euclid Ave., archts.

O., Cleveland—Association—F. C. Worth, 2268 East 49th St., soon lets contract, brick and steel. Central and East 55th Sts. About $200,000. J. Eisenman, 491 Arcade Bldg., archt.

O., Cleveland—Church—St. Martins Episcopal Congregation having plans prepared by Meade & Hamilton, archts., 1002 [illegible] Bldg., brick, on Euclid Heights. About $[illegible].

O., Cleveland—Theater—Stork Amusement Co., care of A. A. Silberberg, having plans prepared by S. H. Weis, archt., 1030 [illegible] Bldg., brick and concrete. About $[illegible].

O., Cleveland—Home—Montefiore Home for Aged and Infirm Israelites plans, 2- or [illegible]-story [illegible]. About $75,000. L. [illegible], 111 [illegible] Bldg., chn. C. R. [illegible], 729 Guardian Bldg., archt.

O., Cleveland—[illegible]—Cleveland [illegible] American Trust Bldg., [illegible]-story, 119x125 ft., brick and steel, [illegible] Euclid Ave. About $[illegible]. H. [illegible], 418 American [illegible] Bldg., archt.

O., Cleveland—[illegible] High School—Bd. Educ. having plans prepared by C. S. [illegible], archt., 2258 Euclid Ave., 2- or [illegible]-story. About $[illegible].

O., Cleveland Heights—(Warrensville P. O.)—Home for Aged and Infirm Israelites—Montefiore Home for Aged and Infirm Israelites having plans prepared by C. R. Greco, archt., 729 Guardian Bldg., Cleveland, 2-story. About $75,000.

O., Columbus—Y. M. C. A. soon lets contract 4-story building. About $100,000. G. E. Smith, 175 North Front St., chn. Shattuck & Hussey, 19 South La Salle St., Chicago, and O. C. Darst, 1109 Brunson Bldg., archts.

O., Columbus—School—Franklin Twp. plans 2-story high and grade. About 100,000. Mills & Millspaugh Co., 67 East Long St., archts., soon receive bids.

O., East Cleveland—(Cleveland P. O.) Junior High School—Bd. Educ. having plans prepared, 2- or 3-story. C. S. Schneider, 2258 Euclid Ave., Cleveland, archt. About $100,000.

O., East Cleveland—(Cleveland P. O.) Technical High School—Bd. Educ. plans, 2-story. About $200,000. W. H. Nicklas, 1900 Euclid Ave., Cleveland, archt.

O., Ironton—Hotel, Store, Etc.—Ironton Hotel Co. had plans prepared by Howard & Merriam, archts., 8 East Broad St., 5-story, 32 x 132-ft. About $125,000.

O. Latty—School—Bd. Educ. having plans prepared, 2-story. About $50,000 or $60,000. F. L. Packard, 1212 Hayden Bldg., Columbus, archt.

O., Rushville—High and Grade School—Bd. Educ. plans, 2-story. About $70,000. F. L. Packard, Hayden Bldg., Columbus, archt.

O., Toledo—Museum—Toledo Museum of Art having plans prepared by Green & Wicks, archts, 110 Franklin St., Buffalo, for addition. About $600,000. G. W. Stevens, Monroe and Scottwood Sts., dir.

O., Zanesville—Lodge—Loyal Order Moose plans. About $50,000.

Ind., Evansville—High School—Bd. Educ. having plans prepared by C. Shopbell & Co., archts., 707 Furniture Bldg., 2-story, 84 x 300-ft., junior high school. About $100,000.

Ind., Vincennes—Church—First M. E. Congregation having plans prepared by L. H. Ostehage, archt., 2nd Natl. Bank Bldg., 1-story, 76 x 116-ft. About $75,000.

Mich., Detroit—School—Bd. Educ. having plans prepared by Malcomson & Higgenbotham, archts., 404 Moffatt Bldg., 2-story, for crippled children. About $100,000.

Mich., Detroit—Hospital—Ford Hospital plans 4-story addition. About $1,500,000. E. L. McPhee, Hamilton and West Grand Blvd., supt.

Mich., Hancock—Church—First Congregational Church soon receives bids. About $75,000. L. Christensen, Houghton, Secy. H. T. Liebert, Marathon Co. Bank Bldg., Wausau, Wis., archt.

Mich., Marquette—High School—Bd. Educ. having plans prepared, 3-story. About $150,000. A. R. Watson, supt. J. D. Chubb, 109 North Dearborn St., Chicago, archt.

Ill., Chicago—Church—Grace Episcopal Congregation having plans prepared by B. G. Goodhue, 2 West 47th St., New York City, and Lowe & Bollenbach, 14 East Jackson Blvd., archts., rebuilding church and chapel. About $200,000.

Ill., Chicago—Church—16th Church of Christ Scientist having plans prepared by H. L. Cheney, archt., 30 North Michigan Ave., 120 x 160-ft. About $100,000.

Ill., Niles Center—Club House—New Evanston Golf Club having plans prepared, 1-, 2- and 3-story, 60 x 280-ft. club house and golf links. About $200,000. C. F. Yegge, pres., and W. Ahlschlger, archt., both of 111 West Washington St., Chicago.

Ill., Riverside—Home—Scottish Old People's Home, recently destroyed by fire, will be rebuilt. Mundie & Jensen, 39 South La Salle St., Chicago, archts., soon receive bids. About $100,000.

Ill., Rockford—Bank and Office—Porter Bldg. Co., 302 State St., had plans prepared by F. Carpenter, archt., 420 Brown Blk., 10-story, 66 x 114-ft. About $275,000.

Wis., Ladysmith—Convent and Hospital—Mantelate Sisters of St. Marys, having plans prepared 3-story, 48 x 100-ft. and 2-story, 40 x 90-ft. H. F. Lieber, Marathon Co. Bank Bldg., Wausau, archt.

Wis., Milwaukee—Restaurant—Grove Investment Co., care W. Schroeder, 86 Michigan St., plans 6- or 8-story. About $100,000. Kirchoff & Rose, Majestic Bldg., archts., soon receives bids.

Wis., Wauwatosa—Children's Cottage—Bd. Administration plans. About $60,000. D. H. Davies, secy., R. A. Messmer & Bros., Majestic Bldg., Milwaukee, archts.

Buildings (Continued)

Ia., Glidden—School—Consolidated Dist. having plans prepared, 3-story, 144 x 144-ft. brick, terra cotta and rein.-con. About $80,000. H. M. Marker, Jefferson, and N. T. Vorse, 911 S. & L. Bldg., Des Moines, archts.

Ia., Jordan—School—City plans election July 16 to vote on $60,000 bond issue to build school.

Ia., Mapleton—High and Grade School—Bd. Educ. soon lets contract, 3-story, 79 x 164-ft. Trunk & Gordon, Donnell Court Bldg., St. Joseph, Mo., archts.

Ia., Sioux City—Church—Trinity Lutheran Church plans, 1-story, 60 x 100-ft. About $75,000. D. R. Huber, pastor. Beutler & Arnold, 609 Security Bldg., archts., soon receive bids.

Ia., Sioux City—Hotel—W. B. Nation having plans prepared, 10-story. F. W. Fitzpatrick, 4200 16th St., Wash., D. C., archt.

Minn., Hibbing — Home — Elks Lodge plans to build. About $60,000. Holstead & Sullivan, Pallidio Bldg., Duluth, archts.

Minn., Minneapolis—Hospital—City Hospital having plans prepared, 3-story. About $60,000. A. S. O'Donnell, superv. Long, Lamoreaux & Long, 830 Hennipin Ave., archts.

Minn., New Ulm—Church—St. Marys Congregation having plans prepared for parochial school and church. R. Chlinkert, pastor. Parkinson & Dockendorf, Linker Bldg., La Crosse, Wis., archts.

Minn., St. Paul — Schools — Bd. Educ. plans 30-room intermediate and 20-room elementary school. About $365,000. A. Wunderlich, school comr.

Minn., St. Paul—College—Concordia College plans to build on Syndicate Ave., between Carroll and Iglehart Aves. About $100,000.

Minn., St. Paul—Hotel—J. H. Meyering, Leamington Hotel, Minneapolis, having plans prepared, 10-story. About $600,000. Cederburg & Van Kirk, 300 Endicott Bldg., St. Paul, archts.

Minn., Shakopee—Women's Reformatory—State Bd. Control will build, 3-story, 65 x 125-ft. About $200,000. D. F. Mullen, secy. C. H. Johnston, 715 Capital Bldg., St. Paul, archt.

Kan., Augusta—School—Bd. Educ. rejected bids. New bids. About $50,000. G. P. Washburn & Son, 222 South Main St., Ottawa, archts.

Kan., Hutchinson — High School — Bd. Educ. soon lets contract, 4-story, 95 x 114-ft. About $125,000. W. E. Hulse & Co., First Natl. Bank Bldg., archts.

Kan., Kansas City — Stations — Kansas City Terminal Ry. plans 2 passenger stations. About $50,000. J. V. Hanna, 209 Union Sta., Kansas City, Mo., ch. engr.

Kan., Leavenworth—School Bd. Educ. had plans prepared for 3-story addition. W. P. Feth, Feth Bldg., archt.

Neb., Lincoln—Bank and Office—Nebraska Central Bldg. and Loan Assn., care of Folson Bros., 1423 O St., soon receives bids, 5-story, 25 x 142-ft. About $80,000. Fiske & Meginnis, 529 Bankers' Life Bldg., archts.

Neb., Omaha—Church—Second Church of Christ Scientist plans new building. About $50,000. H. P. Dunker, chn. bldg. com.

S. D., Mitchell—School—Bd. Educ. had plans prepared for 2-story addition. About $75,000. A. B. McKeel, clk., Holmes & Flinn, 8 South Dearborn St., Chicago, archts.

Mont., Great Falls—School—City voted $125,000 bonds to build [illegible] school.

Mo., Kansas City—Club House—Kansas City Athletic Club having plans prepared, 12-story. About $1,000,000. L. C. Smith, chn. bldg. comn. Smith, Rea & Lovitt, Washington Arcade, archts.

Mo., St. Louis—School—Bd. Educ. plans 2-story, 80 x 110-ft. About $[illegible]. C. F. Mason, secy., R. M. Milligan, B. of E. Bldg., archt.

Tex., Austin—Library—City plans election to vote on $100,000 bond issue to build library. A. P. Woolridge, mayor.

Tex., Dallas—Terminal—Texas Electric Ry. plans to erect new terminal building. About $100,000. O. A. Teal, Dallas, chief engr.

Tex., Denton—Dormitory—College of Industrial Arts had plans prepared for hall and dormitory. E. C. Taylor & C. W. Bulger, Dallas, archts. About $[illegible]

Tex., Waco—Store—Williams Dry Goods Co. having plans prepared for [illegible] Cason, archts., Amicable Bldg. About $100,000.

Okla., Oklahoma—Art Bldg.—City and State Exposition Co. plan, 1-story, 200 x 300-ft. brick and rein.-con. About $100,000. Layton & Smith, 701 Majestic Bldg., archts.

Okla., Oklahoma—City and State Exposition Co. plans prepared, 1-story, 200 x 300-ft., rein.-con. and brick building. About $100,000. Layton & Smith, Majestic Bldg., archts.

Okla., Stillwater—Science Hall—State Bd. Agriculture plans 2-story, 80 x 110-ft. About $100,000. F. C. Biggin, state archt.

Colo., Greeley—Theater—H. T. Nolan, 1301 Ogden Ave., Denver, and others, plan, on 9th street. About $100,000.

Utah, Salt Lake City—Gymnasium—Regents of University of Utah plan. About $512,500.

Ore., Ashland—High School—City voted $70,000 bond issue for high school.

Cal., Healdsburg — School — City voted $100,000 to build school.

BIDS DESIRED

N. Y., Troy—High School—Until Aug. 20 by Bd. Educ., on Columbia Terrace. Tooker & Marsh, 101 Park Ave., New York City, archts.

Fla., Jacksonville — School—Until July 21, by F. A. Hathaway, supt. bd. educ., for 10-room school at Johnson Addition, La Villa Park. About $65,000. Noted Apr. 5.

Ind., Ft. Wayne—(Official)—Until Aug. 1, by C. R. Weatherhogg, archt., Hamilton Natl. Bank Bldg., for 7-story rein.-con., stone and brick building at East Washington Blvd. and Barr St. for Y. M. C. A. About $225,000. A. H. Perfect, chn. Noted May 24.

Ind., Greencastle—(Official)—School—Until July 20 by Bd. Educ. About $100,000. H. L. Bass, Hume-Mansur Bldg., Indianapolis. Noted June 21.

Ia., Mapleton—Schools—Until July 16, by N. W. Pike, secy. bd. educ., 3-story, 79x164-ft. About $95,000. Trunk & Gordon, Court Bldg., St. Joseph, Mo., archts.

Minn., Randolph—School—Until July 18, by G. L. Morrill, clk., bd. educ. About $50,000. Tyrie & Chapman, Auditorium Bldg., Minneapolis, archts. Noted May 31.

N. D., Blue Hill—School—Until July 16, by O. Johnson, clk. bd. educ. About $80,000. G. R. Horton, Jamestown, archt.

Colo., Monte Vista—High School—Until July 16, by G. B. Robertson, archt., Majestic Bldg. About $60,000.

Okla., Stillwater—Court House and Jail—Until Aug. 1 by W. T. Keys, co. clk. About $100,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Dorchester**—School Bd. Educ. let contract, 2-story, 151x159-ft., brick and limestone, in Glenway St., to W. H. Haynes, 40 Court St., Boston. About $275,000.

★**N. Y., Athens**—School Bd. Educ. let contract to William B. Richards, 24 Gates St., Wilkes-Barre. About $51,485

★**N. Y., Brooklyn**—Church—First Baptist Congregation, Pierpont St., let contract rebuilding, Flatbush Ave. and Schermerhorn St., to H. J. Brown & Son, 1354 Fulton St. About $[illegible]

★**N. Y., Brooklyn**—Church—First Baptist Congregation, 247 New York Ave., let contract rebuilding to H. J. Brown & Son, Inc., 1534 Fulton St. About $[illegible]

★**N. Y., Brooklyn**—Theater—Putnam Theatrical Co., let contract, 124x205-ft. terra cotta, brick and granite at Fulton, Livingston and South Sts. and Gallatin Pl. to Fleischman Constr. Co., 7 West 45th St., New York City. About $[illegible]

N. Y., Brooklyn—Hospital—[illegible] Memorial Hospital let contract [illegible] and stone addition to J. G. Hegeman, Inc., [illegible] West 42nd St., New York City.

★**N. Y., New York**—Exchange—[illegible] New York Tuberculosis Co. let [illegible] 1750 [illegible], 82 x 81 ft., [illegible] 44 West 18th St. to E. E. Paul Co., 101 Park Ave. $100,000

★**N. Y., New York**—Club House—Columbia University Club let contract, 7-story, 100 x 125-ft., to J. Lankenau, 103 Park Ave.

★**N. Y., New York**—Theater—[illegible] Co. let contract, 100 x 175-ft., to [illegible] Vanderbilt Ave. About $300,000

★**N. Y., Niagara Falls**—Y. W. C. A., care of Mrs. P. H. Barton, 352 Buffalo Ave., let contract to Brass Bros., 1110 Whitney Ave., $66,000.

★**N. Y., Syracuse**—School—Bd. Educ. let contract to Phelan Bldg. and Constr. Co., 79 River St., Hoboken. About $500,000.

★**N. J., Newark**—Theater—A. W. Moore, 22 Green St., let contract, 1- and 2-story, 125x150-ft. brick, on Mt. Prospect Ave. and Heller Pkway, to I. Feinsod, 402 Hunterdon St. About $70,000.

★**Pa., Brownsville**—School—Ed. Educ., Luzerne Twp., let contract 2-story, 65 x 110-ft., to Brownsville Constr. Co., Brownsville. About $60,000.

★**Pa., Locust Gap**—High School—Bd. Educ. let contract 2-story, 80 x 140-ft., to A. Breslin, Summithill. About $80,000.

★**Pa., Phila.**—Hotel—Hotel Bedford let contract, 7-story, 60 x 160-ft., Brown and Broad Sts., to Steele & Sons Co., 1600 Arch St. About $142,500.

★**Pa., Phila.**—Office—Studebaker Corp. let contract, 7-story, at Broad and Brown Sts., to Wm. Steele & Sons Co., 1600 Arch St. About $350,000.

★**Pa., Pittsburgh**—Theater—Olympic Theater, J. Baziotes & M. Antonopolis, 318 5th Ave., let contract addition and remodeling to H. Miller & Sons, May Bldg. About $100,000.

★**Va., Petersburg**—School—Bd. Educ. let contract to D. P. Bass, Petersburg. About $79,972.

★**Va., Richmond**—Hospital—Memorial Hospital, care of Virginia Medical College, 11th and Broad Sts., let contract 4-story addition to A. M. Walkup & Co. Noted June 28.

★**Fla., Miami**—Hospital—City let contract to St. John Constr. Co. About $52,218.

★**Ala., Ensley**—Bank—Bank of Ensley let contract new building, Ave. E and 19th St., to G. W. Muller Bank Fixture Co. About $150,000.

★**O., Dayton**—Theater and Store—Dayton Theater Bldg. Co., care of F. Rike, Main and 2nd Sts., let contract, 3-story, 99 x 198-ft., to Danis Hunt Co., 1st and Webb Sts. About $225,000.

★**Ind., Auburn**—Jail—DeKalb Co. let contract 2-story, 43 x 115-ft., to H. H. Achemier. About $[illegible]

★**Mich., Highland Park**—High School—Bd. Educ. let contract addition to Bryant & Detwiler, 2336-39 Dime Bank Bldg., Detroit. About $550,000.

★**Ill., Chicago**—Theater, Stores, Etc.—Thomas Chamales, 4800 Bway., let contract, 3-story, 149 x 163-ft., to Kusel & Harris, 30 North La Salle St. About $300,000.

★**Ia., Nevada**—House—Story Co. let contract 2-story, 92 x 118-ft., brick, stone and rein.-con., to W. F. Kucharo, Security Bldg., Des Moines. About $[illegible]

★**Ia., Woodward**—Children's Bd. Control let contract, 2-story, 35 x 220-ft., brick, tile and rein.-con. to J. E. Fuson & Son, 844 18th St., Des Moines. About $[illegible]

★**Minn., Ironton**—School—Bd. Educ. let contract [illegible], 46 x 102-ft., to Hedges Constr. Co., 629 Monmouth Bldg., Minneapolis. About $[illegible] Noted June 18

★**Neb., Hastings**—Store—[illegible] let contract to Olson & Johnson, 508 Montana Bldg., Missoula, Mont. About $[illegible]

★**Neb., Omaha**—Office—Mat Livery Motor Co. let contract, [illegible] brick and stone, to Olson & Johnson, 618 1st Natl. Bank Bldg. About $50,000

★**Neb., York**—Hotel—York Hotel Co. let contract to Hans Kuest & Son, 14th and Pratt Sts., Omaha. About $[illegible] Noted May 3

★**Neb., York**—Schools—Bd. Educ. let contract, 2-story, 55 x 84-ft., to Olson & Johnson, Omaha. About $[illegible]

★**Mont., Billings**—Hospital—St. Vincent's Hospital let contract addition to Cooper & Co., 101 Pine St. About $[illegible]

★**Mo., St. Louis**—Theater—Vaudeville Theater Co., 704 Olive St., let contract alterations to theater and office building to [illegible] Const. Co., 817 Olive St. [illegible]

★**Mo., St. Louis**—Y. M. C. A. let contract building to John Hill Const. Co., 1619 Pine St. Address About $[illegible]

★**Tex., Beaumont**—Office—[illegible] let contract [illegible] and remodeling 2-story building to T. Olson, [illegible] Arthur. About $[illegible]

★**Tex., Dallas**—Bank and [illegible] Addition and [illegible] let contract 15-story, [illegible] to J. W. Thompson, St. Louis

★Tex., El Paso—[illegible]forced Concrete

★Tex., Sour Lake—School—Bd. Educ. [illegible] n, 1801 C St., Galveston. About $[illegible]

★Tex., Victoria—[illegible]—Bd. Educ. let contract [illegible] to S. M. [illegible] $76,487

Ariz., Tucson—School—[illegible] suite received [illegible] W. H. Young. About $[illegible]

★Ore., Pendleton—[illegible]—City let contract to Parker & Benfield, Portland. About $[illegible]

Cal., Los Angeles—[illegible]—Bear Lake [illegible] Security Bldg. let contract [illegible] at Bear Lake to C. L. Robinson, Hibernian Bldg. About $[illegible]

★Cal., Yreka—School—Bd. Educ. let contract to T. B. Goodwin, San Francisco, About $[illegible]

FEDERAL GOVERNMENT WORK

Proposed Work

Pa., Monessen—Post Office—J. A. Wetmore, supervy. archt., treas. dept., Wash., rejected bids. Noted July 5.

Wash., D. C.—[illegible]—Bureau Yards and Docks (F. R. Harris, ch.), Navy Dept., let contract building [illegible] at Annapolis, Md.; Quantico, Va., Key West, Fla., Mare Island (Vallejo P. O.), Cal., Puget Sound (Bremerton P. O.), Wash., Portsmouth, N. H., Jamestown, R. I., Newport, R. I. and Norfolk, Va.

N. C., Wash Woods—Coast Guard—Navy Dept., U. S. Coast Guard Headquarters, Wash., rejected bids opened June 16. Noted June 28.

Cal., San Francisco—Quarters—Bureau Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., received no bids July 2 for chief petty officers' quarters at Naval Training Station.

BIDS DESIRED

R. I., Newport—Prince Filling Hose—Bureau Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., until [illegible] for [illegible] steel sash [illegible] and concrete slab electric conduit and lighting at Naval Torpedo Station, Correspondence July [illegible]

N. Y., New York—[illegible] July 20 by [illegible] Army Bldg., 39 Whitehall St., for dredging in Wallabout Creek and Turning Basin and Foundation Harbors, N. Y.

Wash., D. C.—Post Office—Until Aug. 17, by J. A. Wetmore, supervy. archt., Treas. Dept., Wash.

Ga., West Point—Post Office—Until Aug. 17, by J. A. Wetmore, supervy. archt., Treas. Dept., Wash.

Ala., Jasper—Post Office—Until July 17, by J. A. Wetmore, supervy. archt., treas. Dept., Wash.

Mo., St. Louis—Lock Work—Until July 11 by Mississippi River Comm., 1311 International Life Bldg., for [illegible] cast-iron [illegible] at Lock No. 2, Ill.

Wash., Puget Sound—[illegible] by Bureau Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., for [illegible] at Puget Sound Navy Yard.

Wash., Puget Sound—[illegible] by Bureau Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., for [illegible] at Puget Sound Navy Yard.

Wash., Puget—Tanks and Towers—Bureau Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., for [illegible] at Puget Sound Navy Yard.

Cal., Mare Island—[illegible] by Bureau Yards and Docks, Navy Dept., Wash., for [illegible] at Mare Island Navy Yard.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Pa., Erie—[illegible]—Bureau Yards and Docks, Navy Dept., Wash., let contract for [illegible] at Marine Barracks, to Schaffner & Gray, Erie, for $[illegible], July 5.

Wash., D. C.—Buildings—Bureau Yards and Docks, Navy Dept., received low bids, June 25, 14 magazine buildings: 7 for Lake Denmark, 2 for Iona Island, N. Y., 5 for Hingham, Mass., as follows: Snare & Triest, Woolworth Bldg., New York City, $546,000; J. C. Lyons Sons Co., 30 East 42nd St., New York City, $63,000; Kennedy & Paterson, 7 Water St., Boston, $416,400; J. H. Miller, Baltimore, $347,700; Boyle-Robertson Co., Evans Bldg., $360,175. Noted May 31.

Wash., D. C.—Canal Wall—Dist. Comrs., Room 509, Dist. Bldg., received low bids July 2, (a) ordinary excavation above elevation, (b) ordinary excavation below elevation, (c) rock excavation above elevation, (d) rock excavation below elevation, (e) concrete above elevation, (f) concrete below elevation, from W. F. Cush, 1st and F Sts., (a) $1.75, (b) $2.00, (c) $3.50, (d) $5.00, (e) $9.50, (f) $10.00; W. D. Murray, Benning Rd., (a) $2.17, (b) $3.12, (c) $2.75, (d) $2.75, (e) $11.00, (f) $12,000. Noted June 28.

★**Wash., D. C.**—Cement—F. G. Lane, secy. of Interior, U. S. Rec. Ser., let contract furnishing portland cement for various reclamation projects during year as follows: Southwestern Portland Cement Co., El Paso, 9000 bbls., $2.28 per bbl.; Riverside Portland Cement Co., Crestmore, Cal., 3250 bbl., $1.90; Dewey Portland Cement Co., Dewey, Okla., 2960 bbls., $1.80; Pacific Portland Cement Co., Tolenas, Cal., 22,463 bbls., $1.80; International Portland Cement Co., Irwin, Wash., 5100 bbls., $2.10; Three Forks Portland Cement Co., Trident, Mont., 7055 bbls., $2.30; U. S. Portland Cement Co., Concrete, Colo., 22,200 bbls., $2.00; Portland Cement Co. of Utah, 8 Exchange Pl., Salt Lake City, 2000 bbls., $2.30.

★**Wash., D. C.**—Coast Guard—Navy Dept., U. S. Coast Guard Headquarters, let contract Coast Guard Station No. 184, Creeds Hill, N. C., to J. W. Martin, Elizabeth City, N. C., $17,567.

★**Wash., D. C.**—Generators—Bureau Yards and Docks, Navy Dept., let contract motor-generator sets at Norfolk, Puget Sound, Phila., Charleston, S. C. and Washington Navy Yards to General Electric Co., River Road, Schenectady, N. Y. Total cost, $155,675.

★**Wash., D. C.**—Quay Wall—Bureau Yards and Docks, Navy Dept., let contract extension to quay wall to Clark & Winston Co., 10th St., Wash., D. C., $21,965.

W. Va., Charleston—Cranes—Bureau Yards and Docks, Navy Dept., Wash., received low bids furnishing electric traveling cranes for projectile plant, from Cleveland Crane & Engr. Co., Wycliff, O., (a) $55,965, (b) $34,925, (c) $11,345, (d) $29,075, time 3 to 6 mos.; Manning, Maxwell & Moore, 119 West 40th St., New York City, (a) $48,864, (b) $27,918, (c) $9338, (d) $28,956, spare parts for motors, $224, time 244 to 252 days; Morgan Engr. Co., City National Bank Bldg., Dayton, (a) $61,[illegible] (b) $37,450, (c) $13,115, (d) $36,309, f.o.b. Alliance, freight allowed to Charleston; delivery, 8 mos.

★**Ky., Louisville**—Mason & Hanger Co., general contractors for U. S. cantonment, sublet contract building 6-mi. asphalt and concrete roadway through camp to H. Bickel Co., 1601 South 6th St., $75,000 to $100,000; plumbing for cantonment to City Plumbing & Heating Co., $300,000.

★**Ill., Great Lakes**—Bridges, etc.—Bureau Yards and Docks, Navy Dept., Wash., let contract building temporary but substantial bridges to Leyden-Ortseifen Co., Monadnock Bldg., Chicago, cost plus basis.

★**Ill., Great Lakes**—Dormitory, Etc.—Bureau Yards and Docks, Navy Dept., Wash., let contract dormitory, latrine, mess hall and accessory buildings for 2 detention units, etc., at Camp Ross, to J. O. Heyworth, 606 South Michigan Ave., Chicago, cost plus basis.

★**Ill., Great Lakes**—Dormitory, etc.—Bureau Yards and Docks, Navy Dept., Wash., let contract dormitory, latrine, mess hall and accessory building for 4 regiments to [illegible] Conway Bldg., Chicago, cost plus basis.

★**Ill., Great Lakes**—Sewerage System, Bureau Yards and Docks, Navy Dept., Wash., let contract sewerage system and road work at U. S. cantonment to H. J. Nichols, 459 Rookery St., Chicago, cost plus basis.

Ark., Prescott—Post Office—J. A. Wetmore, supervy. archt., treas. Dept., Wash., received low bid, June 28, from A. Blair, Hill Bldg., Montgomery, Ala., $49,520. Noted June 7.

★**N. Mex., Pueblo Boneto**—Mess Hall, Etc.—Comr. Indian Affairs, Wash., let contract mess hall and schoolhouse to H. T. Zillmer, Albuquerque, $22,705 and $31,075 respectively; work complete $50,200.

MISCELLANEOUS

Proposed Work

Dam — Readsboro, Vt. — New England Power Co. plans earthen dam, 200 ft. high to create storage basin having capacity of 3,600,000 cu.ft.; from this dam tunnel is to be bored through mountain a distance of 14,000 ft. to point known as Davis Bridge where power plant with a capacity of 36,000 hp. will be erected. H. I. Harriman, pres.

Parks—Newark, N. J.—Bd. Freeholders will sell $500,000 bonds July 24, to acquire lands for public parks and erecting buildings thereon. F. E. Ward, clk.

Elimination of Grade Crossings—N. J., South Orange—See "Sewers."

Park Improvements—Kansas City, Mo.—Council passed ordinance to issue $100,000 bonds to improve Brush Creek Park. H. L. Jost, mayor.

Channel—Beaumont, Tex.—City election in August to vote on $300,000 bonds to deepen Beaumont ship channel.

Park Improvements, Etc.—Utah, Salt Lake City—See "Sewers."

Tunnels—San Francisco, Cal.—City receives bids in August building 19 mi. tunnels on Hetchy-Hetchy aqueduct. About $6,000,000.

Harbor Improvements, etc.—Toronto, Ont.—Bd. Control plan to issue $4,000,000 for harbor improvements and $720,000 for civic hydro system.

BIDS DESIRED

Tide Gate with Spillways, etc.—New Haven, Conn.—Until July 18, by F. L. Ford, city engr., for tide gate with spillways and river walls on Mill River, north State St.

Stations—New York, N. Y.—Until July 18 by Pub. Ser. Comn., 120 Bway., station finish for 2 stations on Bway-4th Ave. Rapid Transit R.R.

Street Signs—Camden, N. J.—Until July 16 by Bd. Freeholders, for 1000 metal street signs. F. S. Vanhart, chn. st. com.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Riprap — Richmond, Cal. — Bd. Harbor Comn. received low bids, 12,000 tons riprap for clay bulkhead in inner harbor, from Plate Bros., $2.73 per ton; Healy-Tibbits Constr. Co., 9 Main St., San Francisco, $2.78; Daniel Contr. Co., 503 Market St., San Francisco, $3.10.

BUILDING OPERATIONS FOR JUNE

Following is a list of contracts awarded published by the F. M. Dodge Co. for New England, New York, New Jersey, Pennsylvania, Maryland, Delaware, District of Columbia, Virginia, Ohio, West Virginia, Illinois, Indiana, Iowa, Wisconsin, Michigan, Minnesota, North and South Dakota, and portions of Missouri and eastern Kansas from Jan. 1 to July 1:

From January 1 to July 1:

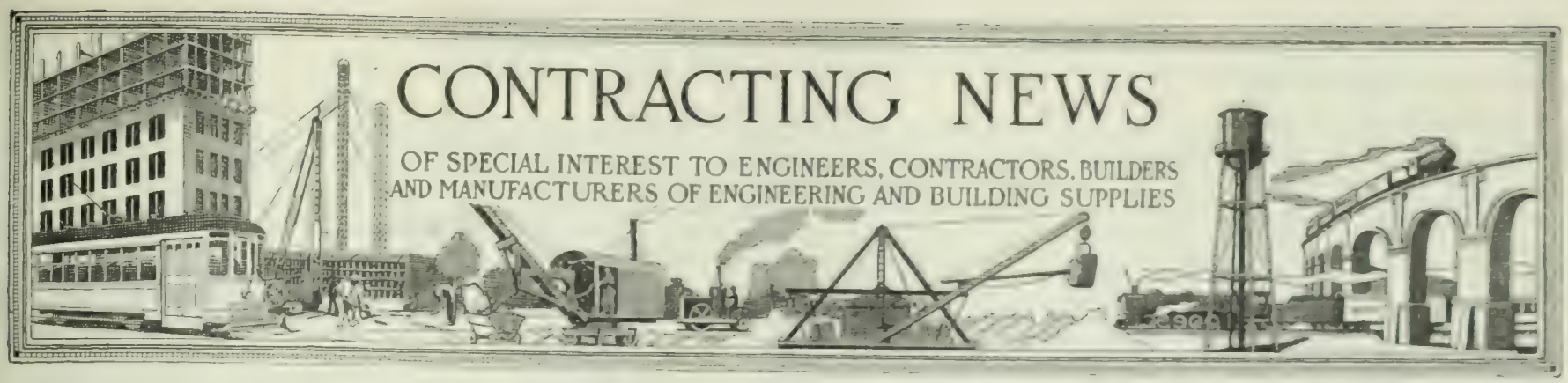
1917	$831,402,000
1916	596,583,586
1915	413,532,600
1914	382,532,000
1913	472,372,500
1912	406,011,000
1911	416,227,813
1910	454,145,798

NEW YORK AND NORTHERN NEW JERSEY

January 1 to July 1:

1917	$155,281,000
1916	74,922,500
1915	72,558,000
1914	65,926,000
1913	158,017,500
1912	122,328,000
1911	129,784,000
1910	144,918,000

For the larger territory covered contracts awarded amounted to $206,541,000 against $157,563,000 for May and $148,513,000 for April, an increase over May of $49,000,000. For the smaller territories in New York and the northern part of New Jersey, the contracts awarded amounted to $27,387,000 as against $32,419,000 in May and $26,823 in April, showing very little change.



Proposals

For Proposals Advertised See Pages 52 to 57 Inclusive

WATER-WORKS

Bids Close		See Eng. News-Record
July 25.	Waverly, Ia.	July 12
Sept. 11.	New York, N. Y.	July 12

SEWERS

Bids Close		See Eng. News-Record
July 21.	**Hagerstown, Md.**	**July 12**
July 23.	Wingdale, N. Y.	June 28
	Adv. June 28 to July 12.	
July 23.	Canton, O.	July 19
July 24.	Crosby, Minn.	July 12
July 24.	New Brunswick, N. J.	July 19
July 25.	Orange, Conn.	July 19
	Adv. July 19.	
July 25.	Lebanon, Pa.	July 19
	Adv. July 19.	
July 30.	Mukwonago, Wis.	July 19
July 31.	Linndale, O.	July 5
July 31.	Glenwood, Minn.	July 12
Aug. 1.	Atwater, Minn.	July 12
Aug. 1.	Hazeltown, Md.	July 12
Aug. 6.	Cleveland Heights, O.	July 19

STRUCTURAL STEEL WORK

Bids Close		See Eng. News-Record
July 25.	Warren, O.	July 12
July 27.	Eufaula, Okla.	July 19
July 30.	New York, N. Y.	July 12
July 31.	Norwalk, O.	July 19
July 31.	Seattle, Wash.	July 19
Aug. 2.	Miami, Fla.	June 28
	Adv. June 28 and July 5.	
Aug. 2.	Little Falls, Minn.	July 19
Aug. 3.	Albany, N. Y.	July 19
	Adv. July 19	
Aug. 6.	Spencer, Ind.	July 19
Aug. 14.	Brazil, Ind.	July 12
Aug. 16.	Hamlin, W. Va.	July 12

REINFORCED CONCRETE

Bids Close		See Eng. News-Record
July 23.	Newton, N. J.	July 19
July 23.	Junction City, Kan.	July 19
July 25.	Carroll, Ia.	July 19
July 25.	Tehamah, Neb.	July 5
July 27.	Somerville, N. J.	July 12
July 28.	Sullivan, Ind.	July 12
July 30.	Watsontown, Pa.	July 5
Aug. 3.	Athens, Tenn.	July 12
Aug. 6.	Greenville, Miss.	July 12
Aug. 6.	Columbus, O.	July 19
Aug. 13.	Spencer, W. Va.	July 19
Aug. 22.	Beatrice, Neb.	July 19

STREETS AND ROADS

Bids Close		See Eng. News-Record
July 21.	Wauseon, O.	July 5
July 23.	Indiana	July 12
July 23.	Eastwood, N. Y.	July 19
	Adv. July 19	
July 23.	Columbus, O.	July 19
July 23.	New York, N. Y.	July 19
July 23.	Louisiana	July 12
July 24.	Pennsylvania	July 19
July 24.	Pennsylvania	July 19
July 24.	Pottstown, Pa.	July 12
July 24.	Letcher, Ky.	July 19
July 24.	Michigan City, Ind.	July 19
July 24.	Massachusetts	July 19
July 24.	North Bergen, N. J.	July 19
July 25.	Warsaw, Ind.	July 12
July 25.	Indiana	July 12
July 25.	Idaho	July 5
July 25.	Sidney, O.	July 19
	Adv. July 19	
July 25.	Cleveland, O.	July 19
July 25.	Huntington, W. Va.	July 19
July 26.	Little Rock, Ark.	July 19
July 26.	Newark, N. J.	July 19
July 26.	East Liverpool, O.	July 19
July 26.	Brooklyn, N. Y.	July 19
July 26.	New York, N. Y.	July 19
July 26.	Bronx, N. Y.	July 19
July 27.	Cincinnati, O.	July 19
July 27.	Ceredo, W. Va.	July 19
July 27.	West Frankfort, Ill.	July 19
July 28.	Somerset, Pa.	July 19
July 30.	Albany, N. Y.	July 19
	Adv. July 19.	
July 30.	Jefferson, O.	July 19
July 30.	Seattle, Wash.	July 19
Aug. 3.	Uniontown, Pa.	July 19
Aug. 3.	Greenville, Miss.	July 19
Aug. 3.	Indianapolis, Ind.	July 19
Aug. 6.	Clifton, Ariz.	July 12
Aug. 6.	Indianapolis, Ind.	July 12
Aug. 7.	Indiana	July 12
Aug. 7.	Houston, Tex.	July 19
Aug. 7.	Huntsville, Tex.	July 19
Aug. 7.	Pennsylvania	July 19
Aug. 8	Santa Ana, Cal.	July 19
Aug. 13.	Lewiston, Idaho	May 24
Aug. 14.	New Bedford, N. J.	July 19
Aug. 16.	Hamlin, W. Va.	July 12

INDUSTRIAL WORKS

Bids Close		See Eng. News-Record
July 25.	Brooklyn, N. Y.	July 12
Aug. 1.	St. Petersburg, Fla.	July 5

EXCAVATION AND DREDGING

Bids Close		See Eng. News-Record
July 21.	Cadiz, O.	July 19
July 23.	Marshall, Minn.	July 12
July 23.	White Plains, N. Y.	July 19
July 23.	Mason City, Ia.	July 19
July 24.	Slayton, Minn.	July 5
July 24.	Troy, Ala.	July 19
July 25.	Dyersburg, Tenn.	July 12
July 26.	Brownstown, Ind.	July 19
July 26.	Lawrenceville, Ill.	July 19
July 27.	Detroit, Mich.	July 5
July 30.	Walker, Minn.	July 12
July 30.	Winamac, Ind.	July 19
July 31.	Susanville, Cal.	July 12
July 31.	Central Islip, N. Y.	July 19
	Adv. July 19.	
Aug. 1.	Sac City, Ia.	July 12
Aug. 3.	Lebanon, O.	July 19

BUILDINGS

Bids Close		See Eng. News-Record
July 21.	Greencastle, Ind.	July 12
July 21.	Jacksonville, Fla.	July 5
July 21.	Martins Ferry, O.	July 5
July 21.	Lexington, Mass.	July 5
July 23.	Hebington, Kan.	July 12
July 23.	Columbus Ave., Ia.	July 12
July 24.	Quincy, Mass.	June 12
July 24.	Huntington, Ind.	July 19
	Barksdale, Wis.	July 19
	McPherson, Kan.	July 12
	Ft. Wayne, Ind.	July 19
July 31.	Ft. Wayne, Ind.	July 5
Aug. 1.	Stillwater, Okla.	July 12
Aug. 1.	Ft. Wayne, Ind.	July 5
Aug. 1.	Cushing, Okla.	July 5
Aug. 1.	Warwood, Minn.	July 5
Aug. 6.	Cheyenne, Wyo.	July 19
Aug. 6.	Santa Barbara, Cal.	July 19
Aug. 8.	Great Neck, Ky.	July 19
Aug. 20.	Troy, N. Y.	July 12

FEDERAL GOVERNMENT WORK

Bids Close		See Eng. News-Record
July 20.	Ft. Fairfield, Me.	June 21
July 21.	St. Louis, Mo.	July 12
July 23.	Washington, D. C.	June 21
July 30.	Phila., Pa.	July 19
July 30.	St. Louis, Mo.	July 19
July 31.	Key West, Fla.	July 19
Aug. 9.	Louisville, Ky.	July 19
	Adv. July 19.	
Aug. 17.	Lancaster, Ky.	July 19
Aug. 21.	Eldorado, Kan.	July 19
Aug. 22.	Cherokee, Ia.	July 19
July 23.	Cincinnati, O.	June 28
	Adv. June 21 to July 12.	
July 25.	Cherokee, Okla.	July 5
July 25.	Mare Island (Vallejo P. O.), Cal.	July 12
July 25.	Puget Sound (Bremerton P. O.), Wash.	July 12
July 26.	Key West, Fla.	July 12
July 26.	Gallatin, Tenn.	June 28
	Adv. June 21 and 28	
July 27.	Vernon, Tex.	June 28
July 30.	New York, N. Y.	July 12
July 30.	Keyport, Wash.	July 12
July 30.	San Antonio, Tex.	July 12
July 30.	Newport, R. I.	July 12
July 31.	Chardon, Neb.	July 5
Aug. 3	Winchester, Mass.	July 5
Aug. 6.	Globe, Ariz.	July 5
Aug. 14	West Point, Ga.	July 12
Aug. 17.	Wash., D. C.	July 12

MISCELLANEOUS

Bids Close		See Eng. News-Record
Aug. 22	Tunnel—San Francisco, Cal.	June 19
	Adv. July 19.	

Where name of official is not given, inquiries should be addressed to City Clerk County Clerk or corresponding official

WATER-WORKS

Proposed Work

N. J., New Brunswick—Bd. Pub. Utilities authorizes Middlesex Water Co. to issue $200,000 bonds for extending water system.

La., Alexandria—City voted $10,000 bonds for installing water mains.

Pa., Harrisburg—City plans installing other filter beds and increasing capacity water works. H. E. Dennis, supt.

O., Dayton—Dayton City to put in new water works. H. E. Wall, city engineer and supt.

Minn., Duluth—City votes $1,000,000 bonds for improvements. About $1,000,000 to be spent.

Ohio, Lorain—City election July 31 to vote on $475,000 bonds for improving water works. H. M. Waring, city engineer.

Okla., Ryan—City voted $15,000 bonds for improving water works. Date June 26.

Water-Works (Continued)

N. B., Edmunston—Town plans additions to sewerage plant and electric system. Address Mayor.

BIDS DESIRED

Kan., Junction City—Sealed proposals for reinforced concrete

PRICES AND CONTRACTS AWARDED

N. Y., New York—(Official)—City received low bid from Contr. No. 184, paving [illegible] from H. P. [illegible] St., at $4.25 S.Y., from Lanfer & Remick, Ellicott Sq., Buffalo. Noted June 21.

N. Y., New York—(Official)—City received low bid from Contr. 187, fitting up chemical and bacteriological laboratory, etc., Jerome Park Reservoir, from Isaac Lang Supply Co., 105 West 40th St., $14,839. Noted June 21.

N. Y., New York—(Official)—Bd. Water Supply received only bid on Contr. 179, sur[illegible] with vitr. brick block about 2000 ft. Kensico Dam, North Castle, from Degen Eng. Co., 6 Church St., $39.-[illegible]

O., Cincinnati—City let contract 1200 tons sulphate iron for water-works to American Steel and Wire Co., 1005 Union Trade Bldg. $19,440.

★Ill., Maywood—Village let contract drilling artesian well to S. B. Geiger, 37 Van Buren St., Chicago, $[illegible].

Wis., Shawano—(Official)—Electric Light & Water Comm. let contract furnishing high pressure non-condensing heavy duty Corliss engine and 3 motor-driven centrifugal pumps to Allis-Chalmers Co., West Allis. Noted June 28.

Mont., Helena—City sold $225,000 bond issue for extending water system. L. Workman, engr. Noted Apr. 19.

Okla., Lawton—City election, July 23, to vote on $[illegible] to improve and extend water system; plans include 2nd pipe line from dam to Ft. Sill. R. H. Warren, chn. L[illegible] comm.

Cal., Calipatria—North End Water Co. plans to enlarge its plant. About $75,000 is involved. [illegible]

★Que., Pointe Claire—(Official)—City let contract water filtration plant and lift pumps to Arsenault & Plamondon, 70 St. James St., Montreal, $38,500. Noted June

★Que., St. Johns—City let contract constructing filter, water tank, and replacing some of the mains to Lanrin & Leitch, 5 Jacques Hall Sq., Montreal, $[illegible].

★Que., Thetford Mines—Town let contract for plans and reservoir to W. C. Goff. [illegible]

SEWERS

Proposed Work

N. J., Camden—Council passed ordinances for constructing sewers in Twps. 22nd, Fremont, Atlantic, Cuthbert and 24th, 25th and Westfield aves. W. D. Bunce, city clk.

N. J., Kenilworth—Bids receive soon to take up $[illegible] bond issue for street and [illegible] improvements. Address A. H. Letzler, [illegible].

N. J., Paterson—City plans sewers in Pearl, Pond, East 5th, and other streets. [illegible] Harding, city engr.

Pa., Pittsburgh—Council authorized contracting debts in certain Manchester and Fineview dists. J. Bryan, Jr., city engr.

O., Youngstown—City received no bids awarding sewers in Atlantic and Johns dists. Amount $[illegible]. Noted June 14.

Mich., Detroit—City soon let contract constructing new sewerage system. About $[illegible]. A. Hubbard, city engr.

Kan., McPherson—City plans to install sewage disposal plant. About $[illegible].

Ark., Texarkana—City election, Aug. 7, to vote on $[illegible] bond issue to extend and improve sewerage system. Address City Clk.

Okla., Frederick—City voted $[illegible] bonds to construct sewers and street improvement. W. D. Womack, city [illegible].

Tex., San Antonio—City plans sewerage improvements and to provide Castle Village with sewerage system. About $[illegible]. A. C. Pahmeyer, city engr.

Ariz., Jerome—City Council plans passed to Ormond & Gulick, engrs., Hollingsworth Bldg., Los Angeles, for sewerage system. E. Marshall, city engr.

Cal., Corcoran—City council having plans prepared for sewerage system to connect all to Main Sts. and sewers in some other and apply same to 10 acre sub-[illegible] site.

BIDS DESIRED

Conn., Orange—(Official)—Until July 25, by Bd. Selectmen, installing 6 mi. sewers, sewage disposal works, pumping station, etc. J. Wilkinson, 1st selectman; advertised in this issue. Plans and specifications on file at this office.

N. J., New Brunswick—Until July 24, by City Comn., constructing vitr. pipe sewers in Rutgers, Delevan and other streets. A. Atkinson, city engr. Noted June 28.

Pa., Lebanon—(Official)—Until July 25, by Mayor and Council, building Contract No. 2 Lebanon's Flood Prevention Project; advertised in this issue.

O., Cleveland Heights—(Warrensville P. O.)—(Official)—Until Aug. 6, by H. H. Canfield, clk., installing brick, segment block and vitr. pipe storm sewer. F. A. Pease Eng. Co., 812 Marshall Bldg., Cleveland, engrs.

Ill., Chicago—(Official)—Until Aug. 1, by Bd. Local Improv., for sanitary sewerage system including septic tank and sand filters; about 7000-ft. 8- and 12-in. pipe sewer, 74 brick manholes, 10 flush tanks and sewage treatment plant, etc. J. Ericson, city engr. Noted June 28.

Wis., Mukwonago—(Official)—Until July 30, by W. G. Skewes, village clk., furnishing and laying 2078 ft. of 12-in., 4312 ft. 10-in. and 246 ft. of 8-in. vitr. pipe sewers, together with manholes, lampholes, flush tank and bulkhead. W. C. Kirchoffer, 31 Vroman Bldg., Madison, engr.

PRICES AND CONTRACTS AWARDED

★**N. Y., Buffalo**—City let contract building sewer to take care sewage from Albany outlet to Great Lakes Dredge and Dock Co., Morgan Bldg., $80,000.

★**N. Y., Scarsdale**—Village let contract sewers and appurtenances to J. Cuozzo, 179 Linden St., Yonkers. About $25,319. Noted June 28.

★**N. J., Newark**—(Official)—Passaic Valley Sewerage Comrs. let contract outfall pressure tunnel under Jersey City, to C. A. Haskin, 16 City Sq., Boston, $1,900,000,000. Noted July 5.

★**Ky., Louisville**—City let contract constructing sewer for cantonment near Audubon Park to G. M. Eady Co. and K. E. Barker, Brook St. between A. and Lee St. About $70,000.

★**Ia., Ankeny**—City let contract installing sewers to Empire Constr. Co., 203 Flynn Blk., Des Moines, $31,270.

★**Wyo., Casper**—City let contract sewerage system to Security Bridge Co., Billings, Mont., $117,430. Noted July 5.

★**Tex., Graham**—(Official)—H. E. Elrod, engr., Interurban Bldg., Dallas,. let contract sewerage system and sewage disposal plant here to Winslett-Eldridge Co., 101 Main St., Dallas.

Wash., Spokane—See 'Streets and Roads."

STRUCTURAL STEEL WORK

Proposed Work

N. J., Bloomingdale—Bd. Freeholders of Passaic and Morris Cos. plan new bridge on Paterson-Hamburgh Turnpike. Address Co. Clk., Paterson.

N. J., Camden—New Jersey Bridge and Tunnel Comn. had plans prepared by Waddell & Son, engrs., 165 Broadway, New York City, for 1745-ft. suspension bridge over Delaware River between Cooper St., Camden and Arch St., Phila. About $[illegible].

N. J., Elizabeth—Bd. Freeholders plan election to vote on $97,000 bonds to build new bridges.

W. Va., Parkersburg—Baltimore & Ohio R.R. plans to rebuild bridge over Little Kanawha River. R. N. Begien, Baltimore, [illegible] engr.

Ga., Savannah—M. B. Lane, pres. Citizens & Southern Bank organizing company to build bridge over Altamaha River.

Fla., Jacksonville—County voted $950,000 bonds to build bridge over St. Johns River to connect Jacksonville and South Jacksonville. Noted June 7.

O., Ironton—County plans to build Mill St. bridge over Neshahannock Creek, 54 ft. wide. About $66,000. Mahoning Valley Ry. and New Castle Electric Street Ry. (controlled by Mahoning & Shenango Ry. and Light Co.), Youngstown, will pay $19,-[illegible] toward cost. E. Sullivan, mgr.

O., Youngstown—Youngstown Sheet and Tube Co., Youngstown Bridge, plans to rebuild bridge recently destroyed by tornado, [illegible] high, 487 ft. long.

Ill., East Dundee—(Dundee P. O.)—County prepared for Main St. bridge, 240 ft. long, 60 ft. wide. Bonds voted for work. G. N. Lamb, Geneva, co. supt. highways.

Ia., Marshalltown—City preparing plans for bridge over lagoon, 74 ft. long, 8 ft. wide. A. O. Rosengren, clk.

Montana—State Highway Comn., Helena, plans to build 12 bridges on State Highway in Mineral, Musselshell, Dawson, Beaverhead, Sheridan and Deer Lodge Cos. About $200,000.

Ark., Osceola—County appropriated $15,-000 to build bridge over Big Lake.

Washington—See "Streets and Roads."

Wash., Tacoma—Co. Comrs. rejected bids building Bridge No. 26213A, over Hylebos Creek waterway on Lincoln Ave., Strauss trunnion bascule or Scherzer Rolling lift bridge, trestle approaches, piers and fenders as too high. New bids. Noted June 21.

Ont., Sarnia—Mueller Brass Co. having plans prepared for new steel rolling mills. About $200,000.

BIDS DESIRED

N. Y., Albany—(Official)—Until Aug. 3 by W. W. Wotherspoon, supt. pub. wks., building highway bridge over Rood Creek; advertised in this issue.

Pa., Somerset—See "Streets and Roads."

Ind., Spencer—Until Aug. 6, by Co. Comrs., building 3 steel bridges, also 94 "I" beams, bids to be submitted by pounds. S. M. Royer, aud.

O., Norwalk—Until July 31, by C. E. Bloomer, clk. co. comrs. building bridges in Wakeman, Norwalk and Fairfield Twps., also on Town Line Rd. between Fairfield and Ripley Twps.

Minn., Little Falls—Until Aug. 2, by County, building state bridge No. 2726, two 120-ft. steel truss spans, one 23-ft. steel beam span, rein.-con. with wooden superstructure. B. Y. McNairy, co. aud.

Okla., Eufaula—Until July 27, by Jefferson Highway Bridge Co., building bridge over Canadian River, 3160 ft. long, involving 1300 ft. channel spans, 1000 ft. timber approach, 860-ft. embankments. Harrington, Howard & Ash., Orear-Leslie Bldg., Kansas City, Mo., engrs.

Wash., Seattle—Until July 31, by Co. Comrs., rebuilding bridge over Stuck River near Pacific City. S. J. Humes, co. engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Ala., Birmingham**—Southern Ry. let contract 21st St. viaduct to T. Worthington, 1st Natl. Bank Bldg., $180,000.

★**Ky., Dawson Springs**—See "Railways."

★**O., Painesville**—See "Streets and Roads."

★**Ia., Albia**—Bd. Supervs. let contract building bridges and culverts to Ottumwa Supply & Constr. Co., Ottumwa, $12,010; J. A. Lafferty, Eddyville, $7080.

★**Ia., Emmetsburg**—Bd. Supervs. let contract building bridges and culverts to Iowa Bridge Co., Hubbell Bldg., Des Moines, $6167; Des Moines Bridge & Iron Works, 9th and 11th Aves., Des Moines, $8900.

★**Ia., Pocahontas**—Bd. Supervs. let contract building bridges and culverts to Iowa Bridge Co., Hubbell Bldg., Des Moines, $2974; Federal Bridge Co., 1122 Equitable Bldg., Des Moines, $11,647.

★**Iowa, Spencer**—Bd. Supervs. let contract building bridges and culverts to E. Landsmann, Everly, $21,070; J. H. Johnson, Royal, $6400; Federal Bridge Co., 1122 Equitable Bldg., Des Moines, $2709.

★**S. D., Mitchell**—County let contract for 13 bridges to Pioneer Bridge Co., Mitchell, $25,000.

★**Man., St. Boniface**—City let contract steel bridge to Dominion Bridge Co., Canada Bldg., Winnipeg, $225,000.

★**Ark., Morrillton**—County let contract building bridge over Arkansas River to Midland Bridge Co., 504 Ry. Ex. Bldg., Kansas City, Mo., $125,000. Noted June 7.

★**Washington**—(Official)—State Highway Comn., Olympia, let contract Walla Walla River bridge to C. G. Huber, Central Bldg., Seattle, $21,215.

Structural Steel Work (Continued)

★**Wash., Mt. Vernon**—Co. Comrs. let contract building concrete piers, re-timbering and rebuilding wooden spans and approaches bridge over Skagit River to J. R. Wood, 621 Valley St., Seattle, $27,900. Noted June 28.

Oregon—State Highway Dept., Salem, received low bid building inter-county bridge between Marion and Polk Co.'s from Coast Bridge Co., Ry. Ex. Bldg., Portland, $247,-901. Noted June 28.

REINFORCED CONCRETE

Proposed Work

N. Y., Newton Falls—Newton Falls Paper Co. had plans prepared by C. E. Easton, archt., Sherman Blk., Watertown, for rein.-con. hydro-electric plant. About $50,000. F. L. More, pres.

N. J., Jersey City—Pennsylvania R.R. plans new rein.-con. bridges over tracks at Baldwin Summit and Chestnut Aves. About $30,000. A. C. Shand, Broad St. Sta., Phila., ch. engr.

N. J., Newark—Packard Motor Car Co. plans 4-story, 90 x 150-ft. rein.-con. showroom and garage and 1-story, 90 x 150-ft. addition at 1020-4 Broad St. E. S. Hare, Bway and 61st St., pres. W. E. Lehman, 738 Broad St., archt.

Pa., Phila.—Cunningham Piano Co., 1101 Chestnut St., plans 12-story rein.-con. factory, 1312-1314 Chestnut St. P. J. Cunningham, secy. and treas.

Pa., Pottstown—Pennsylvania R.R. plans new rein.-con. bridge over Mantawny Creek, to replace present steel span. A. C. Shand, Broad St. Station, Phila., ch. engr.

Ala., Mobile—See "Miscellaneous."

Ky., Montgomery—Louisville & Nashville R.R. plans rein.-con. bridge on Bell St. About $20,000. W. H. Courtenay, Louisville, ch. engr.

Ill., Chicago—T. Swanson, 321 Fullerton Pkway., having plans prepared by Hall & Ostergren, archts., 139 North Clark St., 7-story, rein.-con. apartment hotel at Wrightwood and Pine Grove Aves. About $525,000.

Ill., Chicago—Armour & Co., Union Stock Yards, had plans prepared for 2-story, 110x 304-ft. rein.-con. mechanical shop at West 39th St. and Packers Ave. About $70,000.

Mont., Livingston—Northern Pacific R.R. plans to build rein.-con. bridge over Shields River near Livingston. About $200,000. H. E. Stevens, 5th and Jackson Sts., St. Paul, ch. engr.

Mo., Bay St. Louis—City voted $200,000 bonds to build rein.-con. sea wall. D. U. Harris, Mobile, Ala., engr.

Wash., Seattle—Puget Sound Traction, Light & Power Co. plans to build 60x100-ft. rein.-con. oil storage tank, Greeley Ave. between 13th and 14th Ave. S., 15,000-bbl. capacify. About $30,000.

Ont., Weston—City having plans prepared by James, Loudon & Hertzberg, engrs., for rein.-con. intake crib, concrete dividing wall in sedimentation basin and lining basin with concrete.

Sask., Moose Jaw—Alberta Pacific Grain Co. preparing plans new rein.-con. grain elevator. About $75,000.

BIDS DESIRED

N. J., Newton—Until July 23, by Bd Freeholders, building rein.-con. bridge over Paulin's Kill. H. Snook, co. engr.

W. Va., Spencer—Until Aug. 13, by County building rein.-con. bridges as follows: Lowe, Lawrence, Nancy's Run, Mile 3, Gandeeville, Wolf branch, Walton, Gibson, Crawford and Clover bridges, also steel bridge over West Fork at Rocksdale. W. A. Carpenter, clk.

Tenn., Athens—Until Aug. 3, by Co. Rd. Comrs., building 3 rein.-con. bridges. J. P. Firestone, superv.-secy.

O., Columbus—(Official)—Until Aug. 6, by Co. Comrs., building rein.-con. bridges over Olentangy River at Lane and 3rd Aves., Clinton and Franklin Twps. J. Scott, clk.

Ia., Carroll—Until July 25, by County, building 2 rein.-con. bridges. C. Wright, co. engr.

Kan., Junction City—(Official)—Until July 23, by G. W. Dorn, city clk., for concrete reservoir. About $15,000. Noted June 14 under "Water-Works."

Neb., Beatrice—Until Aug. 23 by County for rein.-con. bridge. E. M. Burnham, clk.

Neb., Tehamah—Until July 25, by City, building highway bridge and retaining walls. M. S. McGrew, clk. A. C. Arend, Brandies Bldg., Omaha, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Long Island City**—New York Telephone Co., 15 Dey St., New York City, let contract 3-story, 50 x 75-ft. and 1-story, 75 x 150-ft. rein.con. garage on Pomeroy St. and 8th and Pierce Aves., to A. J. Robinson Co., 123 East 23rd St., New York City. About $50,000.

★**N. J., Rahway**—Bd. Freeholders let contract rein.-con. bridge, West Grand St. to A. E. Smith, Westfield, $18,944. Noted June 28.

★**Pa., Oreland**—Philadelphia & Reading R.R. let contract 2-span rein.-con. bridge near Oreland to F. H. Leonard, Wayne.

★**Pa., Phila.**—De Long Hook & Eye Co., Broad and Wallace Sts., let contract 4-story rein.-con. factory, 21st and Clearfield Sts., to W. Steele & Sons Co., 34 South 15th St., $180,000.

★**W. Va., Clarksburg**—County let contract rein.-con. bridge over Elk Creek, Bridge St. to Luten Bridge Co., West Market St., York, Pa., $16,000. Noted June 14.

★**S. D., Wessington Springs**—High School—Bd. Educ. let contract 2-story, 91 x 105-ft. rein.-con., to F. R. Comb Co., 201 Lumber Ex., Minneapolis. About $57,602. Noted June 7.

★**Mo., St. Joseph**—Buchanan Elevator Co. let contract 16 rein.-con. tanks to Lehr Constr. Co., 1712 Frederick Ave., $125,000.

★**Okla., Tulsa**—Oklahoma Union Ry. let contract rein.-con. bridges to be built on line between Tulsa and Sapulpa to Topeka Bridge and Iron Co., Topeka, Kan.

STREETS AND ROADS

Proposed Work

Mass., Boston—Bd. St. Comrs. plan resurfacing Beacon St., topeka, bitulithic or filbertine. E. F. Murphy, comr. pub. wks.

Mass., Springfield—City plans $1,500,000 bond issue to widen Dwight St. F. H. Clark, city engr.

R. I., Newport—City plans election to vote on $35,000 bond issue for improving Bath Rd. R. J. Easton, city engr.

N. Y., Buffalo—Bd. Pub. Wks. plan to pave Spencer, Carolina, Milton, Erie, Genessee and Terrace Sts., Michigan Ave. and Broadway. G. H. Norton, city engr.

N. Y., Geneseo—Village voted $12,000 bonds for improving portion Court St.

N. Y., Rochester—City plans to pave Marigold St., about $5000; Goodman St., $35,000, grading, walks and sewers on Alberta St., $4800; Wilton Terrace, $8000. F. O. Elwood, city engr.

N. J., Bayonne—Boulevard Comrs., Jersey City, having plans prepared improving portion Boulevard. T. J. Wasser, co. engr.

N. J., Butler—Bd. Freeholders, Morristown, soon lets confract paving Boonton Ave., concrete.

N. J., Collingswood—City plans election to vote on $121,000 bond issue for repaving Haddon Ave. and other streets.

N. J., East Orange—City passed ordinance to repave portion of Springdale Ave., wood block, asphalt or granite block on 6-in. concrete base. W. D. Willegerod, city engr.

N. J., Jersey City—City soon lets contract repaving Central Ave., asphalt. About $20,-000. C. A. Van Kuren, city engr.

N. J., Kenilworth—See "Sewers."

N. J., Metuchen—Bd. Freeholders, New Brunswick, plan to pave road from Metuchen to Plainfield, bituminous concrete. About $76,000.

N. J., Newark—Bd. St. and Water Comrs. plan repaving South Canal St., using granite block pavement 6 in. concrete foundation and resurfacing Wesmont Ave., asphalt Mac. Wanted, ch. engr.

N. J., Union—City Council plans repaving Hudson Ave., New York, Palisade and Tracy Aves. About $55,000. T. F. Rowe, city engr.

Pennsylvania—State Highway Comm., Harrisburg, rejected bids for Chester County road. New bids Noted May 17.

Pennsylvania—State Highway Comm., Harrisburg, rejected bids building 11½-ft. concrete Rd., with brick. New bids United June 21.

Pa., Harrisburg—Senate passed bill appropriating $12,215,000 for public roads. This with $6,000,000 estimated revenue from automobile licenses dedicated to good roads, makes total of more than $18,500,000 appropriated by the legislature for road work for next 2 years.

Pa., Harrisburg—Council passed ordinance to pave Brensinger St. and Sprague Alley, asphalt, concrete base. M. B. Cowden, city engr.

Pa., Meyersdale—Boro. voted $14,000 to pave streets and $6000 to extend sewers. Noted June 28.

Pa., Northampton Heights—Boro. council authorized sale of $40,000 bonds for improving streets.

Pa., Schuylkill Haven—(Official)—Boro. postponed for 1 year paving and curbing 10,000 sq.yd. Canal, Main and St. John Sts., brick and concrete. G. W. Butz, 205 Centre Ave., boro. engr. Noted June 28.

Pa., Scranton—City soon lets contract paving, grading, curbing portion Wheeler Ave. and Front St., sheet asphalt, concrete base, cost, $12,600 and $5250 respectively; Gibson St., sheet asphalt and stone block, concrete base, $10,278. W. Schunk, city engr.

Pa., Washington—(Official)—County soon lets contract resurfacing 4800 ft. Taylorston Rd. and 1 mi. Burgettstown-South Rd. T. J. Underwood, controller. Noted June 28.

Delaware—State Highway Dept., Dover, making surveys for new Lincoln Highway from Pennsylvania to Maryland state lines, via Newark, Dover, New Castle, Smyrna, etc. Legislature appropriated $500,000 for project.

S. C., Spartanburg—County plans improving Howard Gap, Mills Gap, Chesnee, Goodjoin, Spartanburg, Glenn Springs, Pacolet, Walnut Grove and Buncomb Rd., also Natl. Highway.

Miss., Greenwood—Bd. Superv. cancelled contract let to Kane-Kelly Constr. Co., New Orleans, at $300,000, and will readvertise for bids. Noted May 31

Miss., Gulfport—City Comrs. passed ordinance to build 7 mi. concrete sidewalks. About $50,000. J. W. [illegible], city engr.

Louisiana—State Highway Comn., New Orleans, plans to build New Orleans-Tangipanoa Highway. D. Buie, engr.

Louisiana—Bd. State Engrs. prepared plans 52-mi. highway from Gretna to Ft. St. Phillips. D. Buie, state engr.

Tenn., Knoxville—City soon lets contract paving sections McKee St., Hannah, Highland and Winona Aves. J. B. McCalla, city engr.

Tenn., Sevierville—County defeated $268,-000 bond issue, June 21, to build roads Noted Apr. 19.

Tenn., Sneedville—County voted $100,000 bonds to improve highways.

O., Cleveland—County plans to improve Highland Pd., Euclid Twp., Bagley Rd., Elm and Main Sts., Lyndale Rd. Brooklyn Twp., also Broadway and Cedar Hills. W. A. Stinchcomb, co. engr.

O., Cleveland—City council plans $284,-000 bond issue to improve streets. R. Hoffman, city engr.

O., Cleveland—City voted to improve and pave portion of Ashland, Clarkson, East 116th, East 118th, East 55th and West 57th Sts. R. Hoffman, city engr.

O., East Liverpool—Bd. Control rejected bids for tunneling Pennsylvania and Harvey Ave. and Elizabeth St. Noted June 14.

O., Findlay—County will [illegible] to pave Pikeruns, Smith, Fifield, Hunter, Ewing and Buttermann Rd. Noted May 31.

O., London—(Official)—City postponed election from July 7 to Aug. 11 to vote on $43,000 bonds to pave Jackson street, McCafferty & Clark, engrs. Noted June 28.

O., Sandusky—City plans paving East 4th St. and Cleveland Ave. About $40,000. H. L. Wagner, city engr.

O., Toledo—County plans to rebuild River Rd. from Maumee to point beyond Waterville, 18 ft. concrete roadway. About $150,000. Federal Government to appropriate $[illegible] toward cost.

O., Warren—Council passed ordinance to widen Quinby Ave. and extend Park Ave. to Governor. City engr.

O., Youngstown—City plans paving portion of Ryan Blvd. F. B. Lillie, engr.

Ind., Fowler—(Official)—County removal of [illegible] grading, paving and erecting [illegible] over Big Pine Creek, 8 mi. north of Otterbein, 40 ft. steel beam and gravel. W. Maudlin and [illegible] June 18.

Streets and Roads (Continued)

Ind., Peru—(C) preparing plans paving portion West and St. J Huron, city engr

Ill., Rock Island—City plans extensive sidewalk paving on Churchill and Illsworth Sts. and 22nd Ave. W Tweedt, city engr Noted Apr. 5.

Wis., Baldwin—City Council plans $40,- and bond issue for paving Main, Watertown and Hamilton Sts.

Ia., Davenport—Town supvs. let contract paving portion Mississippi Blvd. and 16th St.

Kan., Eldorado—Butler Co. Good Rds Club taking bonding issue road 18 ft. wide Commerce, Colorado and Douglass. About

Kan., Wichita—City plans paving portion of 21st St. and Central and Rutan Aves. B Wells, city engr.

Mont., Butte—Council passed resolution to improve and pave East No. 1st asphaltic concrete, bitulithic, creosoted wood block or brick. About $80,089 to $107,754.

Missouri—State Highway Comm., St. Louis plans 1,000 mi. hard surface highways to connect 114 counties. About

Mo., Benton—County election Aug. 15th to vote on $800,000 bonds for constructing good roads. Noted July 5

Mo., Eminence—County defeated $150,- bond issue June 30 to build roads. Noted June 14

Mo., Harrisonville—County plans to build rock road. About $51,000

Mo., Lathrop—County plans 6 mi. road from Lathrop to Holt. About $31,000.

Tex., Center—County election in August to vote on $600,000 bonds to build roads.

Tex., Cold Springs—County election July 26 to vote on $75,000 bonds to build roads in Pct. No. 4

Tex., Daingerfield—County voted $10,000 bonds to build roads Cason Precinct

Tex., Dallas—City passed resolution to pave Cedar Springs, Oak Lawn, Englewood, College Grand and Haines Sts. also widening portions Harwood and Masten Sts. H Manning, city engr

Tex., Dallas—City soon receives bids paving portion Main Ave. bitulithic H Manning, city engr

Tex., Greenville—County election Aug. 4 to vote on $100,000 bonds to build roads.

Tex., Sulphur Springs—County voted $12,- bonds to build roads, Arbala and Liberty Precincts

Tex., Uvalde—County election Aug 11 to vote on $1,000,000 bonds to build roads Commissioners Precinct No. 2

Okla., Falls—County voted $16,000 bond issue to build roads Address Co. Clk., Grandfield

Okla., Frederick—See "Streets"

Okla., Tulsa—County plans to spend about $250,000 to build roads

Utah, Ogden—City soon let contract improving Main St. About $125,000. J. M Greig, city engr

Ariz., Douglas—City plans paving 11th and 15th Sts. About $145,000

Washington—State Highway Comm. Olympia, awarding surface highway from Richmond to Silvana, Snohomish Co., over bridge near Williamsburg River. About

Wash., Seattle—Pk. Bd. plans resurfacing Lake Washington Blvd. About $14,000 E Cornell, engr.

Oregon, State Highway Comm., Salem, having report prepared Dead Indian road from Klamath to Lake Counties

Cal., Lancaster—County voted $140,000 bonds for paving Sierra Highway 11 mi. N. of Los Angeles to Kern Co. line

Cal., Merced—City selected bids for paving Main St. and Alley and Main St. to be let to

Cal., San Diego—City soon let contract building road to Point Loma to cost $100,000 Noted June 21

Cal., San Diego—City soon receives bids paving Main St. bitulithic H Manning, city engr

BIDS DESIRED

Massachusetts—(Official)—Until July 24 by State Highway Comm., Boston building 14,600 ft. state highway, Egremont and Sheffield Twps.; 14,600 ft., Worcester and West Royalston Twp. W. D. Sohier, comr.

N. Y., Albany—(Official)—Until July 30, by State Highway Comn., 55 Lancaster St., building highways various counties. E. Duffey, comr.; advertised in this issue.

N. Y., Bronx—Until July 26, by D. Mathewson, boro. pres., repaving portion roadway St. Ann's Ave., sheet asphalt and redressed granite blocks, concrete foundation; Stebbins Ave. and White Plains Rd., sheet asphalt, concrete foundation; Sedgwick Ave., granite block, sand foundation; Fieldston Rd., Tremont Ave., East 228th St., Boston Rd., waterbound macadam; East 184th St., Morris Ave., bituminous concrete, cement concrete foundation; Leggett Ave., second hand granite blocks, sand foundation; also sewers in portions Barry and Worthen St.

N. Y., Brooklyn—Until July 26, by W. Williams, comr. Water Supply, Gas and Electricity, Municipal Bldg., Manhattan, paving roadway, furnishing new fence posts and resetting fence in front of Mt. Prospect Laboratory, Flatbush Ave., near Eastern Pkway.

N. Y., Eastwood—(Official)—Until July 23, by Bd. Trustees for grading and macadamizing portion Blust St. L. B. Smith, clk.; advertised in this issue.

N. Y., New York—Until July 23, by M. M. Marks, boro. pres. regulating and paving roadway of West 172nd St. from Bway. to Ft. Washington Ave., also portion Houston St., sheet asphalt, concrete foundation; roadway of West 172nd St., from Ft. Washington Ave. to Haven Ave., bituminous concrete, concrete foundation.

N. Y., New York—Until July 26, by Park Bd., Municipal Bldg., for regulating, grading, paving with concrete pavement roadway on Washington Ave. across Jacob Riis Park (Queens Boro.)

N. J., Newark—Until July 26, by Bd. St. and Water Comrs., paving portions Passaic, Isabelle and Parkhurst Aves., bitulithic on 6-in. concrete base. M. R. Sherrard, chief engr. Noted June 7.

N. J., Newark—Until July 26, by Bd. St. & Water Comrs., grading, curbing and flagging Hamburg Pl. and paving East Peddie St., also repaving South 11th St.; about 9200 sq.yd. asphalt pavement on 6-in. concrete base. M. R. Sherrard, city engr. Noted June 28.

N. J., North Bergen—Until July 24 by Co Park Comn., Jersey City, paving road at North Hudson Park, asphalt block or bituminous concrete. W. G. Muirheid, secy.

Pennsylvania—(Official)—Until Aug. 7 by State Highway Comn., Harrisburg, building improved highways, Cambria, Allegheny, Washington, Lehigh, Butler, Lackawanna, Luzerne and Dauphin Cos.

Pa., Somerset—(Official)—Until July 28, by Co. Comrs., grading, draining and bridging County Rd. from Brotherton to Berlin. W. J. Glessner, comr.

Pa., Uniontown—Until Aug. 3 by H. Kisinger, co. controller, for Fairbanks-New Salem Rd., Menallen Twp. and Connellsville-Pennsville Rd., Bullskin Twp.

W. Va., Ceredo—Until July 27, by City Pavement paving E and Main Sts., brick on concrete foundation, concrete curb and gutter. About $13,000. F. W. Gesling, Ashland, Ky., engr.

W. Va., Huntington—(Official)—Until July 25, by Bd. Comrs. grading, curbing and paving portions of 5th and 6th Sts. J B. Maupin, city engr.

Miss., Greenville—(Official)—Until Aug. 3, by Co. Highway Comrs. for grading highway from Arcola to Sunflower River. C. C. Griffin, asst. engr

Louisiana—(Official)—Until July 23 ... Bd. State Engrs., New Orleans, building 6-mi. Highway, Caddo Co.; Alexandria-Marksville Highway, Rapides Co. D. Buie, state engr

O., Cincinnati—(Official)—Until July 27, by Co. Comrs. repairing portions of Church St. bituminous macadam. F. E. Wesselmann, pres.

O., Cleveland—Until July 25, by City, ... curbing and paving portions of Arena, Bass, East 141st and Fairmont Sts. and approaches of Clark Ave. viaduct. H. Hedman, city engr

O., Columbus—Until July 21, by J. Scott, co. clk., surfacing portions Reynoldsburg & Johnstown Albany Road

O., East Liverpool—(Official)—Until July 26, by T. Doherty, dir. pub. serv., for paving Penn Ave., Elizabeth and Harvey Sts. J. C. Kelly, city engr.

O., Jefferson—(Official)—Until July 30, by Co. Comrs., building Williamsport Rd. No. 1. B. E. Brainard, clk.

O., Sidney—(Official)—Until July 25, by C. B. Deweese, dir. pub. ser., paving 95,-000-sq.yd. streets, vitr. brick, asphalt, asphaltic concrete, bitulithic and wood block; advertised in this issue.

Ind., Indianapolis—(Official)—Until Aug. 3, by Bd. Pub. Wks., improving portion Newman and Denny Sts., Central and Sheffield Aves. B. J. T. Jeup, city engr

Ind., Indianapolis—(Official)—Until Aug. 6, by Bd. Pub. Wks., improving portion Julian Ave., Oriental, Station and Walnut Sts. B. J. T. Jeup, city engr.

Ind., Michigan City—Until July 24, by Bd. Pub. Wks., paving portion 11th St. E. G. Dunn, city engr.

Ill., West Frankfort—(Official)—Until July 27, by Co. Clk., 10 concrete highways, 33,500 sq.yd. pavement and necessary bridges. Putnam & Mautz, Benton, engrs. Noted Apr. 19.

Arkansas—Until July 26, by State Highway Comn., Little Rock, for constructing 8-mi. concrete and 14 mi. gravel road, with bituminous carpet cover.

Tex., Huntsville—(Official)—Until Aug. 7 by T. E. Humphrey, mayor, paving 15,000 yd. street.

Wash., Seattle—Until July 30 by Co. Comrs. building 5-mi. Cascade Scenic Highway. About $45,000 to $50,000. S. J. Humes, co. engr.

Cal., Santa Ana—Until Aug .8 by Bd. Supervs. building and grading ½-mi. Sect. 3, Irvine Blvd., concrete. W. B. Williams, clk.

Cal., Santa Ana—Until Aug. 8, by W. B. Williams, co. clk., grading Sect. 2 Brea-Olinda Road, 1.53 mi. J. L. McBride, co. sur-

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Massachusetts**—State Highway Comn., Boston, let contract asphalt macadam road, Uxbridge Twp., to R. H. Newell Co., Uxbridge, $29,801. Noted July 5.

N. Y., Brooklyn—L. H. Pounds, boro. pres., received low bids (a) regulating, curbing and paving with permanent asphalt pavement, 6-in. concrete foundation roadway Ave. J; (b) 64th St.; (c) regulating, paving and repaving with asphalt on 6-in. concrete foundation 7th Ave.; (d) center roadway 7th Ave.; from Brooklyn Alcatraz Asphalt Co., 407 Hamilton Ave., (a) $13,-805, (b) $6398, (c) $6869, (d) $63,861; Borough Asphalt Co., 1301 Metropolitan Ave., (a) $13,978, (b) $6465, (c) $6953, (d) $58,092; Uvalde Asphalt Paving Co., Metropolitan Ave., (a) $14,830, (b) $6844, (c) $7448, (d) $64,190.

N. Y., East Aurora—Bd. Supervs., Buffalo, received low bids paving 2⅜-mi. road from East Aurora to Lancaster, macadam from Meyers & Meyers, Buffalo, $30,000.

N. J., Mt. Holley—(Official)—Bd. Freeholders received low bids improving (a) Moorestown-Camden Pike, Chester Twp., (b) Johnstown Pike, Northampton, Easthampton and Springfield Twps., (c) Pemberton-Lewiston Rd., Pemberton Twp., as follows: Sutton & Corson, 739 Asbury St., Ocean City, (a) $97,339, (b) $43,059, (c) $41,817; J. M. Kelly Constr. Co., 432 Market St., Camden, (a) $114,303; C. A. Reed Co., Trenton, (b) $51,672; Eastern Paving Co., 1414 South Penn Sq., Phila., (b) $42,-103; Utility Constr. Co., 46 Paterson St., New Brunswick, (c) $36,274. Noted June 28.

★**N. J., Rutherford**—City let contract paving Union Ave. to Union Constr. and Bldg. Co., Main St., Passaic. About $65,-460. Noted June 21.

★**N. J., Trenton**—(Official)—Bd. Freeholders let contract building Sect. 3, River Rd., Hopewell Twp., to C. A. Reed Co. Trenton, $11,191. Noted June 28.

N. J., West New York—Town received bids July 10, paving portion Bergenline Ave., (a) asphalt block, (b) trap rock block, redressed, (c) bituminous concrete as follows: G. J. Horning, 513 16th St. (a and b), 89½%, (c) 79½%; Curtin Bros. 45 Madison Ave., Guttenberg, (a and b) 113%, (c) 107%; Clinton Contr. Co., River Rd., Woodcliff, (a and b) 103%, (c) 89% R. Mazzoni, 584 9th St., (a and b) 105% (c) 93%. Noted June 28.

Streets and Roads (Continued)

★**Pa., Erie**—City let contract paving portion 28th St. to Mayer Bros. Constr. Co., Commerce Bldg. and J. Doyle; Plum St. to J. McCormick & Son.

★**Pa., Phila.**—City let contract paving Queen Park, 2nd and Catharine Sts. to G. Dobbins & Co.

★**Pa., Pittsburgh**—Co. Comrs. let contract for road work as follows: M. O'Herron Co., South 1st and McKean Sts., reconstructing Squaw Run Rd., brick, $40,310; Banksville Rd., rein.-con. and brick surfacing, $22,150 and $38,850 respectively; D. McNeil Co., Rochester Rd., asphaltic concrete, $23,677; R. Swan, Jr., Co., Jenkins Ave., Little Deer Creek Valley Rd., rein.-con., $46,667.

★**Pa., Williamsport**—Council let contract resurfacing asphalt streets to Central Constr. Co., 7th and Emerald Sts., Harrisburg, $1.32 per sq.yd.; paving portion Water and Walnut Sts., Dewey and Erie Aves., Paxton brick, to Busch & Stewart, Trust Bldg., $1.68.

★**Md., Frederick**—(Official)—County let contract building 5 mi. Lewiston-Creagerstown Rd. to L. R. Waeschex, Thurmont. About $52,000. Noted June 14.

★**Miss., Sumner**—County Comrs. let contract gravel highways to C. V. Evans, Loveman Bldg. About $200,000.

★**La., Crowley**—County let contract building 45 mi. roads to Healey Constr. Co., Meridian, Miss. About $242,826. Noted May 10.

★**O., Bellaire**—City let contract paving South Belmont St. to Resser & Maloney, $1.65 per sq.yd.

O., Cincinnati—(Official)—City received low bid paving playground from D. Gordon Bldg. and Constr. Co., 734 West 7th St. About $31,530.

★**O., Cleveland**—County let contract paving portion Lee Rd. to McHugh Bros., 1430 South Penn Sq., Phila.

★**O., Cleveland**—Bd. Control let contracts for following street improvements: Bentley Bros., 410 Electric Bldg., paving Lakeside Ave., N. E., $11,000; Cleveland Trinidad Paving Co., 3409 Trumbull St., East 65th St., $14,000, East 77th St., $4000, East 128th St., $12,000, Adelaide Ave., $10,800; A. M. Pejsa Paving Co., 2370 East 93rd St., Ingersoll Rd. Noted June 7.

★**O., Cleveland**—Bd. Pub. Wks. let contract paving portions St. Clair St. to R. B. Burnett, 527 Society for Savings Bldg., $161,064; Lincoln and 11th Sts., to Cleveland Trinidad Co., 420 Lakeside Ave., $35,-833. Noted June 28.

★**O., Columbus**—City let contract asphalt resurfacing to Citizens Rd. Preserving Co., $40,500; tarvia repair work to Barrett Co., Ill. Bldg., Cleveland, $64,000; bitumas macadam, to Jaber Constr. Co., $10,574.

O., Coshocton—City received bids paving portion (a) 6th St., (b) Denman and Cossingham Aves., from J. Hall, (a) $15,-435, (b) $22,913, Coshocton Constr. Co., Coshocton; (b) $24,871; Henderson Bros., (a) $16,713, (b) $22,021.

★**O., Defiance**—County let contract paving Okolona-Ridgeville Rd. to J. A. Westrick, Holgate. About $64,616.

★**O., Fremont**—City let contract Garvin Rd., 2.25 mi. of 16-ft. macadam, to J. Strausel, Fremont, $20,000, Artz Rd., 2.50 mi. same pavement, Barnes & Taber, Rocky Ridge, $18,000.

O., Granville—City Council received bids for paving and improving Pearl St., as follows: Keeley & Bolen, concrete curb and gutter with Lincoln block paving, $18,-493; Federal Asphalt Paving Co., Trinidad, $17,112.

★**O., Jefferson**—Co. Comrs. let contract building Jefferson-Eagleville Rd. to Hart & Kemp.

★**O., Painesville**—County let contract grading and bridging 7-mi. Lincoln Highway, Madison Twp. to Campbell Bros., Stambaugh Bldg., Youngstown, $57,420

O., Youngstown—Co. Comrs received low bids improving New Buffalo and Hillsdale Corner Rd. and Orris and Niles County Rd. from L. H. Young, $14,6[illegible] and $4[illegible], respectively.

★**Indiana**—Co. Comrs. let contracts road work as follows: Lebanon gravel road, Jackson and Jefferson Twps. to P. Long, $14,600; Nashville, gravel road Jackson Twp., to J. M. Fleetwood $10,000; Goshen gravel road, Osolo Constr. Co., Elkhart, $12,750; Albion, brick road, Northern Constr. Co., Elkhart, $52,500. Noted June 28.

Ind., Indianapolis — City received bids paving portion South St. as follows: Amer. Constr. Co., 1201 East Georgia St., 1st grade asphalt, $5.10 per lin.ft., wood block, $7.56 per lin.ft.; Columbia Constr. Co., 2nd grade brick, $5.22; Marion Co. Constr. Co., 1600 South West St., 1st grade asphalt, $5.45, wood block, $7.27; Republic Constr. Co., 1614 Merchants Bank Bldg., 1st grade asphalt, $5.60, wood block, $7.42, granite block, $7.62; Union Asphalt Constr. Co., 308 Amer. Life Bldg., 1st grade asphalt, $5.34, wood block, $7.17, granite block, $7.65; Union Stone & Material Co., 1007 Gilbert St., Cincinnati, granite block, $7.50. B. J. T. Jeup, city engr.

★**Ind., Indianapolis**—Co. Comr. let contract concreting portion National Rd. to J. E. McNamara Constr. Co., Indianapolis, About $78,450.

★**Ind., Indianapolis**—Bd. Pub. Wks. let contract paving Newmant St., asphalt, to Union Asphalt Constr. Co., 308 Amer. Central Life Bldg., 1-alley, brick, to A. D Bowen, Meridian St., to Amer. Constr. Co., 1201 East George St.; cement walks to H. Pothast.

★**Ind., Lafayette**—(Official)—County let contract 2.06 mi. brick road, Fairfield Twp., to W. Mahoney, 5 Sharp Bldg., $78,200; road in Wabash Twp., Slattery Constr. Co., Crawfordsville, $64,217. Noted June 2.

★**Mich., Bay City**—Bd. Pub. Wks. let contract paving portion Lincoln Ave., 11th and Water Sts., to Cleveland Trinidad Paving Co. 3407 Trumball St., Cleveland, $35,834. Noted July 5.

★**Illinois**—State Highway Comn., let contract 4800 lin.ft. in Saline Twp., to Hug Lumber & Constr. Co., $10,425

★**Ill., Glencoe**—(Official)—City let contract paving Glencoe Rd., 4800 sq.yd. brick on 3-in. sand-cement cushion filled with cement grout, concrete curb and crushed stone and screening to level up present foundation to E. M. Laing, Highland Park. Noted June 28.

★**Ill., Joliet**—City let contract improving 3rd Ave. and Wilson St., asphalt on 5-in. concrete base, concrete curb and gutters, etc., to R. F. Conway Co., Chamber of Commerce Bldg., Chicago; $24,077.

★**Ill., Rock Island**—City let contract paving portion 6th Ave. to T. J. McCarthy, 3rd and Perry Sts., Davenport, Ia., $2.19 for paving, 49c. curbing.

★**Ill., Winnetka**—(Official) — City let contract paving Sheridan Rd., 35,500 sq.yd. 2-course rein.-con. with integral curb, 11,755 cu.yd. grading and 98 catch basins to H. E. Goelitz & Co., Oak Park, $114,000. Noted June 28.

★**Minn., Buhl**—(Official)—City let contract paving 12,000 sq.yd. streets, bitulithic, to L. McCann, Eveleth. Noted June 21

★**Kan., Hutchinson**—City let contract paving streets to Stamey-Mackey Constr Co., $56,000; curbing and guttering to J H. Shear & Sons and C. E. Brown, all of Hutchinson. Noted June 7.

Mo., Kansas City—County received low bid resurfacing and macadamizing Kansas City-Independence Rd. from W. F. Dwyer, $31,684, and A. Jaicks Co., Amer. Bank Bldg., $32,040.

★**Tex., Dallas**—Co. Comrs. let contract paving Coppell Rd., trap-rock concrete, to Vibrolithic Constr. Co., Terminal Bldg., 94c. per sq.yd.

★**Tex., McLean**—City let contract of 18-mi. clay road to P. M. Skinner. About $15,000.

★**Idaho, Lewiston**—Washington State Highway Bd. let contract constructing highway from Idaho-Washington State line to Uniontown to G. L. Strickler, Pullman, Wash. About $17,276

Utah, Salt Lake City—(Official)—City received low bids grading, guttering and paving Custer and other streets bitulithic on bituminous macadam base from J. Morgan, Inc. 167 West 3rd St., $[illegible]; J. W. Mollan, Auditorium Bldg., $52,159; Strange-Metcalfe Pav. Co., Utah Savings & Trust Bldg., $56,965. Contract will not be awarded because of defect of improvement bond issue. S. Q. Cannon, city engr. Noted June 21

Wash., Asotin—City received low bids paving various street contracts from Lloyd & Dale, Lewiston, Idaho, $[illegible]; C. M. Payne, Spokane, $[illegible].

Wash., Spokane—City received low bids paving and grading portion Mallon St. from Warren Constr. Co., Alder Bldg., Portland, bitulithic, $[illegible]; C. M. Payne, East 714 Mission Ave., Spokane, $[illegible]; Spokane Bitumus Paving Co., bitumas, $[illegible]; installing culverts from Reynolds, Miller & Paulsen, $[illegible]; P. L. Lawson, $[illegible]; Spokane Bitumus Paving Co., $[illegible]. Noted June 21

★**Wash., Walla Walla**—City Council let contract paving portion 4th St. to Warren Constr. Co., Journal Bldg., Portland; about $12,854.

★**Wash., Waterville**—(Official)—County let contract building highway. Local Improv. Dist. No. 3, to Bailey & O'Connor, Wenatchee, $11,610. Noted June 21.

★**Oregon**—State Highway Comn., Salem, let contract 10 mi. hard surface pavement, to Warren Constr. Co., 14 Assoc. Bldg., Portland. About $119,120.

★**Ore., Astoria**—City let contract for building 1 mi. concrete pavement to Montague O'Reilly Co., Blake McFall Bldg., Portland. About $16,236. Noted June 28.

Ore., McMinnville—City received low bids paving in Dists. Nos. 17 and 19 from Dennis Constr. Co., McMinnville, $12,528; Dists 18, 20, 21, 22, Montague-O'Reilly Co., Blake McFall Bldg., $39,675. Noted June 14

★**Ore., Pendleton**—County let contract paving 10-mi. highway to Warren Constr. Co., Journal Bldg., Portland. About $119,120.

★**Ore., Portland** — Council let contract paving portion Woodstock Ave. to Oregon-Hassam Paving Co., Bd. of Tr., $26,654.

Ore., Warrenton—Co. Comrs., Astoria, received low bid building 1-mi. hard-surfaced road from Arenz Contr. Co., Astoria, $17,897. Noted June 21

★**California**—State Highway Comn., Sacramento, let contract 10.8 mi. road in Yolo Co., between Blacks and Hershey, to C. H. and A. H. Gorrill, San Francisco, $71,152; 6.4 mi. Tulare Co., Pixley to Tipton, to L. C. Garnsey, 108 West 6th St., Los Angeles, $34,980; 11 mi. Monterey Co., Camphora to Chualar, to Palmer & McBride, Hooker & Leub Bldg., San Francisco, $60,-118.

★**Cal., Los Angeles**—Bd. Superv. let contract bituminous paving on Lexington-Gallatin Rd., Dist. 103, involving 6594 sq.yd. excavation, 14,242 lin.ft. shaping roadbed, 3100 sq.yd. paving, 3698 lbs. rein. steel, 11,420 lin.ft. expansion joints, 64 cu.yd. concrete in culverts, etc., to F. Hoffman, Long Beach, $16,990

★**Cal., Manhattan Beach**—City let contract improving streets to R. H. Beaton, 623 Beacon St., San Pedro, $54,569. Noted June 14

★**Cal., Martinez**—County let contract building Sect. 5 of county highway system to O'Brien Bros., Martinez. About $119,058.

★**Cal., Napa**—County let contract concrete highway between Greenwood Hill and county line to Worswick Constr. Co., Vallejo, $86,673. Noted June 21.

★**Cal., San Bruno**—City let contract improving several streets to Municipal Improve. Co., Richmond. About $119,000

★**Cal., San Diego**—Bd. Supervs let contract grading and building road from Poia to north line of county, involving excavating through rock to F. Doran, 3886 36th St., $29,779.

Cal., Ventura—Bd. Supervs received low bid grading and building 4-in. concrete paving and concrete and corrugated iron culverts on 7[illegible] mi. Div. Y Sec. 2 La Crosse to Nordhoff Rd. from C. H. Hudson, Marsh Strong Bldg., Los Angeles, $44,422; similar work on 6.91 mi. Div. 4, Piru to county line from Brashear-Barnt Co., Wilshire Blvd. and La Brea Ave., Los Angeles, $19,368. Noted June 28

Cal., Visalia—Bd. Supervs received low bid 2,368,722 sq.ft. warrenite or topeka surfacing on southern division of county on roads connecting Porterville, Exeter, Lindsay, etc., via Tagus Ridge and Ivanhoe, follows: A. Teichert & Son, Oschner Bldg., Sacramento, warrenite, $141,[illegible]; H. H. Oswald, 405 O. T. Johnson Bldg., Los Angeles, topeka, $35,[illegible].

★**Cal., Visalia**—Bd. Supervs. let contract constructing 2,368,[illegible] sq.ft. warrenite surfacing connecting North Visalia, West Dinuba, Visalia and Exeter, to Thomas Bros., Fresno, $[illegible].139

RAILWAYS—STEAM & ELECTRIC

Proposed Work

New Jersey—[illegible] & New England R.R. granted permission by Bd. Public Utility Comrs. to issue $1,[illegible],000 stock to extend and improve road. H. H. Wilbur, Phila., gen. mgr.

West Virginia—[illegible] & Western R.R. plans new line for transportation coal from [illegible] to [illegible] mi. with passenger and freight station. J. E. Crawford, Braxton, W. Va., engr.

Railways—Steam and Electric (Continued)

Georgia—Ocilla Pinebloom & Valdosta R.R. plans to extend line from Milltown to Lakeside, about 7 mi. H. Henderson, Ocilla.

Montana—Montana Power Co. having surveys made for laying steel between Twin Bridges and Birmingham-Hoggam and Lake Shore Mines, for electric road 14 mi. long. About $[illegible]. F. M. Kerr, Butte, gen. supt.

Arkansas—Iron Mountain R.R. plans to build 10-mi. spur to U. S. government near Little Rock, under supervision of A. Robertson, St. Louis. W. L. Cole, Keswick, Cal., asst. engr.

Washington—City of Tacoma soon lets contract building 1.6-mi. track to Todd Shipyards; work includes ½-mi. viaduct and yards at Chicago, Milwaukee & St. Paul Ry. About $185,000. C. F. Loweth, Chicago, ch. engr.

Saskatoon—City Comrs. Regina, plan to build 4-mi. track on Dewdney St. to convert into belt line. Also 2nd track on Elphinstone St. to extension grounds. E. Green, Regina, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. C., Lake Toxaway**—Moltz Lumber Co. let contract for road to H. E. Millard Co. Inc. E. S. Brown, Legal Bldg., Asheville, engr.

★**Kentucky**—Illinois Central R.R. let contract to L. J. Smith Const. Co., Commerce Bldg., Kansas City, Mo., to build line from Dawson Springs to Providence, about 17½ mi. involving handling 500,000 cu.yd. material, mostly rock, to Walsh Const. Co., 1113 West 3rd St., Davenport, Ia., to revise grades and alignment from Hopkinsville to Dawson Springs, about 11½ mi. involving 70,000 cu.yd. material; also bridge with 13-span and trestle approach over Tradewater River.

Indiana—(Correction)—Pennsylvania Lines West of Pittsburgh let contract grading and masonry for 2nd track work, grade revision and yard work for 10½ miles between Logansport and Royal Center to P. T. Clifford & Son, Valparaiso.

EXCAVATION AND DREDGING

Proposed Work

Ia., Plaquemine—Drainage—Lake Long to La. Valley [illegible] to drain 25,000 acres between Plaquemine, town of Baton Rouge, Mississippi River and Grand River. E. Hall, J. Wilbert and J. Tempest, Ed Plaquemine, Mgrs. [illegible]

O., Youngstown—Canal—Lake Erie & Ohio River Canal [illegible] Harris Bldg., Pittsburgh, Natl. Canal Assn. with Commerce of Pennsylvania and favors building of waterway. Cost of canal is estimated on prices prevailing in 1914 and 1915 at $65,000,000 exclusive of [illegible] Pa., and Warren, O., each of which will cost $4,000,000 and is designed to furnish last class waterway [illegible] necessary to connect lines on [illegible] Mississippi with those of West Pennsylvania, West Virginia and Ohio.

Ill., Havana—Drainage—Chautauqua Land and Improvement Corp. plans to reclaim 4,000 acres of land, about 12 mi. east of Havana. Estimated cost $[illegible]. Includes 4-mi. levee and [illegible] pumping plant to remove water from marshlands.

Ia., Storm City—Drainage—County plans [illegible] to Circle Lk. [illegible] Also [illegible] Mississippi River [illegible] Also [illegible] Blue Gold—Drainage—County proposed new drainage district to be known as Minnie D. to drainage [illegible] acres, of which [illegible] acres will be drained. Also [illegible]

Ore., Salem—Drainage—Portion Clackamas County [illegible] to install drainage system.

BIDS DESIRED

Ind., Brownstown—Drainage—Until July [illegible] by Trustee, on [illegible] Bldg., Indianapolis, engr. [illegible]

Ind., Winamac—Until July 26 by Co. Aud. [illegible] Co. Comrs. Engr. Johnson, Peru, [illegible] Engr. Mohler, Winamac, [illegible] and Kelly sluices.

Ill., Lawrenceville—Ditch—Until July 26, by L. A. Funk, comr. Allison Ditch Dist. No. 1 for redredging ditch, 10 mi. long, 78,427 cu.yd. for dredge boat, 5500 cu.yd. for teams. Bottom width from 12- to 14-ft. wide.

Ia., Mason City—Drainage—Until July 23, by G. E. Frost, co. aud., building D.D. No. 53.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. J., Trenton—Dredging—Dept. Commerce and Navigation received low bids dredging section of proposed inland waterway connecting Barnegat Bay with Manasquan River from L. B. Harrison, 220 Bway., New York City, 36c. per cu.yd.; Hill Dredging Co., Atlantic and Somerset Pl., Atlantic City, 41⅜c.; Delaware Dredging Co., Phila., 44½c. About $50,000 available for work. Noted July 19.

★**Ia., Cedar Falls**—Drainage—County let contract D. D. No. 1 to A. D. McCall, 611 West 12th St., $30,000.

★**Minn., Benson**—Ditch—County let contract Judicial Ditch No. 9 to E. A. Barr, Redwood Falls, $33,442. Noted June 14.

★**N. D., Milnor—Drain**—County let contract Milnor Hall Drain to Great Northern Bridge Co., 635 Lumber Exchange Bldg., Minneapolis, $35,000.

Cal., Chino—Ditch—Storm Water Protection Dist. received low bids building 5 sections of ditch from Los Angeles Rock & Gravel Co., 3439 Pasadena Ave., Los Angeles, $11,830, and L. Farrell, Pomona, $26,-649.

★**Cal., San Diego**—See "Streets and Roads."

INDUSTRIAL WORKS

Proposed Work

N. Y., Brooklyn—Lancastershire Realty Co. had plans prepared by Shampan & Shampan, archts., 772 Bway., for 2-story, 121 x 153-ft. brick service station at Bedford Pl. and Atlantic Ave. About $150,000. L. Gold, 44 Court St., pres.

N. Y., Newton Falls — See "Reinforced Concrete."

N. Y., New York—J. Nimphius, 521 Bergen Ave., having plans prepared by M. J. Garvin, 3307 3rd Ave., for 6-story, 75 x 75-ft. brick garage and storage bldg. About $60,000.

N. J., Newark — See "Reinforced Concrete."

N. J., Rahway—Merck & Co., Lincoln Ave., plans rein.-con. and brick additions to its plant. About $140,000.

N. J., Trenton—American Bridge Co., foot of Warren St., plans addition on Delaware River, South Trenton. About $1,000,000.

Pa., Phila.—See "Reinforced Concrete."

Pa., Phila.—Niagara Mfg. Co., 323 North 2nd St., soon lets contract 2-story brick factory, 54th and Lancaster St. F. E. Hahn, archt.

Pa., Pittsburgh—National Biscuit Co. has plans prepared baking plant at Penn Ave. and Lambert St. About $600,000.

Pa., Reading—Metropolitan Electric Co., controlled by W. S. Barstow & Co., 50 Pine St., New York City, plans to rebuild electric power station at Klapperthal. About $100,000.

Va., Alta Vista—Alta Vista Cotton Mills, Alta Vista, plans to enlarge its plant. About $75,000.

W. Va., Belle—C. H. Hughes, 27 William St., New York City, and associates, plans chemical factory here. About $1,000,000.

N. C., Newbern—East Carolina Packing Co. having plans prepared by C. L. Brooks Eng. Co., Moultrie, Ga., for packing plant. About $65,000.

Ala., Mobile—See "Miscellaneous."

La., De Ridder—American Creosoting Co. plans factory here. About $100,000.

La., Jeffris—Jeffris Lumber Co., Jeffris, plans [illegible] mill. About $266,000.

Tenn., Chattanooga—De Camp Glass Casket Co., Bank of Commerce Bldg., Memphis, plans [illegible] here. About $200,-

O., Akron—Akron Mitchell Tire & Rubber Co. has plans prepared for new factory. About $[illegible]00. W. C. Owen & Co., archt., 1228 Euclid Ave., Cleveland, soon receives bids.

O., Cleveland—A. & B. Realty Co. plans [illegible] garage. About $100,-[illegible] mill, 1100 Euclid Ave., pres., A. W. Wolf, archt., Swetland Bldg., soon receives bids.

O., Cleveland—Baltimore & Ohio R.R. plans freight terminal. About $2,500,000. H. Lane Baltimore, ch. engr.

O., Cleveland—Detroit-Lake Ave. Co., c/o A. M. Allen, archts., 1900 Euclid Ave., will build 1- and 2-story, brick and steel market house at Detroit and Lake Aves. About $250,000.

O., Cleveland—Ohio Blower Co., 5125 Perkins Ave., has purchased site near Cedar Ave. "Y" and plans to build plant.

O., Euclid—Supreme Motor Corp. plans 1-story, 100 x 400-ft. factory, St. Clair Ave. and Bliss Rd. About $300,000. C. F. Jamison, 218 Union Bldg., pres., and M. Allen Co., 303-1900 Euclid Bldg., archts., both of Cleveland.

O., Toledo—Curtiss Aeroplane Co. plans to build largest airplane factory in country on Terminal R.R. J. N. Willys, pres.

O., Youngstown—Wilcoff Co., Wilson Ave., has increased capital stock from $300,000 to $600,000 and plans new factory.

Mich., Detroit—Aluminum Castings Co. plans 1-story, 106 x 177-ft. addition. About $100,000. C. B. Bohn, 1576 Jos. Campau Ave., mgr. C. W. Brandt, archt., 502 Kresge Bldg., soon receives bids.

Mich., Detroit—Diamond Power Specialty Co. plans 2-story, 112 x 128-ft. factory on Caniff Ave. About $70,000. R. Herman, 82 1st St., pres. Esselstyn & Murphy, archts., 206 New Telegraph Bldg., soon receive bids.

Ill., Champaign—E. V. Kirby, Orpheum Bldg., had plans prepared by J. Royer, archt., Flat Iron Bldg., Urbana, for 3-story, 68x132-ft. garage. About $60,000.

Ill., Chicago—See "Reinforced Concrete."

Ill., Chicago—Gibson Motor Co., 923 East 47th St. plans garage. About $50,000. H. L. Newhouse, 4630 Prairie Ave., archt.

Ill., Chicago—W. F. Hall Printing Co., Chicago Ave., Townsend, Kingsbury and Superior Sts., plans 7-story addition. About $900,000.

Ill., Chicago—Illinois Engineering Co., 314 Federal Bldg., plan factory on Racine Ave. and 21st St. About $65,000.

Ill., Peoria—L. E. Roby, and associates, organized company to be known as Peoria Malleable Castings Co., with $175,000 capital stock and plan malleable iron plant. L. E. Roby, pres. H. Hemingway, vice-pres.

Wis., Milwaukee—W. G. Kellogg, 103-373 Bway., and C. Petit plant to build grain elevator on belt line of North-Western R.R. About $200,000.

Ia., Des Moines—Campbell Baking Co. had plans prepared for brick and terra cotta addition to bakery. About $150,000. N. T. Vorse, 911 S. & L. Bldg., archt.

Minn., Minneapolis—Minneapolis, St. Paul & Sault Ste. Marie Ry. plans addition to present elevated plant to have capacity of 1,150,000 bu. C. N. Kalk, 317 2nd Ave., ch. engr.

Ark., Springdale—Middle West & Electric Co., purchased plant of Springdale Light & Power Co., and plans electric plant and transmission lines supplying electricity in Springdale, Fayetteville and Rogers plant in Fayette. About $75,000.

Tex., Wichita Falls—Atlas Wind Mill Co. plans factory. About $150,000. J. E. Robertson, Mineral Wells, pres.

Idaho, Oneida—Amalgamated Sugar Co. plans new factory. About $1,000,000.

Nev., Fallon—Nevada-Utah Sugar Co. plans addition. About $100,000. F. S. Bramwell, mgr.

Ore., North Bend—North Bend Mill & Lumber Co., plans new sawmill, planing mill and dry kiln. About $120,000.

Ore., Portland—W. P. Fuller & Co., 12th and Davis Sts., plans 4 steel tanks and concrete factory on 17th and Holgate Sts. About $100,000.

Que., Shawinigan Falls—Canadian Aloxite Co., subsidiary Carborundum Co., Buffalo Ave. and 18th St., Niagara Falls, plans factory. About $250,000.

Ont., Chatham—International Harvester Co. plans new brick foundry. About $50,-000.

Ont., Kitchener—Canadian Consolidated Rubber Co. preparing plans brick additions to machine shops. About $50,000.

Ont., Sarnia—See "Structural Steel."

Sask., Moose Jaw—See "Reinforced Concrete."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Long Island City**—See "Reinforced Concrete."

★**Pa., Phila.**—Penn Chemical Co. let contract brick and concrete factory and 1-story power house to Nickson, Duggan & Co., Bailey Bldg., $75,000.

Industrial Work (Continued)

★**Mich., Grand Rapids**—Llewellyn Bean Co. let contract, 120 x 400 ft. bean elevator, to C. Hoertz & Son. About $200,000.

★**Minn., Minneapolis**—Yerza Andrews & Thurston Co., 622 Flour Exchange, let contract large grain elevator at 35th St. and Hiawatha Ave., to Barrett & Record Co., Flour Exchange.

☆**Kan., Ft. Scott**—Borden's Condensed Milk Co. let contract condensing plant to A. E. Madorie, 409 Reliance Bldg., Kansas City, Mo. About $100,000.

★**Neb., Omaha**—Hoagland Lumber Co., Keeline Bldg., let contract to J. C. Mardis & Co., for 4-story, 132x132-ft. mill. About $200,000.

★**Neb., Omaha**—McCaffrey Motor Co., 10th and Howard Sts., let contract, brick and stone garage, to Olson & Johnson, 638 1st Natl. Bank Bldg. About $50,000.

★**N. D., Grand Forks**—Northern Packing Co. let contract to Spald Albee & Smith General Constr. Co., Minneapolis, $168,950.

★**Mo., St. Joseph**—Battreall Shoe Co., 4th and Jule Sts., let contract 7-story addition to P. P. Buddy Constr. Co., 501 North Main St., $125,000.

Mo., St. Joseph—Montgomery Elevator Co. let contract, 6-story, 121x125-ft., brick and stone warehouse addition, 4th and Mitchell Sts., to T. W. Hackett, 1023 Church St. About $75,000.

★**Tex., Wichita Falls**—Wichita Mill & Elevator Co. let contract 1000 bbl. flour mill to Burrell Eng. & Constr. Co., 323 South La Salle St., Chicago. About $300,000.

★**Wash., Seattle**—Earl Fruit Co. let contract 10 warehouses in eastern Washington towns to Hurley-Mason Co., Hoge Bldg. About $500,000.

★**Cal., Fresno**—Willys Overland Co. let contract 3-story, 100x150-ft. brick and concrete automobile service plant, Van Ness Ave., to R. F. Felchlin Co. About $60,000 Noted June 7.

★**Ont., Toronto**—Willard's Chocolate Co., Ltd., 260 Spadina Ave., let contract factory and warehouse, to Yolles & Rotenberg, 67 Baldwin St. About $80,000

BUILDINGS

Proposed Work

N. H., Nashua—High School—Bd. Educ. plans, 2-story, brick. About $200,000. T. M. James, 1855 Devonshire St., Boston, archt.

Mass., Falmouth — Hotel — Siders Pond Inn Incorporation, care W. H. A. Sisson, having plans prepared by Smith & Howland, archts., 545 Pleasant St., New Bedford, 3-story, 36 x 80-ft., 2 wings 35 x 120-ft. About $125,000.

Mass., Wellesley—College—Wellesley College had plans prepared by Day & Klauder, archt., 925 Chestnut St., Phila., for 3 buildings—2- and 3-story. Crain & Furgeson, 5 Beacon St., Boston, archt.

Conn., Mansfield—State plans new buildings for Mansfield Training School and Hospital. About $250,000. L. P. Marvin, Hartford, chn. Cudworth & Thompson, 148 Main St., Norwich, archts

Conn., Norwich—Ward—State Hospital for Insane had plans prepared, 3-story, 40 x 285-ft. About $130,000. T. F. Erdmann, supt. Cadworth & Thompson, 148 Main St., archts.

N. Y., Auburn—Hospital—Sisters of St. Francis, c/o St. Anthonys Academy, Court St., Syracuse, and Rev. W. Payne, 15 Clark St., having plans prepared, 4-story, 70 x 190 ft. brick and steel with 4-story wings and chapel, by S. S. Hillger, 9 Seward Blk., archt.

N. Y., Brooklyn—Exchange—New York Telephone Co., 15 Dey St., has plans prepared, 3-story, Liberty Ave. and Milford St. About $125,000

N. Y., Brooklyn—Loft, H. & P. Corp. plans, 4-story, 100 x [illegible] ft., [illegible] on Atlantic Ave. About $[illegible] c/o Farnum 51 East 97th St., New York City; [illegible] Millman & Son, 26 Court St., Archts.

N. Y., Brooklyn—Parish House—Presbyterian Church, Lafayette Ave., [illegible] story, 40 x 90 ft., brick and stone, at 927 Oxford St. About $[illegible] c/o Allen-[illegible] 336 Washington Ave., [illegible] Cook & Arms, 21 West 15th St., archts.

N. Y., Lily Dale—Hospital—F. Stanton Tuberculosis Hospital having plans prepared to be built on west shore of Cassadago Lake. About $150,000

N. Y., New York—Hospital—Bronx Hospital Assn. plans, 2- and 4-story, 35 x 100 ft., brick and terra cotta, at Charlotte St. and Boston Rd. About $50,000. A. Goldman, 108 2nd Ave., pres. L. A. Abramson, 220 5th Ave., archt.

N. Y., New York—Store—J. C. Davies, 149th St. and 2nd Ave., plans 1-story, brick, at Burnside and Jerome Aves. (Bronx Boro.). About $50,000. Moore & Landsiedel, 149th St. and 3rd Ave., archts.

N. Y., Rochester — Club — Knights of Columbus having plans prepared by Gordon & Madden, archts., Sibley Bldg. About $150,000.

N. J., Newark—Engine House—City having plans prepared by F. Grad, Amer. Natl. Bank Bldg., Suringfield and Belmont Aves., in 13th Ward at Orange and Sandford Aves. About $50,000. T. L. Raymond, City Hall, mayor.

N. J., New Jersey—Labor Temple—Labor Organizations of Hudson Co. having plans prepared by J. T. Rowland, Jr., archt., 100 Sip Ave., 4-story, 127 x 140-ft. About $60,000.

N. J., Jersey City—School—City voted $50,000 bonds to build addition to P. S. No. 11 and $350,000 bonds for new 3rd Ward School. G. E. Keenan, pres. school bd.

N. J., Red Bank—School—Bd .Educ. voted $161,700 bonds to build 2 schools. J. Bucklin, pres.

Pa., Erie — Depot — New York Central R.R. had plans prepared. About $600,000. G. W. Kittredge, Grand Central Terminal, New York City, ch. engr.

Pa., Lititz — Bank and Store — Lititz Spring Natl. Bank, care E. H. Snyder, 40 East Main St., having plans prepared by C. E. Urban, archt., Woolworth Bldg., Lancaster, 2-story. About $90,000.

Pa., Phila.—Bank and Office—C. E. Durant, care of F. C. Durant, Land Title Bldg., having plans prepared by M. Fielding, archt., 520 Walnut St., 8-story, 25 x 80 ft. About $50,000.

Pa., Schuylkill Haven—Hospital—Comrs. Schuylkill Co., Pottsville, soon let contract 1-story, 130 x 138-ft. addition. About $50,000. F. X. Reilly, 112 South Centre St., Pottsville, archt.

Wash., D. C.—Club—Washington Athletic Club, plans, 12-story, 133x150-ft. About $650,000. J. M. Kenyon, pres. Millburn Heister & Co., Union Savings Bank Bldg., archts.

Wash., D. C.—Parochial School—Holy Trinity Congregation having plans prepared by F. G. Pierson, archt., Washington Loan and Trust Bldg., 2-story. About $150,000.

Va., Richmond—High School—Bd. Educ. plans. About $50,000. C. M. Robinson, Times-Dispatch Bldg., archt.

W. Va., Petersburg—Station—See "Railways."

S. C. Saluda—Court House—County having plans prepared by A. Sayre, archt., Beckley Bldg., Anderson, brick and stone. About $50,000.

Ala., Bessemer—Court House—Co. Comrs. plan. About $150,000.

Tenn., Memphis—Hospital—Baptist Memorial Hospital having plans prepared by C. O. Pheil, archt., Tennessee Trust Bank Bldg., 8-story, brick, terra cotta and rein.-con. addition. About $175,000.

O., Akron—Hotel and Business—J. Sop[illegible] 419 2nd Natl. Bank Bldg. having plans prepared by Practical Eng. Co., Akron Savings and Loan Bldg., 3-story, 60 x 115-ft.

O., Akron—School—Bd. Educ. plans 2- or 3-story. About $500,000. F. L. Packard, 1212 Hayden Bldg., Columbus, archt.

O., Cleveland Heights—(Warrensville P. O.)—School—Bd. Educ. soon let contract 2-story, brick and stone. About $150,000. E. Bryan, clk. F. C. Warner, 707 Hippodrome Bldg., archt.

O., Columbus—Hospital—McKinley Hospital having plans prepared by Stribing & [illegible] avenue, S. North High St., for [illegible] addition.

O., Cleveland—House—P. Sterling Parish having plans prepared by J. E. Sabaski, archt., 564 Rose Bldg., 45 x 76-ft., on Forman Ave., S. E. cor. East 84th St. About $[illegible]

O., Cleveland—School—Bd. Educ. having plans prepared by W. J. McNamara, East 9th St. and Hodgson Ave., 2-story addition. About $[illegible]

O., Elyria—Club House—Lake Shore Country Club having plans prepared by B. H. Hinsdale, archt., [illegible] Bldg. About $15,000. W. D. Mayne, Garfield Bldg., engr.

O., Lakewood—High School—Bd. Educ. having plans prepared by C. W. Hopkinson, Archt., 900 Rose Bldg., Cleveland, 3-story addition. About $250,000.

O., Lakewood—School—P. T. Harrold, clk. bd. educ., soon receives bids, 2-story. About $100,000. W. Hopkinson, 900 Rose Bldg., Cleveland, archt

O., Latty—School—Bd. Educ. plans, 2-story. About $60,000. F. L. Packard, 16 Broad St., Columbus, arch.

O., Mt. Vernon—Hospital—State Bd. of Administration, c/o T. E. Davy, Oak and 9th Sts., Columbus, plans 2-story, 95 x 125-ft., here. About $50,000.

O., Toledo—Hotel—Bond Hotel Co. having plans prepared by Mills, Rhines, Bellman & Nordhoff, Archts., Ohio Bldg., 12-story. About $2,250,000.

O., Warrensville — Cottages — City of Cleveland plans to build 8 Cottages at tuberculosis sanitarium here, 3-story, 60 x 115 ft. About $100,000. L. T. Beman, 327 City Hall, dir. pub. welfare. F. H. Betz, 604 City Hall, archt., both of Cleveland

O., Youngstown—Office—Union Land & Bldg. Co. plans, 16-stories, brick, concrete and stone. About $750,000. H. H. Stambaugh, pres., Knox & Elliott, archts., 1248 Rockefeller Bldg., Cleveland, soon receives bids.

O., Zanesville—Y. M. C. A. having plans prepared for new building. About $200,000. H. Smith, 737 Eppley Ave., chn.

Ind., Lafayette — Office — Lafayette Life Insurance Co. plans 10-story 51 x 121 ft., 3rd and Main Sts. About $250,000. W. Lane, Lansing Bldg., secy. J. F. Alexander and Son, archts., Ball Blk., soon receives bids.

Ind., New Palestine—School—Bd. Educ. having plans prepared by C. Boone, archt., Greenfield. About $50,000.

Mich., Ionia—High School—Bd. Educ. election soon to vote on $150,000 bonds to build high school.

Mich., Ishpeming — Hospital — Cleveland Cliffs Iron Co. having plans prepared, 3-story, 50 x 150, brick and rein.-con. About $80,000. M. J. Sturmarcht, 116 South Michigan Ave., Chicago, archts.

Mich., Rochester—Club—Brookland Golf and Country Club having plans prepared, 2-story, 119 x 219-ft. J. W. Case, 1448 David Whitney Bldg., archt.

Mich., Vassar—School—Bd. Educ. plans, 2-story, 80 x 148 ft. About $60,000 J. C. Peterson, State Bank Bldg., Traverse City, archt.

Ill., Chicago — Church — Sheridan Road Methodist Episcopal Congregation plans, on Sunnyside Ave. About $70,000.

Ill., Chicago — Hotel — See "Reinforced Concrete."

Ill., Rock Island—Hospital—St. Anthony's Hospital having plans prepared by H. B. Fox, archt., 301 Apollo Theater Bldg., Peoria. About $200,000.

Wis., Racine—Terminal—Chicago, Racine & Milwaukee Transportation Co., foot South Main St., soon lets contract, 6-story, brick and concrete

Wis., Wauwatosa—Temple—Wauwatosa Lodge No. 267 plans to build. F. A. Stevens, chn. Bldg. Com. Lockwood & Greene, 401-403 Jefferson St., Milwaukee, archts.

Ia., LeMars—Western Union College having plans prepared for [illegible] auditorium, $85,000; music conservatory, $[illegible]; library, $[illegible]; gymnasium, $[illegible]; W. H. Pritchard, Commercial Bldg., Sioux City, archt.

Minn., Faribault—Seminary—Plans having plans prepared for girls' normal cottage at school for feeble-minded, cost $[illegible]. H. Johnson, archt. (A partial list). Harry Imes, St. Paul, receives bids about Aug. 10.

Kan., Augusta—School—Bd. Educ. having plans prepared by C. E. Boeschen & Son, archts., 211 South Main St., Wichita, Kan.

Kan., Garden City—School—Bd. Educ. [illegible] 18 x 110 ft., [illegible] story and 2 story basement, about $[illegible]. W. S. Hoss & Co., Topeka, Kan., Gen. Contrs.

Kan., Wichita—[illegible] Neb., Omaha—Theater, Store and Office—A. H. Blank, Des Moines, Iowa, has plans prepared by J. Latenser, archt., for Farnam, 4-story, 141 x 66-ft. About $[illegible]

Buildings (Continued)

Wyo., Riverton—Temple—Masonic Fra- Realty Bldg., Omaha. 2-story, 50 x ft. About

Mont., Billings—Hospital—Sisters of about $250,000

Mo., St. Louis—City soon lets building to be constructed issue. H. W. Kiel, Jefferson Ave.

Mo., St. Louis—Hall—City prepared by W. H. Ittner, Bldg. About $2,000,000. Bldg.

Tex., Abilene—College—State plans West Texas and Mechanical College here. About

Tex., Brownwood—College—D. Baker prepared by C. D. Hill Bldg., Dallas. About

Tex., Carlsbad—Sanitarium—State hav- prepared by Sargalnet & Staats, Bank Bldg., Waco, tuberculosis sanitarium. About

Tex., College Station—Dormitory—A and M College soon lets contract. About

Okla., Bartlesville—Temple—Masonic prepared by J. H. Temple. City, Mo. About $75,000. Mc-

Okla., Tulsa—Store—Commerce Bldg. Co., 4th and Main St., having plans pre- 4-story, 41 x 146-ft. brick, steel and About $ Rush, Endicott & Bldg., archts.

Ariz., Tucson—High School—City election soon to vote on $200,000 bonds to build Address H. A. Trachman, Bldg.

Wash., Spokane—Administration—Whit- About $110,000

Cal., Las Banos—School—Bd. Educ. soon let contract, brick and concrete, about E. J. Kress, Rowell Bldg., Fresno, archt.

Cal., Ojai—Hotel—Ojai Inn Co. having plans prepared by Mead & Requa, Arcata, 233 F St., San Diego, rebuilding Foothills Hotel, recently destroyed by fire. About

Cal., Santa Barbara—Hospital—County prepared by H. F. Sauter, archt., type stone. About $50,000

N. B., Moncton—Hotel—Brunswick Hotel Ltd. having plans prepared, stone and brick. About $ H. Carter, archt.

Que., Montreal—School—City plans to build 2 About $ J. E. A. Prefontaine, Wellington St., archt.

Ont., London—Theater—P. Smythe, 197 Dundas St., plans. About $

B. C., Burnaby—Studio—Associated Film Co., Ltd., Hinton Bldg., Vancouver, plans new building. About $ J. A. Nelson, managing dir.

BIDS DESIRED

N. Y., Central Islip—(Official)—Acute Epileptic Building—Until July 31 for State Hospital, Kings County, addition to Central Islip State Hospital, E. H. Hammond, secy.; plans prepared by Otis Lacey. Noted July 12.

N. Y., White Plains—High School—Until July 31 for Bd. Educ., at C. Elton, secy. Bd. Educ.

O., Xenia—Hotel—Until Aug. 1 by Miller & Hollingsworth, 17 Engrs. Bldg., Dayton, for remodeling hotel to be conducted as Patterson Hotel Co. About $ prepared for Patterson Hotel Co.

O., Cadiz—House—Until July 27 by F. E. Hines, archt., for addition to Harrison Co. Children's Home.

O., Lebanon—Office—Until Aug. 1 by Bramhall & Tinsley, 307 Union Bldg., Cincinnati, archts.

Wis., Barksdale—Hotel—Until June 15 by H. Bronsard, archt., 417 Chester Bird Bldg., Milwaukee.

Minn., Warroad—High School—Until Aug. 1 by Ed. Educ., Lloyd Andrews, C. F. Bentzen, Inc., Lyceum Bldg., Duluth, archts.

Kan., Great Bend—Court House—Until Aug. 4 by W. F. Buchero, 622 Hubbell Bldg., Des Moines, archt. 4-story, 102 x 144 ft., stone, brick and concrete. Hutchinson & Co., Kent Bldg., Kansas City, Mo., engrs. Noted June 21.

Kan., Hutchinson—High School—Until July 24, by Bd. Educ., brick. E. Hulse & Co., 207 1st Natl. Bank Bldg., archts.

Kans., McPherson—School—Until July 25, by F. H. Hawley, chn. bd. educ. Markgraf & Mampe, 413 Ridge Bldg., Kansas City, archts.

S. D., Wessington Springs—High School—See "Reinforced Concrete."

Wyo., Cheyenne—Until Aug. 6, by City, for city and county buildings. About $170,000. J. A. Martin, comr. finance. W. Dubois, 1st Natl. Bank Bldg., archt.

Okla., Cushing—Bath House—Until Aug. 1, by City Clk., to be built in Randlett Pk. About $100,000.

Okla., Cushing—Court House—Until Aug. 1, by county, for new building. About $100,000.

Cal., Santa Barbara—Hospital—Until Aug. 6, by Co. Supervs., 1-story, 51 x 235-ft., brick and rein.-con. About $60,000. C. A. Hunt, co. clk. R. F. Sauter, San Marcos Bldg., archt.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Brooklyn**—Hospital—Bay Ridge Hospital, 60th St. and 2nd Ave., let contract 4-story, to E. E. Paul, Co., 101 Park Ave., New York City, $150,000.

★**N. Y., Mt. Vernon**—School—Bd. Educ. let contract addition to School 9, East 5th St. and Bedford Ave., to O. J. Tegan, 452 Union Ave. About $50,000.

★**N. Y., Niagara Falls**—Y. W. C. A. let contract brick, concrete and stone building to Brass Bros., 110 Whitney Ave. About $66,000.

N. Y., Syracuse—School—Bd. Educ. received low bid from Central City Constr. Co., 104 Union Blk., $97,450.

★**N. J., Newark**—Theater—A. W. Moore, 22 Green St., let contract, 1- and 2-story, 125 x 150 ft., Prospect Ave. and Heller Pkway., to I. Feinsod, 402 Hunterdon St. About $70,000.

★**Pa., Phila.**—Office—Lit Bros. let contract, 7th and Filbert Sts., to Keostone State Constr. Co., Pennsylvania Bldg. About $605,000.

Pa., Phila.—Stations—City received low bid 3-story, brick, concrete and terra cotta stations, from Standard Constr. Co., Drexel Bldg. About $510,000. Noted June 21.

★**Pa., Scranton**—Bank—Third Natl. Bank, 118 Wyoming Ave., let contract addition and alterations to E. S. Williams, Coal Ex. Bldg., $80,000.

★**Wash., D. C.**—Convent—Asso. of Professors of St. Mary's Seminary let contract, 2-story, to C. L. Cassidy Co., Southern Bldg. About $50,000.

Fla., St. Augustine—Hospital—Trustees Flagler Hospital rejected bids, 3-story, brick and rein.-con. About $100,000. New bids soon. F. A. Hendrick, 26 Cathedral St., archt. Noted June 14.

★**O., Cleveland**—Church—St. John's Nepomucene Congregation c/o Rev. J. Hroch, 4914 Fleet St., let contract, 1-story, 78 x 138-ft., to C. A. Garson Co., 6408 Euclid Ave., $75,000.

★**Ill., East Moline**—Y. M. C. A. let contract 4-story, 82 x 101-ft. building to C. E. Heaps, 310-12 Peoples Bank Bldg., Moline. About $59,000. Noted July 5.

★**Ill., Urbana**—Educational—University let contract to English Bros., 55 North Walnut St., Champaign. About $151,000.

★**Ia., Nevada**—Infirmary—County let contract to W. F. Kuchero, 622 Hubbell Bldg., Des Moines. About $56,000.

★**Ia., Traer**—High and Grade School—Bd. Educ. let contract to McNanus & Tamoske, Endicott Bldg., St. Paul, $71,552.

★**Minn., St. Paul**—Depot—St. Paul Union Depot Co. let contract depot and accompanying terminal yards and improvement consisting an estimated expenditure of $11,500,000 to Morris, Shepard & Dougherty, 711 Globe Bldg. and G. J. Grant Constr. Co., 902 Exchange Bank Bldg. Practically all railroads entering St. Paul will terminate here. M. V. Seymour, atty. for com-

Minn., St. Paul—Exchange—Northwestern Telephone Co. let contract to F. C. Shepard Co. 317 Alms Natl. Bank Bldg. About $125,000.

★**Kan., Larned**—Court House—County let contract, 3-story, brick, stone, concrete and steel, to W. Paige, Larned. About $117,-000. Noted June 14.

★**Neb., Lincoln**—University—Bd. Regents State University let contract 4-story, 62 x 156-ft., brick, stone, terra cotta and concrete, to B. J. Gobst, Lincoln, $125,000. Noted June 21.

★**Neb., York**—Hotel—York Hotel Co. let contract 6-story, 90 x 118-ft., brick, terra cotta and rein.-con. to P. Kiewitts, 754 Omaha Natl. Bank Bldg., $130,000.

★**Ark., Little Rock**—Hotel—Bd. Dir. Marin Hotel let contract, 9-story fireproof annex to W. F. Ault, 481 Main St. About $100,000.

★**Tex., Waco**—Coliseum—City let contract new Cotton Palace Coliseum to H. J. Ainsworth, 414 Amicable Bldg. About $50,000.

★**Okla., Miami**—Hotel—Miami Hotel Co. let contract 7-story, brick, stone and concrete to F. H. Crites, 2136 Belleview St., Kansas City, Mo., about $20,000. Noted May 31.

★**Okla., Norman**—Auditorium—State Bd. Pub. Affairs let contract, at Oklahoma University, to Holmboe Constr. Co., 311-15 Majestic Bldg., About $140,000.

★**Colo., Longmont**—Bank—Farmers' Natl. Bank, 4th and Main Sts., let contract to Hoggson Bros., 1735 Mapleton Ave. About $50,000.

★**Ariz., Tucson**—School—Bd. Educ. let contract 2-story, brick, to W. H. Young, $102,910. Noted July 12.

★**Wash., Seattle**—Naval Training Station, University of Washington, let contract to be built on campus to Puget Sound Bridge & Dredging Co., Central Bldg. About $65,-000.

★**Ont., Toronto**—Mausoleum—Trustees Toronto Burying Grounds let contract, to Witchall & Son, Jr., 156 St. Helens Ave. About $250,000.

FEDERAL GOVERNMENT WORK

Proposed Work

S. C., Charleston—Buildings—Bureau Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., soon receives bids for 1 shell house, 1 magazine building and 1 torpedo house. About $110,000. Noted Apr. 26.

Cal., San Francisco—Pipe Line—Bureau of Docks (F. R. Harris, ch.), Navy Dept., Wash., rejected bids opened June 25. Noted July 5.

T. H., Kuahua—Building—Bureau Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., soon receives bids for mine storage building. About $62,400.

BIDS DESIRED

Pa., Phila.—Crematory—Until July 30, Bureau Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., building crematory, brick walls, rein.-con. floors, roof slabs, steel beams, pitch, felt and gravel roof covering.

Wash., D. C.—Coal Handling Plants—Until July 23, by Bureau Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., at Navy Yards, Norfolk, Va., and Phila., Pa.

Fla., Key West—Towers—Until July 31, by Light House Inspector, furnishing and delivering f.o.b. Key West, metal work and glass complete for 2 light towers, at Molasses and Pacific Reef, Fla.

Miss., Vicksburg—Stone—Until July 25, by 3rd Mississippi River Comn., P. O. Box 404, furnishing 20,000 short tons stone.

Ky., Lancaster—Post Office—Until Aug. 17 by J. A. Wetmore, superv. archt., treas. dept., Wash.

Ky., Louisville—(Official)—Until Aug. 9, at U. S. Engr. Office, furnishing and delivering horses, props, etc., for Bebout weir, Dam 48, Ohio River; advertised in this issue.

Ia., Cherokee—Post Office—Until Aug. 22, by J. A. Wetmore, superv. archt., treas. dept., Wash.

Kan., Eldorado—Post Office—Until Aug. 21, by J. A. Wetmore, superv. archt., treas. dept., Wash.

Mo., St. Louis—Levee Work—Until July 30, by Mississippi River Comn., 1311 International Life Bldg., 80,000 cu.yd. earthwork. Druary D. D., Ill.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., Broklyn—Cranes—Bureau Yards and Docks, Navy Dept., Wash., received low bids furnishing electric traveling cranes at Navy Yard (a) 2 15-ton bridge cranes, complete; (b) add for each additional bridge crane up to 4, from Niles-Bement-Pond Co., 111 Bway., New York City, (a) $40,750, 365 days (b) $20,375 each, 400 days; Pawling & Harnischfeger, 38th and National Sts., Milwaukee, (a) $44,599, 300 days, (b) $22,250, 30 days; Penn Bridge Co., Bond Bldg., Wash., D. C., (a) $49,887, 250 days, (b) $24,375, 14 days for each additional crane.

Federal Government Work (Continued)

Md., Annapolis—Building—Bureau Yards and Docks, Navy Dept., Wash., received low bids addition to Isherwood Hall (work complete), from W. P. Lipscomb & Co., 1405 F. St., Wash., D. C., $211,000, time 400 days; H. D. Watts Co., South and Water St., Baltimore, $220,000, time 350 days; N. Ker Co., 1123 Bway., New York City, $223,470, time 415 days.

Md., Annapolis—Buildings—Bureau Yards and Docks, Navy Dept., Wash., received low bids, July 9, for addition to Bancroft Hall, U. S. Naval Academy, as follows: (a) Net price and time for work complete in accordance with drawings and specification. (b) Amount and time to be deducted from net price under (a) if cement required for the work, not in excess of amount estimated by successful bidder, is furnished by Government, f.o.b. cars, Naval Academy, Annapolis, Md. Under this item bidders muse state number of barrels of cement which they estimate is required for work. If cement is furnished by Government, contractor will be required to provide ample and satisfactory storage to insure an adequate supply being maintained, and he shall be responsible for all cement delivered to him. Any cement damaged after delivery to the contractor shall be made good by him. (c) Amount and time to be deducted from net price under (a) if Government defrays transportation charges on granite. Contractor shall arrange for such transportation and shall replace any defective stone without expense to Government. (d) Amount and time to be added to or deducted from net price under (a) if concrete piles are substituted for wood piles as specified under alternative No. 1, paragraphs 382 to 387 of the specifications. (e) Amount and time to be added to or deducted from net price under (a) if brick masonry is substiuted for hollow terracotta backing of granite work above terrace-floor level, as specified under alternative No. 2, paragraphs 388 to 389 of the specifications. (f) Amount and time to be deducted from net price under item (a) if artificial cast stone is substituted for carved granite as specified under alternative No. 3, paragraphs 390 to 332 of specifications. (g) Amount and time to be deducted from net price under (a) if wood sheathing is substituted for gypsum roof construction, as specified under alternative No. 4, paragraphs 393 to 396 of specifications. (h) Amount and time to be deducted from net price under (a) if composition roofing is substituted for sheet copper as specified under alternative No. 5, paragraphs 397 to 407 of specifications. (i) Amount and time to be added to net price under (a) if entire roof construction of the present mess hall is rebuilt as specified under alternative No. 6, paragraph 408 of specifications. (j) Amount and time to be added to net price (a) if existing wood floor finish of the present mess hall is replaced with tile and cement mortar as specified under alternative No. 7, paragraph 409 of specifications. J. Henry Miller, Miller Bldg., Baltimore. (a) $2,597,000, time, 365 days. (b) $58,800, (c) $59,000, (d) $5000, (e) $3800, (f) $21,000, (g) $9400, (h) $17,000, alternate $9600, (i) $42,700, alternate $19,700, (j) $6500. P. J. Carlin Constr Co., 1123 Bway., New York City, (a) $2,788,000, 760 days, (b) $95,000. (c) $45,000, (d) no change, (e) $10,000, (f) $10,000, (g) $5000, (h) $14,000, alternate $5000, (i) $40,000, alternate $12,000, (j) $10,000. George A. Fuller Co., Munsey Bldg., Wash., D. C., (a) $2,945,000, 415 days, (b) $100,000, (c) $96,000, (d) $10,000, (e) $9500, (f) $63,000, (g) $10,000, (h) $18,000, alternate, no change, (i) $70,000, alternate $10,000, (j) $9000. Noted June 28.

★**Wash., D. C.**—Bridges—Comm. of Indian Affairs, Wash., let contract steel highway bridges on Umatilla Indian Reservation to Monarch Eng. Co., 312 17th St., Denver, $26,000. Noted June 28.

Wash., D. C.—Cement—U. S. Engr. Office, Room 305 Southern Bldg., received low bids furnishing and delivering at foot 35th St., here 15,000 bbl. of portland cement, from Security Cement and Lime Co., 107 Equitable Bldg., Baltimore, $1.81 per bbl; Edison Portland Cement Co., 8 West 40th St., New York City, $1.84; National Mortar Co., 1st and M Sts., $1.94 Noted June 28.

★**Va., Hampton**—Buildings—Bureau Yards and Docks, Navy Dept., Wash., let contract temporary buildings, emergency camp, to Carolina Wood Product Co., Asheville, N. C., and Wise Granite Co., Inc., American Natl. Bank Bldg., Richmond, cost plus percentage.

Ia., Glenwood—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., received low bids, from C. Weitz & Sons, 713 Mulberry St., Des Moines, $38,820; C. E. Goodhand, Wahoo, Neb., $39,500; J. H. Wiese, 1301 Citizens Natl. Bank Bldg., Omaha, $42,910. Noted June 28.

★**Wyo., Ft. Laramie**—Canal—U. S. Rec. Ser. let contract excavating main canal on Ft. Laramie Project to J. E. Hilton, Lingle, $53,410. Noted June 28.

★**Cal., Vallejo**—Storehouse—Commandant, Navy Yard, Vallejo, let contract to Clinton Constr. Co., 140 Townsend St., San Francisco, $198,200. Noted June 14.

MISCELLANEOUS

Proposed Work

Terminal—Mobile, Ala.—Gulf Mobile & Northern R.R. plans to spend $500,000 to build first unit terminal improvement to consist of slip to accommodate several ships, pier above high water, rein.-con. stormproof wharf, series of warehouses, 5 and 6 stories high. Work will involve 4000 lin.ft. piers for accommodation of vessels, 2000 lin.ft. warehouses requiring 200,000 sq.ft. floor space. Lumber docks with frontage of 2000 ft. on Mobile Bay also contemplated. B. V. Wright, Laurel, Miss., ch. engr

Garbage Disposal Plant—Newport, Ky.—City plans About $40,000.

Garbage Disposal Plant—Chicago, Ill.—E. R. Pike, city comptroller, purchased site, Goose Island, for garbage disposal plant About $158,000.

Transmission Line—Springfield, Ill.—Pub. Utilities Comn. granted permission to Consolidated Ry. to extend transmission line over tracks of Chicago, Peoria & St. Louis R.R., Sangamon Ave. to 11th St. A. D. Mackie, genl. mgr.

Park Improvements—Salina, Kan.—City council purchased Kenwood Park and plans to improve same.

Sea Wall—Bay St. Louis, Mo.—See "Reinforced Concrete."

Transmission Line—Ark., Springdale—See "Industrial Works."

Tank—Seattle, Wash.—See "Reinforced Concrete."

Flood Protection—Santa Barbara, Cal.—City having plans prepared for controlling flood waters on lower east side. Present ditch will be dredged, banks raised and automatic drainage gates installed at every block. A. B. Cook, city engr

Transmission Line — Sherbrooke, Que.—City voted $150,000 bonds to build transmission line from Sherbrooke to power plant at Two-Mile Falls.

BIDS DESIRED

Retaining Walls—Tehamah, Neb.—See "Reinforced Concrete."

Tunnels—San Francisco, Cal.—(Official)—Until Aug. 22, by Bd. Pub. Wks. building 18-mi. tunnel aqueduct, Hetchy Hetchy Water Supply Project. M. M. O'Shaughnessy, city engr.; advertised in this issue. Noted July 12.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Elevated Railway—Brooklyn, N. Y.—Pub. Ser. Comm., 149 Bway., New York City, received low bid building Route 40, Sect. 3, Culver Rapid Transit R.R. from point near Ave. X to Sheepshead Bay, from O. Tomkins & Co., Woolworth Bldg., New York, $84,000. Noted June 28

★**Docks — Buffalo, N. Y.**—(Official)—Comm. Pub. Wks. let contract improving along Bird Island Pier to Great Lakes Dredge & Dock Co., D. S. Morgan Bldg., about $189,000. Noted June 21

Incinerator—Long Island City, N. Y.—M. F. Connolly, Astn. pres., received low bids for handling and runway, furnishing appurtenances and chimneys of Eastern Boulevard Destructor, 1st Ward from Kelly & Kelley, 27th St., $117,000; H. H. Martin, $103,465.

★**Tanks—St. Joseph, Mo.**—See "Reinforced Concrete."

★**Harbor — Redondo Beach, Cal.**—City Trustees voted to enter into preliminary contract with Lumsden Corpn. & Contr. Co., 42 Bway., New York City, to build harbor to cost about $4,000,000. City has voted $150,000 toward work. Harriman Bros. will raise similar amount and Atchison, Topeka & Santa Fe R.R. and other interests will raise $500,000 each. Noted May 31

Barney-Hocke-Ahlers Constr. Corp., New York, N. Y., has been incorporated to engage in construction, dredging and engineering. J. G. Hocke, J. G. Ahlers and W. J. Barney, 1187 Lexington Ave., incorporators.

Hayden-Corbett Chain Co., Columbus, O., plans to open a branch at Huntington, W. Va.

Lakewood Engineering Co., of Cleveland, announces that Carleton R. Dodge, recently of C. R. Dodge & Co., New York City, has been appointed assistant sales manager in charge of the Philadelphia territory, with offices in the Widener Building, and that George H. Edbrooke, until recently with C. R. Dodge & Co., New York City, has been made sales engineer of contractors' plant and equipment.

The Laurence Contracting Co., formerly located at 2409 Walton Ave., Bronx, New York, has moved to 90 Broadway, New York City

New Jersey Shipbuilding and Dredging Co., Jersey City, N. J., has been incorporated with $500,000 capital stock to operate a general shipbuilding and dredging business. John F. Clarke Bayonne, Albert P. Margolies, Jersey City, and E. C. Moore, New York, incorporators

William M. Hind has resigned as general manager of the Buffalo Contractors' Plant Corp. of Buffalo, N. Y.

George R. Prout has been elected president of James Leffel & Co., Springfield, O., manufacturer of water turbines.

George Schautz Engr. Co., Inc., Buffalo, N. Y., has been incorporated to engage in a general contracting and engineering business. F. J. Leuthner, G. and J. A. Schautz, incorporators

The Vulcan Steel Products Co., 120 Bway., New York, N. Y. has secured the services of E. J. Parker, New York manager of the Morgan Eng. Co., as sales manager of their machinery and tool department. They plan, at the present time, to open a chain of offices throughout Europe, Japan and China, etc., and Mr Parker expects to leave New York very shortly and personally conduct this work abroad.

State Highway Comn., Commercial Natl Bank Bldg., Raleigh, would like to receive catalogs and prices on the following machinery, etc.: Road signs, motor trucks, steam tractors, appliances for rural telephone systems, rural lighting systems, road oilers, power on the farm, asphalt equipment, dump wagons, wagon loading machinery and pamphlets on asphalts, tar and road oils. W. S. Fallis, engr.

TRADE CATALOGS

"Stanley" Cotton Belting. Stanley Belting Corp., 32-40 S. Clinton St., Chicago, Ill. Booklet. Pp. 8, 3½ x 6 in.; illustrated

Filtros—The New Porous Mineral Medium. General Filtration Co., Inc., Cutler Building, Rochester, N. Y. Pamphlet. Pp. 32, 6 x 9 in.; illustrated. This contains detailed information regarding the manufacture, composition, degree, grades, uses and applications of this material

Electric Hoists. Sprague Electric Works, 527-531 W. 34th St., New York. Bulletin No. 48,024. Pp. 8 x 10½ in.; illustrated

Electric Hoists. Lidgerwood Mfg. Co., 96 Liberty St., New York. Bulletin No. 20; Pp. 32, 7 x 10 in.; illustrated

Erie Revolving Shovels. Ball Engine Co., Erie, Penn. Bulletin S-18. Pp. 16, 8½ x 11 in.; illustrated.

The Chesapeake Iron Works, Baltimore, Md., announces that they are enabled to manufacture entirely in anthracy electric hoisting engines of 5 motor direct-current type of from 5 to 75 horse capacity, and that they are in a position to offer very satisfactory deliveries.

Wire Rope. Macomber & Whyte Rope Co., Kenosha, Wis.; catalog M. Pp. [illegible] 4½ x 6½ in.; illustrated

Olsen Double Drum Batch Mixer. Olsen Concrete Mixer Co., Racine, Wis. Catalog. Pp. [illegible] 4½ x 6½ in.; illustrated

Mechanical Stoker, Type E. Combustion Engineering Co., 11 Broadway, New York. Bulletin B-2, Second Edition. Pp. 16, 8½ x 11 in.; illustrated

"The Story of the Chimney." The M. W. Kellogg Co., 90 West St., New York. Pamphlet. Pp. 14, 7 x 11 in.; illustrated. This is an interesting story of the origin and development of the chimney.

"The Building of a Modern Chimney." The M. W. Kellogg Co., 90 West St., New York. Pamphlet. Pp. 12, 7 x 11 in.; illustrated.

Public Work Wanted

Thousands of reliable contractors and manufacturers constantly seek opportunities to bid on public work. They compete for it. That keeps public expenditures down. It makes the taxpayers' money go farther. It puts public buying on an efficient basis. It makes local bidders figure more closely.

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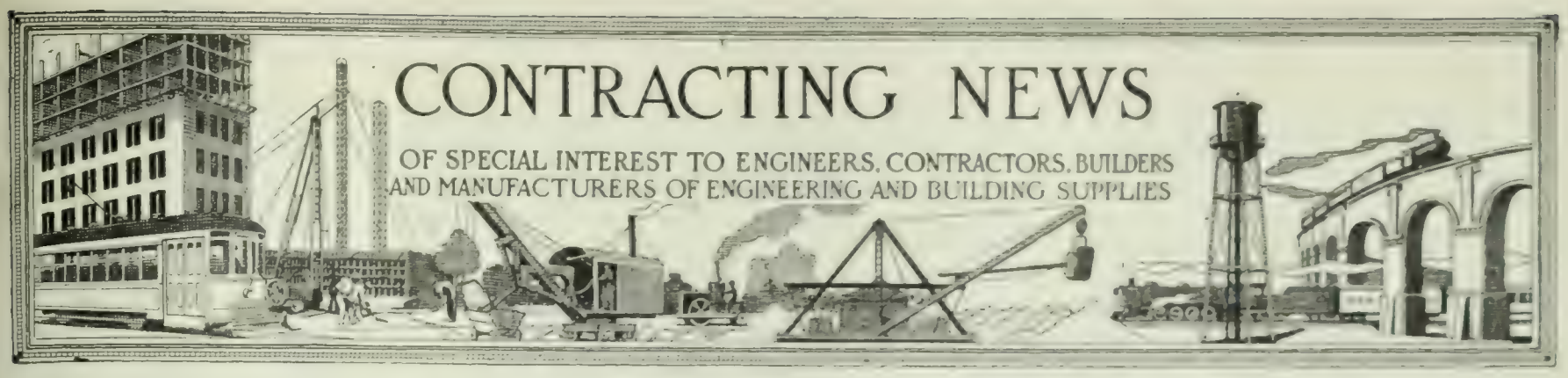
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Proposals

For Proposals Advertised See Pages 50 to 57 Inclusive

WATER-WORKS

Bids Close		See Eng. News-Record
July 30.	Hamilton, Ont.	July 26
Aug. 16.	Waterloo, Ia.	July 26
Aug. 2.	Akron, O.	June 26
Aug. 7.	New York, N. Y. Adv. July 26.	July 26
Sept. 11.	New York, N. Y.	July 12

SEWERS

July 30.	Mukwonago, Wis.	July 19
July 30.	Huntington, W. Va.	July 26
July 30.	West Park, O.	July 6
July 30.	Commerce, Okla.	July 26
July 31.	Salt Lake City, Utah	July 26
July 31.	Linndale, O.	July 5
July 31.	Glenwood, Minn.	July 12
Aug. 1.	Atwater, Minn.	July 12
Aug. 1.	Hazeltown, Md.	July 12
Aug. 1.	Chicago, Ill.	July 19
Aug. 1.	White Plains, N. Y. Adv. July 26.	July 26
Aug. 2.	Buffalo, N. Y.	July 26
Aug. 6.	Cleveland Heights, O.	July 19
Aug. 7.	Caledonia, Minn.	July 26
Aug. 8.	Dardanelle, Ark.	July 26
Aug. 14.	Lebanon, O.	July 26

STRUCTURAL STEEL WORK

July 30.	New York, N. Y.	July 12
July 31.	Norwalk, O.	July 19
July 31.	Seattle, Wash.	July 19
Aug. 1.	Monument, Ore.	July 26
Aug. 2.	Elgin, Ill.	July 26
Aug. 2.	Miami, Fla. Adv. June 28 and July 5.	June 28
Aug. 2.	Little Falls, Minn.	July 19
Aug. 3.	Albany, N. Y. Adv. July 19.	July 19
Aug. 6.	Camden, N. J. Adv. July 26.	July 26
Aug. 6.	Spencer, Ind.	July 19
Aug. 6.	Rio Vista, Cal.	July 26
Aug. 9.	Vancouver, Wash.	July 26
Aug. 9.	Portland, Ore.	July 26
Aug. 14.	Brazil, Ind.	July 12
Aug. 14.	Fairmont, W. Va.	July 26
Aug. 16.	Hamlin, W. Va.	July 12
Aug. 21.	Albany, N. Y. Adv. July 26.	July 26

REINFORCED CONCRETE

July 30.	Watsontown, Pa.	July 5
July 31.	Dayton, O. Adv. July 26.	July 26
Aug. 2.	Maquoketa, Ia.	July 26
Aug. 3.	Athens, Tenn.	July 19
Aug. 6.	Greenville, Miss.	July 12
Aug. 6.	Columbus, O.	July 26
Aug. 6.	Santa Barbara, Cal.	July 19
Aug. 6.	Camden, N. J.	July 19
Aug. 7.	Columbus, Mo.	June 26
Aug. 9.	South Bend, Wash.	June 26
Aug. 13.	Spencer, W. Va.	July 19
Aug. 22.	Beatrice, Neb.	July 19

STREETS AND ROADS

July 28.	Somerset, Pa.	July 19
July 30.	Albany, N. Y. Adv. July 19.	July 19
July 30.	Jefferson, O.	July 12
July 30.	Seattle, Wash.	July 19
July 30.	South River, N. J.	July 26
July 30.	Barre, Vt. Adv. July 26.	July 26
July 30.	Kenilworth, N. J.	July 26
July 21.	Toledo, O.	July 19
July 31.	Richmond, Mo.	July 26
July 31.	Indiana	July 26
Aug. 1.	New York, N. Y. Adv. July 26.	July 26
Aug. 2.	Buffalo, N. Y.	July 26
Aug. 3.	Uniontown, Pa.	July 19
Aug. 3.	Greenville, Miss.	July 19
Aug. 3.	Indianapolis, Ind.	July 26
Aug. 3.	Fond du Lac, Wis.	July 26
Aug. 3.	Cincinnati, O.	July 26
Aug. 6.	Clifton, Ariz.	July 12
Aug. 6.	Kittanning, Pa.	July 26
Aug. 6.	Tunica, Miss.	July 26
Aug. 6.	Cincinnati, O.	July 26
Aug. 6.	California	July 26
Aug. 6.	Poplar Bluffs, Mo.	July 26
Aug. 6.	Indiana	July 26
Aug. 7.	Indiana	July 26
Aug. 7.	Wallace, Idaho	July 26
Aug. 7.	Indiana	July 12
Aug. 7.	Houston, Tex.	July 19
Aug. 7.	Huntsville, Tex.	July 19
Aug. 7.	Pennsylvania	July 19
Aug. 7.	Camden, N. J.	July 26
Aug. 7.	Paterson, N. J.	July 26
Aug. 7.	Billings, Mont.	July 26
Aug. 8.	Santa Ana, Cal.	July 19
Aug. 8.	Indianapolis, Ind.	July 26
Aug. 8.	Indiana	July 26
Aug. 9.	South Bend, Wash.	July 26
Aug. 10.	Indiana	July 26
Aug. 10.	Uniontown, Pa.	July 26
Aug. 11.	Indiana	July 26
Aug. 13.	Lewiston, Idaho	May 24
Aug. 13.	Ashland, Ala.	July 26
Aug. 13.	Indiana	July 26
Aug. 13.	Centerburg, O.	July 26
Aug. 14.	New Bedford, N. J.	July 19
Aug. 14.	Pennsylvania	July 26
Aug. 16.	Hamlin, W. Va.	July 12
Aug. 20.	Indiana	July 26

INDUSTRIAL WORKS

Aug. 1.	St. Petersburg, Fla.	July 5
Aug. 1.	Bennington, Vt.	July 26
Aug. 6.	Mottville, Mich. Adv. July 26.	July 26

EXCAVATION AND DREDGING

July 30.	Walker, Minn.	July 12
July 30.	Winamac, Ind.	July 19
July 31.	Susanville, Cal.	July 12
July 31.	Central Islip, N. Y. Adv. July 19.	July 19
Aug. 1.	Sac City, Ia.	July 12
Aug. 3.	Lebanon, O.	July 19
Aug. 3.	Rockwell City, Ia.	July 26
Aug. 4.	Cadwell, Ill.	July 26
Aug. 4.	Marshall, Minn.	July 26
Aug. 5.	New Ulm, Minn.	July 26
Aug. 6.	Paxton, Ill.	July 26
Aug. 7.	Ft. Madison, Ia.	July 26
Aug. 7.	Jersey City, N. J.	July 26
Aug. 9.	Centre City, Minn.	July 26
Aug. 10.	Lewiston, Ill.	July 26
Aug. 20.	Des Moines, Ia.	July 26

BUILDINGS

July 30.	Ft. Wayne, Ind.	June 28
July 30.	Washington, O.	July 26
July 31.	Ft. Wayne, Ind.	July 5
July 31.	Healdton, Okla.	July 26
Aug. 1.	Guthrie, Okla.	July 5
Aug. 1.	Ft. Wayne, Ind.	July 12
Aug. 1.	Cushing, Okla.	July 19
Aug. 1.	Warsaw, Minn.	July 19
Aug. 1.	Trenton, Mo.	July 26
Aug. 3.	Cincinnati, O.	July 19
Aug. 3.	Lebanon, O.	July 26
Aug. 4.	St. Louis, Mo.	July 26
Aug. 4.	Glendora, Cal.	July 19
Aug. 4.	Dilltown, Pa.	July 26
Aug. 6.	Cincinnati, Ohio	July 26
Aug. 6.	Santa Barbara, Cal.	July 19
Aug. 7.	New York, N. Y. Adv. July 19.	July 26
Aug. 7.	Youngstown, O.	July 26
Aug. 8.	Coral Gables, Fla.	June 26
Aug. 9.	Cincinnati, O.	June 26
Aug. 10.	Fall River, Mass.	July 26
Aug. 11.	Bedford, O.	June 26
Aug. 11.	Mason City, Ia.	June 26
Aug. 11.	Columbus, Ohio	June 26
Aug. 20.	Troy, N. Y.	July 12
Aug. 22.	Greensboro, N. C.	July 26
Aug. 24.	New Brunswick, N. J.	July 26
Sept. 10.	El Paso, Tex.	July 26

FEDERAL GOVERNMENT WORK

July 29.	New York, N. Y.	July 12
July 30.	Keyport, Wash.	July 12
July 30.	San Antonio, Tex.	July 12
July 30.	Newport, R. I.	July 12
July 30.	Melville, R. I.	July 26
July 31.	Chardon, Neb.	July 5
Aug. 2.	San Francisco, Cal.	July 26
Aug. 2.	Buffalo, N. Y. Adv. July 26.	July 26
Aug. 3.	Winchester, Mass.	July 5
Aug. 6.	Globe, Ariz.	July 5
Aug. 6.	Charleston, S. C.	July 26
Aug. 11.	St. Louis, Mo.	July 26
Aug. 14.	West Point, Ga.	July 12
Aug. 17.	Washington, D. C.	July 12
Aug. 21.	Grand Haven, Mich. Adv. July 26.	July 26
Aug. 30.	Franklin, Pa. Adv. July 26.	July 26
Sept. 5.	Torrington, Wyo. Adv. July 26.	July 26

MISCELLANEOUS

Aug. 3	Embankment—Greenville, Miss.	July 26
Aug. 3	Incinerator—Kansas City, Mo.	July 26
Aug. 6.	Air Compressors—Galesburg, Ill. Adv. July 26.	July 26
Aug. 21.	Piers—Albany, N. Y. Adv. July 26.	July 26
Aug. 22.	Tunnels—San Francisco, Cal. Adv. July 19.	July 19

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official

WATER-WORKS

Proposed Work

N. J., Cape May—Bd. Comrs. to sell $19,000 bonds extending and improving water mains and water plant. W. Porter, city clk.

N. J., New Brunswick—City to sell $117,[illegible] bonds July 26 to purchase additional land to construct and equip new water supply system. E. F. Farrington, mayor.

N. J., Perth Amboy—Council authorizes $[illegible] bond issue for extension and improvement to water-works system. Also for installing new machinery. J. Hansen Jr., city clk. V. H. Crowell, engr.

N. J., Roosevelt—See "Sewers."

Fla., Leesburg—City contemplates issuing $[illegible] bonds as follows: Construction water works, $[illegible]; street paving, $[illegible]; sewers, $40,000; street paving, $[illegible].

O., Ashland—City to sell $[illegible] bonds to construct water system from Mohl Well to waterworks. D. H. Crum, city engr.

O., Clayton—Village council has authorized sale of $[illegible] bonds for sewage disposal works. C. [illegible], Dayton, Ohio, consulting engr.

O., Dayton—(Official)—City to sell $[illegible] bonds Aug. 3, to extend water-mains. H. Collins, engr.

O., Marietta—City had plans prepared by [illegible] for water-works extension. Address The Mayor.

Miss., Red Lake Falls—City to sell $18,- [illegible] gal. per day.

Kan., Liberal—City had plans prepared [illegible] Address The Mayor.

Neb., Alexander—City voted $16,000 bonds to construct water-works.

S. D., Ramsted—City voted $14,000 bonds to improve water-works system; and $15,000 bonds for electric light system.

Mo., Hamilton—City plans to install [illegible] New England Bldg., Kansas City, engrs.

Ark., Batesville—City Council authorized [illegible] and lighting systems. W. H. [illegible]

Ark., Texarkana—City to vote, Aug. 1, on $140,000 bonds for water-works extension. Address The Mayor.

Tex., Abilene—City election, Aug. 15, to vote on $240,000 bonds to be used in constructing Elm Creek water project. W. A. [illegible], city engr.

Tex., Mineral Wells — (Official) — City election, July 31st, to vote on bond issue [illegible] water supply system, including [illegible] pipe line. W. W. McClendon, city engr.

Okla., Ada—City had plans prepared by Benham Eng. Co., 1300 Colcord Bldg., [illegible] for water-works improvement; including 36-in. rein.-con. flume, new intake, [illegible] of mains, and 500,000-gal. tank [illegible]; also building sewage disposal [illegible].

Okla., Enid—City voted $50,000 bonds for water-works extension. F. W. Brooks, [illegible].

Okla., New Wilson—City voted $25,000 bonds for water-works improvements. Benham Engineering Co., Concord Bldg., Oklahoma, engrs.

Okla., Poteau—City plans water-works [illegible]. Address The Mayor. Benham Eng. Co., 1300 Colcord Bldg., [illegible], engrs.

Okla., Tulsa—[illegible]—City voted $675,- [illegible] bonds to extend and improve water [illegible]. Noted June 11.

Okla., Wanka—[illegible]—City sold $16,- [illegible] bonds to improve water supply. H. [illegible], city [illegible]. Noted July 17.

Ariz., Globe—City having plans prepared by Benham Eng. Co., engrs., 1300 Colcord Bldg., Oklahoma, for constructing water-works and sewerage [illegible]. Address The Mayor. [illegible] J. F. Mayo, city [illegible].

Wash., Pullman—[illegible] "Streets and Roads."

Wash., Seattle—Council will soon [illegible] bonds to improve water-works. Work [illegible] impounding reservoir at Swan [illegible] Lake, [illegible] gal. daily from [illegible] Lake, [illegible] south end of [illegible] Lake, [illegible] capacity of [illegible] gal. daily from [illegible] Lake, [illegible] north end of [illegible] Lake, [illegible] capacity of

Sewers (Continued)

★**Wis., Neenah**—(Official)—City let contract installing 5300 lin.ft. sanitary sewers to Kispert & Hendricks, Kaukauna, $10,-558. Noted June 28.

★**Wis., Superior**—City let contract constructing main sewer in Wisconsin Ave. and lateral sewers in adjoining alleys to Riches & Son, $10,432. Noted Apr 26

★**Ia., Spirit Lake**—(Official)—City let contract sewerage system and sewage disposal plant, involving 10½ mi. sewers, Imhoff tank, dosing chamber, sludge bed, and filter beds to Dearborn Constr. Co., Waterloo Savings Bldg., Waterloo.

★**Mo., Mexico**—(Official)—City let contract sewage disposal plant and outfall sewers to O'Neil Constr. Co., Leavenworth, $13,425. Noted Apr. 19.

★**Tex., Graham**—(Official)—City let contract installing sewerage system and sanitary disposal plant to Winslett Eldridge Co., 1001 Main St., Dallas, $23,500. Noted June 28.

Okla., Ada—City received low bids installing sewers, from Tolbert Constr. Co., Muskogee, $24,100; James Constr. Co., Guthrie, $24,125; T. McCormick, Oklahoma, $24,265. Noted June 21.

Wash., Seattle—City received low bid for building sewers in West and North 45th Sts., from Florito Bros., 1630 25th Ave., S., $17,048.

★**Ore., Portland**—City received low bid installing vitr. pipe for 50th St., S. E., and 31st Ave., S. E., sewerage systems, from J. F. Shea, 6 North 2nd St., $23,531; cement pipe from J. Keating, Lumbermens Trust Co., 5th Ave. and Stark St., $25,810. Noted June 21.

★**Cal., Fresno**—City let contract sewerage system consisting of 6-, 8-, 10- and 12-in. vitr. pipe, 48 manholes, etc., in Arlington Heights, to Thompson Bros., Fresno, $30,-900.

★**B. C., Trail**—City let contract waterworks to Bianco & Maglio, $26,387. Noted June 7.

STRUCTURAL STEEL WORK

Proposed Work

Mass., Boston—Metropolitan Park Comn. rejected bids building bridge over Neponsit River between Boston and Quincy. Temporary bridge will be constructed. Noted July 12.

N. J., Belmar—Bd. Freeholders, Freehold, plan to build bridge over Shark River here. G. D. Cooper, Red Bank, co. engr.

N. J., Newark—Lehigh Valley R.R. submitted plan to city for building steel bridge over tracks on Ave. R. About $185,000 of which railroad will pay $100,000 and city balance. M. R. Sherrard, city engr. E. B. Ashby, New York City, ch. engr. R.R

N. J., Weston—Philadelphia & Reading Ry. plans to improve bridges at Weston and Belle Meade. S. T. Wagner, Phila., ch. engr.

Pa., Scranton—Council voted $90,000 bonds to build bridge over Roaring Brook, between Harrison and Crown Aves. W. A. Schunk, city engr.

La., White Sulphur Springs—County plans to build steel bridge over Little River, also concrete bridges over important streams. About $100,000. Address Co. Clk., Jean.

O., Lima—See "Streets and Roads."

Okla., Holdenville—County voted $[illegible] bonds to build bridges, Wetumka Twp.

Okla., Lehigh—See "Streets and Roads."

Okla., Tulsa—City voted $40,000 bonds to build north approach to Arkansas River bridge and $30,000 to build and repair viaducts and subways. F. Newkirk, aud. Noted June 21.

Ore., Portland—Co. Comrs. plan to build bridges over Beaver Creek. About $17,000

Cal., Los Angeles—Bd. Pub. Wks. lets contract bridge over Los Angeles River on Brand Blvd., creosoted piles, asphalt paved plank floor. About $[illegible]

Cal., Santa Barbara—Bd. Supervs. plan to build Honda and Refugio Bridges on Santa Barbara Gaviota Highway. About $80,000.

BIDS DESIRED

N. Y., Albany—(Official)—Until [illegible] by W. W. Wotherspoon, [illegible] building substructure, superstructure and approaches of bascule bridge over Tonawanda Creek, Tonawanda and North Tonawanda, N. Y., also highway bridge over Lock 27, Clyde River, Lyons, N. Y.; advertised in this issue.

W. Va., Fairmont—Until Aug. 14, by County, building Paw Paw Creek and Benefield Fork bridges. A. G. Martin, clk.

Wash., Vancouver—Until Aug. 9, by Co. Comrs., building 90-ft. truss bridge near Dole and 1 72-ft. bridge over Lewis River near Yacolt.

Ore., Monument—Until Aug. 1, by Co. Comrs., Canyon City, building 180-ft. Howe Truss span over north fork of St. John Day River, concrete piers, 250-ft. timber approaches.

Ore., Portland—Until Aug. 9 by M. R. Haack, co. aud., building 72-ft. truss bridge over Lewis River.

Cal., Rio Vista—Until Aug. 6 by Bd. Supers. Sacramento and Solano Cos., at Sacramento, for bascule bridge over Sacramento River here. About $120,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Md., Baltimore**—Baltimore & Ohio R.R. let contract 1210-ft. bridge over Colgate Creek and Union Ry. & Electric Co. tracks to H. S. Kerbaugh, 50 Church St., New York City.

★**W. Va., Logan**—See "Streets and Roads."

★**N. C., Newton**—Catawba and Iredell Cos. let contract Island Ford, Terrell and Buffalo Shoals bridges over Catawba River to Virginia Bridge & Steel Co., Roanoke, Va

★**O., Warren**—(Official)—Bd. Co. Comrs. let contract Huston Bridge on Rd. No. 101, Sect. "A," Newton Twp. to G. B. Shade & Son, Newton Falls.

★**Mont., Chinook**—Co. Comrs. let contract 17 bridges to Midland Bridge Co., 504 Midland Bldg., Kansas City, Mo.

★**Ark., Wynne**—(Official)—Rd. Improv. Dist. No. 1 let contract steel drawbridge over St. Francis River to Larimer & Burget Bridge Co., Memphis, $33,560. Noted May 31

★**Tex., Lagrange**—(Official)—Co. Comrs. let contract for east approach to Colorado River Bridge to Wessels & Letzerich, La Grange, $20,650. Noted June 28.

★**Washington**—(Official)—State Highway Comn., Olympia, let contract Kalma River bridge to R. E. Mieth, Yeon Bldg., Portland, $25,390. Noted June 28.

★**Wash., Wenatchee**—Co. Comrs. let contract rebuilding steel bridge over Wenatchee River to C. G. Huber, Central Bldg., Seattle, $16,000.

★**Oregon**—(Official)—State Highway Dept., Salem, let contract building intercounty bridge between Marion and Polk Cos. to Coast Bridge Co., Ry. Ex. Bldg., and R. Wakefield, Worcester Bldg., both of Portland, $230,000. Noted July 19

★**Que., London**—See "Railways."

REINFORCED CONCRETE

Proposed Work

Pa., Phila—H. Belfield Co., 435 North Broad St. plans 5-story, 100 x 280 ft., reinforced concrete factory at 19th and Cambria Sts., also 1-story, 100 x 280 ft., building and 1-story, 100 x 280 ft. foundry. W. Steele & Sons Co., 39 South 15th St., archts.

Pa., Phila.—D. Berg and P. Publicker plan 7-story, 80 x 140-ft. concrete and steel theatre and office building on Broad St. H. J. Krapp, 114 East 16th St., New York City, archt.

O., Troy—Co. Comrs. to sell $18,000 bonds Aug. 6 to build reinforced concrete bridge over Stillwater River and $14,400 and $6400 bonds to build Hoke and Range Line Rds. Noted Aug. 12.

Ind., Terre Haute—See "Streets and Roads."

Mich., Detroit—R. G. Olds and Ransom Motor Car Co., Lansing, had plans prepared for 4-story reinforced mercantile building, about $750,000, Baxter, O'Dell & Hamilton, Hammond Bldg., archts.

Wis., Milwaukee—Kellogg & Post, Chamber of Commerce Bldg., retained J. M. Gossart & Co., elevator and mill engrs., 140 South Dearborn St., Chicago, to prepare plans and advertise construction of reinforced grain elevator, 500,000-bushel capacity, on Chicago and North Western Railway Line. About $250,000. W. G. Kellogg, general manager.

Okla., Ada—See "Waterworks."

Cal., Santa Barbara—City had plans prepared constructing 1,000,000-gal., concrete lined reservoir at Monecito. A. B. Cook, city engr.

BIDS DESIRED

N. J., Camden—(Official)—Until Aug. [illegible] by County building 219 ft. rein.-con. bridge over Newton Creek. J. J. Alberton, co. engr.; advertised in this issue.

O., Dayton—(Official)—Until July 31, by J. E. Barlow, dir. pub. ser., building 10,-000,000-gal. rein.-con. reservoir; advertised in this issue. Noted May 10.

Ill., Elgin—(Official)—Until Aug. 2, by W. F. Sylla, city clk., building concrete slab bridge over Fox River, Kimball St., former bids rejejcted; advertised in this issue. Noted July 5

Ia., Maquoketa—(Official)—Until Aug. 2, by Co. Aud., building 3 trusses, 4 I-beams, 1 through girder, 3 sets of abutments and 14 box culverts, all to be rein-con. C. M. Fisher, co. engr.

Mo., Columbia—(Official)—Until Aug. 7, by J. S. Bicknell, city clk., for constructing rein.-con.-lined reservoir, including excav. and embankment, about $1,000,000 gal. capacity

Tex., Houston—Until July 30, by E. B. Bonney, city secy., building rein.-con. wharf foot of Main St. About $30,000. E. E. Sands, city engr.

Wash., South Bend—Until Aug. 9, by Co. Comrs., building 2 60-ft. rein.-con. bridges over Willapa River, Lebam Twp., 1 40-ft. span over Trap Creek, Nalpee Twp., 1 30-ft. span over Green Creek between Menlo and Holcomb Twps. C. S. Henry, co. engr.

Cal., Santa Barbara—Until Aug. 6, by C. A. Hunt, co. clk., building 1-story, 235-ft. county hospital with 2 wings 51 ft. long, rein.-con. About $50,000. R. F. Sauter, archt. Noted July 19, under "Buildings."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—United Fruit Co., Bd. Trade Bldg., let contract 9-story, 80 x 197-ft. rein.-con. engine house and warehouse to Turner Constr. Co., 45 Milk St.

★**Mass., Greenfield**—Town let contract rein.-con. bridge over Green River to W. M. Bailey Co., 141 Milk St., Boston, $14,000.

★**N. Y., Long Island City**—Oakes Mfg. Co., Blackwell St., let contract 2-story, 60 x 80-ft. and 3-story, 82 x 100-ft. rein.-con. factories to Turner Constr. Co., 244 Madison Ave., New York City.

★**N. J., Hopewell**—Philadelphia & Reading R.R. let contract rein.-con. bridge over tracks on Greenwood Ave. to American Bridge Co., Widener Bldg., Phila. About $40,000. Noted June 7

★**Pa., Phila.**—Pennsylvania R.R. let contract 2-story, 61 x 105-ft. rein.-con. pumping plant at West Phila. Stock Yards to W. C. Dell Co., 201 North Broad St. About $120,000.

★**Pa., Phila.**—S. S. White Dental Mfg. Co., 12th and Chestnut Sts., let contract 4-story, 60 x 75-ft. rein.-con. factory, at 211 South Quince St., to Turner Concrete Steel Co., 171 Sansom St.

W. Va., Fairmont—Bd. Affairs received only bid building [illegible] bridge over Coal Run from J. F. Carey Co., 1st Union Arcade, Pittsburgh, [illegible] $18,150 in event of plans "A" being adopted, and plus $15,600 in event of plans "B" being adopted. Noted June 21.

★**Ind., Marion**—(Official)—Co. Comrs. let contract rein.-con. bridge over Mississinewa River to S. H. Weaver & Co., Marion, $38,-424. Noted July 11.

★**Mich., Detroit**—Theatre and Store—De Luxe Theatre Co. let contract [illegible] rein.-con. and steel, Kercheval Ave., to Blake Concrete Co., 243 Elliott St. About $100,000.

Ill., Danville—(Official)—Comrs. received bids [illegible] building rein.-con. arch bridge over I. & Chattanooga Park, from P. McNally, County Co., Monticello, [illegible] M. & P. County Co., Holland Bld., [illegible] McCalman Const. Co., Champaign, $[illegible] Noted July 13.

★**Ia., Mason City**—City let contract [illegible] ft. rein.-con. bridge on South Pennsylvania Ave. to Hedale & Brown, Mason City, $[illegible]

★**Ariz., Clifton**—Town Council let contract rein.-con. bridge over San Francisco River to Midland Bridge Co., 504 Midland Bldg., Kansas City, Mo., $[illegible]. Noted June 7.

Reinforced Concrete (Continued)

★**Wash., Colfax**—City Comrs. let contract [illegible] span reinforced arch bridge over Union Flat Creek, near La Crosse, to [illegible] Magill, 1020 City Ave. N. E., Seattle, $11,-[illegible]. Noted July 12.

STREETS AND ROADS

Proposed Work

N. Y., Syracuse—Council authorized [illegible] bond issue for paving sidewalks and sewer construction. H. C. Allen, city engr.

N. J., Camden—Bd. Freeholders plan [illegible] road over Atco and eliminating "death trap" of overhead bridge at that point. About $2,000. J. J. Albertson, Magnolia, co. clk.

N. J., Deal Beach—Boro. plans paving and [illegible] concrete on Pearl St. and Pull-man and Brighton Aves. C. Conover, boro. clk.

N. J., Freehold—Bd. Freeholders soon [illegible] paving 1½ mi. Freehold-Smith-burg Rd., concrete.

N. J., Jersey City—City soon receives [illegible] for paving 5th Ave. between Grand and Erie Sts. C. Van Kuren, city engr.

N. J., Newark—City passed ordinance to pave [illegible] Ave., asphalt. M. R. Sherrard, city engr.

N. J., Newark—City plans to pave por-tion Wilsington St. bitulithic, 6-in. concrete foundation; South 18th St., 10-in. pavement. M. R. Sherrard, city engr.

N. J., New Brunswick—City prepared plans paving curbing, grading and resurfac-ing portion Howard Ave., Commerce, Bruns-wick and Comstock Sts. with brick as-phalt block or warrenite. A. Atkinson, city engr.

N. J., Passaic—Bd. Freeholders to sell [illegible] bonds for improving 13 roads, asphalt and bituminous macadam. O. W. Bailey, clk.

N. J., Somerville—Bd. Freeholders plans to repair Union Ave., and Kingston-Franklin Rd. About $11,000. J. Toughill, Jr., co. engr.

Pennsylvania—State Highway Comn., Harrisburg, plans to build 11-mi. brick road from [illegible] City to Jamestown. About [illegible]. H. W. Clelland, asst. engr.

Pa., Carlisle—City plans election to vote on $[illegible] bonds to pave streets, etc. J. T. Hancock, city engr.

Pa., Carnegie—Boro. Council plans pav-ing Liberty Ave. and Doolittle St. and curb-ing and paving Chestnut St. C. B. Highley, boro. engr.

Pa., Pittsburgh—Co. Comrs. receive bids about Jan. 1 for widening Noblestown Rd. to make 24-ft. brick highway from city line to intersection of Hillcrest Rd., con-struction of [illegible] for existing widen-ing of road to 18 ft., also widening Noble-town Rd. for distance of 11 mi.

W. Va., Carlisle—Town section in November to vote on $[illegible] bonds to pave streets.

W. Va., Wheeling—City voted $[illegible] bonds for improving and paving various streets. C. B. Cooke, city engr.

S. C., Mt. Holly—Town plans to issue $[illegible] bonds to build sidewalks, curbs and gutters, paved alleys, concrete or [illegible] crossings. W. F. Johnston, clk.

S. C., Charleston—City plans paving Hasel-wood Ave. and Mill and Montague Sts., also extending present lines on [illegible]. About $[illegible]. J. H. Gregg, city engr.

Ga., Waycross—City Council passed ordi-nance for paving portions Memorial Drive, Pierce and other streets. J. L. Varnadoe, city engr.

Fla., Tampa—City section soon to vote on $[illegible] bonds, $[illegible] to be used for street paving, sewers, etc. Noted.

Ala., Dothan—City has plans prepared by Heller & Brodie, Dothan, for construct-ing [illegible] mi. road from here to Headland, also several concrete bridges.

Tenn., Crossville—City plans paving several streets and let out contract to E. Alexander, city engr.

Ky., Carrollton—City plans to build 5 concrete streets. Main, 3rd and Court, etc.

Ky., Owensboro—County reported bids [illegible] road building program, on the high-[illegible]. J. Watt, clk. Noted June 14.

O., Canton—County plans paving 7½ mi. Louisville-Stevens Rd. with Hale and I. A. [illegible] co. aid.

O., Cincinnati—City soon lets contract paving Beadnot, Columbus, Davey, Glen Parker, Glen Armand, Kling, Laclede, Monteith, Minton, Central and Freeman Aves. and Concordia, Davoran, Haven, Tun-nel and Terry Sts. F. Krug, city engr.

O., Cincinnati—City to issue $18,000 bonds for widening portion of Madison Rd. F. Krug, city engr. Noted June 7.

O., Cincinnati—Council passed ordinance to improve portions of Earnshaw and Hazlewood Aves. and Dayton St. F. Krug, city engr.

O., Elyria—City Council plans new high-way through Foster Ave. from Elyria to South Lorain. About $35,000. C. M. Theo-bald, city engr.

O., Lima—City plans $45,000 bond issue for improving Elizabeth St. and building bridge over Ottawa River. C. Bryson, city engr.

O., Painesville—City to sell $2,000,000 bonds improving portions North St. Clair St. by grading, curbing and paving, brick on concrete foundation, also installing sewer and water mains. J. Crabbs, city engr.

O., Piqua—City passed ordinance to issue $13,450 bonds to pave certain streets. A. Schroeder, city engr.

O., Sandusky—City Comrs. plan $27,200 bond issue for paving Fulton, Adams and Division Sts. A. F. Johnston, city engr.

O., Steubenville—City plans paving por-tion Oregon Ave. J. M. Leech, city engr.

O., Toledo—City Council plans paving portion Water St., granite block. H. Mc-Kechnie, city engr.

O., Toledo—City election Sept. 2nd to vote on $508,000 bond issue for extending Sum-mit St. from Perry St. to B'way. and diverting course of Swan Creek necessary to extend street. H. McKechnie, city engr.

O., Troy—See "Reinforced Concrete."

O., Youngstown—City to sell $32,000 bonds to pave portions Glenwood, and Mahoning Aves., Worthington and Thurman Sts., grade portion Florencedale Ave. and build sidewalks on portions of Alpine and Carlyle Sts., Donald, Helena, Indianola, Manhattan and Milton Aves.; also install sewers in Glenwood and Warren Aves. and Compbell St. F. M. Lillie, city engr.

Ind., Richmond—(Official)—County sold $48,000 bonds to improve Thomas G. Dun-bar Highway, Center Twp. L. S. Bowman, aud. Noted June 28.

Ind., South Bend—City soon lets contract for paving portion Howard St. About $27,-150. F. J. Anderson, engr.

Ind., Terre Haute—County soon lets con-tract paving portion 25th St., brick; also building Robert E. Gibbons' rein.-con. bridge over Lost Creek, Lafayette Rd. About $70,518 and $9700 respectively.

Ind., Terre Haute—County plans paving Ed. Sparks Rd., about $44,000.

Mich., Escanaba—City authorized repav-ing portions of Stephenson Ave., bitulithic, about $27,149; also resurfacing road be-tween end of Harnett Ave. and Wells. W. J. Hodson, engr.

Mich., Pontiac—City plans sidewalks on portions Willard Ave., Whittemore, Osmun and Paddock Sts. W. J. Fischer, city engr.

Mich., River Rouge—City plans paving portions of Henry, Jefferson, Batavia, Burke, Miswela and other streets.

Ill., East Dubuque—City plans to pave 1st, Wall and other streets, tarvia, cement and bitulithic [illegible]. Tschirgi & Son, 712 American Trust Bldg., Cedar Rapids, Ia., engrs.

Ill., Kankakee—City soon lets contract paving portions East Court St., brick. About $[illegible]. E. E. Gregg, city engr.

Ill., Rockford—(Official)—Co. Bd. Supervs. soon lets contract paving 5-mi. on 11th St., concrete 18-ft. wide, 6-ft. macadam should-ders. About $[illegible]. A. R. Carter, co. engr. Noted.

Ill., Springfield—Local improv. passed ordinance to pave sections of Vine St. and Woodland Ave., bitulithic concrete. About $[illegible]. W. D. Feeley, city engr.

Minn., Olivia—County plans to gravel [illegible] Trail between Lake and Bird Island. C. Johnson, co. aud.

Kan., Hutchinson—City Comm. approved plans improving Ave. A, E. North Madison St. streets in three parts, North Washing-ton, West Sherman, 12th St. W. and 6th Ave. E. H. L. McLane, engr.

Neb., Omaha—City plans repaving 395 blocks. Address Comr. Parks., City Hall.

Neb., Wayne—County election, July 31, to vote on $30,000 bonds to pave streets and drain wet land.

N. D., Fargo—County having plans pre-pared by C. J. Estlund, asst. state engr., Bismark, building 17 mi. Meriden Rd.

Mont., Billings—County to sell $175,000 bonds building permanent highways. F. E. Williams, co. clk.

Mo., Caruthersville—City plans paving, grading and curbing portions West 6th St., tarvia filled macadam with concrete curbs and gutters. J. M. Ginnis, clk.

Mo., Kansas City—County rejected bids resurfacing and macadamizing Kansas City-Independence Rd. Noted July 19.

Arkansas—State Highway Comn., Little Rock, prepared plans estimating cost build-ing 15-mi. road from Ft. Smith to Green-wood, 9 mi. from Harrisburg to Truman, Rd. Improv. Dist. No. 4, at $75,000 and $68,000 respectively; 23 mi. from Lake City to M. Missouri state line, Rd. Improv. Dist. No. 6, $148,000; 13 mi. from Pulaski co. line to Carlisle, $86,000.

Ark., Des Arc—County prepared plans 10-mi. road from Mesa to Carlisle, Rd. Improv. Dist. No. 5. About $59,000.

Ark., Forrest City—County plans to spend $400,000 building roads in Dists. Nos. 1 and 2.

Ark., Mena—City plans paving portions Porth Arthur Ave. and Neine St. M. Martin, clk.

Ark., Newport—County plans 52-mi. main line rock road and 8 mi. lateral road in Rd. Dist. No. 2; $25,000 bond issue voted for work.

Tex., Austin—Attorney General's Dept. approved $40,000 bond issue to pave and improve Plainview St. M. C. Welborn, city engr.

Tex., Dallas—County election, Aug. 31, to vote on $1,000,000 bonds to construct permanent hikhways.

Tex., Eastland—County election, Aug. 10, to vote on $130,000 bonds to build roads, Rd. Dist. No. 1. Noted Apr. 5.

Tex., Franklin—County voted $20,000 bond issue for improving and repairing roads and bridges.

Tex., Paducah—County election soon to vote on $400,000 bonds issue to build roads.

Tex., Pittsburgh—County election Aug. 6, to vote on $35,000 bonds to construct roads in Dist. No. 2. Noted May 31.

Tex., Plainview—State Atty. General's Dept., Austin, approves $40,000 bond issue to pave streets.

Tex., Port Lavaca—County election, Aug. 14, to vote on $75,000 bond issue to build roads in Rd. Dists. Nos. 1 and 2.

Tex., Stephenville—County plans election to vote on $100,000 bond issue for improv-ing roads.

Tex., Wolfe City—City election Aug. 11, to vote on $100,000 bonds to construct roads.

Okla., Lehigh—County election soon to vote on $650,000 bonds to build roads and bridges.

Ariz., Globe—County to spend $154,705 building roads; ElCapitan highway included in project will cost $75,000.

Wash., Bellingham—County plans to spend $45,000 to pave and improve Pacific Highway between Bellingham and Everett.

Wash., Port Angeles—Co. Comrs. rejected bids clearing, grading, grubbing, bridging and graveling Permanent Highway No. 7. New bids soon. A. U. Blackwood, co. engr. Noted June 21.

Wash., Pullman—County rejected bids paving 8000 sq.yd. and extending water system in College Park addition. New bids. About $15,000. Noted June 28.

Wash., Seattle—City plans to pave and grade Empire Way, cost, $262,425; concrete sidewalks Thorndyke Ave. et al, $40,000. A. H. Dimock, city engr.

Wash., Spokane—City rejected bids pav-ing and grading portion Mallon Ave. About $23,500. M. Mac Cartney, city engr. Noted July 19.

Oregon—State Bd. Control, Salem, plans to issue $400,000 bonds to match federal appropriation for highway work in state.

Cal., Corcoran—City receiving bids in August paving 15 blocks on Whitly Ave., macadam.

Cal., San Diego—City prepared plans paving portion National Ave. About $15,-720.

Streets and Roads (Continued)

Cal., Santa Barbara—Bd. Supervs. appropriated $50,000 bonds to build Cuyama Rd. Federal Government to bear part of cost of work.

Cal., Santa Barbara—La Mesa Permanent Road Assn., plans paving La Mesa Rd. from city limits to Arroyo Burro, thence Modoc Rd. to beach at mouth of the Arroyo. About $50,000. R. Wheeler, secy.

Que., Portinuf—Town soon lets contract paving 2-mi. macadam roads. A. Babin, engr.

Que., Shawinigan Falls—Town soon lets contract building highways. About $43,000 J. E. Meunier, secy.

Que., Three Rivers—City plans to pave streets, asphalt, and build highways. About $20,000 and $22,000 respectively. Z. Lambert, engr.

Ont., Steelton—City plans new concrete sidewalks. About $14,500. J. Robinson, city clk.

Sask., Regina—City plans laying pavements to cost about $47,000. A. W. Haddow, city engr.

B. C., South Vancouver—City received $10,000 from Provincial Government to improve Fraser Ave.

BIDS DESIRED

Vt., Barre—(Official)—Until July 30, by City, paving portion South Main St. F. O. Lee, city engr.; advertised in this issue.

N. Y., Buffalo—Until Aug. 2, by Bd. Pub. Wks., paving Columbia St., 40-ft. wide, Walnut St., 30-ft. wide, Burton, Allen and Hamburg Sts. G. A. Norton, city engr.

N. Y., New York—(Official)—Until Aug. 1, by Bronx Parkway Comn., paving portion Bronx River Pkway. J. Downer, engr. and secy.; advertised in this issue.

N. J., Camden—Until Aug. 7, by F. B. Lewallen, boro. clk., for building macadam streets with hot liquid asphalt surface and concrete gutters. J. C. Remington, Jr., 601 Market St., boro. engr.

N. J., Kenilworth — Until July 30, by Common Council for resurfacing boulevard 3880 sq.yd. macadam top and bituminous surface. J. W. Higgins, 52 Vanderbilt Ave., New York City, boro. engr.

N. J., Paterson—(Official)—Until Aug. 7, by Bd. Wks., paving Goodwin, Madison, Deremus, Temple, North 40th and Lyons Sts. and various avenues. H. J. Hardes, city engr. Noted July 12.

N. J., South River—Until July 30, by Bd. Freeholders for 10,327 sq.yd. pavement on Main and Ferry Sts. and Causeway. A. W. Bissett, clk.

Pennsylvania—(Official)—Until Aug. 14, by F. B. Black, state highway comr., Harrisburg, for road work as follows: Clarion Co., 14,126 ft. vitr. block, Clarion and Paint Boro.; 22,101 ft., Westmore, Boro.; Somerset Co., 6675 ft., Somerset Boro., Centre Co., 2454 ft., Bellefonte Boro., Venango Co., 7857 ft., Cornplanter Boro., Beaver Co., 23,546 ft. rein.-con., White and Big Beaver Boro.

Pa., Kittanning—Until Aug. 6, by Boro. Council, for grading, curbing and paving McKean Way Water Alley, Jefferson Alley and Walnut St. W. H. Mast, Keystone Bldg., boro. engr.

Pa., Uniontown—Until Aug. 10, by H. Kissinger, co. controller, furnishing and applying 6500 gal. asphalt on road from boro. line of Fayette City to bridge over Pittsburgh & Lake Erie tracks toward Wickhaven in Washington Twp.; also furnishing and applying 1800 gal. asphalt on road from Gillespie towards Brownsville in Washington Twp.

Ala., Ashland—Until Aug. 16, by Co. Comrs., grading and surfacing road between Lineville and here. W. G. Keller, state highway engr.

Miss., Tunica—Until Aug. 6, by Bd. Supervs., for building 41-mi. gravel road. W. Nicholas, pres. Y. W. Mashburn, Clarksdale, engr.

O., Cincinnati—Until Aug. 1, by Co. Comrs., improving portion Cooper Ave., Sycamore Twp., waterbound macadam.

O., Cincinnati—Until Aug. 6, by Bd. of Trustees of Cincinnati Southern Ry., Ingalls Bldg., for grading and paving [illegible] in connection with building railroad track, granite paving and curbing and concrete sidewalks.

O., Toledo—Until July 24, by City, for repaving portions of Oak and Dorr Sts. and Stickney Ave. H. Mackenzie, city engr. Noted June 7.

Indiana—By Co. Comrs. for building roads as follows: July 31: Indianapolis; gravel road Warren Twp. L. K. Fesler, aud. Aug. 6: Rushville; gravel road, Posey Twp. W. H. McMillan, aud. Nashville; gravel road, Hamblin Twp. O. Morrison, aud. Valparaiso; 2.07 and 2.02-mi. road, Center Twp. C. A. Blachly, aud. Franklin; gravel road, Blue River Twp. J. C. Gregg, aud. Evansville; 2 roads, Knight Twp. C. P. Beard, aud. South Bend; cement road, Penn Twp. A. F. Wolf, aud. Cannelton; macadam road, Troy Twp. M. C. Conway, aud. Aug. 7: Wabash; 2 roads, Chester Twp. F. P. Kircher, aud. Aug. 7 Bluffton; building stone streets, Uniondale and Petroleum Twps. C. T. Kain, aud. Columbus; 11,-712-ft. gravel road, Flatrock Twp. W. H. Scott, aud. Brazil; stone and gravel road on line between Posey and Perry Twps. W. O. Graesser, aud. Kokomo; stone road, Clay Twp. W. L. Benson, aud. Rensselaer; stone roads, Carpenter and Marion Twps. J. P. Hamilton, aud. Bloomfield; macadam road, Richland Twp. G. E. Kidd, aud. Aug. 8: Lafayette; gravel road, Laramie Twp. G. W. Baxter, aud. Rockville; gravel roads, Penn and Adams Twps. C. Davis, aud. Lafayette; 2.83-mi. and 2.39-mi. brick road, Fairfield, Twp. G. W. Baxter, aud. Aug. 10: Corydon; 17,142-ft. stone road, Franklin, Harrison and Jackson Twps. S. C. Mauck, aud. Aug. 11: Vernon; crushed stone road, Center Twp., bituminous binder roads, Vernon and Center Twps. G. J. Bernhart, aud. Aug. 13: South Bend; 2 gravel roads, Penn Twp. A. F. Wolf, aud. Aug. 20: Huntington; gravel road, county line. O. E. Eviston, aud.

Ind., Indianapolis—(Official)—Until Aug. 8, by Bd. Pub. Wks., improving portion roadway St. Clair St., wood block, asphalt, bitumbinous concrete or brick. B. J. T. Jeup, city engr.

Wis., Fond Du Lac—Until Aug. 3, by City Clk., paving and grading portion Oshkosh Rd., rein.-con. base of 3½- to 5-in. concrete and 1½-in. cement sand and granite wearing surface. J. S. McCullough, engr.

Minn., Center City—Drainage—Until Aug. 9, by A. F. Stromgren, co. aud., clearing 46 acres, grubbing 21.8 acres, grading 122,-621-cu.yd. side ditching, 10,717-cu.yd. off-take ditching, 34,020-cu.yd. gravel surfacing, 37,702-cu.yd. clay surfacing, etc.

Mont., Bilings—(Official)—Until Aug. 7, by J. M. Bresnahan, city clk., 18,000 sq.yd. asphaltic concrete, bitulithic, concrete or asphaltic macadam, concrete gutters, storm sewer, etc. About $54,000. E. M. Sneckenberger, city engr.

Mo., Poplar Bluff—Until Aug. 6, by E. C. Thomas, city engr., 10,394 sq.yd. pavement, 6- and 5-in. bituminous, 1811 cu.yd. grading, 5848-ft. curbing. About $20,000.

Mo., Richmond—Until July 21, by City, for 6000 yd. brick block paving and 2900 ft. curbing. W. H. Kirham, city engr.

Ida., Wallace—Until Aug. 7, by D. H. DeLong, city clk., paving certain streets and [illegible]. About $[illegible].

Wash., South Bend—Until Aug. 9 by Bd. Co. Comrs. for clearing, grubbing, grubbing, clearing and finishing graded earth roadway, placing [illegible] surface over Hall, Columbia-County Road, Highway from Chehalis to River Ferry. S. E. Henry, co. engr.

California—(Official)—Until Aug. 6 by State Highway Comr. 3½ Penn. Hwy., Sacramento, laying [illegible] from [illegible] Creek to Alameda [illegible] and [illegible] from Oxnard to [illegible] Creek, Ventura Co.; Santa Barbara Co. Portland cement concrete. A. B. Fletcher, highway engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. H., Claremont**—City let contract paving Main and Pleasant Sts. Riverside, about [illegible] sq.yd. pavement, [illegible] sq.yd. [illegible] ft. sewers to Hoyle Construction Co., $[illegible]. Noted June 14.

★**Massachusetts**—State Highway Comr. Burton let contract surfacing 7.5-mi. state highway in Lincoln Twp. to H. F. Hinson, Marion. About $30,000.

★**Massachusetts**—State Highway Comr. Burton let contract surfacing [illegible] sq.yd. in Washington Twp. to Mann Construction Co., Hyde and Bridge Sts., Methuen, Conn., $[illegible]. Noted July 5.

★**Mass., Boston**—City let contract asphalt pavement to Central Const. Co., 371 South Boston St., Roxbury, $[illegible].

Mass., Dorchester—City received low bids for granite block paving on Dorchester Ave., from J. Doherty, 133 Calumet St., Roxbury. About $40,335.

★**Mass., Dorchester**—City let contract artificial stone sidewalks on Adams, Belfort, King and Rosemont Sts. and Dorchester and Neponset Aves. to D. M. Bizzo & Co., 69 Marst. St. About $24,741.

★**Mass., Peabody**—City let contract building [illegible] macadam roadway to A. G. Tassello, 69 Gilman St., Dorchester. About $35,000.

★**R. I., Providence**—City let contract 13,-000 sq.yd. asphalt pavement Charlestone Ave., to Warren Bros., 141 Berkeley St., Boston, $[illegible].

N. Y., Brooklyn—L. H. Pounds, boro. pres., received low bids improving Prospect Plaza from Brooklyn Alcatraz Asphalt Co., 2306 Creston Ave., New York City, $[illegible]; Barnagh Asphalt Co., [illegible] Metropolitan Ave., $[illegible]. Cranford Co., 190 Montague St., $[illegible].

★**N. Y., Moravia**—Village let contract paving to Soper & Son, Seneca Falls. About $10,299.

★**N. Y., Olean**—(Official)—City let contract paving portions 9th St., brick, to Loomis & King, Central Trade Bldg., Altoona, Pa., $16,196. Noted June 28.

★**N. Y., Rochester**—City let contract paving Genesee Rd. to Whitmore, Hayden & Vedmar, 170 South Ave. About $[illegible]. Noted July 12.

★**N. Y., St. Johnsville**—(Official)—City let contract 12,000 sq.yd. bituminous pavement on concrete foundation, and about 2000 ft. 18- and 20-in. storm sewers on North Division and Center Sts., to C. E. Weed Co., Albany, $40,122. Noted June 28.

★**N. J., Belvidere**—Bd. Freeholders let contract resurfacing 5-mi. Highstown-Columbia Rd. to Salmon Bros., [illegible] St., Arlington, $37,529. Noted June 28.

★**N. J., Elizabeth**—County let contract repaving portion Terrill Rd., amounts involving 1348 tons bituminous concrete, [illegible] ft. French underdrain grading, [illegible] ft. gutters and sidewalks to C. H. Winans Co., 207 Broad St. $17,821. Noted July 12.

★**N. J., Montclair**—City let contract paving Belleville Ave. and Park St. Warrenville Standard Bitulithic Co., [illegible] Bldg., Newark, $71,705 and $[illegible], respectively.

★**N. J., Mt. Holly**—Bd. Freeholders let contract paving road from Pemberton to Eastampton, concrete, 1½ mi. to Public Constr. Co., 46 Paterson St., [illegible]. $[illegible]. Mt. Holly to Chambers Corner, asphalt, 2 mi. Eastern Paving Co., Penn Sq. Bldg., Phila., $[illegible]. Noted July 12.

N. J., New Brunswick—Bd. Freeholders received low bid for [illegible] Main, Penn, Commerce and Smith Sts., also Hale Street, [illegible]-00 Feeder, Throughout from Y. H. Hiltis, 107 Church St., $[illegible] for pave and $[illegible] respectively. Noted June 14.

★**N. J., Paterson**—(Official)—City let contract paving portion Ogden Ave., granite block, to A. Cramer, 38 Ward St., $11,000. Noted July 12.

★**N. J., Princeton**—Work on contract repaving [illegible] sq.yd. pavement on State Route, [illegible] Boundary St., Princeton, Co., Princeton. About $[illegible]. Noted July 12.

★**Pa., Lebanon**—City let contract paving 5th, 6th, 7th and 8th Sts. to Hodgson, Pugh & Dunn, Pottsville, $[illegible].

★**Pa., Sharon**—City let contract paving portion State St., [illegible] to [illegible] Sawyer & Sons, State Street Ave., $[illegible] per sq.yd.

★**Md., Cumberland**—City let contract paving [illegible] sq.yd. [illegible] ft. sewers, [illegible] ft. curbing and [illegible] ft. [illegible] to W. H. Hoffman, Bay Ridge Ave. & [illegible] Ave., Brooklyn, $[illegible]. Noted June 14.

Md., St. Michaels—City Council has let contract paving [illegible] to [illegible] Shaffer & Williams, Easton, $[illegible].

★**Va., Norfolk**—City let contract paving [illegible] to Lafayette River, [illegible] Co., Bank Bldg., Norfolk, $[illegible].

★**W. Va., Fairmont**—County let contract building [illegible] to Meredith Construction Co., Fairmont. Noted May 31.

★O., New Lexington—County let contract paving highway between Shawnee and New Straitsville to Houston & Henderson, Logan. About $15,650. Noted May 4.

★O., Portsmouth—City let contract paving 21st St., to S. Monroe & Sons, $13,357. Noted July 5.

O., Sandusky—City received low bids paving 9th St. from Central Constr. Co., Fremont, $36,027. Noted July 19.

★O., Springfield—(Official)—City let contract improving and paving portion Sherman St. to R. J. Kavanaugh, Springfield, $11,628. Noted July 12.

★O., Toledo—City let contract paving Austin and Pontiac Sts. to H. Streicher Co., 317 Terminal Bldg., $20,000 and $8400 respectively; Hawthorne St. to Asphalt Block Paving Co., $17,200. Noted July 12.

★O., Wapakoneta—City let contract building 13,530 sq.yd. asphaltic concrete and vitr. block pavement, including 6120 cu.yd. grading, to H. P. Streicher Co., 317 Terminal Bldg., Toledo, $42,680. Noted Apr. 26.

Ind., Logansport—City received low bids paving Miami St. from Andrews Asphalt Paving Co., Hamilton, O., $2.05 per sq.yd.; Bell & Hall, $1.48 for Bermuda Asphalt.

★Mich., Adrian—(Official)—County let contract improving 4½-mi. road, Dover Twp. to Hayes & Clark, Quincy, $24,455. Noted May 24.

Mich., Detroit—City received low bid asphaltic concrete pavement on concrete foundation, Amherst curbstone on portions of Kercheval and Grey Aves., from Detroit Asphalt Paving Co., McGraw Bldg., $90,870; St. Joseph St., $34,170; Homer Ave., $18,887.

★Illinois—State Dept., Springfield, let contracts hard roads in northern part of state as follows: Cook Co., Sect. P, concrete, to Chicago Heights Constr. Co., Chicago Heights, $69,996; Sect. Q, concrete, to Connelly & Dunning, 133 West Washington St., Chicago, $50,968; Knox Co., Sects. F and G, combination bids, to Cameron & Joyce Co., Keokuk, Ia., $12,827. Madison Co., concrete, Sect. B, A. Fahrig, $9965, Sect. E, G. R. Hyten, $8869, Sect. F. J. Keel, $9822.

★Ill., Grayville—County let contract constructing 6¾ mi. gravel rd. in Hawthorne Twp. to Arkansas Constr. Co., Mt. Vernon, Ind

★Ill., Grayville—(Official)—City let contract 15,813 sq.yd. brick paving, 25,483 sq.yd. tar macadam paving, 30,107 ft. curb and gutter and 7918 ft. storm sewers to J. R. Crews, Fairfield, $113,124. Noted July 12.

★Wis., Racine—City let contract laying concrete road portion Rapids Dr. to J. Griffin, Racine, $19,000

★Ia., Des Moines—City let contract paving portions Carpenter, Meek, Mondamin, College, Penn, Indian, East Court, Olive Ave., Ingle, Flat, Decatur, Ascension, and other streets, to Des Moines Asphalt Paving Co., 2nd and New York Aves., $2.09 per sq.yd. About 10,000 sq.yd

★Minn., Rochester—City let contract grading Kansas, Beaver, 6th, Cherry and Third Sts., to Fuller Bros.

★Mo., St. Joseph—City let contract reinforcing curves of Felix, Frances and Auxvasse Sts.; also paving Sycamore St., to Metropolitan Paving Co., 7th and Olive Sts.

★Arkansas—State Highway Comm., Little Rock, let contract grade road from Iron Mountain Depot to Lake Park, Lonoke, to M. H. Eno, Hot Springs Trust Bldg., $141,000. Noted July 19.

★Arkansas—State Highway Comm., Little Rock, let contract for road from Iron Mountain Depot to Lake Park, Lonoke, to M. H. Eno, Hot Springs Trust Bldg., $141,000. Noted July 19.

★Ark., Wynne—Imp. Rd. Improv. Dist. No. 1 let contract grading 15 mi. gravel road to Hodge & Anderson, Arkadelphia, Ark., $75,000. Noted July 19.

★Ark., Fort—City let contract paving Garrison Ave. to Bradley Bros., Little Rock, $15,000. Noted July 5.

★Ark., Fort Smith—City let contract paving Garrison Ave. to Bradley Bros., Little Rock, $15,000. Noted July 5.

★Ky., Danville—(Official)—Co. Council let contract improving portion Main St. to Federal Asphalt Paving Co., Hamilton, O., $14,000. Noted June 11

★Ky., Winchester—County let contract building 4 mi. state aid road to H. S. Haggard, Winchester.

★O., Akron—County let contract paving portion West Cedar Run to S. & W. Bituminous, $43,000.

★O., Ashtabula—County let contract to T. F. Wheeler for paving 3½ mi. of Ashtabula-Painesville Rd. About $100,000

★O., Columbus—City Comrs. let contract installing Market Rd., Curtis, Teal and supplementary Phillips Rd., Franklin Twp., to T. Vogelsang, Columbus, $7418 and $11,-142 respectively, paving 1 mi. Agler Rd., Hilltop, and 1 mi. S. W. Road, City to A. W. Rose Co., Columbus, $63,317.

★O., Dayton—City let contract paving portion of Oxford St. and Wood Sts. to S. J. Groves & Co., $45,317

★O., East Liverpool—City let contract paving Broadway Ave. to Pittsburgh Brick Co., $15,143. Noted July 5

★O., Fremont—City let contract paving 1st and 2nd Sts., Front St. to Monroe Court to Fremont Asphalt Co., $11,000. Noted June 14

★O., Kenton—County let contract building Main Pike to H. S. Williams, Kenton, Pike to J. H. Rogers and Pike to J. H. Cook to Hillsboro, Pike to J. H. Rogers and Pike to Hillsboro, Pike to Hardin Co. line to Hardin Co. Comrs., $14,731. Low bidder on Hillsboro Pike, $11,500.

★O., Marysville—City Comrs. let contract for Court and Maryville Pike to J. Hood, Richwood, $11,000. Noted July 5. Road and Bridge Fund let contract for Court and Richwood Pike to

RAILWAYS—STEAM & ELECTRIC

Proposed Work

Utah—Salt Lake, Garfield & Western R.R. plans electrification of line. About $50,000. J. Nelson, Salt Lake City, genl. mgr.

Washington—Union Pacific Ry. plans to build 3½-mi. marginal way spur track in Seattle from Spokane St. to city limits. Northern Pacific R.R., Great Northern and Chicago R.R. and Milwaukee & St. Paul Ry. will share cost. R. L. Huntley, Omaha, ch. engr., Union Pacific.

California—Atchison, Topeka & Santa Fe R.R. plans to build 4-mi. spur track in Santa Fe Springs. W. G. Harris, Kerckhoff, Los Angeles, ch. engr.

California—Orange Co. Supervs. granted franchise to Pacific Electric R.R. to extend traction line from Santa Ana to Tustin. G. E. Pillsbury, Los Angeles, ch. engr.

California—San Diego & Southeastern R.R. plans to rebuild line from Santee to Foster. About $75,000. J. D. Spreckles, Union Bldg., pres.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Quebec**—Canadian Pacific Ry. let contract grading work from London to Guelph, involving sidings, bridges, etc., to Sherwood Constr. Co., Mail Bldg., Toronto, $185,000.

EXCAVATION AND DREDGING

Proposed Work

Ia., Council Bluffs — Drainage — J. H. Mayne, co. engr., prepared plans diverting Indian Creek and confining it to concrete channel through city. About $844,093.

Minn., Breckenridge—Ditch—Co. Comrs. voted to build Co. Ditch No. 31. P. E. Traux, aud.

Neb., Lincoln—Drainage—A. Edgren, co. engr., preparing plans to straighten Middle Creek near West O St., D.D. No. 1. A. E. Sutherland, clk.

Neb., Wayne—Drainage—See "Streets Roads."

Tex., Orange—Irrigation—Orange Co. Irrigation Co. plans to build large irrigation pumping plant recently destroyed by fire.

Cal., Madera—Irrigation—Madera Irrigation Dist. had plans prepared by L. C. Hill, engr., 1112 Hollingsworth Bldg., Los Angeles, for diverting water from San Joaquin, Fresno and Chowchilla Rivers and tributaries to irrigate 400,000 acres land in Merced and Madera Cos. About $10,000,000. Noted Apr. 5.

BIDS DESIRED

N. J., Jersey City—Dredging—Until Aug. 7, by City Comrs., dredging and deepening Hudson River, foot of Morgan St. Pier. C. A. Van Keuren, city engr. Noted July 12.

Ill., Cadwell—Drainage—Until Aug. 4, by Comrs. Cadwell D.D. at office of W. M. Davis, for open ditch involving 45,000-cu yd. exca. J. W. & E. C. Craig, Mattoon, attys.

Ill., Lewiston—Drainage—Until Aug. 10, by Comrs. West Matanzas Drainage and Levee Dist., laying 4200-ft. 16-in. tile. J. H. Wehner, comr. A. Onion, clk.

Ill., Paxton—Drainage—Until Aug. 6, by Cloud & Thompson, attys., redredging main ditch, Wall Twp. D.D., length 41,608-ft. yardage 73,796; lateral No. 2, length 3800-ft., yardage 4000; new work extended into main ditch 7780-ft. long

Ia., Des Moines—(Official)—Drainage—Until Aug. 20, by J. M. Wells, engr., Nevada, for Joint Dist. No. 1, Polk and Storey Cos., involving 16,629 ft. 18-, 26- and 34-in. tile. About $26,405. Former bids rejected. F. J. Alber, clk. Polk Co. F. E. King, clk. Story Co. Noted July 12

Ia., Ft. Madison—(Official)—Drainage—Until Aug. 7, by C. T. Hull, co. aud. building drainage pumphouse; advertised in this issue

Ia., Rockwell City—Drainage—Until Aug. 3, by R. B. Dixon, co. aud. [illegible] main open ditches and rebuilding [illegible] Joint D.D. Nos. 9 and [illegible] 285-ft. 18- to 5-ft. [illegible] laterals 17,738-ft. 6-ft. bottom, [illegible] tile branches involv[illegible] 14- 16- 18- 20- 22- [illegible] and 36-in. tile.

Minn., Marshall—Ditches—Until Aug. 4, by E. S. Shepard, co. aud., building Co. Ditch No. 32, involving 54,550-ft. 5- 6- 7- 8- 9- 10½- 14- 16- 20- 22- 24- and 28-in. tile, cost, $22,754; Ditch No. 37, 29,756-ft. 5- 6- 7- 8- 9- 10- 12- 14- 16- 18- 20- 22- and 24-in. tile, $12,667; 54,299-cu yd. open ditch, $7601; Ditch No. 38, 28,858-ft. 5- 6- 7- 8- 9- 10- 12- 15- 18- and 24-in. tile, $11,655.

Minn., New Ulm—Drainage—Until Aug. 5, by L. F. Vogel, co. aud., building D.D. No. 33. Work involves main open ditch, 3-mi. long, 8-ft. wide at bottom, average depth 8-ft. involving 131,200-cu yd. excav. and 171,851-ft. 6- to 32-in. tile. F. D. Minium, co. engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Fla., Arcadia**—Drainage—J. B. Wilcoken, pres. bd. supervs., let contract 33-mi. open drainage ditches to W. B. Williams, Oviedo, $51,581. Noted June 14.

★**O., Cleveland**—Excavation—Bd. Control let contract excavating for public hall to F. R. Jones Co., Citizens Bldg., $44,890.

★**Ia., Estherville**—Drainage—County let contract Ditch No. 87 to Cement Products Co., $14,444.

★**Ia., Glenwood** — (Official) — Ditch — County let contract Silver Creek Ditch No. 1 to Phelan & Shirley, Glenwood, 7c. per cu.yd. Noted June 21.

Ia., Nevada—(Official)—F. E. King, co. aud. received low bids building ditches and drains, Richland Twp. D.D. No. 81, from J. McKillip, Faribault, Minn., 19½c. per cu. yd., open work; Fry & Hankins, Cole, $11,533 labor; Macomb Sewer Pipe Co., $23,982 tile. Noted July 12.

★**Minn., Cambridge**—(Official)—Ditch—G. C. Smith, co. aud., let contract Co. Ditch No. 16 to Petersen & Olson, Stauchfield, $16,145. Noted July 5.

★**Minn., Chaska**—(Official)—Ditch—J. B. Connelly, co. aud., let contract dredging Co. Ditch No. 6 to Central Contr. Co., Minneapolis, $14,567. Noted May 31.

★**Minn., Redwood Falls**—Ditch—County let contract Ditch No. 121 to J. Gerding, Redwood Falls, $14,000. Noted July 5

★**N. D., Fargo**—(Official)—Dredging—County let contract 800,000-yd. floating dredge work, Drain No. 21 to W. J. Hoy & Co., Metropolitan Bldg., St. Paul, 12c. per yd.

INDUSTRIAL WORKS

Proposed Work

Mass., Boston—Armour & Co., 43 Commercial St., plans 6-story, 74 x 213-ft., brick refrigerator warehouse. About $200,000.

Mass., Cambridge—Swift & Co., 60 North Market St., Boston, plans 5-story, 60 x 80-ft. addition to plant. A. E. Bump, 60 North Market St., Boston, archt.

N. Y., S. I., Milliken—(Port Richmond P. O.)—Downey Shipbuilding Corp., 120 Bway., New York City, plans 6 machine shops. Milliken Bros. Inc., 111 Bway., New York City, engrs.

N. J., Bayonne—Hudson Mill Supply Co., 373 Bway, plans to build factory. About $100,000.

N. J., Jersey City—American Can Co., 120 Bway, New York City, negotiating with City Comrs., for permission to build new plant at Grand St. and Cornelison Ave. About $500,000.

N. J., New Brunswick—T. A. Gillespie Co., purchased 64 acres in Sayreville, Pa., and will build plant. About $3,000,000.

Pa., Phila.—See "Reinforced Concrete."

Md., Baltimore—H. E. Crook, 18 Light St., recently incorporated, has increased capital stock from $120,000 to $150,000. Company plans to build shipbuilding plant. H. E. Crook, pres.

Md., Sparrows Point—(Baltimore P. O.) Bethlehem Steel Co., c/o Thomas Scuffle, architect, receive bids about Aug. 1 for factory, 65 x 700-ft. plant. About [illegible]

Ga., Moultrie—Moultrie Packing Co., manufacturer lumber, $8,000 addition to plant, will start work. E. L. Lawton, supt.

Ga., Savannah—Cordele Steel Co. (65 Broad St., New York City) plans large addition to plant near here.

Fla., Pensacola—Georgia Florida & Alabama Ry. plans to build shops here. About $40,000. H. F. Coleman, Jacksonville, [illegible] engr.

La., New Orleans—Dixie Steel Corp., Metropolitan Bank Bldg., plans 60 x 200-ft. iron and steel [illegible]. About $130,000.

O., Akron—Kendall Tire & Rubber Co., Ohio Bldg., plans steel and brick plant. About $100,000. W. C. Owen & Co., 1900 Euclid Ave., Cleveland, archt.

O., Cleveland—Parish & Bingham Co., Madison Ave. and West 106th St., receives bids about Aug. 1 for brick and steel garage and shipbuilding plant. About $225,000. E. McGeorge, Leader-News Bldg., archt.

O., Orrville—Ohio Blower Co., 5125 Perkins Ave., N. E. Cleveland, is having plans prepared for new factory by E. McGeorge, archt., Leader-News Bldg., Cleveland. About $150,000.

O., Toledo—Maumee Ice & Storage Corp., c/o Central Products Co., 247 Ottawa St., plans 6-story, 100 x 127-ft. cold storage plant. L. M. Levine, Room 1855, 120 Bway., New York City, ch. engr. A. McLean, Hotel Michigan, supt. of constr.

O., Youngstown—Barrett Co., 12 Poland Ave., plans new addition to plant. About $50,000.

Mich., Detroit—City will build 1- and 2-story, rein.-con. and steel repair shop for fire dept. on Russel St. About $90,000.

Ill., Chicago—W. F. Hall Printing Co., 466 West Superior St., plans 7-story, brick and steel plant at Chicago Townsend, Kinsburg and Superior Sts. About $200,000. Glaver & Dinkelberg, archts.

Ill., Peoria—Hoe Mfg. Co., West Washington St., East Peoria, plans 1-story, 140 x 300-ft. foundry. About $100,000. Postle & Fisher, 140 South Dearborn St., Chicago, archts.

Wis., Milwaukee—See "Reinforced Concrete."

Wis., Milwaukee—L. Teweles Seed Co., 113 Clybourn St., receives bids about Sept. 1, for 7-story, 150 x 180-ft. rein.-con. and brick seed elevator and warehouse. About $200,000. Fraser Co., 667 East Water St., mill engr.

Wis., Milwaukee—J. Wilde Evaporated Milk Co., 67 East Long St., Columbus, plans 2-story, 100 x 220-ft. brick and steel plant and boiler house here. About $200,000.

Ia., Sac City—City plans election, August 3, to vote on $60,000 bonds issue for light plant. T. H. Stafford, engr.

Minn., Minneapolis—Green Mountain Investment Co. [illegible] 6-story [illegible] at 714 Washington Ave. About $100,000.

Tex., Waco—Exporters & Traders' Compress & Warehouse Co., 104 South 4th St., plans warehouse in East Waco. About $50,000.

Cal., Berkeley—Philadelphia Quartz Co. plans to build plant here. About $100,000. A. C. Ellington, pres.

Cal., San Diego—A. J. Savage Munitions Co., San Diego, plans factory here. First unit to cost about $175,000.

Cal., San Francisco—Union Iron Works plans addition to plant here. About $1,000,000. J. A. McGregor, 24 Spear St., pres.

BIDS DESIRED

Vt., Bennington, Until Aug. 1, [illegible] Bennington Garage Co., Secury, 21 x 100-ft. garage and office building. About $30,000. L. W. Williams, prop. F. W. Thayer, Bennington, archt.

Mich., Mottville—(Official)—Until Aug. 6, by G. S. Williams, engr., [illegible] Bldg., Ann Arbor, for [illegible] and [illegible] hours etc., advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—[illegible] Co., [illegible] & Warehouse Co., [illegible] contract to build [illegible] plant on Turner Court Co., 18 Mill St.

★**Mass., Boston**—[illegible]

★**Mass., Quincy**—[illegible] and extensions [illegible] & 150-ft. boiler shop to [illegible] Co., 31 [illegible] St., Boston.

★**N. Y., Long Island City**—[illegible]

★**N. Y., Utica**—[illegible] Co. [illegible] Bldg., [illegible]

★**Pa., Hazelton**—[illegible] Co., Worthington Pump & Machinery Co. [illegible] & 150-ft. [illegible] Jeanes and Walnut Sts., Phila. About $[illegible]

[illegible] (Continued)

★Pa., Phila—See "Reinforced Concrete."

★Md., Baltimore—Baltimore Dry [illegible] & Shipbuilding Co., 1724 Thames St., let contract warehouse, 2nd addn. [illegible] and office, 22 West Comm. Co. Assn. Bldg. About $[illegible]

★O., Cleveland—[illegible] Mobile[illegible] & Mfg. Co., 204 St. Clair St., let contract 1- and 2-story, 40 x 100-ft. machine shop to [illegible] & Co., 1103 Rockefeller Bldg. About $[illegible]

★O., Cleveland—Federal Brewery Co., 2[illegible] Ave., let contract 60 x 100-ft. brick addition to warehouse, to Bankers Contract Co., 121 Euclid Ave. About $[illegible]

★O., Cleveland—Ideal Tire & Rubber Co., [illegible] Bldg., let contract brick and steel addn. to Hodgkin-Cowles Const. Co., 811 Engineers Bldg. About $100,000. Noted June [illegible]

O., Cleveland—Wade Co., East 79th and St. Clair Sts., let contract 114 x 200-ft. factory to Worth County Co., Citizens Bldg. About $[illegible]

★Ind., South Bend—Studebaker Corp., [illegible] Bldg., let contract factory, Kendall and Garst Sts., to J. Stewart Co., 30 Church St., New York City. About $[illegible]

Ill., Chicago—Stutz Motor Car Co., 2021 South Michigan Ave., let contract 3-story, [illegible] ft. garage building to Pleas [illegible] Co., 40 North LaSalle St. About $125,000. Noted May 25.

★Wis., Kenosha—Nash Motor Co., [illegible] contract addn. to [illegible] Co., 19 South LaSalle St., Chicago. About $[illegible]

★Wis., La Crosse—A. [illegible] Seed Co., [illegible] Letters, 40 x 100-ft. post office, [illegible] & Sons, 1st Nat. Bank Bldg. About $[illegible]

★Wis., Racine—[illegible] Auto Tire Co., [illegible] & [illegible] Co., 1[illegible] ft. factory, 40 ft. high, general contr. Co., Mc[illegible] Bldg., Chicago. About $[illegible]

★Mo., Kansas City—Montgomery & Ward Co., [illegible] & [illegible] Sts., let contract [illegible] x 211-ft. concrete warehouse, to [illegible] Co., 11 West Jackson Blvd., Chicago. About $[illegible]

★Cal., Los Angeles—Pacific Coast Roof [illegible] & Supply Co., [illegible] to [illegible] Hellman Bldg. About $[illegible]

BUILDINGS

Proposed Work

[illegible]

Mass., Boston—Office—J. [illegible] 17 [illegible] Sts., let contract 4-story, 70 x 72-ft. addn. to [illegible] Co., 18 Tremont St. About $[illegible]

Mass., Boston—Warehouse—[illegible] Co., 1[illegible] Ave., let contract 4-story, 100 x 200-ft. warehouse to [illegible] Co., 18 Tremont St. About $[illegible]

Mass., Boston—Warehouse—[illegible] Co., 1[illegible] Ave., let contract 4-story, 100 x 200-ft. warehouse to [illegible] Co., 18 Tremont St. About $[illegible]

Mass., Southampton—Dormitories—[illegible] Co., [illegible] Bldg., Northampton, let contract [illegible] to [illegible] & Ferguson, 15 Devonshire St., Boston. About $[illegible]

Mass., Wakefield—School—Bd. Educ. [illegible] Bldg., Boston, let contract [illegible] to [illegible] Co., 18 Tremont St., Boston. About $[illegible]

Mass., Worcester—[illegible] Bldg., Boston, let contract [illegible] to [illegible] Co., 18 Tremont St., Boston. About $[illegible]

Mich., Detroit—Mercantile—See "Reinforced Concrete."

Mich., Detroit—Opera House—R. E. Olds, Lansing, having plans prepared, 11-story, steel, granite and tile. About $750,000. Baxter, O'Dell & Halpin, 1024 Hammond Bldg., archts.

Mich., Lansing—Armory—State soon receives bids, 1- and 2-story, 125 x 240-ft. About $120,000. S. D. Butterworth, Tussing Bldg., archt. Noted July 5.

Mich., Port Huron—School—Bd. Educ. plans new building on 10th St. About $175,000. G. L. Harvey, 201 Huron Bldg., archt.

Ill., Chicago—School—Bd. Educ. plans, 3-story, on Keeler Ave. About $320,000. J. A. Guilford, mgr. A. F. Hussander, 7 South Dearborn St., archt.

Ill., Decatur—High School—Bd. Educ. receives bids about Aug. 10, 2-story, 153 x 236-ft. About $165,000. Brooks & Bremhall, Natl. Bank of Decatur Bldg.,, archts.

Wis., Milwaukee—School Bd. Educ. having plans prepared, 4-story, 264 x 300-ft., new Bay View High School, Montana and Lenox Sts., about $450,000. Van Ryn & DeGelleke, Caswell Blk., archts.

Wis., Milwaukee—School—Bd. Educ. receives bids about Sept. 1, 3-story, 110 x 150-ft., rein.-con. and brick addition. F. M. Harbach, secy. Van Ryn & DeGelleke, Caswell Blk., archts.

Wis., Milwaukee—School—Bd. Educ. plans 3-story, 110 x 115-ft. addition on 9th St. About $115,000. E. M. Harbach, 10th and Prairie Sts., secy. Van Ryn & DeGelleke, Caswell Bldg., archts.

Wis., West Salem—High School—Bd. Educ. had plans prepared for 16-room addition to high school. About $75,000. E. J. Hancock, Eau Claire, archt.

Ia., Ames—Armory—State Bd. Educ. 1-story, 200 x 400-ft. About $125,000. W. C. Demmill, secy. Proudfoot, Bird & Rawson, 810 Hubbell Bldg., Des Moines, archts.

Ia., Hampton—Hotel—North American [illegible] plans prepared by Bankers [illegible] Co., 1[illegible] Bee Bldg., [illegible] 122 x 132-ft. About $60,000.

Ia., Leon—School Bd. Educ. plans, 2-story. About $50,000. Eckland, Fugard & Knapp, McKinnie Blk., Moline, Ill., archts.

Ia., Spirit Lake—Home—Knights Templars [illegible] recently destroyed by fire. About $[illegible]

Kan., Lawrence—Art—Bldg. plans 1-story, [illegible] ft. for Liberal arts [illegible] Bldg. [illegible] A. Kimball, [illegible] & [illegible] C. H. [illegible] Bldg., Topeka, archts.

Pa., [illegible]—Store and Office—See [illegible]

Md., Baltimore—[illegible]—J. Hopkins [illegible] stone and brick, about $[illegible], E. Goodnow, pres. Archer [illegible] archts.

Ohio, Bellefontaine—City voted $[illegible] for building school.

N. Y., Rochester—School—Bd. Educ. [illegible] 2-story, 240 x 240 ft. About $500,000. J. S. Mylan, Municipal Bldg., secy. [illegible] & Madden and W. G. Kaelber, 300 Sibley Blk., archts.

N. J., Bayonne—Hospital—Bd. Dir. of Bayonne Hospital soon receive bids for new addition. About $100,000.

N. J., Newark—Fire House—City having plans prepared by F. Grad, archt., American Natl. Bank Bldg., at Palm St. and Sanford Ave. About $100,000.

O., Lakewood—School—Bd. Educ. receives bids about Aug. 1, for 3 schools. About $500,000. C. W. Hopkins, 900 Rose Bldg., Cleveland, archt. Noted June 28.

Ind., Gary—Hospital—Bd. of Governors of Gary General Hospital having plans prepared, 5th Ave. and Grant St. About $200,000. R. E. Smith, 111 West Monroe St., archt.

Ind., New Castle—Asylum—Indiana Epileptic Village plans 1-story addition to boys cottage. About $63,000. W. C. Van Nuys, supt. H. Foltz, 1456 Lemcke Annex., Indianapolis, archt.

Mich., Bessemer—School—Bd. Educ. plans to build 2-story building to replace Ashland School recently destroyed by fire. About. $175,000.

Mich., Detroit—Mercantile—See "Reinforced Concrete."

Mich., Detroit—Opera House—R. E. Olds, Lansing, having plans prepared, 11-story, steel, granite and tile. About $750,000. Baxter, O'Dell & Halpin, 1024 Hammond Bldg., archts.

Mich., Lansing—Armory—State soon receives bids, 1- and 2-story, 125 x 240-ft. About $120,000. S. D. Butterworth, Tussing Bldg., archt. Noted July 5.

Mich., Port Huron—School—Bd. Educ. plans new building on 10th St. About $175,000. G. L. Harvey, 201 Huron Bldg., archt.

Ill., Chicago—School—Bd. Educ. plans, 3-story, on Keeler Ave. About $320,000. J. A. Guilford, mgr. A. F. Hussander, 7 South Dearborn St., archt.

Ill., Decatur—High School—Bd. Educ. receives bids about Aug. 10, 2-story, 153 x 236-ft. About $165,000. Brooks & Bremhall, Natl. Bank of Decatur Bldg.,, archts.

Wis., Milwaukee—School Bd. Educ. having plans prepared, 4-story, 264 x 300-ft., new Bay View High School, Montana and Lenox Sts., about $450,000. Van Ryn & DeGelleke, Caswell Blk., archts.

Wis., Milwaukee—School—Bd. Educ. receives bids about Sept. 1, 3-story, 110 x 150-ft., rein.-con. and brick addition. F. M. Harbach, secy. Van Ryn & DeGelleke, Caswell Blk., archts.

Wis., Milwaukee—School—Bd. Educ. plans 3-story, 110 x 115-ft. addition on 9th St. About $115,000. E. M. Harbach, 10th and Prairie Sts., secy. Van Ryn & DeGelleke, Caswell Bldg., archts.

Wis., West Salem—High School—Bd. Educ. had plans prepared for 16-room addition to high school. About $75,000. E. J. Hancock, Eau Claire, archt.

Ia., Ames—Armory—State Bd. Educ. 1-story, 200 x 400-ft. About $125,000. W. C. Demmill, secy. Proudfoot, Bird & Rawson, 810 Hubbell Bldg., Des Moines, archts.

Ia., Hampton—Hotel—North American [illegible] plans prepared by Bankers [illegible] Co., 1[illegible] Bee Bldg., [illegible] 122 x 132-ft. About $60,000.

Ia., Leon—School Bd. Educ. plans, 2-story. About $50,000. Eckland, Fugard & Knapp, McKinnie Blk., Moline, Ill., archts.

Ia., Spirit Lake—Home—Knights Templars [illegible] recently destroyed by fire. About $[illegible]

Kan., Lawrence—Art—Bldg. plans 1-story, [illegible] ft. for Liberal arts [illegible] Bldg. [illegible] A. Kimball, [illegible] & [illegible] C. H. [illegible] Bldg., Topeka, archts.

Pa., [illegible]—Store and Office—See [illegible]

Md., Baltimore—[illegible]—J. Hopkins [illegible] stone and brick, about $[illegible], E. Goodnow, pres. Archer [illegible] archts.

Ohio, Bellefontaine—City voted $[illegible] for building school.

Cal., Coalinga—(Official)—High School—Bd. Educ. receives bids about Aug. 15. About $100,000. E. J. Kump, Fresno, archt. Noted June 28.

BIDS DESIRED

N. H., Durham—(Official)—Until Aug. 4, by Governors Council, Concord, for Commons building and brick dormitory, $100,000. E. T. Huddleston, Dept. Drawing, c/o College, archt. Noted June 21.

Mass., Fall River—Hospital—Until Aug. 10, by D. H. Fuller, supt. of hospitals, City Hall, on Bay St. About $150,000.

N. Y., Cohoes—High School—(Official)—Until Aug. 17, by Bd. Educ., 2-story, Columbia and Bevan Sts. About $150,000. Tooker & Marsh, 101 Park Ave., New York City, archts.

N. Y., New York—(Official)—Until Aug. 7, by Bd. Water Supply, for removing steel-frame superstructure and furnishing and building portable steel building at Shaft 11; advertised in this issue.

N. J., Brunswick—Junior High School—Until Aug. 24, by Bd. Educ. About $275,000. A Merchant, 363 George St., archt.

N. C., Greenshoro—Court House and Jail—Until Aug. 22, by Co. Comn. About $250,000. H. Barton, archt.

O., Bedford—High School—(Official)—Until Aug. 10, by Bd. Educ. About $50,000. E. Sentner, clk. E. E. Beat. Elyria, archt. Noted May 24.

O., Lebanon—High School—(Official)—Until Aug. 3, by Bd. Educ. W. Chester, clk. Bausmith & Drainie, 901 Gerke Bldg., Cincinnati, archts.

O., St., Paris—Grade and High School—Until Aug. 4, by Bd. Educ., Jackson Twp., 2-story. About $75,000. G. Shelfs, 319 New 1st Natl. Bank Bldg., Columbus, archt. Noted June 7.

O., Springfield—Hospital—Until Aug. 2, by Pythian Hospital, c/o R. C. Gotwald, archt., Gotwald Bldg., 62 x 105-ft., brick and stone. About $50,000. Noted May 22.

O., Washington—C. H.—School—Until July 30, by Bd. Educ., 2-story, 74 x 36-ft. About $50,000. A. W. Glowser, pres. J. H. Hicks, Dennis Blk., archt.

O., Youngstown—Schools—Until Aug. 7, by Bd. Educ., for 5 grade schools. About $360,000. C. H. Baird, 123 McKinley Ave., pres. P. Boucherle, Stambaugh Bldg., archt.

★**Mich., Detroit**—See "Reinforced Concrete."

Ia., Mason City—School—Until Aug. 13, by R. L. James, secy. bd. educ., 2-story, brick, stone and rein.-con. About $100,000. J. H. Felt & Co., 800 Grand Ave. Temple, Kansas City, Mo., archts. Noted June 21.

Neb., Springfield—High and Grade School—(Official)—Until Aug. 17, by Bd. Educ. F. Davidson, secy. Bankers Realty Investment Co., Bee Bldg., Omaha, archts.

Mo., Trenton—School—Until Aug. 1, by Bd. Educ., 3-story, brick and rein.-con. About $75,000. H. E. Morris, clk.

Cal., Glendora—School—Until Aug. 4, by Trustees Glendora School Dist., brick and hollow tile. About $50,000. Allison & Allison, 1406 Hibernian Bldg., Los Angeles, archts.

Cal., Santa Barbara—Hospital—See "Reinforced Concrete."

PRICES AND CONTRACTS ADARDED

(★Indicates award of contract)

★**Mass., Boston**—Y. M. C. A. let contract 4-story, 70 x 72-ft., brick and rein.-con. building at City Sq., Charleston Dist to C. Logan Bldg. Co., 18 Tremont St. About $350,000.

★**Conn., Bridgeport**—Industrial Home—Bridgeport Christian Union let contract, to Dowling & Bottomley Co., 1119 Broad St. About $100,000.

★**Conn., New Haven**—Dormitories—Trustees of Yale College let contract to M. Eidlitz & Son, 30 East 42nd St, New York City. About $3,000,000.

★**N. Y., Niagara Falls**—Police Station and Jail—City let contract 3-story, brick to Brown Pollard Constr. Co., Gluck Bldg. About $60,000.

★**N. Y., Syracuse**—School—Bd. Educ. let contract, to Central City Constr. Co., 747 Mill St., Watertown.

★**N. J., Trenton**—Bank—Trenton Banking Co. let contract for new building, State and Warren Sts., to S. W. Mather & Son, Greenwood and Canal Sts. About $166,789.

Buildings (Continued)

★**Pa., Phila.**—Library—City let contract, Vine, 19th, Wood and 20th Sts., to J. Gill. & Sons, Citizens Bldg., Cleveland. About $2,270,000. Noted June 28.

★**Md., Baltimore**—School, Assembly Hall and Gymnasium—Park School let contract, 2½-story, 35 x 350-ft., to W. E. Burnham, Law Bldg. About $75,000. Noted May 17.

★**Va., Portsmouth**—Office—Texas Co let contract 10- or 12-story, brick and terra cotta, to Baker & Brinkley, Dickson Bldg., Norfolk. About $50,000.

★**Ga., Atlanta**—Dormitory—City let contract 48 x 150-ft. rein.-con., brick and terra cotta, to Griffin Constr. Co., Candler Bldg. About $60,000.

★**O., Cleveland**—Office—Glengariff Realty Co., Erie Bldg., let contract, 2-story, concrete and steel at 4812 Windsor Ave. to Masters & Mullen Constr. Co., Electric Bldg. About $75,000.

O., Cleveland—School—Bd. Educ. received low bids for Gladstone School from H. F Juergens Co., 3315 West 25th St. About $165,225. Noted June 14.

★**Mich., Detroit**—Bank—Dime Savings Bank let contract, 1-story, 43 x 63-ft., to E. D. Jackson Contr. Co., 1921 Ford Bldg. About $70,000.

★**Ill., Carthage** — Dormitory — Carthage College let contract, 4-story, brick and stone, to E. S. Moore Danville. About $80,000.

★**Ill., Chicago**—School—Bd. Educ. let contract 3-story, brick addition, at 1235-57 North Claremont Ave., to A. & E. Anderson Co., 5954 Magnolia St. About $650,000.

★**Wis., Ashland**—School—Bd. Educ. let contract, rebuilding school recently destroyed by fire, to Tomlinson, Egan, Ashland. About $90,000. Noted July 5.

★**Wis., Kenosha**—High School—Bd. Educ. let contract, 2-story, 93 x 168 ft., new Washington High School, to Riesen Bros. Co., 1003 1st Natl. Bank Bldg., Milwaukee. About $120,000.

★**Wis., Manitowoc** — Club — Manitowoc Lodge of Elks let contract, 2-story, 60 x 90 ft., to Michie Constr. Co., Camp Bldg., Milwaukee. About $75,000. Noted July 5.

★**Wis., Mt. Horeb**—(Dane, O. P. O.)—High School—Bd. Educ. let contract to Wagner & Bauman, Monroe. About $93,000.

★**Wis., Racine**—Bank and Office—Manufacturers Natl. Bank let contract to Anderson-Stranberg Co., 19 South La Salle St., Chicago. About $150,000.

★**Wis., Stevens Point**—Depot—Minneapolis, St. Paul & Sault Ste. Marie R.R. let contract 2-story, 80 x 144-ft., brick and concrete depot, division offices, club house, etc., to Withee Constr. Co., Withee. About $75,000.

★**Wis., Wilwaukee** — Restaurant — Globe Investment Co., c/o Schroder, 86 Michigan St., let contract, 7-story, 114 x 124-ft., to Olson Carson Co., Tacoma Bldg. About $500,000. Noted July 12.

★**Ia., Woodward** — Dining Hall, etc.—State Hospital Colony let contract, to J. E. Tusant & Son, 583 7th St., Des Moines. About $75,000.

★**Kan., Ft. Scott**—High School—Bd. Educ. let contract, 3-story, 70 x 200-ft., brick and stone, to Eberhardt Constr. Co., Salina. About $85,000. Noted June 21.

S. D., Sioux Falls—City Hall—City received low bids from Sioux Falls Constr. Co., Sioux Falls, $92,900; Collins Bros., Sioux Falls, $96,500; O. H. Olsen, Stillwater, Minn., $99,175.

S. D., Wessington Springs—High School—(Official)—Bd. Educ. let contract, to F. R. Comb, 201 Lumber Ex. Bldg., Minneapolis, $57,600. Noted June 7.

★**N. D., Blue Hill**—School—(Official)—Bd. Educ. let contract to G. W. Tenning, Bismarck. About $77,000. Noted July 12.

★**Mo., St. Louis**—Hotel—Mortgage Trust Co., 204 North 4th St., let contract, 15- to 25-story, 130 x 150-ft., to Westlake Constr. Co., 717 Locust St. About $2,000,000.

★**Mo., St. Louis**—School—Bd. Educ. let contract, 2-story, 80 x 110-ft., to Murch Bros. Constr. Co., Ry. Ex. Bldg. About $134,840. Noted July 12.

★**Okla., Tulsa**—School—Bd. Educ. let contract, 1- and 2-story, brick and rein.-con. to Latimer & Rouch, 1301 South Carson St. About $70,000.

★**Okla., Tulsa**—Office—J. A. Wallace, 215 East 1st St., let contract, 3-story, 50 x 120-ft., brick, steel and rein.-con. to J. Simpson Constr. Co., 219 East 1st St. About $50,000.

★**Colo., Rocky Ford**—School—Bd. Educ. let contract, 3-story, 115 x 160-ft., to G. O. Teats, Rocky Ford, about $73,963. Noted May 17.

★**Cal., Los Banos**—School—School Trustees let contract, brick and concrete, to L. G. Bergen, Call Bldg., San Francisco. $61,472.

FEDERAL GOVERNMENT WORK

Proposed Work

N. J., Vineland—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., rejected bids opened June 27 as too high. Work will be readvertised. Noted July 5.

S. C., Port Royal—Buildings—Bureau Yards and Docks, Navy Dept., Wash., rejected bids opened June 25, for 8 buildings for officers' quarters. Noted July 5.

R. I., Melville—Extending Fuel-Oil Storage Plant—Until July 30, by Bureau Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., for underground concrete oil reservoir, pumps, piping, heaters and buildings at Naval Coal Depot.

BIDS DESIRED

N. Y., Buffalo—Cement—Until Aug. 2, by Lighthouse Inspector, furnishing 1500 bbl. Amer. Portland cement; advertised in this issue.

Pa., Franklin—Post Office—Until Aug. 30, by J. A. Wetmore, superv. archt., treas. dept., Wash.; advertised in this issue.

S. C., Charleston—Storehouse—Until Aug. 6, by Bureau Yards and Docks (F. R. Harris, ch), Navy Dept., Wash., rein.-con., at Navy Yard.

Mich., Grand Haven—Building—Until Aug. 21, by Navy Dept., U. S. Coast Guard, Wash., for additions and repairs to station building and launchway at Coast Guard Station No. 268; advertised in this issue.

Wyo., Torrington—Until Sept. 5, by U. S. Rec. Ser., for earthwork and structures on Ft. Laramie Canal, North Platte Project, Nebraska, Wyoming, involving 1,274,000 cu.yd. excav. placing 2925 cu.yd. concrete, 336,000 lb. steel and 5 gates. A. P. Davis, ch. engr.

Mo., St. Louis—Levee Work—Until Aug. 11, by Secy. Mississippi River Comn., 1311 International Life Bldg., 90,000 cu.yd. earthwork. Hunt D D.

Cal., San Francisco—Dredging Plant—Until Aug. 2, by U. S. Engr. Office, U. S. Army, 405 Custom House, for hire and operation of 1 clam shell dredging plant for work in Sacramento, San Joaquin, Feather and Mokelumne Rivers.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. J., Lake Denmark—Buildings—Bureau Yards and Docks, Navy Dept., Wash., received low bids, July 16, building additions to 8 magazine buildings at naval ammunition depot (a) work complete (b) making all foundation walls of concrete instead of stone, from J. C. Lyons Sons Co., 30 East 42nd St., New York City, (a) $127,305, (b) $129,480; Columbus Circle Constr. Co., 51 East 42nd St., New York City, (a) $128,000, (b) $130,000; Frymier & Hanna, 25 West 45th St., New York City, (a) $129,900, (b) $129,480.

★**Md., Annapolis** — Buildings — Bureau Yards and Docks, Navy Dept., Wash., let contract addition to Isherwood Hall to J. H. Miller, Eutaw and Franklin Sts., Baltimore, $203,000. Noted July 19.

★**Md., Annapolis** — Buildings — Bureau Yards and Docks, Navy Dept., Wash., let contract addition to Bancroft Hall U. S. Naval Academy to J. H. Miller, Inc., Eutaw and Franklin Sts., Baltimore, cost plus 10%. Noted July 19.

Wash., D. C.—Repair Shop—Bureau Yards and Docks, Navy Dept., received low bids addition to Nautical Instrument Repair at Naval Observatory, (work completed) from W. E. Mooney Evans Bldg., $44,400, 75 days; Mellon Constr. Co., Real Estate Trust Bldg., $37,527, 130 days; W. P. Lipscomb & Co., 1405 F St., $32,800, 120 days. Noted July 5.

W. Va., Charleston—Projectile Plant—Bureau Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., received low bids Building for machine shop, foundry, forge shop, heat treating shop, lavatory and locker rooms at U. S. naval projectile plant, from C. W. McNitt Co., $144,[illegible] quarters St., Boyle-Robertson Constr. Co., Inc., Evans Bldg., Wash., D. C.; F. W. Mayer Constr. Co., 701 Finance Bldg., Phila.; J. Stewart & Co., Inc., 30 Church St., New York City; R. H. Arnold Co., 548 Mallard St., Los Angeles; Kettler-Elliott Erection Co., 1407 Ashland Blk., Chicago; Warren Moore & Co., Colonial Trust Bldg., Phila.; J. W. Cooper, 721 Fidelity Bldg., Buffalo, cost plus percentage.

Fla., Key West—Officers' Quarters, Bureau Yards and Docks, Navy Dept., Wash., received only bid from W. L. Hadlow, 4 Borland Bldg., Jacksonville, (work complete) $11,654.

★**Ala., Jasper**—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to A. Blair, Hill Bldg., Montgomery. Noted July 12.

Ill., Hoopeston—Post Office—J. A. Wetmore, superv. archt., treas dept., Wash., received low bids, July 12, (a) limestone, (b) sandstone, from Clarke Constr. Co., Danville, (a) $54,[illegible] (b) $55,[illegible] E. A. Steininger, St. Louis, (a) $56,000; Yeager & Sons, Danville, (a) $58,497 (b) $58,997. Noted June 7.

★**Ia., Glenwood**—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to C. Weitz Sons, 712 Mulberry St., Des Moines, $38,820, time 12 mos. Noted July 19.

★**Wash., American Lake**—Roads—N. D. Baker, secy. war, let contract paving all roads within army cantonment to Independent Asphalt Paving Co., Northern Bank Bldg., Seattle, $15,000 per mi. Cost plus percentage of profit.

Mass., Newburyport—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., received low bids, July 16, from J. M. Monroe, North Attleboro, $69,712; C. S. Cunningham & Sons Co., 23 Central Ave., Lynn, $79,800; W. H. Fissell & Co., 1328 Bway., New York City, $84,797. Noted June 14.

MISCELLANEOUS

Proposed Work

Tide Gate, etc.—New Haven, Conn.—(Official)—City rejected bids opened July 18, for tide gate with spillways and river walls on Mill River, North State St. Noted July 12.

Parks—Syracuse, N. Y.—Park Comn. approved $160,000 bond issue to build and improve parks, including Burnet and Onondaga Parks.

Elimination of Grade Crossings—Bristol, Pa.—Pennsylvania R.R. made application to Pub. Ser. Commission to abolish grade crossings at Central Ave. by constructing new road parallel to tracks, connecting with White Hall Rd., also abolishment of grade crossings at Edgely Rd., Clark Ave. and Hellings's Rd. by building overhead bridges. A. C. Shand, Broad St. Sta., Phila., ch. engr.

Incinerating Plant—Paducah, Ky.—City Comrs. plan. Proposition has been made by International Sanitation & Development Co. of Springfield to build double unit plant here at once. About $12,000.

Dock—Minneapolis, Minn—City prepared plans dock for loading ore from Minnesota iron ranges for shipment down Mississippi to St. Louis. O. Claussen, city engr.

Levee Improvements—Clarksville, Tex.—Attorney General's Dept., Austin, approved $27,500 bonds for work in Red River Co. Levee Improv. Dist. No. 2.

Incinerator—Okmulgee, Okla.—City election Aug. 7 to vote on $40,000 bonds to build incinerator. M. N. Coles, city engr.

BIDS DESIRED

Piers, etc.—Albany, N. Y.—(Official)—Until Aug. 31 by W. W. Wotherspoon, supt. pub. wks., for piers, dolphins, etc., Gowanus Bay, Brooklyn, N. Y.; advertised in this issue.

River Improvements—White Plains, N. Y.—See "Sewers."

Embankment—Greenville, Miss.—(Official)—Until Aug. 4 to Highway Comm., [illegible] cu.yd. embankment. O. C. Kulicka, asst. engr.

Air Compressors—Galesburg, Ill.—(Official)—Until Aug. 6, to N. L. Bonville, city clk., advertised in this issue.

Incinerating Plant—Kansas City, Mo.—Until Aug. 8, by City Sanitary Supt. for one company, heavy loading [illegible] ft. stack. W. H. Beauchamp, [illegible] Noted June 14.

Wharf—Houston, Tex.—See "Bridges and Culverts."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Tunnel Improvements—Boston, Mass.—[illegible] Rapid Transit Comm., received low bids letting [illegible] Dorgan, Old Colony Bldg., Boston, [illegible] Andrew Mc Mc Donald Co., 441 Dorgan, Old Colony Bldg., Boston, [illegible] Co., 120 Boylston St., Boston, [illegible] Rapid Transit Comm., Old Colony Bldg., Boston, [illegible] J. Timmons Co., Old Colony Bldg., Boston, [illegible] Donald Co., Old Colony Bldg., Boston, [illegible]

Stations—New York, N. Y.—[illegible] Comm., [illegible] Rapid Transit Comm., Old Colony Bldg., Boston, [illegible] West 45th St., [illegible] Noted July 12.

SEARCHLIGHT SECTION

Contracts To Be Let

PROPOSALS

Bids received until Aug. 4, 1917.

Canal Improvements

STATE OF NEW YORK
OFFICE OF SUPERINTENDENT OF PUBLIC WORKS

Albany, July 6th, 1917.

Sealed proposals will be received by the undersigned at his office in the Capitol at Albany, N. Y., until twelve o'clock noon of Friday, August 3rd, 1917, at which place and hour they will be publicly opened and read for improving the New York State canals pursuant to the provisions of Chapter 147 of the Laws of 1903, and of the acts amendatory thereof and supplementary thereto, and Chapter 570 of the Laws of 1915, as follows:

CONTRACT NO. 156
Erie Canal—Section 3

For constructing a highway bridge across Wood Creek about one mile east of Sylvan Beach.

Sheets 1 to 3, inclusive.

Plans may be seen and detailed specifications, engineer's estimate of quantities, proposal blanks, form of contract and bonds required and other information for proposers may be had at the office of the Superintendent of Public Works at Albany, N. Y.; at the office of the Assistant Superintendent of Public Works for the Middle Division at Syracuse, N. Y.; at the office of the Assistant Superintendent of Public Works for the Western Division at Rochester, N. Y., and at the canal office, Spaulding's Exchange, Buffalo, N. Y.

Copies of detailed plans of drawings may be obtained from the State Engineer and Surveyor at Albany, N. Y., upon payment to him of the cost of producing them.

Monthly estimates will be paid of ninety per centum (90 per cent.) of the work done at the contract price. Every proposal for said work must be accompanied by a money deposit in the form of a draft or certified check upon some good banking institution in the City of Albany or New York, made to the order of the State Engineer and Surveyor, or a national or state bank in good credit within the state and payable at sight to the Commissioner of Public Works, for five per centum (5 per cent.) of the amount of the proposal.

The person whose proposal shall be accepted will be required to execute a contract and furnish bonds within ten days from the date of notice of award thereof, or his or their proposal may be rejected and the deposit accompanying the proposal forfeited to the People of the State of New York.

Upon execution of the contract and approval of bonds the certified check or draft will be returned to the proposer unless the same shall have been proposed for unless the amount of the deposit will be forfeited to the Superintendent of Public Works.

The Superintendent of Public Works reserves the right to reject any or all proposals, except that no proposal will be rejected or contract awarded otherwise than to the lowest responsible bidder.

The bond required for the faithful performance of the contract shall be in such sum as shall be fixed by the Superintendent of Public Works, which sum shall not be less than twenty per centum (20 per cent.) of the estimated cost of the work to be done under the contract, and one of sureties approved as to the sufficiency thereof by the Superintendent of Public Works.

Official Proposals

Price, $3.60 an inch—Copy can be received until Wednesday, 10 a. m. for issue mailed the next day

PROPOSALS

bond, known as the labor bond, in the sum of ten per centum (10 per cent.) of the same shal have been presented for collection according to the contract price, will be required as security that the contractor will pay in full at least once in each month all laborers employed by him upon the work specified to be done in the contract.

In the event that more than one surety company is offered as surety on said bonds co-insurance only will be accepted.

Each proposal must be addressed to the Superintendent of Public Works, Albany, N. Y., and must be endorsed on the envelope with the name of the construction for which the proposal is made.

Award, if made, will be made to the person or persons whose proposal shall be lowest in cost to the State for doing the work, and which shall comply with all provisions required to render it formal. Before any award shall be made the lowest bidder will be required to satisfy the Superintendent of Public Works of his ability to provide suitable equipment and materials for the proper performance of the work.

The right is reserved to reject all proposals and readvertise and award the contract in the regular manner if, in the judgment of the undersigned, the interests of the state will be enhanced thereby.

W. W. WOTHERSPOON,
Superintendent of Public Works.

Bids received until July 30, 1917.

Sanitary Sewers

Commerce, Okla.

Town of Commerce, Okla., will receive bids for system of sanitary sewers on July 30. Plans and specifications on file in clerk's office at Commerce City. Council reserves usual rights concerning bids.

CITY CLERK.

Bids received until Aug. 22, 1917.

Tunnel Aqueduct

San Francisco, Cal.

Sealed proposals will be received at the office of the Board of Public Works, City Hall, San Francisco, up to 3:00 o'clock P.M., Wednesday, August 22, 1917, for constructing 18 miles of tunnel aqueduct in the Mountain Division of the Hetch Hetchy Water Supply Project, California.

Tunnel is to be of horseshoe section, lined with concrete and to be 19 ft. 3 in. in height and width inside of lining.

Specifications and proposal blank may be obtained from the City Engineer, City Hall, San Francisco, on deposit of $20.

The estimated cost of the work is approximately $11,000,000. It is divided into three parts, each of which may be bid on one or all parts.

M. M. O'SHAUGHNESSY,
City Engineer.

PROPOSALS

Bids received until July 30, 1917.

Highway Work

Albany, N. Y.

Office of the State Commission of Highways, Albany N. Y.—Sealed proposals will be received by the undersigned at their office, No. 55 Lancaster Street, Albany, N. Y., at one o'clock P.M. on Monday, the 30th day of July, 1917, for the construction and completion of highways in the following counties:

Albany	(two highways; 0.12 and 2.93)
Dutchess	(Approx. 6.18)
Hamilton	(Approx. 4.54)
Herkimer	(Approx. 5.10)
Lewis	(Approx. 8.82)
Livingston	(Approx. 8.34)
Madison	(Approx. 5.65)
Montgomery	(Approx. 7.10)
Nassau	(Approx. 1.57)
Niagara	(Approx. 0.61)
Oneida	(two highways; 0.70 and 1.05)
Onondaga	(Approx. 2.37)
Suffolk	(Approx. 9.57)
Westchester	(Approx. 4.29)
Wyoming	(Approx. 6.99)

And also for the following repair contract:

Washington ..(one contract—resurfacing)

Maps, plans, specifications and estimates may be seen and proposal forms obtained at the office of the Commission in Albany, N. Y., and also at the office of the Division Engineers in whose division the roads are to be improved. The addresses of the Division Engineers and the counties in which they are in charge will be furnished on request.

The especial attention of bidders is called to "General Information for Bidders" on the itemized proposal, specifications and contract agreement.

EDWIN DUFFEY, Commissioner.
I. J. MORRIS, Secretary.

Bids received until August 6, 1917.

Concrete Arch Bridge

Camden, N. J.

Sealed proposals are invited for the erection of a three span concrete arch bridge 219 feet long, and 50 feet wide, and the approaches over Newton Creek, on Champion Road, Camden Co., N. J. All in accordance with plans and specifications which are on file with Fred W. George, Clerk, at the Court House, Camden, N. J., or he will mail the same to any address on receipt of $1.00.

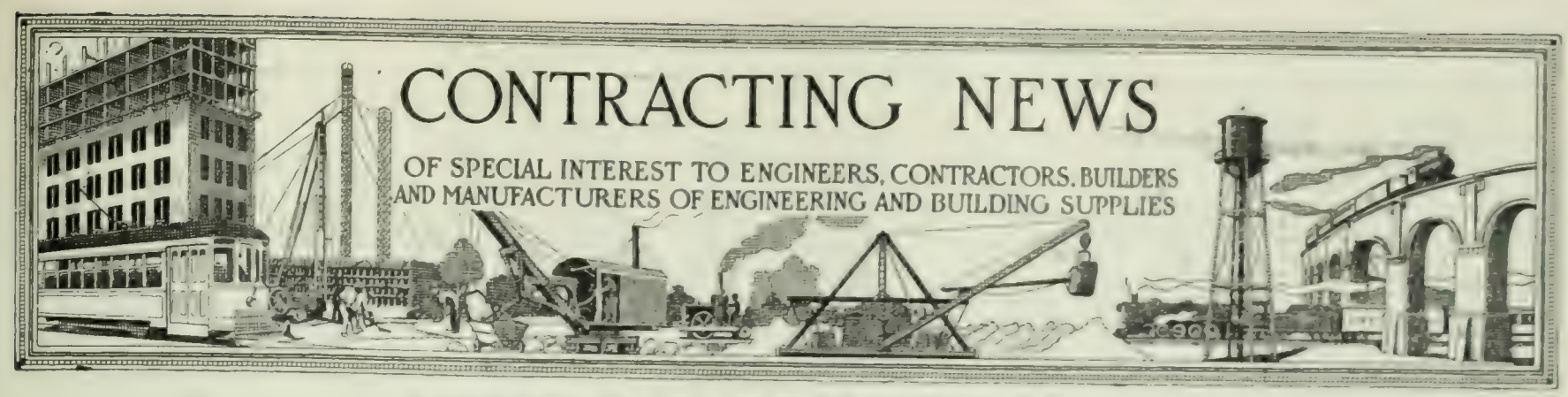
Bids will be received, immediately opened and publicly read at the Court House, Camden, N. J., on Monday, August 6th, 1917, at 10.30 a.m.

Dated, July 17, 1917.

FRED. W. GERCKE,
Chairman.

J. J. ALBERTSON,
County Engineer.

TREASURY DEPARTMENT, Supervising Architect's Office, Washington, D. C., July 19, 1917.—Sealed proposals will be opened in this office at 3 p.m., Aug. 30, 1917, for the construction of the United States post office at Franklin, Penn. Drawings and specifications may be obtained from the custodian of the site at Franklin, Penn., or at this office, in the discretion of the Supervising Architect, Jas. A. Wetmore, Acting Supervising Architect.



Price advances are indicated by heavy type; declines by *italics*.

PIG IRON

Below are the present quotations with a comparison of a month and a year ago.

	July 31, 1917	One Month Ago	One Year Ago
CINCINNATI			
No. 2 Southern foundry....	**$49.90**	$47.90	$16.90 to 17.90
No. 2 Northern foundry....	56.26	....	19.76 to 20.26
NEW YORK			
No. 2X Northern foundry..	54.25	50.25	19.70 to 20.25
No. 2 plain Northern foundry	53.75	49.25	19.50 to 20.00
No. 2 Southern foundry†...	52.75	49.25	19.50 to 20.00
BIRMINGHAM			
No. 2 Southern foundry....	**47.00**	45.00	14.00
CHICAGO			
No. 2 Northern foundry....	55.00	55.00	19.00
PITTSBURGH			
Bessemer iron*	55.95	55.95	21.00
Basic iron*	53.95	50.00	18.00

*These prices include the freight charge from the valley to the Pittsburgh district. †Delivered Tidewater, New York.

RAILWAY SUPPLIES

STEEL RAILS—The following quotations are per ton f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh		Chicago	
	July 31, 1917	One Year Ago	July 31, 1917	One Year Ago
Standard bessemer rails.	$38.00	$33.00	$38.00	$33.00
Standard openhearth rails	40.00	35.00	40.00	35.00
Light rails, 8 to 10 lb..	**83.00 to 84.00***	50 00	68.00	43.00
Light rails, 12 to 14 lb.	**82.00 to 83.00***	49.00	67.00	42.00
Light rails, 25 to 45 lb.	**75.00 to 80.00***	47 00	65.00	40.00

*Demand for light rails active and mills are obtaining premiums. Rerolled rails as valuable as new.

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh				
	July 31, 1917	One Year Ago	Chicago	St. Louis	San Francisco
Standard railroad spikes, ⅝-in. and larger.....	**$5.00**	$2.65	$5.00	$5 75	$5.75
Track bolts	6.75	3 25	6 25	Premium	7 30
Standard section angle bars	3.65	2.00	4.00	Premium	4 65

RAILWAY TIES—For fair-sized orders, the following prices per tie hold:

	Material	6 In. x 8 in. by 8 Ft.	7 In. x 9 in. by 8 Ft. 6 In.
New York	Yellow Pine	$1.06 to 1.11	$1 25
St. Louis	No. 1 White Oak	1.00	.75
Chicago	White Oak	.97	.82
San Francisco..	Green	.77	*1 01*
San Francisco..	Creosoted	**1.20**	**1.62**

PIPE

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh, as per basing card of July 2, 1917:

BUTT WELD

Steel Inches	Black	Galvanized	Iron Inches	Black	Galvanized
¾ to 3.....	42%	28%	¾ to 1½	33%	17%
LAP WELD					
2	35%	22½%	2	26%	12%
2½ to 6.....	35%	22½%	2½ to 4.....	28%	15%
7to 12.....	29%	15½%	4½ to 6.....	28%	15%
13 and 14.....	32½%	....	7 to 12.....	25%	11%
15	30%	....			
BUTT WELD, EXTRA STRONG PLAIN ENDS					
¾ to 1½.....	40%	27½%	¾ to 1½.....	33%	18%
2 to 3.....	41%	28½%			
LAP WELD, EXTRA STRONG PLAIN ENDS					
2	33%	21½%	2	27%	11%
2¼ to 4.....	36%	24½%	2½ to 4.....	29%	17%
4½ to 6.....	35%	23½%	4½ to 6.....	28%	16%
7 to 8.....	31%	17½%	7 to 8.....	20%	8%
9 to 12.....	20%	16½%	9 to 12.....	15%	3%

From warehouses at the places named the following discounts hold for steel pipe:

Black	New York	Chicago	St. Louis
⅜ to 3 in. butt welded.....	38%	42.8%	34.27%
3½ to 6 in. lap welded.....	38%	38.8%	27.27%
7 to 12 in. lap welded.....	30%	35.8%	21.27%
Galvanized	**New York**	**Chicago**	**St. Louis**
⅜ to 3 in. butt welded.....	28%	32.8%	19.27%
3½ to 6 in. lap welded.....	16%	24.8%	13.27%
7 to 12 in. lap welded.....	10%	20.8%	6.27%

Malleable fittings Class B and C from New York stock sell at 5 and 5% from list prices. Cast iron, standard sizes 34 and 10

CAST-IRON PIPE—The following are prices per net ton for carload lots:

	New York							
	July 31, 1917	1 Mo. Ago	One Yr Ago	Birmingham	Chicago	St. Louis	San Francisco	Dallas
4 in.	$68.50	$68.50	$34.00	**$63.00**	$68.50	$67.00	**$75.00**	**$72.00**
6 in. and over	65.50	65.50	31.00	**60.00**	65.50	64.00	**73.00**	**69.00**

Gas pipe and 16-ft. lengths are $1 per ton extra.

SEWER PIPE—The following prices are in cents per foot for carload lots:

Size, In.	New York July 31, 1917	New York One Year Ago	St. Louis	Chicago	San Francisco	Dallas
3	$0.111	$0.0725	.....	$0.09	$0.0875	**$0.1032**
4	.111	.0725	.....	.10	.09	**.1032**
5	.1665	.12	.....	.135	.1125	**.1548**
6	.1665	.12	$0.12	.15	.135	**.1548**
8	.255	.165	.165	.21	.2025	**.215**
10	.3885	.24	.23	.315	.30	**.301**
12	.4995	.30	.33	.405	.375	**.387**
15	.666	.405	.50	.54	....	**.559**
18	.925	.57	.75	.75	.75	**.731**
20	1.11	.675	.90	.90	.9625	**.86**
22	1.48	.90	1.13	1.20	1.155	**1.118**
24	1.665	.975	1.28	1.35	1.375	**1.29**
27	2.47	1.665	1.30	....	....	**1.935**
30	2.736	2.035	1.70	....	....	**2.365**
33	3.60	2.625	2.25	....	....	**3.05**
36	4.10	2.94	2.50	....	....	**3.11**

Size, In.	Denver	Seattle	Boston	City	Orleans	St Paul
3	**$0.07**	$0 075	$0 114	$1 10	**$0.0464**	**$0.084**
5	.12	.075	171	.145	.0725	**.126**
8	.19	.225	.266	.18	.135	**.175**
12	.31	.4125	.513	.36	.255	**.315**
24	1.14	1.75	1.71	1.35	1.00	**1.35**
36	2.10	.....	4.2025	3.25	....	**2.83**

CLAY DRAIN TILE—The following prices are per 1000 lin.ft.:

Size, In.	New York July 31, 1917	New York One Year Ago	St Louis	Chicago	San Francisco	Dallas
3	$35.00	$22.50	$18.40	$15.00	**$26.25**	**$19.80**
4	51 00	32.50	20.70	18.00	33.75	28 10
5	65.00	47.50	28.75	23 00	48.75	....
6	90.00	57.50	40.25	27.00	67.50	45 95
8	130.00	97.50	74.75	55 00	....	82 75

ROAD AND PAVING MATERIALS

ROAD OILS—Following are prices in tank cars 8000 gal minimum f.o.b. places named:

New York, 40-50% asphalt	6½c gal
New York, 60-70% asphalt.....	7c gal
New York, dust layer.....	7½c gal
New York, binder	8½c gal
St. Louis, 45-50% asphalt	7c gal
Chicago, 15-20% asphalt	6½c gal
Dallas, 40-50% asphalt	7c gal
Dallas, 60-70% asphalt.....	8c gal
San Francisco 75-95% asphalt.....	**$1.90** bbl

Note—Barrel of 42 bulk gal.

ASPHALTUM—Price per ton in packages and bulk in carload lots:

	Brand	Package	Bulk
New York	Texaco	$40 00	
New York	Mexican*	14 00	11 00
Chicago	Mexican	14 00	10 00
St Louis	Texas or Mexican	13 50	11 00
San Francisco	California	14 50	11 50
Dallas	Texas or Mexican	13 00	11 00
Seattle			10 00
Denver	Trinidad	40.00	
Denver	California	38.00	
Kansas City	Trinidad	40.00	
Kansas City	Texas	44.00	
St Paul	Trinidad	42 00	

*Nominal

PAVING BRICK AND BLOCK—See "Brick" under "Construction Materials."

PAVING STONE—

		June 30, 1917
New York	Manhattan	$ 00
	Other boroughs	
Boston		4.50
Chicago	Albert Dodd granite	2 00
	Aetna granite	2 00
San Francisco	Basalt block, 4x12	2 75
Kansas City		2 00
St. Paul	Sandstone	2 00
New Orleans.....		2 00
		2 00

WOOD BLOCK PAVING—

	Size of Block	Treatment	Per Sq Yd.
[illegible]	3½	16	$2.00
[illegible]	4	16	2.25
[illegible]	4	16	1.85
[illegible]	City specifications		2.10
[illegible]	3½	16	1.91
[illegible]	4	16	1.47
[illegible]	4	20	2.02
[illegible]	4	16	1.95
St. Paul	Minneapolis specifications		2.00

FLAGGING—

		June 29 1917
New York	[illegible]	$0.17 sq ft
	Manhattan	.17 sq.ft.
	[illegible] ft square	.18 sq ft
Chicago	18 in. wide	.75 lin.ft.

CURBING—Prices per lineal foot are as follows:

New York	[illegible]	$0.45
	[illegible]	.50
Chicago	[illegible]	.60
St. Louis	[illegible] edge	.79
	[illegible]	.95
San Francisco	[illegible]	.75
	[illegible]	.85

CONSTRUCTION MATERIALS

SAND AND GRAVEL—Price for cargo or carload lots is as follows, per cu yd.:

	Gravel				Sand	
	1½ In.		¾ In.			
	July 31 1917	One Yr Ago	July 31, 1917	One Yr. Ago	July 31, 1917	One Yr. Ago
Parker	$1.[illegible]	$1.25	$0.90	$1.35	$1.00	$0.50	$0.50
[illegible]	1.40	1.40	.85	1.40	.85	1.00	.85
St. Louis		1.08	.70	1.08	.70	1.08	.60
[illegible]		1.50		1.50	...	1.10	....
San Francisco	1.00	1.[illegible]	1.00	1.00	1.00	1.00	.90
[illegible]		1.85		2.25	....	1.25	....
[illegible]		1.15		1.15	....	1.00	....
[illegible]		.[illegible]		2.25	....	.60	....
[illegible]	....	1.[illegible]	....	1.60	....	.80	....
St. Paul	....	1.10	....	1.10	....	.50	....
[illegible]	....	.[illegible]	....	.75	....	.75	....

Fine White Sand—St. Louis [illegible] $5.00 per ton. Ottawa.....$7.00 per ton

CRUSHED STONE—Price for cargo or carload lots is as follows, per cu yd.:

	1½ In.		¾ In.	
	July 31, 1917	One Year Ago	July 31, 1917	One Year Ago
[illegible]	$1.10	$0.85	$1.25	$0.95
Chicago	1.35	1.10	1.40	1.10
St. Louis	1.35	1.00	1.35	1.00
[illegible]	[illegible]		[illegible]	
San Francisco	1.00	1.00	1.00	1.00
[illegible]	1.50	....	1.50	....
[illegible]	1.45	....	....	....
[illegible]	1.40	....	*1.40*	....
[illegible]	[illegible]	....	1.60	....
St. Paul	1.00	....	1.10	....

LIME—Warehouse prices.

	Hydrated per Ton		Lump per 300-Lb. Barrel	
	Finishing	Common	Finishing	Common
New York	$16.50	$13.25	$2.10	$1.90
Chicago	[illegible]	1.60	....	....
St. Louis	[illegible]	10.75	....	....
[illegible]	[illegible]	15.00	....	....
San Francisco	[illegible]	....	....	1.65

ROSENDALE NATURAL CEMENT—Price to dealers for 500 lb. or more f.o.b. [illegible] including bags:

New York [illegible] $1.15

PORTLAND CEMENT—These prices are for barrels in carload lots, including bags:

	July 31 1917	One Month Ago	One Year Ago
New York	$[illegible]	$[illegible]	$1.72
[illegible]	[illegible]	1.70	1.66
[illegible]	2.77	2.77	1.92
[illegible]	[illegible]	2.31	1.81
[illegible]	[illegible]	2.31	1.81
[illegible]	[illegible]	2.44	1.94
[illegible]	[illegible]	2.40	1.90
[illegible]	[illegible]	2.44	1.94
[illegible]	2.44	2.44	1.94
[illegible]	2.43	2.43	1.93
[illegible]	[illegible]	[illegible]	2.08
[illegible]	[illegible]	[illegible]	1.96
[illegible]	[illegible]	[illegible]	1.89
[illegible]	[illegible]	2.54	2.00
[illegible]	[illegible]	2.49	1.90
[illegible]	[illegible]	2.45	1.85
[illegible]	[illegible]	2.39	
[illegible]	[illegible]	[illegible]	2.30
[illegible]	[illegible]	2.15	
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	2.56	
[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	2.70	
[illegible]	[illegible]	2.63	
[illegible]	[illegible]	[illegible]	

TRIANGLE MESH REINFORCEMENT—Price per 100 sq ft in carload lots:

PLAIN 4-IN. x 8-IN. MESH

036P	0.036	.69	.71	.72	.73	.82	...
053P	0.053	.97	1.01	1.02	1.03	1.16	...
072P	0.072	1.26	1.30	1.32	1.33	1.50	...
097P	0.097	1.62	1.68	1.70	1.71	1.93	...
049R	0.049	.97	1.01	1.02	1.03	1.15	1.97
067R	0.067	1.26	1.30	1.32	1.33	1.50	...
089R	0.089	1.62	1.68	1.70	1.71	1.93	...

Made in 16-, 20-, 24-, 28-, 32-, 36-, 40-, 44-, 48-, 52- and 56-in. width in rolls 150-, 200- and 300-ft. lengths.
Galvanized runs about 10% higher than plain.

EXPANDED METAL LATH—Prices per 100 yd. for painted are as follows:

Carlod

		New York					
Gage	Weight	July 31, 1917	One Year Ago	Chicago	St. Louis	San Francisco	Dallas
27	233	$31.00	$17.00	**$31.00**	**$34.00**	$29.00	**$32.00**
26	250	32.03	18.00	**32.00**	**35.00**	30.25	....
25	300	33.13	19.00	**33.00**	....	....	....
24	340	34.25	20.00	**34.00**	**37.00**	**33.00**	**36.00**
22	450	36.44	23.00	**36.00**	....	....	....

About 10% additional for smaller quantities.

BARS, CONCRETE REINFORCING—The following quotations are per 100 lb.:

ROLLED FROM BILLETS

		Warehouse				
		New York				
In.	Mill Shipment	July 31, 1917	One Year Ago	St. Louis	Chicago	San Francisco	Dallas
¾ and larger.	...*	$5.10	$3.25	$4.736	$4.50	**$6.00**	$4.75
⅝	...*	5.15	3.35	4.786	4.55	6.05	4.80
½	...*	5.20	3.40	4.836	4.60	6.10	4.85
⅜	...*	5.35	3.65	4.986	4.75	6.25	5.00
¼	...*	5.60	4.00	5.236	5.00	6.50	5.25

*Mill quotations on actual specifications.

ROLLED FROM RAILS

	St. Louis	Dallas		St. Louis	Dallas
¾ in. and larger...	$4.00	$4.75	⅜	$4.25	$5.00
⅝	4.05	4.80	¼	5.00	5.25
½	4.10	4.85			

BRICK—The price per 1000 in cargo or carload lots is as follows:

	Common			Paving	
	July 31, 1917	One Month Ago	One Year Ago	Brick	Block
New York	*$8.50*	$9.00	$7.75	$25.00	$35.00
Chicago	8.00	8.00	6.00	*16.00*	24.00
Ct. Louis, salmon	7.00	7.00	9.00	....	....
St. Louis, selected	10.00	10.00	9.00	....	....
Denver	8.00	8.00	....	....	14.00
San Francisco	10.00	....	10.00	....	....
Dallas	8.10	8.10	....	22.00	22.50
New Orleans	9.00	9.00	....	....	27.50
Kansas City	11.00	11.00	....	....	....
Boston	13.25	13.25	....	....	25.00
Seattle	9.00	....	....	....	28.75
St. Paul	8.70	....	....	....	27.00

HOLLOW TILE—Hollow building tile price per block in cents:

	New York					
	July 31, 1917	One Year Ago	Chicago	St. Louis	San Francisco	Dallas
4x12x12	$0.0925	$0.065	$0.07895	$0.054	$0.0825	$0.07
6x12x12	.1295	.091	.11845	.066	.11	.09
8x12x12	.15725	.11	.1369	.09	.1275	.12
10x12x12	.185	.13	.1579	.15	.20	.15
12x12x12	.23125	.1625	.2053	.18	.22	.18

	4x12x12	8x12x12	12x12x12
Boston	$0.0957	$0.171	$0.2266
St Paul	*.055*	*.103*	*.138*
Kaansas City	.0595	.1125	.1575
Denver	.09	.17	.25
New Orleans	**.0892**	**.1417**	**.1863**
Seattle	.06	.10	.16

STRUCTURAL MATERIAL—The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

		New York				
	Pittsburgh	July 31, 1917	1 Yr. Ago	St. Louis	Chicago	San Francisco	Dallas
Beams, 3 to 15 in.	$4.50	$5.25	$2.50	$5.05	$5.00	$7.75	$6.00
Channels, 3 to 15 in.	4.60	5.25	2.50	5.05	5.00	7.75	6.00
Angles 3 to 6 in., ¼ in. thick	4.50	5.25	2.50	5.05	5.00	7.75	6.25
Tees 3 in. and larger	4.50	5.30	2.50	5.05	**5.05**	7.75	6.25
Plates	9.00	9.00	2.90	**8.05**	**8.00**	10.00	9.00

RIVETS—The following quotations are per 100 lb.:

STRUCTURAL

	Mill,	Warehouse				
	Pittsburgh	New York	Chicago	St. Louis	San Francisco	Dallas
¾ in. and larger	$5.25	$7.00	$5.50	$5.55	$6.65	$8.40

CONE HEAD BOILER

¾ in. and larger	5.35	7.10	5.60	5.65	6.75	8.50
⅝ and ¾	5.50	7.25	5.75	5.80	6.90	8.65
½ and ⅝	5.85	7.60	6.10	6.15	7.25	9.00

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York and Chicago:

	1-Ply		2-Ply		3-Ply	
	c.l.	l.c.l.	c.l.	l.c.l.	c.l.	l.c.l.
No. 1 grade	$1.15	$1.30	$1.45	$1.60	$1.75	$1.90
No. 2 grade	1.00	1.15	1.25	1.40	1.50	1.65

Asbestos asphalt-saturated felt (14 lb. per square) costs **$6.50** per 100 lb.

[illegible]-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $1.85 per roll in carload lots and $2.10 for smaller quantities.

Shingles, red and green slate finish, cost **$4.75** per square in carloads, $5 in smaller quanties, in Philadelphia.

ROOFING MATERIALS—Prices per ton f.o.b. New York or Chicago:

	Carload Lots	Less Than Carload Lots
Tar felt (14 lb. per square of 100 sq.ft.)	$59.00	$60.00
Tar pitch (in 400-lb. bbl.)	15.00	*16.50*
Asphalt pitch (in barrels)	29.00	30.50
Asphalt felt	60.00	62.00

CORRUGATED SHEETS—Price of corrugated sheets (2½-in. corrugations) in cents per pound:

Gage		Cincinnati	Birmingham	St. Louis	Denver
18–20	Black	$18.00*	....	$0.092	....
28	Black	5.75*	....	.094	$0.10
18–20	Galvanized	22.50*	$0.11	....	....
28	Galvanized	8.75*	.12	.113	.12

*Price per square of 100 sq.ft.

SHEETS—Price in cents per pound:

Blue Annealed	Large Lots. Pittsburgh	St. Louis	Chicago	San Francisco	New York July 31, 1917	New York One Yr. Ago
No. 10	8.25	9.55	9.50	10.50	**10.00**	4.35
No. 12	8.65	9.60	9.55	10.55	**10.05**	4.30
No. 14	8.85	9.65	9.60	10.60	**10.10**	4.35
Black						
Nos. 18 and 20	8.55	**9.65**	9.30	10.80	**10.30**	3.45
Nos. 22 and 24	8.60	**9.70**	9.35	10.83	**19.35**	3.50
No. 26	8.65	**9.75**	9.40	10.88	**10.40**	3.55
No. 28	8.75	**9.85**	9.50	10.98	**10.50**	3.65
Galvanized						
No. 10	9.50	10.45	9.70	....	....	....
No. 12	9.60	10.45	9.70	12.15	....	4.50
No. 14	9.75	10.45	9.70	12.15	**12.10**	4.50
Nos. 18 and 20	9.90	10.65	10.00	12.45	**12.40**	4.80
Nos. 22 and 24	**10.30**	10.80	10.15	12.62	**12.55**	4.55
No. 26	**10.45**	10.95	10.20	12.77	**12.70**	....
No. 28	**10.75**	11.25	10.50	13.06	**13.00**	5.00

LINSEED OIL—These prices are per gallon:

	New York July 31, 1917	New York One Year Ago	Cleveland July 31, 1917	Cleveland One Year Ago	Chicago July 31, 1917	Chicago One Year Ago
Raw in barrels	$1.16	$0.71	$1.20	$0.73	$1.21	$0.73
5-gal. cans	1.26	.81	1.35	.83	1.36	.83

WHITE AND RED LEAD in 500-lb. lots sell as follows in cents per pound:

	Red July 31, 1917 Dry	Red July 31, 1917 In Oil	Red 1 Year Ago Dry	Red 1 Year Ago In Oil	White July 31, 1917 Dry and In Oil	White 1 Yr. Ago Dry and In Oil
100-lb. keg	13.25	13.50	10.50	11.00	13.00	10.50
25- and 50-lb. kegs	13.50	13.50	10.75	11.25	13.25	10.75
12½-lb. keg	13.75	14.00	11.00	11.50	13.50	11.00
1- to 5-lb. cans	15.25	15.50	12.50	12.50	15.50	12.50

LUMBER—Price per M in carload lots:

Square Edge and Sound Green

	Southern Pine New York 20 Ft. and Under	Southern Pine New York 22-24 Ft.	Southern Pine Chicago 20 Ft. and Under	Southern Pine Chicago 22-24 Ft.	Yellow Pine St. Louis 20 Ft. and Under	Yellow Pine St. Louis 22-24 Ft.
3x 4 to 8x 8	$35.75	$37.75	$31.75	32.75	28.75	29.75
3x10 to 10x10	35.75	36.75	33.75	34.75	30.75	31.75
3x12 to 12x12	38.75	39.75	36.75	37.75	33.75	34.75
3x14 to 14x14	41.75	42.75	39.75	40.75	36.75	37.75
3x16 to 16x16	46.75	47.75	44.75	45.75	41.75	42.75
3x18 to 18x18	51.75	52.75	49.75	50.75	46.75	47.75
4x20 to 20x20	56.75	57.75	54.75	55.75	51.75	52.75

Over 24 ft.—Add $1 for each additional 2 ft. in length up to 40 ft. for sizes 12 x 12 and under; for sizes over 12 x 12 add $2. For merchantable add $2 to sizes 10 x 10 and under. For prime add $2 to the price of merchantable for all sizes.

Prices from Lumberman's Bureau.

Yellow Pine—Dallas. Price per M:

2x4 to 2x12—12 to 16 ft long	$32.50
2x4 to 2x12—10, 18 and 20 ft long	35.00
2x4 to 2x12—22 and 24 ft. long	37.50
4x4, 4x6, 6x6, 8x8, 3x8	37.50
8x10, 10x10, 3x10	40.00
12x12, 3x12	40.00

Rough Douglas Fir, No. 1 Common—More than carload lots in San Francisco:

Size in Inches	15 Ft. and Under	16 to 24 Ft.	25 to 32 Ft.
3 and 4x4	$22.00	$23.50	$34.50
3 and 4x6 and 8	22.00	22.50	23.50
6x6 to 8x8	22.50	23.50	23.50
3 and 4x10	22.00	23.50	24.50
6 and 8x10	23.00	24.00	24.00
10x10	23.00	23.00	25.00
3 and 4x12	22.00	23.50	24.50
6 and 8x12	23.50	24.50	24.50
10 and 12x12	23.00	23.00	25.00
3 and 4x14	23.00	25.00	26.00
6 and 8x14	24.50	25.50	25.50
7 and 9x14	25.50	26.50	26.50
10 and 12x14	24.00	24.00	26.00

	1 In. Rough 10 In. x 16 Ft. and Under Y.P.	1 In. Rough 10 In. x 16 Ft. and Under Fir	1 In. Rough 10 In. x 16 Ft. and Under Hemlock	2 In. T. and G. 10 In. x 16 Ft. Y.P.	2 In. T. and G. 10 In. x 16 Ft. Fir
Boston*	....	....	....	....	....
Kansas City	$44.00	$44.00	$44.00	$52.00	....
Seattle	18.50	18.50	18.50	18.50	18.50
New Orleans	*26.00*	....	....	....	....
St. Paul	....	34.00	34.00	50.00	37.50
Denver	30.00	40.00	27.50	....	*39.00*

	8 x 8-In. x 20 Ft. and Under Y.P.	Fir	Hemlock	Spruce	12 x 12-In. 20 Ft. and Under Y.P.	Fir
Boston*	....	....	....	$40.00	....	....
Kansas City	$39.00	$35.00	$35.00	....	$45.00	$35.00
Seattle	18.50	18.50	18.50	$18.50	18.50	18.50
New Orleans	*24.50*	....	....	....	30.00	....
St. Paul	....	40.00	31.50	32.00	....	45.00
Denver	....	*30.00*	30.00	....	30.00	....

*Prices demoralized; no standing quotations.

NAILS—The following quotations are per keg from warehouse:

	Pittsburgh	St. Louis	Chicago	San Francisco	Dallas
Wire	$4.00	$4.50	$4.45	$4.60	$4.35
Cut	4.65	5.00	4.65	6.15	....

MISCELLANEOUS

FREIGHT RATES—On finished steel products in the Pittsburgh district, including plates, structural shapes, merchant steel bars, pipe fittings, plain and galvanized wire nails, rivets, spikes, bolts, flat sheets (except planished), chains, etc., the following freight rates are effective in cents per 100 lb.:

Baltimore	15.4	Minneapolis	32.9
Boston	18.9	New Orleans	30.7
Buffalo	11.6	New York	16.9
Chicago	18.9	Pacific Coast (all rail)	77.0
Cincinnati	15.8	Philadelphia	15.9
Cleveland	10.5	St. Louis	23.6
Denver	68.6	St. Paul	32.9
Kansas City	43.6		

WATER TREATMENT CHEMICALS—Prices per lb. in New York are as follows:

Sulphate of alumina (iron free)	$0.045 (in 400-lb. bbl.)
Hypochlorite of lime	.03 (in 700-lb. drums)
Soda ash	.04 (in 400-lb. bbl.)
Liquid chlorine	.175 f.o.b. Niagara Falls

Lime is quoted separately on next page.

CONTRACTORS' MISCELLANEOUS SUPPLIES

STEEL SHEET PILING—The following price is base per 100 lb. f.o.b. Pittsburgh, with a comparison of a month and a year ago

July 31, 1917	One Month Ago	One Year Ago
$4.50 to $5.00	$3.60 to 4.00	$2.50

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York July 31, 1917	New York One Year Ago	St. Louis	Chicago	San Francisco
Galvanized	10—2½%	25—2½%	10—2½%	10—2½%	15%
Bright	20—2½%	35—2½%	20—2½%	20—2½%	5%

MANILA ROPE—For rope smaller than ⅝-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ⅝-in., 8 ft.; ¾-in., 6; ⅞-in., 4½; 1-in., 3½; 1⅛-in., 2 ft. 10 in.; 1¼-in., 2 ft. 4 in. Following is price per pound for ⅝-in. and larger, in 1200-ft. coils:

Boston	$0.34	New Orleans	$0.31
New York	.33½	Seattle	.41
Denver	.36	St. Paul	.41
Kansas City	31½		

EXPLOSIVES—Price per pound in small lots at cities named:

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	Gelatin 80%	Black Powder*
New York	....	$0.26½	$0.33½	....	$2.35
Boston	....	....	.33¼	.40¼*	....
Kansas City	.19	.25¼	.30¼	.36½	....
New Orleans	.20¼	.24¼	.29¼	....	....
Seattle	.17½	.23¾	.30¼	....	....
St. Paul	.19	.25¼	.32¼	.41¾	2.35
St. Louis	.15½	.21½	.29½	.34¾	1.95
Denver	.18	.24¼	.31¼	.41¼	....

*75%.

OLD MATERIAL—The prices following are per gross ton paid to dealers and producers in New York. In Chicago and St. Louis the quotations are per net ton and cover delivery at the buyer's works including freight transfer charges.

New York	July 31, 1917	One Month Ago	One Year Ago
Heavy melting steel scrap	$16.00 to 16.50	$15.00 to 15.50	$11.00 to 11.50
No. 1 railroad wrought	17.00 to 17.50	16.00 to 16.50	12.00 to 12.50
Stove plate	13.00 to 13.50	12.00 to 12.50	9.00 to 9.50
No. 1 machinery cast	21.00 to 21.50	20.00 to 20.50	14.00 to 14.50
Machine shop turnings	12.00 to 12.50	11.00 to 11.50	8.00 to 8.50
Cast borings	12.00 to 12.50	11.00 to 11.50	7.00 to 7.50
Railroad malleable cast	23.00 to 24.00	22.00 to 23.00	14.00 to 15.00

Chicago	July 31, 1917	One Month Ago	One Year Ago
No. 1 railroad wrought	$16.00	$15.00	$11.00
Stove plate	13.00	12.00	9.00
No. 1 machinery cast	21.00	20.00	14.00
Machine shop turnings	11.00	10.00	7.00
Cast borings	11.00	10.00	7.00
Railroad malleable cast	19.00	18.00	12.00

St. Louis	July 31, 1917	One Month Ago	One Year Ago
Heavy melting steel scrap	$17.00 to 17.50*	$16.00 to 16.50	$11.00
No. 1 railroad wrought	17.00	16.00	10.00
Stove plate	13.00	12.00	9.00
No. 1 machinery cast	21.00	20.00	14.00
Machine shop turnings	19.00 to 19.50	18.00	11.00
Cast borings	18.50 to 19.00	17.00	10.00
Railroad malleable cast	29.50 to 30.00	28.00	27.00

*For [illegible]

Proposals

For Proposals Advertised See Pages 61 to 66 Inclusive

WATER-WORKS

Bids Close		See Eng. News-Record
Aug. 16.	Waterloo Ia	July 26
Aug. 2	Akron, O.	June 26
Aug. 6.	New York, N. Y.	Aug. 2
Aug. 7.	New York, N. Y. Adv. July 26.	July 26
Aug. 9	Atlantic City, N. J.	Aug. 2
Aug. 13	Red Rock, Okla.	Aug. 2
Aug. 19.	Cumberland, Md. Advertised Aug. 2	Aug. 2
Aug. 25	San Francisco, Cal.	Aug. 2
Sept. 11.	New York, N. Y.	July 12

SEWERS

Aug. 6	Cleveland Heights, O.	July 19
Aug. 7	Caledonia, Minn.	July 26
Aug. 8	Little Rock, Ark.	July 26
Aug. 9.	Newark, N. J.	Aug. 2
Aug. 10.	Piqua, O.	Aug. 2
Aug. 14.	Lebanon, O.	July 26
Aug. 14	Toronto, Ont.	Aug. 2

BRIDGES

Aug. 6.	Camden, N. J.	Aug. 2
Aug. 6.	Fairfield, Cal.	Aug. 2
Aug. 6.	Canton, O.	Aug.
Aug. 6.	San Jose, Cal.	Aug.
Aug. 6.	Elkhart, Ind.	Aug. 2
Aug. 6.	Waseca, Minn.	Aug.
Aug. 6.	Grundy, Va.	Aug.
Aug. 9.	Hartford, Ky.	Aug.
Aug. 10.	La Grange, Ky.	Aug.
Aug. 14.	Tehamah, Neb.	Aug. 2
Aug. 14.	Somis, Cal.	Aug.
Aug. 16.	Storm, N. J.	Aug.
Aug. 23.	Troy, O.	Aug.
Aug. 27.	Elberton, Ga.	Aug.
Aug. 30.	Kankakee, Ill.	Aug.

STRUCTURAL STEEL WORK

Aug. 2.	Albany, N. Y. Adv. July 19 to Aug. 2.	July 19
Aug. 6.	Camden, N. J. Adv. July 26	July 26
Aug. 6.	Spencer, Ind.	July 19
Aug. 6.	Rio Vista, Cal.	July 26
Aug. 9.	Vancouver, Wash.	July 26
Aug. 9.	Portland, Ore.	July 26
Aug. 14.	Brazil, Ind.	July 12
Aug. 14.	Fairmont, W. Va.	July 26
Aug. 16.	Hamilton, W. Va.	July 12
Aug. 21.	Allegan, Mich.	July 26

Adv. July 26 and Aug. 2.

REINFORCED CONCRETE

Aug. 6.	Greenville, Miss.	July 12
Aug. 6.	Columbus, O.	July
Aug. 6.	Santa Barbara, Cal.	July 26
Aug. 6.	Camden, N. J.	July 26
Aug. 7.	Columbia, Mo.	July 26
Aug. 9.	Sultan, Wash.	July 26
Aug. 13	Summit, W. Va.	July 19
Aug. 22.	Lincoln, Neb.	July 19

STREETS AND ROADS

Aug. 6.	Clifton, Ariz.	July 12
Aug. 6.	Kittanning, Pa.	July 26
Aug. 6.	Tacoma, Minn.	July
Aug. 6.	Cincinnati, O.	July 26
Aug. 6.	California	July
Aug. 6.	Poplar Bluffs, Mo.	July
Aug. 6.	Indiana	July 26
Aug. 6.	N. J. & St. George, N. Y.	Aug.
Aug. 6.	Dayton, O.	Aug.
Aug. 6.	West Broward, La.	Aug.
Aug. 6.	Owensboro, Ky.	Aug. 2
Aug. 6.	Jefferson City, Mo.	Aug. 2
Aug. 6.	Bennington, Ia.	Aug. 2
Aug. 6.	Ft. Wall Bluff, Ark.	Aug. 2
Aug. 6.	Council Bluff, Ia.	Aug.
Aug. 7.	Indiana	July
Aug. 7.	Wallace, Idaho	July
Aug. 7.	Indiana	July 12
Aug. 7.	Hinsdale, Ill.	July 19
Aug. 7.	Hunterville, Tex.	July 19
Aug. 7.	Pennsylvania	July 19
Aug. 7.	Camden, N. J.	July 26
Aug. 7.	Paterson, N. J.	July 26

Bids Close		See Eng. News-Record
Aug. 7.	Billings, Mont.	July 26
Aug. 7.	Friar Point, Miss.	Aug. 2
Aug. 7.	Grand Island, Neb.	Aug. 2
Aug. 7.	Buffalo, N. Y.	Aug. 2
Aug. 7.	Wabash, Ind.	Aug. 2
Aug. 7.	S. I., St. George, N. Y.	Aug. 2
Aug. 7.	Rockville, Mo.	Aug. 2
Aug. 8.	Santa Ana, Cal.	July 19
Aug. 8.	Indianapolis, Ind.	July 26
Aug. 8.	Indiana	July 26
Aug. 8.	Canton, O.	Aug. 2
Aug. 8.	New York, N. Y.	Aug. 2
Aug. 8.	Santa Ana, Cal.	Aug. 2
Aug. 8.	Mountainside, N. J.	Aug. 2
Aug. 8.	Atlantic City, N. J.	Aug. 2
Aug. 8.	Elizabeth, N. J.	Aug. 2
Aug. 9	South Bend, Wash.	July 26
Aug. 9.	Portsmouth, Va.	Aug. 2
Aug. 9	New York, N. Y.	Aug. 2
Aug. 9.	Coshocton, O.	Aug. 2
Aug. 9.	Alberquerque, N. M.	Aug. 2
Aug. 10.	Indiana	July 26
Aug. 10.	Uniontown, Pa.	July 26
Aug. 10.	Seattle, Wash.	Aug. 2
Aug. 10.	Walla Walla, Wash.	Aug. 2
Aug. 10.	Boise, Idaho	Aug. 2
Aug. 11.	Indiana	July 26
Aug. 11.	Westerville, O.	Aug. 2
Aug. 11	Whitley City, Ky.	Aug. 2
Aug. 13.	Lewiston, Idaho	May 24
Aug. 13.	Ashland, Ala.	July 26
Aug. 13.	Indiana	July 26
Aug. 13.	Centerburg, O.	July 26
Aug. 13.	Plattsmouth, Neb.	Aug. 2
Aug. 13.	Cincinnati, O.	Aug. 2
Aug. 13.	Sandusky, O.	Aug. 2
Aug. 14.	New Bedford, N. J.	July 19
Aug. 14.	Pennsylvania	July 26
	Adv. July 26 and Aug. 2.	
Aug. 14.	Freehold, N. J.	Aug. 2
Aug. 14.	St. Louis, Mo.	Aug. 2
Aug. 14.	Salt Lake City, Utah	Aug. 2
Aug. 14.	Tampa, Fla.	Aug. 2
Aug. 15.	Canton, O.	Aug. 2
Aug. 15.	Ohio	Aug. 2
Aug. 15.	Medina, O.	Aug. 2
Aug. 15.	Pioneer, O.	Aug. 2
Aug. 16.	Hamlin, W. Va.	July 12
Aug. 16.	Ohio	Aug. 2
Aug. 16.	Savannah, Tenn.	Aug. 2
Aug. 16.	Hazards, Ky.	Aug. 2
Aug. 17.	Jenkins, Ky.	Aug. 2
Aug. 17.	Cincinnati, O.	Aug. 2
Aug. 20.	Indiana	July 26
Aug. 20.	Washington	Aug. 2
Aug. 21.	Stone Harbor, N. J.	Aug. 2
Aug. 27.	Newark, N. J.	Aug. 2

INDUSTRIAL WORKS

Aug. 6.	Mottville, Mich. Adv. July 26.	July 26

EXCAVATION AND DREDGING

Aug. 5.	New Ulm, Minn.	July 26
Aug. 6.	Paxton, Ill.	July 26
Aug. 6.	Mason City, Ia.	Aug. 2
Aug. 7.	Ft. Madison, Ia. Adv. July 26 and Aug. 2.	July 26
Aug. 7.	Jersey City, N. J.	July 26
Aug. 7.	Jefferson City, Mo.	Aug. 2
Aug. 9.	Centre City, Minn.	July 26
Aug. 9.	Mankato, Minn.	Aug. 2
Aug. 10.	Lewiston, Ill.	July 26
Aug. 10.	Portsmouth, O.	Aug. 2
Aug. 13.	Sibley, Ia.	Aug. 2
Aug. 17.	Fairbault, Minn.	Aug. 2
Aug. 20.	Des Moines, Ia.	July 26
Aug. 24.	Memphis, Tenn.	Aug. 2
Oct. 2.	St. Cloud, Minn.	Aug. 2

BUILDINGS

Aug. 3	Columbus, O.	Aug. 2
Aug. 6.	Cheyenne, Wyo.	July 19
Aug. 6.	Santa Barbara, Cal.	July 19
Aug. 7	Cleveland, O.	Aug. 2
Aug. 7	Columbus, O.	Aug. 2
Aug. 5.	North Raymond, Me.	Aug. 2
Aug. 7.	New York, N. Y. Adv. July 26 and Aug. 2	July 26
Aug. 7	Youngstown, O.	July 26
Aug. 8.	Great Bend, Kan.	July 19
Aug. 8.	McPherson, Kan.	Aug. 2
Aug. 8	New York, N. Y.	Aug. 2
Aug. 8.	Morristown, N. J.	Aug. 2
	Lancaster, O.	July 26
Aug. 10.	Fall River, Mass.	July 26
Aug. 10.	Bedford, O.	July 26
Aug. 10.	Vergennes, Vt.	Aug. 2
Aug. 13	Winnfield, La.	Aug. 2
Aug. 14	Mason City, Ia.	July 26
Aug. 15.	Tower, Minn.	Aug. 2
Aug. 15.	Hudson Falls, N. Y.	Aug. 2
Aug. 15.	Burnaby, B. C.	Aug. 2

Bids Close		See Eng. News-Record
Aug. 17.	Cohoes, N. Y.	July 26
Aug. 20.	Troy, N. Y.	July 12
Aug. 22.	Greensboro, N. C.	July 26
Aug. 22.	Modesto, Cal.	Aug. 2
Aug. 24.	New Brunswick, N. J.	July 26

FEDERAL GOVERNMENT WORK

Aug. 6.	Globe, Ariz.	July 5
Aug. 6.	Charleston, S. C.	July 26
Aug. 11.	St. Louis, Mo.	July 26
Aug. 13.	Ft. Mifflin, Penn.	Aug. 2
Aug. 14.	West Point, Ga.	July 12
Aug. 17.	Washington, D. C.	July 12
Aug. 20.	GGlenwood Springs, Colo.	Aug. 2
Aug. 20.	Washington, D. C.	Aug. 2
Aug. 21.	Grand Haven, Mich. Adv. July 26 and Aug. 2.	July 26
Aug. 30.	Franklin, Pa. Adv. July 26 and Aug. 2.	July 26
Sept. 4.	McKees Rocks, Penn.	Aug. 2
Sept. 5.	Torrington, Wyo. Adv. July 26.	July 26
Sept. 5.	Washington, Ga.	Aug. 2
Sept. 6.	Forsyth, Ga.	Aug. 2

MISCELLANEOUS

Aug. 6.	Air Compressors—Galesburg, Ill. Adv. July 26 and Aug. 2.	July 26
Aug. 8.	Incinerator—Brookline, Mass.	Aug. 2
Aug. 21.	Piers—Albany, N. Y. Adv. July 26 and Aug. 2.	July 26
Aug. 22.	Tunnels—San Francisco, Cal. Adv. July 19.	July 19
Aug. 25.	Incinerator—Paducah, Ky.	Aug. 2

Where name of official is not given, inquiries should be addressed to City Clerk County Clerk or corresponding official.

WATER-WORKS

Proposed Work

N. Y., New York—(Official)—Bd. Water Supply rejected bid, contract 187, fitting up chemical and bacteriological laboratory, etc., lower gate chamber Ashokan reservoir, Olive Twp. Noted July 19.

N. J., Jersey City—City plans to lay new water mains in Arlington Sect. About $15,000. R. M. Dolan, clk.

N. J., Rahway—Bd. Water Comrs. plans to improve water system. About $25,000. Address A. J. Wendell.

N. J., South Orange—See "Sewers."

O., Dayton—City had plans prepared by Metcalff & Eddy, engrs., 14 Beacon St., Boston, Mass., building 10,000,000 gal. reservoir in southeastern part of city. Noted May 10.

Mich., Gladstone—City plans to install 500,000 gal. concrete reservoir. About $16,000.

Wis., Niagara—City election soon to vote on $35,000 bond issue to build waterworks system.

Kan., Palo—City voted $30,000 to build waterworks system and electric light plant. G. P. Taylor, Stockton, engr.

Kan., Towanda—City election Aug. 7, to vote on $25,000 bond issue to improve waterworks. A. E. Dudney, clk.

Mont., Philipsburg—City election Aug. 4 to vote on $10,000 bond issue to construct reservoir. W. Neu, clk.

Tex., El Paso — City plans to enlarge waterworks system. About $100,000. W. E. Race, supt.

Tex., Pleasanton— City soon lets contract building waterworks plant and distributing system. About $20,000.

Tex., Waco—City plans to build 1,500,000-gal. reservoir to supply army camp. S. J. Quay, supt.

Okla., Bristow—City election for Aug. 16, to vote on $12,000 bond issue water-works and sewer extensions. Noted June 21

Water-Works (Continued)

Okla., Norman—City election soon to vote on $10,000 bond issue to construct reservoir and pump house.

Okla., Shamrock—City election Aug. 4 to vote on $40,000 bond issue to build waterworks.

Wash., Waitsburg—City election Aug. 20 to vote on $50,000 bonds to construct waterworks system.

Cal., Corcoran—City soon lets contract constructing waterworks system. About $60 000. W. R. Mayer, supt.

Cal., El Centro—City election Sept. 20, to vote on $50,000 bonds to build filtration plant, capacity 3,000,000 gal.

Cal., Los Angeles—Pub. Ser. Comn. secured site near Chatsworth Park and plans to build reservoir, 9,000,000-gal. capacity, 3 dams, earth and rock, from 25 to 75 ft. high and 7 earth dikes. About $ 50,000. W. Mulholand, Knickerbocker Bldg., ch. engr.

Cal., Santa Barbara—City Comrs. to sell $90,000 bonds of $590,000 recently voted to construct concrete lined earth reservoir on Mission Ridge, pipeline from Santa Barbara portal of tunnel to reservoir, and to start preliminary work for concrete dam on Gibralter damsite. J. B. Lippincott, Central Bldg Los Angeles. engr. Noted May 17.

Ont., Ojibway—See "Sewers."

BIDS DESIRED

N. Y., New York—Until Aug. 6, by W. Williams, comr. water supply. Gas and electricity, Municipal Bldg., for furnishing, delivering, unloading, stacking and storing c.-i. box castings, valves, and double-nozzle fire hydrants

Md., Cumberland—(Official)—Until Aug. 20, by A. W. Straub, city clk., for 7,000,000 gal. reservoir in Ridgedale Addition; advertised in this issue.

Okla., Red Rock—Until Aug. 13, by Bd. Trustees, for building waterworks system; including sinking open caisson well, pump house and installing 250 r.p.m. 200-ft. head triplex pump, etc. About $22,000. Noted Apr. 5.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., New York — (Official) — Dept. Water Supply, Gas and Electricity received low bids, July 17, furnishing, delivering, unloading, stacking and storing c.-i. pipe special and valve-box castings, valve and double nozzle fire hydrants as follows: R D. Wood & Co., 400 Chestnut St., Phila., Sect. 1, $48.505; Ornamental Fdry. Co., Anniston, Ala., Sect. 2, $13 690; T. J. Radley Co., 143 Liberty St., Sect. 3, $9850; A. P. Smith Mfg. Co., East Orange, $7999.

★N. Y., New York—(Official)—Bd. Water Supply let Contract No. 29, completing superstructure over drainage chamber, Shaft 21 city tunnel, Catskill Aqueduct, to Lustig & Weil, 103 Park Ave., $61,516.

★N. Y., New York—(Official)—Bd. Water Supply let contract No. 184, paving vitr. brick, Kensico Aerator, Mt. Pleasant, to H. E. Fox Constr. Co., 81 East 125th St., $42,850. Noted July 19.

★N. Y., New York—(Official)—Bd. Water Supply let Contract No. 179, surfacing with vitr. brick block about 2000-ft. highways, Kensico Dam, North Castle to Empire Eng. Co., 6 Church St., $39,695. Noted July 2.

N. J., Newark—Bd. Wks. received low bid building meter recording station, Bloomfield Ave. and North 6th St. from F. McCue, 142 Market St., $12,496.

★Ga., Macon—C. T. Williamson, chr. water com., let contract extending water mains from East Macon to cantonments at Holley Bluff to U. S. Cast Iron Pipe & Fdry. Co., 30th Ave., Birmingham, $45,000. Noted June 14.

★Ia., Waverly—(Official)—City let contract installing 200,000-gal. rein.-con. reservoir to C. H. J. H. Russell, Waverly, $14,154; 1200-ft. 12-in. c. i. pipe to W. A. Edgar, Cedar Rapids, $6600. Noted July 12.

★Minn., Duluth—(Official)—City let contract 500 tons c. i. pipe to U. S. Cast Iron Pipe & Fdry. Co., 122 South Michigan Ave., Chicago. Noted July 19.

★Kan., Chanute—City let contract improving waterworks to Chanute Constr. Co., Chanute, $25,000. Noted July 5.

★Kan., Junction City — (Official) — City let contract concrete reservoir to Lyon & Paterson, Salina, $12,873. Noted July 19.

★Kan., Pittsburg—City let contract 1,000,000 gal. crank and flywheel pumps to H. R. Worthington Co., 824 Scarritt Bldg., Kansas City, Mo., $18,400; also 6,000,000-gal. centrifugal pump to Allis Chalmers Mfg. Co., West Allis, Wis., $7661. Noted July 5.

Wyo., Casper—City received low bid improving water-works from W. F. Henning, Casper, $98,200. Noted July 5.

★Colo., Colorado Springs—City let contract laying water pipe line extensions to J. Schwartz, 1015 East Boulder St., $41,900. Noted May 10.

★Colo., Colorado Springs—City let contract addition to Reservoir No. 4, to increase capacity from 660,000,000 gal. to 864,000,000 gal., to H. J. Reid, Colorado Springs. About $35,000. Noted June 28.

★Ariz., Winslow—Atchison, Topeka & Sante Fe R.R. let contract 5,000,000-gal. rein.-con. reservoir and filtration plant on Clear Creek to C. W. Miller, San Bernardino.

★Wash., Seattle—Bd. Pub. Wks. let contract installing water mains in Shilshole Ave. to Superior Constr. Co., 1642 Lane St., $27,587, using wood pipe. Noted June 14.

SEWERS

Proposed Work

N. J., Passaic—Bd. Comrs. plans to build sewer in Amsterdam Ave. and extend sewers in Palmer and Elliot Sts., and Union and Park Aves. C. R. Wise, city engr.

N. J., Paterson—Bd. Wks. plans to build sewers in East Main, Hoxsey, East 23rd and Courtland Sts. and 7th Ave. H. J. Hardes, city engr.

N. J., South Orange—(Official)—Village sold $35,000 bonds for sewer improvements, $19,000 for waterworks, $12,000 for streets, and $23,000 for eliminating grade crossings. F. Feneer, treas. Noted July 12.

O., Barberton—City had plans prepared by R. W. Pratt, engr., 708 Hippodrome Bldg., Cleveland, for constructing lateral sewer in northern section of city. About $90,500.

O., Canton—City election soon to vote on $290,000 bond issue for building East and West intercepting sanitary sewer. W. E. Sarver, city engr.

O., Cleveland—City plans to install sewers in East 123rd, East 155th, East 156th and East 140th Sts.. R. Hoffman, city engr.

O., Youngstown—City plans to build sewers in portions of Clinton, Webb and Drummond Sts. F. M. Lillie, city engr.

Ill., Cross Point—(Official)—Bd. Local Improv. rejected bids for building sanitary sewerage system. J. S. Braun, clk. Noted May 3.

Ia., Dubuque — City soon receives bids building sanitary sewers in Cora and Exchange Sts. J. J. Shea, city engr.

Colo., Midvale—City plans laying 8-in. sewers in Dist. No. 2. About $13,500.

Ariz., Glendale—City voted $50,000 bonds to construct sewerage system. F. Holmquist, Phoenix, engr.

Wash., Port Angeles—See "Streets and Roads."

Wash., Seattle—City had plans prepared for trunk sewers and outfall in 42nd Ave., et al. About $32,626. A. H. Dimock, city engr.

Ore., Woodburn—State Bd. Health, Salem, approved plans of L. B. Wickersham, engr., Chamber Commerc Bldg., Portland, building sewerage system here. Bids soon. About $40,000.

Cal., Santa Barbara—See "Streets and Roads."

Cal., Ventura—City having plans prepared by Olmstead & Gillelen, engrs, 1112 Hollingsworth Bldg., Los Angeles, for sewerage system. About $15,000.

Ont., Ojibway—City having plans prepared building waterworks and sewerage systems, including sewage disposal and filtration plants. O. E. Fleming, utility comr.

B. C., Vancouver—Vancouver and Dists. Joint Sewerage & Drainage Bd having plans prepared for sewerage system. A. D. Creer, engr.

BIDS DESIRED

N. J., Atlantic City—Until Aug. 9, by Bd. Freeholders for chlorine control apparatus and 5 year contract for supply of liquid chlorine for tuberculosis hospital sewer plant. Address T. Haines

N. J., Newark—(Official)—Until Aug. 9, by Bd. St. and Water Comrs. for constructing sewers in Wheeler Point Rd. Fording South 20th and Miller Sts. M. R. Sheppard, ch. engr.

O., Medina—See "Streets and Roads."

O., Piqua—(Official)—Until Aug. 10, by J. F. Lucky, dir. pub. ser., for constructing Northwest storm sewer. A. Schroeder, city engr.

Ont., Toronto—Until Aug. 14, by T. L. Church, chn. bd. control, for extending Rosedale Creek sewer from high level pumping station to Russell Hill Rd. and Clarendon Ave. About $40,000. T. McQueen, secy. Noted July 12.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., Brooklyn — (Official) — L. H. Pounds, boro. pres. received low bids building sewers (a) Bay 37th and Bay 38th, (b) Montgomery St., from C. Pessacca, 803 Kent Ave., (a) 135%; (b) 120%; Murphy Bros., 215 4th Ave., (a) 159%; (b) 148%. Noted June 28.

★N. Y., Rochester—See "Streets and Roads."

★Pa., Phila. — (Official) — G. E. Datesman, dir. pub. ser., let contract constructing Northeast sewage treatment works to Phila. Subway Constr. Co., 712 Lincoln Bldg., $1,025,000. Noted July 12.

Ia., Davenport—(Official)—City received low bids, June 17, installing sewers using single and double block in (a) Howell St., (b) Cedar St., (c) McManus Creek sewer, (d) Kirkwood Blvd., (e) Rock Island St., as follows: Independent Constr. Co., 304 Lane Bldg., (b) $17,691 single block, $17,479 double block, (c) $20,105 and $19,510, (d) $27,762 and $26,738, (e) $77,183 and $74,318; D. E. Keeler Co., foot Marquette St., (a) $2208 and $2347, (b) $17,282, (c) $19,135, (d) $28,433 and $28,973, (e) $74,449 and $71,563; McCarthy Improv. Co., 220 Main St., (a) $2232, (b) $17,700, (c) $19,314, (d) $27,981 and $28,651, (e) $78,378 and $76,150. Noted July 12.

★Kan., Manhattan—City let contract installing storm sewer on Bertrand Ave. to Central Bridge Co., $11,691. Noted June 7.

★Wash., Seattle—City let contract building sewers in West and North 45th Sts., to Fiorito Bros., 1630 25th Ave., S., $18,115. Noted July 26.

Ore., Portland—City received low bids building sewrs in Powell Valley Rd. Dist. from J. F. Shea, 6 North 2nd St., $23,531; Jacobsen-Jensen Co., 407 Stanton St., $25,486; J. Keating, Portland, $25,810.

BRIDGES

Proposed Work

S. C., Charleston — See "Streets and Roads."

Ky., Paducah—McCracken Co. plans to build several rein.-con. bridges. About $40,000. R. H. Young, co. engr.

O., Dayton—Montgomery Co. to sell $15,000 bonds Aug. 6 to build and repair bridges. W. H. Aszling, clk.

Ind., Warsaw—Kosciusko Co. plans to build viaduct under Pennsylvania R.R. About $28,000. Railroad to pay $21,000 toward cost.

Mont., Virginia City — (Official)—State Highway Comn. rejected bids for 1 130-ft. span combination highway bridge over Saline Spring Creek and 1 65-ft. combination highway bridge over Odell Creek, Madison Co. as too high. C. C. Adams, co. engr. Noted July 12.

Mo., Linn—City voted $20,000 bonds to build bridge over Osage River.

Okla., Wetumka—Town voted $34,000 bonds to build bridges and roads.

Wash., Seattle—Council appropriated $17,600 to build approaches to 15th Ave. northwest bridge from Nickerson St. side. A. H. Dimock, city engr.

Cal., Fresno—Fresno and Madera Cos. plans to rebuild Lane Bridge. About $19,062. Address Co. Clk., Fresno.

BIDS DESIRED

N. J., Camden—Until Aug. 6, by Bd. Freeholders for 3-span rein.-con. bridge over Newton Creek, 115 ft. long, 50 ft. wide. J. J. Albertson, Magnolia, co. engr.

N. J., Newark—Until Aug. 27, by Bd. Freeholders Essex Co. for rein.-con. Edison bridge over Passaic River, Little Falls Bd. also cross-drains and catch-basins. F. A. Reimer, co. engr.

N. J., Salem—Until Aug. 16, by Bd. Freeholders, Salem Co. building rein.-con. highway bridge and spillway at Axia Mills. H. P. Gray, clk.

Va., Grundy—(Official)—Until Aug. 6, by Comrs. Buchanan Co. for 144-ft. steel bridge over Dismal River, fill approaches

Bridges (Continued)

Ga., Elberton—(Official)—Until Aug. 27, by Elbert and Madison Co. Comrs., Elberton building Towus lattice highway bridge over Broad River, 300 ft. long, 16 ft. wide, 3 split rock piers. J. McIntosh and G. O. Griffith, comrs.

Ky., Hartford—(Official)—Until Aug. 9, by F. M. Kaisersatt, aud. Ohio Co., building steel bridge over public ditch near Reynolds, involving 208 cu.yd. concrete, 31,800 lb. structural steel for 16-ft. roadway, 25,000 lb. 12-ft. roadway, 4900 lb. lumber 16 ft. roadway, 3740 lb. 12-ft. roadway. C. D. Snead, engr.

Ky., La Grange—(Official)—Until Aug. 10, by Oldham Co., building 3 concrete bridges on La Grange and Shelbyville Rd., involving 350 cu.yd. concrete all classes, and 10,304 lb. steel. R. Wiley, comr.

O., Canton—(Official)—Until Aug. 6, by Stark Co. Comrs., for repairing Tuscarawas River Bridge, Navarre-Justus Rd., involving 27,739 lb. new steel joists, 80 pieces new joist clips, etc. W. C. Schick, clk.

O., Troy—(Official)—Until Aug. 22, by Miami Co. Comrs. for removing Bridge No. 20 on I. C. H. No. 208 over Stillwater River at Covington, also building new structure. C. N. Peters, co. aud. Noted July 26.

Ind., Elkhart—Until Aug. 6, by Comrs. Elkhart Co., Goshen, for bridge over St. Joseph River on Elkhart Ave. County to appropriate $63,800 toward cost, Indiana & Michigan Electric Co., $18,400. C. L. Kinney, co. engr. Noted June 21.

Ill., Kankakee—Until Aug. 30, (readvertised) by Comrs. Kankakee and Will Cos., Court House, Kankakee, for rein.-con. arch bridge over Kankakee River between 2 counties; 7 spans 70-ft. long and 2 spans 68 ft. long with 20-ft. roadway. Cost bridge proper, $43,000; culvert approach, grades, spandrel fill and wearing surface, $7150. Noted June 28.

Minn., Waseca—(Official)—Until Aug. 6, by Waseca Co. Comrs., building 1 40-ft. girder span concrete bridge, 1 16-ft. slab span concrete bridge, 1 6 x 8 x 40-ft. rein.-con. culvert, concrete backing, wing walls for I-B bridge. T. Peterson, co. aud.

Neb., Tehamah—(Official)—Until Aug. 14 (readvertised) by M. S. McGrew, city clk., for rein.-con. highway bridge, 2 34-ft. deck girder type spans and 150-ft. retaining walls. About $12,000. A. C. Arend, Brandies Bldg., Omaha, engr. Noted July 19.

Cal., Fairfield—Until Aug. 6 by Bd. Superv. Solano Co. for constructing bascule bridge over Sacramento River.

Cal., San Jose—(Official)—Until Aug. 6, by Bd. Superv. Santa Clara Co., building rein.-con. bridge over Llagas Creek on Church Ave., Superv. Dist. No. 1.

Cal., Somis—Until Aug. 14, by Bd. Supervs. Ventura Co., Ventura, for Center St. bridge, 4 mi. east of Somis, involving 94 cu.yd. concrete in abutments, 6 cu.yd. concrete in pavement slab, 7640 lb. reinforcing steel. J. B. McCloskey, clk

PRICES AND CONTRACTS AWARDED
(★Indicates award of contract)

N. Y., New York—(Official)—Boro. received low bid constructing Park Ave. viaduct from 40th St. to Grand Central Sta., from Terry & Tench, Grand Central Terminal, $57,020; Snare & Triest Co., Woolworth Bldg., $575,500; P. T. Cox Contr. Co., 7 Nassau St., $580,224.

★**Pa., Birdsboro**—Philadelphia & Reading R.R. let contract 5-span rein.-con. Bridge No. 85 to Bennett & Randall, Reading.

★**Ala., Birmingham**—(Official)—Bd. Revenue of Jefferson Co. let contract steel bridge over Warrior River to Southern Bridge Co., 39th St., 8c. per lb. Noted June 28.

O., Barberton—T. J. Davies, dir. pub. ser., received low bids for concrete and steel viaduct known as Tuscarawas Ave. Viaduct from E. J. Landers, Canton, and Harbaugh-Constr. Co., 1134-6 Ind.-Pythian Bldg., Indianapolis, $182,983. Both bids were above amount appropriated for work. Noted June 28.

O., Miamisburg—W. H. Azzling, co. clk., Dayton, received low bids for steel superstructure for bridge No. 248 over Great Miami River, from Brookville Bridge Co., $114,700; Central States Constr. Co., 606 Beecher St., Indianapolis, $115,500; Illinois Bridge Co., 53 West Jackson Blvd., Chicago, $117,000. Noted July 5.

★**O., Youngstown**—(Official)—Youngstown Sheet and Tube Co., Stambaugh Bldg., let contract rebuilding bridge recently destroyed by tornado, 100 ft. high, 327 ft. long to Heyl & Patterson. Noted July 19.

★**Okla., Buffalo**—See "Railways."

★**Mich., Cassapolis**—Cass Co. let contract 18 bridges on Dowagiac River Drain to Reach Mfg. Co., Charlotte, $66,500.

★**Ill., Danville**—(Official)—Vermilion Co. let contract rein.-con. arch bridge, Sect. 6, Georgetown Twp. to Porter-McCully Constr. Co., Mackinaw, $19,500. Noted July 26.

★**Okla., Tulsa**—Tulsa Co. let contract Sand Springs Bridge to Canton Bridge Co., Weder Ave., Canton, $17,000.

Wash., Bellingham — Whatcom Co. Comrs., Marietta, received low bids for rein.-con. pier bridge from Worel & Co., Bellingham, $49,020; Illinois Bridge Co., Seattle, $54,220; Croxson & Kirk, Portland, $56,702.

Cal., Nicolaus—Sutter Co. Supervs., Yuba City, received low bids bridge over Feather River from W. C. Duncan Constr. Co., Sharon Bldg., San Francisco, $118,516; C. E. Cotton Co., $146,730; Clinton Constr. Co., 140 Townsend St., San Francisco, $148,880.

STRUCTURAL STEEL WORK

BIDS DESIRED

Va., Grundy—See "Bridges."
O., Canton—See "Bridges."
Cal., Fairfield—See "Bridges."

PRICES AND CONTRACTS AWARDED
(★Indicates award of contract)

★**Ala., Birmingham**—See "Bridges."
O., Dayton—See "Bridges."
O., Miamisburg—See "Bridges."

REINFORCED CONCRETE

Proposed Work

Ky., Paducah—See "Bridges."
Cal., Santa Ana—See "Miscellaneous."
Cal., Santa Barbara—See "Waterworks."

BIDS DESIRED

N. J., Camden—See "Bridges."
N. J., Newark—See "Bridges."
N. J., Salem—See "Bridges."
Ky., Hartford—See "Bridges."
Ky., La Grange—See "Bridges.",
Ill., Kankakee—See "Bridges."
Neb., Tehamah—See "Bridges."
Cal., San Jose—See "Bridges."
Cal., Somis—See "Bridges."

PRICES AND CONTRACTS AWARDED
(★Indicates award of contract)

N. J., New Brunswick—See "Miscellaneous."
★**Pa., Birdsboro**—See "Bridges."
★**Pa., Phila.**—See "Industrial Works."
★**Fla., Panama City**—See "Streets and Roads."
O., Barberton—See "Bridges."
★**O., Cleveland**—See "Industrial Works."
★**Ind., Indianapolis** — See "Industrial Works."
★**Ill., Danville**—See "Bridges."
★**Ia., Waverly**—See "Waterworks."
★**Kan., Junction City** — See "Waterworks."
★**Ariz., Winslow**—See "Waterworks."
Wash., Bellingham—See "Bridges."

STREETS AND ROADS

Proposed Work

Massachusetts—(Official) — State Highway Comn., Boston, rejected bids building 14,600 ft. state highway, Egremont-West Boylston Twps. Noted July 19.

N. Y., Eastwood — (Official) — City rejected bids grading and macadamizing portion Blust St. L. B. Smith, clk. Noted July 19.

Pa., McKeesport — Council passed ordinance to improve portions Patterson, Garbett and Oakland Aves., and Craig and De Long Sts. J. M. Smith, city engr.

Delaware—(Official) — State Highway Comn., Dover, made surveys for proposed highway from Newark, Del., to Elkton, Md., 2.6 mi. in New Castle Co. Bids will be received about Aug. 30. County will bear cost of work. C. M. Upham, ch. engr. state highway dept.

Va., Newport News—City plans $100,000 bond issue for improving streets. Address the Mayor.

W. Va., Parkersburg—Wood Co. Court plans to pave 2 mi. of River Rd., about 2000 mi., between this city and Williamstown.

S. C., Charleston — Charleston Co. will vote Aug. 29 on $275,000 for improving roads and bridges.

Ga., Atlanta—City plans to repave portion North Ave. County to appropriate $15,000 toward cost. H. M. Hunt, city engr.

Fla., Key West—Monroe Co. election Aug. 14 to vote on $100,000 bonds to build hard surfaced road from Key West to Stock Island.

Fla., Milligan—Okaloosa Co. voted $50,000 bond issue for grading and hard-surfacing portions of road in special road and bridge district.

Miss., Magnolia—Pike Co. Comrs. sold $10,000 bonds to build good roads.

Miss., Weathersby—Simpson Co. Comrs. sold $60,000 bonds to construct Central Highway. Address Co. Clk., Mendenhall.

La., Kenner—Town Council plans $25,000 bond issue for improving streets. Address the Mayor.

La., Lake Providence—Carroll Co. sold $100,000 bonds to build lateral roads and highway to Oak Grove, West Carroll Co. Noted May 10.

Tenn., Chattanooga—Hamilton Co. Highway Comrs. plans to build Manufacturers Rd., to be an extension of Frazier Ave. About $10,000.

Tenn., Clarksville — Montgomery Co. Comrs. voted $50,000 bond issue for building roads.

O., Bryan—Williams Co. to sell $21,000 bonds Aug. 3 to improve portion I. C. H. No. 306. G. C. Boucler, aud.

Ill., Belleville—Bd. Superv. St. Clair Co., sold $400,000 bonds to improve streets. Noted July 5.

O., Cincinnati—City Council plans resurfacing Larch Ave., bituminous macadam, paving Jones St., asphalt or bitulithic and Verdin Ave., brick. F. Krug, city engr.

O., Cincinnati—C. F. Hornberger, dir. pub. wks., soon lets contract repaving Lincoln Ave., with wood block; about $37,000; also improving Dayton St. with either granite and bitulithic or all granite; about $24,150 and $29,455 respectively.

O., Cleveland—City plans paving portions of East 123rd, East 128th, East 158th, East 160th, East 117th, East 157th, Korman, Olive and McElhatten Streets. R. Hoffman, city engr.

O., Warren—Trumbull Co. Comrs. sold $113,250 bonds to improve roads. W. Fahr, clk. Noted June 14.

Ind., South Bend—Bd. Wks. had new plans prepared for paving Mishawaka Ave. and Eddy St., about $199,800; also paving portion Dubail Ave., $44,000; F. J. Anderson, city engr.

Ill., Chicago—City plans extending Ogden Ave. from Union to Lincoln Park; also improving Robey St., Ashland and Western Aves. J. Ericson, city engr.

Ill., Galesburg—City plans to build 133,000 sq.ft. sidewalk on North Seminary St., cement. About $25,376. F. M. Connolly, city engr.

Ill., Hillsboro—City plans paving Hamilton, Brailey and Water Sts. and Springfield Rd.

Ia., Des Moines—City passed resolution to widen and grade portion North Union St., 50 ft. K. Kastberg, city engr.

Minn., Duluth—St. Louis Co. voted $20,000 bond issue to improve roads. O. Halden, aud.

Kan., Beloit—City plans paving portion of Mill St. C. R. Herrick, clk.

Kan., Wichita—City plans paving portion James St. B. Wells, city engr.

Neb., Lincoln—Comrs. Paving Dist. No. 18, Lancaster Co., plan to build highway joining Lincoln and University Pl., brick.

Neb., Lincoln—City plans paving portion L St. A. Dobson, city engr.

Mo., Independence—Jackson Co. plans to build roads. About $70,000. Federal Government to appropriate $35,000 toward cost.

Mo., New Madrid—New Madrid Co. election Aug. 3 to vote on $800,000 bonds to build highways. Noted July 5.

Mo., Sedalia—City passed ordinance for paving and building sidewalks, portions of Quincy Ave., also curbing East 5th St. F. T. Leaming, city engr.

Arkansas — E. H. McGill, engr. State Highway Dept., Little Rock, had plans prepared building road from Melbourne to Mt. Olive, a link in Hot Springs-Mammoth Spring State Highway.

Ark., Berryville—Carroll Co. Comrs. voted $75,000 bond issue for improving roads.

Tex., Cameron.— State Atty. General's Dept., Austin, approved $20,000 bond issue to build good roads in Milam Co., Rd. Dist. No. 7 and $15,000 bond issue for same purpose in Rd. Dist. No. 12.

Streets and Roads (Continued)

Tex., Center—(Official)—Shelby Co. election Sept. 1 to vote on $600,000 bond issue to build roads. R. H. McCauley, clk. Noted July 19.

Tex., Lavaca—County election Aug. 14 to vote on $75,000 bond issue to improve roads in Dist. No. 2.

Tex., Victoria—City soon lets contract paving various streets. About $300,000. A. Block, city engr.

Okla., Buffalo—Harper Co., Good Twp., voted $13,500 bond issue for building roads.

Okla., Fallis—(Official)—Lincoln Co. sold $16,000 bonds to build roads. Address Co. Clk., Chandler. Noted July 19.

Washington—State Highway Comn., Seattle, soon lets contract constructing about 18 mi. Central Washington Highway in Franklin Co., to cost $60,000. County will gravel and surface road next year, $30,000.

Wash., Ellensburg—City plans concrete walks portion 2nd, 4th, 7th, Sprague and Ruby Sts. About $12,000.

Wash., Everett—Snohomish Co. Comrs. rejected bids hardsurfacing Bond Issue Propositions Nos. 26 and 29. New bids. W. C. Bickford, co. engr. Noted July 5.

Wash., Port Angles—Council passed ordinance to pave, grade, and build sewers, ditches and culverts on several streets. About $20,000.

Wash., Port Orchard—Kitsap Co. Comrs. rejected bids building and improving Permanent Highway No. 1-C. New bids. F. D. Gore, co. engr Noted July 5.

Wash., Seattle—City had plans prepared planking, etc., on Northlake Ave., about $84,873; paving portions 24th Ave. N. and East Montlake Pl., $10,000, Beacon Ave., $70,000. A. H. Dimock, city engr.

Wash., South Bend—Pacific Co. Comrs. to sell $275,000 bonds Aug. 7 to build highway. E. E Decker, co. treas.

Oregon—State Highway Comn. soon lets contract paving 10 mi. road between Monroe and Junction City, in Benton and Lane Cos.

Oregon—State Highway Comn. plans grading and paving portions Lower Columbia River Highway. About $435,000.

Ore., Condon—Gilliam Co. soon receives bids macadamizing portion Canyon Rd. About $15,000.

Cal., Eureka—City plans paving B'way., concrete base and asphalt surface. About $50,000. G. A. Strand, city engr.

Cal., Glendora—City sold $10,000 bonds to improve streets.

Cal., Oceanside—City election soon to vote on bonds to pave Hill St., from north to south boundaries of city, concrete.

Cal., Santa Barbara—City soon lets contract paving San Andreas, Canon, Perdio, and Marilla Sts., 4-in. concrete, 2-in. asphalt surface, concrete curbs and gutters; also vitr. pipe sewers. A. B. Cook, city engr.

BIDS DESIRED

N. Y., Buffalo—Until Aug. 7, by A. C. Hinkley, clk. bd. supvrs. Erie Co., for Co. Rd. No. 22, Glenwood-East Concord Part 1.

N. Y., New York—Until Aug. 8, by M. M. Marks, boro. pres., Municipal Bldg., furnishing and delivering 1000 tons limestone dust, 350,000 gal. refined asphalt 15,000 cu. yd. asphaltic wearing surface.

N. Y., New York—Until Aug. 8, by M. M. Marks, boro. pres., Municipal Bldg., regulating, repaving with sheet asphalt, portion roadways Pine, West 162nd St. and Broadway.

N. Y., New York—Until Aug. 9, by Park Bd., Dept. Parks, Municipal Bldg., repaving cement walks, Battery Pk., paving and repaving walks of Central and other parks, asphalt mastic. C. Ward, pres.

N. Y., S. I., St. George—Until Aug. 6 by C. D. Van Name, boro. pres., Boro. Hall, regulating and repaving with bituminous concrete portion roadway Wright Ave.

N. Y., S. I., St. George—Until Aug. 7 by C. D. Van Name, boro. pres., Boro. Hall, St. George, furnishing and delivering 650 cu.yd. 1- to 2-in. broken stone, 300 cu.yd. screenings of trap rock, Dist. No. 1; 900 cu.yd. 1- to 2-in. broken stone, 450 cu.yd. screenings of trap rock, Dist. No. ; 1040 cu.yd. 1- to 2-in. broken stone, 100 cu. yd. screenings trap rock, Dist. No. 3.

N. J., Atlantic City—Until Aug. 8 by Bd. Freeholders Atlantic Co., for furnishing 190,000 gals. lignin binder known as pigrim for Absecon, Hammonton, Egg Harbor City, Mays Landing and Pleasantville. A. H. Nelson, co. engr.

N. J., Elizabeth—Until Aug. 9, by Bd. Pub. Wks., paving Monroe Ave., sheet asphalt, 6-in. concrete foundation. O. E. Collins, city engr.

N. J., Freehold—Until Aug. 14, by E. C. White, chn. twp. com. for improving 6790 sq.yd. Hamilton-Glendola Rd. with gravel surface.

N. J., Mountainside—(Westfield P. O.)—Until Aug. 8, by Bd. Freholders Union Co., repairing Mountain Ave., 5000 lin.ft. stone and tarvia. J. L. Bauer, co. engr.

N. J., Newark—(Official)—Until Aug. 27 (change of date) by Bd. Freeholders Essex Co., improving Little Falls Rd., bituminous concrete, Type A, Cedar Grove Twp., also constructing concrete I-beam bridge over Peckham River, Little Falls Rd. F. A. Reimer, co. engr. Noted June 28.

N. J., Stone Harbor—Until Aug. 21, by Cape May Co. Comrs., Cape May for constructing stone road through here. L. M. Rice, Wildwood, co. engr.

Md., Rockville—(Official)—Until Aug. 7 by Comrs. Montgomery Co., for State aid highway; advertised in this issue. Noted June 28.

Va., Portsmouth—Until Aug. 9 by Comrs. Norfolk Co., for building new Jamestown Blvd. with bituminous macadam on concrete base.

Ga., West Point—Until Aug. 7 by City paving, grading, curbing, draining, building sidewalks various streets, concrete, brick or asphalt. About $60,000. L. Strong clk. Noted July 5.

Fla., Tampa—Until Aug. 14, by Comrs., Hildsborough Co. for building hard surfaced road in Wimauma Spl. Rd. & Bridge Dist. W. P. Culvreath, clk. Noted May 17.

Miss., Friar Point—Until Aug. 7, by Bd. Aldermen, for building 120,000 sq.ft. concrete sidewalks. M. Y. Scott, city clk.

Miss., Indianola—Until Aug. 17 by J. E. Johnson, chancery clk., for 25-mi. gravel road in Sunflower Co.

Louisiana—Until Aug. 6, by Highway Dept., Bd. State Engrs., New Orleans Court Bldg., New Orleans, for building 33-mi. gravel road in Road Dist. No. 1, Coupee Parish. F. M. Kerr, ch. engr.

Tenn., Savannah—Until Aug. 16, by J. E. Holland, chn. highway comn., for building 40 mi. gravel road in Hardin Co. F. M. Patton, Savannah, engr.

Ky., Hazards—Until Aug. 16, by city improving various streets. About $30,000.

Ky., Jenkins—Until Aug. 17, by City improving streets. About $20,000. L. B. Abbott, engr.

Ky., Owensboro—Until Aug. 6, by Fiscal Court of Daviess Co., for improving Henderson Rd., involving 11,888 cu.ft. excav., 57 cu.yd. concrete, 2318 tons broken stone, or 1756 cu.yd. river gravel.

Ky., Owensboro—Until Aug. 6, by Fiscal Court, Daviess Co., for improving 3.54 mi. Hardinsburg Rd. involving 33,620 cu.yd. excava. and 32.3 cu.yd. concrete. J. Weir, co. clk. Noted July 26.

Ky., Whitley City—Until Aug. 11, by City and McCreary Co. for improving streets. About $10,000.

Ohio—Until Aug. 15, by State Highway Comn., Columbus, building roads as follows: Asntabula Co., Sect. "C," Youngstown-Conneaut Rd., I. C. H. 13, grading roadway, building bridges and culverts and paving with either monolithic brick or concrete, 5 mi., about $114,656; Auglaize Co., Sect. "A-1," Wapakoneta-St. Marys Rd., I. C. H. 165, brick, rein.-con., Warrenite or waterbound macadam, 1.79 mi., $33,953; Clark Co., Sect. "A-1" Springfield-Jamestown Rd., I. C. H. 472, grading roadway, building bridges and culverts and paving with bituminous macadam, 1.54 mi., $32,145; Coshocton Co., Sect. "A," Mt. Vernon-Coshocton Rd., I. C. H., 339, bituminous macadam or waterbound gravel, 3.60 mi., $47,998; Crawford Co., Sect. "J," Columbus-Sandusky Rd., I. C. H. 4, brick, 1.02 mi., $29,957; Sect. "G," Bucyrus-Upper Sandusky Rd., I. C. H., 200, 1.31 mi., $39,141; Cuyahoga Co., Sect. "A," Chagrin Falls-Cuyahoga Falls Rd., I. C. H., 91, either brick or monolithic brick, 2.72 mi., $99,356; Fairfield Co., Sect. "A-1," Baltimore-Reynoldsburg Rd., I. C. H. 461, waterbound macadam, 2.25 mi., $31,241; Sect. "M," Cincinnati-Zanesville Rd., I. C. H., 10, waterbound macadam, 3.22 mi., $45,093; Guernsey Co., Sect. "I," Cambridge-Caldwell Rd., I. C. H. 258, bituminous macadam, 1.15 mi., $17,978; Harrison Co., Sect. "P," Steubenville-Cambridge Rd., I. C. H. 26, waterbound macadam, 1.60 mi., $19,246; Holmes Co., Sect. "A," Navarre-Berlin Rd., I. C. H. 79, grading only, 1.69 mi., $14,633; Knox Co., Sect. "A," Mt. Vernon-Mt. Gilead Rd., I. C. H. 338, rein.-con., 2.52 mi., $17,385; Lake Co., Sect. "B," Euclid-Chardon Rd., I. C. H. 44, rein.-con., 1.25 mi., $24,164; Mahoning Co., Sect. "I," Akron-Canfield Rd., I. C. H. 87, waterbound macadam, 1.12 mi., $13,569; Sect. "A-1," Niles-Canfield Rd., I. C. H. [illegible] waterbound macadam, 1.20 mi., $14,131; Sect. "Y," Canfield-Poland Rd., I. C. H., 486, waterbound macadam, 1.88 mi., $22,124; Sect. "U," Youngstown-Lowellville Rd., I. C. H., 14, brick 1.50 mi., $48,280; Medina Co., Sect. "A-2," Elyria-Medina Rd., I. C. H., 314, concrete, 0.97 mi., $13,251; Morgan Co., Sect. "H," McConnellsville-Athens Rd., I. C. H., 162, waterbound macadam, 2.34 mi., $46,555; Muskingum Co., Sect. "M-1," Zanesville-Dresden Rd., I. C. H., 344, concrete, bituminous macadam or non-bituminous macadam, 0.99 mi., $16,690; Putnam Co., Sect. "H," Kalida-Lima Rd., I. C. H., 134, grading only, $6695; Sandusky Co., Sect. "O," Fremont-Castalia Rd., I. C. H., 281, brick, 1.30 mi., $35,719; Scioto Co., Sect. "A-1," Portsmouth-Lucasville Rd., I. C. H., 406, brick or monolithic brick, or bituminous macadam, 3.01 mi., $79,012; Stark Co., on Section "B-2," Canton-New Franklin Rd., I. C. H. 72, brick, 1.17 mi., $44,483; Warren Co., Sect. "B," Dayton-Lebanon Rd., I. C. H. 64, waterbound macadam, 2.65 mi., $19,940.

Ohio—Until Aug. 16, by State Highway Comn., Columbus, building roads as follows: Athens Co., Sect. "A," Athens-Hockingport Rd., I. C. H. 156, grading roadway, building bridges and culverts and paving with brick, 1.34 mi., about $32,840; Butler Co., Sect. "I," Hamilton-Middleton Rd., I. C. H., 179, rein.-con. and monolithic brick, 3.18 mi., $76,914; Butler Co., Sect. "J," Hamilton-Middletown Rd., I. C. H. 179, rein.-con. and monolithic brick, 3.54 mi., $81,814; Clermont Co., Sect. "I," Ohio River Rd., I. C. H., 7, bituminous macadam, 4.12 mi., $27,654; Erie Co., Sect. "P," Sandusky-Norwalk Rd., I. C. H., 294, concrete or brick, 0.46 mi., $24,652; Erie Co., Sect. "O," Sandusky-Clyde Rd., I. C. H., 276, rein.-con. 1.53 mi., $30,943; Franklin Co., Sect. "Q," Columbus-Sandusky Rd., I. C. H., 4, bituminous macadam, 1.96 mi., $38,987; Fayette Co., Sect. "M," Hillsboro-Washington Rd., I. C. H., 259, waterbound macadam, 2.29 mi., $23,065; Fulton Co., Sect. "K-1," Archbold-Fayette Rd., I. C. H., 301, waterbound macadam, 1 mi., $13,729; Gallia Co., Sect. "F-1," Gallipolis-Jackson Rd., I. C. H., 399, bituminous or waterbound macadam, 1.65 mi., $18,317; Gallia Co., Sect. "A-1," Ohio River Rd., I. C. H., 7, waterbound gravel or concrete and gravel, 1.69 mi., $18,424; Sect. "E-1," Gallipolis-Ironton Rd., I. C. H., 405, waterbound macadam, 1.70 mi., $21,700; Geauga Co., Sect. "K," Cleveland-Meadville Rd., I. C. H., 15, concrete, 2.80 mi., $37,693; Sect. "B," Hampden-Andover Rd., I. C. H., 475, rein.-con., 2.63 mi., $33,316; Hardin Co., Sect. "A," Kenton-Upper Sandusky Rd., I. C. H., 229, rein.-con., bituminous macadam or bituminous concrete, 1.35 mi., $35,701; Hocking Co., Sect. "J," Logan-Chillicothe Rd., I. C. H., 363, waterbound gravel, 1.89 mi., $27,537; Huron Co., Sect. "A," Savannah-Vermillion Rd., I. C. H. 149, concrete or monolithic brick, 2.12 mi., $25,401; Knox Co., Sect. "K," Columbus-Wooster Rd., I. C. H., 24, rein.-con. 1.61 mi., $46,389; Lawrence Co., Sect. "K," Ohio River Rd., I. C. H., 7, concrete or bituminous macadam, 4.97 mi., $[illegible] Sect. "E," Ironton-Miller Rd., I. C. H. 494, bituminous macadam, 1 mi., $16,152; Lake Co., Sect. "E," Newark-Fallsburg Rd., I. C. H. 479, waterbound macadam, 1.45 mi. $33,167; Lorain Co., Sect. "I," Avon-Oberlin Rd., I. C. H. 134, concrete or bituminous macadam, 1.71 mi., $26,544; Mahoning Co., Sect. "R-1," Akron-Youngstown Rd., I. C. H. 18, waterbound macadam, 0.98 mi., $11,428; Sect. "P," Akron-Youngstown Rd., I. C. H. 18, brick, 1.11 mi., $[illegible]; Ottawa Co., Sect. "C," Port Clinton-Marblehead Rd., I. C. H., 440, brick, 1 mi., $28,018; Portage Co., Sect. "V," Akron-Youngstown Rd., I. C. H., 18, concrete, bituminous macadam and monolithic brick, 3.68 mi., $47,818; Putnam Co., Sect. "G," Kalida-Lima Rd., I. C. H. 134, waterbound macadam, 1.47 mi., $11,347; Ross Co., Sect. "N," Chillicothe-Lancaster Rd., I. C. H. 361, semi-monolithic brick, 1.44 mi., $41,491; Stark Co., Sect. "I," Barnesville-Louisville Rd., I. C. H. 74, bituminous macadam, 3.11 mi., $14,471; Trumbull Co., Sect. "A," Warren-Meadville Rd., I. C. H. 448, bituminous macadam, 3.48 mi., $38,354; Sect. "A-1," Canfield-Niles Rd., I. C. H. 448, brick, 4.73 mi., $73,081; Vinton Co., Sect. "A," Columbus-McArthur Rd., I. C. H. 398, $8,811; Williams Co., Sect. "I," Bryan-Pioneer Rd., I. C. H. 108, waterbound or bituminous macadam, 1.81 mi., $25,240; Wyandot Co., Sect. "A," Upper Sandusky-Marion Rd., I. C. H. 178, brick, 4.74 mi., $73,[illegible]; Sect. "A," Upper Sandusky-Piqua Rd., I. C. H. 183, brick, 4.86 mi., $[illegible]

O., Canton—Until Aug. 8 by Bd. County Comrs. of Stark Co. for improving Sub. No. 8 N. P. involving 19,183 cu.yd. subgrade excavation, 2240 sq.yd. vitr. block paving, 1800 lin.ft. stone curb, 210 lin.ft. circle stone curb and 165 lin.ft. stone or concrete pavement headers.

Streets and Roads (Continued)

O., Cincinnati—(Official)—Until Aug. 13, E. Von Bargen, purch. agt., City Hall, for furnishing about [illegible] gal. coal tar bituminous road surfacing material to treat both waterbound and bituminous asphalt and bitulithic streets; also for 40,000 gal. paving pitch to use as filler in brick and granite pavement. F. Krug, city engr.

O., Cincinnati—Until Aug. 17, by A. Reinhardt, clk. bd. comrs. for improving Plainsville Rd. from Wooster Pike to corporation limits of Cincinnati; also parts of Livingston Rd., Hamilton Co.

O., Coshocton—Until Aug. 9, by S. Ashman, serv. dir., for paving 18,000 sq.yd. on Sycamore and 3rd Sts., brick

O., Dayton—Until Aug. 6, by Dept. Pub. Ser., for paving portions Leo, Pitts and Foundry Sts. F. O Eichelberger, city engr.

O., Medina—Until Aug. 15 by W. P. Ainsworth, city clk., paving and grading Prospect, South B'way, Smith Rd. and North Court St., vitr. brick, concrete base; also setting curbs, building storm sewers, culverts, drains and retaining walls.

O., Pioneer—(Official)—Until Aug. 15, by W. W. Coulon, village clk., for paving various streets, about 13,000 sq.yd. surface. L. A. Boulay Co., 1248-51 Nicholas Bldg., Toledo, engrs.

O., Sandusky—(Official)—Until Aug. 13 by City Comrs., for paving portions of Adams, Fulton, Division and Boult Sts. and Maple Ave. F. Johnston, city engr. Noted July 26.

O., Westerville—Until Aug. 11, by R. S. Bennett, village clk., for curbing, paving, grading, draining and laying water and sewer laterals on various streets; also paving and curbing Park St.

Ind., Wabash—(Official)—Until Aug. 7, by F. Kircher, co. aud., grading Hains Rd. No. 1 and 2. About $10,000. Noted July 12.

Ia., Burlington—(Official)—Until Aug. 5, by A. F. Felker, aud. Des Moines Co., for grading about 15,000 cu.yd. Bottom Rd., and Mile 2, Wapello Rd. M. L. Hutton, co. engr.

Ia., Council Bluffs—Until Aug. 6, by E. V. Gustafson, city clk., for paving portion of Military Ave., 16-in. concrete. Noted June 7.

Neb., Grand Island—Until Aug. 7, by City, for paving Walnut, 10th St. and other streets, vertical fiber brick, sheet asphalt, etc. About $100,000. H. W. Kibley, city engr.

Neb., Plattsmouth—Until Aug. 13, by City, for 12,850 yd paving, brick or wire cut brick, and 7442 ft. curbing in Dist. No. 13. J. F. Warga, clk.

Mo., Jefferson City—Until Aug. 6 by City Council, curbing and guttering Adams St. with cement and macadamizing with asphalt binder. P. C. Harding, city engr.

Mo., St. Louis—(Official)—Until Aug. 14, by Bd. Pub. Ser., for improving alley in City Block No. 3995 with vitr. brick, St. Charles St., treated wood-block pavement and Wilcox Ave., vitr. brick pavement and concrete curb. E. R. Kinsey, pres.

Ark., DeVall Bluff—Until Aug. 6, by W. H. Wheeler, pres. dist. comrs., for improving roads in Rd. Dist. No. 3, Prairie Co., involving 2½ mi. macadam, 4420 cu.yd. embankment, 80 cu.yd. concrete and 4066 tons crushed rock

Idaho—Until Aug. 10, by Secy. State Highway Comn., Boise, building 17 mi. Idaho-Utah highway in Bannock Co.

Utah, Salt Lake City—Until Aug. 14, by City Rec., for paving Virginia and Alta Sts. and 3rd and 4th Aves., also grading, curbing, guttering and paving of Pavement Extension No. 137. S. Q. Cannon, city engr.

Washington—Until Aug. 20, by State Highway Bd., Olympia for clearing grading, draining and surfacing Sect. State Rd. No. 21 between Clifton and Charleston, Kiptsap Co.

Wash., Seattle—(Official)—Until Aug. 10, by Comrs. Park Bd. for resurfacing Blaine Blvd., 2500 lin.ft. asphaltic concrete, 1100 lin.ft. macadam brick 24 ft. wide. About $10,660. P. Cotterill, secy. A. H. Dimock, city engr. Noted July 19.

Wash., Walla Walla—Until Aug. 10, by Bd. Comrs. Walla Walla Co. for building Permanent Highway No. 16 and repaving and resurfacing College Ave.

Cal., Santa Ana—Until Aug. 8, by Bd. Supervs. for surfacing about 142,256 sq.ft. of Grand Ave. and about 141,756 sq.ft. of Huntington Beach Rd. with Bitucrete, wearing surface. W. B. Williams, co. clk.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Massachusetts—State Highway Comn., Boston, received low bids building roads Egremont-Sheffield Twp. from L. C. Fay & Co., 318 Main St., Springfield, $49,442; Cordner & Montague, 433 Bay St., Springfield $54,231.

★**Massachusetts**—(Official)—State Highway Comn., Boston, let contract building 14,600 ft. state highway, Worcester-West Boylston Twps. to R. H. Newell Co., Uxbridge, $44,800. Noted July 19.

★**Mass., Boston**—City let contract paving portion Commonwealth Ave., 3-in. st. aspha, to Central Constr. Co., 288 Southampton St., Roxbury, $119,975. Noted May 3.

★**Mass., Dorchester** — City let contract paving portion Dorchester Ave. to J. Doherty, 133 Calumet St., Roxbury, $40,336. Noted July 26.

★**R. I., Pawtucket**—(Official)—City let contract paving Broad St. to E. B. Roberts Constr. Co., 2 North St., Pittsfield, Mass., $4.47 per sq.yd.

★**Connecticut**—J. C. Bennet, state highway comr., Hartford, let contract building highway to E. Tracy Derby, $42,000.

★**Conn., New Haven**—City let contract laying 5 mi. cement walks, Spring Glen Manor, and 14,000 sq.ft. granolithic walks, Tuberculosis Hospital, West New Haven, to New Haven Engineering & Constr. Co., 82 Church St.

N. Y., Albany—State Highway Comn., 55 Lancaster St., received low bids building highways in various counties as follows: Rd. No. 1405, Thompson's Lake-Van Auken Corner, Albany Co., 2.93 mi., Graylock Constr. Co., New York City, $19,934, Klein-Zwick Co., Albany, $24,411; Rd. No. 1300, Barnes Corners-West Lowville, Pt. 2, Lewis Co., 8.82 mi., Dale Engr. Co., Utica, $118,-975; Rd. No. 1321, Conesus-Wayland, Livingston Co., 8.34 mi., Atlanta Constr. Co., Wayland, $131, 537, P. H. Murray, Rochester, $151,568; Rd. No. 1361, Oneida Lake-South Bay and Oneida-South Bay, Pt. 2, Madison Co., 5.65 mi., Graylock Constr. Co., New oYrk City, $49,292; Rd. No. 5280, Little Neck-Old Westbury, Pt. 2, Nassau Co., 1.57 mi., J. McAvoy, New York City, $37,504, Jos. Capek, Inc., Astoria, N. Y., $37,936, R. W. Smith Corp., New York City, $37,955; Rd. No. 5604, Utica-Poland, Pt. 1, Oneida Co., 1.05 mi., H. W. Roberts & Co., Utica, $47,765; Rd. No. 1208, East Islip-Smithtown Branch, Suffolk Co., 9.57 mi., R. W. Smith Corp., New York City, $170,951; Rd. No. 5571, White Plains-East View, Westchester Co., 4.29 mi., Leo. T. Welch, Albany, $29,278, F. G. Fowler Constr. Co., Mt. Kisco, $51,835.

★**N. Y., Albany**—City let contract repaving portion Delaware Ave. to P. W. Mulderry, $140,103; Northern Blvd. to M. F. Dolard, Manning Blvd., $30,047; Euclid, Lenox, Homestead Aves., Glenwood, Parkwood and other streets to R. C. Sheehan, $43,312.

N. Y., Brooklyn — (Official) — L. H. Pounds, boro. pres. received low bids regulating, curbing and paving portion of 19th Ave., asphalt, 6-in. concrete foundation from Brooklyn Alcatraz Asphalt Co., 47 Hamilton Ave., $21,381; Cranford Co., 52 9th St., $21,077.

★**N. Y., Irvington** — Town let contract grading, clearing, curbing and paving portions of Cummings St. and Ridgewood Ave. to J. Dorer, 646 Nye Ave. About $24,352.

N. Y., Long Island City—Park Bd., Municipal Bldg., received low bid regulating, grading and paving Washington Ave. across Jacob Riis Park, concrete, from E. F. Monahan, Manhattan Beach, Brooklyn, $23,033. Noted July 19.

N. Y., Long Islaand City—M. M. Connolly, boro. pres., received low bids regulating, recurbing and repaving with asphaltic concrete portion (a) 5th Ave., (b) Thomaston Ave., wood blocks and improved granite blocks (c) Payntar Ave., granite blocks, (d) Hamilton St., sheet asphalt, (e) Grand Ave., (f) regulating, grading, curbing, laying sidewalks, portion 51st St., from Cleveland Trinidad Paving Co., Flushing, (a) $60,907, (e) $40,102; Leonard Paving Co., 233 Bway., New York City, (b) $28,937; E. Fitzpatrick, 128 3rd Ave., Astoria, (c) $11,733, (f) $8278; Borough Asphalt Co., 1301 Metropolitan Ave., (d) $10,602, (e) $38,996; Uvalde Asphalt Paving Co., 1 Bway., New York City, (a) $61,-680, (d) $10,774, (e) $35,751.

N. Y., New York—D. Mathewson, boro. pres., received low bids repaving portion (a) St. Anns Ave., sheet asphalt, redresed granite blocks (b) Stebbins Ave., sheet asphalt, concrete foundation (c) Sedgwick Ave., granite blocks, sand foundation (d) Morris Ave., bituminous concrete, cemnet concrete foundation, (e) White Plains Rd., sheet asphalt, concrete foundation, (f) East Tremont Ave., waterbound macadam, (g) Dyre Ave., from Davney Asphalt Co., 53 Vanderbilt Ave., (a) $20,212, (b) $7123, (d) $12,353, (e) $12,089; Asphalt Constr. Co., Madison Ave. and 137th St., (b) $6946, (d) $12,013, (e) $11,908; Leonard Paving Co., 233 Bway., (c) $74,875; Uvalde Asphalt Paving Co., 1 Bway., (d) $11,610, (e) $11,760; F. V. Smith, Lafayette Ave. and Westchester Creek, (f) $15,438, (g) $10,360.

★**N. Y., Rochester**—City let contract paving, building sewers and walks on Marigold, Goodman and other streets to F. V. Brotsch Co., E. & B. Bldg., $75,000. Noted July 19.

★**N. Y., Syracuse**—Bd. Contract & Supply let contract paving Ackerman Ave., asphalt, Hillside brick, to T. Hockway Constr. Co., Bastable Blk., $34,561.

N. J., New Brunswick—City received low bids paving Stratford and Llewellyn Pl. and Powers St., concrete, from Utility Constr. Co., 46 Paterson St., $15,730; T. H. Riddle, 102 Church St., $15,990.

★**N. J., Rahway**—City let contract 20,000 ft. material for street improvements to Fireprof Products Co., Rahway, $1.29 per sq.ft.

★**N. J., Ridgewood** — City let contract 27,000 sq.yd. paving on Prospect St., West Ridgewood and Goodwin Aves., concrete or bitulithic concrete, to Standard Bitulithic Co., 50 Church St., New York City.

★**Pa., Erie**—City let contract paving portion 17th St., asphalt, to J. J. Doyle, Erie, $17,500.

★**Pa., Johnstown**—Comrs. Cambria Co., Ebensburg, let contract grading and paving 4 mi. brick road in Adams Twp., to Portage Concrete Constr. Co., Portage, $57,-800 and J. L. Elder, Ebensburg, $59,000.

★**Pa., McKeesport**—City let contract improving Brown Ave. to F. H. Crozier, $10,-698.

★**Pa., McKees Rocks** — Comrs. Stowe Twp., c/o Andrew & Southard, Curry Bldg., Pittsburgh, let contract paving B'way., concrete base, to Bryan & McDermott, McKees Rocks, $13,000.

★**Pa., Pittsburgh**—Co. Comrs. rescinded contract awarded to Pittsburgh Amiesite Co., Jenkins Bldg., for improving Lovedale Rd. and relet contract to D. McNeil Co., $70,537. Noted July 12.

★**Del., Wilmington**—Comrs. New Castle Co. let contract resurfacing portion Foulk Rd. to A. H. McDowell, Marshalltown.

W. Va., Kingwood—Preston Co., Portland Dist., let contract building 7.3 mi. 15-ft. roadway to C. Spindler, Kingwood. About $175,000. Noted June 7.

★**N. C., Kenilworth**—Town let contract building 2 mi. roads, concrete, to Asheville Paving Co., Asheville.

★**Miss., Yazoo**—Yazoo Co. Comrs. let contract building road, 2065 mi. vitr. brick to Southern Paving & Constr. Co., James Bldg., Chattanooga, $32,854; grading, 28 mi. to Healy Constr. Co., Meridian, $78,128.

★**Louisiana**—(Official)—Bd. State Engrs., New Orleans, let contract building 6-mi. Sect. 4 Arkansas Highway, Caddo Co., to J. M. Montgomery, Shreveport, $15,411. Noted July 19.

★**O., Cleveland**—Bd. Control let contract paving portion of East 55th St. to A. M. Pejea Paving Co., 2359 East 93rd St., $43,-174. Noted June 14.

★**O., Springfield**—City let contract paving portion Sherman Ave. to R. J. Cavanaugh, Springfield, $11,628.

Ind., Elkhart — (Official) — City received low bids (bids July 20) paving Edwardsburg Ave., brick, from Northern Constr. Co., Elkhart, $28,500; Greenleaf St., bitulithic macadam, E. Atkins, Elkhart, $21,400.

★**Mich., Escanaba** — City let contract paving Harnett Ave. to Wells crossing, bitulithic, to General Contr. Co., 1254 Plymouth Bldg., Minneapolis, $10,000.

★**Ill., Rock Island**—City let contract paving portion 13th Ave., brick and 24th St., asphalt, to Tri-City Constr. Co., 315 Putnam Bldg., Davenport. Noted May 1.

★**Ia., Davenport**—Bd. Local Improv. let contract repaving portion 2nd St., bitulithic, to W. Horrabin, $25,895. Noted July 12.

★**Ia., Des Moines**—City let contract paving portion West Grand Ave., bitulithic, to J. Horrabin & Co., 11th and Vine Sts., $2.59 per yd.

★**Minn., Albert Lea**—Freeborn Co. let contract widening Jefferson Highway to B. F. Gallea, Albert Lea.

★**Minn., Winona**—Union Co. let contract grading road between St. Charles and Dutchman's Crossing to G. E. Smith, Winona, $13,000.

Neb., Lincoln—Comrs. Lancaster Co., received low bid paving and grading Dist. No. 16, (a) monolithic, (b) concrete, from Roberts Constr. Co., Lincoln, (a) $2.03 per ft.; (b) $1.63 per ft.; Burke-Cochran Co., Lincoln, (a) $2.06 per ft.; (b) $1.75 per ft. Noted July 5.

Streets and Roads (Continued)

★**Wyo., Caspar**—City let contract paving, grading and curbing in Dist. No. 2 to Warren Constr. Co., 14 Assn. Bldg., Portland, Ore. About $49,380. Noted July 5.

★**Ark., Pine Bluff**—Co. Comrs. Jefferson Co. Rd. Improv. Dist. No. 19 let contract building 18½ mi. gravel roads, bituminous carpet top, to W. P. McGeorge & Co., Pine Bluff. Noted June 28.

★**Ark., Pine Bluff**—(Official)—Comrs. Rd. Improv. Dist. No. 21, let contract building 5 mi. gravel road, bituminous carpet cover to W. P. McGeorge & Co., Pine Bluff. About $39,000. Noted July 12.

★**Tex., Amarillo**—City let contract paving 18 blocks, brick, vibrolithic and asphalt concrete to Vibrolithic Constr. Co., Terminal Bldg., Dallas; 12,000 sq.yd. at $1.94 per sq.yd., 60c. for guttering; 12,000 sq.yd. asphaltic concrete, to F. P. McCormick, Columbus Bldg., St. Louis, $1.90, curb and gutter, 65c.; 12,000 sq.yd. brick paving to C. E. Willmering Paving Co., Amarillo, $2.03, guttering, 65c. Noted Apr. 12.

★**Tex., Victoria**—(Official)—City let contract paving 8 streets, asphaltic concrete, bitulithic, sheet asphalt, Uvalde rock asphalt, vertical fibre brick, portland cement concrete and 2 course concrete to Uvalde Rock Asphalt Co., San Antonio, $104,521. Noted July 12.

★**Idaho, Idaho Falls**—City let contract paving 6000 sq.yd. South Ridge Ave. to J. C. Maguire, Butte, Mont., $11,640.

★**Wash., Everett**—City let contract paving portion Everett Ave. to Grant & Erving, Everett, $18,502. Noted June 28.

★**Wash., Seattle** — Comrs. King Co. let contract grading 2½ mi. Permanent Highway No. 2 to L. H. Goerig, Seattle, $45,000. Noted July 12.

★**Wash., Spokane** — (Official) — Spokane Comrs. let contract paving 2.62 mi. permanent highway to H. C. Root, Spokane, $35,-825. Noted July 12.

★**Ore., Grants Pass**—Josephine Co. let contract grading 2 mi. Pacific Highway between Grants Pass and Jackson Co. line to A. Anderson, Grants Pass, $72,000.

★**Ore., Pendleton**—City let contract paving portion Webb St. to Warren Constr. Co., Journal Bldg., Portland, $16,030. Noted July 5.

California—State Highway Comn., Sacramento received low bids paving and grading 10.6 mi. betwen Seeley's ranch and point near Action, Los Angeles Co., from Tyron & Brain, 502 Merchants Trust Bldg., Los Angeles, $117,492; 8.7 mi. between Action and Palmdale, Los Angeles Co. from R. Rothwell, 2842 West 8th St., Los Angeles, $144,152. Noted June 28.

★**Cal., Fairfield**—Solano Co. let contract building concrete highway in Green Valley Dist. to Western Motor Draying Co., 373 Noe St., San Francisco, $75,832.

★**Cal., Los Angeles**—City let contract improving portion Bonnie Brea St. to Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., $10,757.

★**Cal., Sacramento**—Bd. Superv. let contract furnishing 170,000 bbl. cement for county highway work to H. Cowell Lime & Cement Co., 2 Market St., San Francisco, $1.95 to $2.17 per bbl. according to delivery, after allowance has been made for return of sacks; furnishing sand, Pratt Building Material Co., Sacramento, $0.19 per ton.

Cal., San Diego—City received low bid paving 136,575 sq.ft. Sierra Vista St., asphalt, 4-in. concrete base from T. C. Breitenstein, 465 Van Wyck St., Pasadena, $15,364.

★**Cal., Stockton**—City let contract paving streets in South Stockton to Clark & Henery Constr. Co., Ochsner Bldg., San Francisco, $250,000 and Paul & Cauldwell Constr. Co. $180,000.

★**Cal., Stockton**—City let contract paving several streets in Villa addition to Federal Constr. Co., Sharon Bldg., San Francisco, $44,181.

★**Que., Marieville**—City let contract constructing cement walks to A. Codere, St. Eusebe, $10,000.

RAILWAYS—STEAM & ELECTRIC

Proposed Work

Virginia—Kentucky & Virginia R.R. branch of Louisville & Nashville R.R., making surveys line from Wise to Pound River Sect. J. L. Smith, ch. engr. consl.

Kansas—Union Pacific R.R. plans [illegible] double tracking from Manhattan to Junction City. About $1,000,000. R. [illegible] Huntley, 15th and Dodge St., Omaha, ch. engr.

Washington—Oregon Washington R.R. & Navigation Co. plans 4 mi. extension to North River Valley Line. S. Murray, Portland, ch. engr.

California—California Eastern & Northern R.R., incorporated with $150,000 capital stock by W. H. Smallman of San Francisco, E. L. Weber, Napa, D. R. Morgan, St. Helena, plans line from Rutherford to Monticello.

California—San Diego & Southern Ry. plans to rebuild tracks from Santee to Foster washed out by 1916 floods. About $75,-000. J. D. Spreckels, San Diego, Pres.

California — Southern Pacific R.R., San Francisco, and Salt Lake R.R. plan large terminal at Los Angeles. According to present plans Salt Lake tracks on east side of Los Angeles River will be abandoned and new tracks built on west side of river parallel to Southern Pacific tracks. The latter's tracks will be moved off Alameda St. nearer to river and numerous grade crossings will be eliminated. W. Hood, San Francisco, ch. engr. Southern Pacific R.R.

PRICES AND CONTRACTS AWARDED
(★Indicates award of contract)

★**Alabama**—Muscle Shoals Traction Co. let contract 64 mi. interurban railway from Florence to Huntsville and 12 mi. branch line to Lexington to Central Constr. Co., Indianapolis.

★**Texas**—Dallas Southern Traction Co. let contract 59-mi. line from Dallas to Irving and Cleburne to Creek Constr. Co., Sapulpa, Okla. Noted June 14.

★**Oklahoma**—Atchison, Topeka & Santa Fe Ry. let contract 63 mi. line from Ralston to Owen, via Pawhuska and through oil fields, to Maney Bros. & Co., 304 Empire Bldg., Oklahoma. Noted June 7.

★**Oklahoma**—Buffalo Northwestern Co. of Buffalo let contract 52 mi. standard gauge railway, 2600 ft. pile bridge over Cimarron River and 7 small pile bridges, to Walker & Bell Constr. Co., Ft. Worth, Tex., $300,000.

★**Idaho**—Oregon-Washington R.R. & Navigation Co., Portland, let contract Pine Creek extension to Twohy Bros., Spokane and Portland, $300,000.

★**California**—Bd. Pub. Wks., San Francisco, let contract Municipal Ry. unit through Twin Peeks tunnel to Eaton & Smith, 407 11th St., San Francisco, $81,000. Noted July 5.

EXCAVATION AND DREDGING

Proposed Work

N. Y., Buffalo—Dredging—City preparing plans dredging lands between Buffalo River and City ship canal to depth of 23 ft., to extend and enlarge city harbor G. H. Norton, city engr.

La., Crowley — Drainage — Arcadia Co. Comrs. created new drainage district in 4th Ward. Bonds for $60,000 to be voted for project.

Minn., St. Cloud — (Official) — Ditch—N. Thomey, co. aud., received no bids for Co. Ditch No. 41, requiring 7764 cu.yd. excav. and furnishing and laying 8850 ft. of 12-in. tile, 1 24-in. drain head and 1 10-ft. 16-in. terminal box. Noted June 21.

Cal., Dos Palos—Irrigation—City to organize irrigation district to be known as Tierra Loma Irrigation Dist., involving 92,000 acres, 52 mi. canal, 1 mi. tunnel through mountains, 288 mi. 1 ft. laterals and meters at all section lines. Water will be taken from San Joaquin River. About $300,000. D. M. Steyer, South Dos Palos, chn.

Cal., Stockton—Irrigation—West Side Irrigation Dist. sold $590,000 bonds for irrigation project. W. G. Hunter, engr.

BIDS DESIRED

O., Portsmouth—(Official)—Reclamation—Until Aug. 10 by Bd. Co. Comrs. for flood defense system to reclaim about 150 acres; plans involve change of channel of Scioto River at point north of Lucasville Bridge. 76,923 cu.yd. excava. and 18,615 ft. piling. S. D. Eckhart, aud. and clk. Noted Apr. 19.

Ia., Mason City—Drainage—Until Aug. 6 by C. E. Frost, and Cerro Gordo Co. building D. D. No. 51. Main line [illegible] involving 17,989 ft. 10-, 12-, 15-, 18-, 21-, 24-, 27-in. tile, Sect. 1 including Lateral No. [illegible] 2 to 31, 3 to 43, 4 to 47, 5 to 51, 6 to 54, 7 to 58, 8 to 16,530 ft. 6-, 8-, 10- and 12-in. tile.

Ia., Sibley—Drainage—Until Aug. 13, by Bd. Supervs. Osceola Co. building D. D. No. 37, involving 1900-ft. open ditch containing 2500 cu.yd., 56,450 ft. 6- to 30-in. tile, bulkheads, inlets, etc. About $32,000. D. W. Clayton, aud.

Minn., Faribault—Ditch—Until Aug. 17 by Comrs. Rice Co., digging and building Co. Ditch No. 12, involving 51,300 lin.ft. open ditch and removing 176,790 cu.yd. earth, temporary bridges, concrete waterfall, extending foundation walls of highway bridge, cost $23,274, furnishing and laying 31,300 lin.ft. tile including trenching, backfilling end walls, $9134.

Minn., Mankato—Until Aug. 9, by C. L. Kennedy, co. aud., building Co. Ditch No. 47 involving 42,650 ft. 8- to 24-in. tile, 1000 cu.yd. cleanout work, 6-ft. bottom.

Minn., St. Cloud—Ditch—Until Oct. 2, by Stearns Co., building Co. Ditch No. 40, involving 18,769 cu.yds. About $12,899. N. Thomey, aud. Noted July 5.

Mo., Jefferson City—Excavation—Until Aug. 7, by Cole Co., grading and excavating solid rock ditches, Sect. 20, Twp. 43. E. F. Harding, co. engr.

PRICES AND CONTRACTS AWARDED
(★Indicates award of contract)

★**Ky., Calhoun** — (Official) — Drainage — Bd. Drainage Comrs. let contract D.D. No. 7 to J. N. Fiorgy, Owensville, $14,900. Noted July 12.

★**Ky., Louisville** — Ditch — Jefferson Co. let contract improving Big Ditch to T. B. Miller & Sons Co., $30,420.

★**Tenn., Huntingdon**—Reclamation—Carroll Co. D.D. No. 1 let contract for ditches and canals to reclaim 12,500 acres, involving 1,226,000 cu.yd. excava., to Canal Constr. Co., 189 West Madison St., Chicago, 8½c. per cu.yd. Noted July 5.

★**Ind., Auburn**—Ditch—De Kalb Co. let contract 7 mi. dredge ditch known as David Lein drain, Fairfield and Smithfield Twps., to W. A. Daniels, Auburn and C. A. Walb, La Grange, $12,100.

★**Ia., Mason City** — Drainage — Cerro Gordo Co. let contract drainage work, Dist. No. 53, to A. W. Dunlap, $18,529. Noted July 19.

★**Ia., Nevada**—Drainage—Story Co. let contract Drain No. 80 as follows: Tile to Macomb Sewer Tile Co., Macomb, Ill., $28,-982; open work to J. McKillip, Faribault, Minn., 19½c. per yd.; labor to Fry & Hankins, $11,533.

★**Minn., Mankato**—Ditches—Blue Earth Co. let contract Ditch No. 52, Sterling Twp., to C. C. Knudson, Blue Earth, $20,350; Ditch No. 51, Ceresco Twp., to Judson Concrete Co., Judson, $3475.

Cal., Chino—Ditch—Chino Storm Water Dist. received low bid 91,000 cu.yd. excava. for storm water ditch from Los Angeles Rock & Gravel Co., 3439 Pasadena Ave., Los Angeles, $11,830.

INDUSTRIAL WORKS

Proposed Work

Mass., New Bedford—Fairport Co. plans 4-story, 100 x [illegible]-ft. brick storehouse on Howland St. About $100,000.

Mass., Worcester—Burgess Lang & Co., 201 Sears Bldg., Boston, plans 8-story, 60 x 250 ft. plant on Central and Commercial Sts. Monks & Johnson, 78 Devonshire St., Boston, archts.

N. Y., Buffalo — Curtiss Aeroplane Co., 1738 Elmwood Ave., plans new additions to plant on Elmwood Ave.

N. J., Jersey City—Nu Storage Co., Communipaw Ave., plans storage warehouse in South Cove Sect. About $[illegible]

N. J., Newark—Federal Shipbuilding Co., Trenton, has purchased 83 acres land on Newark meadows and will erect shipbuilding plant. About $3,000,000. E. H. Gray, United States Steel Corp., interested.

Pa., Point Breeze—(Phila. P. O.)—American Refining Co., 717 North Broad St., Phila., plans rebuilding oil plant recently destroyed by fire with loss of $[illegible]. J. W. Van Dyke, [illegible].

Pa., Temple — Temple Malleable Iron & Steel Co. plans [illegible] stone and concrete foundry buildings. P. O. Case, Peoples Gas Bldg., Chicago, archt.

Ga., Augusta—Dugan & O'Dowd, [illegible] Reynolds and 5th Sts., having plans prepared by Lawrence Cottrell Co., Augusta, [illegible] warehouse, to be built in 10 compartments each to have capacity of about 1000 bales of cotton.

Industrial Work (Continued)

O., Akron—Canton & Youngstown Ry. plans large terminal freight warehouse on Furnace St. About $1,000,000. J. A. Donahey, Akron, ch. engr.

O., Cincinnati—Cincinnati Gas & Electric Co., 4th and Plum Sts., plans $2,500,000 bond issue for improving and extending plant.

O., Cleveland—Cleveland Macaroni Co., 7275 Wentworth Ave., plans 3-story, 130 x 201-ft. addition to plant. About $60,000.

O., Cleveland—Fen Far Co., 2163-71 East 9th St. plans 2-story factory, garage and repair shop. About $110,000. F. C. Warner, Hippodrome Bldg., archt.

O., Cleveland — W. McClellan File Co., 3444 Hamilton Ave., N. E., plans 2- and 3-story, 32 x 190-ft. plant. About $130,000. Briggs & Nelson, Rose Bldg., archts.

Ind., Goshen—Studebaker Corp., Administration Bldg., South Bend, plans forging and heating plant here. About $150,000.

Ind., Richmond — Richmond Commercial Club plans to build incubator factory. About $50,000.

Ill., Chicago—Felt & Tarranf Co., 1717 North Paulina St., plans 5-story brick warehouse. About $60,000. L. G. Haulberg, archt.

Ill., Chicago—Mark Co., 103 East Front St., plans to build large steel plant at East Chicago. About $6,000,000.

Ill., Rock Island—Armour & Co., 105 Rock Island St., plans addition to plant, Front and Rock Island Sts. About $100,000.

Minn., Duluth—Minnesota Steel Co., Gory St., plans new buildings. About $2,000,000.

S. D., Huron — Farmers' Coöperative Packing Co. plans to build rein.-con. packing plant here. About $450,000.

Tex., Memphis—Memphis Cotton Oil Co., Memphis, has increased its capital stock from $75,000 to $200,000 and plans to enlarge plant. About $125,000.

Cal., Long Beach — Merchants Marine Constr. Co., 1st Natl. Bank Bldg., plans shipbuilding plant on inner harbor. About $500,000.

Cal., Los Angeles—Southern California Edison Co., 129 East 4th St., plans to spend $10,000,000 for extending and improving its power developing and distribution system. The company will apply to the State R.R. Comn. for permission to issue this amount of stock.

Que., Chambly Canton—Canadian Leatherboard Co. plans to build plant here. About $250,000.

Que., St. Lambert—Dominion Textile Co., 112 St. James St., Montreal, plans textile plant here. About $60,000.

Ont., Hamilton—Canada Screw Co., 334 Wellington St., W., plans addition to plant. About $100,000.

Ont., Strathroy—Strathroy Canning Co. plans rein.-con. and brick factory. About $200,000. T. Dunn, mgr.

Ont., Toronto — Willys-Overland, Ltd., Weston Rd., will build plant, brick and concrete. About $60,000.

B. C., Vancouver—Cotton Co., Ltd., plans shipbuilding plant at False Creek. About $100,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—Boston Wharf Co., 259 Summer St., let contract 7-story warehouse on Midway St., South Boston, to W. F. Kearns Co., Albany St., Cambridge. About $130,000.

Mass., Boston—Burgess Lang & Co., 201 Sears Bldg., received bids for new 4-story, 30 x 200-ft. brick and concrete plant and addition on Brighton St. from W. M. Bailey Co., 99 Broad St.; J. F. Woodbury & Sons Co., 185 Summer St.; G. A. Fuller Co., 131 State St.; R. H. Howes Constr. Co., 165 West 46th St., New York and J. T. Scully, 1st St., E., Cambridge.

★**Mass., Worcester** — Consolidated Rendering Co., 49 North Market St., Boston, let contract 3-story, 50 x 164-ft. brick and rein.-con. plant to G. A. Fuller Co., 1110 Park Bldg. About $50,000.

★**N. Y., S. I.—Mariners Harbor**—Staten Island Shipbuilding Co., 1983 Richmond Terrace, Port Richmond, let contract machine shop, boiler shop and tool room to J. Milnes, Port Richmond.

★**N. J., Jersey City**—United Realty Co., c/o L. S. Beardsley, 39 West 32nd St., New York City, archts., let contract 7-story, 100 x 100-ft. factory addition on Provost and Bay Sts. to Turner Constr. Co., 244 Madison Ave.

★**N. J., Newark**—Aluminum Goods Mfg. Co., Springfield Ave., let contract 6-story, 100 x 260-ft. factory on Ridgewood St., to W. W. Oeflein, Manitowoc, Wis.

★**Md., Baltimore**—Baltimore Drydock & Shipbuilding Co. let contract office building and warehouse on Locust Point to West Constr. Co., Amer. Bldg. About $50,000.

★**O., Cleveland**—A. & B. Realty Co., 4500 Euclid Ave., let contract, 4-story, 82 x 192-ft., rein.-con. garage on Euclid Ave. and 46th St. to J. C. Gloyd Constr. Co., Hippodrome Annex. About $100,000. Noted July 19.

★**O., Cleveland**—American Express Co., Lakeside Ave. and East 17th St., let contract 2-story, 116 x 132-ft. addition to garage to Craig Curtiss Co., Guardian Bldg. About $120,000.

★**O., Cleveland**—Cleveland Electric Illuminating Co. let contract brick, steel and reincon. power plant, 720 East 20th St., to Turner Constr. Co., 244 Madison Ave., New York City, $100,000.

★**Ind., Indianapolis** — Pennsylvania R.R. Broad St. Sta., Phila., let contract 150 x 300-ft. rein.-con. roundhouse to Alliance Constr. Co. About $120,000.

BUILDINGS

Proposed Work

Conn., Westport—School—Bd. Educ. having plans prepared, 2-story, 60 x 115 ft. at Myrtle Ave. About $65,000. P. N. Sunderland, 7 Spring St., Danbury, archt.

N. Y., New York—Theater and Store—E. Higgin, 1 Madison Ave., plans, between 94th and 95th Sts. About $200,000. G. Keister, 56 West 45th St., archt.

N. Y., Potsdam — Normal School — Bd. Educ. soon receives bids. About $275,000.

N. Y., Queens—School—Bd. Educ. plans 2 additions to Bryant School. About $350,000.

N. J., Asbury Park—Hotel and Convention Hall—Chamber of Commerce plans hotel and convention hall to occupy 1 block About $1,000,000. Address J. D. Carton, 505 2nd Ave.

N. J., Jersey City — Terminal — City Comrs. plan to build. About $1,038,000. Address G. F. Brensinger, 75 Montgomery Ave.

N. J., Newark—Denison University plans rebuilding and extending several buildings. About $1,000,000.

N. J., Princeton—Princeton University having plans prepared for several new buildings. Day & Klauder, 925 Chestnut St., Phila., archts. Address R. M. Anderson, 275 Nassau St.

N. J., Trenton—School—Bd. Educ. Hamilton Twp. plans 2-story, 85 x 122 ft. on Greenwood Ave. W. W. Slack & Son, St. Regis Bldg., archt.

Pa., Chester—High School—Bd. Educ. plans, 3-story, stone. About $400,000. C. S. Adams, 1509 Arch St., Phila., archt.

Pa., Fairview—Wards, etc.—State Commission for Treatment of Criminal Insane plans to build. About $80,000. H. F. Walton, 284 City Hall, pres., and J. C. M. Shirk, 421 Chestnut St., archt., both of Phila.

Pa., Glenside—Club House—Lulu Temple Country Club will build, 2-story, 52 x 204-ft. About $150,000. C. T. Martin, c/o Kensington Trust Co., Kensington and Allegheny Aves., pres., and H. W. Castor, Stephen Girard Bldg., archt., both of Phila.

Pa., Holmesburg—House of Correction—City plans brick and concrete addition. About $90,000. C. E. Oeschlager, Harrison Bldg., Phila., archt.

Pa., Miners Mills—School—Bd. Educ. plans 2 new buildings. About $100,000. P. Mayock, secy. A. L. Reilly, Bennett Bldg., Wilkes-Barre, archt.

Pa., Phila.—Office and Store—Cunningham Piano Co., 50th and Parkside Sts., having plans prepared, 10-story, brick, concrete and steel, at 1312-14 Chestnut St. A. J. Sauer & Co., 1114 Chestnut St., archts.

Pa., Pittsburgh—Hospital—Mercy Hospital, Pride and Vickory Sts., plans 2-story addition. About $89,000.

Md., Baltimore — Church — University Baptist Church plans new building on Charles St. and Greenway Ave. About $175,000. W. M. McCormick, Baltimore Commercial Bank, chn. bldg. com. M. A. Long, Baltimore & Ohio Bldg., archt.

Md., Hagerstown—Y. M. C. A. receives bids about Sept. 1, for 2- and 4-story, 80 x 195-ft. About $150,000. J. C. Byron, Negley Bldg., chm. bldg. com. H. E. Yessler, 17 Hamilton Row and M. A. Kountz, Negley Bldg., archts. Noted June 21.

Wash., D. C.—Home Savings Bank soon lets contract for 6-story, 35 x 70-ft. addition. About $100,000. B. F. Gaul, 7th and Massachusetts Aves., N. W., pres. C. Waggaman, 1211 Connecticut Ave., archt.

Wash., D. C.—Club—(Official)—Washington Athletic Club receives bids about Aug. 10, 12-story, 133 x 150-ft. About $65,000. Milburn, Heister & Co., Union Savings Bank Bldg., archts. Noted July 19.

Wash., D. C.—Recreation Hall—Knights of Columbus, c/o L. O'Horn, Woodward Bldg., had plans prepared, 1-story, 60 x 100-ft. About $200,000.

W. Va., Charleston—Hotel—Holley Hotel plans 4-story addition. About $50,000. E. Ern, Quarrier St., mgr. C. C. & E. A. Weber, Citizens Bldg., Cincinnati, archts.

W. Va., Keyser—State Bd. Control plans replacing University of West Virginia building recently destroyed by fire. About $120,000. P. A. Davis, 1713 Sansome St., Phila., archt.

W. Va., Lindsey—Dormitory—Lindsey Institute plans, 3-story, near Eoff St. About $50,000.

Miss., Grenada — Church — University Baptist Congregation plans church, parsonage and Sunday-School. About $175,000. W. M. McCormick, Baltimore Commercial Bank, chn. bldg. com.

Miss., Jackson—Dormitory—Millsap College having plans prepared by H. N. Austin, archt., Century Bldg. About $65,000.

La., Merryville—High School—Bd. Educ. plans election August 1, to vote on $70,000 bond issue to build high school. Address President of School Bd.

Tenn., Nashville—City plans election to vote on following bond issues: Fire hall, $55,000; hospital, $45,000; library, $125,000. Address J. H. Faucette, City Hall, mayor.

Tenn., Nashville—School—City plans to vote, in September, on $125,000 bond issue for school. Address R. Ewing, mayor.

Ky., Lexington — Fayette Turberculosis Sanatorium plans to build. About $55,000.

Ky., Paducah—Hospital—Illinois Central R.R. plans rebuilding hospital recently destroyed by fire. About $50,000 to $75,000. S. Baldwin, 135 East 11th Pl., Chicago, ch. engr.

O., Akron — Parish House — St. Pauls Episcopal Church soon receives bids, 2-story, 40 x 300-ft. About $75,000. F. Sherman, 58 North Forge St., pastor. F. L. Packard, 1212 Hayden Bldg., Columbus, archt.

O., Cleveland — School — Holy Family Congregation plans, brick, at 3855 East 131st St. About $50,000. W. Koehl, 906 Park Bldg., archt.

O., Columbus—Club House—Ohio State University soon lets contract. About $150,000. J. N. Bradford, Hayden Bldg., archt.

O., Dayton — Church — Beulah Baptist Church plans to build on Kercheval and McClellan Aves. About $50,000. G. G. Laughlin, pastor.

O., Dayton — Office — Germania Bldg., Assn. having plans prepared by Peters, Hermann & Brown, archts., Reibold Bldg., new building at 5th and Main Sts.

Mich., Grand Rapids—Nurses' Home—Hackley Hospital, Clinton St., having plans prepared by H. H. Weemhoff, archt., Murray Bldg., 72 x 120-ft. About $65,000.

Mich., Highland Park — Hospital — City plans. About $250,000 available. G. W. Graves, 120 Oregon Ave., Detroit, archt.

Ill., Chicago — Hotel — Kercher Hotel & Bath Co. having plans prepared, 10-story, 80 x 170-ft., at 410-16 Wabash Ave. About $750,000.

Ill., Park Ridge—Church—Park Ridge Methodist Congregation plans to build. About $50,000. F. C. Jorgeson, chm. bldg. com. C. A. Eckstrom, 5 North LaSalle St., Chicago, archt.

Ill., Rock Island — Hospital — St. Anthony's Hospital had plans prepared by H. B. Dox, archt., 301 Powell Bldg., Peoria. Bids soon. About $200,000.

Wis., Madison—Infirmary—University of Wisconsin plans to build. About $50,000. M. E. McGaffrey, University Administration Bldg., secy. A. Peabody, Capitol Bldg., archt.

Wis., Madison—Theater—Finn & Heiman, 104 Michigan Ave., Chicago, having plans prepared by G. Rapp, archt., 69 West Washington St., Chicago. About $75,000.

Buildings (Continued)

Wis., Milwaukee—Church—Holy Ghost Church plans, 68 x 172 ft. About $59,000. Rev. C. M. Grobschmidt, R.R. No. 1, Sta. D., Nicholson Rd., pastor.

Wis., Wauwatosa—Temple — (Official) — Wauwatosa Lodge No. 267 receiving bids about Aug. 10. F. A. Stevens, chn. bldg. com. Leenhouts & Guthrie, 301-404 Jefferson St., Milwaukee, archts. Noted July 19.

Ia., Des Moines—Natatorium—City plans 2-story natatorium, swimming and wading pools. About $200,000. F. E. Wetherell, Youngerman Bldg., archt.

Ia., Gordon—School—City voted on $60,000 bond issue to build school.

Ia., Manly — Hospital — Polk Co. plans election Oct. 15 to vote $100,000 bond issue to build hospital. F. J. Alber, aud.

Ia., Sioux City—Church—Trinity Lutheran Congregation having plans prepared by Buettler & Arnold, archts., 610 Security Bank Bldg., 74 x 113-ft. brick and stone. About $75,000.

Ia., Sioux City—Church—First Baptist Congregation having plans prepared by Beuttler & Arnold, archts., 610 Security Bank Bldg., 66 x 130-ft. brick and Bedford stone. About $85,000.

Ia., Sioux City—Home—Woodbury Co. plans, about $100,000. W. L. Steele, 502 United Bank Bldg., archt.

Ia., Ventura—School—City plans election Aug. 20 in Consolidated Dist. to vote on $50,000 bond issue to build school.

Kan., Peabody—School—Bd. Educ. plans, 2-story, 65 x 110-ft. About $50,000. A. Kent, secy. G. W. Van Meter, 604 Caldwell Murdock Bldg., Wichita, archt.

Kan., Wichita—Church—First Methodist Episcopal Church soon receives bids. 1-story, 100 x 130-ft. About $85,000. H. Imboden, chm. J. Gaisford, Goodwyn Inst. Bldg., Memphis, archt.

Kan., Wichita—School— Bd. Educ. receives bids about Nov. 1, for 2-story, 100 x 155-ft. intermediate school. About $120,000.

Neb., Norfolk—Hospital—Drs. Campbell & Baker plan, 3-story, 34 x 82 ft., brick, stone and rein.-con. About $60,000. J. T. Allen, 224 Brandies Theatre Bldg., Omaha, archt.

Neb., Omaha — Laboratory — Nebraska Medical College plans, 4-story, 101 x 101 ft., on 42nd and Dewey Aves. About $110,000. J. Latenser & Sons, Baxton Blk., archts.

N. D., Fargo—School—Bd. Educ. plans. About $200,000. W. B. Ittner, Bd. Educ. Bldg., St. Louis, archt.

Mont., Great Falls—Office—Great Falls Brick & Tile Co. plans new building. About $100,000. G. H. Shanley, 1st Natl. Bank Bldg., archt., soon receives bids.

Mo., Kansas City — School — Sweeney Auto School plans, 10-story, 102 x 120-ft. brick and rein.-con. About $180,000. E. J. Sweeney, 1110 East 15th St., pres. Keene & Simpson, 400 Reliance Bldg., archts.

Mo., Kansas City — Church — Third Church of Christ, Scientist plans. About $100,000. Address The Reader.

Mo., St. Louis—Hospital—City will vote Nov. 6 on $150,000 bond issue to build Koch Hospital. Address E. Glenman, City Hall Bldg., mayor.

Tex., El Paso—Church—Calvary Houston sq. Baptist Church plans, 3-story, 90 x 120-ft. About $100,000. A. H. Thorman, 425 1st Natl. Bank Bldg., archt.

Tex., Ft. Worth—Station—Texas & Pacific Ry. plans, steel, concrete and stone. About $800,000. H. Chamberlin, Dallas, ch. engr.

Tex., Houston—Mausoleum—Mausoleum & Monument Constr. Co., Carter Bldg., plans to build. About $200,000 to $500,000

Okla., Miami—Bank and Office—B. T. Hainer and A. James plan, 4- or 5-story, 75 x 120-ft., brick and rein.-con. About $180,000. J. W. Roberts, Claremore archt.

Okla., Oklahoma—Hospital—City Comrs. soon let contract to build hospital as addition to University Medical School. About $200,000. E. Overholser, mayor.

Okla., Oklahoma—Station—St. Louis & San Francisco Ry. plans, 2-story brick, stone and rein.-con. About $300,000. G. H. Schleyer, Oklahoma, genl. mgr. Lenanbaum, Maix & Vegeant, archts., 175 West Jackson Blvd., Chicago, receive bids about Aug. 30.

Wash., Olympia—High School—Bd. Educ. plans to build here. Stephen & Stephen, New York Bl., Seattle, archts. About $100,000.

Ore., Portland — School — Dir. Cleveland Hebrew School and Institute plan to rebuild, on Portland Ave. and East 55th St. About $75,000 to $100,000.

Cal., Bakersfield—Gymnasium—Kern Co. Union High School Dist. soon lets contract, 1-story, 84 x 152-ft. About $60,000. O. L. Clarke, 422 Brower Bldg., archt.

Cal., Long Beach—Schools—City defeated $150,000 bond issue for improving schools. Noted June 21.

Cal., Los Angeles—Bd. Pub. Ser. having plans prepared for 5-story, rein.-con. and brick addition to shops and offices at 201 Rose St. About $55,000. J. Vroman, secy.

Cal., Oakland—(Official)—Almshouse and Poor Farm—Alameda Co. plans election Aug. 14 to vote on $1,000,000 bond issue for additions and improvements at almshouse and poor farm.

Cal., Turlock—High School—Bd. Educ. plans new building on Lander Ave. About $65,000.

N. B., Bathhurst—College—Sacred Heart College plans new buildings, brick. About $250,000. R. A. Frechette, 30 Bonnacord St., archt.

Ont., London—Church—Parish of Limoilou plans new brick and stone building. About $200,000. J. P. Ouellet, archt., 28 St. Famille St., soon receives bids.

BIDS DESIRED

Vt., Vergennes—Industrial School—Until Aug. 10, by Bd. Educ. F. L. Austin, 240 College St., Burlington, archt.

N. Y., Hudson Falls—(Official)—School—Until Aug. 15, by W. L. Sawyer, clk. bd. educ. About $120,000. Noted June 21.

N. Y., New York—High School—Until Aug. 8 by C. B. J. Snyder, supt. bd. educ., Park Ave. and 59th St. for completing Evander Childs High School, East 184th St. (Bronx Boro.). About $50,000.

N. J., Morristown—Hospital—Until Aug. 8, by Morristown Memorial Hospital Assn. Palmer & Hornbostle, 63 Williams St., New York City, archts. Noted May 10.

N. J., New Brunswick—School—Until Aug. 24, by Bd. Educ., 3-story, 200 x 200 ft., Livingston Ave. and Walton St. About $275,000. A. Merchant, 363 George St., archt.

La., Winnfield—Court House and Jail—Until Aug. 13, by Police Jury of Winn Parish. W. L. Stevens, White Central Bldg., New Orleans, archt.

O., Cleveland—(Official)—Library—Until Aug. 7, by C. Lorenz, secy. pub. library bd., 1375 Euclid Ave., on West 25th St. and Maplewood Ave.

O., Columbus—School—(Official)—Until Aug. 3, by Bd. Educ. Perry Twp., Franklin Co., new school, near Linworth. F. L. Packard Co., 16 East Broad St., archt.

Minn., Tower—School—Until Aug. 15, by M. Jeranson, clk. bd. educ., in School Dist. No. 9, St. Louis Co. W. T. Bray, 1200 Fidelity Bldg. Duluth, archt.

Kan., McPherson — High and Grade Schools—Until Aug. 8, by G. Nyquist, clk. bd. educ. Markgraf & Mampe, 413 Ridge Bldg., Kansas City, archts.

Tex., El Paso—Lodge—Until Sept. 10, by Scottish Rite Benevolent Assn. About $180,000. Hubbell & Greene, 619 20 North Texas Bldg., Dallas, archts.

Cal., Modesto—School—Until Aug. 24 by S. C. Nowten, clk. bd. trustees, for 3 concrete and tile buildings. About $135,000. DeRemer & Hewitt, 624 Title Insurance Bldg., Los Angeles, archts. Noted Apr. 19

B. C. Burnaby—Studio—(Official)—Until Aug. 15 by Dominion Film Co. 412 orpheum Bldg. About $50,000 to $75,000. Noted July 19

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Hyde Park**—High School—Bd. Educ. let contract, 3-story, 49 x 131 ft., Harvard Ave., Everett and Webster Sts. to J. Bowen, 184 Dudley St., Roxbury. About $89,990.

★**Mass., South Framingham** — Theatre, Store and Office—Tremont Theatre Bldg., c-o G. A. Giles, Cambridge, let contract 1- and 2-story, 72 x 148 ft., brick and stone to Haynes Constr. Co., 40 Court St. About $[illegible]

★**N. Y., New York City**—(Official)—Store—J. C. Davies, 149th St. and 2nd Ave., let contract, 1-story, brick, on Burnside and Jerome Aves. (Bronx Boro.) to P. Murphy, 371 East 144th St. About $50,000. Noted July 12.

★**N. J., Camden**—Wood Mfg. Co., 7th and Erie Sts., let contract 1-story, 72 x 265 ft. brick and concrete plant to Barclay White & Co., 1713 Sansom St., Phila. About $50,000.

★**Pa., Phila.**—Gorgas-Pierce Mfg. Co. let contract 5-story, 75 x 155 ft. rein.-con. warehouse at 114 East Allen St., to Turner Concrete Steel Co., 1715 Sansom St.

Fla., Jacksonville—Bd. Pub. Instruction of Duval Co. received low bids for 8-room addition to Lackawanna school from O. P. Woodcock, Trade Bldg. About $52,400.

★**La., New Orleans**—College—Newcomb Memorial College let contract for additions to G. J. Glover, Whitney Bldg. About $648,000.

★**Ky., Louisville**—First Church of Christ, Scientist, let contract, stone, steel and concrete, to Rommel Bros., 919 East Bway. About $200,000.

O., Bedford — (Official) — School — Bd. Educ. received low bids from R. G. Evans Co., Savings & Trust Bldg., Columbus, J. Kaiser & Bros Co., Elyria and Crump Eng. Co., Leader-News Bldg., Cleveland. About $50,000. Noted July 26.

★**O., Cleveland**—Hotel—Doan-Brook Co., 10702 Superior Ave., let contract, brick, at 1928 East 105th St. to Bolton-Pratt Constr. Co., Columbia Bldg. About $200,000.

★**O., Dayton**—Lodge—Dayton Aerie of Eagles No. 321 let contract, 1-story, 80 x 100-ft., to Engle & Cohn, 207 Lexington Ave. About $50,000.

★**O., Lorain**—Store and Lodge—Lorain Aerie No. 343 let contract, 4-story, 50 x 135-ft., to Stauder & Cook, 1050 9th St. About $60,000.

★**O., Martins Ferry**—School—Bd. Educ. let contract for new Elms School to C. D. Keyser, Bellaire. About $72,000. Noted July 5.

★**O., Rocky River**—School—Bd. Educ. let contract, brick, to Willing Bros., Bellevue. About $70,000. Noted June 28.

★**O., Struthers**—Church—St. Nicholas Creek Congregation let contract, 1-story, 54 x 110-ft., to L. Adavasio, Dollar Bank Bldg., Youngstown. About $60,000. Noted Apr. 26.

★**O., Warrensville**—Sanatorium—City let contract school and 3-ward buildings at Warrensville Sanatorium to Cleveland Fireproof Constr. Co., 412 Anisfield Bldg. About $78,986.

★**Ind., Decatur**—High School—Bd. Educ. let contract, 2-story, 70 x 160-ft., to W. F. Peterson, Chicago, $68,620. Noted June 21

★**Ill., Chicago**—Hotel—T. Swanson, 701 Tacoma Bldg., let contract 7-story, brick and steel, at 413-23 Wrightwood Ave., to Olson-Carson Co., Chicago. About $50,000

★**Ill., Joliet**—Standard Paint Co., Woolworth Bldg., New York City, and Joliet, Ill., let contract 13 brick factory buildings to Hansen & Deterson Co., Joliet.

★**Wis., Osceola**—High School—Bd. Educ. let contract Linstrom & Anderson, 1493 Grand Ave., St. Paul. About $[illegible]

★**Wis., Racine**—Bank and Office—Manufacturers Natl. Bank let contract to Anderson Strandberg Co., 19 South La Salle St., Chicago. About $[illegible]

★**Wis., Stevens Point**—Depot—Minneapolis St. Paul & Sault Ste. Marie Ry. let contract to Wilson Construction Co. Wilson $[illegible]

★**Ia., Bronson**—School—Bd. Educ. let contract [illegible] brick and stone, to C. E. Little (Unadv. Co. Little Blk. About $[illegible] Noted July 5.

★**Ia., Des Moines**—Hotel and Office—F. M. Hubbell & Co., Hubbell Bldg., let contract remodeling 2-story brick and terra-cotta at 801-811 6th Ave. to J. C. Maeder Co., 819 Hubbell Bldg. About $[illegible]

★**Ia., Sioux City**—Junior High School—Bd. Educ. let contract [illegible] 4th & 5th St. to X. Otis, 810 16th St. About $[illegible]

★**Kan., Larned**—Court House—Pyramid Co. let contract, [illegible] stone and rein.-con. to W. Foss, Kansas City. About $[illegible] Noted June 14

Buildings (Continued)

★**Neb., Columbus**—Store—T. Friedhof let contract, 2-story, brick and rein.-conc., to H. F. Woerth. About $65,000.

★**Mont., Livingston**—High School — Bd. Educ. let contract addition to Park Co. high school to Pew Constr. Co., Helena. About $71,000. Noted July 5.

★**Okla., Ardmore**—Hotel—Ardmore Hotel Co. let contract 6-story, 100 x 100 ft., brick, to G. W. Stiles Constr. Co., 209 LaSalle St., Chicago. About $200,000.

★**Okla., Tulsa**—Store—Commerce Bldg. Co., 2nd and Main Sts., let contract, 4-story, 43 x 140 ft. brick, steel and rein. con. to J. R. Burnside. About $75,000. Noted July 19.

★**Cal., Pasadena**—Hertel Dry Goods Co., 4147 North Raymond St., let contract, 3-story brick, on Colorado St. and Euclid Ave., to J. F. Rhodes, 415 Central Bldg., Los Angeles. About $75,000.

FEDERAL GOVERNMENT WORK

Proposed Work

Mass., Newburyport—Post Office—J. A. Wetmore, superv. archt., treas. dept. Wash., rejected bids opened July 16. Noted July 26.

Okla., Ft. Sill—Observers' Camp—N. D. Baker, secy. war, soon lets contract observers' camp for army signal corps. About $500,000.

BIDS DESIRED

Pa., Ft. Mifflin—Chief Gunners' Quarters—Until Aug. 13, by Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., 2-story, concrete footings, hollow terra cotta tile walls, etc. at Naval Ammunition Depot.

Pa., McKees Rocks—Post Office—Until Sept. 4, by J. A. Wetmore, superv. archt., treas. dept., Wash.

Wash., D. C.—Torpedo Storehouse—Until Aug. 20, by Bureau Yards and Docks, (F. R. Harris, ch.) Navy Dept.

Ga., Forsyth—Post Office—Until Sept. 6, by J. A. Wetmore, superv. archt., treas. dept., Wash.

Ga., Washington—Post Office—Until Sept. 5, by J. A. Wetmore, superv. archt., treas. dept., Wash.

Tenn., Memphis—(Official)—Levee Work—Until Aug. 24, by Mississippi River Comn. U. S. Engr. Office, Customhouse, building 3,400,000 cu.yd. earthwork, Upper and Lower St. Francis and White River Dists.

Mich., Detroit—(Official)—Engine Shelters—Until Aug. 28, by U. S. Engr. Office, building 8 engine shelters for 4th Lock at St. Marys Falls Canal; advertised in this issue.

Mich., White River — Buildings and Launchway—Until Aug. 21, by E. P. Bertholf, capt. commandant, U. S. Coast Guard, Wash., for moving, alterations, additions and repairs to station building and launchway at Coast Guard Sta. No. 268.

Ark., Rodgers—Post Office—Until Aug. 3, by J. A. Wetmore, superv. archt., treas. dept., Wash.

Colo., Glenwood Springs—Post Office—Until Aug. 20, by J. A. Wetmore, superv. archt., treas. dept., Wash.

Wash., Puget Sound—(Bremerton P. O.)—Structures—Until Aug. 13, by Bureau Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., at Navy Yard.

Alaska, Ketchikan—Towers—Until Aug. 13, by Light House Inspector, furnishing 2 steel towers.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Me., Ft. Fairfield—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., received low bids from W. H. Fissell & Co., 34th St. and B'way, New York City, limestone $65,340; sandstone $64,360. Noted June 21.

★**N. Y., Mineola**—Aviation School—War Dept., Wash., let contract to Clough-Bourne Co., 101 Park Ave., New York City, cost plus percentage basis.

★**Wash., D. C.**—Cement—U. S. Engrs' Office let contract 15,000 bbls. portland cement for Key Bridge to Security Cement & Lime Co., 507 Equitable Bldg., Baltimore, $1.81 per bbl.

Wash., D. C.—Lumber—Engr. Depot and Purch. Office received low bids: (a) 650 pieces rough heavy timber, (b) 2,765,664 ft. No. 1 common timbers, (c) 1,518,256 ft. lumber surfaced 4 sides, (d) 1641 ft. lattice strips, from J. G. Rainwater Lumber Co., Whitney Bldg., New Orleans, (a) $12,297, (b) $121,689 (c) $66,803, (d) $72.20, time 90 days; T. E. Cole Lumber Co., Phila., (b) $91,267 (c) $50,102; time 90 days.

★**Wash., D. C.**—Roads—N. D. Baker, secy. war, let contract roads at new naval base, Hampton Rds., Va., to Atlantic Bitulithic Co., Virginia Ry. & Power Bldg., Richmond, cost plus 10% basis.

★**S. C., Beaufort**—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to Wise Granite & Constr. Co., Amer. Natl. Bank Bldg., Richmond, $39,945. Noted July 5.

Tenn., Gallatin—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash. received low bids from R. P. Farnsworth & Co., Owensboro, Ky., $37,500; Rock City Constr. Co., 150 4th Ave., Nashville, $39,630; R. K. Stewart & Son, South Boston, Va., $40,060. Noted June 28.

★**Ill., Hoopeston**—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to Clarke Constr. Co., 306 Temple Bldg., Danville, $53,699. Noted July 26.

★**Neb., Omaha**—Baracks—N. D. Baker, secy. war, let contract to E. A. Wickham, 19 Scott St., Council Bluffs, $200,000.

Tex., Vernon—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., received low bids, from W. D. Lovell, Minneapolis, $41,700; Johnson Constr. Co., Fargo, N. D., $44,997; J. F. McKnight, Hallettsville, $45,500. Noted June 28.

★**Okla., Ft. Sills** — Encampment — N. D. Baker, secy. war let contract National Guard encampment to Selden Breck Constr. Co., Fullerton Bldg., St. Louis.

★**Cal., Linda Vista**—(San Jose P. O.)—Army Cantonment—N. D. Baker, secy. war, let contract to W. E. Hampton Co., Trust & Savings Bldg., Los Angeles. Cost of work has been variously estimated from $800,000 to $1,500,000.

MISCELLANEOUS

Proposed Work

Transmission Line—Milford, Me.—Bangor Ry. & Electric Co. plans to extend transmission line from Milford to Lincoln, about 33 mi., and from Somerville to Southwest Harbor, about 12 mi. E. M. Graham, 84 Harlow St., Bangor, ch. engr.

★**Dam—New Brunswick, N. J.**—City let contract for concrete dam involving 1200 cu.yd. concrete and 3 30-in. sluice gates to B. G. Coon Constr. Co., Luzerne, Pa.

Bulkhead, etc.—Stone Harbor, N. J.—Council to sell $13,500 bonds Aug. 7 for new bulkhead and improvements at Berkely Point, jetties at great channel and repairs to municipal pier. C. P. Bower, chn.

Transmission Line—Munhall, Pa.—Carnegie Steel Co., Carnegie Bldg., Pittsburgh, plans to build electric transmission line from Munhall to Rankin to connect Homestead steel works and Carrie furnaces.

Incinerating Plant — Sharpsville, Pa.—Sewer Com. preparing plans.

Dam—Yorkhaven, Pa.—Yorkhaven Water & Power Co. will build dam over eastern channel of Susquehanna River by day labor under supervision of R. W. Robinson, engr., Roundbottom, Va.

Transmission Line — Norton, Va. — Old Dominion Power Co. plans to build 25-mi. transmission line from Norton to St. Paul and Tom's Creek to supply coal operating companies.

Transmission Lines—Fairmont, W. Va.—Monongahela Valley Traction Co. made surveys for 30-mi. electric transmission lines to furnish energy to various coal mines; a mine 20 mi. long will extend from Ocean Mine near Clarksburg via Bridgeport, Rosemont, Flemington, Astor and to Galloway to supply Simpson Creek Coal Co. and other companies, also line from Riverside toward Morganstown to supply Lehigh Mines operated by Jamison Coal & Coke Co. and mines of South Pittsburgh Coal Co. and Antler Coal Co., 10 mi. long. E. B. Moore, Fairmont, ch. engr.

Levee Work—Vicksburg, Miss.—Warren, Yazoo, Holmes, Issaquena and Sharkey Cos. plan new levee to protect 1,000,000 acres fertile land. Greenville Levee Bd. to appropriate $200,000 toward cost, Clarksdale Dist. like amount and Federal Government, $800,000. Address Co. Clk., Vicksburg.

Breakwater—Kenosha, Wis.—Council appropriated $45,000 to build breakwater from Garfield St. to Eichelman Park. B. C. Brennan, city engr.

Levee Work—Muscatine, Ia.—(Official)—Muscatine and Louisa Cos. retained Elliott & Harman Engr. Co., 144 Fredonia Ave., Peoria, Ill., to prepare plans for 3 mi. levee work along Mississippi River.

Incinerator — Oklahoma, Okla. — City plans election to vote on bonds to build incinerator. G. V. McClure, city engr.

Dock — Georgetown, Wash. — King Co. Comrs. Seattle, having plans prepared for 60 x 600-ft. dock, near Georgetown. S. Humes, co. engr.

Elimination Grade Crossings—San Francisco, Cal.—See "Railways."

River Improvements—Santa Ana, Cal.—Fullerton-Orangethorpe Storm Water Protection Dist. plans to improve 24 mi. along river front, involving 147,000 cu.yd. embankment, 887 cu.yd. concrete, 55,475 lb. steel, 910 lin.ft. culvert. W. J. Renshaw, engr.

BIDS DESIRED

Incinerator—Brookline, Mass.—Until Aug. 8, by Public Works Bd. Health for incinerator on Hammond St.

Incinerator—(Official) — Paducah, Ky. — Until Aug. 25, by F. N. Burns, mayor, for 2 unit incinerator, 20 ton capacity in 12 hour operation. L. A. Washington, city engr. Noted July 26.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Tunnel Improvement—Boston, Mass.**—B. L. Beal, secy. Boston Transit Comn., let contract 4100 sq.yd. ribbed tile on walls, etc. on Bway. and Andrews Sq. Sta. to Galassi Mosaic & Tile Co., South Ash St., $28,558. Noted July 26.

★**Station Finish—New York, N. Y.**—Pub. Ser. Comn. let contract for 34th St. and Times Sq. stations to A. W. King & Co., Inc., 81 East 125th St., $178,172.

★**Subway—Pa., Phila.**—(Official)—W. S. Twining, dir. dept. city transit, let contract 3 sections Delivery Loop Subway with work appurtenant thereto as follows: Contract No. 201, 203, 103, 204 to Keystone State Constr. Co., 704-709 Pennsylvania Bldg.; Contract No. 202 to Smith, Hauser & Mac Isaac, Inc., 18 East 41st St., New York City; Contract No. 104 to Phila. Subway Constr. Co., 712 Lincoln Bldg.

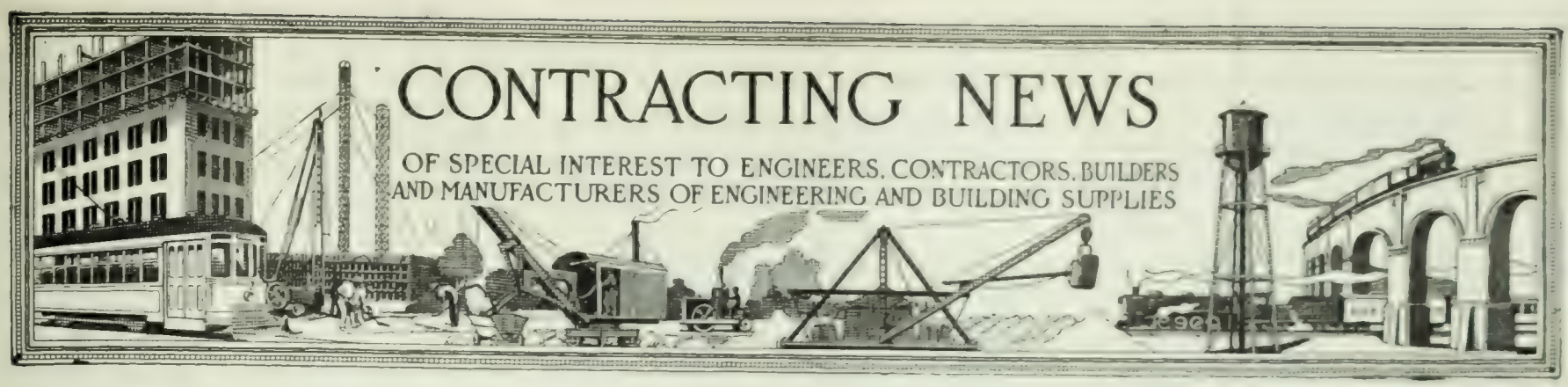
★**Track Floor, etc.—Phila., Pa.**—(Official)—Frankfort Elevated Ry. let contract No. 528 involving concrete track floor, floor drains and footwalks in Front St., Kensington Ave. and Frankford Ave. from Callowhill to Dyre St. (grouping contracts No. 526 and 527) to Keystone State Constr. Co., Penn. Bldg., Phila., $909,400. Noted July 12.

★**Rip Rap—Richmond, Cal.**—City let contract rip rap on inner harbor bulkhead to Healy-Tibbitts Constr. Co., San Francisco, $22,620.

Government Will Require Warehouses—A great number of warehouses at various points will have to be built by the Government very soon, according to a recent report in the Official Bulletin. These are mainly to be at ocean terminals to take care of the congestion of supplies across the Atlantic, although some of them probably will be at inland centers where railway communication permits the assembly of goods for further transportation to the ocean terminals. This work is in charge of the Storage Committee of the General Munitions Board, of which M. L. Cooke is chairman.

This committee is endeavoring to introduce system into distribution methods in an effort to eliminate congestion, delay and double haulage, factors that seriously embarrass transportation systems in European countries engaged in the world war. Its aim is to simplify assemblage and storage of supplies required by the army or otherwise necessary to the prosecution of the war. In addition to the construction of warehouses, the committee will urge upon manufacturers the advisability of storage at the point of fabrication, where they will wait requisition for forwarding. It is proposed to establish points of local assembling at which goods in less than carload lots will be temporarily stored and full carloads made up for shipment.

Vancouver To Have New Shipyard—The Griswold-O'Donnell Co., of Portland, Ore., is the latest shipbuilding firm to be organized, and it will erect a plant on the waterfront at Vancouver to have four ways. Plans for machinery to accommodate eight ways have been completed, and the second unit will likely be put in shortly. Room is also leased for a sawmill to accompany the yard.



Proposals

For Proposals Advertised See Pages 51-55 Inclusive

WATER-WORKS

Bids Close		See Eng. News-Record
Aug. 13.	Red Rock, Okla.	Aug. 2
Aug. 16.	Waterloo, Ia.	July 26
Aug. 16.	Kentland, Ind.	Aug. 9
Aug. 20.	Cumberland, Md. Advertised Aug. 2 and Aug. 9.	Aug. 9
Aug. 20.	Chicago Heights, Ill.	Aug. 9
Aug. 25.	San Francisco, Cali	Aug. 2
Sept. 4.	Cumberland, Md. Adv. Aug. 9.	Aug. 9
Sept. 11.	New York, N. Y.	July 12

SEWERS

Aug. 10.	Cashton, Wis.	Aug. 9
Aug. 10.	Abington, Va.	Aug. 9
Aug. 14.	Lebanon, O.	July 26
Aug. 14.	Toronto, Ont.	Aug. 2
Aug. 14.	Salt Lake City, Utah	Aug. 9
Aug. 14.	Escanaba, Mich.	Aug. 9
Aug. 15.	Kings Park, N. Y. Adv. Aug. 9.	Aug. 9
Aug. 20.	New Hampton, N. Y.	Aug. 9
Aug. 20.	Milford, Ia.	Aug. 9
Sept. 4.	Cumberland, Md. Adv, Aug. 9.	Aug. 9

BRIDGES

Aug. 14.	Somis, Cal.	Aug. 2
Aug. 14.	Tekamah, Neb.	Aug. 9
Aug. 14.	Waterbury, Conn.	Aug. 9
Aug. 14.	Tipton, Ia.	Aug. 9
Aug. 15.	New Ulm, Minn.	Aug. 9
Sept. 15.	Anderson, Ind.	Aug. 9
Aug. 15.	Reading, Pa.	Aug. 9
Aug. 16.	Salem, N. J.	Aug. 2
Aug. 20.	Angola, Ind.	Aug. 9
Aug. 22.	Troy, O.	Aug. 2
Aug. 25.	Martinsburg, W. Va.	Aug. 9
Aug. 27.	Elberton, Ga.	Aug. 2
Aug. 30.	Kankakee, Ill.	Aug. 2

STRUCTURAL STEEL WORK

Aug. 14.	Brazil, Ind.	July 12
Aug. 14.	Fairmont, W. Va.	July 26
Aug. 16.	Hamlin, W. Va.	July 12
Aug. 21.	Albany, N. Y. Adv. July 26 and Aug. 2.	July 26

REINFORCED CONCRETE

Aug. 13.	Spencer, W. Va.	July 19
Aug. 22.	Beatrice, Neb.	July 19

STREETS AND ROADS

Aug. 13.	Lewiston, Idaho	May 14
Aug. 13.	Ashland, Ala.	July 26
Aug. 13.	Indiana	July 26
Aug. 13.	Centerburg, O.	July 26
Aug. 13.	Plattsmouth, Neb.	May 2
Aug. 13.	Cincinnati, O.	Aug. 2
Aug. 13.	Sandusky, O.	Aug. 2
Aug. 13.	Brownsville, Pa.	Aug. 9
Aug. 13.	Andalusia, Ala.	Aug. 9
Aug. 13.	Jacksonville, Ill.	Aug. 9
Aug. 13.	Danville, Ky.	Aug. 9
Aug. 13.	Peoria, Ill.	Aug. 9
Aug. 13.	Wheeling, W. Va.	Aug. 9
Aug. 13.	Indianapolis, Ind.	Aug. 9
Aug. 14.	New Bedford, N. J.	July 19
Aug. 14.	Pennsylvania Adv. July 26 and Aug. 9.	July 26
Aug. 14.	Freehold, N. J.	Aug. 2
Aug. 14.	St. Louis, Mo.	Aug. 2
Aug. 14.	Salt Lake City, Utah	Aug. 2
Aug. 14.	Tampa, Fla.	Aug. 2
Aug. 14.	Montclair, N. J.	Aug. 9
Aug. 14.	Massachusetts	Aug. 9
Aug. 14.	Delaware	Aug. 9
Aug. 15.	Canton, O.	Aug. 2
Aug. 15.	Ohio	Aug. 2
Aug. 15.	Medina, O.	Aug. 2
Aug. 15.	Pioneer, O.	Aug. 2
Aug. 15.	Sand Springs, Okla.	Aug. 9
Aug. 15.	Brooklyn, N. Y.	Aug. 9
Aug. 15.	Rhode Island Adv. Aug. 9.	Aug. 9
Aug. 15.	Indianapolis, Ind.	Aug. 9
Aug. 15.	Montezuma, Ga.	Aug. 9
Aug. 16.	Hamlin, W. Va.	July 12
Aug. 16.	Ohio	Aug. 2
Aug. 16.	Savannah, Tenn.	Aug. 2
Aug. 16.	Hazards, Ky.	Aug. 2
Aug. 16.	Colorado	Aug. 9
Aug. 16.	Santa Barbara, Cal.	Aug. 9
Aug. 17.	Jenkins, Ky.	Aug. 2
Aug. 17.	Cincinnati, O.	Aug. 2
Aug. 17.	Somerville, N. J.	Aug. 9
Aug. 18.	Walla Walla, Wash.	Aug. 9
Aug. 18.	Allegan, Mich.	Aug. 9
Aug. 20.	Indiana	July 26
Aug. 20.	Washington	Aug. 2
Aug. 20.	Dubuque, Ia.	Aug. 9
Aug. 20.	St. Paul, Minn.	Aug. 9
Aug. 20.	California	Aug. 9
Aug. 20.	Nebraska City, Neb.	Aug. 9
Aug. 20.	Salmon, Idaho	Aug. 9
Aug. 21.	Stone Harbor, N. J.	Aug. 2
Aug. 21.	Billings, Mont.	Aug. 9
Aug. 21.	Seattle, Wash.	Aug. 9
Aug. 21.	Jersey City, N. J.	Aug. 9
Aug. 23.	Fulton, N. Y. Adv. Aug. 9.	Aug. 9
Aug. 24.	Pennsylvania	Aug. 9
Aug. 24.	Uniontown, Pa.	Aug. 9
Aug. 27.	Newark, N. J.	Aug. 2
Aug. 27.	Portland, Me.	Aug. 9
Aug. 30.	Oklahoma, Okla.	Aug. 9

EXCAVATION AND DREDGING

Aug. 11.	Madison, Minn.	Aug. 2
Aug. 13.	Sibley, Ia.	Aug. 2
Aug. 15.	Cannelsburg, Ia.	Aug. 2
Aug. 17.	Fairbault, Minn.	Aug. 2
Aug. 18.	Sullivan, Ill.	Aug. 2
Aug. 19.	Des Moines, Ia.	July 26
Aug. 19.	Owatonna, Minn.	Aug. 2
Aug. 24.	Peoria, Ill.	Aug. 2
Aug. 24.	Memphis, Tenn.	Aug. 2
Oct. 8.	St. Cloud, Minn.	Aug. 2

INDUSTRIAL WORKS

Aug. 15.	New Hamburg, N. Y.	Aug. 2

BUILDINGS

Aug. 13.	Winnfield, La.	Aug. 2
Aug. 13.	Mason City, Ia.	July 26
Aug. 13.	Nashua, N. H.	Aug. 9
Aug. 13.	Aberdeen, S. D.	Aug. 9
Aug. 13.	Evansville, Ind.	Aug. 9
Aug. 14.	Washington, D. C.	Aug. 9
Aug. 14.	Landsdowne, Pa.	Aug. 9
Aug. 15.	Tower, Minn.	Aug. 2
Aug. 15.	Hudson Falls, N. Y.	Aug. 2
Aug. 15.	Burnaby, B. C.	Aug. 2
Aug. 15.	Holmesburg, Pa.	Aug. 9
Aug. 16.	Raleigh, N. C.	Aug. 9
Aug. 17.	Boston, Mass.	Aug. 9
Aug. 17.	Cohoes, N. Y.	July 26
Aug. 20.	Troy, N. Y.	July 12
Aug. 20.	Topeka, Kans.	Aug. 9
Aug. 20.	Kansas City, Mo.	Aug. 9
Aug. 20.	Brooklyn, N. Y.	Aug. 9
Aug. 22.	Mattapan, Mass.	Aug. 9
Aug. 22	Greensboro, N. C.	July 26
Aug. 22.	Modesto, Cal.	Aug. 2
Aug. 24.	New Brunswick, N. J.	July 26
Aug. 28.	Detroit, Mich.	Aug. 2
Sept. 1.	Elmira, N. Y.	Aug. 9
Sept. 1.	Milwaukee, Wis.	Aug. 9
Sept. 15.	Spirit Lake, Ia.	Aug. 9

FEDERAL GOVERNMENT WORK

Aug. 6	Globe, Ariz.	July 5
Aug. 6	Charleston, S. C.	July 26
Aug. 11.	St. Louis, Mo.	July 26
Aug. 13	Ft. Mifflin, Penn.	Aug. 2
Aug. 13	New York, N. Y.	Aug. 9
Aug. 14	West Point, Ga.	July 12
Aug. 17	Washington, D. C.	July 12
Aug. 20.	GGlenwood Springs, Colo.	Aug. 2
Aug. 20.	Washington, D. C.	Aug. 2
Aug. 20.	Phila., Pa.	Aug. 9
Aug. 20.	New London, Conn.	Aug. 9
Aug. 20.	Port Royal, S. C.	Aug. 9
Aug. 31	Grand Haven, Mich. Adv. July 19 and Aug. 2.	July 19
Aug. 24	Memphis, Tenn.	Aug. 9
Aug. 15	Charleston, S. C.	Aug. 9
Aug. 27.	Hingham, Mass.	Aug. 9
Aug. 17	Washington, D. C.	Aug. 2
Aug. 28	Detroit, Mich.	Aug. 2
Aug. 29	Glenwood Springs, Colo.	Aug. 2
Aug. 30	Franklin, Pa. Adv. July 19 and Aug. 2.	July 19
Sept. 1	Kansas, T. H.	Aug. 9
Sept. 1	Mullens, Fork, S. C.	Aug. 9
Sept. 1	Detroit, Mich. Adv. Aug. 9.	Aug. 9
Sept. 1	Kewaunee, Wis. Adv. July 26	July 26
Sept. 1	Washington, D. C.	Aug. 2
Sept. 1	San Francisco, Cal. Adv. Aug. 9	Aug. 2
Sept. 8	Burnside, Ky.	Aug. 2
Sept. 11	Long Island City, N. Y.	Aug. 2

MISCELLANEOUS

Aug. 6	Mt. Pleasant, Penn. Adv. July 26 and Aug. 2.	July 26
Aug. 8	Jacksonville, Florida, Mass.	Aug. 2

Aug. 13. Timber Bulkhead—Albany, N. Y. ..... Aug. 9
Adv. Aug. 9.
Aug. 14. Twin Falls, Idaho ..... Aug. 9
Aug. 16. Dam—Buffalo, N. Y. ..... Aug. 9
Aug. 21. Piers—Albany, N. Y. ..... July 26
Adv. July 26 and Aug. 2.
Aug. 22. Tunnels—San Francisco, Cal. ..... July 19
Adv. July 19 and Aug. 9.
Aug. 25. Incinerator—Paducah, Ky. Aug. 2

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official

WATER-WORKS

Proposed Work

N. Y., Lockport—City had plans prepared building storage reservoir containing 56,000,000 gal. About $165,000. J. F. Frehsee, city engr.

Fla., Leesburg—City election soon to vote on $40,000 bond issue to build water-works system and electric-light plant. Address Mayor.

Fla., Orlando—City plans to build water and electric light plant. F. N. Williams, clk.

Miss., Moorhead — City voted $10,000 bond issue to construct waterworks system. W. E. Stevenson, mayor.

La., Pineville—City plans water-works system. Address City Clk.

Tenn., Trezevant—City defeated $125,000 bond issue to extend and improve water-works system. Noted June 22.

O., Bluffton—Village to sell $35,000 bonds to build waterworks and electric light system.

O., Hamilton—City to sell $10,000 bonds to improve water-works system. S. D. Nelson, city supt.

Mich., Pontiac—City sold $65,000 bonds to improve and extend waterworks system; this is part of $275,000 bond issue voted. H. L. Weaver, city supt.

Ia., Carroll—City plans to extend water-works. Address City Clk.

Kan., Elkhart—City voted $10,000 bonds to extend water-works system.

S. D., Spencer—City plans to build water-works and sewerage systems.

Mont., Scobey—City voted $19,000 bonds to build waterworks system.

Mo., Monett—City having plans prepared building reservoir, 1,000,000 gal. capacity. About $15,000.

Tex., Mineral Wells — (Official) — City voted $150,000 bonds to build water supply system, including 100,000 cu.yd. fill for dam, 10,000 cu.yd. concrete for spillway and filters, new pumping station and 4½-mi. pipe line. W. W. McClendon, city engr. Noted July 26.

Okla., Norman—City voted $10,000 bonds to construct reservoir and pump house. Noted Aug. 2.

Okla., Okmulgee—City election Sept. 15 to vote on $55,000 bonds to build water-works. Address City Clk. Noted July 5.

Okla., Shattuck—City plans to improve water-works. E. Jenning, city engr.

Nev., Elko—City plans to build reinforced concrete reservoir, 1,000,000 gal. capacity. T. J. Critchley, city supt.

BIDS DESIRED

N. Y., New Hampton—See "Sewers."

Md., Cumberland—(Official)—Until Sept. 4, by A. W. Straub, city clk., furnishing and laying 6-in. water mains and building outlet tunnel. R. L. Rizer, city engr. Advertised in this issue.

Ind., Kentlands—(Official) — Until Aug. 16, by Ed. Trustee Council Chamber building reservoir, tower and tank, 50,000 gal. capacity. Address C. A. Rinard.

Ill., Chicago Heights—Until Aug. 15, by O. W. Ritter, city clk., drilling deep well.

N. D., Goodrich—(Official)—Until Aug. 31, by T. R. Atkinson, engr., Bismarck, for waterworks system.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Boston—Dept. Pub. Wks. let contract laying water pipes Brookline Ave., Roxbury, to T. Costello & Co., 20 Fenwood Rd., Roxbury, $18,105.

★**S. C., Columbia**—City let contract, water mains, sewage and electrical wiring, military cantonment, to Walker Electric & Plumbing Co., Columbus, Ga., $500,000.

★**Ga., Macon**—City let contract laying c.-i. and wood pipe line of from 14 to 20 in. to Camp Wheeler, and building concrete reservoir, 600,000 gal. near camp, to H. B. Hoppenditzel, $18,389.

O., Dayton—City received low bid building 10,000,000 gal. reservoir in southeastern part of city, from J. L. Geiger, Dayton, $160,000. Noted Aug. 2.

★**N. D., Lakoton**—City let contract, water-works and sewerage system, to Haggard Construction Co., Fargo, $80,012.

Wash., Seattle—Bd. Pub. Wks. received low bids building 50,000 gal. pumping plant at Maple Leaf reservoir, including water tank and steel tower, from Swenson & Co., Arcade Bldg., $18,804; E. G. Peters, Oriental Bldg., $24,519. Noted June 21.

SEWERS

Proposed Work

N. J., Hightstown—Boro. plans to install new sewage disposal plant.

Pa., Coatesville — City had plans prepared by A. Potter, engr., Coatesville, building sewerage system and disposal plant. About $350,000.

Pa., Sharon—City soon lets contract, Pine Hollow sanitary sewer, 5000-ft., 24-in. pipe. G. Nicholls, city engr.

Tenn., Mt. Vernon—City plans to extend sewerage system involving laying 3½ mi. pipe. O. E. Mauer, clk.

Ky., Owensboro—City to sell $25,000 of $225,000 sewer bonds recently issued. H. Talbother, city engr. Noted July 5.

O., Cleveland—City rejected bids installing sewers portion East 171st St. R. Hoffman, city engr. Noted July 12.

O., Lorain—City plans sanitary sewer in portions Park View Ave. O. M. McCahon, clk. C. M. Osborn, city engr.

O., Rocky River—(Official)—Village to sell $50,000 bonds Sept. 4 to build sewage disposal plant, flushing tunnel, etc. F. Mitchell, clk.

O., Salem—City plans to rebuild sewage disposal plant. About $200,000. B. M. French, city engr.

O., Waynesburg — See "Streets and Roads."

Mich., Grand Rapids—City to sell $250,000 bonds to construct sewage disposal plant; this is first step in the construction undertaken. W. S. Moore, city engr.

Wis., Burlington—City to sell $13,000 bonds to construct sewers in Perkins Park and in East side of river.

Wis., Milwaukee—City having plans prepared by T. C. Hatton, engr. sewerage comn., sewage disposal plant, Jones Island. About $15,000,000. G. Staal, city engr.

Ia., Creston—City sold $30,000 bonds to construct sewerage system. T. S. DeLay, city engr.

Ia., Pella—City had plans prepared by I. J. Stoddard, engr., to build storm sewerage system. About $15,420.

Kan., Larned—City plans sewage disposal plant. Black & Veatch, 507 Interstate Bldg., Kansas City, Mo., engrs.

Kan., Wichita—City having plans prepared installing sewer mains in Hydraulic Ave., to furnish district lying between drainage canal and river with complete sewerage system. A. Brockway city engr.

Neb., Wayne—(Official) — City defeated $30,000 bond issue to construct storm sewers. J. M. Cherry, clk. Noted July 26.

Wyo., Cheyenne—City defeated $60,000 bond issue to install storm sewers. E. W. Glakeke, city engr. Noted June 7.

Tex., San Antonio—City plans to build sewage pumping plant, Sherman St. to operate sewer system at Camp Travis. H. Helland, city engr.

Tex., Victoria—City plans building storm sewer in 11 blocks consisting of Williams, Liberty, Main and other streets. W. Wheeler, city supt.

Okla., Altus—City soon lets contract addition sewerage system. About $15,000; also paving portions South Main St.

Okla., Bristow—City election Aug. 16th, to vote on bond issue to improve sewerage system. T. B. Gibson, city clk.

Ariz., Glandale — Town voted $50,000 bonds to construct sewerage system.

Wash., Seattle—City had plans prepared sewers, 43rd Ave., N. E. About $15,835. A. H. Dimock, city engr.

Cal., Bishop—City having plans prepared by B. E. Sherwin for sewer extensions. About $35,000.

Ont., St. Catharines—City soon lets contract building next section relief sewer, Dufferin and Maple Sts., also extending relief sewer in Carlton St. W. P. Near, city engr.

Ont., St. Thomas—City plans to construct storm sewers. About $75,000.

Cal., Santa Barbara—City plans extensions to sewerage system including 9400 ft. of from 10- to 33-in. pipe, Imhoff tank, etc. About $85,000. A. B. Cook, city engr.

BIDS DESIRED

N. Y., Kings Park—(Official)—Until Aug. 15 by State Hospital Comn., extending sewage disposal plant, Kings Park State Hospital. E. S. Elwood, secy. Advertised in this issue.

N. Y., New Hampton—Until Aug. 20 by B. G. Lewis, comr. of Correction, installing drainage and water supply of power house and connecting tunnels of New York City reformatory.

N. J., Newark—Until Aug. 9, by St. & Water Comrs., building sewers in Wheeler Rd., Ferdon, South 20th and Miller Sts. M. R. Sherrard, city engr.

Md., Cumberland—(Official)—Until Sept. 4, by A. W. Straub, city clk., building sanitary sewers, Boulevard and Mary St. R. L. Rizer, city engr. Advertised in this issue.

Va., Abington—Until Aug. 10, by City, constructing sewerage system; work involves 37,034 ft. of from 6- to 12-in. salt-glazed vitr. clay pipe. R. Gray, Bristol, engr. Noted Apr. 26.

Mich., Escanaga—Until Aug. 14, by City, 5 sanitary sewers. M. J. Hodson, city engr. Noted July 12.

Wis., Cashton—Until Aug. 10, by P. J. Hegge, village clk., constructing sewage disposal plant, 1200 ft., together with suitable appurtenances. W. S. Woods, La Crosse, engr.

Ia., Milford—(Official)—Until Aug. 20, by J. E. Shelledy, city clk., 4½-mi. 8 15-in. sanitary sewer. C. P. Chase, Clinton, engr.

Utah, Salt Lake City—(Official)—Until Aug. 14 by G. Snow, city recorder, constructing pipe sewers, Sewer Extension No. 374, portions 3rd and 4th Aves.

Cal., Santa Barbara—See "Streets and Roads."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**R. I., Pawtucket**—Bd. Pub. Wks. let contract, sewer in portions Mineral Spring and Smithfield Aves. to E. B. Roberts Constr. Co., Pittsfield, Mass., $20,000.

N. Y., New York — (Official) — M. M. Marks, boro. pres., received low bids (a) repairing barrel sewers Ft. Vestry St., and North River, Pier 29, (b) foot Duane St. and North River, Pier 21, from Lawrence Contr. Co., 2409 Walton Ave., (a) $13,388 (b) $14,502; Riverside Contr. Co., 39 Cortlandt St. (a) $14,762; (b) $13,732; Melrose Constr. Co., 147 West 125th St., (a) $17,382; (b) $15,829.

★**N. Y., Wingdale**—Comn. on New York Prisons, Room 615 Hall of Records, New York City, let contract sewage disposal plant at Wingdale Prison to New York Sewage Disposal Co., 37 East 28th St., New York City, $37,769. Noted June 28.

★**Pa., Dorranceton**—See "Streets and Roads."

★**O., Cleveland**—Bd. Control let contract building "takeout" pipes East 140th St. sewage disposal plant to Amer. Constr. Co., 1552 Rockefeller Bldg., $360,700.

★**O., Cleveland**—City let contract, sewer in portion West 59th St. to Manson Co., 120 Engineers' Bldg., $12,625, drainage sewer around public hall site to Hoag & Dall, 510 Court Bldg. About $98,728.

Sewers (Continued)

★**O., Cleveland**—Bd. Control let contract installing sewers East 116th to Brookside Constr. Co., $12,686; Corlett Ave. to Randall & Cooper, $43,077; Tampa Ave. to Amata Constr. Co., 1108 Engineers Bldg., $4450. Noted July 12.

★**Ind., Garrett**—City let contract building Walsh St. sewer to C. Weis, Peru, $22,-881.

★**Wis., La Crosse** — (Official) — City let contract building sewers to Hill, Manning, Whalen Co., 512 State St., $67,487.

★**Wis., Neenah** — (Official) — Bd. Pub. Wks. let contract installing 5300 lin.ft. sanitary sewers to Kispert & Hendricks, Kaukauna, $10,558.

★**Ia., Farley**—City let contract sewerage system to O. Kvingle, Dubuque, $15,563; also disposal plant to M. Tschivgi, Cedar Rapids, $7700.

★**Minn., Crosby** — Village let contract sewer in central addition to Pastoret Constr. Co., Duluth, $12,267. Noted July 12.

★**Kan., Augusta**—City let contract, sewers in Dists. Nos. 2 and 3 to McCoy & Taylor, Emporia, $33,623.

★**N. D., Drake**—City let contract installing sewerage and waterworks systems to Badger Constr. Co., Drake, $80,000.

★**N. D., Lakoton**—See "Water-works."

★**Mo., Ada**—City let contract, sewer, to D. Tolbert, Muskogee, $24,100.

★**Okla., Claremore**—City let contract laying 8-in. sewer main, 6-in. laterals, in sewer dists. 12, 13, 14 and 15 to Municipal Excavating Co., Oklahoma, $11,000.

★**Okla., Frederick**—City let contract sewers portions Grand Ave., 10th and 11th Sts., to Vibrolithic Constr. Co., $18,681.

★**Ore., Astoria**—See "Streets and Roads."

★**Wash., Seattle**—Bd. Pub. Wks. let contract, sewers in West and North 45th St. to Fiorito Bros., 1630 25th Ave., $18,119.

★**Wash., Seattle**—Bd. Pub. Wks. let contract installing clay pipe sewers 11th Ave., N. W., to Fiorito Bros., Seattle, $12,495.

BRIDGES

Proposed Work

N. Y., Watertown — New York Central R.R. and City plans to build double-deck bridge at Court St. G. W. Kittredge, Grand Central Terminal, New York City, ch. engr. R.R. E. W. Sayles, city engr.

Pa., Emaus—Philadelphia & Reading Ry. having plans prepared by A. L. Carhart, engr., for rein.-con. bridge. S. T. Wagner, Phila., ch. engr.

Pa., Reading—Berks Co. plans to build rein.-con. bridge over Monocacy Creek, ½ mi. south of Baumstown.

O., Dayton—City plans to build 2 span steel bridge over Wolf Creek, earth filled approaches, spans 233 ft. and 50 ft. long. F. O. Eichelberger, city engr.

O., Niles — Trumbull Co., Westhersfield Twp. voted $120,000 bonds to build 382-ft. bridge involving 4000 yd. concrete over Mahoning River to connect Niles and McDonald. Noted June 28.

Ia., Sac City—Bd. Supervs. Sac Co. plans to spend $20,000 to build bridges.

Ia., Waukon—Allamakee Co. sold $116,-000 bonds to build bridges.

Minn., Duluth—St. Louis Co. prepared plans for rein.-con. bridge over St. Louis River. About $100,000.

Mo., Charleston — See "Streets and Roads."

Mo., Osceola—See "Streets and Roads."

Okla., Ada.—See "Streets and Roads."

Okla., Ardmore—See "Streets and Roads."

Okla., Atoka—Atoka Co. election Aug. 15, to vote on $30,000 bonds to build bridges.

Okla., Chickasha—Grady Co. Comrs. appropriated $20,000 to build bridge over Canadian River.

Okla., Sapula—Creek Co. Comrs. plan to build 2 rein.-con. bridges between Kelleyville and Bristow. About $65,000.

Okla., Stroud—See "Streets and Roads."

Wash., Olympia—City soon receive bids for rein.-con. bridge over Des Chutes River, 4th St. About $150,000.

Cal., Los Angeles—Bd. Supervs. Los Angeles Co. appropriated $25,000 to build Sanford bridge over east branch Los Angeles River, near Rivera. $37,000 for Old Mission bridge on San Gabriel Blvd., near Whittier, $15,000 for Verdugo Wash bridge, Glendale; $5000 for Ivanhoe bridge over Los Angeles River between Glendale and Los Angeles.

BIDS DESIRED

Conn., Waterbury—Until Aug. 14, by City, building 3-span rein.-con. bridge over Naugatuck River at West Main St. About $100,000. R. A. Cairns, city engr. Noted Apr. 26.

Pa., Reading—Until Aug. 15, by W. H. Dechant & Sons, engrs., Baer Bldg., building bridge over Schuylkill River for Carpenter Steel Co.

W. Va., Martinsburg—Until Aug. 25, by Berkeley Co., building 100-ft. rein.-con span over Opequon Creek.

Ind., Anderson—Until Sept. 15, by Madison Co. Comrs., building 100-ft. bridge over Sugar Fork, Adams Twp.

Ind., Angola—Until Aug. 20, by Steuben Co. Comrs., building 2 rein.-con. bridges and lengthening 1 concrete bridge.

Ia., Tipton—Until Aug. 14, by Cedar Co. building 35 rein.-con. culverts and 1 I-beam bridge, concrete floor and abutments. About $16,300. A. C. Yetter, aud.

Minn., New Ulm—Until Aug. 15, by Brown Co., building 1 60-ft. steel truss bridge over Little Cottonwood River. L. G. Vogel, aud.

Minn., Warren—Until Aug. 14, by Marshall Co. building 4 highway bridges and 2 rein.-con. culverts. A. G. Ludgren, aud.

Neb., Tekamah—Until Aug. 14, by City building rein.-con. highway bridge and retaining walls. A. C. Arend, Brandeis Bldg., Omaha, engr.

Cal., Ventura—Until Aug. 14, by J. B. McCloskey, Ventura Co. aud., building bridge near Somis, involving 100 cu.yd. concrete, 7640 lb. reinforcing steel.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Dedham — See "Streets and Roads."

★**N. Y., Buffalo**—See "Industrials."

★**Fla., West Palm Beach**—See "Excavation and Dredging."

★**O., Youngstown**—See "Railways."

★**Ark., Little Rock**—Pulaski Co. Bridge Com. let contract repairing free bridge to Missouri Valley Bridge & Iron Co., Leavensworth, Kan., $38,000.

★**Cal., Marysville**—Yuba Co. let contract 3 Creps bridges in Superv. Nutt's Dist. to Jenkins & Wells, 3530 York Ave., Sacramento, $17,671.

STRUCTURAL STEEL WORK

Proposed Work

O., Dayton—See "Bridges."

Okla., Ardmore—See "Streets and Roads"

BIDS DESIRED

Minn., New Ulm—See "Bridges."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**O., Cleveland**—See "Industrials."

REINFORCED CONCRETE

Proposed Work

Pa., Emaus—See "Bridges."

Pa., Reading—See "Bridges."

O., Cleveland—See "Buildings."

O., Niles—See "Bridges."

Minn., Duluth—See "Bridges."

Okla., Ardmore—See "Streets and Roads."

Okla., Sapulpa—See "Bridges."

Cal., Huntington Beach—See "Miscellaneous."

Ont., Amherstburg—See "Miscellaneous."

BIDS DESIRED

Conn., Waterbury—See "Bridges."

N. Y., Buffalo—See "Miscellaneous."

W. Va., Martinsburg—See "Bridges."

Ind., Angola—See "Bridges."

Ind., Kentland—See "Waterworks."

Ia., Tipton—See "Bridges."

Minn., Warren—See "Bridges."

Nev., Elko—See "Waterworks."

Cal., Ventura—See "Bridges."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Ark., Ft. Smith**—See "Industrials."

★**Ore., Portland**—See "Buildings."

STREETS AND ROADS

Proposed Work

Mass., Peabody — City to sell $50,000 bonds to pave streets. F. Emerson, city engr.

N. Y., Albany—State Highway Comn. plans to build Gateway Blvd. from Buffalo to Pennsylvania state line. Chautauqua Co to bear part of cost. E. Duffey, comr.

N. Y., Long Island City—Boro plans to pave portion Jamaica Ave., $100,000.

New Jersey—State Highway Dept., Trenton, appropriated $65,000 for road work in Mercer Co. Address, Bd. Freeholders, Trenton.

N. J., Collingswood—Council voted $120,-000 bond issue to repave Haddon Ave. and other streets. Address D. S. Rush. Noted July 19.

N. J., East Orange—City Council to sell $18,000 bonds, Aug. 13, for paving Harrison St. W. D. Willegerod, city engr.

N. J., Gladstone—Town plans to improve road from here to Pottersville. About $10,000.

N. J., Lyndhurst—Town plans to expend $14,356 to pave streets.

N. J., Montclair—Town Court declared void contract let to Standard Bitulithic Co., 31 Clinton St., Newark Paving Park St. and Bellevue Ave., $269,360. New bids soon. Noted July 26.

N. J., Newton—Sussex Co. Bd. Freeholders plans to pave Springdale-Tranquility Rd., macadam.

N. J., Trenton—Bd. Freeholders Mercer Co. plan to build road from Sullivan Way to River Rd., boulevard style. About $10,-000. F. McCullough, clk.

N. J., Union—Town election soon to vote on $54,000 bond issue to repair streets.

Pennsylvania — State Highway Dept., Harrisburg, received to bid paving Moscaca-Aliquippa Rd., vitr. block and waterbound macadam. New bids soon. F. H. Black, state highway engr. Noted July 12.

Pennsylvania — State Highway Comn., Harrisburg, authorized surveys building new highways in Westmoreland Co. Roads to be built jointly with county officials. Address Co. Comrs., Greensburg.

W. Va., Claredon—Alexandria Co. prepared plans improving Rossiyn-Cherrydale Rd. About $35,000 available.

W. Va., Parkersburg—City plans paving Spring, and many other streets, brick. About $46,000. T. L. Higgs, city engr.

W. Va., Wheeling—Ohio Co. soon lets contract building concrete road between Atkinson's crossing and Pennsylvania line.

W. Va., Wheeling—City had plans prepared for improving streets. About $125,-000. C. B. Cooke, city engr. Noted July 26.

N. C., Smithfield—Town plans to pave 7 blocks; also building sidewalks. About $10,000.

Ala., Anniston—Calhoun Co. Comrs. plan to build highway from here to Bynum, 8 mi. About $85,000.

Ala., Gadsden—City sold $18,000 bonds to pave portion Chestnut St. H. Smith, city engr.

Miss., Liberty—Amite Co. Comrs. having plans prepared for building Fenetia Highway to 3rd Dist. About $40,000 available for work. F. J. Russell, engr.

Louisiana—State Highway Dept. plans to build road from Pineville to Camp Beauregard. About $15,000 per mile. D. Dale, New Orleans, state highway engr.

La., Cameron—Cameron Co., Hackberry Dist. plans to build road from Hackberry across Bayou Nezo and connecting Calcasieu Co. Highway. $50,000 bond issue voted.

La., Edgard—St. John Baptist Co. sold $150,000 bond issue to build roads. W. Lassalle, clk. Noted July 19.

Penn., Cleveland—City to sell $85,000 bond issue to pave 74 sts. crossings, S. E. Newton, Box 54, city engr. Noted May 10.

Penn., Springdale—Butterman Co. Court to sell $50,000 bonds to improve roads. Noted July 19.

Ky., Cadiz—Trigg Co. soon lets contract building gravel intermediate road between here and Hopkinsville. O. W. Rose, co. engr.

Ky., Clinton—Hickman Co. plans to build 4 road roads improvement program.

O., Bryan—Williams Co. to sell $125,000 bonds Aug. 15, to improve roads. C. C. Streator, aud.

O., Cleveland—City plans to improve E. 55th, Carnegie, Superior, E. 79th, Woodland, Hough, Cedar, Payne, Lexington, West 14th, West 25th, Miles and Franklin Sts. E. Hopkins, city engr.

Streets and Roads (Continued)

O., Columbus—City election Aug. 14 to vote on $500,000 bonds to improve streets. H. Mactzel, city engr. Noted June 21.

O., Dayton—City plans to pave West 5th St., from Perry to Wilkinson Sts., creosoted wood block, and from Perry to Great Miami bridge, brick; also building sidewalks on Lakeview Ave. F. O. Eichelberger, city engr.

O., Findlay—Hancock Co. Comrs. sold $46,000 bonds to improve roads.

O., Norwalk—Huron Co. to sell $31,500 bonds, Aug. 21, for improving I. C. G. No. 289, Lyne Twp. C. E. Bloomer, aud.

O., Ravenna—Portage Co. to sell Aug. 20, $75,000 bonds to improve I. C. H. No. 474, Mantua and Aurora Twps., Atwater-Limaville Rd., Atwater Twp. M. J. Kelley, co. aud.

O., Wapakoneta—Auglaize Co. sold $62,500 bonds to improve Wapakoneta Roundhead Rd.

O., Waynesburg — (Official) — Village to sell $16,840 bonds grading paving and building catch basins, storm sewer, etc. J. W. Elsass, clk.

O., Youngstown — Mahoning Co. sold $103,000 bonds to improve Youngstown-Conneaut I. C. H. No. 13, Monroe Sect. B. E. Brainard, clk.

Ind., Goshen—Elkhart Co. sold $14,000 bonds to improve Osolo Twp. highways.

Ind., Indianapolis—Marion Co. to sell $200,000 bonds Aug. 10th, to improve highways. L. K. Fesler, aud.

Ind., Lafayette—Tippecanoe Co. to sell $148,000 bonds Aug. 10 to improve highways. H. G. Leslie, treas.

Ill., Amboy—City plans to pave, curb and gutter Mason St., brick. F. W. Leake, engr.

Ill., North Chicago — City plans paving portions of 67 streets. About $120,000. M. J. Douthitt, city engr.

Ill., Pontiac—City plans to pave streets involving 3069 sq.yd. concrete, 14,722 sq.yd. monolithic and 13,345 ft. curb and gutter.

Ia., Des Moines—Bd. Supervs. Polk Co. rejected bids, 5-mi. highway from Des Moines to Camp Dodge. Noted July 5.

Ia., Des Moines—City plans to pave portion of 11th St. K. Kastberg, city engr.

Ia., Marion—Linn Co. plans to pave road between here and Cedar Rapids, 1½ mi. About $60,000

Ia., Oskaloosa—City plans to improve A Ave. from 11th St. to city limits on the east.

Ia., Tama—City preparing plans paving 4 mi. streets

Minn., Duluth—City plans paving portions Birch Ave., rein.-con. E. Ayers, engr.

Minn., Duluth—City plans to curb and gutter portion of 5th St. About $400,000. L. Ayers, city engr.

Kan., Columbus—Cherokee Co. soon lets contract grading and graveling about 10-mi. Blake Rd. C. M. Cooper, co. engr.

Kan., Concordia—Cloud Co. Comrs. plan to pave White Way between here and Clyde.

Kan., Great Bend—City soon lets contract paving William St. F. A. Moses, clk.

Kan., Wichita — City soon lets contract paving portions of Fairmont Ave. Address A. Brockway, city engr.

Neb., Lincoln—Lancaster Co. plans to pave portion O St. Rd., 6 mi. A. Edgren, co. engr.

Neb., Wayne—(Official)—Wayne Co. defeated $75,000 bond issue to pave streets and drain wet land. J. M. Cherry, clk. Noted July 26.

Montana—State Highway Comn., Helena, plans to build highway between Butte and Helena, 3 routes: main route from Butte to Basin and Boulder by way of Elk Park and thence to Helena; from Butte to Whitehall and from there to Boulder; from Deer Lodge over Priest pass route to Helena.

Mo., Carthage—Jasper Co. plans to build 7.4 mi. concrete road with state aid.

Mo., Charleston—Mississippi Co. voted $275,000 bonds to build highways and bridges. Noted June 14.

Mo., Jefferson City—Cole Co. plans to build 27.8 mi. rock and gravel road with state aid.

Mo., Joplin—City plans to resurface portions 5th, Wall, 3rd, Joplin, 4th Sts. and Virginia Ave., asphalt filler. J. J. McAffee, city engr.

Mo., Linn—Osage County voted $180,000 bond issue for improving roads in county.

Mo., Osceola—Bd. Supervs. St. Clair Co. sold $400,000 bond issue to grade roads and build bridges on State Rds. Noted June 28.

Mo., St. Joseph—(Official)—City passed ordinances for improving portions Savannah Ave., Edmond, Locust, Seneca and other streets by paving and building sidewalks. C. P. Hoff, city engr.

Mo., Sikeston—Scott Co. voted $750,000 bond issue to build 230 mi. hard roads. Noted July 5.

Mo., Warrensburg — Johnson Co. plans election to vote on $500,000 bond issue to improve roads. T. Hyatt, clk.

Arkansas—State Highway Comn., Little Rock, prepared plans building 47 mi. earth roads, Montgomery Co., cost, $26,357; 13 mi. gravel road, Arkansas Co., $93,007; 13 mi. bituminous gravel road, Lonoke Co., $141,582.

Ark., Newport—Jackson Co. Comrs. sold $250,000 bonds to build 52-mi. main line road and 8-mi. lateral roads in Rd. Dist. No. 2.

Ark., Pocahontas—Randolph Co. Comrs. having plans prepared for building 41-mi. new roads. About $248,000. Address C. F. Bode, O'Kean.

Ark., Russellville—City plans paving 16 blocks Main St., Dist. No. 1 and 1-mi. Oak St., Dist. No. 2.

Ark., Walnut Ridge — Lawrence Co. Comrs. had plans prepared 13-mi. road, macadam, from Lauratown north to Black Rock. About $80,268.

Tex., Canadian — Hemphill Co. defeated $150,000 bond issue to build roads. Noted June 21.

Tex., Sanford—City plans to spend $12,500 to pave streets.

Okla., Ada—Pontiac Co. election Aug. 20 (change of date) to vote on $523,000 bond issue to build roads and bridges. Noted July 12.

Okla., Ada—City having plans prepared by Benham Eng. Co., engrs., Colcord Bldg., Oklahoma, paving 8 blks., Dist. No. 5, asphaltic concrete. About $35,000.

Okla., Altus—See "Sewers."

Okla., Ardmore—Carter Co. preparing plans for 50 mi. hard surfaced roads, gravel or rock asphalt also steel and rein.-con. bridges. About $200,000. E. E. Gravelle, co. engr.

Okla., Sapulpa—Creek Co. Comrs. plan to spend $300,000 to build roads; plans include 15 mi. new road.

Okla., Stroud — City defeated $60,000 bonds to build roads and bridges. Noted June 7.

Idaho — State Highway Comn., Boise, plans paving portions N. and S., Sawtooth Park, Idaho and Pacific, and Yellowstone Park Highways with gravel.

Ariz., Kingman—Mohave Co. Bd. Superv. plans to expend $28,000 to build roads.

Ariz., Phoenix—City plans to pave portions East Moreland and Willetta Ave., concrete base, bitulithic surface. J. B. Girand, city engr.

Ore., Eugene—Lane Co. plans improving Cottage Grove Rd. with state aid. About $100,000.

California—State Highway Comn., Sacramento, rejected bids, paving 8.7-mi. state highway in Los Angeles Co. between point near Action and Palmdale, with concrete. Noted Aug. 2.

Cal., Los Angeles—Los Angeles Co. Rd. Comn. plans to complete harbor truck boulevard on Alameda St. from Slauson Ave. to Wilmington, 13.31 mi. concrete. About $365,107. F. H. Joyner, rd. comr.

Cal., Stockton—San Joaquin Co. election soon to vote on $150,000 bond issue to build and pave 55-mi. roads.

BIDS DESIRED

Me., Portland—(Official)—Until Aug. 27, by E. M. Hunt, comr. pub. wks., paving portions Congress St., 2580 sq.yd. split, redressed, granite block.

Massachusetts—(Official)—Until Aug. 14 by State Highway Comn., Boston, surfacing 3400 ft., Swansea; building highway, 2200 ft., Lynn, 3300 ft., West Springfield. W. D. Sohier, member.

Rhode Island—(Official)—Until Aug. 15, by State Bd. Pub. Rds., Providence, rebuilding 1.5 mi. state highway; advertised in this issue.

N. Y., Brooklyn—Until Aug. 15, by L. H. Pounds, boro. pres., Boro. Hall, regulating and paving permanent asphalt, 6-in. concrete base portion roadway Hegeman, Q. Sneider, 16th, 19th Aves., and West 29th St., regulating, grading, curbing, laying sidewalks, paving, preliminary asphalt block, portion roadway Narrows Ave., regulating and restoring pavement portion roadway Park and Tomkins Ave., regulating, grading, curbing and laying sidewalks, Q and Stone Aves., regulating, repaving permanent grade 1 granite, 6 in. concrete foundation, roadway Van Brunt St., 81st St., preliminary asphalt blocks.

N. Y., Fulton—(Official)—Until Aug. 23, by C. M. Allen, Jr., city clk., paving various streets; advertised in this issue.

N. J., Jersey City—(Offical)—Until Aug. 21 by Hudson Blvd. Comrs., building roadway between Central R.R. of New Jersey, near 8th St. to 36th St., Bayonne, rein.con. J. C. Sweeney, clk. C. A. Van Kuren, city engr.

N. J., Montclair—(Official)—Until Aug. 14 by H. Trippett, town clk., paving portion Park St., warrenite, concrete curb; Bellevue Ave., warrenite, Hillside brick.

N. J., Somerville—Until Aug. 17, by Bd. Freeholders, improving portion Chimney Rock Rd. J. Dougherty, co. engr.

Pennsylvania—Until Aug. 24, by State Highway Dept., Harrisburg, building 5-mi. state highway from Morado to Lawrence Co. line.

Pa., Brownsville—(Official)—Until Aug. 13, by C. W. Coulter, boro. secy., improving Water St., involving 4800 cu.yd. excava., 4900 lin.ft. curbing and 5500 sq.yd. paving, vitr. block. L. G. Moslener, boro. engr.

Pa., Uniontown — (Official)—Until Aug. 24, by H. Kisinger, Fayette Co., controller, grading 19,000 cu.yd. River Rd., Brownsville Twp.

Delaware—Until Aug. 14, by State Highway Dept., Dover, building 5-mi. Lincoln Highway.

W. Va., Wheeling—(Official)—Until Aug. 13, by H. C. Underwood, clk. Ohio Co. bd. comrs., grading and building concrete road surface, portions National Rd., Steenrod and Mount de Chantal Rd. W. O. McCluskey, Jr., co. rd. engr.

Ala., Andalusia—Until Aug. 13 by Bd. Revenue, grading, draining and sand-clay surfacing 4.3 mi. road in Covington Co. J. M. Garrett, co. engr.

Ga., Montezuma—Until Aug. 15, by city paving 12,000 sq.yd. streets, vitr. brick, cement concrete, bituminous concrete, bituminous macadam or creosoted wood block.

Ky., Danville—(Official)—Until Aug. 14, by Boyle Co. Fiscal Court, county road No. 14, waterbound macadam. C. B. Arnold, co. rd. engr. Noted Apr. 26.

Ind., Indianapolis—(Official)—Until Aug. 13, by Bd. Pub. Wks., grading, paving portions California, Washington and Court Sts., wooden blocks, asphalt, bituminous concrete, or brick, 6-in. gravel concrete foundation. J. A. Rink, pres. B. J. T. Jenks, city engr.

Ind., Indianapolis—(Official)—Until Aug. 15, by Bd. Pub. Wks., grading, paving portions Middle, Illinois, New York and other streets, wooden blocks, asphalt, bituminous concrete, or brick, 6 in. gravel concrete foundation; also grading and paving sidewalks, Blvd. Pl. Harding St., and other streets, cement. J. A. Rink, pres. B. J. T. Jenks, city engr.

Mich., Allegan—Until Aug. 18 by W. McCarn, chn. Allegan Co. Rd. Comn., building road running south 2 mi. between Dorr and Leighton Twps.

Ill., Danville—(Official)—Until Aug. 13, by Bd. Local Imprv. paving portion Robinson St. W. H. Martin, city engr.

Ill., Jacksonville—(Official)—Until Aug. 13, by Bd. Local Imprv., improving roadways, South West, West Morgan, South Sandy Sts., College Ave., and other streets. E. M. Henderson, city engr.

Ill., Peoria—(Official)—Until Aug. 13, by Bd. Local Imprv., paving Kansas Ave., vitr. brick, including 1502 lin.ft. sandstone curb, 2510 sq.yd. concrete foundation and same amount of brick pavement. L. D. Jeffries, city engr.

Ia., Dubuque—(Official)—Until Aug. 20 by City, for improving portion Cox St. involving 1695 sq.yd. macadam, 1800 lin.ft. curb and gutter, 2720 cu.yd. rutting and 1740 cu.yd. filling. E. C. Blake, city engr.

Minn., St. Paul—(Official)—Until Aug. 20, by H. W. Austin, city purch. agt., grading portions Fulham St., May and Hamline Ave. and certain alleys; also curbing portion Jenks St., furnishing material paving portion 9th St., including 915 sq.yd. vitr. clay brick, 2710 sq.yd. sandstone blocks, 1177 bbls. portland cement, etc. O. Claussen, city engr.

Neb., Nebraska City—Until Aug. 20, by Otoe Co., grading 20,000 yd. road. O. Stevenson, clk.

Mont., Billings—Until Aug. 21 by J. M. Bresnahan, clk., for paving 7360 sq.yd. in Dist. No. 157. E. M. Schneckerberger, city engr.

Okla., Oklahoma—Until Aug. 30, by City, for 2 mi. rock asphalt paving. G. V. McClure, city engr.

Streets and Roads (Continued)

Okla., Sand Springs—Until Aug. 15, by City paving 30,000 yd. streets, Dist. No. 2, asphaltic concrete. About $85,000. Benham Eng. Co., 1300 Colcord Bldg., Oklahoma, engrs. Noted July 5.

Colorado—Until Aug. 16, by State Highway Comn., Denver, building road Estes Park to Grand Lake, 5½ mi.

Idaho, Salmon—Until Aug. 20 by Lemhi Co. Comrs., building 16-mi. Lemhi Highway. Allen & Merrett, engrs.

Utah, Salt Lake City—Until Aug. 14, by City Rec., for paving Virginia and Alta Sts. and 3rd and 4th Aves., also grading, curbing, guttering and paving of Pavement Extension No. 137. S. Q. Cannon, city engr.

Wash., Seattle—Until Aug. 21, by King Co. Comrs. building Kirkland-Houghton Rd., Permanent Highway No. G. About $15,000. S. J. Humes, co. engr.

Wash., Walla Walla—Until Aug. 18 by County Comrs., building permanent highway No. 18, Walla Walla Co. G. Cookerly, co. engr.

California—Until Aug. 20 by State Highway Comn., 515 Forum Bldg., Sacramento, paving 13.3 mi. road from Sacramento River to Lamoine Shasta Co. with concrete.

Cal., Santa Barbara—Until Aug. 16, by A. C. Hall, city clk., paving 17 blocks Bath St., from Montecito to Mission Sts., 5-in. concrete, 1½- warrenite wearing surface, including 3-ft. concrete gutters, cement and stone curbs, 126-ft. concrete cross gutters, 20 concrete catchbasins, 6- and 18-in. vitr. pipe sewers, rubble stone retaining wall, etc. About $65,000. A. B. Cook, city engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston** — E. F. Murphy, comr. pub. wks., 511 City Hall Annex, let contract paving Seaver St., Roxbury to Warren Bros., 142 Berkeley St. Noted June 28.

Mass., Dedham—Town received low bid building highway and 2 bridges, Bussey St., from Clark & Gore, 11 Montague St., Dorchester, $26,000.

Mass., Woburn—(Official)—State Highway Comn., Boston, received only bid paving, asphalt macadam, from A. Pallato, 1117 Crosby St., Lowell, $14,405.

N. Y., Brooklyn—W. Williams, comr. Water Supply, Gas and Electricity, Municipal Bldg., Manhattan, received low bid paving roadway, furnishing new fence posts, and resetting fence in front of Mt. Prospect Laboratory, Flatbush Ave., near Eastern Pkway., from F. Gallagher, 490 Park Pl., $21,089. Noted July 19.

★**N. Y., New York**—(Official)—M. M. Marks, boro. pres., let contract regulating and paving roadway of West 172nd St. from B'way. to Ft. Washington Ave., asphalt; and from Ft. Washington to Haven Ave., bituminous concrete, concrete foundation, also portion Houston St., asphalt, to Davney Asphalt Co., 52 Vanderbilt Ave., $11,844. Noted July 19.

★**N. Y., Port Washington**—Town let contract improving Reid and Murray Aves., Washington and Mitchell Pl. to Andrews Bros., Mineola, $48,364.

★**N. Y., Poughkeepsie** — (Official) — Bd. Pub. Wks. let contract paving, grading and curbing various streets, brick, bituminous and asphaltic concrete, to Schenectady Constr. Co., 332 State St., Schenectady. About $65,202. Noted June 21.

★**N. Y., Yonkers**—City let contract regulating, grading, etc., portion Central Park Ave. to T. Grady, 11 Myrtle St., $66,437.

★**N. J., Cape May**—Bd. Freeholders Cape May Co. let contract paving 3-mi. road, bituminous top, to E. A. Corson, Ocean City, $60,000.

N. J., Paterson—Passaic Co. received low bids paving (a) Madison Ave., (b) East Main St., (c) 1st Sect. Goffle Rd., (d) 2nd Sect. Goffle Rd., (e) East 18th St., (f) Murray Ave., (g) Franklin Ave., from M. J. O'Connell (a) $31,043 (b) $20,127. J. T. Harrop, East 30th St., (a) $32,839 (b) $19,428 (c) $12,968 (d) $22,259; G. F. Brackett, (a) $33,192; G. Dreher, Paterson, (c) $11,982 (d) $21,971; Franklin Contr. Co., 52 Vanderbilt Ave., New York City, (e) $7336; L. Cramer, (e) $7624; P. Kramer, Grand St., (f) $12,965; McKierman & Bergin, 1st Natl. Bank Bldg., (f) $13,947; F. Spats, (g) $29,964; Union Building & Contr. Co., Main Ave., Passaic, (g) $31,169.

N. J., Paterson—Bd. Freeholders received low bids paving River Dr. from G. B. Belcher, Paterson, about $30,597; Union Bldg. and Constr. Co., Main Ave., Passaic, $39,794; M. J. O'Connell, Paterson, $42,357; Cedar Grove Rd. and Wilmore Ave., Francisco Bros., United Bank Bldg., $24,029, Osborne & Marselis, Paterson, $25,121; and M. J. O'Connell, $25,486.

★**N. J., Somerville**—Bd. Freeholders Somerset Co. let contract improving 2.84 mi. Mead-Griggstown Rd., waterbound macadam, to Hickey Constr. Co., Somerville, $12,100. Noted July 12.

N. J., South River—Bd. Freeholders Middlesex Co., New Brunswick, received low bids paving Main, Ferry, Causeways Sts and South Amboy-Sayreville Rd. from T. H. Riddle, 102 Church St., New Brunswick, $40,576; Utility Constr. Co., 46 Paterson St., New Brunswick, $41,317; Graham & McKeon, $41,328. Noted July 26.

Pennsylvania—(Official)—State Highway Comn., Harrisburg, received low bids road work as follows: McKean Co. Route 96, Olean, N. Y., to Pennsylvania-New York state line, Foster Twp., 8367 ft. vitr. brick, from E. M. Love & Sons, Corry, $54,502; J. B. Sheehan, Bradford, $56,939, Eartino & Bevaqua, Bradford, $59,153; Somerset Co. Route 51, Myersdale to Garrett, from R. B. Taylor, Bellefonte, $81,428; Hoblitzell & Price, Myersdale, $114,977; W. G. Evans, Ambler, $146,711. Noted July 12.

★**Pa., Birdsboro**—City let contract macadamizing Main and Furnace Sts. to I. S. Horton & Co., Reading.

★**Pa., Carnegie**—City let contract paving portion Cubbage, Elm, and 4th, Howard, Jane, Walnut, Williams Sts., and 7th, 1st and Midland Aves. to S. Gamble Co.

★**Pa., Dorranceton** — Boro. let contract paving and installing storm sewers Pierce St. to B. G. Coons Constr. Co., Luzerne, $12,500.

★**Pa., East Mauch Chunk**—Boro. let contract paving 1852 ft. Center St., to C. E. Riebe, Lansford, $2.70 per sq.ft. Noted Apr. 19.

★**Pa., Erie**—(Official)—City let contract paving Lighthouse St. to J. J. Doyle, 457 West 3rd St., $12,069.

★**Pa., Sayre**—Town let contract paving North Elmer Ave. to R. J. De Long, 516 Anthony St., Williamsport, $16,406.

★**Maryland**—State Highway Comn., Baltimore, let contract building 4.64 mi. concrete road, Talbot Co. to Shafer & Williams, Easton; roads, Frederick Co. to M. J. Grove Lime Co., Limekiln.

★**Va., Lynchburg**—City let contract roadway, Campbell Courthouse Turnpike from Grace St. to city limits, rubble stone, to Burnett Bros., Lynchburg, $13,000.

★**Ala., Bessemer**—City let contract paving portion 2nd Ave. to Sullivan, Long & Haggert, Bessemer, $2.25 per sq.yd.

★**Miss., Biloxi**—City let contract resurfacing streets to W. E. Callahan, City National Bank Bldg., Omaha, Neb. About $35,000. Noted July 12.

★**Tenn., Chattanooga** — Hamilton Co. Comrs. let contract paving Market St. bridge, oil distillate asphalt, to West Constr. Co., 10th and Market Sts., $29,456.

★**Tenn., Wartburg**—Morgan Co. Comrs. let contract surfacing, crushed sandrock, surfaced with chert, near Lancing, to Arthur B. Long, Victoria, $20,000.

★**Ky., Carrolton**—City let contract paving portions Main, 5th and Court Sts., concrete, to Mastor Constr. Co., Seymour, Ind., $2.40 per yd. Noted July 26.

★**Ky., Jenkins**—City let contract 4100 sq. yd. paving, concrete, to Phelps-Post-Gwyn Co., Lexington, $2.25 per sq.yd.

O., Canton—City received low bid improving portion Belden Ave., N. E., from Cable Co. and Wise Bros., both of Canton. Noted June 28.

★**O., Cleveland**—Bd. Control let contract paving portion Clifton Rd. to Cleveland Trinidad Paving Co., The Arcade, $66,[illegible]. Noted July 19.

★**O., Columbus**—City let contract paving Edward and Hamilton Sts. and St. Clair Ave. to G. Park, Commerce Bldg., also paving several streets to Andrews Asphalt Paving Co., 464 West 6th Ave.

★**O., Coshocton**—City let contract grading, paving and curbing 6th and Pine Sts. to J. Hall, Berman Ave. to Henderson Bros. About $12,21[illegible]. Noted July 19.

★**O., Coshocton**—City let contract paving Roscoe St. to Henderson Bros., Coshocton, $17,700.

★**O., Dayton**—City let contract paving portion Burkhardt Ave. to Pinke Bros. Co., $2.85 per sq.yd.; East 3rd St. to E. Murray, $2.[illegible] per sq.yd.

★**O., East Liverpool**—(Official)—T. Doherty, dir. pub. serv., let contract paving Penn Ave., Elizabeth and Harvey Sts., to F. G. Waggoner, Carrollton. Noted July 19.

★**O., Fremont**—Sandusky Co. let contract improving 2 mi. Cleveland-Sandusky Rd., concrete to J. Gotron, $40,000.

★**O., Marion**—City let contract sidewalks on Herber, Spencer, Glad, Ivanhoe and other streets, to J. H. Kinsler, Marion. Noted Apr. 26.

★**O., Marysville**—Union Co. let contract building Wapakoneta-Roundhead Rd., 11.72 mi. to Creagor & Co., Hamler, $59,923.

O., Newport—City received low bids repaving portion 3rd St., wood block, from E. J. Knepfle, $14,291, Schoolfield & Jones, $15,980; Metzel & O'Hearn, $14,339. Contractors all of Newport.

★**O., Warren**—Trumball Co. Comrs. let contract building New Buffalo Rd. to E. E. Miller, $14,600; McClure Rd. to Gialdini & Mango, $11,000; Burley Rd. to L. H. Young, $16,700; Salem-Warren Rd. to J. E. Paxton, $27,700; Damascus Rd. to L. H. Young, $20,500.

★**O., Youngstown**—Mahoning Co. Comrs. let contract macadamizing roads as follows: Damascus, Berlin and Princetown Rd., Sect. No. 6, to L. H. Young, $20,565; Salem-Warren Rd., Sect. No. 3, to J. D. Paxon, $28,733; Burkey Rd., Sect. No. 1, to L. H. Young, $16,771; McClurg Rd., Sect. 2, G. Mango, $10,997; New Buffalo and Ribletts Corners' Rd., Sect. No. 3, to E. E. Miller, $14,658; contractors all of Youngstown.

★**Ind., Elkhart**—City let contract paving Edwardsburg Ave., brick, to Northern Constr. Co., Elkhart, $28,492; Greenleaf Park, bituminous macadam to E. Atkins, Elkhart, $21,400. Noted Aug. 2.

★**Ind., Ft. Wayne**—City let contract resurfacing Fairfield View Pl., bituminous concrete, and portion Bryn Mawr Ave., to Grace Constr. & Supply Co., 702 Wintes St., paving portion State Blvd., to Crudes Realty Co., Ft. Wayne.

Ind., Ft. Wayne—City received low bids paving Coombs, Osage, and Wall Sts., brick, and Liberty, Grace, Garden, Kinnaird, Lake and Wildwood Aves. and Lasselle and Webster Sts., bituminous concrete, from Grace Constr. Co., 1702 Winter St. and Moellering Constr. Co., Ft. Wayne. Noted June 7.

★**Ind., Logansport**—City let contract paving Miami Ave., to Andrews Asphalt Paving Co., Hamilton, $2.05 per sq. yd. Noted July 26.

Ind., Michigan City—Bd. Pub. Wks. received low bids paving portions 11th St. Municipal Contr. & Supply Co., Gary, and Williston Constr. Co., 243 South Dearborn St., Chicago. Noted July 19.

★**Ind., Rochester**—Marshall and Fulton Co. comrs. let contract building Gibbons Co. line gravel road; about 8 mi. to J. M. Hatch, Macy. Noted July 5.

Ind., South Bend—(Official)—City let contract paving portions Howard St., asphaltic concrete, to Williston Constr. Co., 343 South Dearborn St., Chicago. Noted July 26.

Ind., Terre Haute—Vigo Co. received low bid paving 2¾ mi. South 25th St. brick, from Weaver & Welch Co., Terre Haute, $70,382, Foulkes Contr. Co., 705 Ohio St., $70,458. Noted July 26.

★**Ind., Warsaw** — Kosciusko Co. Comrs. let contract concrete roads to Hatton-Harris Constr. Co., Mt. Vernon, $44,[illegible].

★**Ind., Whiting**—Bd. Local Improv. let contract paving Standard Ave. to Laverne Bros., 424 Summer St., Hammond, $30,[illegible].

★**Mich., Grand Rapids** — Kent Co. Rd. Comrs. let contract building 7 mi. Byron-Center Rd., Byron and Wyoming Twp., concrete to Childs & Hoier, 76 Market Ave., N. W.

★**Illinois**—State Highway Comm., Springfield, let contract building roads, Kaskaskia and Greenville Co., to Koerner Quarry Contr. Co., Breese, $[illegible] and $[illegible] respectively.

★**Ill., Riverside**—[illegible] let contract paving Riverside Park and Ave. to W. P. Ryan, Lyons, $[illegible].

★**Ill., Rockford**—(Official)—Winnebago Co. let contract [illegible] Beattie Bros., 10 S. Dearborn St., Chicago, [illegible] Court St., [illegible] inclusive of [illegible].

Ill., Rockford—City received low bids paving 11th St. to Government [illegible] Ave. to Kishwaukee River, A. Guthrie & Co., 111 West Washington St., Chicago, $[illegible]; Hart & Page, 115 South Court St., Rockford, $[illegible]. Noted July 26.

Streets and Roads (Continued)

★**Ill., Springfield**—County let contract, 4000 ft. concrete highway south of Chatham limits to Goggins Constr. Co., Arcola. About $10,730.

★**Ill., Springfield** — (Official) — City let contract paving 15th and portion Laurel St., to J. O. Patterson & Co., Springfield, $13,468.

★**Ill., West Frankfort** — (Official) — Franklin Co. let contract building concrete highways and necessary bridges in Deming Twp. to Stocker Graveling & Constr. Co., Highland, $42,342. Noted July 19.

★**Wis., Eau Claire**—W. J. Wolf, highway comr., let contract road in Eau Claire Co. to J. Gobler, Fairchild. About $50,000.

★**Ia., Des Moines**—City let contract paving 10,000 yd. streets, concrete, to Des Moines Asphalt Paving Co., 2nd and New York Aves. $2.00 per yd.

★**Ia., Nevada**—City let contract paving 10 blks., vitr. brick, to Cary & Sons, Clinton, $2.45 per yd.

★**Ia., Spirit Lake**—Dickinson Co. let contract about 12 mi. grading to J. E. Kughn & Sons, Iowa, $ 229.

Minn., Crookston—City received low paving bids 7400 sq.yd. streets, concrete, from J. McDougall, Crookston, $2.09 per sq.yd.; Grand Forks Concrete Co., Grand Forks, $1.98 sq.yd.

★**Neb., Beatrice**—(Official)—City let contract paving Dists. Nos. 28, 29, 30, 31 and repaving Dist. No. 6 to Abel Constr. Co., Lincoln.

★**Neb., Grand Island**—City let contract paving Dist. No. 22, asphalt, to E. D. Tyner Constr. Co., Kansas City, Mo., $1.74 per yd.

★**Neb., Hastings**—City let contract paving 55,000 yd. sheet asphalt, to Watts Constr. Co., Salina, Kan., $1.84 per yd.

★**Neb., Lincoln**—Lancaster Co. Comrs. let contract paving and grading 1 mi. county highway, Dist. No. 16, to Roberts Constr. Co., Lincoln, $2.03 per sq.yd. Noted Aug. 2.

★**Mont., Geraldine**—City let contract for concrete walks, crosswalks and curbs to S. Birch & Sons Constr. Co., $17,000.

★**Mo., Kansas City**—Bd. Pub. Wks. let contract to J. Lyle Constr. Co., Grand Ave. Temple, paving 12 blocks 55th St., concrete and 1 block Brooklyn St., $1.56 and $1.46 per sq.yd. respectively; A. Jacks Co., Amer. Bank Bldg., 1 mi. Prospect St., 1½ blocks 25th St. and 2 blocks 25th St., brick, $3.20, $3.05 and $3.18 respectively; D. T. Brosnaham, 2222 Karnes St., 2 blocks 32nd St., brick, $2.89; J. E. Welsh, 1122 East Gilman, Rd., 4 blocks on 25th St., brick and concrete, $3.00 and $1.60 respectively.

★**Tex., Vega**—Oldham Co. let contract building roads to Smith Bros., Crockett, $50,095.

★**Okla., Oklahoma**—City let contract paving 22nd St. to Western Paving Co., Terminal Bldg., $13,730.

Okla., Tulsa—City received low bid paving portions Cosher, Rice, Martin, Mitchell and other streets from Eureka Paving Co., 1115 Carter Bldg., Houston, Tex., $425,000.

★**Idaho, Cocntello**—Bannock Co. let contract gravelling Yellowstone Park highway, 16 mi. north of here, to J. J. Carroll, $16,668.

★**Wash., Everett**—Snohomish Co. Comrs. let contract paving 2½ mi. Edmonds Rd. to Robinson Bros., Everett, $16,953.

★**Wash., Seattle**—King Co. Comrs. let contract reconditioning highway connecting Kirkland and Juanita, 7½ mi., to L. H. Goering, Seattle, $42,000. Noted Apr. 26.

★**Wash., Seattle** — King Co. Comrs. let contract building first length Cascade Scenic Highway, 5½ mi., to Quigg Constr. Co., Hoge Bldg., $47,607. Noted July 19.

★**Wash., Seattle**—Bd. Pub. Wks. let contract grading 15th Ave., S. L. I. Co. 1646 to Superior Constr. Co., 1042 Lane St., $19,427. Noted July 12.

★**Oregon**—State Highway Comr., Salem, let contract building 19 mi. Portland-Salem-East side Highway, Marion and Clackamas Cos., to Hansen Paving Co., Bd. Trade Bldg., Portland, $435,944; road from Multnomah Co. line to Newberg, to O. Huber, Selling Bldg., Portland, $161,417; section Pacific Highway between Astoria and Flavel, to Warren Constr. Co., Journal Bldg., Portland, $155,743.

★**Ore., Astoria**—City let contract paving and concreting portion Exchange and 15th Sts. to Miller & Hamer, $48,844 and $16,745 respectively; sewering streets and building D. D. 4 to Keating & Jameson, $16,900. Noted Apr. 19.

★**Cal., Berkeley**—City let contract paving Hopkins St. to Clark & Henery Co., Ochsner Bldg., San Francisco, $33,705.

★**Cal., Lemoore**—City let contract improving streets and installing electrolier lighting-system to California Road and Street Improv. Co., Fresno, $140,000. Noted July 12.

Cal., Long Beach—City received low bid for 659,145 sq.ft. 4-in. concrete pavement, warrenite surface, 3275 lin.ft. 8-in. vitr. pipe sewer, corrugated iron pipe and concrete culverts, etc., on Atlantic Ave., from Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., Los Angeles, $91,340.

★**Cal., Los Angeles**—City let contract 70,183 sq.ft. paving, asphalt, 2395 sq.ft. granite block gutter, and vitr. pipe sanitary sewer in McPherson St. to G. H. Oswald, 405 O. T. Johnson Bldg., $12,747.

★**Cal., San Diego**—City let contract building 4-in. concrete paving with asphaltic surface on Sierra Vista and other streets to T. C. Breitenstein, 465 Van Wyck St., Pasadena. About $15,385. Noted Aug. 2.

★**Cal., San Diego**—City let contract building Sect. 1 of road to army cantonment at Linda Vista, involving 1710 cu.yd. excava., 10,400 cu.yd. embankment, 329,344 sq.ft. 5-in. paving, concrete and 200 ft. 2-in. cement pipe culverts, to Rooney-Wycoff Co., 421 Consolidated Realty Bldg., Los Angeles, $52,118; Sect. 2, taken under advisement, J. Engebretsen, 614 5th St., San Diego, low bidder, $22,146. Noted July 19.

★**N. B., Monocton**—City Council let contract building roads to Carritte-Paterson Co., Ltd., 89 Water St., St. John. About $16,000.

RAILWAYS—STEAM & ELECTRIC

Proposed Work

Pennsylvania—Lehigh Valley R.R. plans to electrify mountain divisions from Mauch Chunk to Wilkes-Barre and from Penn Haven to Mahoney City. E. B. Ashley, New York, ch. engr.

Maryland—Pennsylvania R.R. preparing plans for freight yards and other branch from Bayview Jct. to increase facilities to and from the plant of Bethlehem Steel Co. at Sparrow Point. A. C. Shand, Broad St. Sta., Phila., ch. engr.

North Carolina—Southern Ry. to lay 5 mi. tracks for army cantonment at Camp Greene, near Charlotte. W. H. Wells, Washington, D. C., ch. engr.

Minnesota—Duluth, Missabe & Northern Ry. prepared plans double-tracking 10-mi. line from Virginia to Wolf, also for additional yard tracks. About $150,000. H. L. Dresser, Duluth, ch. engr.

Texas—Freeport Sulphur Co. plans 60-mi. line from Freeport, Tex., to Rosenberg, by way of Brazzoria and Columbia. W. A. Randle, Freeport, ch. engr.

Oklahoma—Rock Island R.R. plans to extend line from Ft. Sill to army cantonment. About $200,000. C. A. Morse, Chicago, ch. engr.

Idaho—Oregon Short Line R.R. plans to build 4 mi. line from Idaho Falls and 7 mi. line from Firth. C. Stradley, Salt Lake City, Utah, ch. engr.

Arizona—A. B. McGaffey, Albuquerque, N. M., and associates making surveys 60-mi. railway from Holbrook to White River.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Georgia**—Elberton & Eastern R.R. let contract 10-mi. extension from Tignall to Washington, to Stanley & Singer Constr. Co., Alabama.

★**Ohio**—Youngstown & Niles Ry. let contract new high speed electric line from Youngstown to Niles to J. W. Garland, Inc., bridges, culverts and similar works for entire line to S. R. Smythe Co., Inc., House Bldg., Pittsburgh.

★**Arkansas**—Missouri Pacific R.R. will build 4 mi. spur from Dalhoff to army cantonment south of Argenta, by company forces. Noted July 12.

★**Ont., London**—Canadian Pacific Ry. let contract grading work from London to Guelph, including viaducts, bridges, etc. to Stewart Constr. Co., Mail Bldg., Toronto, $185,000.

EXCAVATION AND DREDGING

Proposed Work

Fla., Ft. Pierce—Reclamation—St. Lucie D.D., Lucie Co., plans election to vote on $400,000 bonds to reclaim 75,000 acres of land.

Fla., Miami — Drainage — Dade and Brownard Cos. retained Isham, Randolph & Co., engrs., to make surveys building Napoleon B. Brownard D.D., involving 550,000 acres land between Deerfield and Miami. Address W. C. Kyle, Ft. Lauderdale, comr.

Ill., Marengo—Drainage — McHenry Co. plans to organize Coral-Grafton D. D. embracing 19,258 acres in McHenry and Kane Cos., plans involve 16-mi. open ditch, 477,281 cu.yd. excavation, 30-mi. tile drains.

Ill., Newton—Drainage — Comrs. North Fork D. D., Jasper Co., received no bids for drainage work involving 40,367 cu.yd. excavation. Will be readvertised. Fithian & Kasserman, Newton, attorneys. Noted June 21.

Minn., Fairmont—Ditches—Martin Co. sold $100,000 bonds to build drainage ditches. H. C. Nolte, aud.

Minn., Slayton—Ditch—E. V. O'Brien, co. aud. rejected bids repairing Co. Ditch No. 6 and Judicial Ditch No. 19. Noted July 5.

Minn., Thief River Falls—Drainage—State Drainage Engrs. making surveys Red Lake to establish drainage and flood control Dist. to drain 500,000 acres of land.

Kan., Westmoreland—Drainage — Pottawatomie Co. soon receives bids for drainage work in Lost Creek, Welch Creek and Vermillion River Dist. V. R. Parkhurst, Topeka, engr.

Neb., Omaha — Emerson-Brantingham Co., South Independence Ave., Rockford, Ill., will build 4-story, 108 x 132-ft. rein.-con. and brick warehouse, 11th and Jackson Sts., by day labor.

Neb., Lincoln—Drainage—Lancaster Co. soon lets contract building Salt Creek D. D., involving open ditch and channel work. W. S. Scott, 310 Little Bldg., engr.

Neb., Lincoln—Drainage—Lancaster Co. soon lets contract building Middle Creek D. D. No. 1, involving 100,000 cu.yd. open ditch and straightening and deepening creek. A. H. Edgren, co. engr. Noted July 26.

Utah, Salt Lake City—Reclamation—Salt Lake Co. soon receives bids reclaiming 4080 acres salt lands, Brighton D.D. Bonds for $80,000 voted for project. R. A. Hart, engr.

BIDS DESIRED

Ill., Paxton—Redredging—Until Aug. 21, by Cloud & Thompson, attorneys, Paxton, redredging main ditch, Union D. D., length 59,745 ft., yardage, 209,086 cu.yd.

Ia., Sibley—Drainage—Until Aug. 13, by Osceola Co., building D. D. No. 37, involving 1900 ft. open ditch, 56,450 ft. 6- to 30-in. tile, bulkheads, inlets, etc. About $32,000. D. W. Clayton, aud.

Ill., Sullivan—Drainage—Until Aug. 18, by Drainage Comr. Dist. 2, Livingston Co., building system of drainage involving 18,478 ft., 8-, 10-, 12-, 16-, 22- and 30-in. tile. J. D. Brown, comr.

Ia., Des Moines—Drainage—Until Aug. 20, by J. M. Wells, Nevada, engr. for Joint Dist. No. 1, Polk and Storey Cos., involving 16,629 ft. 18- 26- and 34-in. tile. About $26,405. Former bids rejected. F. J. Alber, clk. Polk Co. F. E. King, clk. Storey Co. Noted July 26.

Ia., Emmetsburg—Drainage—Until Aug. 16, by Palo Alto Co. building D. D. No. 98, involving 315,000 yd. excava., 8- to 12-ft. bottom, 106,180 ft. of 6-, 10-, 12-, 14-, 15-, 16-, 18-, 20-, 22-, 24-, 26-, 30- and 36-in. tile. G. R. Campbell, co. engr.

Minn., Madison—Until Aug. 14, by Lac Qui Parle Co., Building Co., Ditch No. 44, involving 12,750 ft. 6-, 8-, 9-, 10-, 12-, 14-, 15-, 16-, 18-, 20- and 22-in. tile, cost, $11,650; Co. Ditch No. 4, involving 51,100 ft. 6-, 7-, 8-, 9-, 10-, 12-, 14-, 15-, 16-, 18-, 20-, 22- and 24-in. tile. Cost, $56,838. A. G. Shogren, aud.

Minn., Owatonna—Ditch—Until Aug. 20, by M. J. Parcher, aud. Steele Co., building Co. Ditch No. 5, involving 168,476 cu.yd. excavation, spreading 84,238 cu.yd., 88,700 ft. tile, etc. About $51,450.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. C., Wilmington**—Drainage—(Official)—W. E. Price, chn. bd. drainage comrs., let contract 9 mi. drainage ditches, D. D. No. 3, to Southern Drainage and Construction Co., Kingston, $13,000. Noted June 21.

★**Fla., West Palm Beach**—Bd. Superv. Lake Worth D. D., Palm Beach Co., let contract drainage work involving removal 7,205,000 cu.yd. earth, 180,000 cu.yd. rock, also building necessary bridges to A. V. Wills & Sons, St. Louis, Mo., and J. T. McCarthy, Gainesville, $684,684.

Excavation and Dredging (Continued)

★**Miss., Greenville**—Drainage—Washington Co. let contract building drainage ditch, 133 mi. long, involving 5,000,000 cu.yd. earthwork to J. B. Arpin Dredging Co., 422 Bing Bldg., Houston, $493,600.

★**Ky., Louisville** — Dredging — Jefferson Co. let contract dredging north and south forks Pong Creek to Miller Bros., Louisville, $30,420.

★**Mich., Sturgis**—Excavation—Bd. Pub. Wks. let contract excavating 3-mi. tail race for power plant on St. Joseph River to G. W. Bunker Co., 1570 Robinson Rd., Grand Rapids.

★**Ill., Geneseo**—Drainage—Henry Co. let contract 489,723 cu.yd. excavation, Lower Green River Spl. D. D. to W. Long, Sheffield and R. Meak, Jacksonville.

★**Ill., Lawrenceville**—Redredging—L. A. Funk, comr. Allison Ditch Dist. No. 1, Lawrence Co., let contract redredging 10-mi. ditch, involving 73,427 cu.yd. excavation to S. Day, Rock Island. Noted July 19.

★**Ill., Tuscola**—Drainage—Douglas Co. let contract laying 8640 ft. tile ditch, D. D. No. 8 to National Drain Tile Co., 20 Rose Disp. Bldg., Terre Haute, Ind., and Goggins Constr. Co., Arcola, Ill.

★**Ia., Boone**—Drainage—Joint Bd. Supervs., Boone and Storey Cos., let contract for Boone-Story Joint Drain Sub. No. 1 involving 35,000 ft. tile as follows: tile to Jefferson Cement Products Co., Jefferson, and Iowa Pipe and Tile Co., Des Moines; labor to A. G. Hueter, and Johnson & Caldwell, both of Lytton. Noted June 28.

★**Ia., Indianola**—Drainage—Squaw Creek D. D. No. 4, Warren Co., let contract new channel involving 543,401 cu.yd. excavation to L. E. Sternberg, Memphis. Noted July 5.

★**Ia., Logan**—Drainage—Harrison Co. let contract for Upper Soldier D. D. No. 2, involving 156,260 cu.yd. excavation to R. S. Morrow, 5006 Burt St., Omaha.

★**Ia., Mason City**—Drainage—Bd. Superv. Cerro Gordo Co. let contract building D. D. No. 53 to A. W. Dunlap.

★**Ia., Nevada**—Drainage—F. E. King, Aud. Story Co., let contract building Richland Twp. D. D. No. 81 to J. McKillip, Faribault, Minn., 19½c. per cu.yd., open work; Fry & Hankins, Cole, $11,533, labor; Macomb Sewer Pipe Co., $28,982, tile. Noted July 26.

★**Ia., Spencer**—Ditch—A. W. Chamberlain, Clay Co. aud., let contract for 393,000 cu.yd. excavation and 2 bulkheads on D. D. No. 37 to Northern Constr. Co., Elkhart. Noted July 5.

★**Minn., Austin**—Excavation, Etc.—A. C. White, Mower Co. engr., let contract 12,000 cu.yd. excavation, 17,000 cu.yd. borrow, 27,000 cu.yd. side borrow, 1000 cu.yd. side ditching, 1700 lin.ft. tiling to R. Drummond, Austin.

★**Minn., Mahnomen** — Ditch—Mahnomen Co. let contract building Co. Ditch No. 3, involving 173,422 cu.yd. excavation to W. H. Small & Son, Aitkin.

★**Minn., Mankato**—Ditch—Blue Earth Co. let contract building Judicial Ditch No. 15 to North Star Constr. Co., $64,975.

★**Neb., Lincoln**—Ditch—Lancaster Co. let contract straightening and deepening 2 mi. Dead Man's Run Ditch to E. Walworth, Lincoln.

★**S. D., Madison**—Ditch—Lake County let contract building ditch to P. A. Thompson, Green, Ia., $32,750.

★**Ore., Astoria**—Drainage—See "Streets and Roads."

INDUSTRIAL WORKS

Proposed Work

Conn., New Haven — American Steel & Wire Co., 238 Fairmont Ave., Worcester, plans 1-story, 88 x 363 ft. brick rope mill, 1-story, 50 x 125 ft. addition to building No. 31 and 1-story, 223 ft. addition to No. 7.

N. Y., Brooklyn—Lancaster Realty Co. having plans prepared by Silverman & Shampan, 772 Broadway, 2-story, 121 x 155-ft. brick service station. About $150,000. L. Gold, 44 Court St., pres.

N. Y., Flushing—New York & Queens Electric Light, Heat & Power Co., 344 Jackson Ave., Long Island City, plans 1-story, 94 x 103 ft. brick, steel and concrete substation and storehouse on Lawrence Ave. About $50,000. W. W. Knowles, 41 West 39th St., New York City, archt.

N. J., Kingsland—Canadian Car & Fdry. Co., 165 Bway., New York City, plans rebuilding large munition factory recently destroyed by fire. J. G. Evans, asst. mgr.

N. J., Trenton—American Steel & Wire Co., Hamilton Ave., plans 1-story, 173 x 173 ft. brick and steel addition to wire rope plant; also addition to machine shop.

Pa., Darby—Griswold Worsted Co. plans filter plant. Willard Case Co., 1st Natl. Bank Bldg., Phila., archts.

Pa., Phila.—Pennsylvania R.R. plans large addition to shops between 47th and 48th Sts. A. E. Shand, Broad St. Sta., ch. engr.

Pa., Phila.—G. P. Wetherill & Co. having plans prepared by G. King & Co., archts., 1513 Walnut St., 4-story, 37 x 78-ft. brick and concrete, 16 x 30-ft. wing factory, 114 North Front St.

S. C., Beaufort—American Shipbuilding & Dry Dock Corp. plans shipbuilding plant on Beaufort River, including shipways, machine shops and erecting shops. R. C. Horne, Jr., Beaufort, pres.

O., Cincinnati—Natl. Lead Co., 659 Freeman Ave., plans 3-story, 50 x 100-ft. plant. About $60,000. E. C. Goshoin, mgr. B. L. Baldwin, Clerin Bldg., archt.

O., Cleveland—H. D. Koblitz, 370 The Arcade, purchased site on East 72nd St. and will build 4 6-story factory buildings. About $500,000.

O., Cleveland — Morgan Lithographing Co., St. Clair Ave., plans 3-story, 138 x 250 ft. plant on Payne Ave. and East 17th St. About $250,000.

O., Defiance—Definance Machine Works has increased its capital stock from $600,000 to $1,200,000 and plans 2-story, concrete and brick plant on 3rd, Perry and Jackson Sts. W. F. McCarty, c/o W. B. Daoust, Holgate Ave., ch. engr.

Mich., Coldwater—Michigan Tire & Rubber Co. plans 2-story steel and concrete factory. About $50,000. W. C. Owen & Co., 1900 Euclid Ave., Cleveland, archt.

Mich., Highland Park—J. H. McDonald, attorney, 1323 Woodward Ave., Detroit, plans 3-story, 56 x 150 ft. garage and salesroom. About $60,000. A. E. Harley, 1201 Kresge Bldg., Detroit, archt.

Ill., Chicago—Chicago Screw Co., 1026 Homan Ave., plans factory on 66 x 125 ft. site. About $500,000.

Ill., Chicago—General Electric Co., Nela Park, Cleveland, plans brick warehouse and office building. About $60,000. G. H. Johnson, Citizens Bldg., archt.

Ill., Chicago—Monarch Leather Co., 1101 West Division St., plans 5-story, 60 x 150 ft. leather factory. About $150,000. W. N. Eisenarath, pres. Stern & Reichert, archts., 220 South State St., soon receive bids.

Ill., Chicago—Nat. Biscuit Co., 110 North Morgan St., plans large industrial plant to cost several million dollars.

Ill., Chicago—Peoples Gas Light & Coke Co., 122 South Michigan Ave., receives bids about Jan. 1 for plant. About $30,000,000. R. Scheck, archt.

Wis., Superior—Duluth-Superior Milling Co., 620 Bd. of Trade Bldg., Duluth, plans 150 x 310-ft. addition to Daisy Mill. About $80,000.

Mo., St. Louis—American Mfg. Co., Rialto Bldg., plans large bagging plant in East St. Louis. About $500,000. J. D. Filley, pres.

Tex., El Paso—El Paso Valley Water Users Assn. plans large hydro-electric plant at Elephant Butte Dam with 40,000 hp. capacity. About $1,000,000.

Tex., Grand Prairie—Grand Prairie Mfg. Co. plans rebuilding brick factory recently destroyed by fire. About $125,000.

Tex., Houston—F. Wilde, Houston, has leased site on Houston ship channel and plans 60 x 100-ft. brick plant. About $100,000.

Tex., Orange—Orange Hardwood Lumber Co. plans lumber mill here. About $50,000.

Okla., Oklahoma City—Sifers Candy Co., 317 Grain Ex. Bldg., Hutchinson, Kan., receives bids about Aug. 11 for 2-story, 55 x 110 ft. About $70,000. Bailey & Bailey, 616 Colcord Bldg., archt. Noted Aug. 2.

Okla., Ringling — Peoples Refining Co., Oklahoma City, receives bids about Aug. 10 stills, storage tanks, power and pump house. About $65,000. F. D. Smith, 515 Insurance Bldg., Oklahoma City, engr.

N. Mex., Las Cruces—Holly Sugar Co., Colorado, plans large sugar factory here. About $1,000,000.

Ore., Portland—City having plans prepared by G. B. Hagardt, engr. comn. pub. docks, first unit grain elevator, capacity 1,000,000 bushels.

Ore., Portland—Hesse & Martin Iron Wks., 434 Belmont St., plans forge and foundry shop addition to plant. About $100,000.

BIDS DESIRED

N. Y., New Hampton—Until Aug. 20, by B. G. Lewis, comr. of Correction, Municipal Bldg., New York, building power house and connecting tunnels of New York City reformatory.

Wis., Milwaukee—Until Sept. 1 by Fraser Co., engrs., 667 East Water St. 7-story, 150 x 180 ft. rein.-con. and brick, elevator and warehouse. About $200,000 for L. Towles Seed Co., 113 Clybourn St. Noted July 26.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., New Bedford** — Fairpoint Co., Prospect St., let contract 4-story, [illegible] x 209 ft. brick storehouse on Howland and Prospect Sts., to J. W. Bishop, 109 Foster St. Noted Aug. 2.

★**N. Y., Brooklyn**—Sperry Gyroscope Co. let contract 11-story, 99 x 149-ft. plant to Turner Constr. Co., 244 Madison Ave., New York City.

★**N. Y., Buffalo**—Curtiss Aeroplane Co., 1739 Elmwood Ave., let contract 1,000,000 sq.ft. factory addition to S. Austin Co., 14230 Euclid Ave., Cleveland. About $5,000,000. Noted Aug. 2.

★**N. Y., Buffalo**—Pennsylvania R.R. let contract 2-story, brick, concrete and steel freight house; also 2 bridges to G. H. Scheckler & Sons, Erie Ave., $200,000.

★**N. J., Harrison**—General Electric Co. let contract 2-story, 135 x 255 ft. rein.-con. and struc. steel, glass bulb factory to E. M. Waldron, Inc., 207 Market St., Newark. About $150,000. Noted July 5.

★**O., Cleveland**—Torbenson Axle Co., 1115 East 152nd St., let contract 109 x 142-ft. steel plant to Austin Co., 14330 Euclid Ave. About $50,000.

★**Ill., Chicago**—Gallanis Bros., 2035 Halsted St., let contract 6-story rein.-con. candy factory to Lewis Constr. Co. About $200,000.

★**Ia., Davenport**—Standard Oil Co. let contract warehouse and garage to H. G. Hays Constr. Co., 335 Masonic Temple. About $80,000.

★**Ia., Des Moines**—Bast-Forgarty Milling Co., Des Moines, let contract, brick and rein.-con. mill, headhouse, tanks and warehouse to A. H. Neumann & Co., Hubbell Bldg. About $65,000.

★**Ark., Ft. Smith**—Ft. South Cotton Compress Co., South Side, let contract 1-story, 151 x 380-ft. rein.-con. warehouse to T. T. Reddick, General Contr. & Bldg. Co., 2701 May Ave. About $50,000.

★**Que., Chambly Canton** — Canadian Leatherboard Co. let contract new plant to Trussed Concrete Steel Co., 285 Beaver Hall Hill, Montreal. About $225,000. Noted Aug. 2.

BUILDINGS

Proposed Work

Me., Hallowell — State school — F. W. Hinckley, city treasurer, Portland, will receive bids [illegible]-story, 50 x 192 ft. brick. About $60,000. W. R. Pinkham, Augusta Trust Bldg., Augusta, archt.

Mass., Boston — Office — A. Geiger Jr., 87 Mill St., will build 3-story, 114 x 125 ft., on Massachusetts Ave. and Newbury St. About $150,000.

Mass., Worcester — Hotel — Worcester Auto. Co. will build [illegible] brick, Main and Carleton Sts. W. Company, archt. 316 Main St., receives bids.

Mass., Worthington — Hotel — Worthington Inn, Worthington, has plans completed for 3-story, 40 x 104 ft. addition and 25 x 47 ft. L. About $12,000. Peloquin & Parker, 14 Main St., Northampton, archts.

Conn., Stamford — Pavilion — City, John Lyons, Stamford, will build pavilion, Mill Hill Park. About $10,000. 14 Mar. Also Glover Hill, same.

N. Y., Buffalo — Church — St. John Evangelist Congregation plans [illegible]. About $75,000. M. F. Wolfe, 2515 Seneca St., architect. C. Schmidt & Sons, 1344 Prudential Bldg., [illegible]

Buildings (Continued)

N. Y., New York—Theater and Office—Jason Bldg Co., 225 West 44th St., plans 5-story, 100 x 111 ft. About $50,000. J. J. Shubert, pres. H. J. Krapp, 116 East 16th St., archt.

N. Y., Watertown—School—Bd. Educ. rejected bids, addition and alteration. New bids soon. About $40,000. F. S. Tisdale, City Hall, supt. bd. educ. A. F. Lansing, Sherman Blk., archt.

N. J., Union—School—Bd. Educ. soon receives bids for new School No. 2. About $200,000.

Pa., Braddock—Bank, Store and Office—N. M. Holland Estate, P. S. Kennington, 743 Braddock Ave., executor, plans 3-story, 40 x 129 ft. About $50,000. Carlisle & Sharrer, archts., Jenkins Arcade, soon receive bids.

Pa., Farrell—Shenango Land Co. plans about 200 new buildings.

Del., Dover—Courthouse—Kent Co. plans 2-story addition. About $70,000. J. L. Hopkins, R. D. Harrington, chn. bldg. comm. Wilson, Eyre & McIlvain, 1003 Spruce St., Phila., archts.

Va., Lynchburg—(Official)—Y. W. C. A. soon lets contract brick and stone. N. Chase, secy. S. S. Johnson, 603-5 Peoples Natl. Bank Bldg., archt.

O., Akron — Hospital — County Comrs. voted $50,000 bond issue for addition to Childrens Home.

O., Canton — Office — United Alloy Steel Corp., Belden Ave., soon receives bids, 2-story, 50 x 200 ft. brick, on Georgetown Rd. About $100,000. H. R. Jones, pres. W. Hirsh, 1303 Swetland Bldg., Cleveland, archt.

O., Cleveland — Home — Jewish Infants Orphan Home, 2200 East 40th St., c/o A. Harwitz, Leader-News Bldg., purchased site at Euclid Ave. and plans to build. About $150,000 to $180,000.

O., Cleveland—Office—Physicians & Dentists Bldg. Co. plans, 16-story. About $1,000,000. R. G. Lee, Amer. Trust Bldg., interested.

O., Cleveland—Theatre and Store—M. M. Schneidal soon lets contract, 4-story, 50 x 132-ft. steel and concrete, 1862-66 East 9th St. About $70,000. G. Grielle, Park Bldg., archt.

O., Cleveland—Y. M. C. A.—Young Men's Investment Co., 938 Schofield Bldg., soon receives bids, 6-story, 112 x 200 ft. About $200,000. F. Hart, pres. J. Eisemann, 521 The Arcade, archts.

O., Gallipolis—Dormitories—Ohio Bd. Administration plans factory, 100 x 100-ft. T. E. Ivory Co., and 9th Sts., Columbus, pres.

O., Lakewood—Church and School—St. Gregory's Congregation, c/o C. Isanko, 1040 Highland St., soon lets contract, 2-story, 42 x 80 ft. brick and steel at Lowell and Madison Sts. About $50,000. C. J. Lorenz, 1241 Rose., archt.

O., Mansfield—State Reformatories—Ohio Bd. Administration, 10th and 9th Sts., Columbus, will build 1-story, 50 x 150-ft. addition and 2 50 x 55-ft. wings. About $150,000. C. Orlando, archt.

O., Orient—Charitable — Ohio Bd. Administration plans 2 1-story, 100 x 300 ft. About $175,000. T. E. Ivory Co., and 9th Sts., Columbus, pres.

Ind., Kokomo—Temple — Howard Lodge No. 44 F. and A. M. Bldg. Assn., 1-story, 75 x 90 ft. About $15,000. W. H. Wellington, pres., Kokomo. E. E. Dunlap, 919 State Bldg., Indianapolis, archt.

Mich., Champion—School — Bd. Educ. plans 2 story brick building. J. D. Cobb, 134 North Dearborn St., Chicago, archt. About $75,000.

Mich., Vassar—School—Bd. Educ. plans schoolhouse, 2-story, 75 x 155 ft. About $50,000. H. H. Cook, pres. J. C. Peterson, Graham Cor., archt.

Ill., Aurora—Foundation — M. Daniels Equipment plant, Lake, 88 x 150 ft. Wood. About $40,000. Ware & Phippen, architects, Conway Bldg., soon receive bids.

Ill., Chicago—Theater, Apartment, Theater Co. of Am. Kay Civil Co., soon lets contract, 1-story, brick, steel and concrete. About $150,000. H. L. Stevens, Lytle Pontiac Bldg., archt.

Ia., Charitown—Hospital, Jurisdiction elections Oct. 15 to vote $40,000 bonds to build hospital. F. M. Wilson, archt.

Ia., Des Moines—Hospital — Polk Co. plans election Oct. 15 to vote on $150,000 bond issue to build tuberculosis hospital.

Minn., Kasson—High School—Bd. Educ. plans building in School Dist. No. 3. About $75,000. N. E. Beard, clk. N. Jacobson, Owatonna, archt.

Minn., Minneapolis — Children's Hospital—City hospital soon lets contract, 2-story, 48 x 205-ft. About $60,000. A. O'Donnell, supvr. Long, Lamereaux & Long, 830 Hennpin Ave., archts. Noted July 12.

Kan., Topeka—Freight and Office—Atchison, Topeka & Santa Fe Ry. plans, 2-story on Rex Mill property. About $200,000. R. A. Rutledge, Topeka, ch. engr.

Kan., Wichita—Hotel—Lassen soon lets contract 12-story, 75 x 125 ft. About $625,000. H. Lassen, pres. Richards, McCarry & Bulford, Hartman Bldg., Columbus, archts.

Neb., Franklin—Hotel—Nebraska Bldg. & Investment Co., 120 South 13th St., Lincoln, plans 3-story, brick and stone. About $50,000. J. E. Schaff, pres.

Neb., Omaha — Hospital — Bd. Regents, State University, plans, 4-story, brick and stone. About $130,000. J. S. Dales, Sta. A., Lincoln, secy. J. Latenser & Sons, 626-32 Bee Bldg., archts.

S. D., Brookings—Hall—State Bd. Regents, Pierre, plans 1-story, 132 x 220 ft. About $80,000. P. H. Ellerbe, Endicott Bldg., St. Paul, archt.

Wyo., Thermopolis — Hotel and Bath Houses—Washakie Hotel Co., Thermopolis, plans 5-story, 200 x 200 ft. About $500,000. M. S. Fallis, archt., 900 Ideal Bldg., Denver, soon receives bids.

Mo., Columbia — Dormitory — Stephens College plans, 3-story, brick. About $50,000. J. M. Wood, pres.

Tex., Dallas—Theater and Office—Interstate Amusement Co., Dallas, plans 10-story, 120 x 200 ft. About $350,000. J. Eberson, archt., 64 East Van Buren St., Chicago, soon receives bids.

Cal., Fresno—Natatorium—Fresno Natatorium Co. plans 125 x 150-ft. brick and concrete, San Jacquin and I Sts. About $50,000. F. A. Gardner, secy. Coates & Traver, Rowell Bldg., archt.

BIDS DESIRED

N. H., Nashua—High School—Until Aug. 13 by Bd. Educ., 3-story, 152 x 183 ft., brick and stone. About $200,000. T. M. James, 1855 Devonshire St., Boston, archt. Noted July 16.

Mass., Boston—School—Until Aug. 17 by Bd. Educ., 3-story, 120 x 176 ft., brick and stone, Charter and Phipps Pl. About $150,000. J. McGinniss, 16 Arlington Pl., archt.

Mass., Mattapan—Nurses' Home—Until Aug. 22 by Boston State Hospital, Boston, 3-story, 35 x 147 ft. brick and stone. K. Taylor & Co., 93 Federal St., Boston, archts.

N. Y., Brooklyn—Library—Until Aug. 20 by Bd. of Trustees, 26 Brevoort St., 2-story, 80 x 82-ft., 4th Ave. and Pacific St. R. F. Almerall, 12 East 46th St., New York City, archt.

N. Y., Elmira—Library—Until Sept. 1 by city, 2-story, brick and stone. About $50,000. H. J. Whitfield, 160 5th Ave., New York City.

Pa., Holmesburg—House of Correction—(Official)—Until Aug. 15, by W. H. Wilson, dir. pub. safety, for alterations and additions. About $150,000. C. E. Oeschlager, 1615 Walnut St., Philadelphia, archt. Noted Aug. 2.

Pa., Lansdowne—Home—Until Aug. 14, by St. Vincents Home, 3-story, 40 x 360 ft., brick.

Wash., D. C. — (Official) — Parochial School—Until Aug. 14, by Holy Trinity Roman Catholic Congregation, 2-story, concrete and brick. About $140,000. F. G. Pierson, Washington Loan & Trust Bldg., archt. Noted July 19.

N. C., Raleigh—Administration, Kindergarten and Girls' Dorm.—Until Aug. 16 by Bd. Dirs. State School for Blind, rein.-con. and brick, $150,000 appropriated. F. K. Thompson, Raleigh, archt.

Ind., Evansville—Junior High School—Until Aug. 13 by Bd. Educ., 2-story, 85 x 200 ft. About $100,000. A. Strause, pres. C. Shopbell & Co., 707 Furniture Ex. Bldg., archt. Noted July 12.

Ia., Spirit Lake—(Official)—Home—Until Sept. 15, by D. L. Clark, secy., bldg. com. Grand Commandery K. T. of Iowa. Mission for auditorium and convention hall. About $30,000. Noted July 26.

S. D., Vermillion—Until Aug. 21, by Pres. of South Dakota University for engineering and women's buildings. Holmes & Flinn, 8 South Dearborn St., Chicago, archts.

S. D., Aberdeen—Dormitory—Until Aug. 13 by State Bd. Regents, Pierre, addition to Northern Normal and Indian School. About $125,000. G. Fossum, Van Slyke Bldg., archt. Noted Apr. 26.

Mo., Kansas City—Church—Until Aug. 20, by Trinity Methodist Congregation, 2-story, 60 x 150 ft. and wing, 48 x 56 ft. About $100,000. J. T. Bradley, Southwest Natl. Bank of Commerce, chn. bldg. com.

PRICES AND CONTRACTS AWARDED

★**Mass., Fall River**—Theater—N. Yamis, 78 Bedford St., let contract 1-story, 65 x 102 ft. to C. F. Grinnell & Co., 402 South Main St. About $60,000.

★**Mass., Springfield**—School—Bd. Educ. let contract, 2-story, 160 x 170 ft. Brookline and Greenwood Sts., to W. A. Newton & Co., 150 Birnie Ave. About $225,000.

★**Mass., Taunton** — High School — Bd. Educ. let contract 3-story, 157 x 202-ft. brick addition, to Cunningham & Sons Constr. Co., 7 Water St., Boston, $220,000. Kilham & Hopkins, 9 Park St., Boston, archs.

★**R. I., Providence**—Hospital—Memorial Hospital let contract 40 x 146 ft. addition with 6 x 42 ft. ell on Prospect St. to Norcross Bros. Co., 830 Industrial Trust Bldg. About $60,000.

★**N. Y., Niagara Falls** — School — Bd. Educ. let contract, 2-story, 69 x 168 ft., to Laur & Mack, 1832 Pierce Ave. About $88,000.

★**N. Y., Syracuse**—School—Bd. Educ. let contract Edward Smith school to F. A. Caswell, Cahill Bldg. About $160,000.

★**N. J., Bayonne**—School—Bd. Educ. let contract new school on West 48th St. to Egan & Montague, 1 Montgomery St., Jersey City. About $232,946. Noted May 31.

★**N. J., Trenton**—Bank—Trenton Banking Co., 16 South Warren St., let contract 1-story, 64 x 100 ft. to S. W. Mather & Sons, Greenwood Ave. and Canal Sts. About $100,000.

★**Pa., Lewistown**—Y. M. C. A. Bldg. Com. let contract, 3-story, 80 x 140 ft. building to W. D. Steinbachs Sons, Market and Dorcas Sts. About $75,000. Noted May 3.

★**Pa., Scranton** — Almshouse — Blakely Poor Dist. let contract 2-story, 90 x 90-ft., Scott Twp. to L. T. Stipp, Union Bank Bldg. About $70,000.

★**Wash., D. C.**—Theater—T. Moore, c/o Garden Moving Picture Theater, 423 9th St., N. W., let contract, 1- and 2-story, 70 x 100 and 100 x 100 ft. to M. A. Weller Co., 816 14th St., N. W. About $250,000.

★**S. C., Saluda**—(Official)—Court House—County let contract to J. W. Stout, Sanford, N. C. About $60,000. Noted July 19.

★**O., Cleveland**—High School—Cleveland Catholic Diocese, care of Rev. J. P. Farrelly, East 9th and Superior Sts., let contract, 3-story, brick, Euclid and East 107th Sts., to G. A. Fuller & Co., Swetland Bldg., $200,000. Noted July 5.

★**O., Cleveland** — Welfare — Hydraulic Pressed Steel Co., 315 East 61st St., let contract brick and steel, to G. A. Rutherford, 2160 East 78th St. About $80,000.

★**Ind., Gary** — School and Church—St. Hedwig Congregation let contract 2-story, to J. Wasielewski, 1528 Madison St. About $50,000.

★**Ill., La Salle**—Hotel—F. W. Malthiessen, care of G. P. Blow, La Salle, let contract 3-story, 68 x 120 ft., to Krahl Constr. Co., 350 North Clark St., Chicago. About $130,000. Noted June 7.

★**Ill., Riverside**—Home—Illinois St. Andrews Society let contract rebuilding, 1- and 2-story, 34 x 118 ft. and 31 x 121 ft., to Thomson & Sons Co., 30 North LaSalle St., Chicago. About $100,000. Noted July 12.

★**Wis., Barksdale** — (Official) — School—Bd. Educ. let contract to Tomlinson & Egan, Ashland, on percentage leases. Noted July 19.

★**Ia., Columbus Junction** — School — Bd. Educ. let contract in Columbus Independent School Dist., brick to H. A. Beck, 1707 Mt. Pleasant St., Burlington. About $60,950. Noted June 28.

★**Ia., Shenandoah**.— High School — Bd. Educ. let contract brick, stone and rein.-con. to Getchell & Sugarman, Des Moines. About $140,000. Noted June 28.

Buildings (Continued)

★**Ia., Sioux City**—Courthouse—City let contract 4-story, 150 x 150-ft. brick to Splady, Albee & Smith, 1022 Plymouth Bldg., Minneapolis. About $500,000.

★**Neb., Kearney**—Hotel—North American Hotel Co. let contract 6-story, 75 x 90-ft. rein.-con. and brick to A. Schall, 6th and Jones St., Omaha. About $150,000.

★**Ore., Portland**—Store—L. Phillips, 1224 South Figueroa St., let contract, 3-story, 92 x 128-ft., rein.-con., to Kibach Co., Merchants National Bank Bldg. About $107,500.

★**Que., Maisonville** — School — Roman Catholic School Comrs., 87 Catherine St., let contract, stone and brick to J. A. Durocher, 291 Chambley St., $175,000.

FEDERAL GOVERNMENT WORK

Proposed Work

Me., Ft. Fairfield — Post Office — J. A. Wetmore, superv. archt., treas. dept., Wash., rejected bids opened July 20. Noted Aug. 2.

N. H., Portsmouth—Office Building—Bureau Yards and Docks, Navy Dept., Wash., rejected bids opened June 25. Noted July 5.

N. Y., New York—Storehouses—Bureau Yards and Docks (F. R. Harris, ch.) Navy Dept., Wash., plans to build, 3.

Pa., Phila. — Extension to Quartermaster's Depot—Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., plans, at Marine Corps. About $235,000.

Wash., Puget Sound—(Bremerton P. O.) —Torpedo Station—Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., plans.

BIDS DESIRED

Conn., New London—Storehouse—Until Aug. 20, by Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash.

N. Y., Long Island City—Post Office—Until Sept. 12, by J. A. Wetmore, superv. archt., treas. dept., Wash. About $160,000 available.

N. Y., New York—Electric Lighting System—Until Aug. 13, by Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., for electric lighting system in structural shop.

Pa., McKees Rocks—Post Office—Until Sept. 4, by J. A. Wetmore, superv. archt., treas., Wash.

Pa., Phila. — Quarters for Radio Operators—Until Aug. 20, by Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash.

Wash., D. C.—Magazine Storehouses—Until Aug. 27, by Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., building 2 magazine storehouses at Hingham, Mass., 2 at Lake Denmark, N. J., 1 at Ft. Mifflin, Pa., 1 at St. Juliens Creek, Va.

S. C., Charleston—Shell House, Torpedo Storehouse, Magazine Building—Until Aug. 25, by (F. R. Harris, ch.), Navy Dept., Wash., for 3 steel frame buildings, concrete foundations, terra cotta tile walls, etc.

S. C., Port Royal—Officers' Quarters—Until Aug. 20, by Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., for officers' quarters at Marine Recruiting Sta.

Ga., Washington — Post Office — Until Sept. 5, by J. A. Wetmore, superv. archt., treas. dept., Wash.

Tenn., Memphis — Levee Work — Until Aug. 24, by Mississippi River Comn., U. S. Engr. Office, for building 3,400,000 cu.yd. earthwork, Upper and Lower St. Francis and White River Levee Dists.

Mich., Detroit—(Official)—Backfilling—Until Sept. 4, by U. S. Engr. Office, backfilling walls, 4th lock, St. Marys Canal; advertised in this issue.

Colo., Glenwood Springs — Post Office—Until Aug. 29, by J. A. Wetmore, superv. archt., treas. dept., Wash.

Cal., San Francisco—(Official)—Dredging—Until Sept. 5, by U. S. Army Engr., 405 Custom House, dredging part of point off Dos Rios Island, etc.; advertised in this issue.

T. H., Kuahua—Mine Storehouse—Until Sept. 3, by Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. H., Portsmouth**—Emergency Hospital—Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., let contract to M. Kelly, Newport cost plus percentage.

★**Mass., Boston** — Buildings — Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., let contract miscellaneous buildings at Bumkin Island, Boston Harbor, to E. Currier, 10 High St., Boston, $37,639.

★**Mass., Watertown**—Storehouse—Watertown Arsenal let contract 2-story, brick and steel, to Stone & Webster Engr. Corp., 147 Milk St., Boston, $70,000.

Mass., Winchester — Post Office — J. A. Wetmore, superv. archt., treas. dept., Wash. received low bids (a) limestone, (b) sandstone, from J. Miles & Co., 393 Main St., Worcester, (a) $58,470 (b) $59,900; L. F. Woodbury & Son, 400 Dorchester Ave., (a) $63,403 (b) $64,203; W. H. Fissell & Co., 1328 Bway., New York City, (a) $64,989 (b) $69,989. Noted July 5.

R. I., Melville—Extending Fuel-Oil Storage Plant—Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., received low bids (a) excavation (b) concrete work (c) reinforcement (d) miscellaneous metal work (e) buildings (f) mechanical and electrical equipment (g) piping (h) tests (i) miscellaneous work from J. W. Danworth, 70 Ellicott St., Buffalo, (a) $1.40 (b) $16.00 (c) .0465 (d) 76c. (e) $9600 (f) $94,924 (g) $84,989 (h) $500; W. G. Cornell Co., 923 12th St., Wash., D. C., (a) $1.25 (b) $28.00 (c) .0625 (d) .15 (e) $10,000 (f) $100,000; Snare & Triest, Woolworth Bldg., New York City, (a) $2.00; (b) $19.00 (c) .065 (d) .40 (e) $15.00 (f) $162,000 (g) $162,500 (h) $5000. Noted July 26.

★**R. I., Newport**—Primer Filling House—Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., let contract to Hyde & Baxter, Albany, $78,890. Noted July 12.

★**Pa., Monessen**—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to W. H. Fissell & Co., 1328 Bway., New York City, $57,000. Noted July 26.

Pa., Phila. — Crematory — Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., received low bids building crematory (work complete) from Metzger & Fisher, Otis Bldg., Phila., $12,926, 75 days; W. Linker, 9th and Cherry St., $13,922, 130 days; W. W. Austin & Co., 3028 North 16th St., $14,664, 180 days. Noted July 19.

Pa., Phila. — Cranes — Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., received low bids for electric traveling cranes for Smithery addition, at Navy Yard (work complete) from Morgan Eng. Co., Alliance, O., $52,125; Niles-Bement & Pond, 111 Broadway, New York City, $108,610.

Wash., D. C.—Coal Handling Plants—Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., received low bids (a) navy yard, Norfolk, (b) Philadelphia as follows: Wellman, Seaver & Morgan, 7000 Central Ave., Cleveland, $135,600, both items, 365 days; Brown Hoisting & Machine Works, 4403 St. Clair Ave., Cleveland, (a) $58,000, 150 to 180 days; Bergen Point Iron Works, Foot West 5th St., Bayonne, N. J., (a) Link belt equipment, $114,985; Jeffery equipment, $101,875, 210 days; (b) Link belt equipment, $113,689, 210 days, Jeffery equipment, $100,795, 210 days; (a) and (b) Link belt $224,674, Jeffery $198,670; 250 days. Noted July 19.

★**Va., Norfolk**—Heating System Foundry and Machine Shop—Bureau Yards and Docks, Navy Dept., Wash., let contract to H. E. Crook Co., Baltimore, $71,945.

★**S. C., Columbia**—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to W. H. Maxwell, Lake Chelan, Wash., $241,440.

★**Miss., Vicksburg**—Levee Work — 3rd Mississippi River Dist. let contract 1,765,000 cu.yd. levee work on Arkansas River to Hensel Co., Ltd., New Orleans, 23.3 per cu. yd. Noted June 21.

★**Tenn., Gallatin**—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to R. P. Farnsworth & Co., Owensboro, Ky., $37,500. Noted Aug. 3.

Neb., Chadron—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., received low bids from C. E. Goodhand, Wahoo, $40,281; C. A. Shaul, Seneca, Kan., $34,944; J. H. Wiese, 1501 City Natl. Bank Bldg., Omaha, $34,350. Noted July 5.

★**Tex., Vernon**—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to W. D. Lovell, Minneapolis, $41,700. Noted Aug. 2.

Wash., Keyport — Tanks and Towers — Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., received low bids for 2 steel water tanks and towers at torpedo station (work complete) from Omaha Structural Steel Co., 370 Jay St., Omaha, $18,400, 135 days; Pittsburgh-Des Moines Steel Co., Phila., $18,100, 150 days; Chicago Bridge & Iron Co., 91 West Van Buren St., Chicago, $18,478, 120 days. Delivered, 2nd tank 150 days. Noted July 12.

Cal., Mare Island — (Vallejo P. O.) — Cranes—Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., received low bids furnishing (a) 1 40-ton and 1 15-ton crane (b) net price, 1 40-ton crane complete; from Morgan Engr. Co., Alliance, O., (a) $38,950, (b) $15,115, 240 to 270 days; Niles-Bement & Pond, 111 Bway., New York City, (a) $47,000 (b) $18,500 390 days. Noted July 12.

★**Cal., Palo Alto** — Cantonment — N. D. Baker, secy. war, let contract to Lindgren Co., San Francisco, cost plus percentage.

MISCELLANEOUS

Proposed Work

★**Park Improvements—Brooklyn, N. Y.**—Park Bd. let contract for paving Prospect Park Plaza at main entrance, to Brooklyn Alcatraz Asphalt Co., 407 Hamilton Ave., $52,533.

Pier—Phila., Pa.—City purchased site on Delaware River at Delaware Ave. and plans to build pier.

Harbor Improvements — Mobile, Ala.—City election Aug. 13 to vote on $600,000 bonds for harbor improvements at Arlington site. W. Smith, city engr.

Bay St. Louis, Miss.—Sea Wall—City voted $200,000 bonds to build sea wall.

River Terminals—Memphis, Tenn.—City election Aug. 16th to vote on $5,000,000 bonds to build river terminals. J. H. Weathersford, city engr.

Disposal Plant—Salem, O.—City preparing plans to rebuild disposal plant. About $200,000. W. Skelton, city engr.

Dock—Detroit, Mich.—City plans, at foot of 24th St. R. H. McCormick, city engr.

Breakwater—Kenosha, Ill.—Council appropriated $45,000 to reclaim land to north and south of city and to build new breakwater.

Elimination of Grade Crossings—Moline, Ill.—Chicago, Rock Island & Pacific R.R., Chicago, Burlington & Quincy R.R. and City plan to eliminate grade crossings on various streets. C. A. Morse, Chicago, ch. engr. former, A. W. Newton, Chicago, ch. engr. latter. L. Payton, city engr.

Park Improvements — Peoria, Ill. — Pk. Bd. appropriated $35,000 to improve Glen Oak Park, $22,000 Bradley Park, $8000 South Park, $15,000 Grand View Dr., $13,000 Madison Park. L. D. Jeffries, city engr.

Snow Sheds—Rock River, Wyo.—Union Pacific R.R. let contract concrete lumber snowsheds near Rock River and other Wyoming points to Houghton Constr. Co., San Francisco, $1,000,000.

Canal Work—Twin Falls, Idaho—(Official)—Until Aug. 14 by Secy. Twin Falls Canal Co., for concrete structures and enlarging 4 mi. Lower Line Canal.

Pavilion and Pier—Huntington Beach, Cal.—City preparing plans for pavilion and pier—con. per. Bonds for $80,000 issue voted for work.

Canal—San Francisco, Cal.—J. F. Swift Union Steel Yards Co. plans plant, 18 ft. deep, also inland turning basin to improve 1000 acre industrial manufacturing and warehouse site. About $1,000,000.

Dock and Wharf—Amherstburg, Ont.—Brunner Mond Co. preparing plans for one. About $50,000. A. MacGregor, engr.

BIDS DESIRED

Timber Bulkhead—Albany, N. Y.—(Official)—Until Aug. 15 by J. W. Stanbery, adjutant gen., building timber bulkhead; advertised in this issue.

Dam—Buffalo, N. Y.—Until Aug. 15 by Dept. Parks and Pub. Bldg. Building reinforced dam over Cazenovia Creek, Cazenovia Park. Address J. P. Mahon.

Retaining Walls — Tekamah, Neb. — See "Bridges."

Retaining Wall—Santa Barbara, Cal. — See "Streets and Roads."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Docks and Warehouse—Orange, Tex.**—City let contract to Austin Bros., 1418 Commerce St., Dallas, $44,000.

★**Gas Main—Lima, Ohio**—Lima Star Gas Co. let Nall Bros. Bldg. Wrought Iron contract to lay 6-in. cast iron gas main from Lima, Ohio, to Cairo, Ohio, to Engineering Eng., 1 J. E. Thomas. Noted May 24.

Transmission Line—Sherbrooke, Que.—(Official)—Until ... by ... engineer for transmission line from Sherbrooke to power plant at Two Mile Falls. Noted July ...

SEARCHLIGHT SECTION

Contracts To Be Let

PROPOSALS

Bids received until August 21, 1917.

Frankford Elevated Railway

DEPARTMENT OF CITY TRANSIT
754 BOURSE BUILDING
Philadelphia, August 7, 1917.

Sealed proposals, properly indorsed and addressed to the undersigned at the office above mentioned, will be received until 12 o'clock noon, on Tuesday, August 21, 1917, and opened immediately thereafter, for the following work appurtenant to the Frankford Elevated Railway, authorized by Ordinances of Councils approved July 2, 1915, July 20, 1916 and March 6, 1917:

CONTRACT NO. 524—Steel frame work and railings, concrete floors and parapets side enclosures, roofs, drain gutters and spouts for ten (10) station platforms and connecting passages or foot bridges between station platforms and station buildings at Allegheny Avenue, Tioga Street, Torresdale Avenue, Ruan-Church Streets and Orthodox-Margaret Streets.

Plans and specifications can be seen at Room 748, Bourse Building, and copies of same with blank forms for proposals will be supplied to intending bidders upon deposit of $10 (cash or certified check), which will be refunded upon return of plans.

Bidders must be skilled and regularly engaged in this class of work.

No bid will be considered unless accompanied by a certificate from the City Solicitor that a proposal bond in the sum of five hundred dollars ($500) has been filed in accordance with the provisions of an ordinance approved May 25, 1860.

The Director reserves the right to reject any or all bids as he may deem best for the interest of the City of Philadelphia.

WM. S. TWINING,
Director.

Bids received until August 20, 1917.

Filter Bed and Appurtenances

New Canaan, Conn.

Sealed proposals will be received by the Board of Warden and Burgesses of the Borough of New Canaan, at the office of the Borough Clerk, on or before Monday, August 20, 1917, at 8 P. M., for the construction of an emergency filter bed and appurtenances, renewal of Beds Nos. 1, 2 and 3, and such other additions and alterations designated on the plan for the Borough of New Canaan, Conn., at their sewage disposal plant. Plans and specifications may be secured at the office of the Clerk, John E. Hersam, 9 Railroad Avenue, New Canaan, Conn., or the office of the Engineer, W. H. Arthur, 1 Bank Street, Stamford, Conn. The Board of Warden and Burgesses reserves the right to reject any or all bids.

Per Order of the Board of Warden and Burgesses. JOHN E. HERSAM, Clerk.

Dated at New Canaan, Conn., August 8, 1917.

Bids received until Aug. 20, 1917

Surface Treatment

Swarthmore, Pa.

Bids will be received until August 20, 1917, at the Borough Hall for 10,000 yd. surface treatment for macadam roads.

PROPOSALS

Bids received until August 20, 1917.

Outfall Sewer, etc.

Scotia, N. Y.

Notice is hereby given that sealed proposals will be received by the Board of Trustees of the Village of Scotia, N. Y., at the office of the village clerk in said village, until 8:00 o'clock P.M. on the 20th day of August, 1917, for the construction of a screening chamber and outfall sewer, in accordance with plans and specifications on file in the office of the Village Clerk.

All bids must be made upon printed forms to be obtained of the Village Clerk at the Village Hall, Scotia, N. Y.

All bids must be written in words and figures, and accompanied by a certified check, payable to the order of the Treasurer of the Village of Scotia, for ten (10%) per cent. of the amount of the bid.

All bids must be enclosed in a sealed envelope, directed to the Board of Trustees of the Village of Scotia, N. Y., and endorsed upon the outside of the envelope "Proposal for Screening Chamber and Outfall Sewer."

The Board of Trustees reserves the right to reject any or all bids or proposals.

By order of the Board of Trustees of the Village of Scotia, N. Y.

E. CROSBY HOYT,
Village Clerk.

Dated Village of Scotia, N. Y., this 7th day of August, 1917.

Note: Outfall sewer composed of approximately 2400 feet of 18" vitrified pipe.

W. W. CHADSEY, Engineer.

Bids received until August 20, 1917.

Notice to Paving Contractors

Elmira, N. Y.

Sealed proposals for grading, curbing and paving the below named street will be received by the undersigned at his office in the City Hall until 11 a.m. August 20, 1917: East and West Gray Streets, from west line Baldwin Street to east line Main Street, about 2400 square yards.

Plans and specifications are on file in the City Engineer's office, City Hall, where also may be obtained the "proposal blanks," which must be used.

A certified check for $1250 payable to the order of the Mayor of Elmira, N. Y., is required and must accompany the bids. It will be returned to the bidder upon execution of the contract.

The Board of Public Works reserves the right to reject any or all bids.

LOUIS C. ANDREWS, City Clerk.

Plans received until August 15, 1917.

Building Plans

Voluntary competitive plans for a Knights of Columbus Building will be received on or before 10:00 A.M. Wednesday, August 15th, 1917. The right is reserved to reject all drawings submitted. All information may be obtained from Thomas F. Feeley, 904 East 20th St., Chester, Pennsylvania.

PROPOSALS

Bids received until August 29, 1917.

Centrifugal Pumps, etc.

Jackson, Mich.

Sealed Proposals will be received at the office of the City Manager, Jackson, Mich., until 12 o'clock noon of Wednesday, Aug. 29th, 1917, for the construction, delivery and erection of one (1) steam driven vertical, centrifugal pump, one (1) or more electrically driven deep well pumps, and two (2) electrically driven horizontal centrifugal pumps for the City Water Works.

Each proposal must contain the full name of the party or parties making same and must be accompanied by a certified check for ten per cent. (10%) of the greatest amount bid as a guarantee that if the proposal is accepted the contract will be entered into. Said check shall be forfeited to the City if the bidder fails to execute the contract within ten (10) days after notice of award.

Plans, specifications and blank forms of proposals and contract may be obtained at the office of the Superintendent of Water Works of the City of Jackson, Michigan, or at the office of Seabury G. Pollard, Consulting Engineer, 3422 Burch Avenue, Cincinnati, Ohio, by making a deposit of Ten Dollars ($10), which will be refunded upon their return in good condition.

The right is reserved to reject any and all bids.

A. W. D. HALL,
City Manager.

OSCAR E. BULKELEY,
Superintendent Water-Works.
ated August 3rd, 1917.

Engine and Pump

The City of Frederick, Oklahoma, will install one steam engine, 250-hp., 125 lb. steam pressure, not to exceed 200 r.p.m. noncondensing, steam consumption not more than 25 lb. per i.hp. when running at half load. Engine to pull 150-kw. generator, 2200-volt, 3-phase, 48 amperes, 50 per cent. P. F.

One centrifugal pump, 2-stage, direct connected to motor, maximum capacity 20,000 gallons per hour against a 16' lift and 65-pound head. One pump of same capacity, either steam plunger or turbine type, to be used as emergency. Address communications City Clerk, Frederick, Oklahoma.

HENRY A. PRESSEY,
City Hall, Oklahoma City, Oklahoma.

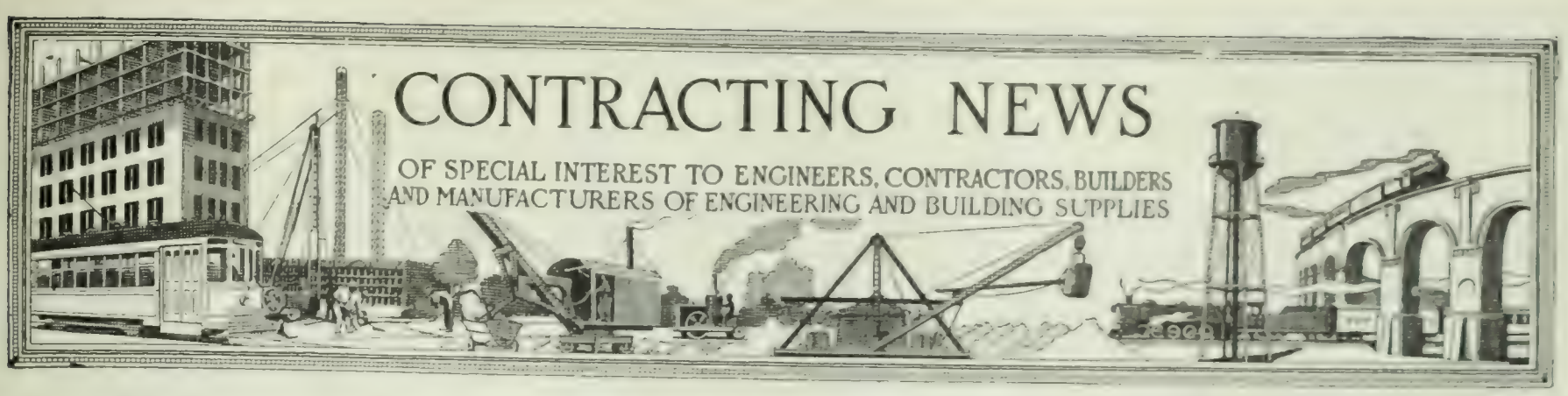
Bids received until August 17, 1917.

Concrete Bridge

Hampton, N. Y.

Bids will be received by the undersigned until two o'clock P.M., August 17th, at the Town Hall in Hampton, N. Y., for the construction of a steel reinforced-concrete arch bridge across the Poultney River at Leonard's. Plans and specifications can be obtained at the Allen Bank in Fair Haven, Vt., or at the town clerk's office, Hampton, N. Y. The right to reject any or all bids is reserved.

E. S. DOUGLASS,
Supt. Highways, Hampton, N. Y.
SELECTMEN, Fair Haven, Vt.



Proposals

For Proposals Advertised See Pages 46 to 51 Inclusive

WATER-WORKS

Bids Close		See Eng. News-Record
Aug. 20.	Cumberland, Md. Advertised Aug. 2 to Aug. 16.	Aug. 9
Aug. 20.	Chicago Heights, Ill.	Aug. 9
Aug. 20.	New York, N. Y.	Aug. 16
Aug. 21.	Boston, Mass.	Aug. 16
Aug. 22.	Jackson, Mich. Adv. Aug. 16.	Aug. 16
Aug. 23.	Akron, O.	Aug. 16
Aug. 25.	San Francisco, Cali.	Aug. 2
Aug. 27.	Ottawa, Ont.	Aug. 16
Sept. 3.	Burlingame, Kan.	Aug. 16
Sept. 4.	Hamilton, Ont.	Aug. 16
Sept. 4.	Cumberland, Md. Adv. Aug. 9 and 16.	Aug. 9
Sept. 6.	Brockton, Mass. Adv. Aug. 16.	Aug. 16
Sept. 6.	Thomson, Ill. Adv. Aug. 16.	Aug. 16
Sept. 10.	Cumberland, Md. Adv. Aug. 16.	Aug. 16
Sept. 11.	New York, N. Y. Adv. July 12 and Aug. 16.	July 12

SEWERS

Aug. 16.	Cincinnati, O.	Aug. 16
Aug. 17.	Beloit, Wis.	Aug. 16
Aug. 18.	Bowling Green, O.	Aug. 16
Aug. 18.	Muncie, Ind.	Aug. 16
Aug. 20.	Camden, N. J.	Aug. 16
Aug. 20.	New Hampton, N. Y.	Aug. 9
Aug. 20.	Milford, Ia.	Aug. 9
Aug. 20.	New Haven, Conn.	Aug. 16
Aug. 20.	Marshalltown, Ia.	Aug. 16
Aug. 21.	Chicago, Ill.	Aug. 16
Aug. 21.	Seymour, Ia.	Aug. 16
Aug. 21.	Salt Lake City, Utah	Aug. 16
Aug. 21.	Columbus, O.	Aug. 16
Aug. 21.	Sharon, Pa.	Aug. 16
Aug. 22.	San Francisco, Cal.	Aug. 16
Aug. 24.	Cleveland, O.	Aug. 16
Aug. 30.	Mora, Minn.	Aug. 16
Sept. 4.	Cumberland, Md. Adv. Aug. 9 and 16.	Aug. 9
Sept. 15.	Hillsboro, Ill.	Aug. 16

BRIDGES

Aug. 17.	Somerville, N. J.	Aug. 16
Aug. 17.	Hampton, N. Y. Adv. Aug. 16.	Aug. 16
Aug. 20.	Angola, Ind.	Aug. 9
Aug. 22.	Troy, O.	Aug. 2
Aug. 24.	Spokane, Wash.	Aug. 16
Aug. 25.	Martinsburg, W. Va.	Aug. 9
Aug. 27.	Elberton, Ga.	Aug. 2
Aug. 28.	Hohenwald, Tenn.	Aug. 16
Aug. 28.	Rockville, Ind. Adv. Aug. 16.	Aug. 16
Aug. 28.	Channahon, Ill. Adv. Aug. 16.	Aug. 16
Aug. 29.	Columbus, O.	Aug. 16
Aug. 30.	Kankakee, Ill.	Aug. 2
Sept. 1.	Annapolis, Md.	Aug. 16
Sept. 1.	New Martinsburg, W. Va.	Aug. 16
Sept. 4.	Williamsport, Pa. Adv. Aug. 16.	Aug. 16
Sept. 11.	Bradentown, Fla.	Aug. 16

STRUCTURAL STEEL WORK

Aug. 21.	Albany, N. Y. Adv. July 26 and Aug. 2.	July 26

REINFORCED CONCRETE

Aug. 22.	Beatrice, Neb.	July 19

STREETS AND ROADS

Bids Close		See Eng. News-Record
Aug. 20.	Indiana	July 26
Aug. 20.	Indiana	Aug. 16
Aug. 20.	Washington	Aug. 2
Aug. 20.	Dubuque, Ia.	Aug. 9
Aug. 20.	St. Paul, Minn.	Aug. 9
Aug. 20.	California	Aug. 9
Aug. 20.	Nebraska City, Neb.	Aug. 9
Aug. 20.	Salmon, Idaho	Aug. 9
Aug. 20.	Louisiana	Aug. 16
Aug. 20.	Connecticut	Aug. 16
Aug. 20.	New York, N. Y.	Aug. 16
Aug. 20.	Muskegon, Mich.	Aug. 16
Aug. 20.	Danville, Ill.	Aug. 16
Aug. 20.	Sheridan, Wyo.	Aug. 16
Aug. 20.	Dorchester, Mass.	Aug. 16
Aug. 20.	Jefferson, Ia.	Aug. 16
Aug. 21.	Cape May, N. J.	Aug. 16
Aug. 21.	Salt Lake City, Utah	Aug. 16
Aug. 21.	Stone Harbor, N. J.	Aug. 2
Aug. 21.	Billings, Mont.	Aug. 9
Aug. 21.	Seattle, Wash.	Aug. 9
Aug. 21.	Jersey City, N. J.	Aug. 9
Aug. 21.	Massachusetts	Aug. 16
Aug. 22.	Baltimore, Md.	Aug. 16
Aug. 22.	Amite, La.	Aug. 16
Aug. 22.	Beloit, Wis.	Aug. 16
Aug. 22.	Oxford, O.	Aug. 16
Aug. 23.	Fulton, N. Y. Adv. Aug. 9.	Aug. 9
Aug. 23.	Burlington, Ia.	Aug. 16
Aug. 24.	Escanaba, Mich.	Aug. 16
Aug. 24.	Pennsylvania	Aug. 9
Aug. 24.	Uniontown, Pa.	Aug. 9
Aug. 24.	Lancaster, O.	Aug. 16
Aug. 25.	Indiana	Aug. 16
Aug. 27.	California	Aug. 16
Aug. 27.	Indiana	Aug. 16
Aug. 27.	Newark, N. J.	Aug. 2
Aug. 27.	Portland, Me.	Aug. 9
Aug. 27.	New Brunswick, N. J.	Aug. 16
Aug. 27.	Elizabeth, N. J.	Aug. 16
Aug. 27.	Little Falls, N. J.	Aug. 16
Aug. 27.	Los Angeles, Cal.	Aug. 16
Aug. 27.	St. Paul, Minn.	Aug. 16
Aug. 28.	Farmville, Va.	Aug. 16
Aug. 30.	New Brunswick, N. J.	Aug. 16
Aug. 30.	Oklahoma, Okla.	Aug. 9
Aug. 30.	Indiana	Aug. 16
Aug. 30.	Kingsport, Tenn.	Aug. 16
Aug. 30.	Pennsylvania Adv. Aug. 16.	Aug. 16
Sept. 1.	Scotsboro, Ala.	Aug. 16
Sept. 4.	Pittsburgh, Pa.	Aug. 16
Sept. 4.	Columbus, O.	Aug. 16
Sept. 4.	New Brunswick, N. J.	Aug. 16
Sept. 4.	Yazoo City, Miss.	Aug. 16

RAILWAYS

Aug. 30.	Pennsylvania Adv. Aug. 16.	Aug. 16

EXCAVATION AND DREDGING

Aug. 18.	Mora, Minn.	Aug. 16
Aug. 20.	Des Moines, Ia.	July 26
Aug. 20.	Owatonna, Minn.	Aug. 9
Aug. 20.	Glenwood, Minn.	Aug. 16
Aug. 20.	Greenock, Ont.	Aug. 16
Aug. 21.	Parton, Ill.	Aug. 9
Aug. 21.	Albany, N. Y. Adv. Aug. 16	Aug. 16
Aug. 22.	Lamar, Colo.	Aug. 16
Aug. 22.	Sac City, Ia.	Aug. 16
Aug. 23.	Spencer, Ia.	Aug. 16
Aug. 24.	Memphis, Tenn.	Aug. 2
Aug. 28.	Winston-Salem, N. C.	Aug. 16
Aug. 30.	Detroit, Minn.	Aug. 16
Aug. 30.	Tallahassee, Fla.	Aug. 16
Oct. 2.	St. Cloud, Minn.	Aug. 2

INDUSTRIAL WORKS

Aug. 20.	New Hamilton, N. Y.	Aug. 9
Aug. 31.	Seattle, Wash.	Aug. 16
Sept. 4.	Columbus, O.	Aug. 16

BUILDINGS

Bids Close		See Eng. News-Record
Aug. 20.	Brooklyn, N. Y.	Aug. 9
Aug. 20.	Tulsa, Okla.	Aug. 16
Aug. 21.	Laconia, N. H.	Aug. 16
Aug. 21.	York, Neb.	Aug. 16
Aug. 21.	Fairmont, Minn.	Aug. 16
Aug. 21.	Boston, Mass.	Aug. 16
Aug. 22.	Mattapan, Mass.	Aug. 9
Aug. 22.	Greensboro, N. C.	July 26
Aug. 22.	Modesto, Cal.	Aug. 2
Aug. 22.	Hamden, Conn.	Aug. 16
Aug. 23.	Boston, Mass.	Aug. 16
Aug. 23.	Raleigh, N. C.	Aug. 16
Aug. 24.	Mingo, Ia.	Aug. 16
Aug. 24.	New Brunswick, N. J.	July 26
Aug. 28.	Detroit, Mich.	Aug. 2
Aug. 28.	Dike, Ia.	Aug. 16
Aug. 28.	Hudson, Wis.	Aug. 16
Aug. 30.	Conde, S. D.	Aug. 16
Aug. 30.	Columbus, O.	Aug. 16
Aug. 30.	London, O.	Aug. 16
Sept. 1.	Lincoln, Neb.	Aug. 16
Sept. 1.	Elmira, N. Y.	Aug. 9
Sept. 1.	Milwaukee, Wis.	Aug. 9
Sept. 4.	Lakewood, O.	Aug. 16
Sept. 5.	Newton, Ia.	Aug. 16
Sept. 5.	Brooklyn, N. Y.	Aug. 16
Sept. 15.	Oklahoma, Okla.	Aug. 16
Sept. 15.	Spirit Lake, Ia.	Aug. 9

FEDERAL GOVERNMENT WORK

Aug. 20.	Washington, D. C.	Aug. 2
Aug. 20.	Phila., Pa.	Aug. 9
Aug. 20.	New London, Conn.	Aug. 9
Aug. 20.	Port Royal, S. C.	Aug. 9
Aug. 20.	Brooklyn, N. Y.	Aug. 16
Aug. 20.	Buffalo, N. Y. Adv. Aug. 16.	Aug. 16
Aug. 21.	Grand Haven, Mich. Adv. July 26 and Aug. 2.	July 26
Aug. 21.	Kendallville, Ind.	Aug. 16
Aug. 21.	Wash., D. C. Adv. Aug. 16	Aug. 16
Aug. 24.	Memphis, Tenn. Adv. Aug. 16.	Aug. 9
Aug. 24.	Colonie, N. Y.	Aug. 16
Aug. 25.	Charleston, S. C.	Aug. 9
Aug. 27.	Hingham, Mass.	Aug. 9
Aug. 27.	Washington, D. C.	Aug. 9
Aug. 27.	Phila., Pa.	Aug. 16
Aug. 28.	Detroit, Mich.	Aug. 2
Aug. 29.	Glenwood Springs, Colo.	Aug. 9
Aug. 30.	Franklin, Pa. Adv. July 26 and Aug. 2.	July 26
Aug. 31.	San Pedro, Cal.	Aug. 16
Sept. 3.	Kuahua, T. H.	Aug. 9
Sept. 4.	McKees Rocks, Pa.	Aug. 9
Sept. 4.	Detroit, Mich. Adv. Aug. 9 and 16	Aug. 9
Sept. 5.	Torrington, Wyo. Adv. Aug. 16	July 26
Sept. 5.	Washington, Ga.	Aug. 2
Sept. 5.	San Francisco, Cal. Adv. Aug. 9 and 16	Aug. 9
Sept. 5.	Wash., D. C. Adv. Aug. 16.	Aug. 16
Sept. 6.	Forsyth, Ga.	Aug. 2
Sept. 12.	Long Island City, N. Y.	Aug. 9
Sept. 21.	Kendallville, Ind. Adv. Aug. 16.	Aug. 16

MISCELLANEOUS

Aug. 19.	Retaining Wall, Lebanon, Pa.	Aug. 16
Aug. 21.	Piers, Albany, N. Y. Adv. Aug. 16 and Aug. 2	July 26
Aug. 21.	Elevator, Hallowell, Phila., Pa. Adv. Aug. 16	Aug. 16
Aug. 21.	Tunnels, San Francisco, Cal. Adv. July 19 and Aug. 2 and 16.	July 19
Aug. 25.	Improvement, Portland, Ky.	Aug. 2
Aug. 31.	Breakwater, [illegible] Harbor, N. H.	Aug. 16

WATER-WORKS

Proposed Work

Ga., Atlanta—City plans to build 48-in. concrete aqueduct 40-mi. long, gravity pressure to improve pumping plant. About $8,000,000. W. M. Gipp, city supt.

O., Dayton—(Official)—City rejected bids building 10,000,000-gal. reservoir in southeastern part of city.

Ill., New Athens—City voted $80,000 bonds to build water-works system. H. Kaiser, city supt.

Wis., Campbellsport—Village plans to install waterworks station and sewerage system.

Wis., Niagara—City defeated $35,000 bond issue to build water-works system. Noted Aug. 2.

Kan., Chanute—Atchison, Topeka & Santa Fe R.R. to build water-works plant in Neosho River to supply its engines at Chanute. About $82,000. R. A. Rutledge, Topeka, ch. engr.

Kan., Eureka—City plans to build waterworks improvements. About $30,000. Black & Veatch, 507 Inter-State Bldg., Kansas City, Mo., engrs.

Kan., Kansas City—City having plans prepared 10,000,000 gal. reservoir, Argentine Hill. L. H. Chapman, comr. light and water.

Neb., Omaha—City plans to extend waterworks line from Albright to Ft. Crook. Address City Engr., Bruce.

S. D., Centerville—City election Aug. 17 to vote on $20,000 bond issue to install waterworks system.

Mont., Ronan—City voted $16,000 bonds to build waterworks system.

Mo., Riverview Gardens—(St. Louis P. O.)—Sikking & Beckwith, agts. Riverview Gardens Realty Co., soon let contract, 3 mi., laying water pipes.

Tex., Rosebud—(Official)—City to sell $16,500 bonds to build waterworks. Z. A. Booth, mayor.

Tex., Wharton—See "Excavation and Dredging."

Okla., Frederick—(Official)—City plans to install 1 steam engine, 1 centrifugal pump. H. A. Pressey, city clk. Advertised in this issue.

Okla., Granite—City election Aug. 20, to vote on bond issue to build waterworks system. H. Arnett, city supt.

Okla., New Wilson—City plans to improve waterworks system. About $10,000.

Okla., Wilburton—City soon lets contract concrete dam and reservoir for waterworks.

Okla., Woodward—See "Sewers."

Idaho, Boise—City soon lets contract repairing flume south of Warm Springs Ave., Cottonwood Gulch and Hull's Gulch, wooden or concrete flumes. About $15,000. J. L. Niday, 307 Overland Bldg., gen. mgr.

Wash., Seattle—City lets contract in October, building 40,000,000 gal. concrete reservoir in Volunteer Park. About $350,000; also 3 dams, concrete core walls at Swan Lake, first unit of over $2,000,000 such improvements to be made this year. L. B. Youngs, supt. water. Noted July 26.

Wash., Tacoma—Pierce Co. Comm. granted franchise to F. C. Ross to build waterworks system on tide-flats. About $25,000. J. Nichol, city engr.

Ore., Oswego—Pub. Serv. Comn. ordered Oswego Lake Water, Light & Power Co. to improve waterworks system, including building steel or cement caisson around spring, auxiliary pump and other additions to pump made, liquid chlorine purification system installed.

Cal., Corona—Circleloe Ranch having plans prepared by A. C. Brenner, Higgins Bldg., Los Angeles, water-works system, including tunnels, submerged dams, and 3 mi. pipe line.

Cal., Filmore—City plans to build waterworks plant. Address City Clk.

Cal., Fresno—Fresno Co. Comm. granted franchise to A. Vetsch, building, operating and maintaining waterworks system, Navelencia.

Ont., Aylmer—Carnation Milk Products Co., Ltd., soon lets contract, reservoir. About $25,000. W. H. Phillipps, Aylmer, engr.

BIDS DESIRED

Mass., Boston—Until Aug. 31, by Comr. Waterways and Public Lands, 473 State House, 6 oil pressure operated sluice gates, 6 - 8 ft. each. J. N. Cole, chn. F. W. Hodgson, engr.

Mass., Brockton—(Official)—Until Sept. 6 by Sewerage Comn. furnishing 3 centrifugal pumps, 2 oil storage tanks, 3 fuel oil engines. A. F. Nordbeck, chmn. Advertised in this issue.

N. Y., New York—Until Aug. 20, by R. C. Harrison, comr. docks, Pier "A," Battery Pl., paving Marginal St. between West 44th and West 47th St., granite block, concrete foundation.

Md., Cumberland—(Official)—Until Sept. 10, by Evitts Creek Water Co., Cumberland, building additions to filtration plant. J. H. Fuertes, engr. Advertised in this issue.

O., Akron—(Official)—Until Aug. 23, by C. F. Beck, dir. pub. serv., Cont. No. 80, furnishing about 200 fire hydrants of from 6 to 8 in. Cont. No. 86, furnishing water meters about 5000 ⅝-in., 210 ¾-in. to 2-in.

Mich., Jackson—(Official)—Until Aug. 29, by A. W. D. Hall, city mgr., building steam driven vertical, centrifugal pump 1 or more electrically driven deep well pumps and 2 electrically driven horizontal centrifugal pumps. Advertised in this issue.

Ill., Thomson—(Official)—Until Sept. 6, by F. J. Stransky, atty. Savanna and York Drain. Dist., Dist. Savanna, building pump house etc. N. D. French, secy. Advertised in this issue.

Minn., Mora—See "Sewers."

Kan., Burlingame—Until Sept. 3, by City, waterworks improvements. About $11,400. W. E. Estep, city supt.

Ont., Hamilton—(Official)—Until Sept. 4 (change of date) by city installing machinery, Beach Pumping Station. Noted July 26.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—City let contract laying water pipes, flexible steel joints, Boston Harbor between Long and Spectacle Island, to Bay State Dredging & Contg. Co., 247 Atlantic Ave., $19,610.

★**N. Y., New York**—(Official)—Bd. Water Supply, Municipal Bldg., let contract, furnishing and delivering gate and pressure-regulating valves, etc., to Coffin Valve Co., Neoponset St., Boston, $147,219. Noted July 26.

★**N. Y., Wyantskill**—Rensselaer Co. Tuberculosis Hospital let contract waterworks system to Hyde & Baxter, 351 Madison Ave., Albany, $30,300. Noted May 24.

★**O., Akron**—City let contract, filtration plant to New York Continental Jewell Filter Co., 15 Broad St., New York City, $190,202; pipe, 30-in. main, portions East Buchtel Ave., to R. D. Wood & Co., Akron, smaller main pipes to Hardware Supply Co., Akron, $87,618. Noted June 21.

★**O., Toledo**—City let contract 30,000,000 gal. steam turbine centrifugal pump to Dravo-Doyle Co., Citizens Bank Bldg., $71,495; 225-ft. radial brick chimney to W. Hawley & Co., Toledo, $15,831; 2 automatic stokers to Sanford Riley Stoker Co., Worsenter, Mass., $8250.

★**Wis., Whitefish Bay**—City let contract waterworks system, laying 23,000 ft. waterworks pipe to J. M. Donahue, Stevens Point, $65,000.

★**Kan., Chanute**—City let contract filtration plant, 2,000,000 gal. capacity to Chanute Constr. Co., Chanute, $100,000. Noted June 28.

★**Kan., Hays**—City let contract machinery equipment water-works system to Merkle-Hines Machinery Co., 508 Inter-State Bldg., Kansas City, Mo., $33,000; building and chimney to A. Jacobs, Hays, $12,000.

★**Okla., Lawton**—City let contract, pipe line from Lake Lawtonka, to Cannady Constr. Co., Tulsa, $75,000. Noted July 19.

★**Okla., Tulsa**—City let contract waterworks improvements to Fogel Constr. Co., 515 Reliance Bldg., Kansas City, Mo., $666,000. Noted June 21.

★**Okla., Tulsa**—City let contract, laying 55,512 ft. of from 14- to 24-in. pipe from Lake Law-ton-ka to Ft. Sill and Lawton, to Cannady Constr. Co., Tulsa, $75,000. Noted July 16.

★**Que., Montreal South**—City let contract, water mains, valves, hydrants, sewers and manholes to J. Toussaint & Cie., Ltd., 83 Craig St., W., elevated steel tanks for waterworks to Chicago Bridge & Iron Works, 37 West Van Buren St., Chicago. About $180,000. Noted May 19.

SEWERS

Proposed Work

N. Y., Altamont—(Official)—Village soon lets contract building sewers and sewage disposal plant. W. W. Chadsey, 20 Swan St., Schenectady, engr.

N. Y., Scotia—Village voted $12,000 bonds to build sewage disposal plant.

N. J., South Orange—9 municipalities plan to build trunk line sewer. About $643,312. Address I. C. Dilks, South Orange.

Pa., Pittsburgh—City had plans prepared building alterations to sewage disposal plant. About $40,000. W. Skelton, city engr.

Ga., Savannah—Fort Wentworth Terminal Corp., 61 Broadway, New York, plans to build sewers, Port Wentworth. About $50,000. C. W. Leavitt, 220 Bway., New York, engr.

Fla., Palm Beach—Town voted $50,000 bonds to improve sewerage system. Address Town Clk.

Tenn., Nashville—City election Sept. 29 to vote on $1,000,000 bond issue to construct sewerage system. W. W. Southgate, city engr.

O., Canton—City to sell $70,000 bonds to build central southwest storm sewer. W. E. Sarver, city engr.

O., Cincinnati—City to sell $920,000 bonds to build Millcreek trunk sewer. F. Krug, city engr.

O., Cleveland—City plans to install sewers Woodhill Rd. and Tate Ave. R. Hoffman, city engr.

O., Lima—City to sell $855,000 bonds to construct intercepting sewers and sewage treatment plant. C. Bryan, city engr.

O., Youngstown—City plans sewers, Mill Creek and Southern Dist. About $1,000,000. F. M. Little, engr.

Ind., South Bend—City rejected bids Chestnut St. sewer. New bids soon.

Mich., Detroit—City plans to build sewerage system, block or brick. About $16,000,000. R. H. McCormick, city engr.

Ill., Oregon—City voted $200,000 bonds to build sewers and improve 4th St.

Wis., Burlington—City sold $13,000 bonds to construct sewers in Perkins Park and in east side of Fox River.

Wis., Campbellsport—See "Water-Works."

Minn., Dodge Center—City soon lets contract sewerage system. About $32,000. J. F. Druar, 312 Commercial Bldg., St. Paul, engr. Noted July 5.

Kan., Hutchison—Council passed ordinance creating Grand View Industrial Sewer Dist. G. L. McLane, city engr.

S. D., Mobridge—City sold $40,000 bonds to build sewers. Noted June 14.

Mo., St. Joseph—Bd. Pub. Wks. soon lets contract building sewer, Dist. No. 16. C. P. Hoff, city engr.

Tex., Austin—City election soon to vote on $315,000 bond issue to build sewage disposal plant and install fire alarm system. A. T. Dickey, city engr.

Okla., Sentinel—City election Aug. 18, to vote on $10,000 bond issue to build sewerage system.

Okla., Woodward—City election soon to vote on $42,000 bond issue to improve water-works, sewerage and light systems. F. H. Killburn, city supt.

Okla., Wynnewood—City election soon to vote on bonds to build sewerage system.

Colo., Trinidad—City voted July 23 in favor of issuing $30,000 bonds to build purification plant and extend sewer system. L. R. Douglas, city engr.

Cal., East San Diego—City plans to install sewerage system. Address Sanitary Engr., State Bd. Health, Sacramento.

Cal., Glendale—F. P. Newton Co., having plans prepared by Quinton, Code & Hill, engrs., Hollingsworth Bldg., Los Angeles, sewerage system, Selvas de Verdugo, a tract north of here.

N. S., Halifax—City plans sewer extensions. About $12,000. F. W. W. Doane, city engr.

BIDS DESIRED

Conn., New Haven—(Official)—Until Aug. 20, by F. L. Ford, city engr. building sewers and appurtenances, portions Hillside Pl., Eddy and Ivy Sts.

N. J., Camden—Until Aug. 20, by Highway Dept., building sewer, Copewood St. L. E. Farnham, city engr.

Pa., Sharon—(Official)—Until Aug. 21, by C. B. Lartz, boro. secy., building sewers and appurtenances, including about 8053 ft. of from 8- to 24-in. vitr. pipe or rein.con. pipe sewer, 34 manholes, 1170 cu.yd. rock excavation. G. Nicholls, boro. engr.

Tenn., Kingsport—See "Streets and Roads."

O., Bowling Green—(Official)—Until Aug. 18, by Dir. Pub. Serv., building sanitary sewers from Outlet 81, through Case and Merry Aves. to Thurston Ditch; also lateral sewer from Outlet No. 75 to Case Ave. Noted June 7.

Sewers (Continued)

O., Cleveland—(Official)—Until Aug. 24, by E. Shattuck, comr. purch. and supplies, constructing Sects. Nos. 4 and 5, intercepting sewer. R. Hoffinger, city engr.

O., Columbus—Until Aug. 21, by A. Borden, dir. pub. serv., sewers in various sts. H. Maetzel, city engr.

Ind., Muncie—(Official)—Until Aug. 18, by Bd. Pub. Wks., building 5th St. sewer No. 3 and Elbright sewer No. 1. J. R. Kelly, city clk.

Ill., Chicago—(Official)—Until Aug. 21, by Bd. Local Imprvs. building sewers and drains on various streets. E. J. Glackin, secy. J. Sinnan, city engr.

Ill., Hillsboro—Until Sept. 15, by W. D. P. Warren, city engr., building sewer extensions. About $12,000.

Wis., Beloit—(Official)—Until Aug. 17, by Pub. Wks. Com., building sewers, Sewerage Dist. B, portions Summit and Park Aves., including about 3740 ft. of 8-in. sewer, 14 manholes. G. E. Heebink, city engr.

Ia., Marshalltown—(Official)—Until Aug. 20, by A. A. Rosengren, city clk., building sanitary sewers in portions North 7th Ave., Fremont, Jerome, West Main, West Nevada, South 12th, South 7th, Turner, and May Sts.; also South 7th and South 9th Aves. W. H. Steiner, city engr.

Ia., Seymour—(Official)—Until Aug. 21, by J. W. Lowrey, city clk., building 2200 ft. of from 6- to 12-in. sewers and 2 disposal plants. M. G. Hall, Centerville, engr. Noted June 7.

Minn., Mora—(Official)—Until Aug. 30, by Ogilvie Village, Kannabeck Co., building sanitary sewerage and water-works systems, including sewage disposal plant and outfall sewers, etc. J. F. Druar, 312-316 Commercial Bldg., St. Paul, engr.

Minn., St. Paul—(Official)—Until Aug. 27, by H. W. Austin, purch. agt., building Jefferson-Cretin Sewer Dist. No. 2. O. Claussen, city engr.

Utah, Salt Lake City—(Official)—Until Aug. 21 (change of date) by G. Snow, city recorder, constructing pipe sewers, Sewer Extension No. 374, portions 3rd and 4th Aves. Noted Aug. 9.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★N. Y., Brooklyn—L. H. Pounds, boro. pres. let contract building sewers in portions Vermont Ave., Crosby Ave., Bulwer Pl., Miller Ave., and Highland Blvd., to Kenmore Contg. Co., 6102 18th Ave. About $14,090.

N. J., Newark—Bd. Freeholders, Essex Co., received low bid, sewage disposal plant, Overbrook Hospital, from Sanitary Sewerage Treatment Co., Newark, $52,500.

★Pa., Midland—See "Streets and Roads."

★Md., Hagerstown—City Sewerage Comn. let contract, 4 mi. main sewers, and 3 mi. house connections, to H. C. Brooks Constr. Co., Martinsburg, W. Va., $111,777. Noted July 12.

★Va., Abington City—(Official)—City let contract constructing sanitary sewarage system to I. C. Mishler, 105 Spruce St., Chattanooga, Tenn., $24,600. Noted Aug. 9.

★O., Cleveland—Bd. Control let contract, outfall service, from East 140th to Lake, to American Constr. Co., 1552 Rockefeller Bldg., $360,000.

★Ind., South Bend—City let contract building sewer, Dunn and Howard Sts. to Staples & Ackerman, South Bend.

★Cal., Folsom—Dirs. Folsom Sanitary Dist. let contract, sewerage system and sewage disposal tank to Heafey & Tobin, Oakland, $20,948.

BRIDGES

Proposed Work

N. J., Mays Landing—Bd. Freeholders, Atlantic and Burlington Cos. preparing plans for 1100-ft. rein.-con. bridge, 15 ft. wide.

N. J., Mays Landing—State Highway Comn., Trenton, preparing plans 100-ft. rein.-con. bridge, Mays Landing Rd., 35 ft. wide.

Pa., New Castle—Lawrence Co. and Mahoning & Shenango Ry. plans bridge over Neshahannock Creek. About $66,000. R. T. Sullivan, Youngstown, ch. engr. ry.

Pa., Sunbury—Northumberland and Union Cos. rejected bid for 2000 ft. rein.-con. inter-county bridge over Susquehanna River between Watsontown and White Deer. Noted July 12.

Va., Sulphur Mine—Mineral Belt R.R. plans to build rein.-con. bridge and trestle. B. Williams, pres.

W. Va., Point Pleasant—Baltimore & Ohio R.R. prepared plans for bridge over Great Kanawha River. H. A. Lane, Baltimore, ch. engr.

N. C., Asheville—City and Buncombe County plans 100-ft. bridge over French Broad River, 30 ft. wide, rein.-con. arches and girders. About $110,000.

Fla., Palmetto—City voted $15,000 bonds to build bridges. W. E. Mann, clk.

O., Columbus—Franklin Co. Comrs. sold $176,000 and $168,000 bonds to build rein.-con. bridges over Olentangy River at 3rd and Lane Aves., Clinton and Franklin Twps. J. Scott, clk. Noted July 19.

O., Lima—City sold $100,000 bonds to build bridges over Ottawa River. D. L. Rupert, aud. Noted June 7.

O., Miami—Troy Co. soon lets contract for rein.-con. bridge over Sweetwater River at Covington. About $18,000. L. P. Knoop, Troy, co. engr.

Ill., Kankakee—Illinois Central R.R. plans to build 4-track rein.-con. bridge over Kankakee River. A. S. Baldwin, Chicago, ch. engr.

Minn., Rochester—City soon receives bids for 50-ft. rein.-con. girder bridge, 79 ft. long, 20 ft. roadway, 33 ft. wood block floors. J. C. Utton, city engr.

N. D., Grand Forks—Grand Forks Co. Comrs. plan to build bridge over Red Lake River.

Mont., Great Falls—Cascade Co. plans election to vote on bonds to build 2 bridges, 1 to connect city proper with Little Chicago.

Mo., Palmyra—Marion Co. Comrs. plans to build 136-ft. bridge over Fabius River at Taylor.

Ark., Texarkana—Comrs. Red River Bridge Dist., Miller Co., plans 1200-ft. steel highway bridge, concrete floors. About $250,000. Harrington, Howard & Ash, Orear-Leslie Bldg., Kansas City, Mo., engrs.

Tex., Palestine—Texas State R.R. plans to build 13 bridges. J. B. Welborn, mgr.

★Okla., Guthrie—Logan Co. receiving bids about Sept. 1 building 15 bridges. About $25,000. A. A. Leer, clk. Peckham & Wilkins, 606 Majestic Bldg., Oklahoma City, engrs.

Okla., Oklahoma—Oklahoma Co. having plans prepared by H. C. Adams, engr., for 300 rein.-con. bridges and culverts, 10-, 40- and 80-ft. spans. About $383,000.

Okla., Poteau—See "Streets and Roads."

Okla., Wetumka—(Official)—Town sold $34,000 bonds to build bridges and roads. Noted Aug. 2.

Ore., Beaver—C. H. Purcell, state bridge engr., prepared plans 120-ft., rein.-con. viaduct over Beaver Creek, Tillamook Co.

Ore., Jacksonville—Jackson Co. soon receives bids building 126-ft. Howe truss bridge over Big Applegate Creek.

Ontario—See "Railways."

Ont., Galt—Canadian Pacific Ry. prepared plans for rein-con. bridge. About $20,000. J. M. Fairbairn, Montreal asst. ch. engr.

BIDS DESIRED

N. Y., Hampton—(Official)—Until Aug. 17 by E. S. Douglass, supt. highways, building rein.-con. arch bridge over Poultney River at Leonards; advertised in this issue.

N. J., Somerville—Until Aug. 17, by J. Dougherty, Somerset Co. engr., building rein.-con. arch bridge on Chimney Rd. Noted July 12.

Pa., Williamsport—(Official)—Until Sept. 4, by Bd. Comrs. Lycoming Co., building rein.-con. bridge over Susquehanna River at Duboistown, advertised in this issue.

Md., Rockville—(Official)—Until Aug. 28, by Montgomery Co. Comrs. building rein.-con. bridge over Big Seneca. J. R. Lewis, pres. advertised in this issue.

W. Va., New Martinsburg—Until Sept. 1 by S. Meyers, Wetzel Co. clk., building I. D. Morgan bridge over Buck Run, Grant Dist., 45 ft. span, 16-ft. center line roadway; Mobley bridge over North Fork Fishing Creek, 40-ft. span, 14-ft. roadway; Wileyville Bridge over Hartley Run, Center Dist., 40-ft. span, 16-ft. roadway; T. A. Shipman Bridge over Steel Run, Center Dist., [illegible]-ft. spans, 16 roadways; B. F. Poe bridge over Raccoon Run, 20-ft. span, 27-ft. center roadway.

Fla., Bradentown—Until Sept. 11, by L. L. Hine, city clk., building bridge over Manatee River, between Bradentown and Palmetto, 1 mi. long, 24 ft. wide, 18 ft. driveway. C. S. Hill, Palmetto, engr. Noted July 5.

Tenn., Hohenwald—Until Aug. 28 by Lewis Co. Highway Comrs. building 2 steel or rein.-con. bridges over Buffalo River and Swan Creek. E. Gallaher, secy.

Tenn., Kingsport—See "Streets and Roads."

Ohio, Columbus—(Official)—Until Aug. 29, by Bd. Comrs. Franklin Co., building Mound St. bridge over Scioto River, 1049 ft. long, 56 ft. wide, involving 24,000 cu.yd. concrete, 880,000 lb. reinforcing steel, 82,000 cu.yd. excavation. J. Scott, clk.

Ill., Channahon—(Official)—Until Aug. 28, by Dept. Pub. Wks., Springfield, building concrete pier and abutment, etc. L. D. Puterbaugh, dir.; advertised in this issue.

Minn., Mora—See "Excavation and Dredging."

Wash., Spokane—Until Aug. 24 by Spokane Co. Comrs. building steel highway bridge over Spokane River, Harvard Rd., 2 200-ft. steel riveted trusses, 1 concrete pier, 2 wing abutments, filled approaches. A. R. Scott, co. engr.

N. S., Annapolis—Until Sept. 1, by E. H. Armstrong, building steel bridge from Annapolis to Granville Ferry for Dept. Wks. and Mines, Provincial Government.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mass., Dedham—See "Streets and Roads."

Conn., Hartford—Bd. Contract and Supply received low bids (a) rein.-con. bridge over Park River, Prospect St., (b) bridge with retaining wall from F. D. Miller, Norwich. (a) $15,605 (b) $27,910. C. H. Slocomb, 5 Victoria Rd., (a) $20,107, (b) $30,233; Acme Eng. Co., 868 Main St., (a) $24,522 (b) $37,037.

★N. J., Plainfield—Bd. Freeholders, Union Co. let contract 50-span rein.-con. bridge, Norwood Ave. to F. W. Schwiers, Jr. Co., 90 West St., New York City.

★Pa., Hamilton—Philadelphia & Reading R.R. let contract steel bridge, New York Branch, to Amer. Bridge Co., Widener Bldg., Phila.

★Pa., Hokendauqua—City let contract repairing bridge over Lehigh River to Allentown Constr. Co., 11 North 11th St., Allentown, $89,300.

★W. Va., Fairmont—(Official)—City let contract South Side Bridge over Coal Run to J. F. Casey Co., Union Arcade, Pittsburgh.

★Ga., Calhoun—Bd. Comrs. Gordon Co. let contract 250-ft. steel drawbridge over Oostanaula River, to Austin Bros., 156 Greenwood Ave., Atlanta.

★Ga., Dalton—Bd. Co. Comrs. Whitfield and Murray Cos., let contract 144-ft. rein.-con. bridge over Conasauga River at Jones Ford to Champion Bridge Co., $16,450. Noted June 7.

★O., Dayton—Montgomery Co. let contract steel superstructure for bridge over Great Miami River to Brookville Bridge Co., Brookville, $114,700.

★O., Norwalk—Huron Co. let contract building bridges to E. K. Jennings, Fostoria; McDonald & Woods, Norwalk, and A. Hayes, Wakemaw.

★Mich., Carrollton—Pennsylvania Detroit R.R. let contract bridge over Huron River near Carrollton to Hill Co., London, O.

★Mich., Crystal Falls—State Highway Comm. and Iron Co. let contract rein.-con. bridge at Iron River to F. W. Dunn, Iron Mountain and B. W. Hicks, Vulcan, $[illegible].

★Ill., Elgin—City let contract building rein.-con. bridge over Fox River, Kimball St. to T. J. McCarthy, 2204 Main St., Davenport, $[illegible].

★Ia., Denison—Crawford Co. let contract building bridges to Union Bridge Co., Joliet, $[illegible]; Des Moines Bridge & Iron Co., Des Moines, $[illegible]; C. H. Knief, $[illegible]; T. A. Hinson, Vail, $[illegible]; Lana Constr. Co., Council Bluffs, $[illegible].

★Ia., Mason—City let contract 3-span bridge over Willow Creek to Henkel & Brown, Mason City, $17,400.

★Minn., Sleepy Eye—Brown Co. let contract building 3 bridges over Judicial Ditches Nos. 17 and 18 to Illig Bridge & Constr. Co., 741 Metropolitan Life Bldg., Minneapolis, $16,[illegible].

★Neb., Geneva—Fillmore Co. let contract for 3 steel and concrete bridges to F. X. Graben, Exeter, and J. W. Kropf & Son, Stockton. Noted June 18.

Mo., Independence—Jackson Co. received low bid [illegible] to build bridges from Harris & Lewis, Kansas City, $14,[illegible]; J. W. Phillips, $14,[illegible]; J. A. Shedd, $17,147.

★Ark., Little Rock—City let contract repairing bridges to Missouri Valley Bridge & Iron Co., Leavenworth, Kan., $11,[illegible].

Bridges (Continued)

★**Okla. Eufaula** — Jefferson Highway Bridge Co. let contract bridge over Canadian River to Midland Bridge Co., 504 Railway Exchange Bldg., Kansas City, Mo., $143,610. Noted July 19.

★**Colo., Denver**—Denver Co. let contract building 10 rein.-con. bridges to Colorado Bridge & Constr. Co., Denver, $28,965.

★**Wash., Kalama**—Cowlitz Co. let contract building bridge over Kalama River to R. C. Nieth, Portland.

★**Ore., Salem**—Marion Co. let contract steel bridge over Williamette River to Coast Bridge Co., Railway Exchange Bldg., and R. Wakefield, $237,401. Noted June 28.

★**Cal., Nicolaus**—Sutter Co. Supervs., Yuba City, let contract building bridge over Feather River to W. C. Duncan Constr. Co., Sharon Bldg., San Francisco, $118,516. Noted Aug. 2.

★**Cal., San Diego**—San Diego Co. let contract rein.-con. bridge over Sweetwater River to Holland Constr. Co., San Diego, $1[illegible] $63.

★**Que., Montreal**—City let contract steel for bridge and appurtenances to Steel Co. of Canada, 1272 Notre Dame St., $78,887.

★**Que., Montreal**—City let contract building bridge, Church Ave., to Deaken Constr. Co., Ltd., 37 Mayor St., $78,887.

★**Que., St. Tite**—Village let contract steel for 4 bridges to Eastern Canada Steel and Iron Works, Ltd., St. Malo, $13,000.

★**Ont., Toronto**—Canadian Pacific R.R. let contract rein.-con. bridge to Wells & Gray, Confederation Life Bldg., $150,000.

STRUCTURAL STEEL WORK

Proposed Work

Ark., Texarkana—See "Bridges."
Ore., Jacksonville—See "Bridges."

BIDS DESIRED

Tenn., Hohenwald—See "Bridges."
Wash., Spokane—See "Bridges."
N. S., Annapolis—See "Bridges."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Pa., Hamilton**—See "Bridges."
★**Ga., Calhoun**—See "Bridges."
★**O., Dayton**—See "Bridges."
★**Mich., Detroit**—See "Industrials."
★**Tex., Dallas**—See "Buildings."
Ore., Salem—See "Bridges."
★**Que., Montreal**—See "Bridges."
★**Que., Montreal South**—See "Water-Works."

REINFORCED CONCRETE

Proposed Work

N. J., Mays Landing—See "Bridges."
Va., Sulphur Mine—See "Bridges."
N. C., Asheville—See "Bridges."
Ga., Atlanta—See "Water-Works."
La., New Orleans—See "Industrials."
O., Columbus—See "Bridges."
O., Miami—See "Bridges."
Ill., Kankakee—See "Bridges."
Minn., Rochester—See "Bridges."
Okla., Altus—See "Miscellaneous."
Okla., Oklahoma—See "Bridges."
Ont., Galt—See "Bridges."

Bids Desired

N. Y., Hampton—See "Bridges."
N. J., Somerville—See "Bridges."
Pa., Williamsport—See "Bridges."
Md., Rockville—See "Bridges."
Tenn., Hohenwald—See "Bridges."
O., Columbus—See "Bridges."
O., Lebanon—See "Miscellaneous."
Ill., Channahon—See "Bridges."
Minn., Mora—See "Excavation and Dredging."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Conn., Hartford—See "Bridges."
★**N. J., Plainfield**—See "Bridges."
★**Ga., Dalton**—See "Bridges."
★**Mich., Crystal Falls**—See "Bridges."
★**Mich., Detroit**—See "Buildings."
★**Mich., Detroit**—See "Industrials."
★**Ill., Elgin**—See "Bridges."
★**Neb., Geneva**—See "Bridges."
Mo., Independence—See "Bridges."
★**Colo., Denver**—See "Bridges."
★**Cal., San Diego**—See "Bridges."
★**Ont., Toronto**—See "Bridges."

STREETS AND ROADS

Proposed Work

Mass., Everett — (Official) — City voted Aug. 9 following street improvements: $50,000 to build streets, $65,000 for paving, $1500 to build sidewalks.

N. Y., Buffalo—City Council plans paving Soldiers Pl. About $13,500. G. H. Norton, city engr.

N. Y., Troy—(Official)—Rensselaer Co. to sell Aug. 21 $75,000 bonds to build roads. D. Runkle, co. treas.

N. J., Freehold—Bd. Freeholders, Monmouth Co., plans paving Church St. and Carr Ave., concrete, Keansburg.

N. J., Newton—Sparta Twp. Comn. plans building Sparta-Woodport Rd., Sussex Co. About $20,000. A. H. Konkle, engr.

N. J., Palmyra—Township Comn. plans paving Broad St., concrete.

N. J., Paterson—Bd. Freeholders Passaic Co. plans to improve 13 roads in Passaic, asphalt bituminous macadam. G. W. Botby, clk.

N. J., Paterson—Bd. Pub. Wks. plans improving Water, Fulton and Arch Sts., concrete, asphalt and granite block. H. J. Harder, city engr.

N. J., Somerville — (Official) — Somerset Co. Bd. Freeholders plans to improve road from Gladstone to Pottersville. About $10,000.

N. J., Trenton—City plans to widen East Hanover, North Montgomery and Chauncey Sts. in center of city. A. Swan, Jr., city engr.

Pennsylvania—(Official)—State Highway Comn., Harrisburg, received no bids paving Alleganey and Washington Cos. Noted July 19.

Del., Georgetown—County Comrs. plans $1,000,000 bond issue to build new roads, slag macadam, Sussex Co. Noted May 24.

Md., Annapolis — Anne Arundel Co. Comrs. soon lets contract concrete roadway, 20 ft., Church St., from Blvd. to Pennington Ave., connecting Brooklyn and Curtis Bay. About $20,000. E. T. Hayman, co. engr.

Va., Bristol—City to sell $20,000 bonds to build street improvements.

Va., Williamsburg—City plans to pave streets. About $15,000.

W. Va., Charleston—City soon lets contract paving portions Washington, Glen, Monongalia, Gardner, Watts, Spring and Kanawha Sts., and Delaware, Ruffner and Columbia Aves. M. J. McChesney, city engr.

W. Va., Charleston—City election Sept. 25, to vote on $400,000 bond issue to pave streets.

W. Va., Wayne—Wayne Co. election soon to vote on $1,000,000 bond issue to build roads.

W. Va., Wheeling—City plans $54,000 bond issue, improving streets. Address D. G. Brown, city clk.

N. C., Charlotte—City soon lets contract building 5 mi. roads between Camp Greene and city.

N. C., Hendersonville—City plans $180,000 bond issue, paving streets, asphalt.

N. C., Morgantown—Burke Co. Comrs. sold $50,000 bonds to build roads. Noted May 31.

S. C., Abbeville—County election, Aug. 7, defeated $300,000 bond issue to build roads. Noted May 17

S. C., Pickens—Pickens Co. voted $250,000 bonds to build roads. C. L. Careton, chn. highway comn.

Fla., Miami—Dade Co. plans election to vote on $140,000 bond issue improving roads and bridges. E. D. V. Burr, chn. bd co comrs

Miss., Biloxi—City election soon to vote on $40,000 bond issue to resurface 6½ mi. streets.

La., Monroe—City election soon to vote on $200,000 bond isue to build roads. Address, Mayor

Ky., Danville—City Council plans paving Wilderness Rd

O., Batavia—Claremont Co. to sell $21,350 bonds Aug. 27 to improve roads. C. Searles, aud.

O., Cleveland—City plans to pave portions Lawn, East 103rd, East 74th, Pow, Joan and Bernard Sts. R. Hoffman, city engr.

O., Cleveland—City rejected bids paving Fairchild, Wilbur and East 167th Sts.

O., Dayton—City sold $186,500 bonds for paving Jefferson St., East 3rd St., Grafton, Manhattan, Oxford and Wroe Aves., Harvard Blvd. and Klee Court.

O., Xenia—City election soon to vote $17,000 bond issue to pave streets. J. P. Shumaker, city engr.

Indiana—(Official)—Co. Comrs. received no bids building roads as follows:

Indianapolis; gravel Rd., Warren Twp., L. K. Kesler, aud.

Brazil; stone and gravel road on line between Posey and Perry Twps. W. O. Graesser, aud Noted July 26.

Ind., Terre Haute—Vigo Co. sold $13,500 bonds to regravel Bolton Rd., Fayette Twp.

Ind., Warsaw—(Official)—Kosciusco Co. to sell, Aug. 20, $45,668 bonds to build roads. A. J. Logan, treas.

Mich., Harrison—Lake Twp., Clare Co., election Aug. 20, to vote on $50,000 bond issue to improve roads.

Mich., St. Joseph—Berrien Co. soon receives bids paving several roads. Address Co. Clk.

Ill., Murphysboro—Jackson Co. plans to build 200 miles rock roads with state aid. About $680,000.

Ill., Oregon—See "Sewers."

Ill., Pekin—Tazewell Co. soon receives bids building 2 sect. state aid roads. About $10,761 and $6697 respectively. F. S. Cook, Mackinaw, supt. highways.

Wis., Fond Du Lac—(Official)—City rejected bids paving, grading portion Oshkosh Rd. Noted July 26.

Wis., West Allis—City plans to pave portions 68th, 55th, 56th, 57th and Greenfiels Aves. E. G. Orlurt, city engr.

Ia., Des Moines—City plans to pave new route to Camp Dodge, Douglas Ave., 5th St., 1½ mi. About $66,000. J. Budd, supt. sts. K. Kastberg, city engr.

Ia., Waterloo—Blackhawk Co. Comrs. plans to extend 17 mi. roads, including 12 mi. between Voorhies and La Porte City, and portion Lincoln St., Cedar Falls connecting Cedar City and Cedar Falls.

Neb., Havelock—City voted $10,000 bonds to pave streets. A. Dobson, city engr.

Neb., Omaha—Douglas Co. Comrs. plans to repair road, 30 mi., macadam.

Mont., Butte—City soon lets contract following street work: Repaving Dist. No. 243, vitr. brick or creosoted wood block. About $21,901; relaying granite block paving and resurfacing bitulithic or asphaltic concrete, Dist. No. 245. About $8304; Dist. No. 244, repaving vitr. brick or creosoted wood block. About $16,176. J. J. Armstrong, city engr.

Missouri—State Highway Comn. Jefferson City having plans prepared building hard surfaced road, Montgomery Co., Trails Highway; also road, Mineola Hills.

Mo., New Madrid—New Madrid Co. voted $850,000 bonds to build roads. Noted Aug. 2.

Ark., Forrest City—St. Francis Co. Rd. Improv. Dist. No. 3, plans to improve roads. About $195,000.

Ark., Harrisburg—Poinsett Co. Comrs. plans to build 9 mi. highways, macadam. About $68,000.

Ark., Jonesboro—Craighead Co. Comrs. plans to build highway, 23 mi., macadam. About $148,000.

Ark., Perryville—Perry Co. Road Dist. No. 1 plans to build 35 mi. road; main highway part, Mammoth Spring to Hot Springs route. About $87,500. D. M. Wallace, pres.

Ark., Rison—Cleveland Co. Comrs. plans to build roads in Dist. No. 1 from Jefferson Co. line south to Kingsland and Rison, 22 mi. gravel. About $126,000.

Tex., Cameron — State Atty. General's Dept. sold $20,000 bonds to build roads in Milam Co. Rd. Dist. No. 7 and $15,000 bonds, same purpose, Rd. Dist. No. 12. Noted Aug. 2.

Tex., Cold Springs—San Jacinto Co. voted $75,000 bonds to build roads, Rd. Dist. No. 4. Noted July 19.

Tex., Crockett—Houston Co. plans election Aug. 21 to vote on $100,000 bond issue improving roads.

Tex., Dallas—City plans to pave Gaston Ave. About $50,000. H. Moseley, city engr.

Tex., El Paso—City had plans prepared paving portions Bassett Ave. About $39,503. G. Eppy, city engr.

Streets and Roads (Continued)

Tex., Pittsburgh—(Official)—Camp Co. Leesburg and Newsome precincts, Road Dist. No. 2, voted, Aug. 6, on $35,000 bond issue, improving highways. M. L. Minter, co. engr. Noted July 26.

Okla., Atoka—Atoka Co. election Aug. 2, to vote on $30,000 bond issue to build roads and bridges. G. Marlow, clk.

Okla., Bartlesville—City plans paving and resurfacing several streets. J. McMullen, supt. streets.

Okla., Clinton—City soon lets contract, paving 30,000 yd. Dist. No. 3. About $85,000. R. Bennett, city clk. Benham Engr. Co., 1300 Colcord Bldg., Oklahoma City, engrs.

Okla., Guthrie—Logan Co. having plans prepared by Peckham & Wilkins, Engrs., 606 Majestic Bldg., Oklahoma, for 2 mi. hard surface road and 28 mi. dirt road. About $50,000. A. A. Leer, clk.

Okla., Oklahoma City—Oklahoma County plans building 100-mi. road. About $100,000. T. Bodine, city clk.

Okla., Poteau—LeFlore Co., voted $20,000 bond issue for building roads and bridges, Page Twp.

Okla., Wetumka—See "Bridges."

Idaho—State Highway Comn., Boisé, soon lets contract building road between New Meadows and Grangeville. About $1,000,000. Address State Highway Engr., Booth.

Idaho, Cottonwood — Cottonwood Highway Dist. voted $50,000 bonds to build roads.

Idaho, Ferdinand—Idaho Co., Ferdinand Highway Dist. voted $25,000 bonds to build highways.

Idaho, Rexburg — City plans to pave, grade, and drain Main, 3rd and other streets. About $93,000. H. M. Sundberg, city engr.

Wash., Bellingham—City plans to pave portions Cherry St., asphalt, concrete or some other hardsurfacing material. About $18,000. C. Lindberg, city engr.

Wash., Mt. Vernon—Skagit Co. Comrs. having plans prepared, paving Cook Rd., 4.1 mi. 16 ft., one course concrete, from Sedro Wooley. About $78,850. W. E. Costello, co. engr.

Wash., North Yakima—Co. Comrs. plan to complete 24 mi. McClellan Pass Highway. About $100,000. Address G. F. Catterill, state highway engr., Olympia. Noted Apr. 26.

Wash., Okanogan—Council passed ordinance, paving P and other streets. About $10,000.

Wash., Seattle—King Co. Comrs. having plans prepared paving road from Enumclaw toward Seattle, 2 mi., concrete. About $30,000; also Hollywood Farm to Redmond, 1 mi. concrete. About $16,000. S. J. Humes, co. engr.

Wash., Seattle—City had plans prepared paving and grading 17th Ave., S. About $114,000. A. H. Dimock, city engr.

Wash., Spokane—Spokane Co. Comrs. granted permission paving Mullinix Rd., Cheney Twp., 15 mi. About $75,000.

Oregon—State Highway Com., Salem, soon lets contract Bend-La Pine highway. About $17,000.

Ore., Coquille—Coos Co. Court soon receives bids macadamizing road between Empire and South Inlet bridge. About $12,000.

Ore., Myrtle—City soon lets contract paving portions 1st St. About $15,000

Ore., Roseburg—Douglas Co. Court plans improving Pacific Highway between Roseburg and Lane Cos., with state aid. About $200,000

Cal., Modesto—City defeated $10,000 bond issue to pave streets Noted July 5

Cal., Riverside—County Supvrs. plan $34,000 appropriation, building highways, either Coachella Valley or Corona Elsinore road projects

Cal., Sacramento—City sold $3,000,000 California state highway bonds to Natl. City Co. of California

Ont., Ottawa—Comrs. of Wks. plans paving several streets About $12,000

Ont., Sandwich, West Twp.—Twp. Council plans paving Bridge Ave About $19,950. E. Bondy, twp. clk.

Ont., Toronto—City plans to pave Dundas St. from Ossington Ave. to Lansdowne Ave., asphalt. About $70,000

BIDS DESIRED

Massachusetts—(Official) Until Aug. 21 by State Highway Comr. Boston, paving in following towns: Randolph, Stoneham, Melrose and Saugus, 6100 ft. Pavement 13,400-ft., Egremont-Sheffield, 13,900-ft. W. D. Sohier, member.

Mass., Dorchester—Until Aug. 29, by Dept. Pub. Wks. paving Dorchester Ave., granite block.

Connecticut—(Official)—Until Aug. 20, by C. J. Bennett, state highway comr., Hartford, for following road improvement: Waterford Twp., Niantic Rd., 3500 lin.ft., grading. A. W. Bushell, Thayer Bldg., Norwich, div. engr. Stratford Twp., Barnum Ave., Hassam or rein.-con. 7300 lin.ft. Cheshire Twp., South Main St., concrete, 16,273 lin.ft. Camden Twp., Whitney Ave., 1633 lin.ft., concrete. E. C. Welden, Chamber Commerce Bldg., New Haven, div. engr.

N. Y., New York—Until Aug. 20, by W. Williams, comr. Water Supply, Gas and Electricity, Municipal Bldg., building filter beds, removing and placing sand on existing filter beds at Mt. Kisco sewage disposal plant.

N. J., Cape May—Until Aug. 21 by Co. Comrs., building stone road through Stone Harbor. L. M. Rice, Wildwood, co. engr.

N. J., Elizabeth—Until Aug. 27, by Bd. Freeholders, Union Co., paving Morris Ave., Summit, 3675 sq.ft., 22 in. wide, bituminous concrete surface pavement on cement, concrete base, Westfield Ave., Rahway, vitr. brick on cement mortar bed and improving Mountain Ave., east sect., Mountainside, Westfield P. O., bituminous concrete on concrete foundation, 25,901 sq.yd. paving. J. L. Bauer, co. engr.

N. J., Little Falls—Until Aug. 27, by Twp. Comn., building pumping station, repairing amiesite pavement, Main St. and Paterson Ave., and grading sidewalks Main St. and Fairfield Rd.

N. J., New Brunswick—Until Aug. 27, by Bd. Freholders, Middlesex Co., repairing and reconstructing Rahway Ave., Roosevelt Sect. 2, warrenite surface on rebuilt macadam base and 21,930 yd. paving. A. Atkinson, city engr.

N. J., New Brunswick—Until Aug. 30, by Boro. Council, Middlesex Co., repairing Riva Ave., Milltown, concrete gutters, macadam with Tarvia X top dressing. C. Bauries, acting mayor.

N. J., New Brunswick—Until Sept. 4, by Bd. Comrs. paving Remsen Ave. and Comstock, Brown, Townsend and Condict Sts. A. Atkinson, city engr. Noted July 26.

Pa., Pittsburgh—(Official)—Until Sept. 4 by Co. Comrs., grading and paving 15 roads in various twps., involving about 96,555 ft. grading. J. P. Moore, co. controller.

Md., Baltimore—Until Aug. 22, by City, grading, curbing and paving portion Weldon Ave., including 2000 sq.yd. sheet asphalt, 1600 lin.ft. armored concrete curb, 250 sq.yd. vtr. brick. J. H. Robinette, pres. R. M. Cooksey, city engr.

Va., Farmville—Until Aug. 28, by City, paving several streets, concrete or asphalt block paving. W. M. Platt, Durham, N. C., engr.

Ala., Scottsboro—Until Sept. 1, by Jackson Co. Comrs. macadamizing part State Trunk Rd. No. 4, between Woodville and Limrock. About $10,000. W. S. Keller, state highway engr.

Louisiana—Until Aug. 20, by State Highway Comrs. building East Baton Rouge Parish, 2.6 mi. Lincoln, 14.32 mi. D. Buie, state highway engr.

Louisiana — (Official) — Until Sept. 1 (change of date) by Highway Dept. Bd. State Engrs., Court Bldg., New Orleans, building 33-mi. road, Rd. Dist. No. 1, Coupee Parish, gravel. F. M. Kerr, ch. engr. Noted Aug. 2

La., Amite—Until Aug. 22, by Bd. Supervs. Road Dist. No. 4, Tangipahoa Parish, grading, bridging and graveling 3.3 mi. Kentwood Rd., east and west, grading and bridging 4.36 mi. and graveling 3.86 mi., Tangipahoa Rd., east and west. Noted July 19

Tenn., Kingsport—Until Aug. 30, by W. R. Ponder, city engr. paving building sidewalks, and curbs, laying sewer drains, building reinforced bridges, including 49,-sq.yd. paving asphalt, wood block, or concrete, 21,808-lin. ft. curb and gutter, 16,-888 lin.ft. sidewalks.

O., Columbus—(Official)—Until Sept. 4 by Bd. Trustees Ohio State University, macadam roadway, 4800 sq.yd. C. E. Sowdsecy.

O., Lancaster—(Official)—Until Aug. 24, by City paving portion West Wheeling, including 10,000 sq.yd. brick, 4800 ft. curbing, 810 lin.ft. steel foundation, concrete, curbing, etc. About $[illegible] Jos. J. Gilligan, city engr. Noted May 19.

O., Oxford—(Official)—Until Aug. 28 by D. P. Boone, village clk. paving High St., 1810 sq.yd. surface, 4100 lin.ft. concrete curb and gutter. L. A. Bentley, 1144-51 Nicholas Bldg., Toledo, engr.

Indiana—By Co. Comrs. building roads, as follows: Aug. 20: Vigo Co., Terre Haute, gravel road, Nevins Twp.; T. Ferguson, aud. Aug. 25: Marion Co., Indianapolis, improving road, Warren Twp.; L. K. Fesler, aud. Bartholomew Co., Columbus, gravel roads, German and Flatrock Twps. W. H. Scott, aud. Aug. 27: Vanderburgh Co., Evansville, building and improving road, Armstrong Twp.; C. P. Beard, aud. Aug. 30: Madison Co., Anderson, bituminous concrete road, Anderson Twp.; E. T. Flahavin, aud

Mich., Escanaba—Until Aug. 24, by C. E. Anderson, town clk., paving portions Stephenson Ave., 15,970 sq.yd. bitulithic W. J. Hodson, city engr. Noted July 26

Mich., Muskegon—Until Aug. 20, by Gasnovia Twp. Bd., grading and graveling 15 miles roads

Ill., Danville—(Official)—Until Aug. 20, by Highway Comn., Carroll Twp., Vermillion Co., paving 13,000 sq.yd. concrete or asphalt; also 5547-sq.yd. plain macadam, 3450 sq.yd. reinforcing metal for Indianola S. K. Van Fleet, town clk., Indianola.

Wis., Beloit—Until Aug. 22, by W. T. Ball, Bd. Pub. Wks., grading and macadamizing 11th St. G. E. Heebink, city engr.

Ia., Burlington—(Official)—Until Aug. 23, by E. P. Weinstein, city clk., paving Bluff Rd., 1 mi. 2-course concrete; portion Main St., brick, 6-in. concrete foundation. C. E. Waterhouse, city engr.

Ia., Jefferson—Until Aug. 20, by Greene Co. Aud., grading Sect. 14; Dana grand junction, Sects. 84, 85 and 86, Jefferson Bagley Rd.

Minn., St. Paul—(Official)—Until Aug. 27, by H. W. Austin, city purch. agt., grading portions Bison, Jefferson and Greenwood Aves., Fulham and Sue Sts.; also graveling portions Tatum Ave., paving Minnesota Ave., creosoted wood block. O. Claussen, city engr.

Wyo., Sheridan—Until Aug. 20, by T. A. Morris, city clk., improvements in paving Dist. No. 7, including portion Loucks and Works Sts., 2-in. standard bitulithic or gravel bitulithic, on present foundation. About $53,621. A. Tschirgi, city engr.

Utah, Salt Lake City—Until Aug. 21, instead of 14, by City Recorder, paving Virginia and Alta Sts. and 3rd and 4th Aves., also grading curb, gutter and pavement of Pavement Extension No. 137. Noted Aug. 2.

California—(Official)—Until Aug. 27, by State Highway Comn., Sacramento, paving roads in Contra Costa Co., between Hercules and Eckley, 5.7 mi., portland cement, involving 17,000 cu.yd. excavation, 5680 cu.yd. Class A, portland cement, 1350 cu.yd. Class C, between Eckley and Martinez, 7 mi. same material Los Angeles Co., between Castaic School and Kay Ranch, 3.8 mi., portland cement, involving 8500 cu.yd. excavation, 4800 cu.yd. Class A portland cement. N. D. Darlington, member

Cal., Los Angeles—Until Aug. 27, by Bd. Pub. Wks. furnishing asphaltic cement for 1 year. H. B. Ferris, secy.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Dedham**—Town let contract building highway and 2 bridges, Bussey St., to Clark & Cate, 11 Montague St., Worcester, $26,000. Noted Aug. 9

★**N. Y., Buffalo**—City let contract paving Mills St., 28 ft. wide, to Cummer Rock Asphalt Co., Morgan Bldg., $21,420

N. Y., New York—M. M. Marks, borough president, received low bid regulating and repaving roadway, Broadway, from 137th to 144th Sts., sheet asphalt, concrete foundation, from Dabney Asphalt Co., 32 Vanderbilt Ave., $19,483; Asphalt Supply Co., 1441 Madison Ave., $20,862; Sullivan Asphalt Paving Co., 41 Park Row, $21,181. Noted Aug. 2.

N. Y., New York—(Official)—Bronx Parkway Comn. received low bids paving portion Bronx River Parkway, (a) Asphalt block, (b) [illegible] concrete, from Hastings Paving Co., 17 Broad St., (a) $18,[illegible]; Union Paving Co., 149 Broad, (b) $20,062. Noted July 28.

★**N. J., Flemington**—Hunterdon Co. Bd. Freeholders let contract paving road from West Portal to Pittstown Corner, 3½ mi., macadam, to W. H. Moore, Fair Hills, $15,444. Noted June 28.

★**N. J., Harrison**—Town Council let contract paving Warren and Ann Sts., to Standard Structure Co., 31 Clinton St., Newark.

★**N. J., Kearney**—Bd. Pub. Wks. let contract, warrenite pavement, Bergen Pl., to Standard Structure Co., 31 Clinton St., Newark. About $[illegible].

Streets and Roads (Continued)

★**N. J., Mt. Holly**—Bd. Freeholders let contract, paving asphalt Burlington Co. sect of Moorestown-Camden Turnpike. About $80,000. Noted July 19.

N. J., Orange—City Comn. received low bids, paving Berkeley Ave., asphalt block on concrete, from Hastings Pavement Co., 25 Broad St., New York City, $32,345, J. J. Geiger, 83 Hartford St., Newark, $36,-512, and Ralhp San Giovanni, 128 Warren St., Newark, $37,540.

Pennsylvania—(Official)—State Highway Comn. Harrisburg received low bids building roads in counties as follows: (a) Cambria involving various twps. (1a) East Taylor and Jackson Twps., 11,070 ft., vitr. brick; (1b) East Taylor Twp., 9878 ft. vitr. block; (1c) Jackson Twp., 11,975 ft. vitr. block; (b) Luzerne, (c) Lehigh, (d) Dauphin, (e) Lackawanna, from G. T. Morgan, Johnstown, (1a) $90,053, (1b) $77,541; Shiesley & Janney, Johnstown, (1a) $99,857, (1b) $85,940; Mainwaring & Cummins, Inc., Phila., (1a) $132,986, (1c) $127,934; E. H. Brua, Hollidaysburg, (1b) $84,866; Gibbons & Bentley, Phila., (b) $51,135; O'Brien Bros., 920 North Mam St., Avoca, $51,178; D. M. Rosser, Kingston, $66,249; (c) J. C. Bentley, Elizabeth, N. J., $78,305; (d) F. J. Reilly, Lancaster, $17,888; Stucker Bros. Constr. Co., Harrisburg, $18,692; (e) M. Stipp & Sons, 435 Moir Court, Scranton, $82,027. Noted July 19.

★**Pa., Midland**—City let contract grading, paving and building sewers to L. B. Markley, Rochester, $67,000.

Pa., Pottsville—City received low bid paving Center St., North and South, from J. B. Trexler, Reading, $4.15 per sq.yd.

Pa., Somerset—Somerset Co. Comrs. received only bid building Brotherton-Berlin Rd. from D. E. Keller, Somerset. Noted July 19.

★**Md., Annapolis**—Anne Arundel Co. Comrs. let contract resurfacing portion Patapsco Ave. to Anthracite Stone Co., Baltimore, $12,000.

★**W. Va., Williamson**—(Official)—Mingo Co. let contract, 35 mi. road, earth, involving 26,000 cu.yd. excavation, 2000 cu.yd. masonry and concrete, to Vaughan Constr. Co., Shawsville, Va. Noted July 12.

★**S. C., McCormick**—(Official)—McCormick Co. Comn. let contract grading and building drainage structures on 70 mi. highway to Ross & Plott, Greensboro, N. C., $121,009. Noted July 12.

★**Ala., Gadsden**—City let contract paving portion Chestnut St. to Morgan & Co., curbing and guttering to C. O. Duncan. Noted Aug. 2.

★**Miss., Friar Point**—(Official)—City let contract, building 120,000 sq.ft. concrete sidewalks to Oxford Concrete Co., 901 Mississippi Ave., Greenwood, $11,700. Noted Aug. 2.

★**Miss., Yazoo City**—Yazoo Co. Comrs. let contract building roads Dist. No. 3 to Healy Constr. Co., Meridian; 2½ mi. beginning Yazoo River Bridge, to Southern Constr. Co., Yazoo. Noted Apr. 26.

★**O., Cleveland**—Bd. Control let contract improving and paving portions Clark Ave. to Rieley Bros., 348 Arcade, $23,236; Lakeside Ave. to Bentley Bros. Co., 410 Electric Bldg., $15,295.

★**O., Columbus**—City let contract grading, paving and curbing Portion Livingston St. and Marcus Alley to G. Geigele & Son, 52 East Fulton St., $14,213.

★**O., Coshocton**—(Official)—Ashman, serv. dir. let contract paving 18,000 sq.yd., Sycamore and 3rd Sts. brick to J. F. Cockran, Coshocton. Noted Aug. 2.

★**O., Dayton**—City let contract, paving Pitts and Foundry Sts. to Ellsworth Brentlinger. About $12,000 or $15,000. Noted Aug. 2.

★**O., Dayton**—City let contract, paving East 3rd St. to Finke Eng. Co., Dayton, $2.85 per sq.yd. Gillipsie Ave., wood block, to E. Murray Dayton, $2.75 per sq.yd.

★**O., Findlay**—City let contract paving West Lincoln St., Nelsonville Brick, to Paul & Sons, Findlay.

O., Mt. Vernon—City received low bids, paving Wooster Ave., brick, from A. A. Graham, $14,187. Noted Aug. 12.

★**O., Toledo**—City let contracts paving, Dorr St., 36 ft., creosote wood blocks, to Russell & Jennings Co., $[illegible]; Superior St., creosote wood blocks, to Peters Bros. Co., $23,440; York St., brick, to M. F. O'Sullivan, $53,347; Chestnut and Paxton Sts. and Homewood Ave., sheet asphalt, to J. Horan, $[illegible], $[illegible] and $[illegible] respectively; Colburn St., rein.-conc., to P. H. Waters, $10,035, and Bissop St., brick, to McKinney Bros., $12,149. Noted July 12.

★**Indiana**—(Official)—Co. Comrs. let contract building roads as follows:

Rushville; gravel road, Posey Twp., to Lawrence & Ennis, Arlington, $6869. Valparaiso; 2.07- and 2.02-mi. road Center Twp. to G. McGillicuddy, $14,350, and Green & Coplin, $15,900, both of Valparaiso.

Franklin; gravel road, Blue River Twp., to Farr & Porter, Edensburg, $8350.

South Bend; cement road, Penn Twp. to Ruth Constr. Co. Goshen, $32,000.

Cannellton; macadam road, Troy Twp. to C. Panlin Co., Cannellton, $6999.

Wabash; 2 roads, Chester Twp. to Grossnickle Constr. Co., North Manchester, $28,-980 and $11,000 respectively.

Columbus; 11,712-ft. gravel road, Flatrock Twp. to D. H. Falout, 2010 West Washington St., Indianapolis, $6990.

Kokomo; stone road, Clay Twp. to F. H. Null, Winfall, $3486.

Renselaer; stone roads. Carpenter and Marion Twps. to M. I. Adams, Rensselaer, $7987.

Rockville; stone and gravel roads, Penn and Adams Twps. to J. Killigan, Bloomingdale, and C. Ireland, Rockville. Noted July 26.

★**Ind., Albion**—Noble Co. let contract, brick highways, to Northern Constr. Co., Ekhart, and Gripe & Seaman, Goshen. About $177,500.

★**Ind., Ft. Wayne**—City let contract paving portion Coombs, Garden, Liberty, Osage, Wildwood Sts., and Lake Ave., bituminous concrete, Grace and Kinnard Aves., Lasselle and Webster Sts., sheet asphalt, to Grace Constr. Co., 1702 Winter St.; Wall St., brick, to Moellering Constr. Co., Murray St. Noted Aug. 9.

★**Ind., Logansport**—Bd. Pub. Wks. let contract improving portion Seybold and Helm Sts., to Palmer & Moore, Logansport, 49c. per cu.ft. curb and gutter, 12c. per sq.ft. sidewalks, 65c. gravel repairs. Noted July 5.

★**Ind., South Bend**—Bd. Pub. Wks. let contract paving 12,058 sq.yd. aztec asphaltic concrete, to Willeston Constr. Co., P. O. Box 446, $24,050.

★**Mich., Bay City**—City let contract resurfacing portion Center Ave., asphalt concrete, to Trinidad Paving Co., 3407 Trumball St., Cleveland, $1.10 per sq.yd.

★**Illinois**—State Highway Comn., Springfield, let contract following road work: Kankakee Co., Kankakee, Sect. H, waterbound macadam to F. L. Shidler, Kankakee, $10,934; Sect. I, concrete, to Goggin Constr. Co., Arcola, $10,469; Ogle Co., Oregon, Sect. D, concrete, to Dronnin & Clark, Box 286, Galesburg, $19,115.

★**Ill., Bloomington**—City let contract to I. D. Lain, Bloomington, portion Grove St., brick with stone curb. About $30,105.

★**Ill., Joliet**—City let contract paving and improving various streets and Michigan Pl., brick and bituminous to F. F. Conway Co., Chamber of Commerce Bldg., Chicago, $2.10 per sq.yd.

★**Ill., Mattoon**—Twp. Comrs. Highways let contract building 2 mi. pavement involving 1900 cu.yd. excava. and 9786.7 sq.yd. monolithic brick paving to James & Thornton.

★**Ill., Rockford**—City let contract building pavement, 21,112 sq.yd., concrete, macadam shoulders, to Hart & Page, 110 North Court St., $33,016. Noted Aug. 9.

★**Wis., Eau Claire**—Eau Claire Co. Comrs. let contract, road work, to J. Godder, Fairchild, $50,000.

★**Ia., Council Bluffs**—City let contract building 3 blocks pavement, concrete, to E. A. Wickham & Co., 19 Scott St., $1.74 per sq.yd. Noted Aug. 2.

Minn., St. Paul—City received low bid paving portion 9th St. and College Ave. from Thornton Bros., Scandinavian-American Bank Bldg., $16,187; Fielding and Shepley, St. Paul, $18,190.

★**Kan., Augusta**—City let contract paving several streets to C. Bessler Constr. Co., Winfield, $62,832.

★**Kan., Hutchinson**—City let contract paving portions Crescent Park, 17th, 18th, 19th and 20th Sts., including 24,400 sq.yd. paving, 11,000 cu.yd. excavation to Stamey-Mackey Constr. Co., Hutchinson, $2.19 per sq.yd. vitr. fiber block, asphalt filler on stone mixed concrete base. Noted June 14.

★**Mont., Billings**—(Official)—City let contract paving 18,000 sq.yd. gravel bitulithic, to Warren Constr. Co., Billings, $54,147. Noted July 26.

★**Mo., Poplar Bluff**—(Official)—City let contract 10,394 sq.yd. pavement, 6- and 5-in. bituminous 1811 cu.yd. grading to G. Gleason, Poplar Bluff, $19,000. Noted July 26.

★**Mo., Richmond**—City let contract, paving, to Kennedy & Olson, 601 Ridge Arcade, Kansas City. About $15,156. Noted July 26.

★**Mo., St. Joseph**—City let contract paving portions King Hill Ave., sheet asphalt, Garfield, Mitchell Aves. and Mulberry Sts., asphaltic concrete, to Metropolitan Paving Co., 7th and Olive Sts. Noted July 5.

★**Mo., Sedalia**—(Official)—City let contract grading, paving, curbing portions Quincy Ave. and Broadway, including 4-in. concrete base, grading, 3-in. vertical fiber brick filler, asphalt, to J. W. Menefee, Sedalia, $2.24¾ per sq.yd. curbing, 40c. per lin.ft. Noted Aug. 2.

★**Ark., Walnut Ridge**—(Official)—City let contract paving Rd. Dist. No. 3, 5.78 mi. macadam, to Gregory Co., Walnut Ridge, $35,000.

★**Tex., Coldspring**—City let contract building roads Dist. No. 3 to Bland & Smith, Coldspring, $31,000.

★**Tex., Ft. Worth**—Tarrant Co. Comrs. let contract graveling 3-mi. road, connecting Dallas Co. Pike with Tarrant Co. Cardina Rd. to P. F. McGee, Arlington.

★**Tex., Galveston**—City let contract surfacing 27,000 sq.yd. shelled streets to Finley Method Co., Galveston.

★**Tex., Tyler**—City let contract paving portions East Locust, North Bois d'Arc and Elm Sts., 1-mi. clay to Southern Paving Co., 1309 Bush Bldg., Dallas.

★**Okla., Oklahoma**—City let contract paving 30th and 32nd Sts., sheet asphalt, to Western Paving Co., Terminal Bldg., $1.94 per sq.yd.

★**Okla., Pauls Valley**—City let contract paving Willow St. to Struble & Mitchell, Pauls Valley, $23,015.

★**Okla., Tulsa**—City let contract paving 150,000 yds. to Eureka Paving Co., 1115 Carter Bldg., Houston. Noted Aug. 9.

★**Utah, Ogden**—City let contract Dist. 127, paving portions 26th Ave. to P. J. Morgan, 52 West 2nd St., $40,956.

★**Wash., Camas**—City Council let contract, paving Beeson St., 2-in. bitulithic, to United Contr. Co., Northwest Bank Bldg., Portland, Ore. About $13,519.

★**Wash., Granite Falls**—City let contract sidewalks, concrete, to Superior Constr. Co., 4th Ave., Northeast and East 8th St., Seattle, $11,000.

★**Wash., Kalama**—Cowlitz Co. Comrs. let contract building Pacific Highway, 2½ mi. permanent highway No. 3 to Jarvis & Berkheimer, Portland, $44,600. Noted June 28.

★**Wash., Port Angeles**—City let contract paving I St. to E. Anderson, Port Angeles, $44,990. Noted June 28.

★**Wash., Port Angeles**—City let contract paving L. I. D. No. 50, to Bullock & Co., Port Angeles, $15,913.

★**Wash., South Bend**—Pacific Co. Comrs. let contract building portion National Park Highway to Allred & James, Centralia, $10,000. Noted June 28.

★**Wash., Spokane**—Spokane Co. Comrs. let contract paving Madison Highway, 1 mi. one course concrete through Valleyford to Baylor, Murphy and Pearson, Spokane, $15,178.

★**Oregon**—State Highway Comn., Salem, let contracts, Columbia River Highway to A. D. Kern, Portland, grading 3 mi. Viento Sect., $71,033, 2 mi. Ruthton Hill, $39,988 and 8.2 mi. near Cascade Locks, $105,930; to Warren Constr. Co., Journal Bldg., Portland, grading Goble Hill, $42,300 and to A. L. Clark, c/o Washington Paving Co., L. C. Smith Bldg., Seattle, grading Rainier Hill, $11,880.

Oregon—State Highway Comn., Salem receive low bids paving Rex-Tigard Rd. from O. Huber, $265,415; Astoria-Swenson Rd., Warren Constr. Co., 14 Association Bldg., Portland, $155,763; Marion-Clackamas Rd., Oregon Hassam Paving Co., $135,954.

★**Ore., Astoria**—City let contract paving Cedar St., bitulithic, to Miller & Bauer, Astoria, $36,982.

★**Cal., San Francisco**—Bd. Pub. Wks. let contract, paving Arkansas St., to Federal Constr. Co., Sharon, Bldg. About $12,539.

★**Cal., Upland**—City let contract grading and oiling 6th Ave. to J. S. Menfee, Watts, 4.95c. per sq.ft., concrete curbs, 24.95c. per ft.

★**N. S., New Glasgow**—City let contract paving South St., bitulithic, to Warren Paving Co., McKinnon Bldg., Toronto, $15,-000.

★**Ont., New Hamburg**—Council let contract paving streets, concrete, to Queen City Conerete Paving Co., 179 Broadview Ave., Toronto, $16,000. Noted July 12.

★**B. C., Burnaby**—City let contract paving Barnet Rd. to M. P. Cotton Co., Vancouver, $15,000.

RAILWAYS—STEAM & ELECTRIC

Proposed Work

Virginia—Petersburg, Hopewell & City Point Ry. of Petersburg, incorporated with $1,000,000 capital stock, plans to take over Petersburg & Appomattox Electric Ry., with 9 mi. line from Petersburg to Hopewell and Hopewell & City Point Ry. operating from Hopewell to City Point, about 2-mi. and will build 6-mi. branch line to Prince George Courthouse, also 2-mi. second track from Petersburg to Camp Lee. R. Mann, Petersburg, pres.

West Virginia — Monongahela Valley Traction Co. preparing plans for extension line from Bridgeport to Rosemont, Flemington, Galloway, Wendell and Simpson. R. D. Henner, Morgantown, Pa., ch. engr.

North Carolina—Chimney Rock Ry. incorporated with $300,000 capital stock has been granted permission to build 25 to 30 mi. railroad from Rutherfordton to Chimney Rock. T. C. Cole, Black Mountain, J. C. Cole, Canton and others, stockholders.

Georgia—Georgia Ry. and Power Co. plans to build 5-mi. line to Camp Gordon, near Chamblee. G. W. Brine, Electric and Gas Bldg., Atlanta, vice-pres. and mgr.

Louisiana—New lines, about 35 mi. in all, proposed to connect Kinder & Northwestern Ry. with other local lines, mainly lumber service. A. Mead, Kinder, vice pres.

Tennessee—Central R.R. Georgia controlled by Illinois Central R.R. preparing plans extending line from Chattanooga to Johnson Stand or Crossville, about 65 mi. H. R. Manby, Nashville, act. supt.

Ohio—Canton & Ohio River Rys. of Pittsburgh has been organized with $10,000,000 capital stock under laws of Ohio and West Virginia by Cincinnati, Canton and Cleveland men for promoting project to build 105-mi. electric railway from Canton, Ohio, to Wheeling, W. Va., via Toronto, Ohio.

Minnesota—Electric Short Line Ry. plans 14-mi. line south from Hutchison. E. D. Luce, Minneapolis, genl. mgr.

Texas—Gulf & East Texas R.R. of Hicks recently incorporated plans to build 10-mi. line from Hicks to Wursbaugh. E. R. Campbell and A. E. Ammerman, Union Natl. Bank Bldg., Houston, and others incorporators.

Texas—M. B. Hereley of Chicago and associates plan 175-mi. railroad from Lubbock, Tex., to Roswell, N. M. Atchison, Topeka & Sante Fe R.R. interested.

New Mexico—Atchison, Topeka & Santa Fe R.R. plans 150-mi. line from Carlsbad to El Paso, Tex. F. M. Bisbee, Amarillo, Tex., ch. engr.

Utah—Utah Light & Traction Co. plans to lower tracks 3000 ft. on South State St. About $26,000. H. L. Beach, Salt Lake City, genl. mgr.

Arizona—Ray-Hercules Copper Co. of Ray plans to spend $200,000 to build railway to connect with Ray and Gila Valley system.

Washington—City Council of Tacoma issued $180,000 bonds to build, extend and equip 11th St. line to east side of bay to connect with ship yards. C. D. Atkins, comr. pub. wks.

California—Pacific Electric R.R. granted franchise to extend interurban road from Santa Ana to Tustin, about 5-mi. G. E. Pillsbury, Los Angeles, ch. engr.

California—Pacific Electric Ry. plans to build line from Glendora and San Dimas.

Ontario—Canadian Pacific Ry. plans to lengthen sidings and strengthen bridges between London, Ont. and West Toronto. About $185,000. W. E. Woodhouse, Montreal, ch. engr.

BIDS DESIRED

Pennsylvania—(Official)—Until Aug. 30, by Atlas Powder Co., Wilmington, building 2-mi. railroad; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Alabama**—Muscle Shoals Traction Co. let contract 64-mi. interurban line from connection with Louisville & Nashville and Southern Ry. at Florence to Huntsville to Central States Constr. Co., Indianapolis.

EXCAVATION AND DREDGING

Proposed Work

Tenn., Selmer — Canal — Lower Cypress D.D. No. 10, McNairy Co., soon lets contract drainage system involving 12-mi. canal with 3 laterals and 481,785 cu.yd. excavation. S. J. Dalton, Boonville, Miss., engr.

O., Urbana—Creek Improvement—Shelby and Champaign Cos. soon lets contract improving Mosquito Creek for about 12 mi. About $42,779.

Minn., Fairmont—Ditches — Martin Co. prepared plans building Judicial Ditches No. 79 and 80. About $24,759 and $12,630 respectively. H. C. Nolte, aud.

N. D., Fargo—Canals—Cass Co. prepared plans building 8 open drainage canals, involving 80,000 acres of land. These canals are to be so built as to make tile drainage feasible. Ultimate discharge will be into Mapleton, Sheyenne and Red Rivers. About $325,000. S. F. Crabble, Fargo, engr.

Mo., Warrensburg — Drainage—Johnson Co. rejected bids for Big Creek D. D. No. 2. New bids. C. E. Jacoby Eng. Co., 514 Shukert Bldg., Kansas City, engrs.

Tex., Wharton—Irrigation—Wharton Co. Irrigation Co., incorporated with $100,000 capital stock, plans to build system of irrigation involving pumping plant. J. W. Jolly, El Campo, stockholder.

Okla., Altus—See "Miscellaneous."

Cal., Dos Palos—Irrigation—City plans to organize irrigation district to be known as Tierra Loma Irrigation Dist., involving 92,000 acres, 52 mi. canal and 288 mi. 1-ft. laterals. About $200,000. D. N. Steyer, South Dos Palos, chn.

BIDS DESIRED

N. Y., Albany — (Official) — Canal Improvements—Until Aug. 21, by W. W. Wotherspoon, supt. pub. wks., improving canals; advertised in this issue.

N. C., Winston-Salem—Until Aug. 28 by Forsyth Co. D.D. No. 1, building drainage system involving 20-mi. canal.

Fla., Tallahassee—(Official)—Excavation—Until Aug. 30, by Bd. Comrs. Everglades D.D., excavating Caloosahatchee Canal between La Belle and Citrus Center. F. C. Elliott, engr.

Ia., Sac City—Drainage—Until Aug. 22, extension of date by E. M. Moyer, aud. Sac County, building drainage ditches, Big Cedar D. D. No. 181 of Sac, Buena Vista, Pocahontas and Calhoun Counties. Noted July 12.

Ia., Spencer—Drainage—Until Aug. 22, by Clav Co. for work on D.D. No. 54. A. W. Chamberlain, aud.

Minn., Detroit—Ditch—Until Aug. 30, by J. A. Narum, Becker Co. aud., building county Ditch No. 19, involving 65,138 cu.yd. excavation.

Minn., Glenwood—Ditch—Until Aug. 20, by O. Irgens, Pope Co., aud., building Co. Ditch No. 15, involving 84,332 cu.yd. excavation main ditch, 45,373 cu.yd. in branches. About $14,269.

Minn., Mora—Ditch—Until Aug. 18 by A. V. Sanders, Kanabec Co., aud., building Co. Ditch No. 11, involving 258,634 cu.yd. excavation, also building rein.-con. bridge and culverts. About $44,089.

Colo., Lamar—Drainage—Until Aug. 22, by Wiley D. D., Prowers Co., building 9¼ mi. open drain ditch, bottom width 4 ft., involving 43½ mi. 6- to 18-in. tile drain. G. R. Wilson, secy.

Ont., Greenock—Ditch—Until Aug. 20 by T. H. Purdy, Glammis, P. O., building 3½-mi. ditch involving 15,500 cu.yd. excavation.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Boston—Comm. Waterways and Pub. Lands, State House, received low bids (a) dredging 25,000 cu.yd. material, Sandwick Harbor, (b) 21,000 cu.yd. Scituate Harbor, (c) 7000 cu.yd. Herring River, Harwich, (d) dredging 12,000 cu.yd. and placing 900 tons rip rap Ellisville Harbor, Plymouth, from Bay State Dredge Co., 247 Atlantic Ave., (a) 60c cu.yd. (b) $ 385 (c) 82c., (d) .79 cu.yd. and $7.00 ton; J. R. Burke, 78 Devonshire St., (a) 70c, (b) (c) 65c., Boston Dredge Co., 49 Central St., (b) $ 365 D. F. Crowley, East Milton, 78c. cu.yd. and $3.65 per ton.

★**N. J., Jersey City**—Dredging—City let contract dredging and deepening Hudson River, foot of Morgan St. to P. S. Pier, 277 Washington St., $10,000. Noted July 26.

★**Tenn., Dyersburg**—Drainage—Dyer Co. let contract Lewis Creek D.D. involving 8½ mi. ditch to N. C. McGinnis & Co., Exchange Bldg. Noted July 12.

★**Ind., La Grange**—Ditch—La Grange Co. let contract building Davis Lein D.D., 7 mi. long to W. A. Daniels, Auburn and C. A. Walb, La Grange.

★**Mich., Centerville**—St. Joseph Co. let contract building tailrace for power development on St. Joseph River, involving 100,000 yd. excavation, 100 yd. retaining walls to G. W. Bunker Co., 1570 Robinson Rd.

★**Ia., Mason City**—(Official)—Drainage—Cerro Gordo Co. let contract building D.D. No. 51 to J. Brark, Clear Lake, $15,337. Noted Aug. 2.

★**Ia., Webster City**—Hamilton Co. let contract building drains, Barth Drainage Dist. No. 212, involving 23,985 ft. 14- to 26-in. tile to Hildal & Peterson, Jewel and Natl. Sewer Pipe Co., Webster City.

★**Ia., Webster City**—Drainage—Hamilton Co. let contract Barth D. D. No. 212 as follows: Material to National Sewer Pipe Co., Sioux City, $14,998; labor to Hudal & Peterson, Jewel, $10,193.

★**Minn., Bagley**—Ditch—Clearwater Co. let contract Co. Ditch No. 3, involving 176,082 cu.yd. excava. to J. F. Flanagan Contr. Co., Alexander, 11.74c. per cu.yd.

★**Minn., Detroit**—Ditch—Becker Co. let contract building extension of branch No. 7 on Co. Ditch No. 15 involving 105,138 cu. yd. excavation, etc. to Northern Minnesota Drainage Co., Litchfield. Noted July 5.

★**Minn., Ivanhoe**—Ditch—Lincoln Co. let contract open work Ditch No. 31 to Kohler Contr. Co., Frazee, $17,950; Ditch No. 35 to Amer. Drainage Co., Thief River Falls, $35,017.

★**Minn., Mankato**—Ditch—Blue Earth Co. let contract building Co. Ditch No. 47 to Brick & Tile Yards, New Ulm, $37,875. Noted Aug. 2.

★**Ore., Bend**—Irrigation—Comrs. Suttle Lake Irrigation Project let contract involving 15,000 acres to C. M. Wickham, Portland, $750,000.

INDUSTRIAL WORKS

Proposed Work

Conn., New Haven — New York, New Haven & Hartford R.R. having plans prepared 95 x 360 ft. roundhouse and 1-story, 40 x 70 ft. machine shop here. Edward Gagel, ch. engr.

N. Y., Albany—Burdick & Son, c/o B. W. Burdick, 72 Hamilton St., plans 4-story, 67 x 160-ft. factory, Hamilton and Mosher Sts. About $50,000. Obenhaus, Nichols Co., 119 State St., archts.

N. Y., Buffalo—F. N. Burt, 540 Seneca St., had plans prepared by W. A. Kidd, archt., 240 Delaware Ave., 7-story, 84 x 124-ft. factory, Seneca and Hamburg Sts. About $175,000.

N. Y., Homer—Newton Fish Line Co., South Main St., plans to rebuild plant recently destroyed by fire. About $50,000.

N. Y., New York—A. Gaw, 319-323 West 77th St., plans remodeling 3, 5-story stables. About $70,000. F. B. Flatt, 101 Park Ave., archt.

N. Y., Syracuse—Onondaga Steel Co., East Water St., plans 3 new additions to plant.

N. Y., Tottenville, S. I.—O. F. K. Jackson, care of Jackson & Duncan, 79 Wall St., New York City, recently organized company and plans shipbuilding plant, Arthur Kill Rd.

N. J., Camden—H. Tiedemann, 19th St. and Washington Ave., Phila., plans 1-story, 70 x 200 ft. woodworking plant, Haddon Ave. About $75,000.

N. J., Jersey City—City Comrs. will sell $1,038,000 bonds and plans freight terminal on New York Bay. Address J. Miller, 15 Ex. Pl.

N. J., Jersey City—C. P. Mueller Co., 180 Paulus Ave., increased capital stock from $100,000 to $[illegible] and plans extensions.

Pa., Phila.—Lanston Monotype Machine Co., 24th and Locust Sts., soon lets contract heating for 4 [illegible] plant, 24th and Locust Sts.

Pa., Phila.—Snyder & Co., 144 North 16th St., having plans prepared 2-story, 41 x 104 ft. brick and concrete warehouse and store. Furnell & Winder, 419 Chestnut St., archts.

Pa., Temple—Thomas Malleable Iron Co. plans to build several new additions to plant. About $[illegible].

Pa., Williamsport—Lycoming Rubber Co. Penn and Erie Aves., plans factory, 94 x [illegible] addition, Penn Ave. About $[illegible].

Industrial Work (Continued)

Md., Fairfield—Ritter-Conley Co., Morris Bldg., Pittsburgh, plans large addition to shipbuilding plant including shipbuilding berths, bulkheads, piers and shops.

W. Va., Martinsburg—Berkley Woolen Mills had plans prepared, 4-story, 65 x 160-ft. addition, Raleigh St. About $100,000. P. O. Keilholtz, Continental Bldg., Baltimore, archt.

N. C., Charlotte—Natl. Sanitation Co. recently organized with capital stock of $100,000 and plans to build

La., Cedar Grove—Western Carbon Co., subsidiary of Columbia Carbon Co., soon lets contract building plant here. About $125,000.

La., New Orleans—Bd. Comrs., 200 New Orleans St., plans multiple story, rein.-conc., warehouse. Address W. B. Thompson, pres.

O., Akron—Akron, Canton & Youngstown R.R. plans large freight terminal warehouse here. About $1,000,000 J. A. Donahey, ch. engr.

O., Akron—Kendall Tire & Rubber Co., soon lets contract factory and power house. About $100,000. W. C. Owen & Co., 449 Leader-News Bldg., Cleveland, archts.

O., Canton—American Motor Car Co., recently incorporated with capital of $100,000, soon lets contract 2-story, 60 x 100 ft. C. R. Volzer, pres.

O., Cleveland—Cleveland Switchboard Co., 430 West Prospect Ave., plans rebuilding plant recently destroyed by fire.

O., Cleveland—Colonial Woolen Mill Co., recently incorporated with capital of $100,000, plans blanket mill. J. N. Hahn, pres. W. S. Lougee, Marshall Bldg., archt.

O., Cleveland—Guide Motor Lamp Co., 11400 Madison Ave., has purchased site on Mandalay Ave., and plans new factory.

O., Cleveland—Morgan Lithographing Co., St. Clair Ave., N. E., and East 3rd St., plans 3-story, 138 x 250 ft., Payne Ave., N. E. About $150,000.

O., East Cleveland—(Cleveland P. O.)—Cleveland Motor Plow Co., Euclid and Lamb Aves., Cleveland, receives bids about Aug. 20, 1- and 2-story, 100 x 500 ft. About $200,000. R. White, pres. G. S. Rider Co., 512 Century Bldg., archts., both of Cleveland

O., Licking View—Rotary Tire and Rubber Co., Zanesville, plans large brick factory, Licking Rd. About $500,000.

Ill., Chicago—Standard Cap and Seal Co., 227 Wells Ave., plans 100 x 160-ft. factory. About $150,000. O. N. Tevander, pres. Davidson & Weiss, archts.

Mo., Kansas City—City plans election Oct. 2 to vote on $1,000,000 bond issue for lighting plant.

Tex., Deweyville—Sabine Tram Co. plans large lumber mill plant and concrete building to contain engines, boilers, machine shop and blacksmith shop. About $150,000. C. E. Walden, Beaumont, pres.

Tex., Houston—Texas Development and Refining Co. has increased its capital stock from $100,000 to $500,000 and plans additions to plant.

Idaho, Rigby—Beet Growers Co., Idaho Falls, plans 600-ton beet sugar factory.

Cal., Alameda—N. Clark & Son, Alameda, plans to rebuild pottery plant recently destroyed by fire. About $250,000

Cal., Fresno—Fresno Planing Mill plans to build plant. About $50,000. A. W. Bernhardt, pres.

Cal., Stockton—Union Ice Co. plans to build plant. About $45,000. W. Toepke, 46 Kearny St., San Francisco, archt.

B. C., Anyox—Granby Consolidated Mining, Smelting and Power Co. plans coke manufacturing plant here. About $1,500,000

BIDS DESIRED

O., Columbus—(Official)—Until Sept. 4 by O. E. Steele, business mgr., Ohio State University, brick and steel power house. About $135,000

Wash., Seattle—Until Aug. 21 by Bd. Pub. Wks., building, portable hydro-electric light and power plant, involving continuous capacity of 13,000 hp.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Vt., Bennington**—F. L. Jewett Mfg. Co. let contract 2-story, 61 x 157 ft. brick to Hilgenberg Constr. Co., Hudson Falls, N. Y.

★**N. Y., New York**—New York Butchers Dressed Meat Co., 11th Ave. and 29th St., let contract 7-story, 100 x 147-ft. plant, 11th Ave. and 40th St., to Bloom Steel Co., 100 Barr. About $250,000.

★**N. Y., Rochester**—Symington-Anderson Co. let contract 227 x 650-ft. brick factory, University St., to Crowell-Lundroff-Little Constr. Co., 1951 East 57th St., Cleveland. About $280,000.

★**N. J., Trenton**—American Steel & Wire Co., Hamilton Ave., let contract 1-story, 50 x 70-ft. machine shop and 175 x 310-ft. rope shop to J. H. Morris, Broad St. Bank Bldg. Noted Aug. 9.

★**Pa., Phila.**—Rex & Co., Inc., 2410 North Philip St., let contract 5-story, 52 x 113-ft. brick warehouse, American and York Sts., to S. B. MacDowell & Son, 1927 West Montgomery Ave. About $70,000.

★**Del., Wilmington**—W. Freihofer Baking Co., Pennsylvania and Lincoln St., Phila., let contract 3- and 4-story, 60 x 100-ft. brick baking plant to Concrete Constr. Co., 1620 Thompson St., Phila. About $75,000.

★**O., Orrville**—Ohio Blower Co., 5125 Perkins Ave., let contract new factory to A. A. Lane, 820 Columbus Bldg. About $150,000. Noted July 26.

★**Ind., Indianapolis**—Pennsylvania Lines West let contract, brick and rein.-con. engine house and annex, to Alliance Constr. Co., Indianapolis.

★**Mich., Detroit**—Ford Motor Co., Woodward Ave. and Detroit Terminal R.R., let contract 4-story, rein.-conc. addition to factory A, to H. G. Christman Co., 315 Stevens Bldg.

★**Mich., Detroit**—Michigan State Telephone Co., Washington and Clifford Sts., let contract 3-story, rein.-conc. telephone building, Hubbard St., to H. G. Christman Co., 315 Stevens Bldg.

★**Mich., Detroit**—Parisian Realty Co., 915 Ford Bldg., let contract 3-story, rein.-conc. laundry plant, West Elizabeth and 3rd Sts., to A. W. Kutscke & Co., 814 Ford Bldg. About $80,000.

Mich., Detroit—L. Smilansky let contract 3-story steel warehouse, store and theater, West Fort St., to F. Swireky & Co., 201-204 Equity Bldg.

★**Ill., Chicago**—E. J. Barker, 556 West Jackson Blvd., let contract 2-story brick plant, 4247-57 Western Ave., to Shumann Constr. Co., 58 East Washington St.

★**Ill., Chicago**—Commonwealth Edison Co., Clark and Adam Sts., let contract altering power house and building 1-story brick locomotive house and concrete ashpit, 22nd and Fisk Sts., to G. A. Fuller & Co., 140 South Dearborn St. About $236,000.

★**Minn., Minneapolis**—G. W. Todd, 403 Brandeis Bldg., let contract 3-story, 66 x 132-ft. warehouse to W. Maier, 415 South 42nd St. About $50,000.

★**Cal., Crockett**—California & Hawaiian Sugar Co. let contract, addition to plant, to Lindgren & Co., Monadnock Bldg., San Francisco. About $1,500,000.

★**Cal., San Francisco**—Atchison, Topeka & Santa Fe R.R. let contract, brick and mill-construction warehouse to C. L. Wold Co., 75 Sutter St. About $59,294.

BUILDINGS

Proposed Work

Mass., Wrentham — Dormitory — Comn. Mental Diseases plans. Kendall, Taylor & Co., 93 Federal St., Boston, archts.

N. Y., Albany—School—Bd. Educ. plans, 2-story. About $50,000. I. Wachsman, secy. bd. control and supply, City Hall. Fuller & Robinson, 95 State St., archts.

N. Y., Buffalo—Church—St. Marys Congregation plans to build, in Hertel Ave. dist. About $65,000

N. Y., Cohoes — Church — St. Josephs Congregation, Cohoes, plans 3-story, 40 x 70-ft. and wing. Rev. A. Lavigne, 65 Congress St., pastor.

N. Y., Lake Placid—High and Grade School—Bd. Educ. plans, 2-story. About $125,000. Pember & Campaigne, 24 James St., archts.

N. Y., New York—Libraries—American Library Assn. plans 32 libraries, various Army and National Guard Camps. About $320,000. F. P. Hill, 26 Brevoort Pl., Brooklyn, chn. E. L. Tilton, 52 Vanderbilt Ave., archt. and engr.

N. J., Passaic—Theatre—Harris Bros., 184 4th St., plans 1-story, 75 x 100-ft. About $60,000. A. Preiskel, Hobart Trust Bldg., archt.

N. J., Red Bank—School Bd. Educ. plans 2-story, 60 x 90 ft., brick and stone, Shrewsbury Ave. About $60,000. F. M. Truex, 1170 Broadway, New York City, archt.

Pa., Eddystone—Convent—St. Rose of Lima Congregation plans, 4-story. About $50,000. Rev. T. F. Ryan, Chester Rd., pastor. Horner & Beale, 10 South 18th St., Phila., archts.

Wash., Seattle—Temple—Seattle Central Labor Council plans 10- or 12-story, 120 x 120 ft., near present temple. F. A. Rust, chn. bldg. com. J. A. Duncan, 1728 13th St., secy.

Wash., Spokane—Theater—Alex. Pantages, Pantages Theater Bldg., had plans prepared by B. Marcus Priteca, archt., Pantages Theater Bldg. About $150,000.

Cal., Long Beach—Schools—City election Sept. 6 to vote on $100,000 bond issue to build schools.

Cal., Los Angeles—Hospital—Bd. Supvrs. Ventura, Los Angeles and Santa Barbara Cos. plan tuberculosis hospital, Los Angeles Co. About $100,000. Wm. Davidson, Hall of Records, archt.

Cal., San Diego—Becker Bros. had plans prepared, altering building, by Eugene Hoffman, Spreckels Bldg. About $50,000.

Cal., San Francisco—Office—B. G. McDougall, 461 Market St., having plans prepared, 2-story addition to Sheldon Bldg. About $70,000.

Cal., San Francisco—School—City plans $3,500,000 bond issue, building and improving schools. J. S. Dunnigan, city clk.

Ont., Stratford—Theater—W. I. Kemp, 69 Nile St., having plans prepared, brick. About $60,000.

BIDS DESIRED

N. H., Laconia—(Official)—Dormitory—Until Aug. 21 by Bd. Trustees, State House, Concord. C. Whitcher, state archt. Noted July 12.

Mass., Boston—Hospital—Until Aug. 23 by City Hospital, 818 Harrison Ave., ward buildings and alterations. About $75,000. Jos. McGinniss, 16 Arlington St., archt.

Mass., Boston—School—Until Aug. 21 by Bd. Educ., 3-story, 120 x 176-ft. brick and stone, Charter & Phipps Pl. About $150,000. J. McGinniss, 16 Arlington Pl., archt.

Conn., Hamden—Schools—Until Aug. 22, by Bd. Educ., Dixwell Ave. and Newhall and Morse Sts. Kelly & Loth, 113 Church St., New Haven, Conn.

N. Y., Brooklyn—Hospital—Until Sept. 5 by Cumberland St. Hospital, Auburn Pl., c/o City. About $600,000. Ludlow & Peabody, 101 Park Ave., New York City, archts.

N. C., Raleigh—(Official)—Administration, Kindergarten, Etc.—Until Aug. 23 instead Aug. 16 by Bd. Dirs. State School for Blind. About $150,000. F. K. Thompson, Raleigh, archt. Noted Aug. 9.

O., Columbus—School—Until Aug. 30 by Bd. Educ., Perry Twp., Franklin Co. Cree Sheets, 33 North High St., archt.

O., Lakewood—High School—Until Sept. 4 by P. T. Harrold, clk. bd. educ., 2-story. W. Hopkinson, 900 Rose Bldg., Cleveland, archt. Noted July 19.

O., London—School—Until Aug. 30 by Bd. Educ., Jefferson Twp., Madison Co., Centralized School Dist. Howard & Merriam, 8 East Broad St., Columbus, archts.

Wis., Hudson—High School—Until Aug. 28, by Dist. Bd. Parkinson & Dockendorff, Linker Bldg., LaCrosse, archts.

Ia., Dike—School—Until Aug. 28 by Bd. Educ., 3-story, 70 x 120-ft., brick and tile. About $65,000. W. L. Pedicord, Dike, archt. Noted Aug. 9.

Ia., Mingo—School—Until Aug. 24 by S. M. Berkeley, pres. bd. educ., 2-story, 60 x 90-ft., brick. About $50,000. Proudfoot, Bird & Rawson, 810 Hubbell Bldg., Des Moines, archt.

Ia., Newton Junior High School—Until Sept. 5 by H. B. Allfree, pres. bd. educ. Temple & Burrow, 63 Davenport Saving Bank Bldg., Davenport, and Fugard & Knapp, 111 Monroe St., Chicago, archts. Noted Apr. 26.

Minn., Fairmont—School—Until Aug. 21 by Bd. Educ., East Chain Twp. G. Pass & Son, Mankato, archts.

Neb., Lincoln—Social School—Until Sept. 1 by J. S. Dales, secy. University. About $300,000.

Neb., York—High School—Until Aug. 2 by Bd. Educ., 2-story, 80 x 220 ft. brick, stone and rein.-conc. About $60,000. W. W. Wyckhoff, secy.

S. D., Conde—Municipal—Until Aug. 3 by J. P. Wolf, aud., 2-story. G. F. Fossum, Wells Blk., Aberdeen, archt.

Okla., Oklahoma — (Official) — Station — Until Sept. 15, by Frisco R.R. About $300,000. Lebebbaum, Marx & Vigeau, 175 West Jackson Blvd., Chicago.

Okla., Tulsa—Club—Until Aug. 20 by A. W. Roth, pres., Y. W. C. A., 4-story, 90 x 150 ft. About $150,000. C. K. Bircsall, 1002 Commerce Bldg., Kansas City, Mo., archt.

Buildings (Continued)

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**R. I., Woonsocket**—School—Bd. Educ. let contract 2-story, 65 × 90 ft. to J. F. Fleurent & Son, 159 Rathbun St. About $50,000. Noted June 21.

★**N. Y., New York**—Office—E. M. Ferriday, 31 East 50th St., let contract to M. Rikes, 891 East 172nd St. About $100,000.

★**Pa., Doranceton**—School—Bd. Educ. let contract 2-story, 30 x 82 ft. to M. L. Roth, 125 South Welles St., Wilkes-Barre. About $60,000.

★**Md., Admiral**—Building—War & Work Council International Y. M. C. A., 124 East 28th St., New York City, let contract 10 Y. M. C. A. buildings to Claiborne & Johnson Co., Inc., Garrett Bldg., Baltimore. About $60,000.

★**Md., Baltimore**—School—Bd. Educ. let contract 1-story, 30 x 225-ft., Liberty Heights Ave. to W. E. Burnham, Law Bldg. About $50,000.

★**O., Cleveland** — Church — Hough Ave. Congregation let contract 2-story, 72 x 80 ft., brick, Hough Ave., to King-Griffin Constr. Co., Engineers Bldg. About $60,000.

O., Cleveland—School—Bd. Educ. received low bid, addition to Empire School, Empire Ave., from Bolton & Pratt Constr. Co., Columbia Bldg. $76,000.

★**Mich., Detroit** — Nurse Home — Bd. Health let contract, 3-story, rein.-conc. to Culbertson & Kelley, 814 Ford Bldg. About $135,000.

★**Mich., Detroit**—Store—H. L. Bowles Co., 412 Bowles Bldg., let contract 6-story, concrete and steel, Gratiot St., to A. A. Albrecht Co., 1130 Penobscot Bldg. About $100,000.

★**Mich., Muskegon**—Official—Union Lodge let contract to Buck & Muller, percentage plan. About $65,000.

★**Ill., Aurora** —(Official)— Sanatorium—Miller Diabetis Sanatorium let contract, 3-story, 60 x 100 ft., to J. MacKimmie, 296 Iowa Ave. About $80,000. Noted Aug. 9.

★**Ia., College Springs**—High and Grade School—Bd. Educ. let contract, 3-story, 72 x 134-ft., brick, to S. Hotchkiss, 18th and Penn. St., St. Joseph, Mo. About $65,000.

★**Kan., McPherson**—School—Bd. Educ. let contract, 2-story, brick, stone and rein.-conc., to J. W. Flanagan Constr. Co., 2836 Benton Blvd., Kansas City, Mo. About $50,000. Noted Aug. 2.

★**Kan., Topeka** — Storehouse — Atchison, Topeka & Santa Fe R.R. let contract, brick and rein.-conc., to F. M. Spencer & Son, Mulvane Bldg. About $200,000. Noted Aug. 9.

★**Kan., Wichita** —(Official)— Hotel — H. Lassen, Wichita, let contract to Selden-Breck Constr. Co., Central Natl. Bank Bldg., St. Louis. About $500,000. Noted Aug. 9.

★**Mo., St. Louis**—College—Poro College let contract to J. Hill, 915 Olive St. About $50,000.

★**Mo., St. Louis**—School—Bd. Educ. let contract 2-story, 80 x 110-ft., to Murch Bros. Constr. Co., Railway Ex. Bldg. About $134,840.

★**Mo., Trenton**—School—Bd. Educ. let contract, 3-story, brick and stone, to J. J. Hoffman, Milan. About $75,000.

★**Tex., Dallas**—Theater—Majestic Theater Co. let contract, steel construction, Elm St., to Austin Bros., 1815 Coombs St., Dallas. Total cost, about $100,000.

★**Okla., Stillwater**—Court House—Payne Co. let contract, 4-story, brick, stone and rein.-conc. to Lisle-Dunning Constr. Co., Oklahoma City. About $125,000. Noted July 12.

★**Colo., Denver**—Stadium—City let contract, Court of Civic Benefactors and stadium, Civic Center, to Edward Seerie Co., 605 Continental Bldg. About $181,000.

★**Ariz., Bisbee**—High School—Bd. Educ. let contract to J. W. Tucker, Lowell. About $59,150. Noted Apr. 17.

★**Cal., Fresno**—Union Natl. Bank, care of W. O. Miles, pres., let contract 2-story, 50 x 96 ft., Mariposa St., to H. H. Winner, Nevada Bank Bldg., San Francisco. About $50,000.

FEDERAL GOVERNMENT WORK

Proposed Work

Mass., Winchester — Post Office — J. A. Wetmore, superv. archt., treas. dept., Wash., rejected bids. Noted Aug. 9.

Wash., North Yakima—Storage Reservoir—U. S. Rec. Ser making surveys at Hells Crossing on American River.

Wash., Tacoma—Hospital—Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., prepared plans involving 59 buildings. About $500,000.

Ore., Oregon City—Locks—Government appropriated $80,000 for locks.

Ariz., Globe—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., rejected bids

BIDS DESIRED

Mass., Hingham—Magazine Storehouse—Until Aug. 27 by Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash.

N. Y., Brooklyn—Paving—Until Aug. 20, by Bureau Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., paving Navy Yard, granite block.

N. Y., Buffalo—Metal Work—Until Aug. 20, by Lighthouse Inspector, furnishing metal work for 1 steel tower; advertised in this issue.

N. Y., Cohoes—Post Office—Until Sept. 24 by J. A. Wetmore, superv. archt., treas. dept., Wash.

Pa., Phila.—Heating System—Until Aug. 27, by Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., at Machine and electric shop.

Wash., D. C.—Refuse and Garbage—Until Sept. 5, by L. Brownland, comr. Dist. of Columbia, collecting and disposing of miscellaneous refuse and garbage, etc.; advertised in this issue.

Wash., D. C.—Storm Warning Lanterns—Until Aug. 21, by U. S. Dept. Agriculture, furnishing storm warning lanterns; advertised in this issue.

S. C., Port Royal—Buildings—Until Aug. 20, by Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., for 2 buildings for officers' quarters. Noted July 26.

Ind., Kendallville — Post Office — Until Sept. 21 by J. A. Wetmore, superv. archt., treas. dept., Wash., advertised in this issue.

Mich., Detroit—Backfilling—Until Sept. 4, by U. S. Engr. Office, for backfilling walls, 4th Lock, St. Marys Falls Canal.

Cal., San Pedro—Fill—Until Aug. 31, by U. S. Engineers Office, 723 Central Bldg, Los Angeles, for fill involving 120,000 cu. yd. rip rap protection.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**R. I., Melville** — Extending Fuel-Oil Storage Plant—Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., let contract to J. W. Danforth Co., 70 Ellicott St., Buffalo, $294,394. Noted Aug. 9.

★**N. Y., Brooklyn**—Emergency Building—Bureau Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., let contract emergency building for receiving ship barracks, to Caldwell Wingate Co., New York City, cost plus 10%.

★**Pa., Harrisburg** — Storehouse — Bureau Yards and Docks, Navy Dept., Wash. let contract to J. L. Stewart & Co., 30 Church St., New York City, $100,000

★**Pa., Phila.** — Aëroplane Factory — Bureau Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., let contract to Austin Co., 3028 North 16th St., $360,960.

★**Pa., Phila.**—Crematory—Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., let contract to Morse-Boulger Destructor Co., 39 Cortlandt St., New York City, $13,835 Noted Aug. 2

★**Pa., Phila.**—Repairs to Stokers—Bureau Yards and Docks, Navy Dept., Wash. let contract to J. G. Thomas, 34 South 17th St., $13,750.

★**Wash., D. C.**—Buildings—Bureau Yards and Docks, Navy Dept., Wash., let contract for 2 magazine buildings for Iona Island and 5 for Lake Denmark, N. J., to Snare & Triest, Woolworth Bldg., New York City, $136,500 Noted July 12

★**Wash., D. C.**—Emergency Hospital—Bureau Yards and Docks, Navy Dept., Wash. let contract emergency hospital at Key West, Fla., to Ward & Price, cost plus percentage. Noted July 12.

★**Wash., D. C.**—Naval Air Stations—Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., let contract for 2 on Long Island to J. Stewart & Co., 30 Church St., New York City; 1 on New Jersey Coast to Cramp & Co., Dexter Bldg., Phila.; 1 at Key West, Fla., to Florida Contr. & Eng. Co., Key West.

★**Wash., D. C.**—Road Work—Bureau Yards and Docks (F. R. Harris, ch.), Navy Dept., let contract rebuilding portion wall on Canal Rd. to W. S. Cush, Wash., D. C., $24,000.

★**Va., Richmond** — Warehouse — Bureau Yards and Docks, Navy Dept., Wash. let contract to J. T. Wilson, Mutual Bldg., Richmond, $400,000

S. C., Charleston—Storehouse—Bureau Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., received low bids from Feeney Sheehan Building Co., State House, Albany, N. Y., $210,415, 200 days; J. H. Wiese, 1301 City National Bank Bldg., Omaha, $239,860, 250 days; R. H. Arnold Co., 1035 Vermont Ave., $241,474, 120 days. Noted July 26.

★**Ill., Great Lakes** — Intake Pumping Plant—Bureau Yards and Docks, Navy Dept., Wash., let contract to Great Lakes Dredge & Dock Co., 104 South Michigan Ave., Chicago, $22,500.

★**Neb., Chardon**—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to C. E. Goodhand, Wahoo, $89,283. Noted Aug. 9.

MISCELLANEOUS

Proposed Work

Park—Batavia, N. Y.—City election soon to vote on $50,000 bonds to purchase 7.7 acres of land for park. R. F. Clark, city engr.

Port Improvements—Jersey City, N. J.—City Comrs. acquire Caven Point, will develop property for port improvements. About $1,000,000. C. A. Van Kuren, city engr.

Park—Trenton, N. J.—Pennsylvania legislature appropriated $25,000 for interstate park at Washington's Crossing. New Jersey to spend like amount. Address W. Edge, governor, Trenton.

Retaining Wall—Woodcliffe, N. J.—Bd. Freeholders Hudson Co. appropriated $50,000 to build retaining wall along bank of Woodcliffe, sloping to Hudson River.

Transmission Line—Greenville, S. C.—Southern Power Co. of Charlotte plans to build line to army cantonment. About $30,000.

Incinerator—Palm Beach, Fla.—Town voted $50,000 for incinerator and other improvements.

Dam and Retaining Walls — Marshalltown, Ia.—City preparing plans for dam and retaining walls over channel north of river at Center St. About $10,000. W. H. Steiner, city engr.

Subway—Parsons, Kan.—City plans election to vote on $60,000 bonds to build subway under tracks at Main St.-Missouri, Kansas & Texas lines to appropriate $60,000 toward cost. F. W. Frye, clk. L. F. Lonnbladh, Dallas, ch. engr.

Dam—Kansas City, Mo.—Bd. Pub. Wks. soon lets contract for 10 x 240-ft. near 9th and Blue River. About $50,000. Harrington, Howard & Ash, Orear-Leslie Bldg., engrs.

Dam—Altus, Okla.—City plans to build 7-mi. rein.-con. dam over North Red River to irrigate 66,000 acres of land.

Parks—Holdenville, Okla. — City issued $10,000 bonds to improve parks.

Tunnel—Los Angeles, Cal.—Bd. Pub. Wks. rejected bids for tunnel through Bunker Hill at 2nd St., from Hill to Figuerora St. Noted Apr. 12.

BIDS DESIRED

Elevated Railway—Pa., Phila.—(Official) —Until Aug. 21 by W. S. Twining, dir. Frankfort Elevated Ry. for steel framework, railings, concrete floors, etc.; advertised in this issue

Retaining Wall—Lebanon, O.—(Official) —Until Aug. 20 by Warren Co. Comrs. building rein.-con. retaining wall, Rd. No. 11

Breakwater—St. John Harbour, N. B.—Until Aug. 31 by R. C. Desrochers, secy. Dept. Pub. Wks., Dominion Government, Ottawa, for extension and repairs to breakwater.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Rip Rap—Boston, Mass.—See "Excavation and Dredging."

★**Garbage Disposal Plant — Charleston, S. C.**—City let contract 5-story, daily capacity 40 tons to Grinnell Co., Land Title Bldg., Phila.

★**Crib Removal—Cleveland, O.**—Bd. Control let contract removal cribs No. 3 at south end, approximately, owned by Great Lakes Dredge and Dock Co., 1848 Wilkinson Bldg., $40,000.

Incinerating Plant—Kansas City, Mo.—Bids received for this from Nye-Ohrstrom Crematory Co., $50,000 and $55,000; Heaton & Foster, $48,000; Horne Incinerating Co., $61,478. Noted July 19.

★**Pier Shed—San Francisco, Cal.**—Bd. State Harbor Comrs. let contract to Cahill-Lee & Mulford, 11 Kearny St., $44,847.

SEARCHLIGHT SECTION

Contracts To Be Let

PROPOSALS

Bids received until August 21, 1917.

Canal Improvements

STATE OF NEW YORK, OFFICE OF SUPERINTENDENT OF PUBLIC WORKS

Albany, July 20th, 1917.

Sealed proposals will be received by the undersigned at his office in the Capitol at Albany, N. Y., until twelve o'clock noon of Tuesday, August 21st, 1917, at which place and hour they will be publicly opened and read, for improving the New York State canals pursuant to the provisions of Chapter 147 of the Laws of 1903, and of the acts amendatory thereof and supplementary thereto, and Chapter 570 of the Laws of 1915, as follows:

—1—

CONTRACT NO. 147.

Erie Canal—Section 11.

For constructing the substructure, superstructure and approaches of a bascule bridge across Tonawanda creek at Main and Webster streets, Tonawanda and North Tonawanda, N. Y.

Sheets 1 to 12 inclusive.

—2—

CONTRACT NO. 148.

Erie Canal—Section 8.

For constructing the substructure, superstructure and approaches of a highway bridge across Lock 27 and the Clyde river at Leach street, Lyons, N. Y.

Sheets 1 to 12 inclusive.

And for the construction of Barge canal, terminals pursuant to the provisions of Chapter 746 of the Laws of 1911, and of the acts amendatory thereof, as follows:

—3—

TERMINAL CONTRACT NO. 55.

For constructing a pier, dolphins, etc., at Gowanus Bay, Borough of Brooklyn, New York.

Contract plans sheets 1 to 16.

Plans may be seen and detailed specifications, engineers' estimate of quantities, proposal blanks, form of contract and bonds required and other information for proposers may be had at the office of the Superintendent of Public Works at Albany, N. Y., at the office of the Assistant Superintendent of Public Works for the Middle Division at Syracuse, N. Y.; at the office of the Assistant Superintendent of Public Works for the Western Division at Rochester, N. Y., and at the canal office, Spaulding's Exchange, Buffalo, N. Y.

Copies of detailed plans or drawings may be obtained from the State Engineer and Surveyor at Albany, N. Y., upon payment to him of the cost of producing them.

Monthly estimates will be paid of ninety per centum (90 per cent.) of the work done at the contract price. Every proposal for said work must be accompanied by a money deposit in the form of a draft or certified check upon some good banking institution in the City of Albany or New York, issued by a national or State bank (or trust company in the case of terminal contract), in good credit within the State and payable at sight to the Superintendent of Public Works for five per centum (5 per cent.) of the amount of the proposal.

Official Proposals

Price, $3.60 an inch—Copy can be received until Wednesday, 10 a. m. for issue mailed the next day

PROPOSALS

The person whose proposal shall be accepted will be required to execute a contract and furnish bonds within ten days from the date of notice of award delivered to him or them in person or mailed to the address given in the proposal.

Upon execution of the contract and approval of bonds, the certified check or draft will be returned to the proposer unless the same shall have been presented for collection prior to such time, in which case the amount of the deposit will be refunded by the Superintendent of Public Works.

The deposits of bidders other than the one to whom the award of contract shall be made will be returned immediately after the award has been made.

The bond required for the faithful performance of each contract shall be in such sum as shall be fixed by the Superintendent of Public Works, which sum shall not be less than twenty per centum (20 per cent.) of the estimated cost of the work according to the contract price, and an additional bond, known as the labor bond, in the sum of ten per centum (10 per cent.) of the amount of the estimated cost of the work according to the contract price, will be required as security that the contractor will pay in full at least once in each month all laborers employed by him upon the work specified to be done in the contract.

In the event that more than one surety company is offered as surety on said bonds co-insurance only will be accepted.

Each proposal must be addressed to the Superintendent of Public Works, Albany, N. Y., and must be endorsed on the envelope with the name of the construction for which the proposal is made.

Award, if made, will be made to the person or persons whose proposal shall be lowest in cost to the State for doing the work and which shall comply with all provisions required to render it formal. Before any award shall be made the lowest bidder will be required to satisfy the Superintendent of Public Works of his ability to provide suitable equipment and materials for the proper performance of the work.

The right is reserved to reject all proposals and readvertise and award the contract in the regular manner if, in the judgment of the undersigned, the interests of the State will be enhanced thereby.

W. W. WOTHERSPOON,
Superintendent of Public Works.

PROPOSALS FOR LEVEE WORK.—Mississippi River Commission, U. S. Engineer Office, Customhouse, Memphis, Tenn.—Sealed proposals will be received here until 11 o'clock A.M., Aug. 24, 1917, and then publicly opened, for constructing about 3,400,000 cubic yards of earthwork in the Upper and Lower St. Francis and White River Levee Districts. Further information on application.

PROPOSALS

Bids received until September 10, 1917.

North Hill Viaduct

FOR SUMMIT COUNTY

Akron, Ohio.

Sealed proposals to be filed Margaret Rebel, Clerk, will be received by the Board of County Commissioners of Summit County, at Akron, Ohio, up to 11:00 A. M. central time, September 10th, 1917, for furnishing the materials and performing the labor necessary for the construction of the North Hill Viaduct, in Akron, Ohio.

The viaduct will be of reinforced concrete with an over-all length of about 2,790 feet, consisting of 16 arch spans varying in length from 116 feet to 191 feet, and of 12 short girder spans. A roadway 52 feet wide and two sidewalks, each 10 feet wide are provided. Certain piers will rest on sand and gravel; others on concrete piles.

Payments will be made in cash and monthly estimates will be rendered. All bids shall be accompanied by a check of the bidder, certified to by a solvent bank in the State of Ohio, made payable to Board of County Commissioners, for an amount of five per cent. of the bid, to be forfeited as liquidated damages (but not a penalty) by any bidder who is awarded a contract and who fails promptly and properly to execute the contract and bond. Upon the execution of the contract and bond by the successful bidder, said check will be returned to him and the checks of unsuccessful bidders will be returned to them. The contract will be awarded to the lowest responsible and competent bidder, but the Board reserves the right to reject any and all bids and to waive informalities.

Conforming to Ohio General Code, bids will also be received on alternate designs prepared by the bidder, providing certain requirements are complied with.

Plans and specifications are on file in the office of the County Auditor, Akron, Ohio, and in the office of Harrington, Howard & Ash, Consulting Engineers, Kansas City, Missouri. Copies of the plans and specifications may be secured from the Consulting Engineers by depositing twenty-five dollars. Such plans and specifications are to be returned upon request, at which time refund of twenty dollars will be made.

Bids received until August 17, 1917.

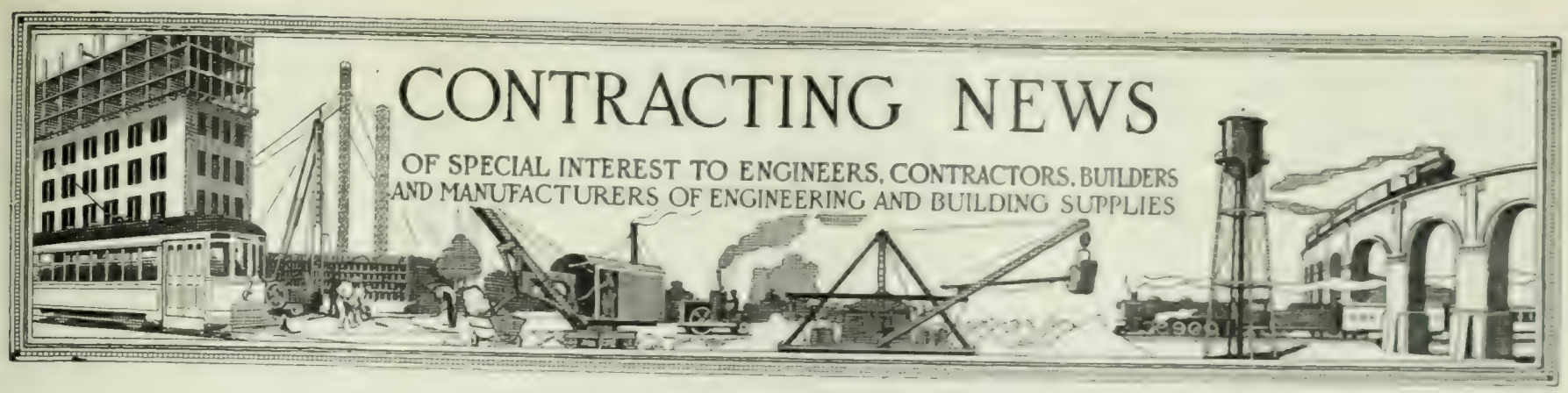
Concrete Bridge

Hampton, N. Y.

Bids will be received by the undersigned until two o'clock P.M., August 17th, at the Town Hall in Hampton, N. Y., for the construction of a steel reinforced-concrete arch bridge across the Poultney River at Leonard's. Plans and specifications can be obtained at the Allen Bank in Fair Haven, Vt., or at the town clerk's office, Hampton, N. Y. The right to reject any or all bids is reserved.

E. S. DOUGLASS,
Supt. Highways, Hampton, N. Y.
SELECTMEN, Fair Haven, Vt.

SEALED PROPOSALS will be opened by the Lighthouse Inspector, Buffalo, N. Y., at 2 o'clock p.m., August 20, 1917, for furnishing metal work for one steel tower. Information upon application to the above office.



Proposals

For Proposals Advertised See Pages 52 to 56 Inclusive

WATER-WORKS

Bids Close		See Eng. News-Record
Aug. 25.	Girard, O.	Aug. 23
Aug. 27.	Ottawa, Ont.	Aug. 16
Aug. 27.	Otis, Colo.	Aug. 23
Aug. 29.	Monett, Mo.	Aug. 23
Aug. 30.	Cleveland, O.	Aug. 23
Aug. 30.	Ogilvie, Minn.	Aug. 23
Sept. 3.	Burlingame, Kan.	Aug. 16
Sept. 4.	Hamilton, Ont.	Aug. 16
Sept. 4.	Cumberland, Md. Adv. Aug. 9 to 23.	Aug. 9
Sept. 6.	Wolverton, Minn.	Aug. 23
Sept. 6.	Brockton, Mass. Adv. Aug. 16.	Aug. 16
Sept. 6.	Thomson, Ill. Adv. Aug. 16.	Aug. 16
Sept. 10.	Cumberland, Md. Adv. Aug. 16 and 23.	Aug. 16
Sept. 11.	New York, N. Y. Adv. July 12 to Aug. 23.	July 12
Sept. 12.	Kansas City, Mo.	Aug. 23

SEWERS

Aug. 28.	Oberlin, O.	Aug. 23
Aug. 28.	Newark, N. J.	Aug. 23
Aug. 28.	New York	Aug. 23
Aug. 29.	Long Island City, N. Y.	Aug. 23
Aug. 30.	Mora, Minn.	Aug. 16
Sept. 4.	Cumberland, Md. Adv. Aug. 9 to 23.	Aug. 9
Sept. 4.	Rocky River, O.	Aug. 23
Sept. 4.	Dodge Center, Minn.	Aug. 23
Sept. 6.	Cleveland Heights, O.	Aug. 23
Sept. 15.	Hillsboro, Ill.	Aug. 16

BRIDGES

Aug. 25.	Martinsburg, W. Va.	Aug. 9
Aug. 27.	Elberton, Ga.	Aug. 2
Aug. 27.	Camden, S. C.	Aug. 23
Aug. 27.	Indianapolis, Ind.	Aug. 23
Aug. 27.	Reading, Pa.	Aug. 23
Aug. 28.	Pawnee, Okla.	Aug. 23
Aug. 28.	Hohenwald, Tenn.	Aug. 16
Aug. 28.	Rockville, Ind. Adv. Aug. 16.	Aug. 16
Aug. 28.	Channahon, Ill. Adv. Aug. 16 and 23.	Aug. 16
Aug. 28.	St. Louis, Mo.	Aug. 23
Aug. 29.	Columbus, O. Adv. Aug. 16 and 23.	Aug. 16
Aug. 30.	Kankakee, Ill.	Aug. 2
Sept. 1.	Annapolis, Md.	Aug. 16
Sept. 1.	New Martinsburg, W. Va.	Aug. 16
Sept. 3.	Sullivan, Ind.	Aug. 23
Sept. 4.	Brazil, Ind.	Aug. 23
Sept. 4.	Montgomery, Pa. Adv. Aug. 16 and 23.	Aug. 23
Sept. 4.	Williamsport, Pa. Adv. Aug. 16 and 23	Aug. 16
Sept. 4.	Olympia, Wash.	Aug. 23
Sept. 6.	Hiawatha, Kan.	Aug. 23
Sept. 6.	Duluth, Minn.	Aug. 23
Sept. 10.	Omaha, Neb.	Aug. 23
Sept. 10.	Akron, O.	Aug. 23
Sept. 11.	Bradentown, Fla.	Aug. 16

STREETS AND ROADS

Aug. 24.	Pennsylvania	Aug. 9
Aug. 24.	Uniontown, Pa.	Aug. 9
Aug. 24.	Lancaster, O.	Aug. 16
Aug. 25.	Indiana	Aug. 16
Aug. 25.	Morrison, Ill.	Aug. 23
Aug. 27.	California	Aug. 16
Aug. 27.	Indiana	Aug. 16
Aug. 27.	Newark, N. J.	Aug. 2
Aug. 27.	Portland, Me.	Aug. 9
Aug. 27.	New Brunswick, N. J.	Aug. 16
Aug. 27.	Elizabeth, N. J.	Aug. 16
Aug. 27.	Little Falls, N. J.	Aug. 16
Aug. 27.	Los Angeles, Cal.	Aug. 16
Aug. 27.	St. Paul, Minn.	Aug. 16
Aug. 27.	Tecumseh, Okla.	Aug. 23
Aug. 27.	Vancouver, Wash.	Aug. 23
Aug. 27.	East Dubuque, Ill.	Aug. 23
Aug. 28.	Weehawken, N. J.	Aug. 23
Aug. 28.	Farmville, Va.	Aug. 16
Aug. 28.	Massachusetts	Aug. 23
Aug. 29.	Springfield, Ill.	Aug. 23
Aug. 29.	Cleveland, O.	Aug. 23
Aug. 29.	Newark, N. J.	Aug. 23
Aug. 29.	Bridgeton, N. J.	Aug. 23
Aug. 30.	New Brunswick, N. J.	Aug. 16
Aug. 30.	Oklahoma, Okla.	Aug. 9
Aug. 30.	Indiana	Aug. 16
Aug. 30.	Kingsport, Tenn.	Aug. 16
Aug. 30.	Pennsylvania Adv. Aug. 16.	Aug. 16
Aug. 30.	Louisiana	Aug. 23
Aug. 30.	Santa Barbara, Cal.	Aug. 23
Aug. 30.	Indiana	Aug. 23
Aug. 31.	East Rutherford, N. J. (Rutherford, P. O.)	Aug. 23
Sept. 1.	Greenville, Miss.	Aug. 23
Sept. 1.	Greenfield, Ind.	Aug. 23
Sept. 1.	Scottsboro, Ala.	Aug. 16
Sept. 3.	Greenfield, O.	Aug. 23
Sept. 3.	Indiana	Aug. 23
Sept. 4.	Canton, Ill.	Aug. 23
Sept. 4.	California	Aug. 23
Sept. 4.	Maryland	Aug. 23
Sept. 4.	Indiana	Aug. 23
Sept. 4.	Seattle, Wash.	Aug. 23
Sept. 4.	Pittsburgh, Pa.	Aug. 16
Sept. 4.	Columbus, O.	Aug. 16
Sept. 4.	New Brunswick, N. J.	Aug. 16
Sept. 4.	Yazoo City, Miss.	Aug. 16
Sept. 4.	Pennsylvania Adv. Aug. 16 and 23.	Aug. 23
Sept. 4.	Toms River, N. J.	Aug. 23
Sept. 4.	Linden, N. J.	Aug. 23
Sept. 5.	Freehold, N. J.	Aug. 23
Sept. 5.	Indiana	Aug. 23
Sept. 6.	Indiana	Aug. 23
Sept. 6.	Muscatine, Ia.	Aug. 23
Sept. 7.	Indiana	Aug. 23
Sept. 19.	Seattle, Wash.	Aug. 23
Sept. 18.	Hohenwald, Tenn.	Aug. 23

RAILWAYS

Aug. 30.	Pennsylvania Adv. Aug. 16.	Aug. 16

EXCAVATION AND DREDGING

Aug. 27.	Benson, Minn.	Aug. 23
Aug. 28.	Winston-Salem, N. C.	Aug. 16
Aug. 28.	Madison, S. D.	Aug. 9
Aug. 30.	Calhoun, Ky.	Aug. 23
Aug. 30.	Detroit, Minn.	Aug. 16
Aug. 30.	Tallahassee, Fla.	Aug. 16
Aug. 31.	Willmar, Minn.	Aug. 23
Oct. 2.	St. Cloud, Minn.	Aug. 2
Sept. 6.	Thomson, Ill. Adv. Aug. 16 and 23.	Aug. 23
Sept. 8.	Madison, Minn.	Aug. 23
Sept. 12.	New Orleans, La.	Aug. 16

INDUSTRIAL WORKS

Aug. 31.	Seattle, Wash.	Aug. 16
Sept. 4.	Columbus, O.	Aug. 16

BUILDINGS

Aug. 28.	Detroit, Mich.	Aug. 2
Aug. 28.	Duke, Ia.	Aug. 16
Aug. 28.	Hudson, Wis.	Aug. 16
Aug. 28.	Columbia, S. C.	Aug. 23
Aug. 28.	Faribault, Minn.	Aug. 23
Aug. 31.	Rochester, N. Y.	Aug. 23
Aug. 30.	Conde, S. D.	Aug. 16
Aug. 30.	Columbus, O.	Aug. 16
Aug. 30.	London, O.	Aug. 16
Sept. 1.	Lincoln, Neb.	Aug. 16
Sept. 1.	Elmira, N. Y.	Aug. 9
Sept. 1.	Milwaukee, Wis.	Aug. 9
Sept. 4.	Lakewood, O.	Aug. 16
Sept. 4.	Detroit, Mich.	Aug. 23
Sept. 4.	Columbus, O.	Aug. 23
Sept. 5.	Englewood, N. J.	Aug. 23
Sept. 5.	Kent, O.	Aug. 23
Sept. 5.	Newton, Ia.	Aug. 16
Sept. 5.	Brooklyn, N. Y.	Aug. 16
Sept. 7.	Albany, N. Y. Adv. Aug. 16 and 23.	Aug. 23
Sept. 15.	Oklahoma, Okla.	Aug. 16
Sept. 15.	Spirit Lake, Ia.	Aug. 9

FEDERAL GOVERNMENT WORK

Aug. 25.	Charleston, S. C.	Aug. 9
Aug. 27.	Hingham, Mass.	Aug. 9
Aug. 27.	Washington, D. C.	Aug. 9
Aug. 27.	Philadelphia, Pa.	Aug. 16
Aug. 27.	Detroit, Mich.	Aug. 23
Aug. 27.	Norfolk, Va.	Aug. 23
Aug. 27.	Washington, D. C.	Aug. 23
Aug. 28.	Mare Island, Cal.	Aug. 23
Aug. 28.	Detroit, Mich.	Aug. 2
Aug. 29.	Glenwood Springs, Colo.	Aug. 9
Aug. 30.	Franklin, Pa. Adv. July 26 and Aug. 2.	July 26
Aug. 31.	San Pedro, Cal.	Aug. 16
Sept. 3.	Kuahua, T. H.	Aug. 9
Sept. 4.	McKees Rock, Pa.	Aug. 9
Sept. 4.	Detroit, Mich. Adv. Aug. 9 to 23.	Aug. 9
Sept. 5.	Torrington, Wyo. Adv. July 26.	July 26
Sept. 5.	Washington, Ga.	Aug. 2
Sept. 5.	San Francisco, Cal. Adv. Aug. 9 to 23.	Aug. 9
Sept. 5.	Washington, D. C. Adv. Aug. 16.	Aug. 16
Sept. 6.	Forsyth, Ga.	Aug. 2
Sept. 12.	Raton, N. M.	Aug. 23
Sept. 12.	Long Island City, N. Y.	Aug. 9
Sept. 21.	Kendallville, Ind. Adv. Aug. 16 and 23.	Aug. 16

MISCELLANEOUS

Sept. 4	Levee Work—New Orleans, La.	Aug. 23
Sept. 4	Dam—San Diego, Cal.	Aug. 23
Sept. 5	Shaft—New York, N. Y.	Aug. 23
Sept. 6	Pumping Machinery—Brockton, Mass.	Aug. 16

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official.

WATER-WORKS

Proposed Work

N. J., New Brunswick—City expects to install 4,000 water meters. About $40,000. Address E. B. Partington, mayor.

Water-Works (Continued)

Pa., Ambridge—Boro. Council passed ordinance Aug. 6 for securing land to improve and enlarge waterworks. Ambridge boro. L. C. Beail, pres.

Pa., Lewiston — Lewiston-Reedsville Water Co. plans to develop additional source of water supply from Lingle Run, and to treat the same. S. W. Cooper, city supt.

Pa., Meshoppen—City plans to improve waterworks system. A. H. Sterling, city supt.

Pa., Mt. Joy—Boro. election soon to vote on $30,000 bond issue to build filtration plant and improve water-works system. R. Fellenbaum, clk.

Pa., Pottsville—Silver Creek Water Co. plans to extend distributing system, Blythe Twp., Schuylkill Co. W. D. Pollard, gen. mgr.

Md., Takoma Park—Maryland State Bd. Health plans to build hypochlorite plant here.

N. C., Belmont—See "Sewers."

Ga., Tallulah—See "Industrial Works."

O., Cuyahoga Falls—City to sell $25,000 bonds to improve water-works system. L. F. Cook, city supt.

O., Dayton—(Official)—City to sell $280,000 bonds, Sept. 20, to extend water-works system. H. Collins, city supt.

Neb., Pawnee—City sold $10,000 bonds to build water-works extension. T. H. Lawrie, city supt.

Mont., Geraldine—City plans to purchase and improve Windmill Spring Water Co. plant and lease Rattlesnake Springs. About $15,000, exclusive of improvements.

Tex., Mineral Wells—City lets contract about Oct. 1, building spillway filters, pipe line, and dam for water-works system.

Tex., Throckmorton—City having plans prepared by E. Eisel, engr. Interurban Bldg., Dallas, building water-works system.

Okla., Coyle—Council passed ordinance authorizing $13,000 bond issue to improve waterworks system.

Okla., Cushing—City having plans prepared improving water-works system, including dam and wells.

Okla., Dewar — City election voted on $_____ bond issue for waterworks.

Okla., Lawton—City plans to extend water-works system. About $275,000. Bonds voted J. M. Haynes, secy. bd. comrs. W. W. Sager, city supt.

Okla., Miami—City having plans prepared improving waterworks system. A. L. Savage, city supt.

Okla., Oklahoma—City plans to spend $10,000 to connect city water mains with 3 privately owned wells. J. W. Bennett, supt.

Okla., Okmulgee — (Official) — City defeated bonds to build water-works system. H. H. Jenkins, mayor. Noted July 5.

Okla., Poteau—City soon lets contract, waterworks extension involving 100,000-gal. reservoir, standpipe, filtration plant and 10-in. main. About $75,000. C. M. Hagwell, mayor.

Okla., Ryan—City voted $16,000 bonds to extend water-works system.

Okla., Shamrock—City voted $40,000 bonds to build water-works system. Noted Aug. 6.

Okla., Woodward—City election Sept. 1 to vote on $40,000 bond issue to improve waterworks, electric light and sewerage system. F. H. Wilburn, city supt.

Idaho, Idaho Falls—Council passed ordinance to issue $81,000 bonds to improve water-works system, light and pave street intersections.

Utah, Vernal—City sold $35,000 bonds to build water-works system. F. Hatch, supt.

Que., Levis—City council authorized $15,000 bond issue to build water-works and drainage system in Villeray Ward. L. Lemieux, clk. F. Lemieux, supt.

BIDS DESIRED

N. J., Little Falls—(Official)—Until Aug. 27, by City, building pumping station. E. A. Stanley, supt. H. J. Harder, 140 Market St., Paterson, engr.

O., Cleveland—(Official)—Until Aug. 30, by City, building foundation 30,000,000 gal. De Laval centrifugal pump, auxiliaries, etc., and building structural steel platform around same, at Division Ave. pumping station. R. Hoffman, city engr. C. F. Schwartz, city supt.

Minn., Ogilvie—(Official)—Until Aug. 30, by Village, building water-works and sanitary sewerage system, including 8150-ft. of from 8- to 15-in. vitr. sewer tile 4- to 19-ft. deep together with sewage disposal plant, sludge bed and 2400-ft. of from 6- to 8-in. c.i. B. & S. water pipe, steel tower, tank, etc., optional bids wood stave pipe and compressed air system. J. F. Druar, 314 Commercial Bldg., St. Paul. Noted July 12.

Minn., Wolverton—Until Sept. 6, by H. C. Ellis, city clk., building water-works and sewerage systems.

Mo., Kansas City—Until Sept. 12, by W. C. Weaver, purch. agt., building 20,000,000-gal. centrifugal pump. B. Lowther, ch. engr. Noted Apr. 19.

Mo., Monett—(Official)—Until Aug. 29, by J. Johnson, city clk. building 1,000,000-gal. rein.-con reservoir. Noted Aug. 9.

Colo., Otis—Until Aug. 27, by Town Clk., building water-works system, including deep well, wrought-iron water pipe, castings, tees, elevated tank and tower, 25,000-gal., etc. R. D. Salisbury, 1415 East Colfax Ave., Denver, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Conn., Hartford**—Bd. Water Comrs. let contract laying c.i. water pipe in city proper to F. B. & W. H. O'Neil 324 Maple Ave., and A. C. Sternberg, Park and Mountain Rd., $30,186; laying mains in Wast Hartford, $220,765. Noted May. 3.

★**Ga., Savannah**—See "Sewers."

★**Wis., Portage**—City let contract water-works system, including reservoir, 460,000 gal. pumping station, piping filtration plant to Cast Stone Constr. Co., Eau Claire, $80,-000. Noted June 7.

★**Kan., La Crosse** — City let contract water-works improvement including laying of pipe to Connor Constr. Co., Kansas City, Mo. Noted June 28.

★**Kan., Oswatomie** — City let contract water-works improvements, including 130-hp. boiler, 200 k.v.a. unit pumps to Merkle Heins Machinery Co., 508 Interstate Bldg., Kansas City, Mo., $21,100.

★**N. D., Goodrich**—Village let contract steel tower and water mains to Robinson & Ward, Grand Forks, $25,000. Noted Aug. 9.

★**Okla., Ada.**—City let contract 500,000 gal. tank to Chicago Bridge & Iron Wks., 37 West Van Buren St., Chicago, $34,000; rein.-con. flume to Independent Concrete Pipe Co., 1201 State Life Bldg., Indianapolis, $24,200. Noted July 26.

★**Cal., Menlo Park**—City let contract furnishing wood-stave pipe for Camp Fremont to Redwood Mfg. Co., Hobart Bldg., San Francisco, $10,000.

SEWERS

Proposed Work

N. Y., Rochester—See "Streets and Roads."

N. Y., Syracuse—City rejected bids building sewers in Grand Ave. and South Salino St. H. C. Allen, city engr. Noted Apr. 12.

N. J., Asbury Park—City Comn. plans to rebuild sewerage system. About $19,-000. H. B. White, clk. R. Bartley, Jr., city supt.

N. J., Bayonne—Bd. Comrs. plans to build sewers in East 23rd St. W. Clarkson, city engr.

N. J., Fanwood—City deferred plans to build sewerage system because of high cost of material and scarcity of labor. Noted May 17.

N. J., Newark—Bd. St. & Water Comrs. plans to build sewer portions Sandford Ave. and Mountain View Pl. M. R. Sherrard, city engr.

N. J., North Arlington—(Arlington P. O.)—State Bd. Health approved plans to build sewers in eastern section. Aspd. F. F. Bowe, Rutherford, engr.

N. J., North Bergen—Twp. Com. soon lets contract sewerage system and sewage disposal plant. R. Gaw, engr.

N. J., Pleasantville—City Council plans installing sewer system. About $150,000. Address City Clk.

N. J., Trenton—City plans to build sewers in North Walter Ave. and Lombard and Cromwell alleys. A. G. Howell, clk.

N. J., Washington—Town plans enlarging sewage disposal plant including additional septic tanks and enlarging sludge beds. About $12,000. Clyde Potts, 30 Church St., New York City, engr.

Pa., Allentown—City had plans prepared building sewerage system and sewage disposal plant. About $2,000,000. W. H. Innis, Phila., supt. constr. C. D. Weisbach, city engr. Noted May 3.

Pa., Brookville—City had plans prepared building sanitary sewerage system.

Pa., Corapolis—State Health Dept. approved plans building sanitary sewerage system and sewage disposal treatment plant. Edeburn, Cooper & Co., city engrs.

Pa., Fayette City—City having plans prepared building sanitary sewer extensions and sewage treatment plant.

Pa., Johnstown—State Health Dept. approved plans main, intercepting and lateral sewers and sewage treatment plant. J. R. Crassey, city engr.

Pa., Latrobe—City plans to build sewage disposal plant and extend sanitary sewage system. D. Jones, city engr.

Pa., Lower Providence—Eagleville Sanatorium for Consumptives plans to build sewerage system and sewage treatment works at institution.

Pa., Norristown — Allan Wood, Iron & Steel Co., plans to build sewerage system and sewage treatment plant, Ivy Rock plant, Plymouth Twp., Montgomery Co.

Pa., Phila. — Council passed ordinance building Rock Run Main Sewer, portions Old York Rd., 15th St., 66th Ave., 18th St. and 67th Ave., North; building relief sewer 29th St. Wingohocking sewer and Wissahickton high level intercepting sewer. C. Albright, city engr.

N. C., Belmont—Town issued $20,000 bonds to build sewerage system; also plans to build water-works system.

N. C., Southport—City plans to build sewerage system. About $12,000.

O., Akron—Council passed ordinance for improving portion Brookside St., including grading, curbing, building sidewalks, sewer laterals and water service connections. S. J. Cole, city clk.

O., Celina—(Official)—Village to sell $14,000 bonds, Sept. 12, to build East Side storm sewer. J. M. Wimter, village clk.

O., Cincinnati—Council passed ordinance to issue $920,000 bonds to build Milcreek trunk sewer and sewers in Madison, Westwood, Clifton, Avondale and other districts. F. Krug, city engr.

Mich., Bessemer—City election, Aug. 27, to vote on $50,000 bond issue to build sewers.

Mich., Menominee — City rejected bid, storm sewer. T. R. Hasley, city engr. Noted June 28.

Wis., Fond du Lac—City plans to build sanitary sewer, portions McWilliams, East Scott, Brooke, Griffith and Ruggles Sts. J. S. McCullough, city engr.

Wis., Milwaukee—Sewerage Comn. soon lets contract building power plant and activated sludge sewage disposal plant on Jones Island. About $800,000. J. H. Fowles, secy.

Ia., Marshalltown—City plans to build sanitary sewerage system. W. H. Steiner, city engr.

Minn., Caledonia — City rejected bids building 18,000 ft., 8- to 18-in. sewer, and sewage disposal plant. Noted July 26.

Kan., Wichita—City plans to build sanitary sewer No. 20, 5-mi. long from northern to southern end of city. About $250,000. B. C. Wells, city engr.

Neb., Oakland—City election Aug. 28 to vote on $35,000 bond issue to build sewerage system. R. Johnson, city clk.

Sewers (Continued)

Neb., Omaha—City Comrs. passed ordinance, $20,000 bond issue, for sewers. J. A. Bruce, city engr.

Neb., Ponca—City having plans prepared by C. Morriarity, engr., 600 United Bank Bldg., Sioux City, Ia., building sanitary sewerage system, including 2- or 3-mi. clay or concrete pipe, 8- to 12-in. H. H. Hart, mayor.

Mont., Bridger—City election soon to vote on bond issue to build sewerage system.

Mo., Springfield — See "Streets and Roads."

Ark., Dardanelle—Comrs. Sewer Dist. No. 1 rejected bids 7½ mi. vitr. pipe sewer 6- to 30-in. diam. Noted July 26.

Okla., Woodward—See "Waterworks."

Cal., Los Angeles—City election, Sept. 5, to vote on $150,000 bond issue to build sewers in Dist. No. 6. A. C. Hansen, city engr.

Cal., San Diego—(Official)—City soon lets contract storm drain in portion 6th St., about $21,292; paving, building sidewalk and curb on portion National Ave., about $37,013. Noted July 26.

Ont., Burlington—City having plans prepared new sewers, by P. Dawson, engr. About $50,000.

Ont., Parry Sound—City had plans prepared sewerage system.

Ont., St. Catharines—City plans to build sewer in portions Frazer St. W. P. Near, city engr.

B. C., South Vancouver—Joint Sewerage Bd. plans building sewer, 1 mi. Manitoba St.

BIDS DESIRED

N. Y., Long Island City—Until Aug. 29, by M. M. Connolly, boro. pres., for sewers and appurtenances in portions of Anthon, Buchman, Fillmore and Junction Aves., Sackett, Glasser and Chicago Sts., 2nd Ward; Forbes St., 3rd Ward; Guion, Woodhaven, Metropolitan and Myrtle Aves. and North Villa and North Wickes Sts. and Fulton Pl., 4th Ward.

N. Y., New York—(Official)—Until Aug. 28, by M. M. Marks, boro. pres., improving and extending sewer in portions of 91st St., building receiving basins on 5th Ave., northwest corner 29th St., and alterations and improvements to basins with inlets northwest corner 27th St. and 4 other points; southwest corner 44th St.; northwest corner 162nd St. and Ft. Washington Ave., and northeast corner Bway. and 121st St.

N. J., Newark—Until Aug. 28, by Passaic Valley Sewerage Comn., Essex Bldg., building superstructure Bayonne Shaft, part Sect. No. 3, including timber fence and wrought iron piping, c.i. filled plates etc.

O., Cleveland Heights—Warrensville P. O.)—Until Sept. 6, by Town, building sewers and water curbs connections in 15 streets. F. A. Pease Eng. Co., 804 Marshall Bldg., Cleveland, engrs

O., Girard—(Official)—Until Aug. 25 by H. E. Rees, village clk., building sewers and house connections in part Sewer Dist. No. 1 portions Olive St. Sewer Dist. No. 3, extension Maple Ave. W. Wilson, Youngstown, village engr.

O., Mingo Junction — (Official) — Until Sept. 1, by G. E. Fithen, village clk., building sewers in Clifton and McListee Aves. and grading Garfield Ave.

O., Oberlin—(Official)—Until Aug. 28 by W. A. Hart, village clk., building storm sewers in Dists. Nos. 1, 2, 4, 5, 6, 7 and 3.

O., Rocky River—(Official)—Until Sept. 4, by F. Mitchell, city clk., constructing sewers, sewage disposal plant, flushing tunnels, etc. E. Hamold, city engr. Noted Aug. 9.

Minn., Dodge Center — (Official) — Until Sept. 4, by village, building sanitary sewerage system, including 23,000 ft. 8- to 18-in. sewer tile together with sewage disposal plant. J. F. Druar, 314 Commercial Bldg., St. Paul, const. engr. Noted Aug. 16

Minn., Ogilvie—See "Water-Works."

Minn., Wolverton—See "Water-Works."

Cal., Santa Barbara—See "Streets and Roads."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Conn., New Haven—City let contract building sewerage system, Prospect Beach Sect. to Acme Eng. Co., Hartford, $80,000.

★N. Y., Syracuse—City let contract Sect B, 17th Ward sewer to T. C. Hookway Constr. Co., 106 Barnstable Blk., $11,800.

★Pa., Phila.—City let contract building Northeast sewage disposal plant, Wheatsheaf Lane, east of Richmond St. to Phila. Subway Constr. Co., $919,070.

★Md., Hagerstown—Sewerage Comn. let contract building main and lateral sewers, 22,500 lin.ft., 2000 ft. sanitary sewers, 8-, 27-in. diam. together with manholes and appurtenances to H. C. Brooks Constr. Co., Martinsburg, W. Va. Noted July 12.

★Ga., Savannah—(Official)—Port Wentworth Terminal Corp., 6 Bway. New York City, let contract sewers, roads, waterworks, and cottages to Terry & Tench, Grand Central Terminal, New York City, $600,000. Noted Aug. 16.

★Tenn., Maryville — City let contract building 12 mi. sanitary sewers, 8- to 15-in. to J. R. Sutherlin Constr. Co., 819 Commerce Bldg., Kansas City, Mo. $70,000 bond issue authorized. Noted May 24.

★O., Cleveland—Bd. Control let contract installing sewer in portion of Euclid Ave. to D. Zullo, 10501 Hudson Ave., $16,543.

O., Lebanon—(Official)—Village received low bids building auxiliary sanitary sewerage system, from W. H. Boyd, 123 Grafton Ave., Dayton, and C. H. Martin, Middletown. Noted July 26

★O., Piqua—(Official)—City let contract building Northwest storm sewer to Shamron & Ziegler, Piqua. Noted Aug. 2.

Mich., Menominee—City received low bid building 6000 lin.ft. sewer, from Carlin & Magnus, Marienette, $16,600.

★Ia., Merrill—City let contract building sewerage system to Moore-Seig Constr. Co., Waterloo, $14,632.

★Ia., Sioux City—City let contract laying sanitary sewer from 34th and Jones St. to 24th and Geneva Sts. to W. B. Carter, Sioux City, $12,000

★Minn., Atwater—City let contract sewerage system including 21,000 ft. of from 8- to 15-in. sewer pipe to E. T. Webster, St. Paul, $29,866. Noted July 12.

★Neb., Norfolk—City let contract sewer extension to G. Vlasnik, 624 North 32nd St., Lincoln.

★Mont., Butte—See "Streets and Roads."

★Tex., Dallas—Sewerage Comn. let contract sewage disposal plant to Cabell M. Kelly, Dallas. About $30,000. Noted May 17.

★Tex., San Antonio—City let contract sewage pumping plant, Sherman St., to be used in connection with Camp Kelly to McKenzie Constr. Co., San Antonio. About $30,000 Noted Aug. 9

★Ariz., Douglas—City let contract sewerage system to M. F. Dicus, Douglas, $46,000. Noted June 7.

Wash., Seattle—(Official)—City lets contract about Nov. 15th, for sewers in 43rd Ave., N. E. About $15,845. A. H. Dimock, city engr. Noted Aug. 9

★N. S., Halifax—City let contract sewer extensions to Cook Constr. Co., 335 Queenpool St., $145,000 Noted Aug. 16

★N. S., New Waterford—See "Streets and Roads."

BRIDGES

Proposed Work

Conn., Waterbury—City rejected bids rein.-con. bridge over Naugatuck River on West Main St. About $75,000. E. A. Cairns, city engr. Noted Aug. 9

Wis., Prairie Du Chien—Prairie Du Chien & Wyalusing Bridge Co. soon let contract building 700 ft. rein.-con. toll bridge over Wisconsin River. About $80,000. J. H. Brandt, St. Paul, and Reynolds, Minn., engr. Noted July 11

Kan., Junction City — See "Streets and Roads."

Mo., Benton—See "Streets and Roads."

Mo., Platte City — See "Streets and Roads."

Mo., St. Louis—City election Aug. 8 to vote on $500,000 bonds to build approaches to free bridges. Also $500,000 to build bridges, viaducts and streets. M. E. Willett, city

Okla., Claremore — Rodgers Co. Comrs. plan to build bridges as follows: Over Verdigris River, north of Sageeyah, cost, $20,000; over Dog Creek, northeast Claremore, $1200; over Spencer Creek, Chelsea Twp., $1200.

Okla., Enid—Garfield Co. plans building 30 new bridges and culverts. About $60,000.

Wash., Spokane—A. R. Scott, Spokane Co. engr., preparing plans for steel bridge over Spokane River, near Greenacres. About $25,000. Noted Apr. 19.

Cal., Porterville—City plans election to vote on $30,000 bonds to build bridges over Porter slough.

Cal., Woodland—Bd. Supervs. Yolo Co. plan to build bridges at Madison and Yolo. About $70,000.

BIDS DESIRED

Pa., Montgomery—(Official)—Until Sept. 4, by Comrs. Lycoming Co., rein.-con. bridge over west branch Susquehanna River on 2nd St.; advertised in this issue.

Pa., Reading—(Official)—Until Aug. 27, by W. H. Dechant & Sons, engrs., Baer Bldg., building bridge over Schuylkill River for Carpenter Steel Co. Noted Aug. 9.

Pa., Williamsport—Until Sept. 4, by Lycoming Co. Comrs. building bridges on Newberry-Duboistown and Montgomery Rds. About $400,000. M. C. Krouse, engr. Noted Apr. 19.

S. C., Camden—Until Aug. 27, by Kershaw Co. building bridge over Wateree River. Frink & Pinner, Norfolk, engr.

O., Akron—(Official)—Until Sept. 10 by Summit Co. Comrs. building North Hill Viaduct, rein.-con.; advertised in this issue. Specifications on file at this office.

Ind., Brazil—Until Sept. 4, by Bd. Comrs. Clay Co., building Carter and Wolfe Bridges.

Ind., Indianapolis—(Official)—Until Aug. 27, by Bd. Pub. Wks., for steel girder bridge across canal on 14th St. J. A. Rink, pres. B. J. T. Jeup, city engr.

Ind., Sullivan—Until Sept. 3, Bd. Comrs. Sullivan Co., building F. M. Nead bridge, rein.-con., in Jackson Twp., Lane bridge, rein.-con., in Jefferson Twp.

Minn., Duluth—Until Sept. 6, by St. Louis Co., for rein.-con. bridge over Amity Creek on East Duluth & Lester River Rd. O. Halden, co. aud.

Kan., Hiawatha—Until Sept. 6, by Brown Co. building 4 rein.-con. bridges. F. Wilcomb, clk.

Neb., Omaha—Until Sept. 10 by County Co. for constructing and repairing bridges during year. F. Dawson, clk.

Mo., St. Louis—(Official)—Until Aug. 28 by city building rein.-con. bridge over Broadway at Bellerive Park.

Okla., Pawnee—Until Aug. 28 by Pawnee Co. for 8 steel bridges. J. D. Scoby, clk.

Okla., Tecumseh—See "Streets and Roads."

Wash., Olympia—(Official)—Until Sept. 4 by city building 415-ft. 3 span reinforced bridge over Deschutes River. Lift span, 90-ft. radius. About $100,000. Noted Aug. 9.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Conn., Hartford—Bd. Comrs. of Hartford let contract rein.-con. bridge with reinforcing embedded Park River on Pavonia St. to Fred S. Miller, Norwich. About $11,000. Noted Aug. 16

★N. Y., Buffalo—See "Industrial Works."

★W. Va., Spencer—(Official)—Contract for contract & bridges in Walton Dist., Roane Co., to Logan Bridge Co., Point, Pa., $11,[illegible]. Noted July 11

★Fla., Fort Myers—See "Streets and Roads."

★Fla., West Palm Beach—Palm Beach Co. let contract building bridge over Lake Worth to C. F. Gunther, Chicago, Ill., including Lake Ridge, Jacksonville, $41,[illegible]. Noted June 11

★La., Crowley—Acadia Co. let contract building bridges in Crowley Paving & Cement Co., Crowley, $25,000.

★Iron Mountain City—See "Streets and Roads."

Bridges (Continued)

Ohio, Cleveland—Cuyahoga Co. received low bid bridge work per report No. 4048 from H. N. Henderson, Chagrin Falls, at $58,000.

O., Lima—City received low bids (a) 2 bridges over Ottawa River, (b) addition to arches on Collett St. bridge, from Natl. Concrete Co., 825 Lemcke Bldg., Indianapolis, (a) $29,750 and $27,250, (b) $15,250; G. C. Hardin, Sidney, (a) $32,548 and $30,533, (b) $16,114; Welty Constr. Co., (b) $15,995.

★**Ind., Brazil** — (Official) — Comrs. Clay Co. let contract Brunswick Bridge over Eel River to Natl. Concrete Co., Indianapolis, $34,960. Noted July 12.

★**Ind., Columbus** — City let contract building 150-ft. rein.-con. bridge to Natl. Concrete Co., 825 Lemcke Bldg., Indianapolis, $21,147.

★**Mich., St. Joseph**—Berrien Co. let contract 19 steel bridges across Dowagiac River drain to Frank A. Stryker.

★**Ill., Cadwell**—Drainage—Comrs. Cadwell D.D. let contract for open ditch involving 45,000 cu.yd. excava. to J. McMann, Goshen. Noted July 26.

★**Wis., Superior**—Great Lakes Coal and Dock Co. let contract building new coal handling bridge, involving 350 tons steel to Mead, Morrison Co., Pittsburgh.

★**Ia., Atlantic**—Cass Co. let contract building bridges to G. Henningson, Red Oak, $13,000.

★**Ia., Maquoketa**—Jackson Co. let contract building and repairing rein.-con. bridges to Internation Bridge Co., Evansville and Anderson & Son, Maquoketa, $26,313 and $18,790 respectively. Noted July 26.

★**Ia., Tipton**—(Official)—Cedar Co. let contract building 35 rein.-con. culverts and 1 I-beam bridge to S. R. Johnston, Tipton and R. W. Hogan, Downey, $17,152. Noted Aug. 9.

★**Minn., Thief River Falls**—Pennington Co. let contract bridge over Redlake River at High Landing to Minneapolis Bridge Co., 728 Metropolitan Life Bldg., Minneapolis, $15,800.

★**Minn., Warren** — (Official) — Marshall Co. let contract 4 highway bridges and 2 rein.-con. culverts to Minneapolis Bridge Co., 728 Metropolitan Life Bldg., Minneapolis, $14,182. Noted Aug. 9.

★**Neb., Omaha**—Douglas Co. let contract building and repairing 27 bridges to Omaha Structural Iron Works, 420 Bee Bldg., $60,680. Noted May 10.

★**Neb., Tekamah** — (Official) — City let contract rein.-con. highway bridge to Pickus Eng. Constr. Co., 405 Davidson Bldg., Sioux City, Ia., $13,885. Noted Aug. 9.

Ore., Salem—State Highway Comn., let contract for 10 rein.-con. bridges over Beaver Creek, Columbia Co. to L. O. Herrold, 1227 Chemeketa, $25,959.

Cal., Fairfield — (Official) — Bd. Supervs. Solano Co. received low bids bascule bridge over Sacramento River from Tibbits Pacific Co., 16 California St., Duncanson-Harrelson Co., Crown Bldg., and Heafey-Tibbits Co., 9 Main St., all of San Francisco. Noted Aug. 9.

STRUCTURAL STEEL WORK

BIDS DESIRED

Pa., Reading — See "Bridges."

O., Cleveland — See "Waterworks."

Ind., Indianapolis — See "Bridges."

Okla., Pawnee — See "Bridges."

Neb., Omaha — See "Bridges."

Ohio, Cleveland — See "Bridges."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Wis., Superior** — See "Bridges."

★**Ind., Brazil** — See "Bridges."

★**Mich., St. Joseph** — See "Bridges."

★**Minn., Thief River Falls** — See "Bridges."

★**Minn., Warren** — See "Bridges."

★**N. D., Goodrich**—See "Waterworks."

Cal., Fairfield — See "Bridges."

REINFORCED CONCRETE

Proposed Work

Conn., Waterbury—See "Bridges."

Wis., Prairie Du Chien—See "Bridges."

BIDS DESIRED

Pa., Montgomery —See "Bridges."

O., Akron—See "Bridges."

Ind., Brazil—See "Bridges."

Ind., Sullivan—See "Bridges."

Minn., Duluth—See "Bridges."

Kan., Hiawatha—See "Bridges."

Mo., Monett—See "Water-Works."

Mo., St. Louis—See "Bridges."

Okla., Tecumseh—See "Streets and Roads."

Wash., Olympia—See "Bridges."

Cal., San Diego—See "Miscellaneous."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Conn., Hartford**—See "Bridges."

★**N. Y., Johnson City**—See "Industrial Works."

★**Pa., Allenport**—See "Miscellaneous."

★**W. Va., Spencer**—See "Bridges."

★**Fla., Fort Myers** — See "Streets and Roads."

★**Ind., Columbus**—See "Bridges."

★**Ia., Maquoketa**—See "Bridges."

★**Ia., Tipton**—See "Bridges."

★**Minn., Warren**—See "Bridges."

★**Kan., Great Bend** — Courthouse — See "Buildings."

★**Neb., Tekamah**—See "Bridges."

★**Tex., Houston**—See "Miscellaneous."

★**Okla., Ada**—See "Water-Works."

★**Ore., Salem**—See "Bridges."

★**Ont., Windsor**—See "Industrial Works."

STREETS AND ROADS

Proposed Work

N. Y., Buffalo—(Official)—A. C. Hinkley, clk. bd. supervs. Erie Co., received no bid building co. road No. 22, Glenwood-East Concord Part 1. Noted Aug. 2.

N. Y., Rochester—Council passed reading of first ordinance for local improvements as follows: Court. St. sewer, $3000; Ambrose St., brick pavement, $7600; Cliff St., brick, $3600; Smith St., asphalt resurfacing, $21,700; Driving Park Ave., asphalt resurfacing, $12,000; Penn St., asphalt, $15,000; Canal St., resurfacing, $14,000; portion Mt. Hope Ave., brick, $16,000; portion Chili Ave. from city line to Genosee Park Blvd., $56,000; Chili Ave. from Genosee Park Blvd. to Lincoln Ave., $23,000; Brockton St., asphalt pavement and sewer, $11,000; and Pavilion St., asphalt walks and sewer, $5200. Final ordinance for local improvements were as follows: Weener Park extension pavements, $9000; paving portion Jefferson Ave., $3600; Ravenwood Ave., grading and walks, $900; Custer St., grading and walks, $2300; Penhurst Ave., paving, $32,000.

N. J., Avon—Boro. soon lets contract paving Main St. Address J. Thompson, mayor. Noted Apr. 19.

N. J., Camden—City Council plans paving South 10th, Walnut and Grant Sts., sheet asphalt on concrete foundation. L. E. Farnham, city engr.

N. J., Newark Bd. St. and Water Comrs. plans paving Bay Ave., granite block, 20 ft. wide; Geneva St., asphalt, 1½-in. surface on 6-in. concrete foundation. A. L. Swain, clk.

Pennsylvania (Official) State Highway Dept., Harrisburg, rejected bids road work Foster Twp., McKean Co. Noted Aug. 9.

Pennsylvania—State Highway Comn., Harrisburg, rejected bids opened Aug. 7, road work in East Taylor and Jackson Twps., Cambria Co., Hanover Twp., Lehigh Co., Swatara Twp., Dauphin Co. and Abington Twp., Lackawanna Co. Noted Aug. 16.

Pa., Erie—Erie Co. Comrs. plan building 163 mi. roads. About $4,075,000. Address Co. Clk., Erie. Noted Apr. 12.

Pa., Pittsburgh — (Official) — Council passed ordinance widening portions Perchment St., and Otter Way. R. Swan, city engr.

Va., Lexington—Rockbridge Co., South River Dist., voted $35,000 bonds to improve roads.

Va., Newport News—City sold $100,000 bonds to pave streets and roads. Noted Aug. 2.

W. Va., New Martinsville — Wetzel Co. plans to build 2 roads from Marshall Co. line to Church Dist. line and from Tyler Co. line, Paden City, through Grant Dist. intersecting Harrison Co. road.

S. C., Greenville—Greenville Co. Comrs. appropriated $85,000 bonds to build roads.

Ga., Augusta—City plans paving several streets, permanent pavement. N. Wingfield, city engr.

Fla., Ocala—Road and Bridge Dist., Marion Co., voted $75,000 bond issue, hardening roads and building bridges.

Ala., Athens — City soon lets contract paving various streets. About $125,000.

Miss., Biloxi—City election Sept. 18 to vote on $40,000 bond issue to improve streets. Noted Aug. 16.

Miss., Okolona — Chickasaw Co. Bd. Supervs. plan to issue bonds to improve 3rd Supervs. Dist. W. A. Wilkinson, clk.

Louisiana—State Highway Dept., New Orleans, had plans prepared New Orleans-Hammond military highway. D. Buie, state highway engr.

La., New Orleans—City Council plans paving portions Franklin, Sayeso and Conti Blvds., Salcedo, Brugelles, Madrid and Paris Sts. W. J. Hardee, city engr.

Ky., Hopkinsville—City plans to improve Virginia St. to city limits. C. A. Cundiff, city engr.

O., Ashland—Council passed ordinance to improve portions West Sandusky St. R. H. Conn, city engr.

O., Bryan—City to sell $15,000 bonds Sept. 10 to improve Wilson, High and Union Sts. J. A. Neill, clk. Noted June 21.

O., Canton—Council passed ordinance to pave 4th Ave. W. E. Sarver, city engr.

O., Cincinnati—City passed ordinance to improve portion Central Ave., 3rd, Madison, Barker, Portmouth, Mapleleaf and Fairbanks Sts. also passed resolution to improve portion St. Lawrence, Weekling, Monteith and Bassett Sts. F. Krug, city engr.

O., Port Clinton—Ottawa Co. Comrs. sold $104,000 bonds to build roads. Noted July 12.

Ind., Laporte—Laporte Co. sold $16,000 bonds to build B. G. Nelson Rd., Center Twp.

Mich., Battle Creek—City plans to pave portion Hamblin and Rumely Aves., brick. E. N. Hunt, city engr.

Wis., Appleton—City had plans prepared widening Pearl St. hill and approach through Fox River Paper Co. mills. A. C. Remley, city engr.

Ia., Sioux City — City plans to pave Jones, Jennings, 39th, Douglas, Pierce, Nebraska and other streets, concrete. About $120,000. T. H. Johnson, city engr.

Minn., Wolford—Town to sell $16,000 bonds Aug. 27 to build roads and bridges. G. Bennett, clk.

Kan., Junction City—Geary Co. to spend $27,450 to build roads and $18,400 to build bridges.

Kan., Osborne—Council passed resolution paving 12 blocks. S. P. Crampton, clk.

Neb., Lincoln—City sold $30,670 bonds to pave various streets. A. Dobson, city engr.

N. D., Fargo—City soon lets contract paving portions 3rd Ave., not included in paving job No. 134, and 10th St.

Mont., Helena—City had plans prepared paving 12½ mi. streets. D. J. McLeod, city engr.

Mo., Benton—Benton Co. voted $750,000 bonds to build roads and bridges. Noted July 19.

Mo., Charleston—Mississippi Co. plans to build 50-mi. gravel roads. About $425,000 available. C. E. Swank, engr.

Mo., Jefferson City—City plans paving Harrison and Jackson Sts., vitr. brick. P. C. Hardin, city engr.

Mo., Platte City—Platte Co. election soon to vote on $20,000 bond issue to build roads and bridges in Parkville Special Rd. Dists.

Mo., St. Louis—See "Bridges."

Mo., Springfield—City plans to improve streets, including 2-mi. paving, 5000 ft. sidewalk, 17,200 ft. curbing, and 8 mi. sewers in east, northeast and southeast sections. About $80,000. O. D. Christman, city engr.

Streets and Roads (Continued)

Ark., Forrest City—St. Francis Co. sold $450,000 bonds to build roads, Dists. Nos. 1 and 2. Noted July 26.

Ark., Helena—Phillips Co. plans to build 200 mi. permanent highways.

Ark., Mt. Ida—Montgomery Co. plans to spend $13,176 to improve highways, Rd. Dist. No. 26.

Ark., Union—Town had plans prepared by State Highway Dept., Little Rock, 5 mi. gravel road northwest corner. About $16,-854.

Ark., Van Buren—Crawford Co. having plans prepared by Winters M. Dove, engrs., Ft. Smith, building highway from Van Buren to Washington Co. line, 42-mi., forming link in Arkansas, Jefferson highway.

Ark., Walnut Ridge—Lawrence Co., Walnut Ridge, sold $65,000 bonds to pave 13 mi. Egypt Highway and $31,000 for 6 mi. Portia Highway.

Tex., Amarillo—City plans paving 60,000 sq.yd. W. D. Howren, city engr.

Tex., Beaumont—City will spend $54,000 to resurface portions of College, Liberty, Orleans, Austin, Tevis, Park, Pearl, Calder, Laurel, Main, Walnut, Alamo, Bowie, Jefferson, Main, Cypress, Fannin, Forsyth and Ann Sts. C. L. Scherer, city engr.

Tex., Port Lavaca—County voted $75,000 bond issue building roads in Port Lavaca Rd. Dist. Noted July 26.

Tex., Wichita Falls—Wichita Co. making surveys for road improvements. About $750,000. J. B. Crockett, co. engr. Noted June 14.

Okla., Enid—Comrs. Garfield Co. plan improving roads. About $100,000.

Okla., Tishomingo—Johnston Co., Garner Twp., plans to issue $30,000 bonds to improve roads. Address Co. Comrs.

Idaho—State, counties and Government voted $100,000 bonds to commence building road through state from Phoenix, Ariz., to Canadian boundary, North and South Highway.

Idaho, Bonners Ferry—Boundary Co. voted $70,000 bond issue for highway work.

Idaho, Idaho Falls—See "Water-Works."

Oregon—State Highway Comn., Salem, soon receives bids paving 33 mi. highway, including grading and macadamizing 3 mi. from Comstock to northern Douglas Co. line, eliminating Rice Hill Canyon Creek Canyon grading and macadamizing Cow Creek Rd., with coöperation of Federal Government, state and county. About $400,000.

Ore., Myrtle—City rejected bids paving portions 1st St. New bids. Noted Aug. 16.

Ore., Toledo—Lincoln Co. election soon to vote on bond issue to improve 100-mi. highway.

Cal., Crescent City—Del Norte Co. election soon to vote on $200,000 bond issue to improve highway from here to Grant's Pass.

Cal., Dinuba—City preparing plans paving portion Tulare, South 1 and North L Sts. A. Sloan, city engr.

Cal., Los Angeles — City council plans paving and widening portion West 1st St. A. C. Hausen, city engr.

Cal., Riverside—(Official)—Bd. Supervs. Riverside Co., formed Rd. Imp. Dist. No. 2 and plans to build 34 mi. road in Palo Verde Valley. R. W. Waterman, Blythe, engr. in charge.

Cal., San Diego—See "Sewers."

BIDS DESIRED

Massachusetts—Until Aug. 28, by State Highway Comn., Boston, building 4400 ft. state highway in Kingston.

N. J., Bridgeton—Until Aug. 29 by Bd. Freeholders, Cumberland Co., resurfacing gravel of Shiloh Pike, 3.45 mi. E. C. Ott, chn. road comn.

N. J., East Rutherford—(Rutherford P. O.)—Until Aug. 31 by Commrs. Council, paving Park Ave., granite block. W. W. Patrick, boro. clk.

N. J., Freehold—Until Sept. 5 by Bd. Freeholders Monmouth Co. reconstructing Freehold Rd., 1st section, 14,667 sq.yd. paving; building Holmdel Rd., rein.-con. G. D. Cooper, Red Bank, co. engr.

N. J., Linden—Until Sept. 4, by Twp. Com., improving Meacham Ave., Dennis Pl., Price St. and Elizabeth Ave., 5-in. macadam. About 5560 sq.ft. J. L. Bonar, Elizabeth, twp. engr.

N. J., Newark—Until Aug. 29, by City Comn. paving South 16th St., telford. M. R. Sherrard, city engr. Noted July 26.

N. J., Rutherford—Until Aug. 31, by Council, sidewalks, cement and concrete, Orient and Rutherford Aves., paving Washington Ave. and Sylvan St., wood, Edgewood Pl., concrete curb and gutters. F. A. Stedman, boro. clk. R. M. Watson, boro. engr.

N. J., Toms River—Until Sept. 4, by Bd. Freeholders Ocean Co., reconstructing 1 mi. road, 20 ft. wide. H. C. Shinn, Lakewood, co. engr.

N. J., Weehawken—Until Aug. 28, by Town Council, West New York, paving several streets. About $40,000.

Pennsylvania—(Official)—Until Sept. 4, by F. B. Black, state highway comr., Harrisburg, constructing highways in various counties; advertised in this issue.

Maryland—Until Sept. 4, by State Road Comn., Baltimore, paving 2 mi. concrete road in Frederick Co., 2.33 mi. in Allegheny Co., 1.30 mi. on Monroe St and Elgin Ave., sheet asphalt.

Miss., Greenville—Until Sept. 1 by Washington Co. Highway Comn., surfacing 150-mi. roads, gravel. E. W. Wod, chmn. J. S. Allen, ch. engr.

Louisiana—(Official)—Until Aug. 30 by State Highway Dept., New Orleans, building road from Alexandria to Camp Beauregard, bituminous macadam surfacing, 20 ft. wide, gravel shoulders. About $105,000. Contract for clearing, grubbing and grading has been let to F. T. Constant. D. Buie, state highway engr. Noted Aug. 9.

Tenn., Hohenwald — Until Sept. 18, by Lewis Co. Comn., grading 30 mi. roads involving 12,000 cu.yd. excava. C. Grossman, co. engr.

O., Cleveland—Until Aug. 29 by City improving portion Archwood, Hulda, Jefferson, Locke, Marshall, Suaer, East 125, 126, 127, West 87, Wilbur and East 107th Sts., Fairmont Rd. and Fairchild Ave. R. Hoffman, city engr. Noted Aug. 16.

O., Greenfield—Until Sept. 3, by E. M. Conner, village clk., improving South St., including draining, grading and paving, tarvia, bound macadam concrete.

O., Mingo Junction—See "Sewers."

Indiana—By Co. Comrs. for constructing roads as follows: Aug. 30: Winchester, 3 roads, Washington Twp.; 1, White River Twp.; 2 gravel roads, Stoney Creek Twp.; stone road, Washington Twp.; road, Greensfork Twp. C. E. Tillson, aud. Sept. 3: Portland, crushed stone road, Wabash Twp. John Bonifas, aud.; Valparaiso, road Center Twp. C. A. Blachly, aud.; Nashville, gravel road, Hamblin Twp. Omer Morrison, aud.; Rochester, 2 roads, Henry Twp. E. A. Smity, aud. Sept. 4: Corydon, 5 stone roads, Harrison, Nester and Boone Twps., Spencer and Blue River Twps., Webster and Harrison Twps.; S. C. Mauck, aud. Ben Davis, grading and graveling road. J. M. Hillman, trustee. Portland, crushed stone road, Jefferson Twp. J. Bonifas, aud. Rensselaer, 2 stone roads, Carpenter Twp. J. P. Hammond, aud. Bloomfield, 2 macadam roads, Jackson and Stockton Twps. G. E. Kidd, aud. Plymouth, 5 gravel roads, Walnut, Center and Walnut, Tippecanoe, Center and German Twps., respectively. O. H. Weber, aud. Salem, road Pierce Twp., 5365 ft. E. E. Batt, aud. Monticello, road Jackson Twp. A. G. Fisher, aud. Sept. 5: Goshen, gravel road, Osolo Twp. A. R. Bemenderfer, aud. Sept. 6: Logansport, gravel road, Bethlehem Twp. A. P. Flynn, aud. Laporte, 3 roads, Hanna, New Durham and Cass Twps. F. A. Hausheer, aud. Jeffersonville, macadam road, Washington Twp. G. W. Stoner, aud. Sept. 7: Ft. Wayne, 8 macadam roads, Wayne, Perry, Cedar Creek, Springfield and Maumee, Pleasant, Monroe, Madison and Marion Twps. W. Johnson, aud.

Ind., Indianapolis—(Official)—Until Sept. 5 by Bd. Pub. Wks. improving portion 44th, Delaware, South and Market Sts. B. J. T. Jeup, city engr.

Ill., Canton—Until Sept. 4 by City Clk., paving South 4th Ave., concrete. E. P. Matsinger, city engr.

Ill., East Dubuque—(Official)—Until Aug. 27, by City Clk., for rein.-con. pavement, curb and gutter on 1st and Wall Sts. Abstract $10.00. M. Tschirgi & Sons, 315 Amid Trust Bldg., Cedar Rapids, Ia., engrs. Noted July 26.

Ill., Morrison—(Official)—Until Aug. 25, by V. N. Taggett, supt. highways, Whiteside Co., building 16,946 sq.yd. gravel or gravel and macadam roadway in Albany.

Ia., Muscatine—Until Sept. 6, by H. B. Caple, city recdr., grading Fuller St., and excavating 747 cu.yd. in alley between 11th and 12th Sts., 900 ft. haul. C. H. Young, city engr.

Kan., Columbus—(Official)—Until Sept. 13, by L. Mobly, chn. bd. comrs. Cherokee Co., grading, graveling, and building Blake Rd. C. M. Cooper, co. engr. Noted Aug. 9.

Okla., Tecumseh—(Official)—Until Aug. 27, by Pottawatomie Co. Comrs. building 10 mi. graded road. About $17,200; 11 concrete culverts and bridges. About $8250. 1 concrete bow string arch and apparatus. About $11,500. L. L. Wimans, co. engr.

Wash., Seattle—Until Sept. 4, by King Co. Comrs., building Auburn-Enumclaw Sect. No. 2, Permanent Highway No. 11C, brick or concrete. About $40,000. S. J. Humes, co. engr. Noted Aug. 16.

Wash., Seattle—Until Sept. 10, by King Co. Comrs., grading and graveling between Renton and Renton Junction, 1 mi., involving removal 9000 cu.yd. material. S. J. Humes, co. engr.

Wash., Vancouver — Until Aug. 27, by Clarke Co. Comrs., 2-mi. permanent highway No. 1-A. About $27,000.

California—Until Sept. 4, by State Highway Comn., Sacramento, grading 10.8 mi. in Shasta Co. and 4.5 mi. in San Diego Co.

Cal., Santa Barbara—Until Aug. 30, by A. C. Hall, city clk., paving De La Vina St., 4-in. concrete base, 2-in. asphalt surface, cement, curbs, gutters, vitr. pipe and sewers, also paving Deer St., Troy and Remington Pl., Breckenridge St. and Wohlers Ave. A. B. Cook, city engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Vt., Barre**—(Official)—City let contract paving portion South Main St. to J. C. De Brune, Barre, $13,135. Noted July 26.

★**Massachusetts**—State Highway Comn., Boston, let contract building highways in following towns: Lynn, granite block, concrete foundation to J. H. Fannon, 26 Hinckley St., Sommerville, $35,251; Swansea to J. McCormack, 315 Taunton Ave., East Providence, R. I., $7632; Freetown, E. J. Rourke, 2280 Massachusetts Ave., Cambridge, $18,215. Noted Aug. 9.

Massachusetts — State Highway Comn., Boston, received low bids building roads in West Springfield from Adams & Ribley Contg. Co., 33 Lyman St., $16,811; L. C. Fay & Co., Main St., $17,946; Cordner & Montague, Bay St., $21,597. Contractors all of Springfield. Noted Aug. 9.

★**Mass., Boston**—[illegible] Street Comrs. let contract paving portion following streets: Berwick, granite block, Park to Charles; asphalt, Park from Tremont to Union; granite, Tremont and Washington Sts., wood blocks, Somerset; granite to P. F. Grant & Co., 27 School St., $75,937. Noted July 19.

★**Mass., Brockton**—City let contract paving Belmont and Main Sts. to [illegible], 166 Devonshire St., Boston, $[illegible].

★**Mass., Woburn**—State Highway Comn., Boston let contract paving 1400 ft. Main-way to A. Pollatto, 1117 Main St., Lowell. About $14,400. Noted Aug. 9.

★**Rhode Island**—State Pk. Pub. Roads, Providence, let contract paving 1½ mi. state highway on Boston Neck Rd. to John Hilliday, Narragansett Pier. Amount $58,-838. Noted Aug. 9.

★**N. Y., New York**—(Official)—Prospect Parkway Comn. let contract paving portion Ebony River Phase, with Asphalt Block, to Hastings Asphalt Pavement Co., 13 Bond St., New York City. Noted Aug. 13.

N. Y., Yonkers—[illegible] Contract & Supply Co. was low bidder paving Palmer Rd., Central Ave. to Bridge Street from Warburton Ave., 1400 Croxton Ave., bituminous and macadam base, $[illegible]. J. Rosario, Jr., 83 Church St., asphalt block, $27,886. J. J. Hart, 150 Hyatt, asphalt block, $[illegible]. Bids to be advertised before contract awarded. Contractors all of New York City.

★**N. J., Belleville**—City let contract paving High St. and Washington Ave. to Franklin Asphalt Co. to Centennial Ave., New York City, [illegible] and [illegible] Contract to be finished before Oct. 15. Bond $[illegible]. Contractors all of New York City.

Streets and Roads (Continued)

★**N. J., Elizabeth**—Bd. Freeholders Union Co. let contract repairing Springfield Ave., New Providence, to Weldon Contg. Co., New Providence, $10,000.

★**N. J., Montclair**—(Official)—Town let contract paving portion Park St., warrenite, concrete curb; Bellevue Ave., warrenite, hillsdale brick to Standard Bitulithic Co., 50 Church St., New York City, $2.86 sq.yd. Noted Aug. 9.

★**N. J., New Brunswick**—(Official)—Bd. Freeholders let contract paving Main and Ferry Sts., South River, to T. H. Riddle, 102 Church St., $40,576. Noted July 26.

★**N. J., Orange**—(Official)—City let contract paving portion Berkely Ave. into asphalt blocks, to Hastings Pavement Co., 25 Broad St., New York City, $32,525. Noted Aug. 16.

★**N. J., Palmyra**—(Official)—Township Comn. let contract paving Broad St., concrete, to A. Martinet, Atlantic City. Noted Aug. 16.

★**N. J., Paterson**—Passaic Co. let contract paving Franklin Ave., from Passaic line to Essex Co. line, through Delawanna St. to F. Spatz, Jr., Nutley, $29,964; Goffle Rd., to Sowerbutt Quarries, Paterson, $51,642; Cedar Grove and Wilmore Rds. Francisco Bros., United Bank Bldg., $24,029. Noted Aug. 9.

★**N. J., Weehawken**—Town Council West New York let contract paving Bergenline Ave., asphalt block, to George J. Hornung, 413 16th St. About $72,476. Noted May 31.

Pennsylvania—(Official)—F. B. Black, state highway comr., Harrisburg, received low bids road work as follows: (a) Somerset Co., Somerset Twp., 6675 ft. vitr. block, (b) Beaver Co., Big Beaver Twp., 23,546 ft. reinforced cement concrete; (c) McKean Co., Wetmore Twp., 22,101 ft. vitr. brick, (d) Clarion Co., Clarion Twp., 14,128 ft. vitr. brick; (e) Centrer Co., Bellefonte Boro., 2454 ft. vitr. brick; from D. E. Keller, Somerset, (a) $66,012, Mainwaring & Cummins, Inc., Phila., (a) $72,699 (d) $152,798; F. P. Whitton, Pittsburgh, (b) $158,953, P. F. Connolly Co., Realty Bldg., Elmira, N. Y., (b) $144,198; E. N. Love & Son, Corry, (c) $144,974, Larson & Pascuzzi, Kane, (c) $144,249; M. J. Scanlan, New Castle, (d) $103,625; R. B. Taylor, Bellefonte, (e) $28,151. Noted July 26.

★**Pennsylvania**—(Official) — State Highway Dept., Harrisburg, let contract grading and draining portion State Highway Route 51, Somerset Co., to R. B. Taylor, Bellefonte, $81,428. Noted Aug. 9.

★**Pa., Johnstown**—City let contract, paving Highland and Larel Aves., Ebbert, Stormer and Hill Alleys to G. T. Morgan, Johnstown.

Pa., Pottstown — City Council received low bid paving portion North and South Centre St., from J. B. Trexler, Reading. About $45,000. Noted July 12.

★**Pa., Uniontown** — Comrs. Fayette Co. let contract 3 mi. road from Chamberlain-Connellsville Twp. to Pennsville to Bell-Bockel Co., Central Tribune Bldg., Altoona. About $120,000. Noted July 19.

Virginia — State Highway Comn., Natl. Bank of Commerce Bldg., Roanoke, received low bids paving highway, 18 ft. wide with 6-in. concrete base from Atlantic Bitulithic Co., Virginia Ry. & Power Bldg., $60,000. J. U. Addenbrook's Sons, Norfolk, $40,000.

★**W. Va., Ceredo**—City let contract paving, to Hunt & Forbes, Ashland, $33,000.

★**W. Va., Wheeling**—(Official)—Ohio Co. Comrs. let contract grading and building concrete road surface on Steenrod and Mt. de Chantal Rds., to Jaconetty & Savage, Wheeling, $15,627. Noted Aug. 9.

★**Ga., Savannah**—See "Sewers."

★**Ga., West Point**—City let contract paving, grading, curbing, draining, building sidewalks various streets to Merrill Road Improvement Co., James Bldg., Chattanooga, $82,000. Noted Aug. 2.

★**Fla., Fort Myers**—Lee Co. Comrs. let contract 33½ mi. roads, Caloosa Valley Good Roads Dist., including 49 concrete bridges and culverts to Trapp & Fraser. About $[illegible]. Noted [illegible].

★**Miss., Greenwood** — LeFlore Co. Bd. Supervs. let contract 150-mi. road to W. F. Kelley. $[illegible] bond issue voted. Noted July 19.

★**Miss., Gulfport**—Harrison Co. let contract surfacing 6 mi. highway to Callahan Constr. Co. About $[illegible] per sq.yd.

Tenn., Chattanooga — Hamilton Co. received one bid building concrete highway Lookout Mountain from Chikamauga Quarry & Constr. Co., James Bldg., $1.90 per yd. concrete and $2.09 per yd. river gravel. Noted Apr. 5.

★**Tenn., Mountain City**—Johnson Co. Comrs. let contract building 34 mi. road from here to Virginia state line, 34 mi., including 30 bridges and culverts, to Charlotte Paving Co., Charlotte, N. C.

★**Ky., Owensboro**—Fiscal Court Daviess Co. let contract 19½ mi. Livermore, Henderson, Booneville and Curdsville Rds. to Montgomery, Perkins & Ellis; Hardinsburg Rd. to Miller & Woodruff, both of Owensboro. Noted Aug. 2.

★**Ohio**—State Highway Comn., Columbus, let contracts building roads as follows: Athens Co., Athens-Hockingport Rd., Wilson & Beckler, Athens, $31,451; Butler Co., Hamilton-Middletown Rd., Strodbeck Bros., Middletown; monolithic brick reinforced concrete; $67,884 and $71,600; Erie Co., Sandusky-Norwalk Rd., John Strauss, Castalia, $24,533; Sandusky-Clyde Rd., John Strauss, Castalia, $29,854; Franklin Co., Columbus-Sandusky Rd.; J. C. McCann & Son, Columbus, bituminous macadam, A-1, $37,243; A-1-C, $38,900; Tar T-1, $36,157; Fayette Co., Hillsboro-Washington Rd., John M. Jones, Washington C. H.; $23,060; Fulton Co., Archbold-Fayette Rd., Gray Bros., Bowling Green, $13,300; Gallia Co., Ohio River Rd., J. L. Betz, Gallipolis, waterbound gravel, concrete and gravel, $17,999; Hardin Co., Kenton-Upper Sandusky Rd., Latshaw & Stinchcomb, Fostoria, reinforced concrete, $32,992; Kenton-Upper Sandusky Rd., Federal Asphalt Paving Co., Hamilton, bituminous concrete, $35,700; Hocking Co., Logan-Chillicothe Rd., Gray Bros., Bowling Green, bituminous macadam, $23,800; Huron County, Savannah-Vermilion Rd., A. J. Baltes, Norwalk, $25,289; Licking Co., Newark-Fallsburg Rd., Vogelmier Bros., Newark, $32,203; Lorain County, Ashland-Oberlin Rd., the Highway Construction Co., Elyria; concrete, bituminous macadam, $25,429; Ottawa Co., Port Clinton-Marblehead Rd., Marsman & Green, Grand Rapids, Mich., $47,309; Putnam Co., Kalida-Lima Rd., Carey & McElroy, Ada, $10,600; Trumbull Co., Warren-Meadville Rd.; Seiple & Wolf Construction Co., Youngstown, $32,348; Trumbull Co., Canfield-Niles Rd., Morgan Bros., Ravenna, $28,661; Vinton Co., Gallipolis-McArthur Rd., John L. Porter, Marysville, $4865; Williams Co., Bryan-Pioneer Rd., Doan & Langenderfer, Toledo, waterbound macadam, $56,062, bituminous macadam, $67,476; D. W. Botkins & Son, Ada, bituminous macadam, $63,638; Wyandot Co., Upper Sandusky-Kenton Rd., Modern Construction Co., Fremont, $7606; Upper Sandusky-Tiffin Rd., Modern Construction Co., Fremont, $29,892.

O., Ashland—City received low bid paving portion Virginia Ave. from D. A. Philips, Ashland, $18,947. Noted July 12.

★**O., Canton**—City let contract paving 8th St., N.E., to Downs Constr. Co., Lawrence Rd. and Gibbs Ave. Noted Aug. 2.

★**O., Cincinnati**—(Official)—Bd. Trustees Cincinnati Southern Ry., Ingalls Bldg., let contract grading and paving Front St., in connection with building railroad track to Kirchner Constr. Co., West 9th St. About $45,000. Noted July 26.

★**O., Cincinnati**—Dept. Pub. Ser. let contract, paving, grading, curbing and draining, Scioto St. to R. E. Cash, 110 Lincoln Inn Court. About $14,000. Noted July 5.

★**O., Cleveland**—Bd. Control let contract paving portion East 24th St. to Freshwater Constr. Co., 9500 Madison Ave., $16,000; West 25th St. to Cleveland Trinidad Paving Co., The Arcade, $22,741.

★**O., Lima**—City let contract paving portion Bellefontaine Ave. to Johnson & Ritz, Napoleon, $48,073.

★**O., Oberlin**—City let contract paving and draining Union and North Main Sts. to C. E. Williams, Oberlin.

★**O., Pioneer**—(Official)—Village let contract paving various streets, involving 13,000 sq.yd. to Fuelling & Krudop, 1324 Eliza St. Noted Aug. 2.

★**O., Sandusky**—(Official)—City Comrs. let contract paving portion Adams, Fulton, Division and Boult Sts. to Cummings Prudden Co., 1907 2nd Natl. Bank Bldg., Toledo, $38,808. Noted Aug. 2.

★**O., Sidney**—City let contract brick paving, to G. H. Heffner Son & Co., Celina; asphaltic concrete paving to Columbus Asphalt Paving Co., 1115 Columbus Savings & Trust Bldg., Columbus; about 95,000 sq.yd. in all. Noted July 19.

Ind., Indianapolis — City received low bids paving portion Massachusetts Ave., about 10 blocks, from American Constr. Co., 108 North Delaware St., $20,000, Union Asphalt Co., American Central Life Bldg., Republic Constr. Co., 1614 Merchants Bank Bldg.

Ind., South Bend—Bd. Pub. Wks. received low bids paving Mishawaka Ave. and Eddy St. from A. H. White Constr. Co., 1600 Railway Exch. Bldg., Milwaukee, $184,000; Williston Constr. Co., 343 South Dearborn St., Chicago; Federal Paving Co., 316 Rentscher Bldg., Hamilton, O. Noted Aug. 2.

★**Ind., Terre Haute**—Vigo Co. let contract paving portion 25th St., brick, to Weaver & Welch, Terre Haute, $70,382. Noted Aug. 9.

★**Mich., Pontiac** — (Official) — City let contract 2½ mi. 5-ft. walks to B. Smith, Pontiac, 14c. per sq.ft. Noted July 26.

★**Mich., River Rouge**—(Official)—Village let contract paving Henry St., east and west, Victoria, Oak and Batavia Sts., and Burke Ave. to Rice Constr. Co., Wyandotte, $45,000. Noted July 26.

★**Ill., Belleville**—Bd. Local Imprvs. let contract paving portion Illinois St. to Bauer Bros., Belleville, $10,800.

★**Ill., Chenoa**—City let contract paving streets to I. D. Lain, Bloomington, $56,037. Noted Apr. 12.

★**Ill., Highland Park**—City let contract paving portions Cedar, St. Johns and Linden Aves., concrete, bituminous concrete surface, to Western Improv. Co., Highland Park, $47,369.

Ill., Hillsboro—City received low bids paving Hamilton and Water Sts. from Sell & Koller, Pana, $26,406, Curdie Contg. Co., Hillsboro, $26,629. Noted Aug. 2.

★**Ill., Naperville**—City let contract paving 56,000 sq.yd. cement concrete to Logan & Giertz Constr. Co., Naperville, $125,000.

★**Ill., Paxton**—Bd. Local Improv. let contract paving Railroad Ave. and East Franklin St. to H. C. Finley, Hoopeston. About $27,208.

Ill., Rock Island—City received low bids improving 6th Ave., (a) concrete gutter and curb, (b) asphaltic concrete paving, (c) excavating, from McCarthy Improvement Co., 3rd and Perry Sts., Davenport, (a) $.65, (b) $2.05, (c) $.40; Ryan Constr. Co., 42 1st Natl. Bank Bldg., Davenport, (a) $.75, (b) $2.18, (c) $.40.

★**Ill., Waukegan**—City let contract paving Colony St. to C. Peterson Constr. Co., Kenosha and C. P. Moran, Waukegan. About $21,000.

★**Wis., Ashland**—City let contract paving to Franzen & Bystrom Bros., Ashland, $25,700.

Wis., Chippewa Falls—Bd. Pub. Wks. received low bids paving portions North Main and Willow Sts., from A. C. Larson & Co., and Cast Stone Constr. Co., both of Chippewa Falls. About $15,000.

★**Ia., Davenport**—Bd. Pub. Wks. let contract laying 12,872 sq.yd. paving, 4500 ft. curb and gutter to D. J. Ryan Constr. Co., 2nd St., $43,895.

★**Ia., Des Moines**—City let contract paving portions Locust, East 9th, Capitol Ave., East 11th and East 12th Sts., Texaco sheet asphalt, 80,000 sq.yd. including sidewalks to T. Carey & Sons, Clinton, $2.18 per yd. Noted Apr. 12.

★**Kan., Pratt**—City let contract paving 50,000 yd. to M. R. Ammerman, Salina.

★**Neb., Havelock**—City let contract paving 40 blocks to Abel Constr. Co., 318 Terminal Bldg., $110,000.

★**Neb., Omaha**—City let contract paving 1 mi. to Bauer & Johnson, Omaha; also repaving 1 mi. to W. E. Callahan, 1514 City Natl. Bank Bldg. Noted June 7.

Neb., Plattsmouth—(Official)—City let contract 12,850 yd. wire cut brick, and 7442 ft. curbing in Dist. No. 13 to Western States Constr. Co., 782½ Brandeis Bldg., Omaha. $30,621. Noted Aug. 2.

★**S. D., Sioux Falls**—City let contract paving portion 20th and 10th Sts., portland cement concrete and bitulithic to C. H. Atkinson, Watertown.

Streets and Roads (Continued)

★**Wyo., Sikeston**—City let Scott St. contract paving portions Malone Ave., asphalt and macadam, concrete base, to R. Williams, Wyatt, $29,573.

★**Mont., Butte**—City let contract grading and building sidewalks, portions Granite St. and paving portions main alley to G. D. Pue, Butte, $10,933. Noted July 5.

★**Mont., Butte** — City let contract improving Montana St., J. C. Maguire, 615 Daly Bank Bldg., bitulithic, $2.70 per sq. yd., 7066 ft. gutter, 50c. per ft., 4165 ft. 19-in. storm sewer, 95c. per ft., 18 catch basins, $35 each, 13 manholes, $50 each. Noted July 19.

★**Mo., Brunswick**—City let contract paving West Main St. to Kennedy Olson Constr. Co., 601 Ridge Arcade Bldg., Kansas City, $15,155.

Mo., St. Louis—Bd. Pub. Wks. received low bids paving Wilcox Ave., vitr. brick, 5-in. concrete base, from F. A. Stiers Constr. Co., 4512 Morgan St., $15,152, Eyermann Constr. Co., 1216 South Grand St., $15,311, Skrainka Constr. Co., Security Bldg., $15,985, repaving St. Charles St., wood block, Perkinson Bros. Constr. Co., 3237 Carter Ave., $11,794, Eyermann Constr. Co., 1216 South Grand St., $12,876, Fruin-Bambrick Constr. Co., 800 South Spring St., $14,544. Noted Aug. 2.

★**Ark., Devall Bluff**—Prairie Co. Rd. Improv. Dist. No. 3 let contract building macadam roads to S. G. Woodsman, Devall Bluff, $150,000. Noted Aug. 2.

★**Ark., Little Rock**—City let contract surfacing East Washington Ave., 2-coat asphalt surface to R. Moble, 104 East 2nd St., 15½c. per sq.yd. About $10,000.

★**Tex., Huntsville**—City let contract building 15,000 sq.yd. rein.-con. paving to G. L. Clark, Huntsville. Noted July 19.

★**Okla., Altus**—City let contract 12,500 yd. paving to Western Paving Co., 518 Terminal Bldg., Oklahoma City.

★**Okla., Ardmore**—City let contract paving portion B St. to Schuler & Petty, $27,098. Noted June 21.

★**Okla., Okemah**—Okfuskee Co. let contract road work to J. T. Thompson, Ringling, $14,342. Noted May 31.

★**Colorado** — (Official) — State Highway Comn., Denver, let contract building road from Estes Park to Grand Lake to R. W. McQueary, Granby, $21,021. Noted Aug. 9.

★**N. M., San Miguel**—City let contract paving Douglas Ave. to N. M. Morton Bros., Las Vegas, $31,354.

★**Idaho**—State Highway Dept., Boise, let contract building highway from Washington Co. line to Council to F. C. Comeford, West of Joplin Cemetery, $83,000. Noted July 5.

★**Idaho** — (Official) — State Highway Comn., Boise, let contract building 17 mi. Idaho-Utah Highway in Bancock Co. to S. A. Forter, American Falls, $38,000. Noted Aug. 2.

★**Idaho, Twin Falls**—City Council let contract, system of concrete walks, to C. H. Helmer, Twin Falls. About $43,715. Noted Apr. 19.

Idaho, Wallace—City received low bids paving 22,000 sq.yd. streets (a) standard bitulithic 2-in. macadam base, (b) 3-in. base, (c) 4-in. base, from H. J. Kaiser, 312 Colby Bldg., (a) $1.49; (b) $1.52; (c) $1.55; Warren Constr. Co., Journal Bldg., Portland, (a) $1.54, (b) $1.58, (c) $1.62. Noted July 26.

★**Utah, Ogden**—City let contract paving portions, Washington Ave. and Riverdale Rd., sheet asphalt, to P. J. Moran, Inc., 52 West 2nd St., Salt Lake City, $126,049.

★**Wash., Kelso** — Cowlitz Co. Court let contract improving 2½ mi. Pacific Highway, from Castle Rock South, to Jarvis & Burkheimer, Portland, $44,600. Noted Apr. 19.

Wash., Seattle—Bd. Pub. Wks. received low bids grading Eddy St. from Sloane Bros., White Bldg., $16,707; paving Roy St., from James Constr. Co., 812—2nd Ave., $42,500; Superior Constr. Co., 1642 Lane St., $43,152; A. L. Clark & Co., c/o Washington Paving Co., L. C. Smith Bldg., $13,765.

Oregon—State Highway Comn., Salem, received low bids grading and paving (a) Tillamook-Cloverdale Rd., 5½ mi.; (b) Columbia River Highway, 2 mi.; (c) Columbia River Highway, Wasco Co., 1.54 mi.; (d) Columbia River Highway, Columbia Co., 7.75 mi.; (e) road from Svenser to Westport, Clatsop Co., 15.5 mi.; (f) road from Condon to Thirty Mile Creek, Hilliam Co., 5.7 mi.; (g) road in Deschutes Co., 17 mi.; (h) road from North Co. line to Cummings Hill, Wheeler Co., 3.5 mi.; (i) road from Canemah to New Era, Clackamas Co., as follows: Warren Constr. Co., Journal Bldg., Portland, (a) $111,451, (b) $37,321, (d) $136,124, (e) $124,576, (f) $23,334, (g) $47,810, (h) $19,179, (i) $33,125; Oskar Huber, Electric Bldg., Portland, (a) $105,951, alternate, $110,307, (b) $38,419, alternate, $39,806; Wolf & Gibbons, The Dalles, (c) $24,970; Clark & Thillitin, Rainier, (d) $113,489; E. T. Johnson & Son, Commercial Bldg., Portland, (g) $61,260. Noted Aug. 2.

★**California** —(Official)— State Highway Comn., 515 Forum Bldg., Sacramento, let contract following road work: Santa Barbara Co., between El Capitan Creek and Alcatraz, Div. 5, Route 2, Sect. F, to Tryon & Brain, 501 Merchants Trust Co. Bldg., Los Angeles, between Elwood and El Capitan Creek, Div. 5, Route 2, Sect. G, to same contractor. Noted July 26.

Cal., Auburn — City received low bids paving Main St., from Blinn & Treacy, 1st Natl. Bank Bldg., San Francisco. About $17,700.

★**Cal., San Francisco**—Bd. Pub. Wks. let contract improving portion Corbett Ave. to H. Grummey, Hearst Bldg., $46,740.

★**N. S., New Waterford**—Town Council let contract 3100 ft. curbing and 1195 sq.yd. concrete sidewalks and 653 ft. sewer pipe, to D. H. McLean Co., New Waterford, $40,000.

★**Que., Hull**—City let contracts building concrete sidewalks to Bison & Bourque, Hull and Ottaway Constr. Co., Central Chambers. About $24,000 and $5500 respectively. Noted July 5.

★**Que., Portinuf**—Town let contract paving 2 mi. macadam roads to J. Ledere & Co., St. Basile de Portinuf, $25,000. Noted July 26.

★**Ont., Listowel**—Town let contract building pavements to W. Brennan and W. Hollingworth, Hamilton, $14,000.

RAILWAYS—STEAM & ELECTRIC

Proposed Work

Alabama—Montgomery Light and Traction Co. plans double tracking line from Montgomery to Pickett Springs, about 6 mi. W. J. Germevan, mgr.

Mississippi — Pearl River Valley R.R. chartered with $1,000,000 capital stock plans to build line from Nicholson to Columbia, about 55 mi. R. L. Emery, 2322 St. Charles Ave., New Orleans, pres.

Illinois—Galesburg Rockford & Northern R.R. incorporated with $200,000 capital stock, plans to build line from Galesburg to Rockford, through Knox, Henderson, Bureau, Whiteside, Lee, Ogle and Winnebago Cos. R. J. Emery, 19 South La Salle St., Chicago, one of incorporators.

Wisconsin — Green Bay & Eastern Ry. increased its capital stock from $50,000 to $3,000,000 and soon lets contract building 70 mi. electric railway from Manitowoc to Green Bay, thence to Sheboygan. Rudolph Stockinger, Manitowoc, secy. Noted Apr. 12.

Minnesota—Great Northern R.R. will build cutoff from Willmar line to Fridley terminal; also plans $20,000,000 bond issue for equipment, double tracking, sidings, terminals and new shops. A. H. Hogeland, St. Paul, ch. engr.

Montana—Montana Southern Ry. plans to extend Elkhorn Mining Dist. line from Dillon. About $500,000. Address E. E. Esselstyn, Butte. Noted May 24.

Texas—Freeport Sulphur Co., owned by Swenson Syndicate, New York, making surveys for proposed interurban electric railway from Freeport to Houston, via Rosenberg; about 100 mi. W. A. Randle, Freeport, ch. engr. Noted Aug. 9.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Pennsylvania**—Lehigh & New England R.R. let contract 6 mi. line between Bethlehem and Allentown to F. H. Clement Land Title Bldg., Phila. Noted May 24.

★**Wisconsin**—Wisconsin Interurban Co., 350 Washington Bldg., Madison, let contract 750-mi. line to J. T. Adams, Columbus Savings & Trust Bldg., Columbus. First unit will be built from Madison to Janesville via Stoughton.

★**Washington**—Spokane Valley & Northern Ry., subsidiary of Great Northern Ry., let contract 14 mi. spur from Valley to quarries of American Mineral Production Co. to Genl. Constr. Co., 1324 Elm St., Spokane. About $300,000.

EXCAVATION AND DREDGING

Proposed Work

La., Lafayette—Drainage—Scott Subdrainage Dist., Lafayette Co., voted $47,500 bonds for system. L. A. Prejean, pres.

Ore., Klamath Falls — Irrigation — Pine Grove Irrigation Dist., Klamath Co., recently organized, plans system to water 1500 acres.

Cal., Fresno — Irrigation — Conservation and Irrigation Dist. Com. will organize irrigation district to conserve flood waters of Kings River. Plans include concrete dam with 600,000 acre-feet capacity in Pine Flats region, 10,000 kw. hydro electric plant, 525 deep well turbine pumping plants with 80 reserve plants in San Joaquin Valley, involving 1,050,000 cu.yd. excavation, $325,000; concrete masonry, $4,515,000; gates, $400,000; spillway, $200,000; flume for bringing lumber to site, $200,000; grouting, $20,000; cement gun work, $15,000; extending railroad, $100,000; roads, $50,000; power substation, $15,000; river diversion, $30,000; pumping and lighting, $10,000; drainage and well drilling, $15,000; power plant, $600,000; 30-mi transmission line, $150,000 and 605 pumping plants, $1,815,000. George C. Roeding, Fresno, chn. I. Teilman, care of Fresno Consolidated Canal Co., Fresno, engr.

Cal., San Bernardino — Irrigation — Bd. Supervs. plan to irrigate 48,000 acres in Apple and Victor valleys with annual flow of 90,000 acre-feet from Mohave River and Deer Creek. About $4,320,000.

BIDS DESIRED

La., New Orleans—Dredging—Until Sept. 12, by Bd. Comrs. Port of New Orleans, 200 New Orleans Court Bldg., dredging and maintaining specified depths of water at public wharves for period of 1 year. J. B. O'Reilly, engr.

Tenn., Hohenwald—See "Streets and Roads."

Ky., Calhoun—Until Aug. 30 by McLean Co. Drainage Comrs. building ditch and laterals, D.D. No. 8, involving 70,550 cu.yd. earth removal.

Ill., Thomson—(Official)—Drainage—Until Sept. 6 Franklin J. Stransky, atty. of Savanna & York D.D., Savanna, furnishing material, machinery and labor for [illegible] houses, etc. E. T. Perkins, 1001 1st Natl. Bank Bldg., Chicago, engr. Advertised in this issue.

Minn., Benson—Ditch—Until Aug. 27 by D. P. Carney Swift Co. aud. building Judicial Ditch No. 4.

Minn., Madison—(Official)—Ditch—Until Sept. 8 (change of date), by A. G. Stegren, aud. Lac Qui Parle Co., building Co. Ditch No. 11 involving 17,750 ft. 8-, 9-, 10-, 12-, 14-, 15-, 16-, 18-, 20- and 22-in. tile, cost, $18,200; Ditch No. 4, 31,100 ft. 6-, 7-, 8-, 9-, 10-, 12-, 14-, 15-, 16-, 18-, 20-, 22- and 24-in. tile and 997,416 cu.yd. dredge work, cost, $58,409. B. Lofgren, engr. Noted Aug. 9.

S. D., Madison—Drainage—Until Aug. 28 by Lake Co. Comrs. building D.D. No. 8, involving 11,840 lin.ft. 6-, 8-, 10-, 12-, 14-, and 16-in. tile. D. J. O'Connell, chn.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Tex., Mercedes**—Drainage—American Rio Grande Land & Irrigation Co. let contract drainage system in Rio Grande Valley to Crawford & Callahan. About $500,000.

Cal., Oroville, Butte Co.—Drainage—Until [illegible] Reclamation Dist. No. 833 received bids excavating canals and drainage ditches from Jessyon & Whitman, $117,854 and [illegible] Constr. Co., $119,181, both of Pacific Bldg., Sacramento.

INDUSTRIAL WORKS

Proposed Work

N. Y., Brooklyn — Interborough Rapid Transit Co., 165 Bway., New York City, plans 1-story, 50 x 100-ft. brick transformer station, Nostrand Ave. About $50,000. George H. Pegram, 165 Bway., New York City, ch. engr.

N. Y., Buffalo—American Brass Foundry Co. plans addition to plant.

N. Y., Buffalo—Sizer Forge Co., 238 Larkin St., had plans prepared, 1-story, 41 x 88 ft. coal house, 40 x 521 ft. covered scrap yard and 88 x 214 ft. electric furnace. About $109,500. A. H. Van Cleve, 238 Larkin Bldg., archt.

N. Y., Cohoes—Cohoes Rolling Mill Co., Canvass St., increased capital stock from $500,000 to $1,000,000 and plans extensions.

N. Y., Flushing—New York & Queens Electric Light & Power Co., 444 Jackson Ave., Long Island City, plans 2-story, substation. About $50,000.

N. Y., New York—F. A. Cella, 888 6th Ave., having plans prepared by J. W. Ingle, archt., 527 5th Ave., 5-story, 38 x 60-ft. garage, rein.-con., brick, 102-4 West 50th St.

N. Y., New York—C. E. Williams, 500 5th Ave., had plans prepared by E. Williams, archt., 500 5th Ave., 6-story, 50 x 100-ft. brick garage, 234 West 67th. About $50,000.

N. Y., Ogdensburg—City plans 2-story market house. About $70,000. Julius Frank, mayor. Williams & Johnston, 40 Ford St., archts.

N. J., Clifton—New Jersey Flour Mill, 1 Chester St., plans 2-story, brick warehouse addition. About $50,000.

N. J., Newark — Des Lauries Aircraft Corp., Jersey City, secured site on Mulberry St., Newark and plans to build. B. H. Dahlan, pres.

N. J., Passaic—New York Belting & Packing Co., 91 Chambers St., New York City, plans 5-story, 87 x 250-ft. brick and rein.-con. factory. Lockwood Green & Co., 101 Park Ave., New York City, archts.

Pa., Athens—Ingersoll-Rand Co. plans 1-story, 75 x 200-ft. machine shop and 1-story, 90 x 145-ft. addition.

N. C., Gastonia—Trenton Cotton Mills increased capital stock to $350,000 and plans extensions.

N. C., Morehead City—North Carolina Shipbuilding Co. has increased its capital stock to $200,000 and plans mill construction buildings.

N. C., Selma—Ethel Cotton Mill Co. increased its capital stock from $100,000 to $200,000 and plans to extend plant.

Ga., Columbus — Columbus Power Co., 1151 Broad St., plans additions and extensions to its present plant. About $200,000. John S. Bleecher, gen. mgr. Stone & Webster Engr. Co., 147 Milk St., Boston, engrs.

Ga., Tallulah—Georgia Ry. & Power Co., Atlanta, plans to build 6th unit of plant here to cost about $230,000; generating station 2 mi below Tallulah Falls power station, $3,000,000; reservoir above Rabun Lake, $1,500,000. C. G. Adsit, Atlanta, constr. engr.

Ala., Mobile—Kelly-Atkinson Constr. Co., Chicago, plans machine shop, blacksmith shop, power house and yard office. About $50,000. W. L. Kelly, 189 West Madison St., Chicago, pres.

Tenn., Memphis—S. S. S. Auto Co. plans 135 x 325-ft. garage. About $50,000. A. G. Field, pres.

O., Cleveland — Cuyahoga Varnish Co., 8820 Bessemer Ave., plans addition to plant. About $40,000.

O., Cleveland—Grabler Mfg. Co., 6565 Bway., soon lets contract 66 x 164-ft. brick, steel and rein.-con. foundry addition, 1115 East 151st St. About $75,000. C. Schwarzenberg & Claude, 1900 Euclid Ave., archts.

O., Cleveland — Smith Facing & Supply Co., Carter Rd., soon lets contract, 78 x 104 ft. factory. M. M. Morse & Co., Citizens Bldg., archts.

O., Columbus—State University plans to build 2 brick aviation buildings on campus. About $200,000.

O., Marion—Marion Packing Co. plans brick and concrete boiler house. About $125,000. Stadley Engr. Co., South LaSalle St., Chicago, engrs.

Ind., Aetna — Aetna Explosives Co., Bluffs Rd., plans rebuilding plant recently destroyed by fire. About $1,000,000. Chas. Martin, gen. supt.

Ind., Elkhart—J. E. Smith Son, c/o A. P. Dippold, archt., 4747 Cottage Grove Ave., Chicago, soon lets contract 2-story, 83 x 115-ft. public garage. About $50,000.

Ind., Richmond—Indiana Portland Cement Co., recently incorporated with $1,000,000 capital stock, plans to build plant. Adam L. Beck, Huntington, pres.

Mich., Detroit—Barnes Foundry & Mfg. Co., 79-81 B'way., plans factory between tracks Michigan Central & Detroit, Toledo & Ironton R.R. C. L. Barnes, pres.

Mich., Detroit—Natl. Biscuit Co., 42-56 Woodbridge St., plans new factory, Baltimore and 3rd Sts. About $1,500,000.

Mich., Muskegon Heights — Anderson Packing Co. having plans prepared by L. Lehle, archt., 38 South Dearborn St., Chicago, for 1-story packing plant. About $150,000. J. S. Anderson, pres.

Ill., Chicago—Pioneer Paper Stock Co. plans 5-story, 50 x 109-ft. warehouse, Ohio St.

Ill., Moline—Moline Forging & Mfg. Co. soon lets contract 1-story, 110 x 264-ft. forging shop and office bldg. About $75,000. O. Z. Gerwin, 311 Safety Bldg., Rock Island, archt.

Wis., Milwaukee—Wevenberg Shoe Co., 212-27 Harmon St., had plans prepared, addition to shoe factory. About $200,000. F. L. Wevenberg, pres. Herman Esser, Camp Bldg., archt.

Tex., Texarkana—G. M. Stone, Quincey, Ill., and associates secured site here and plan machinery plant. Initial unit to cost about $100,000.

Okla., Ringling—Peoples Rendering Co., Insurance Bldg., Oklahoma City, plans new plant here. About $65,000. E. D. Smith, Oklahoma City, mgr.

Wash., Seattle—Pacific Oil Mills Co. soon lets contract 3- or 4-story, brick or concrete, oil refining plant, 2-story, warehouse and storage sheds. About $200,000. Herman Meyer, 1816 4th St., archt.

Wash., Tacoma—City Comrs. plan using Mineral Lake power site, with extensive improvements, as auxiliary to Nisqually plant. About $500,000. W. C. Raleigh, ch. engr.

Cal., Martinez—Pacific Electric Metal Co. plans large ferrosilicon factory including 4 or 5 concrete buildings with 10,000 kw. capacity, near Bay Point.

B. C., Princeton—Canada Copper Co. plans concentrating plant, 3000-ton capacity including hydro-electric plant. About $2,000,000.

BIDS DESIRED

O., Columbus—Until Sept. 4, by Trustees State University, for power house. About $100,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Buffalo**—Pennsylvania R.R. let contract 2-story, 30 x 420-ft. brick and steel freight house, 2 bridges and platform, Louisiana and Seneca Sts. to G. H. Scheckler & Sons, Erie, Pa., $200,000.

★**N. Y., Jamaica**—Armour & Co., Union Stock Yards, Chicago, let contract, 3-story, brick warehouse, Rockton St. to Blome Sinek Co., Bway., New York City, $100,000. Noted May 17.

★**N. Y., Johnson City**—Endicott-Johnson Co. let contract 6-story, 80 x 300-ft. rein.-con. factory to Turner Constr. Co., 244 Madison Ave., New York City.

★**N. Y., New York**—New York Butchers Dressed Meat Co., 11th Ave. and 39th St. let contract 7-story, 98 x 120-ft. cold storage plant to Blome Sinek Co., 120 B'way. Noted Aug. 16.

★**N. Y., New York**—Wm. Pechter, 79 Ridge St., let contract 2 bakeries, 468-70 Cherry St., and 300 Monroe St., to Bradhurst Holding Co., 17 West 120th St. About $50,000.

★**N. Y., Waterloo**—Waterloo Mfg. Co. let contract rebuilding factory to F. T. Ley Co., 499 Main St., Springfield, Mass. About $50,000.

★**N. J., Caldwell**—Bd. Freeholders Essex Co., Newark, let contract addition to brick power plant, Essex Co. Penitentiary to W. G. Sharwell Co., 317 North 5th St., Newark, $75,000.

★**N. J., Maurer**—American Smelting & Refining Co., 120 Bway., New York City, let contract 4-story, 55 x 60-ft. steel, frame and hollow tile coal pulverizing mill to H. D. Best & Co., 52 Vanderbilt Ave., New York City.

★**Md., Baltimore**—Maryland Shipbuilding Co. let contract shop, shipways and sheds, Sollers Point, to Morrow Bros. Constr. Co., 1201 Fidelity Bldg., project to cost several hundred thousand dollars.

★**Ky., Russell**—Chesapeake & Ohio R.R. 1st Natl. Bank Bldg., Richmond, Va., let contract, 1-story, 5-stall roundhouse to J. R. Pettyjohn & Co., 202 8th St., Lynchburg, Va.

★**O., Cleveland** — Cleveland Tractor Co. let contract, brick, steel and concrete factory, to Sam W. Emerson, 1900 Euclid Ave. About $350,000.

★**O., Cleveland**—Grant Motor Co., Kirby Ave., let contract, addition, Coit Rd. and Kirby Ave., to W. I. Thompson & Son Co., 6110 Euclid Ave. Noted May 31.

★**O., Cleveland**—McClellan File Co., 3444 Hamilton Ave., let contract, 2-story, 90 x 120-ft. brick factory to John P. Ford & Son, 9523 Preston Ave. Noted Aug. 2.

★**O., Toledo**—Hettrick Bros. Co., Hoag and Fernwood Sts., let contract 2-story, 250 x 330-ft. factory to Schmidt-Harwood Co. Noted June 28.

★**Mich., Detroit**—Winkley Mfg. Co., 866 West Warren Ave., let contract 3-story, brick and steel factory, to W. E. Wood Constr. Co., 1805 Ford Bldg.

★**Ill., Blue Island**—Libby, McNeil & Libby, United Stock Yards, Chicago, let contract, packing house, to C. A. Moses Constr. Co., 133 West Washington St., Chicago. About $500,000.

★**Ill., Chicago**—Louis Schetnitz, Jackson Blvd. and Market St., let contract 7-story brick factory, 1032-46 Kingsburg St., to Scharmer Constr. Co. About $150,000.

★**Wis., Madison**—Northwestern Ordnance Co., let contract 50,000-sq.ft. factory to Worden-Allen Co., Milwaukee.

★**Wis., Milwaukee** — Wisconsin Gun Co. let contract 1-story, 130 x 300-ft. factory to Worden-Allen Co., Milwaukee.

★**Minn., St. Cloud**—Pan Motor Co. let contract, 1-story, 56 x 715-ft. 56 x 415-ft., 50 x 60 and 50 x 100-ft. assembling plant to Madsen & Peterson, 802 Plymouth Bldg., Minneapolis, on percentage basis. About $250,000.

★**Minn., St. Paul** — Chicago, St. Paul, Minneapolis & Omaha R.R. let contract, 1-story, 53 x 85 ft. power plant and 80 x 264-ft. engine house addition and tender house to W. Baumeister Co., 1203 Pioneer Bldg. About $290,000.

Cal., Bay Point—Pacific Electric Metals Co. let contract factory to Lindgren & Co., Monadnock Bldg., San Francisco. About $50,000.

★**Ont., Belleville**—Graham Co., Ltd., let contract cold storage warehouse to W. F. Sperling Co., 120 Bay St., Toronto. About $100,000.

★**Ont., Windsor**—Maxwell Motor Co. let contract 2-story, 100 x 30-ft. rein.-con. plant to R. Westcott, Woodward and Warden St., $130,000.

BUILDINGS

Proposed Work

Me., Portland — Theater, Store, Office—Nickel Amusement Co., 565 Congress St., plans 2-story, 129 x 132-ft. additions. About $100,000. Fred N. Dow, pres. T. W. Lamb, 644 8th Ave., New York City, archt.

Mass., Athol—Church—First Methodist Episcopal Congregation plans 1-story, 84 x 90 ft. About $60,000. Rev. E. V. Hinchliffe, 105 Main St., pastor. E. T. Chapin, 340 Main St., Worcester, archt.

Conn., Storrs — Connecticut Agricultural College having plans prepared, 6 new buildings, by Unkelbach & Perry, 162 Main St., New Britain. About $75,000.

Buildings (Continued)

N. Y., Buffalo—Church—St. John Baptist Ruthenian Church had plans prepared by W. H. Zawadzki, archt., 1-story, 60 x 92-ft. brick. Filmore St. and Oneda Ave. About $50,000. Father H. Ortynsky, 153 Germain St., pastor.

N. Y., Greece—High and Grade School—Bd. Educ. having plans prepared by C. Ade, archt., 346 East Ave., Rochester, 2-story, 80 x 90-ft. brick and steel. About $75,000.

N. Y., North Tarrytown—Hospital—I. L. Rice Memorial Hospital for Convalescents, c/o I. L. Rice, Jr., 61 B'way., New York City, having plans prepared by H. B. Herts, archt., 507 5th Ave., New York City, 3-story, 150 x 350-ft. brick and stone. About $400,000.

N. J., Asbury—Natatorium—City Comn. will sell $100,000 bonds for rebuilding and installing machinery. H. B. White, city clk.

N. J., Jersey City — Clubhouse — Lodge 211, B. O. P. E., plans, 4-story. About $100,000. Patrick Powers, chn. bldg. comn. W. Neumann, 314 Palisade Ave., archt.

Pa., Edge Hill—Club House—Lulu Temple Country Club plans 3-story, 30 x 70 ft. About $150,000. C. T. Martin, c/o Kensington Trust Co., Kensington and Allegheny Aves., Phila., pres. G. W. Castor, archt., Stephen Girard Bldg., Phila., soon receives bids.

Pa., Farrell — Club House — American Sheet & Tin Plate Co., Frick Bldg., plans, brick, Buhl Terrace and Indiana Ave.

Del., Newark—Women's Dormitory—Delaware College plans 4-story, 30 x 48 ft. About $75,000. S. Mitchell, pres. Day & Klauder, archts., 925 Chestnut St., Phila., soon receive bids.

Va., Lynchburg—Y. M. C. A., Lynchburg had plans prepared. About $75,000.

Va., Petersburg — Theater and Store — Century Amusement Co., Center Sq., plans, 1-story. About $50,000. Walter Sachs, pres. C. K. Bryant, Craig & Isbell, Lehigh Bldg., archts.

W. Va., West Liberty—Dormitory—State Bd. Control, Charleston, soon receives bids, 56.10 x 181.10 ft., brick, and 2 porches F. F. Faris, Schmulbach Bldg., Wheeling, archt.

Fla., Vero—Clubhouse—G. H. Burrows Development Co. plans 5 or 6-story, clubhouse and beach resort. About $1,000,000. G. H. Burrows, 526 Guardian Bldg., mgr. Howell & Thomas, 2032 Euclid Ave., archts., both of Cleveland.

La., Merryville—High School—Bd. Educ. plans $75,000 bond issue for high school.

Ky., Covington—School—City plans election Nov. 6 to vote on $250,000 bond issue for completing school. Address J. J. Craig, mayor.

Ky., Dawson Springs—Hotel—Karlsbad Hotel Co. of America soon receives bids, 450 x 660 ft. casino, hospital, clubhouse and bath house. About $4,000,000. T. R. Troendle, pres. W. Ahlschlager, 1740-44 Conway Bldg., Chicago., archts.

Ky., Lexington—City Hall, Bd. Comrs. plan large auditorium and city hall. A. Rogers, mayor.

O., Akron—Home—Akron Eagles Lodge plans 3-story, 66 x 165-ft., Market and Summit St. Abut $150,000. Forest City Engr. Co., 512 Hippodrome Bldg., archts.

O., Cleveland — Church — Fourth Holy Spirit Congregation having plans prepared by Briggs & Nelson, archts., 629 Rose Bldg., brick, East 107th St. About $200,000.

O., Cleveland — Hotel — C. A. Trebert, Union Bldg., and associates, having plans prepared by H. T. Jeffery, archt., Union Bldg., 12-story brick, Euclid Ave. and 59th St. About $500,000.

O., Cleveland—Office—Physicians & Dentists Co., c/o R. H. Lee, archt., Ameritrust Trust Bldg., had plans prepared, 16-story, brick and steel. About $1,000,000.

O., Cleveland—Store—Kendal Steel Co., Ontario St., plans 3-story, 40 x 82 ft., 210-16 Prospect Ave. About $50,000. Eberhard & Parsons, 1940 Euclid Ave., archts.

O., East Cleveland — (Cleveland P. O.)—Hospital—Hospital Comrs. plan 4-story, brick reinf.-con. and steel. About $[illegible] W. Hirsh, 1303 Swetland Bldg., Cleveland, archt.

O., Lima—Office—Lima Steel Castings Co., South Shawnee St., plans.

O., Zanesville — City Hall and Market house—City Council plans $100,000 bond issue to build.

Mich., Pontiac—Church—First Presbyterian Congregation soon lets contract, 1-story, 75 x 132-ft. About $50,000. C. S. Griese, 6408 Euclid Ave., Cleveland, archt.

Ill., Chicago—Church and Chapel—Grace Episcopal Congregation plans to build. About $200,000. Rev. W. O. Waters, 2001 Prairie Ave., pastor. Lowe & Bollenbacher, archts., 14 East Jackson St., soon receives bids.

Ill., Chicago—Hotel—Kercher Hotel and Bath Co. had plans prepared, 10-story, 80 x 170 ft. J. Kirchner, 505 South Wabash Ave., pres. W. Ahlschlager, archt., 111 West Washington St., soon receives bids. Noted Aug. 2.

Ill., Chicago—Hotel—Winnidemere Hotel East 56th St. and Hyde Park, plans 12-story, 180 x 360-ft. brick, steel and granite addition. About $2,250,000. C. W. George L. Rapp, 69 West Washington St., archts.

Ill., Kewanee—Hospital—Kewanee Pub. Hospital Assn., c/o Mrs. W. F. Jones, 309 Tremont St., having plans prepared by J. G. Beadle, archt., Galesburg, 3-story. About $75,000.

Ia., Boone—School—City voted on $60,000 bond issue for Jordan consolidated school. B. T. Duckworth, secy. bd. educ.

Ia., Chariton—Hospital—Lucas Co. plans election Oct. 15 to vote on $50,000 bond issue for co. hospital. F. M. Wilson, aud.

Ia., Dike — School — City voted $70,000 bond issue to build school. J. J. Schultz, secy bd. educ.

Ia., Earling—Church—St. Josephs Congregation plans 1-story, 80 x 140 ft. About $60,000. Rev. J. Stwiger, Earling, pastor. A. Dohman, 1st Natl. Bank Bldg., Milwaukee, archt.

Ia., Iowa City—Hospital—State University of Iowa plans hospital for cripples. About $150,000. J. M. Fisk, supt. bldgs. Proudfoot, Bird & Rawson, 810 Hubbell Bldg., Des Moines, archts.

Ia., Jordan — High School — Bd. Educ. plans twp. high school. About $60,000.

Ia., Mingo—School—Bd. Educ. plans 2-story, 60 x 90 ft. About $50,000. S. M. Berkley, secy. Proudfoot, Bird & Rawson, Hubbell Bldg., Des Moines, archts.

Ia., Sioux City—Auto Sales — Lessnick Estate, care of Beuttler & Arnold, archts., 609-10 Security Bldg., had plans prepared, 3-story. About $50,000.

Minn., Duluth—High School—Bd. Educ. to sell $150,000 bonds Aug. 24, for central high school. C. A. Bronson, clk. bd. educ.

Kan., Pittsburg — High School — City plans election soon to vote on $200,000 bond issue for high school. W. B. Ittner, Bd. Educ. Bldg., St. Louis, archt.

Kan., Pittsburgh—Normal School—State plans 3-story, 100 x 100 ft. About $200,000. T. A. Kimball, Topeka, mgr. bd. administration. C. H. Chandler, State House, Topeka, archt.

Neb., Lincoln—Office—Rudge & Gunzel Co., 11th and O Sts., plans 7-story, 57 x 100 ft., N St.

Neb., Omaha—Nebraska Telephone Co., 18th and Douglas Sts., will have $200,000 new stock. Also construct new building. About $[illegible]

Neb., Omaha — Comfort Station — City Comrs. plan $50,000 bond issue to build. T. J. O'Connor, city clk.

Neb., Omaha — Police Station — City Comrs. plan $[illegible] bond issue to build. T. J. O'Connor, city clk.

Neb., Scottsbluff—Station—Chicago, Burlington & Quincy R.R. had plans prepared, 41 x 137-ft. station and 24 x 47 ft. general waiting room. About $[illegible]

Mont., Bozeman—Junior High School—Ed. Educ. Dist. No. 7, had plans prepared, 2-story, 60 x 100 ft. About $[illegible] F. F. Willson, archt.

Mo., St. Louis—Theatre and Store—Consolidated Theatres Co., Holland Bldg., had plans prepared, 2-story, 75 x 140 ft. About $75,000. W. Goldman, pres.

Tex., Denton—Normal School—Bd. Regents plans prepared by C. H. Page & Bros., archts., Austin Natl. Bank Bldg., Austin, North Texas State Normal School. About $85,000.

Tex., San Marcos—Normal School—Bd. Regents having plans prepared, Southwest Texas State Normal School, by C. H. Page & Bros., archts., Austin Natl. Bank Bldg., Austin. About $85,000.

Colo., Denver—Museum—City plans wing addition to Colorado Museum, City Park. About $50,000.

Wash., Orting—Hospital—Soldiers' Home plans 2-story and wing here. About $50,000. Andrew Willatzen, Boston Blk., Seattle, archt.

BIDS DESIRED

Mass., Athol—Church—Until Aug. 28, by Athol Methodist Episcopalean Church Society, 1-story, 84 x 90 ft. About $70,000. E. T. Chapin, State Mutual Bldg., Worcester, archt.

N. Y., Albany—(Official)—Laboratory—Until Sept. 7, by H. M. Biggs, M.D., comr. state health dept.; advertised in this issue.

N. Y., Rochester—Junior High School—Until Aug. 31, by Bd. Educ. for 3-story, 226 x 234-ft. rein.-con. Gordon & Madden and W. G. Kaebler, 300 Sibley Block, archts. Noted July 26.

N. J., Englewood—High School — Until Sept. 5, by Bd. Educ., Englewood Ave., Guilbert & Butelle, 665 Broad St., Newark, archts.

O., Kent—Grade and High School—Until Sept. 5, by F. Bechtle, clk. bd. educ., Main St., Franklin Twp., 2-story. About $100,000. Mills & Millspaugh Co., 67 East Long St., Columbus, archts.

Mich., Detroit—School—Until Sept. 4 by Bd. Educ., Wayne Co., Springwells Twp. E. C. Van Leyen and E. A. Schilling, 1115-21 Union Trust Bldg., archt.

Minn., Faribault—School—Until Aug. 28, by State, 2-story, 50 x 170-ft. custodial cottage at School for Feeble-minded. About $75,000. C. H. Johnston, 715 Capital Natl. Bank Bldg., St. Paul, archt. Noted July 19.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Vt., Randolph**—Hotel—A. E. Chandler let contract 2- and 5-story, brick, terra cotta block to Foundation Co., Woolworth Bldg., New York City. Percentage basis. Noted May 3.

★**N. Y., Albany**—Store and Office—James L. Holland, 225 West 78th St., let contract, 4-story, 50 x 80 ft., and 4-story, 42 x 70 ft. brick addition, at James and Steuben Sts., to A. Panzieri & Co., 105 Hudson Ave. About $75,000.

★**N. Y., New York**—Office—Furness, Withy & Co., Ltd., let contract, 8-story, 55 x 72 ft., brick, to John T. Brady & Co., 103 Park Ave. About $200,000.

★**N. Y., Poughkeepsie**—Store and Office—Morgan House Corp. let contract, 6-story, 61 x 142-ft. brick and stone, southwest corner Catherine and Main Sts. to Klingston & Campbell, 1 Washington St. $[illegible]

★**N. Y., Rochester**—School No. 16—Bd. Educ. let contract, 1-story, 120 x 128-ft. addition, to J. H. Schoenheit, 1132 Granite Bldg. About $52,836.

★**N. Y., South Nyack**—(Nyack P. O.)—Clubhouse—Nyack Club, New York City, let contract, [illegible] to N. W. & H. DeBaun, 18 Jackson Ave., Nyack.

★**O., Canton**—Church—St. Charalampus Greek Catholic Congregation, Magnolia, let contract to T. D. Cassalman, Canton. About $15,000.

★**O., St. Paris**—High School—Bd. Educ. let contract to W. E. Bennett, Urbana. About $75,000. Noted July 19.

★**Ind., Evansville**—(Official)—Junior High School—No. 4[illegible], let contract 2-story, 81 x 165 ft. to M. J. Heitman Const. Co., Hussey Bldg. Noted Aug. 2.

★**Mich., Vassar**—School—Bd. Educ. let contract, reinforcing 2-story, 75 x 148 ft., to M. B. Hungerford, Lakeview. About $55,000. Noted Aug. 9.

★**Wis., Ashland**—Hospital—Ashland General Hospital, care M. J. Pyne, let contract 3-story, 75 x 100 ft., to Pugh & Wood, [illegible]. About $[illegible] Noted June 7.

★**Wis., Kenosha**—Hotel—Majestic Carlton Hotel Co., Fox Building, let contract 5-story, 85 x 155 ft., reinforced, to Hunter & Miller, County [illegible]. About $[illegible] Noted May 3.

Buildings (Continued)

★Wis., Ladysmith—Convent and Hospital—Maniolate Sisters of St Marys let contract 4-story, 54 x 129 ft. and 2-story, 50 x 90 ft. respectively, to Hans P. Knudson, Waupaca. About $175,000. Noted July 12.

★Minn., Warroad — High School — Bd. Ed., let contract 78 x 64 ft. to Laurence Constr. Co. About $60,000. Noted May 31.

★Kan., Great Bend—Court House—Barton Co. let contract 4-story, 102 x 124-ft. rein.-con., to Manhattan Constr. Co., 3rd and Fondulac Sts., Muskogee, Okla. About $250,000. Noted July 19.

★Cal., San Francisco—Bank and Office—Amer. Natl. Bank let contract, 10-story, Montgomery and California Sts., to P. J. Walker Co., Monadnock Bldg. About $[illegible].

★Que., Maisonneuve — School — Roman Catholic School Comrs., 87 Catherine St., N., let contract to J. A. Durocher, 201 Chambly St. About $175,000.

★Ont., London—Office—Utilities Bd. let contracts hydro office, brick, to J. W. Carwise, 74 Wharncliffe Rd., rein.-con. to Bains & Peckover, 95 Esplanade, Toronto. About $100,000.

★B. C., Vancouver — Exchange — B. C. Telephone Co. let contract to Adkinson & Dill, Wellington Blk., $90,000.

FEDERAL GOVERNMENT WORK

Proposed Work

N. Y., Iona Island—Buildings—Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., plans to build 2 temporary buildings. About $60,000.

Pa., Dubois—Post Office—Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., rejected bids opened Aug. 9. Noted June 28.

Pa., Ft. Mifflin—Chief Gunners' Quarters—Bureau of Yards and Docks, Navy Dept., Wash., rejected bids opened Aug. 13. Noted Aug. 2.

Wash., D. C.—Buildings—Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., plans to build 5 temporary buildings at Lake Denmark. About $150,000.

BIDS DESIRED

Wash., D. C.—Storehouse—Until Aug. 27 by Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., for storehouse at Hampton Roads.

Va., Norfolk — Tank and Tower — Until Aug. 27 by Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., furnishing and installing 150,000 gal. elevated steel tank and tower.

Ky., Glasgow—Post Office—Until Sept. 26 by J. A. Wetmore, superv. archt., treas. dept., Wash.

Ind., Kendallville — Post Office — Until Sept. 21 by J. A. Wetmore, superv. archt., treas. dept., Wash.

Mich., Detroit—Air Compressors—Until Aug. 27 by Light House Inspector, furnishing 2 oil engine-driven air compressors for Spectacle Reef Light and Fog Signal Station.

N. M., Raton—Building—Until Sept. 12 by J. A. Wetmore, superv. archt., treas. dept., Wash., for public building.

Cal., Mare Island—(Vallejo P. O.)—Electric Traveling Cranes—Until Aug. 28 by Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., furnishing electric traveling cranes for extension to machine shop.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Boston—Locomotive and Crane Shed—Bureau Yards and Docks, Navy Dept., Wash., received low bids (lump sum complete), from Howard Hunt, $43; Lockwood Greene & Engrs. Inc., $[illegible]; C. M. Lewis, Boston, $[illegible].

★N. Y., New York—Embarkation Camp—M. B. Baker, secy. War, let contract, near New York City on McArthur Blvd., New York, cost plus percentage.

★Md., Annapolis — Temporary Officers' Quarters—Bureau of Yards and Docks, Navy Dept., Wash., let contract to J. H. Miles, Shaw and Franklin Sts., Baltimore, cost plus percentage basis.

Wash., D. C.—Radio Receivers—Supply Officer, Navy Dept., received low bids furnishing 150 loop wave radio receivers from Marconi Wireless Telegraph Co., of America, 233 Bway., New York City, $63,750; Natl. Electrical Supply Co., 1330 New York Ave., $71,250; De Forest Radio Telephone and Telegraph Co., $93,000.

Wash., D. C.—Portable Wave Meters—Supply Officer, Navy Yard received low bids furnishing 500 meters from Marconi Wireless Telegraph Co. of America, 233 Broadway, New York City, $93,925; Wireless Improv. Co., 81 New St., New York City, $99,500; Natl. Electrical Supply Co., Wash., D. C., $110,000.

★Va., Newport News — Embarkment Camp—B. N. Baker, secy. War, let contract near Newport News to Westinghouse Church Kerr Co., 37 Wall St., New York City, cost plus percentage.

★S. C., Charleston—Storehouse—Bureau of Yards and Docks, Navy Dept., Wash., let contract to Feeney & Sheehan Bldg. Co., State House, Albany, $210,415, time 400 days. Noted Aug. 16.

Ga., West Point—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., received low bids from W. J. Brent, 506 Bd. Trade Bldg., Norfolk, $42,819; W. P. Francis, 83 Mariette St., Atlanta, $49,950; W. H. Fissell & Co., 1328 Bway., New York City, $59,000. Noted July 12.

Ky., Lancaster—Post Office—J. A. Wetmore, superv. archt., received low bids (a) wood column, (b) steel column, as follows: A. W. Lane, 19 South La Salle St. (a) $27,764, (b) $28,496; F. A. Steininger Constr. Co., Victoria Bldg., St. Louis, (a) $30,988, (b) $31,478; H. G. Mitchell, Scottsburg, Ind., (a) $31,853, (b) $32,278. Noted Aug. 2.

Ariz., Globe—Post Office—Court House—J. A. Wetmore, superv. archt., treas. dept., Wash., received low bid from C. E. Goodhand, Wahoo, $105,000. Noted July 5.

Wash., Puget Sound—(Bremerton P. O.)—Storehouse—Bureau Yards and Docks, Navy Dept., Wash., received low bids (a) net price, (b) omission 9th story, from A. W. Quist Co., New Times Bldg., Seattle, (a) $505,211, (b) $32,110; Sound Constr. Co., 72 Union St., Seattle, (a) $506,000, (b) $28,308; H. Peterson, Seattle, (a) $507,124, (b) $24,454. Noted July 12.

★Wash., Puget Sound—2 Steel Watertanks and Towers—Bureau Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., let contract to Omaha Structural Steel Works, 48th and Leavenworth Sts., Omaha, $16,150.

★Cal., San Pedro—Temporary Submarine Base—Bureau Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., let contract to Regan & McLinn and T. L. Baker, 271 East Ave. 52, both of Los Angeles.

MISCELLANEOUS

Proposed Work

Wharf—Mass., Wareham—City rejected bids. New bids soon. About $13,000.

Creek Improvements—Binghamton, N. Y.—Council voted to issue $25,000 bonds to improve creeks. J. A. Gibel, city engr.

Garbage Disposal Plant—Flushing, N. Y. Bureau of St. Cleaning having plans prepared for new plant on 31st Ave. About $100,000. H. Liebau, Post Office Bldg., Jamaica, archt.

Towers — Newark, N. J. — Butterworth-Judson Co., Ave. R, will build brick, steel and concrete condensing towers, 22 x 33-ft. and 12 x 33-ft. About $65,000.

Incinerating Plant—Trenton, N. J.—City Comm. plans addition. About $55,000. C. B. La Barre, dir. pub. safety. J. R. Fell, Jr., city engr.

Track Elevation—Tullytown, Pa.—Pennsylvania R.R. plans to elevate tracks over Chestland, Fallsington and Oxford Aves. A. C. Shand, Broad St. Sta., Phila., ch. engr.

Wharves, etc.—Savannah, Ga.—Atlantic Coast Line plans to spend about $50,000 or $75,000 to improve wharves, docks and freight houses. J. E. Willoughby, Wilmington, ch. engr.

Harbor Improvements—Mobile, Ala.—Citizens voted $[illegible] bond for harbor improvements at Arlington site. Project includes pier 3000 ft. long. W. Smith, city engr. Noted Aug. 9.

Sea Wall — Detroit, Mich. — (Official) — Dept. Pub. Wks. soon receive bids repairing concrete and timber sea wall, 24th St. About $15,000. C. W. Hubbell, city engr.

River Improvement—Kansas City, Mo.—Bd. Pub. Wks. approved ordinance, improving, widening, dredging and damming the Blue River and building a levee. About $100,000 is available.

Parks and Playgrounds—St. Louis, Mo.—City election Nov. 6 to vote on $2,750,000 bonds for parks and playgrounds. E. R. Kinsey, pres. bd. pub. ser.

Incinerator—St. Louis, Mo.—City election Nov. 6 to vote on $250,000 bonds for garbage incinerator. Noted May 10.

Park Improvements—Beaumont, Tex.—City voted $100,000 bonds to improve parks. J. G. Sutton, clk. Noted July 5.

Levees—Blythe, Cal.—Palo Verde Joint Levee Dist. and Mutual Water Co. plans $500,000 bond issue plus sum sufficient to acquire levees, to construct levees and drain lowlands. C. Allison, engr.

BIDS DESIRED

Pumping Machinery—Brockton, Mass.—Until Sept. 6, by Sewerage Comrs., City Hall; advertised in this issue.

Shaft—N. Y., New York—Until Sept. 5, by Pub. Ser. Comn., 120 Bway., building shaft No. 2, Route No. 26, part of Queensboro Subway Rapid Transit Ry.

Levee Work—New Orleans, La.—(Official)—Until Sept. 4, by Bd. Levee Comrs. of Orleans Levee Dist., Suite 201, New Court House Bldg., for about 165,000 cu.yd. earthwork, length 7700 lin.ft., and removal and reseting 7700 lin.ft. wooden revetment, Lower Beka New Levee, 5th Dist., west bank Mississippi River.

Dam—San Diego, Cal.—(Official)—Until Sept. 4, by City Clk. A. H. Wright, constructing lower Otay Dam, independent spillway and outlet tower with connections involving 30,000 cu.yd. excava., 75,000 cu. yd. concrete, 20,000 cu.yd. mass rock and 1500 lin.ft. of hole for grouting foundations, 6000 cu.yd. excava., 2000 cu.yd. concrete and 750 cu.yd. rein.-con. Noted May 17.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Tide Gate, etc.—New Haven, Conn.—City let contract tide gate with spillways and river walls at Mill River on North State St. to C. W. Blakeslee & Sons, 58 Waverly St., $74,000. Noted July 26.

Timber Bulkhead—Albany, N. Y.—(Official)—L. W. Stotesbury, adjutant gen. let contract to A. M. Hazell, Inc., 26 Cortlandt St., New York City, $40,835. Noted Aug. 9.

★Station Finish—Brooklyn, N. Y.—(Official)—Pub. Ser. Comn., 120 Bway., New York City, let contract station finish for part of Culver Rapid Transit R.R. to Morthenson Woodworking Co., Inc., 65th St. and 3rd Ave.

★Retaining Wall—Allenport, Pa.—Pittsburgh Steel Products Co. let contract concrete retaining wall along river front between here and Stockdale to F. M. Wichert & Co., Hartje Bldg., Pittsburgh. About $100,000.

★Spillway—Hillsboro, Ill.—Bd. Local Improv. let contract to Koler & Sell, Pana.

★Causeway—Galveston, Tex.—Galveston Co. let contract rebuilding to Larkin & Sanhster, Morgan Bldg., Buffalo, N. Y., $550,000.

★Wharf—Houston, Tex.—City let contract, rein.-con., foot of Main St., to Horton & Horton, McKinney and Velasco Sts. About $47,000. Noted July 26.

Lumber to the extent of twenty-five million feet of lumber and timber are wanted in France at an early date it is reported, for the use of the American expedtionary forces. This will supply some of the needs of the troops for forest products until the American forest engineer regiments reach France and begin cutting. It is reported that 10,000,000 ft. of lumber and timber should be delivered in France by Sept. 1, 8,000,000 ft. by Oct. 1, and 5,000,000 ft. additional by Nov. 1. All this is said to be in addition to the 4,000,000 ft. of dock timber and lumber for which the engineer corps of the army opened bids July 21. The material wanted for use in France is described by lumbermen as square and sound. It is needed for wharves and docks, railroads, bridgework and terminal construction. It is said that it may all be bought within a hundred miles of the seacoast in order to insure prompt delivery. Samuel M. Felton, president of the Chicago & Alton R.R., who is in charge of arrangements for the ten or twelve regiments of railroad engineers for service in France is much interested in the plans for buying American timber and lumber for use in France.

PUMPING STATION, NEWARK, N. J.

Bids were received by Passaic Valley Sewerage Commissioners for foundations and connections for Wallington pumping station, from (A) Carrington Constr. Co., River Rd., Passaic; (B) L. L. Brown, Inc., 30 Church St., New York City; (C) Linde & Griffith Co., 4th Ave., Newark; (D) Clup Co., Inc., East 43rd St., Paterson, $151,336. The unit bids of the 3 lowest bidders were as follows:

	A	B	C
Earth excavation and refilling, in trench, for 54-inc. concrete sewer and for 36-inch concrete sewer (lump sum)	$4,500 00	$3,600 00	$3,350 00
Earth excavation for foundations for pumping station, coal house, suction sewer, etc., save those included under item 1 (lump sum)	27,500 00	116,00 00	40,950 00
50 cu.yd. rock excavation, in open excavations	5 00	5 00	3 00
500 cu.yd. concrete masonry, class A, 1:2:4, with Portland cement	11 00	16 50	9 00
3800 cu.yd. concrete masonry, class B, 1:2½:5, with Portland cement	8 50	11 25	8 50
30 cu.yd. brick masonry with Portland cement mortar	24 00	27 00	25 00
1500 long tons rip rap, in place	3 25	4 60	2 50
Cast iron pipes and specials, 36 in., with 4—36-in. gate vaves, 1—36-in. Venturi meter, wall castings, etc., complete in place (lump sum)	9,400 00	12,030 00	11,900 00
12,000 lin.ft. timber piles, for support of masonry structures, in place	0 45	0 50	0 40
260,000 lb. steel for reinforcement, floor frames, etc., in place	0 07	0 085	0 075
800 sq.yd. broken stone road surfacing, complete	1 40	1 80	1 50
Ventilating ducts and surface drains complete (lump sum)	950 00	1,070 00	920 00
Tide gates, for openings 48 x 48 in., one set of two gates, complete and in place (lump sum)	800 00	1,100 00	950 00
150 sq.yd. cobble stone gutters, complete	2 50	1 60	2 00
2000 cu.yd. earth filling for grading about pumping station	1 10	0 50	0 50
Timber bulkhead, complete and in place (lump sum)	10,400 00	10,910.00	11,450 00
Extended totals	$124,490 00	$134,650 00	$137,770 00

PUMPING STATION—NEWARK, N. J.

Bids were received by Passaic Valley Sewerage Commissioners for foundations and connections for Yantacaw pumping station, from (A) J. F. Shanley Co., 31 Clinton St., Newark; (B) L. L. Brown Co., 30 Church St., New York City; (C) O'Gara Constr. Co., 127 Frelinghuysen Ave., Newark; (D) Harrison & Daly, New York City, $113,352; (E) Cadmus Constr. Co., Inc., 120 Liberty St., New York City, $126,475. The unit bids of the 3 lowest bidders were as follows:

	A	B	C
460 lin.ft. earth excavation and refilling, in trench, for 24-in. concrete sewer	$40 00	$45 00	$37 00
Earth excavation for foundations for pumping station, suction sewer, etc., save those included under item 1 (lump sum)	22,000 00	16,500 00	31,000 00
50 cu.yd. rock excavation, in open excavations	6 00	4 50	5 00
250 cu.yd. concrete masonry, class A, 1:2:4, with Portland cement	13 50	17 90	13 00
1350 cu.yd. concrete masonry, class B, 1:2½:5, with Portland cement	10 00	9 25	11 00
30 cu.yd. brick masonry with Portland cement mortar	30 00	22 80	30 00
2500 long tons rip rap, in place	4 50	4 95	3 00
18 in. c.i. pipes ands pecials, 4—18-in. valves, 1—24-in. chuck valve, 1—18-in. Venturi meter, etc (lump sum)	4,500 00	3,540 00	3,000 00
20,000 lin.ft. timber piles, in place	0 65	0 66	0 60
70,000 lb. steel for reinforcement, floor frames, etc., in place	0 075	0 114	0 07
300 sq.yd. broken stone road surfacing, complete	1 50	1 55	2 50
Ventilating ducts and drains, complete (lump sum)	550 00	545 00	500 00
Tide gates, for openings, 30 x 30 in., one set of two gates, complete and in place (lump sum)	200 00	738 00	800 00
Extended totals	$93,675 00	$93,915.00	$96,720 00

FLOOD-PREVENTION PROJECT, LEBANON, PENN.

Bids were received by the Mayor and Council for flood-prevention work (Contract No. 2), from (A) Mangan, Pugh & Dolan, Gregory Bldg., Pottsville; (B) Frank Cannon, 522 Tilghman St., Allentown; (C) Ensign & Co., Hbg. Bk. Bl., Harrisburg. The unit bids were as follows:

	(A)	(B)	(C)
Pumping (lump sum)	$2,560 00	$9,000 00	$2,000 00
13,000 cu.yd. trench excv. earth	1 50	1 40	1 50
1,800 cu.yd. trench excv. rock	4 00	3 00	3 18
10,000 cu.yd. backfill	.40	60	37
1,200 cu.yd. channel excav. A	1 75	3 00	1 91
650 cu.yd. channel excav. B	2 00	4 50	2 12
2,200 cu.yd. channel excav. C	1 25	1 80	1 59
24,000 lb. reinforcement	10	09	09
200 lb. structural steel	.10	10	.13
200 lb. iron castings	05	10	16
10 cu.yd. 1st class concrete	15 00	13 50	16 96
650 cu.yd. 2nd class concrete	13 50	15 00	12 90
80 cu.yd. 3rd class concrete	11 00	8 50	11 66
1,600 lin.ft. 6-in. vitrified pipe	.25	52	65
1,000 lin.ft 8-in. vitrified pipe	.40	50	1 00
50 lin.ft. 10-in. vitrified pipe	.57	75	1 00
460 lin.ft. 12-in. vitrified pipe	.72	90	1 10
550 lin.ft. 15-in. vitrified pipe	94	1 20	1 40
50 lin.ft. 18-in. vitrified pipe	1 27	1 75	1 60
460 lin.ft. laying 24-in. concrete pipe	64	57	1 00
460 lin.ft. laying 27-in. concrete pipe	.70	62	1 00
220 lin.ft. laying 30-in. concrete pipe	.80	.68	1 00
710 lin.ft. laying 33-in. concrete pipe	85	.75	2 10
1,042 lin.ft. laying 36-in. concrete pipe	1 02	81	2 10
3,035 lin.ft. laying 39-in. concrete pipe	1 04	87	2 10
1,290 lin.ft. laying 42-in. concrete pipe	1 09	93	2 10
1,350 lin.ft. laying 45-in. concrete pipe	1 15	1 00	3 00
3 each manholes "A"	50 00	50 00	35 40
8 each, manholes "B"	45 00	45 00	50 10
26 each, catch basins	100 00	63 00	84 80
2 each, curb inlets	55 00	45 00	61 00
13 each, corner inlets	30 00	50 00	63 00
2 each, alley inlets	150 00	60 00	53 00
9 each, sanitary manholes	75 00	61 00	42 40
6 each, flush tanks	25 00	50 00	38 00
15 each, lamp-holes	8 00	20 00	12 72
100 sq.yd. street [illegible]	3 00	3 00	2 00
100 sq.yd. repair bitulithic	3 00	5 00	2 00
120 sq.yd. repair wood block	3 50	3 00	3 00
1,000 lin.ft. relaying [illegible]	15	40	.16
Totals	$[illegible] 94	$[illegible] 67	$[illegible] 29

BUILDING OPERATIONS FOR JULY.

Following is a list of contracts awarded, published by the F. W. Dodge Co. for New England, New York, New Jersey, Pennsylvania, Maryland, Delaware, District of Columbia, Virginia, Ohio, West Virginia, Illinois, Indiana, Iowa, Wisconsin, Michigan, Minnesota, North and South Dakota, and portions of Missouri and Eastern Kansas from January 1 to August 1.

January 1 to August 1, 1917	$990,602,000
January 1 to August 1, 1916	711,005,246
January 1 to August 1, 1915	508,233,600
January 1 to August 1, 1914	454,579,300
January 1 to August 1, 1913	545,067,500
January 1 to August 1, 1912	482,577,500
January 1 to August 1, 1911	477,227,313
January 1 to August 1, 1910	526,425,460

NEW YORK AND NORTHERN NEW JERSEY

January 1 to August 1, 1917	$186,830,000
January 1 to August 1, 1916	104,137,500
January 1 to August 1, 1915	87,661,000
January 1 to August 1, 1914	76,413,500
January 1 to August 1, 1913	181,254,500
January 1 to August 1 1912	146,625,500
January 1 to August 1 1911	143,380,500
January 1 to August 1, 1910	165,524,500

Contracts for the larger territories covered for July amounted to $159,200,000 against $206,541,000 for June and $157,563,000 for May. For the smaller territory of New York and Northern New Jersey contracts for July amounted to $31,549,000 against $27,387,000 for June, and $32,419,000 for May. This shows very little change for the past three months.

STATE APPROPRIATION FOR COUNTY ROAD WORK IN WEST VIRGINIA

Following is a list of the counties and their apportionment of the $435,860 which is available as given out by the state roads commission for the construction and maintenance of class A roads.

County	Mileage	Apportionment
Barbour	85	$8,075 00
Berkeley	69	6,555 00
Boone	94	8,930 00
Braxton	84	7,980 00
Brooke	32	3,040 00
Cabell	65	6,175 00
Calhoun	62	5,890 00
Clay	82	7,790 00
Doddridge	57	5,415 00
Fayette	85	8,075 00
Gilmer	74	7,030 00
Grant	80	7,600 00
Greenbrier	120	11,400 00
Hampshire	115	10,925 00
Hancock	45	4,275 00
Hardy	75	7,125 00
Harrison	110	10,450 00
Jackson	107	10,165 00
Jefferson	60	5,700 00
Kanawha	128	12,160 00
Lewis	73	6,935 00
Lincoln	104	9,880 00
Logan	83	7,885 00
Marion	69	6,555 00
Marshall	92	8,455 00
Mason	87	8,265 00
Mercer	96	9,120 00
Mineral	85	8,075 00
Mingo	85	8,075 00
Monongalia	97	9,215 00
Monroe	75	7,125 00
Morgan	70	6,650 00
McDowell	85	8,075 00
Nicholas	92	8,740 00
Ohio	42	3,990 00
Pendleton	95	9,025 00
Pleasants	42	3,990 00
Pocahontas	127	12,065 00
Preston	112	10,640 00
Putnam	75	7,125 00
Raleigh	83	7,885 00
Randolph	125	11,875 00
Ritchie	113	10,735 00
Roane	83	7,885 00
Summers	71	6,745 00
Taylor	49	4,655 00
Tucker	77	7,315 00
Tyler	70	6,650 00
Upshur	50	4,750 00
Wayne	94	8,930 00
Webster	100	9,500 00
Wetzel	91	8,645 00
Wirt	58	5,510 00
Wood	109	10,355 00
Wyoming	98	9,310 00

An indication of the speed with which [illegible] are being carried to completion is given by the announcement [illegible] adjoining village there were [illegible] from London and in a Methodist place called the Grove Estate. The first work [illegible] on January 1, 1916, and [illegible] on August 1. The [illegible] Limited on Temple Row, Birmingham, and [illegible] of the Tenterden site on Wednesday morning. An event of unusual interest [illegible] the completion [illegible] to Government housing [illegible] the work from [illegible] the Grove had been [illegible]

SEARCHLIGHT SECTION

Contracts To Be Let

PROPOSALS

Bids received until Sept 4, 1917

Duboistown Bridge

Duboistown, Pa.

Sealed proposals for the construction of a reinforced concrete bridge over the West Branch of the Susquehanna River between the foot of Arch Street in West Williamsport and the foot of what will be High Street in the Borough of Duboistown, Pennsylvania, will be received by the Board of Commissioners of Lycoming County, Pennsylvania, at the office of their Chief Clerk, until 12 o'clock, noon, on September 4th, 1917. At the same place, the proposals will be publicly opened at 2 o'clock P. M.

The bridge as contemplated, will be about 1500 feet long and will consist of thirteen (13) open spandrel arches, of ninety-eight (98) feet clear span.

Prospective bidders may secure copies of the plans and specifications, including form of proposals, from L. O. Bower, Chief Clerk of the County Commissioners, at his office in the Court House, Williamsport, Pennsylvania, by making a deposit of twenty-five ($25.00) dollars, which sum will be refunded to all bidders upon return of plans and specifications in good order, and to all other contractors returning same before date on which bids are received.

A certified check for the sum of ten thousand ($10,000.00) dollars payable to H. B. Achenbach, Treasurer of Lycoming County, must accompany each proposal, both of which must be enclosed in a sealed envelope and marked, "Proposal for the Construction of the Duboistown Bridge" and must be delivered to L. O. Bower, Chief Clerk, County Commissioners' Office, Court House, Williamsport, Pennsylvania.

The right is reserved by the Commissioners to reject any and all bids or to accept any bid they may deem to the best interests of the County.

Attest:

L. O. BOWER, Chief Clerk.

CHARLES W. MYERS,
JOSEPH H. MOSLEY,
JOHN G. DIEFENBACHER,
County Commissioners.

M. C. KRAMER, Engineer.
335 Pine Street, Williamsport, Pa.

Bids received until September 4, 1917.

Sewer Construction

Highland Park, N. J.

Sealed bids for the construction of sewers will be received by the Council of the Borough of Highland Park, N. J., at a meeting to be held at the Talbot House, corner Second Ave. and Bridge St., in said borough, September 4, 1917, at 8 P. M.

Proposals must be on blanks to be furnished by Jesse T. Hopkins, Borough Engineer, No. 31 Paterson St., New Brunswick, N. J., from whom specifications and full particulars may be procured.

Council reserves the right to reject any or all bids.

ROBERT B. CRAIG,
Borough Clerk.

PROPOSALS FOR BACK FILLING—U. S. Engineer Office, Detroit, Mich.—Sealed proposals for backfilling walls of Fourth lock, St. Marys Falls Canal, Michigan, will be received here until 11 a.m. Eastern time, September 4, 1917, and then opened. Information on application

Official Proposals

Price, $3.60 an inch—Copy can be received until Wednesday, 10 a. m. for issue mailed the next day

PROPOSALS

Bids received until September 4, 1917.

State Highway Work

PENNSYLVANIA STATE HIGHWAY DEPARTMENT,

Harrisburg, Pa.

Sealed proposals will be received at said office until 10 a. m., September 4, 1917, when bids will be publicly opened and scheduled, and contracts awarded as soon thereafter as possible for the reconstruction of 6513 linear feet of Vitrified Block Pavement, 16 feet wide, situated in Washington Township, Fayette County, Route No. 247; 1,270 linear feet of Vitrified Block Pavement, 26 feet wide, situated in Swatara Township, Dauphin County, State-aid Application No. 570; 13,007 linear feet of Vitrified Block Pavement, 16 feet wide, situated in Manor Township, Armstrong County, State-aid Application No. 397; 5,800 linear feet of Vitrified Block Pavement, 16 feet wide, situated in Clinton Township, Butler County, Bureau of Township Highways Authorization No. 319; 6,537 linear feet of reinforced Concrete Pavement, 16 feet wide, situated in Foster Township, McKean County, Route No. 96; 6,537 linear feet of Reinforced Concrete Pavement, 16 feet wide, situated in Moreland and Abington Townships, Montgomery County, State-aid Application No. 648; 9,878 linear feet of Vitrified Block Pavement, 16 feet wide, situated in East Taylor Township, 11,070 linear feet of Vitrified Block Pavement, 16 feet wide, situated in Jackson and East Taylor Townships, and 11,975 linear feet of Vitrified Block Pavement, 16 feet wide, situated in Jackson Township, all in Cambria County, Route No. 52; 16,852 linear feet of Vitrified Block and Reinforced Concrete Pavement, 16 feet wide, situated in South Fayette Township, Allegheny County, Route No. 108; 19,318 linear feet of Vitrified Block and Reinforced Concrete Pavement, 16 feet wide, situated in Cecil and North Strabane Townships, Washington County, Route No. 108; 5,900 linear feet of Reinforced Concrete and Vitrified Block Pavement, 16 feet wide, situated in East Bethlehem Township, Washington County, Route No. 268; 11,857 linear feet of Reinforced Concrete Pavement, 16 feet to 20½ feet wide, situated in Hanover Township, Lehigh County, Route No. 159, and 7,821 linear feet of Bituminous Pavement, 18 feet wide, situated in South Abington Township, Lackawanna County, Route No. 9; also, for the grading and drainage of 9,299 linear feet of roadbed, 24 feet to 26 feet in width, situated in Moon and Hopewell Townships, Beaver County, State-aid Applications Nos. 254 and 294. Plans and specifications may be seen at office of State Highway Department, Harrisburg, 1001 Chestnut Street, Philadelphia, and 904 Hartje Building, Pittsburgh, Pa. Full particulars and information on application to Frank B. Black, State Highway Commissioner.

PROPOSALS

Bids received until September 12, 1917.

Centrifugal Pumping Unit

Kansas City, Mo.

SEALED PROPOSALS will be received by the Purchasing Agent of Kansas City, Missouri, at the office of the Purchasing Agent, Second Floor City Hall, until two o'clock p. m. of September 12, 1917, for the designing, construction, delivery and erection of a steam turbine, reduction gear, centrifugal pumping unit of a capacity to pump continuously twenty (20) million U. S. gallons of water per twenty-four (24) hours, against a total combined head of three hundred and seventy (370) feet and a steam pressure of one hundred and sixty-five (165) pounds per square inch at throttle; together with all machinery, tools and appurtenances necessary; all in accordance with the plans and general specifications on file in the office of the Chief Engineer of the Water Department.

Each bidder shall deposit with the City Comptroller a certified check in the amount of Fifteen Hundred Dollars ($1500.00), payable to the City Comptroller of Kansas City, Missouri, and accompany his bid with the Comptroller's receipt therefor.

The certified check referred to in the Advertisment shall be submitted by each bidder as a guaranty that the bidder will, within ten (10) days after receiving the award of a contract, file with the City a satisfactory bond to the amount of Fifty Thousand Dollars ($50,000.00) and will execute the contract.

The Board of Fire and Water Commissioners does not bind itself to accept the lowest or any bid offered, and reserves the right to reject any and all bids and to waive any irregularity or informality in the bids.

(Signed) W. C. WEAVER,
Purchasing Agent.

BURTON LOWTHER,
Chief Engineer and Superintendent.

Bids received until August 28, 1917.

Concrete Bridge

Channahon, Will County, Illinois.

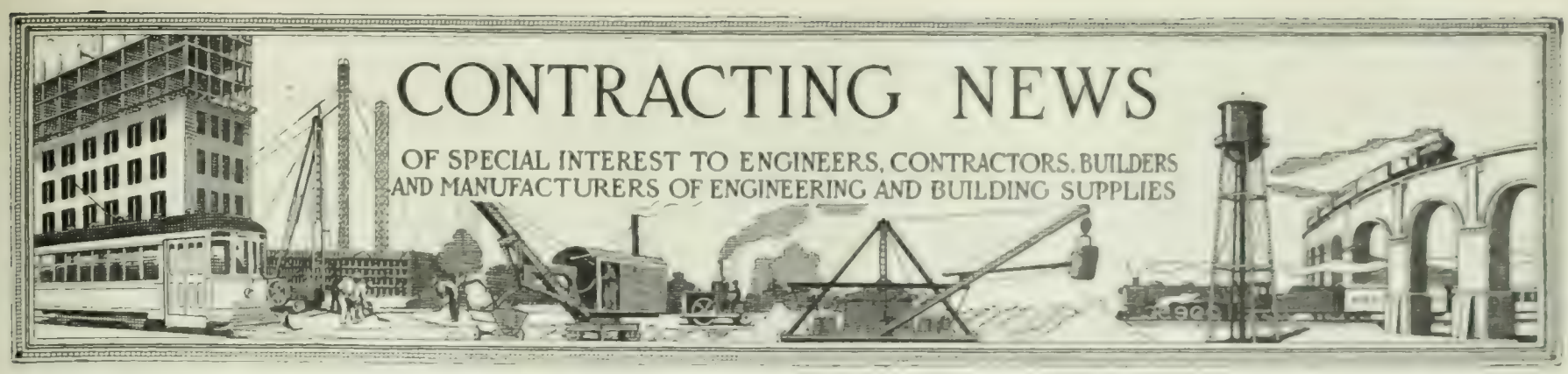
Bids for construction of concrete pier and abutment, 250 cu. yds., straightening and erecting 83 foot truss span, placing wood floor on 83 foot span, and for 2500 cu. yds. of roadway embankment, will be received at Capitol Building, Springfield, Illinois, by the Department of Public Works and Buildings, State of Illinois, Division of Waterways, up to 12 o'clock noon of August 28, 1917, and will be opened at 2 o'clock P. M., of that date. Certified check for $500 will be required to accompany bids.

Plans and specifications can be seen at the office of the Department of Public Works and Buildings, State of Illinois, Capitol Building, Springfield, Illinois, or 905-130 North Fifth Avenue, Chicago; also at the Illinois and Michigan Canal office, Lockport, Illinois.

The department reserves the right to reject any or all bids.

DEPARTMENT OF PUBLIC WORKS AND BUILDINGS.
LESLIE D. PUTERBAUGH,
Director

WILLIAM L. SACKETT,
Superintendent of Waterways.



Proposals

For Proposals Advertised See Pages
52 to 55 Inclusive

WATER-WORKS

Bids Close		See Eng. News-Record
Sept. 3.	Burlingame, Kan.	Aug. 16
Sept. 4.	Hamilton, Ont.	Aug. 16
Sept. 4.	Cumberland, Md. Adv. Aug. 9 to 23.	Aug. 9
Sept. 5.	Leola, S. D.	Aug. 30
Sept. 6.	Wolverton, Minn.	Aug. 23
Sept. 6.	Brockton, Mass. Adv. Aug. 16.	Aug. 16
Sept. 6.	Thomson, Ill. Adv. Aug. 16.	Aug. 16
Sept. 7.	Shawano, Wis.	Aug. 30
Sept. 10.	Cumberland, Md. Adv. Aug. 16 to 30.	Aug. 16
Sept. 11.	New York, N. Y. Adv. July 12 to Aug. 23.	July 12
Sept. 12.	Kansas City, Mo. Adv. Aug. 23 and 30.	Aug. 23
Sept. 13.	Cleveland, O.	Aug. 30

SEWERS

Sept. 4.	Cumberland, Md. Adv. Aug. 9 to 23.	Aug. 9
Sept. 4.	Rocky River, O.	Aug. 23
Sept. 4.	Dodge Center, Minn.	Aug. 23
Sept. 4.	Scranton, Pa.	Aug. 30
Sept. 5.	San Angelo, Tex.	Aug. 30
Sept. 5.	Seymour, Ia.	Aug. 30
Sept. 6.	Cleveland Heights, O.	Aug. 23
Sept. 7.	Avalon, N. J.	Aug. 30
Sept. 7.	Roselle, N. J.	Aug. 30
Sept. 15.	Hillsboro, Ill.	Aug. 16
Sept. 17.	Cleveland Heights, O.	Aug. 30

BRIDGES

Sept. 1.	Annapolis, Md.	Aug. 16
Sept. 3.	Sullivan, Ind.	Aug. 23
Sept. 4.	Marion, Ind.	Aug. 30
Sept. 4.	Brazil, Ind.	Aug. 23
Sept. 4.	Montgomery, Pa. Adv. Aug. 16 to 30.	Aug. 23
Sept. 4.	Williamsport, Pa. Adv. Aug. 16 to 30.	Aug. 16
Sept. 4.	Olympia, Wash.	Aug. 23
Sept. 4.	Bristol, Conn.	Aug. 30
Sept. 4.	Ritzville, Wash.	Aug. 30
Sept. 4.	Sudbury, Ont.	Aug. 30
Sept. 6.	Hiawatha, Kan.	Aug. 23
Sept. 6.	Duluth, Minn.	Aug. 23
Sept. 10.	Omaha, Neb.	Aug. 23
Sept. 10.	Akron, O.	Aug. 23
Sept. 10.	Bryan, O.	Aug. 30
Sept. 11.	Modesto, Cal.	Aug. 30
Sept. 11.	Bradentown, Fla.	Aug. 16
Sept. 13.	Excelsior Springs, Mo.	Aug. 30
Sept. 15.	Guthrie, Okla.	Aug. 30

STREETS AND ROADS

Sept. 3.	Greenfield, O.	Aug. 23
Sept. 3.	Indiana	Aug. 23
Sept. 4.	Canton, Ill.	Aug. 23
Sept. 4.	California	Aug. 23
Sept. 4.	Maryland	Aug. 23
Sept. 4.	Indiana Adv. Aug. 23 and 30.	Aug. 23
Sept. 4.	Seattle, Wash.	Aug. 23
Sept. 4.	Pittsburgh, Pa.	Aug. 16
Sept. 4.	Columbus, O.	Aug. 16
Sept. 4.	New Brunswick, N. J.	Aug. 16
Sept. 4.	Pennsylvania Adv. Aug. 23 and 30.	Aug. 23
Sept. 4.	Toms River, N. J.	Aug. 23
Sept. 4.	Linden, N. J.	Aug. 23
Sept. 4.	San Jose, Cal.	Aug. 30
Sept. 4.	Yazoo City, Miss.	Aug. 30
Sept. 4.	Cincinnati, O.	Aug. 30
Sept. 5.	Salem, Ore.	Aug. 30
Sept. 5.	Freehold, N. J.	Aug. 23
Sept. 5.	Indiana	Aug. 23
Sept. 5.	Ephrata, Wash.	Aug. 30
Sept. 5.	Paterson, N. J.	Aug. 30
Sept. 5.	Freehold, N. J.	Aug. 30
Sept. 5.	Butte, Mont.	Aug. 30
Sept. 6.	Indiana	Aug. 23
Sept. 6.	Muscatine, Ia.	Aug. 23
Sept. 6.	Ventura, Cal.	Aug. 30
Sept. 6.	Towson, Md.	Aug. 30
Sept. 6.	New York, N. Y.	Aug. 30
Sept. 7.	St. Louis, Mo.	Aug. 30
Sept. 7.	Indiana	Aug. 23
Sept. 7.	Avalon, N. J.	Aug. 30
Sept. 7.	Ohio	Aug. 30
Sept. 7.	St. Louis, Mo.	Aug. 30
Sept. 10.	Washington	Aug. 30
Sept. 10.	Wallace, Idaho	Aug. 30
Sept. 11.	Sacramento, Cal.	Aug. 30
Sept. 15.	Visalia, Cal.	Aug. 30
Sept. 19.	Seattle, Wash.	Aug. 23
Sept. 18.	Hohenwald, Tenn.	Aug. 23
Sept. 22.	Cameron, La.	Aug. 30

EXCAVATION AND DREDGING

Aug. 31.	Willmar, Minn.	Aug. 23
Sept. 4.	Estherville, Ia.	Aug. 30
Sept. 6.	Thomson, Ill. Adv. Aug. 16 to 30.	Aug. 23
Sept. 8.	Madison, Minn.	Aug. 23
Sept. 8.	Trenton, Tenn.	Aug. 30
Sept. 10.	Walker, Minn.	Aug. 30
Sept. 12.	New Orleans, La.	Aug. 23
Sept. 12.	Hampton, Ia.	Aug. 30
Oct. 2.	St. Cloud, Minn.	Aug. 2

INDUSTRIAL WORKS

Sept. 4.	Columbus, O.	Aug. 16

BUILDINGS

Sept. 4.	Lakewood, O.	Aug. 16
Sept. 4.	Detroit, Mich.	Aug. 23
Sept. 4.	Columbus, O.	Aug. 23
Sept. 4.	Waterbury, Conn.	Aug. 30
Sept. 4.	West Liberty, W. Va.	Aug. 30
Sept. 4.	Uniontown, Pa.	Aug. 30
Sept. 5.	Ironton, Ohio	Aug. 30
Sept. 5.	Englewood, N. J.	Aug. 23
Sept. 5.	Kent, O.	Aug. 23
Sept. 5.	Newton, Ia.	Aug. 16
Sept. 5.	Brooklyn, N. Y.	Aug. 16
Sept. 5.	Chester, Pa.	Aug. 30
Sept. 7.	Albany, N. Y. Adv. Aug. 16 to 30.	Aug. 23
Sept. 10.	Bridgeport, Conn.	Aug. 30
Sept. 10.	Akron, O.	Aug. 30
Sept. 13.	Upper Sandusky, Ohio	Aug. 30
Sept. 15.	Oklahoma, Okla.	Aug. 16
Sept. 15.	Spirit Lake, Ia.	Aug. 9
Sept. 15.	Bathhurst, N. B.	Aug. 30

FEDERAL GOVERNMENT WORK

Sept. 3.	El Cayey, P. R.	Aug. 30
Sept. 3.	Khalua, T. H.	Aug. 9
Sept. 4.	McKees Rock, Pa.	Aug. 9
Sept. 4.	Detroit, Mich. Adv. Aug. 16 to 30.	Aug. 9
Sept. 4.	Detroit, Mich.	Aug. 30
Sept. 4.	Washington, D. C.	Aug. 30
Sept. 4.	Vicksburg, Miss. Adv. Aug. 23	Aug. 23
Sept. 4.	New London, Conn.	Aug. 23
Sept. 5.	Torrington, Wyo. Adv. July 26	July 26
Sept. 5.	Washington, Ga.	Aug. 9
Sept. 5.	San Francisco, Cal. Adv. Aug. 9 to 23	Aug. 9
Sept. 5.	Washington, D. C. Adv. Aug. 16	Aug. 16
Sept. 6.	Forsyth, Ga.	Aug. 9
Sept. 10.	Annapolis, Md.	Aug. 30
Sept. 10.	Pearl Harbor, Hawaii	Aug. 30
Sept. 12.	Raton, N. M.	Aug. 16
Sept. 12.	Long Island City, N. Y.	Aug. 9
Sept. 18.	Cape Henry, Va. Adv. Aug. 30	Aug. 30
Sept. 21.	Kendallville, Ind. Adv. Aug. 16 and 23.	Aug. 16
Sept. 25.	Washington, D. C. Adv. Aug. 30.	Aug. 30
Oct. 1.	Twin Falls, Idaho	Aug. 30

MISCELLANEOUS

Sept. 4.	Levee Work—New Orleans, La.	Aug. 23
Sept. 4.	Dam—San Diego, Cal.	Aug. 23
Sept. 5.	Duct Line — Brooklyn, N. Y.	Aug. 30
Sept. 5.	Shaft—New York, N. Y.	Aug. 23
Sept. 6.	Pumping Machinery—Brockton, Mass. Adv. Aug. 9 to 30.	Aug. 23
Sept. 10.	Dam and Retaining Walls—Marshalltown, Ia.	Aug. 30
Sept. 10.	Retaining Wall—Lebanon, O.	Aug. 30
Sept. 10.	Dock—Georgetown, Wash.	Aug. 30

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official

WATER-WORKS

Proposed Work

N. J., Bayonne—City plans to lay 12-in. water mains. About $20,000. W. P. Lea, clk.

N. C., Wilmington—City will issue $25,000 bonds to improve Water St. by extending water and sewer mains and curbing. W. E. Merritt, supt.

Miss., Hattiesburg—See "Sewers."

O., Akron—See "Streets and Roads."

O., Defiance—(Official)—City having plans prepared by W. J. Sherman, Cons. engrs., 613 The Nasby, Toledo, for water purification system. Noted Apr. 14.

O., Euclid—Town to sell $155,185 bonds Sept. 24, to build water mains in various streets. H. Migner, city supt.

O., Hamilton—City had plans prepared to improve water-works system. About $34,430. D. W. Meade, Hamilton, engr. Noted Aug. 9.

O., Middleton—City plans to install water mains and sewers on portions of East End St. W. C. Morrison, city engr.

Mich., Flint—City election ordered to vote on $185,000 bond issue for new pumping and extension of water mains. W. L. Parker, supt.

Mich., Ironwood—City voted to build water-works plant. F. R. Hutchinson, supt.

Ia., Atlantic—City had plans prepared building reservoir. About $20,000. J. H. Mayne, Atlantic, engr.

Ia., Conrad—(Official)—City engineer has started Aug. 16 to build sewage disposal plant and sanitary sewerage system.

Ia., Sioux City—City plans to improve water-works system. About $80,000. M. Lewis, engr.

Minn., Duluth—(Official)—City to award bids including $400,000 4½% water bonds. Noted June 13.

Neb., Chappell—City voted $10,000 bonds to extend water works. C. H. Lowe, city clerk.

Mont., Poplar—City plans to build water works system. About $75,000.

Mont., Ronan—City to sell $18,000 bonds Sept. 15 to build water works. Noted Aug. 16.

Water-Works (Continued)

Mont., Scobey—City defeated $19,000 bond issue to build water-works system. Noted Aug. 9.

Tex., Abilene—City voted $280,000 bonds to build $5,000,000-gal. reservoir on Elm Creek. Noted July 26.

Okla., Bristow—City voted $12,000 bonds to build waterworks and sewer extension. Noted Aug. 2.

Okla., Okmulgee—See "Sewers."

Okla., Poteau—City voted $75,000 bonds for new water-works: including pumping station and filtration plant. Benham Eng. Co., Colcord Bldg., Oklahoma, engrs. Noted July 26.

Okla., Waurika—City election, Sept. 11, to vote on $20,000 bond issue to improve water-works system. H. Treadwell, clk. Noted July 26.

Wash., Bremerton—City election Sept. 18 to vote on $60,000 bond issue to extend and improve water-works system.

Wash., Seattle—City to sell $3,700,000 bonds to develop Swan Lake, as an auxiliary storage basin, 3-mi. concrete tunnel and 3rd line from tunnel to city reservoir. L. B. Young, city supt.

Ore., Toledo—City voted $27,000 bonds to extend and improve water-works system.

BIDS DESIRED

O., Cleveland—(Official)—Until Sept. 13, by Comr. Purch. & Supplies, installing 84-in. venturi meters together with all necessary apparatus. R. Hoffman, city engr.

Wis., Shawano—Until Sept. 7, by D. E. Westcott, city clk., building extensions and additions to water-works system. About $40,000. P. Capraro, supt.

S. D., Leola—(Official)—Until Sept. 5, by Town Clk., building 50,000-gal. rein.-con. water-works reservoir. Dakota Eng. Co., Mitchell, engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Boston—City received low bid relaying water pipes in Hyde Park, Collins and Cleary Sq. from Drinkwater, 35 Hemlock St., West Roxbury.

★**Va., Lynchburg**—City let contract building filtration plant to Roberts Filter Mfg. Co., Darby, Pa. Noted June 7.

★**O., Cleveland Heights**—(Warrensville P. O.) See "Sewers."

★**Wis., Madison**—City let contract steam pipe fittings, valves, etc., for connections at new water-works pumping station to Hooper & Schmidt, Madison, $10,000. Noted Apr. 24.

★**Kan., Wilburton**—City let contract water-works improvements to McEachin & McAlester, $26,316.

★**Okla., Oklahoma**—See "Sewers."

★**Cal., Paso Robles**—City let contract building water-works system involving 3660 ft. 8-in., 16,095 ft. 6-in. and 14,630 ft. 4-in. riveted steel pipe, 6940 ft. standard screw pipe and 52 2-way fire hydrants to M. Murphy, San Francisco, $37,248.

SEWERS

Proposed Work

N. Y., Buffalo—City Council authorized sewers in Zittel St., Frank Ave. and Indian Crescent. G. H. Norton, city engr.

N. Y., Rome—City having plans prepared for sewerage system in West Liberty St. J. Piccarelli, city engr.

N. Y., Solvay—State Bd. Health, Albany, approved plans submitted by Semit-Solvay Co. for installing large disposal plant at Split Rock to eliminate pollution of Onondaga Lake by sewage from company's works.

N. J., Camden—City plans to build sewer portions Cope St. A. L. Sayers, st. comr. L. E. Farnham, city engr.

N. J., Hightstown—See "Streets and Roads."

Fla., Miami—City had plans prepared by P. H. Kitts, city building ——disposal system including pump and filtration plant and ——. About $1,000,000.

Miss., Hattiesburg—City plans election to vote on $28,000 bonds to extend water and ——— 2 miles each.

Ky., Shelbyville—City election, Nov. 6, to vote on $15,000 bond issue to build sewerage system.

O., Canton—City defeated $290,000 bond issue to build East and West intercepting sanitary sewer. W. E. Sarver, city engr. Noted July 26.

O., Cleveland—City plans to install sewers in Roanoke, East 100th, East 140th and East 135th Sts. R. Hoffman, city engr.

O., Middleton—See "Water-Works."

O., Wooster—City plans to build sewers in portions Maiden Lane, Callow Hill and Prospect St. H. W. Mowery, city engr.

O., Xenia—See "Streets and Roads."

Ind., Warsaw—City plans to build Phillipson sewer on North Dakota St.

Wis., Springfield—City plans to build new sewerage system. F. H. Clarke, city engr.

Wis., Superior—City plans to install sewer at Billing Park, between Pennsylvania and Wyoming Sts.

Minn., Caledonia—City lets contract about Sept. 15, sewerage system and disposal plant including 18,000 ft. of 8- to 18-in. vitr. clay tile sewer.

Tex., Texarkana—City election Sept. 17 to vote on $50,000 bond issue to build septic tank. C. E. Hayden, city engr.

Okla., Okmulgee—City defeated $145,000 bonds to extend sewers and $390,000 bonds to improve water-works system. Noted July 12.

N. M., Gallup—City having plans prepared by Burns & McDonnell, engrs., 400 Inter-State Bldg., Kansas City, Mo., building sewage disposal plant. R. G. Webb, city clk.

Cal., Newport Beach—City having plans prepared building sewerage system. C. Crego, city clk.

Ont., London—City having plans prepared for sewerage pumping plant at West London. About $50,000. H. Brazier, city engr.

BIDS DESIRED

N. Y., Brooklyn—Until Sept. 6, by L. H. Pounds, boro. pres., for sewers in Snediker Ave. and Newport St. About $13,484.

N. J., Avalon—Until Sept. 7, by Boro. Council, laying sewer pipe, 37th St. and 7th Ave., 6- and 8-in. terra cotta.

N. J., Roselle—Until Sept. 7, by Boro. Council, installing sewers, manholes, etc., in Monroe, Adelphia and Myrtle Sts. Noted July 26.

Pa., Scranton—(Official)—Until Sept. 4, W. G. Robertson, dir. dept. pub. wks., building pipe drain in portions 21st Ward. W. Schunk, supt.

La., Lafayette—(Official)—Until Sept. 25, by City, installing sanitary sewers and sewage-disposal plant; 10 mi. 8- to 20-in. pipe. J. B. McCrary Co., Atlanta, engrs. Noted May 31.

O., Cleveland Heights—(Warrensville P. O.)—Until Sept. 17, by H. H. Canfield, village clk., constructing sewers in Taylor-Caledonia Sewer Dist. No. 5, segment block and vitr. pipe storm and sanitary sewers. F. A. Pease Eng. Co., Marshall Bldg., Cleveland, engrs.

Ia., Seymour—(Official)—Until Sept. 5, (change of date) by J. Lowry, city clk., building 22,000-ft. of from 6- to 12-in. sewers and 2 disposal plants. M. G. Hall, Centerville, engr. Noted Aug. 16.

Mo., St. Louis—See "Streets and Roads."

Tex., San Angelo—(Official)—Until Sept. 5, by San Angelo Sewer Co., building sewage disposal plant. H. E. Elrod, Interurban Bldg., Dallas, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Pa., Reading**—City let contract building section of 24-in. sewerage system to Rundler & Behm, Phila, $50,000.

★**Md., Hagerstown**—Sewerage Comn. let contract additions to sanitary sewerage system to H. C. Brooks Constr. Co., Martinsburg, W. Va., $111,778.

★**O., Cincinnati**—Bd. Control let contract installing sewer in Litherbury St. to Gradison Constr. Co., $13,191.

★**O., Cleveland Heights**—(Warrensville P. O.)—Town let contract sewer and water connections in 15 districts to George Bros., 1448 Bolivar Rd., Cleveland, $34,430. Noted Aug. 16.

O., Lorain—City received low bid building portions 12th St. sewer, (a) brick, (b) segmental block, from Randall & Cooper, (a) $15,727, (b) $14,546; T. Trifiletti, (a) $17,017, (b) $12,855.

★**O., Medina**—See "Streets and Roads."

★**Ind., Muncie**—(Official)—Bd. Pub. Wks. let contract building 5th St. sewer No. 3, and Elbright sewer No. 1 to W. M. Birch Co., Muncie. Noted Aug. 16.

Mich., Escanaba—(Official)—City received low bids building sewers Stephenson Dist. C. Puissant, $8505; Wells, Cochrane, and Jennie Sts., Delto Constr. Co., $15,000; Selden Ave., G. Hogan, $5,32. Contractors all of Escanaba. Noted Aug. 9.

★**Wis., Racine**—Bd. Pub. Wks. let contract building storm sewers in various streets to C. E. Reed, Racine, $50,000.

★**Ia., Marshalltown**—(Official)—City let contract building sanitary sewers in portions of 12 streets to Anderson & Empire, Marshalltown, $20,000. Noted Aug. 16.

★**Okla., Oklahoma**—South Oklahoma Townsite Co. let contract sewerage and water-works systems to A. F. Binns, 225½ West Grand Ave., $18,000.

★**Utah, Ogden**—City let contract building sewer portions Washington Ave. to Heuser-Packard Co., Salt Lake City, $12,000. Noted June 28.

★**Cal., Santa Barbara**—See "Streets and Roads."

Ont., Toronto—Bd. Control received low bids Rosedale Creek sewer from high level pumping station to Russell Hill Rd. and Clarendon Ave. from A. McDonald and P. Nicholson. About $105,000. Noted Aug. 2.

BRIDGES

Proposed Work

N. Y., Rochester—City, New York State Rys. and New York Central & Hudson River R.R. plan new bridge over tracks of New York Central on Main St., E. F. T. Elwood, city engr. E. J. Cook, Rochester, genl. mgr. of former railway, and G. W. Kittredge, Grand Central Terminal, New York City, ch. engr. of latter.

Pa., Dubois—See "Streets and Roads."

Pa., Harrisburg—Comrs. Dauphin Co. plan bridge over tracks of Pennsylvania R.R. north of Middletown. About $45,000.

Ill., St. Joseph—Champaign Co. plans new bridge over channel, 110 ft. long and 18 ft. wide. G. C. Fairclo, co. supt. highways.

Wis., Wausau—Citizens voted $60,000 bonds to build rein.-con. bridge over Wisconsin River at Big Bull Falls. D. B. Luten, Indianapolis, engr. Noted June 28.

Minn., Walker—Comrs. Cass Co. will build bridge over narrows between Cass Lake and Pike Bay. About $20,000.

Kan., Cottonwood Falls—Chase Co. had plans prepared for 9 bridges. About $16,530. J. Frew, co. engr.

Kan., Topeka—Shawnee Co. will build 140-ft. rainbow arch bridge over Soldier Creek on Kansas Ave. About $25,000. Marsh Eng. Co., 205 Masonic Temple, Des Moines, engrs.

Neb., Lincoln—(Official)—Lancaster Co. will build 8 bridges with state-aid. Contracts to be let in October. About $218,000. G. E. Johnson, state highway engr.

Neb., Papillon—Sarpy Co. voted $50,000 bond issue to build bridges.

Wash., Bellingham—Comrs. Whatcom Co. will build steel bridge over Noosack River at Marietta. About $32,000.

Wash., Spokane—Council plans rein.-con. bridge over Hangman Creek at West Riverdale. About $25,000. M. Macartney, city engr.

Cal., Oakland—Alameda Co. voted $900,000 bonds as its share of bascule bridge over estuary between Oakland and Alameda; bridge to be built by county and Southern Pacific Co. Noted June 28.

Cal., Woodland—Bd. Superv. Yolo Co. authorized construction 4 bridges; 1 over Cache Creek, Stephens Bridge, 1 near Dunnigam Highway and 1 to replace Scott Bridge, all to rein.-con. About $43,000.

Ont., Kincardine—Council plans to repair bridges recently damaged by storm. About $12,000. R. M. McDowell, Owen Sound, engr.

BIDS DESIRED

Conn., Bristol—Until Sept. 4, by T. B. Steele, city clk., rein.-con. bridge over Pequabuck River. C. W. Buell, city engr.

O., Bryan—Until Sept. 10, by G. C. Beucler, aud. Williams Co., for 8 bridges in various townships.

Ind., Marion—Until Sept. 4, by Comrs. Grant Co., for rein.-con. bridge over Mississinewa River. Contract recently awarded to F. R. Hoover rescinded. Noted July 26.

Bridges (Continued)

Mo., Excelsior Springs—Until Sept. 13, by W. L. Silvers, city clk., bridge over Henrie Ave. and 1 over Fishing Creek.

Okla., Guthrie—Until Sept. 25, by Comrs. Logan Co., for 19 bridges. About $33,000. A. A. Leer, clk.

Wash., Ritzville—Until Sept. 4, by Comrs. Adams Co., 65-ft. rein.-con. arch bridge.

Cal., Modesto—Until Sept. 11, by Stanislaus Co., for rein.-con. bridge on Oakdale-Waterford Rd.

Cal., Yreka—Until Sept. 4, by Siskiyou Co., 1 40-ft. and 1 80-ft. rein.-con. bridge, also 2 20-ft. spans, 1 32-ft. approach fill and rebuilding floor system of 70-ft. steel bridge.

Ont., Sudbury—Until Sept. 4, by W. J. Ross, town clk., for rein.-con. bridge.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Hampton**—E. S. Douglass, supt. highways, let contract rein.-con. arch bridge over Poultney River to Falkill Constr. Co., 1 Washington St., Poughkeepsie. Noted Aug. 16.

★**N. J., Trenton**—Bd. Freeholders Mercer Co. let contract double-arch culvert on River Rd. at Moore Sta. to R. A. Montgomery, Trenton, about $15,164.

★**Pa., Birdsboro**—Philadelphia & Reading Ry. let contract building bridge, Wilmington Branch, to Bennett & Randall, Lebanon, $15,000.

★**Pa., Kittanning** — Comrs. Armstrong and Westmoreland Cos. let contract repairs and replacements on Kiskiminetas River bridges at Vandergrift and Leechburgh, to Faris Engr. Co., Empire Bldg., Pittsburgh, about $56,265.

★**Fla., Ft. Myers**—Comrs. Lee Co. let contract 89 concrete bridges and culverts in connection with road work to Trapp & Fraser, Ft. Myers.

★**Fla., Palm City** — Palm Beach Co. Comrs., West Palm Beach, let contract building bridge over Lucie River to C. T. Dalkans Constr. Co., $63,517. Noted June 14.

★**O., Barberton**—T. J. Davies, dir. pub. ser., let contract concrete and steel viaduct to be known as Tuscarawas Ave. viaduct to Hackendorn Constr. Co., 1134-6 Ind. Pythian Bldg., Indianapolis; $177,600. Noted Aug. 2.

O., Columbus—Comrs. Franklin Co. received low bid rein.-con. bridge over Olentangy River on Lane Ave. from E. Elford & Co., 104 North 3rd St., $153,814; 1 on 3rd Ave. from Marion Constr. Co., Marion, $156,579. Noted Aug. 16.

★**Wis., Milwaukee**—Milwaukee Co. let contract approaches for rebuilding Grand Ave. viaduct to John Ubbink, $25,590.

★**Ia., Anamosa**—Jones Co. let contract 7 16-ft. and 2 24-ft. I-beam bridges to W. Flaherty, Anamosa, about $20,400.

★**Minn., Duluth**—Duluth & Iron Range Ry. let contract bridge over Sucker River to A. T. Nelson, 5 East Superior St., $10,000.

★**Ark., Wynne**—City let contract steel drawbridge over St. Francis River to Larimer & Burget Bridge Co., Memphis, $33,560.

★**Okla., Muskogee**—Muskogee Co. let contract bridge over South Canadian River to Mid-Western Ditch Co., 610 New England Bldg., Kansas City, Mo., about $150,000.

★**Okla., Poteau**—Le Flore Co. let contract 2 steel bridges across Poteau River in Heavener Twp. to Kansas City Bridge Co., 510 Orear-Leslie Bldg., Kansas City, Mo., $24,000.

★**Wash., Vancouver**—Clarke Co. let contract 1 90-ft. span and 1 72-ft. span bridge over Lewis River near Yacolt to Vancouver Contr. Co., Vancouver. Noted July 26.

Cal., Rio Vista—Bd. Supervs. Sacramento Co., Sacramento, and Solano Co., Fairfield, received low bid bascule bridge over Sacramento River from Tibbitts-Pacific Co., 16 California St., San Francisco, $164,568. Noted July 26.

★**Cal., Sacramento**—Bd. Supervs. Sacramento Co. let contract bridge over American River at Folsom City to Reed Contract Co., Forum Bldg., about $74,940.

★**Cal., San Jose**—City let contract rein.-con. bridge over Guadalupe Creek on Willow St. to A. Matteon, San Bruno, $14,500.

★**Ont., Windsor**—Canadian Pacific Ry. let contract rein.-con. viaduct to Sherrard Constr. Co., Mail Bldg., Toronto, about $50,000.

STRUCTURAL STEEL WORK

Proposed Work

N. Y., Brooklyn—See "Industrial Works."
N. Y., Rochester—See "Bridges."
Pa., Harrisburg—See "Bridges."
O., Cleveland—See "Industrial Works."
Ill., St. Joseph—See "Bridges."
Minn., Walker—See "Bridges."
Kan., Cottonwood Falls—See "Bridges."
Kan., Topeka—See "Bridges."
Neb., Lincoln—See "Bridges."
Neb., Papillon—See "Bridges."
Wash., Bellingham—See "Bridges."
Cal., Oakland—See "Bridges."
Cal., Yreka—See "Bridges."
Ont., Kincardine—See "Bridges."

BIDS DESIRED

O., Bryan—See "Bridges."
Ind., Marion—See "Bridges."
Mo., Excelsior Springs—See "Bridges."
Okla., Guthrie—See "Bridges."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. J., Trenton**—See "Bridges."
★**Pa., Kittanning**—See "Bridges."
★**Pa., Lansdowne**—See "Buildings."
★**Wis., Milwaukee**—See "Bridges."
★**Ia., Anamosa**—See "Bridges."
★**Minn., Duluth**—See "Bridges."
★**Okla., Muskogee**—See "Bridges."
★**Okla., Poteau**—See "Bridges."
★**Wash., Vancouver**—See "Bridges."
Cal., Rio Vista—See "Bridges."
★**Cal., Sacramento**—See "Bridges."

REINFORCED CONCRETE

Proposed Work

N. Y., Brooklyn—See "Industrial Works."
N. Y., Buffalo—See "Industrial Works."
N. J., Jersey City—See "Miscellaneous."
Va., Norfolk—See "Buildings."
W. Va., Huntington—See "Buildings."
O., Cleveland—See "Industrial Works."
O., Lakewood—See "Buildings."
Wis., Wausau—See "Bridges."
Tex., Mineral Wells—See "Water-Works."
Wash., Seattle—See "Water-Works."
Wash., Spokane—See "Bridges."
Cal., San Francisco—See "Buildings."
Cal., Woodland—See "Bridges."
Cal., Yreka—See "Bridges."

BIDS DESIRED

Conn., Bristol—See "Bridges."
O., Lebanon—See "Miscellaneous."
Ind., Marion—See "Bridges."
Ia., Marshalltown—See "Miscellaneous."
S. D., Leola—See "Water-Works."
Wash., Ritzville—See "Bridges."
Cal., Modesto—See "Bridges."
Ont., Sudbury—See "Bridges."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Cambridge**—See "Industrials."
★**N. Y., Poughkeepsie**—See "Bridges."
★**Pa., Lansdowne**—See "Buildings."
★**Fla., Ft. Myers**—See "Bridges."
★**O., Barberton**—See "Bridges."
O., Columbus—See "Bridges."
★**Ind., Indianapolis**—See "Industrial Works."
★**Cal., San Jose**—See "Bridges."
★**Ont., Windsor**—See "Bridges."

STREETS AND ROADS

Massachusetts—State Highways Comm., Boston, rejected bids building highway in Egremont and Sheffield. Noted Aug. 2.

R. I., Woonsocket—City plans to improve various streets. About $[illegible]. F. H. Nullo, city engr.

N. Y., Carthage—City voted $[illegible] bond issue for brick paving on North Mechanic St. and macadam paving on Parmele St.

N. Y., Troy—(Official)—Rensselaer Co. sold $75,000 bonds to build roads. Noted Aug. 16.

N. J., Elizabeth—Union Co. Bd. Freeholders plan to pave north side Westfield Ave. J. L. Bauer, co. engr.

N. J., Hightstown—City Council plans improving South St. and extending sewerage system to Summit St.

N. J., Linden—Town Council may receive bids paving road between Bay and Railway. J. L. Bauer, Elizabeth, twp. engr.

N. J., Westfield—City Council plans $[illegible] bond issue for sidewalk and road improvement. A. W. Vosburgh, city engr.

Pa., Beaver Falls—City soon lets contract, grading 7th, 8th and 14th Aves., laying sidewalks on 3rd, 12th and 14th Aves. E. S. Donaldson, city engr.

Pa., Dubois—Council to issue $22,000 bonds to pave and repair streets. A. L. Bouton, city engr.

Pa., Dubois—City soon lets contract repaving Boulevard, tarvia, and South Franklin St.; also building bridge over Sandy Creek. J. D. Flinn, Harrisburg, engr.

West Virginia—State Highway Comm., Charleston, plans road contruction in 55 counties. About $446,036.

W. Va., Parkersburg—(Official)—City receives bids about Sept. 18, paving, steel grading, and curbing on portions Ann, Charles, George, Spring, 29th, 22nd Sts., sand and gravel, 3-in. concrete base; Depot St., concrete. About $46,000. W. M. Hall, city engr. Noted Aug. 9.

N. C., Wilmington—See "Water-Works."

Ga., Columbus—Polk Co. voted $10,000 bonds to build roads.

Fla., Key West—Monroe Co. voted $100,000 bonds to build hard surfaced road from Key West to Stock Island. Noted Aug. 2.

Fla., Lake City—Columbia Co. plans to vote on $500,000 bond issue to hard surface roads.

Miss., Ellisville—Jones Co. sold $200,000 bonds to build 126 roads in county. Noted July 5.

Miss., Ellisville—Jones Co. Bd. Supvrs., Laurel, plan building roads in Beat 1, 2 and 3. About $100,000.

Miss., Hattiesburg—Bd. Supervs. Forrest Co. plan to build 2-mi. road from Rawis Springs to Lux, also road to Camp Shelby. About $30,000.

Tenn., Greeneville—Greene Co. Comrs. soon let contract road improvement. About $200,000. C. E. Cole, co. engr.

Tenn., Springfield—Robertson Co. Court sold $50,000 bonds to improve turnpikes. Noted Aug. 9.

O., Akron—City Council plans paving, grading, curbing, constructing sidewalks, sewer laterals and water service connection in Ido St. J. A. Gehres, city engr.

O., Bryan—Williams Co. sold $108,000 bonds for road improvements. Noted Aug. 9.

O., Cleveland — City to issue $200,000 bonds to repave Superior Ave. R. Hoffman, city engr.

O., East Cleveland—(Cleveland P. O.)—Town plans draining, curbing and paving Mannheim Ave., brick.

O., Findlay—City plans paving portion Baldwin Ave., brick; also oiling West St. for 1 year. W. K. Stringfellow, city engr.

O., Sandusky — Sandusky Co. will sell $32,000 bonds to improve roads. F. R. Smith, co. aud.

O., Xenia—(Official)—City election Nov. 13 to vote on $17,000 bond issue as city's share in $150,000 street improvement work. Work involves paving 10 streets, sanitary and storm water sewers. J. P. Shumaker, city engr. Noted Aug. 16.

Ind., New Albany—Floyd Co. sold $[illegible] bonds to build roads. C. A. Sittason, co. treas.

Ill., Pittsfield—Pike Co. County plans to extend state road toward Griggsville. About $16,000.

Ill., Tuscola—Douglas Co. may let contract building brick road south and west of Newman.

Wis., Madison—City plans to pave portion North, Russell and Helena Sts. and Yahara Pl. W. G. Kirchhoffer, 33 North Carroll St., engr.

Ia., Davenport—Bd. Pub. Wks. plans grading streets. About $18,000. R. H. Sawistowsky, city engr.

Ia., Ottawa—La Salle Co. had plans prepared [illegible] road (Illinois Corn. Pave. Sec. 11 M. wide. About $[illegible].

Ia., Sioux City—Woodbury Co. Comrs. plan to pave Sioux City-Correctionville Rd. [illegible] also Sioux City-Smithland Rd. About $[illegible].

Minn., Duluth—Dist. Ct. Wks. Comm. plans paving Railroad St. and building road on Garfield Ave. W. E. Ayres, city engr.

Miss., East Brainard—(Brainard P. O.)—City plans paving portions Main and 3rd Sts.

Kansas—State Highway Comm. Topeka, plans to improve Kan. River Rd. between Kansas City and Leavenworth.

Kan., Oswego—Labette Co. had plans prepared improving [illegible] Noted Aug. 9.

Neb., Nebraska City—(Official)—City contemplates paving [illegible] Noted Aug. 9.

Streets and Roads (Continued)

Mont., Helena—City plans to pave portion 6th Ave., 5-in. base brick or 6-in. rein-con. base. About $80,000. J. D. McLeod, city engr.

Mo., Albany—City Council plans paving portions Polk, North Hundley and East Clay Sts.

Mo., Alton—Oregon Co. Court plans opening Stikes Rd. and will survey proposed road from Howell Co. line to Thayer.

Mo., Caruthersville—Pemicott Co. plans $1,000,000 bond issue to improve roads.

Mo., Doniphan—Ripley Co. plans election Oct. 2 to vote on $200,000 bond issue to improve roads.

Mo., Nevada—Vernon Co. had plans prepared building road in Center Twp., sandstone base, 6 in. thick and 16 ft. wide with gravel surface 4 in. thick 16 ft. wide.. A. Wood, co. engr.

Mo., New London—Ralls Co. election Sept. 21 to vote on $250,000 bonds to improve roads.

Mo., New Madrid—New Madrid Co. voted $850,000 bonds to improve roads.

Mo., Oregon — Holt Co. plans $800,000 bond issue to improve roads.

Mo., Springfield—Greene Co. election soon to vote on $10,000 bond issue to build roads in Galloway Dist. L. Luster, atty.

Ark., Perryville—Perry Co. Road Improv. Dist. No. 1 sold $95,000 bonds to construct 26 mi. of road

Texas—State Highway Comn., Austin, plans Tex-O-Kan road through several counties, involving grading, ditching, hard surfacing, clay, sand or gravel with clay binder and concrete culverts.

Tex., Corsicana—Comrs. Court of Navarro Co. plans election Sept. 13 in Rd. Dist. No. 1 to vote on $200,000 bond issue for good roads.

Tex., Corsicana—Comrs. Court of Navarro Co. plans election Sept. 15 in Richland Rd. Dist. to vote on $80,000 bond issue to build roads.

Tex., Dallas—County defeated $1,000,000 bond issue to construct permanent highways. Noted July 26.

Tex., Eastland—Eastland Co. defeated $130,000 bond issue for roads in Dist. No. 1. Noted July 26.

Tex., Greenville—Hunt Co. Rd. Dist. No. 2, voted $100,000 bond issue to build roads. Noted July 19.

Tex., Houston—Harris Co. will sell $1,100,000 bonds for building roads. Noted June 7.

Tex., Palestine—Comrs. Court Anderson Co. plan election Sept. 15 to vote on $25,000 bond issue for roads in Dist. No. 2.

Okla., Ada.—(Official)—Pontiac Co. sold $523,000 bonds to build roads and bridges. Noted Aug. 9.

Okla., Ada—City plans paving in Dist. No. 4 asphaltic concrete. About $50,000. Benham Engr. Co., 1300 Colcord Bldg., Oklahoma City.

Okla., Anadarko—Latham Twp., Caddo Co., election soon to vote on $25,000 bonds to build roads.

Okla., Eufaula—McIntosh Co. voted $50,000 bond issue to improve roads. A. J. Wells, Canadian, co. clk.

Okla., Newkirk—City plans paving 40,000 sq.yd. asphaltic pavement. About $60,000. Benham Engr. Co., 1300 Colcord Bldg., Oklahoma City.

Okla., Okmulgee—Okmulgee Co. having plans prepared by Harrington, Howard & Ash, engrs., Arear Leslie Bldg., Kansas City, Mo., for county road system.

Idaho, Grangeville—Idaho Co. election Oct. 17 to vote on $100,000 bond issue to build River Canyon Highway.

Idaho, Grangeville—Grangeville Highway Dist. defeated $15,000 bonds to build roads. Noted July 12.

Idaho, Mackay—Council passed ordinance building 10 blocks cement curbs, 4 blocks 6 in. thick, remainder 5 in. wide.

Idaho, St. Anthony—Council passed resolution building cement sidewalks on certain streets and avenues. About $15,000.

Idaho, Wallace—City received bids paving in Dist. No. 7. Noted Aug. 16.

Utah, Provo—Utah Co. Comrs. plan concrete highways throughout entire length of county. About $75,000.

Utah, Salt Lake City—Salt Lake Co. election soon to vote on $22,000 bonds to improve roads.

Ariz., Clifton—Greenlee Co. sold $100,000 bonds to build Clifton-Springerville Highway. Noted June 21.

Ariz., Holbrook—Navajo Co. Highway Comrs. sold $160,000 bonds to build roads. Noted May 31.

Wash., Bellingham—City Council passed resolution paving portion Army St., asphalt, 24 ft. wide, 6-in. concrete sidewalk on 1 side. About $30,000. C. Lindberg, city engr.

Wash., Seattle—City had plans prepared paving Wilson Ave., $253,630; portion Stoneway St., $15,856; East 50th St., $109,000. A. H. Pemock, city engr.

Wash., South Bend—Pacific Co. recently sold $275,000 bonds to improve roads. Noted Aug. 2.

Wash., Tacoma—Pierce Co. Comrs. plan election soon to vote on $1,000,000 bond issue to build scenic highway to American Lake Cantonment, Camp Lewis.

Oregon—State Highway Comn., Salem, plans to hardsurface road from Pendleton to Eastern Oregon State Hospital and to pave Kild Horse Rd., Pendelton to Blakely Station, 16 ft. wide.

Ore., Eugene—Lane Co. soon lets contract building portion North Fork Highway, to form a connecting link between Eugene and Florence. H. W. Libby, co. engr.

Ore., Pendelton—Council passed resolution paving portions Jackson and Madison Sts. About $25,000.

Cal., Corte Madra—City voted $50,000 bonds to build streets.

Cal., El Cajon—City plans election Sept. 25 to vote on $11,500 bond issue for paving state highway through town, concrete.

Cal., Santa Barbara—City having plans prepared improving Del Mar to Booth Point highway. About $15,000. A. B. Cook, city engr.

BIDS DESIRED

N. Y., New York—Until Sept. 6, by D. Mathewson, boro. pres., Bronx Boro., improving portions of Spofford, Rhinelander, Sackett, Webster and University Ave., East 138th, Buck and Purdy Sts., Boston Rd. and Butler Pl. by grading, curbing, paving and repaving, laying sidewalks and crosswalks, building inlets, drain, receiving basins and sewers.

N. J., Avalon—Until Sept. 7, by Borough Council, grading, graveling, curbing and cement sidewalks on 7th, 15th and 33rd Sts. and Wirst Ave. W. H. Collisson, Jr., Ocean City, boro. engr.

N. J., Freehold—Until Sept. 5, by Bd. Freeholders, Monmouth Co., reconstructing Tennent-Englishtown Rd., gravel surface on slag foundation, 1940 compacted cu.yd. C. E. Close, clk.

N. J., Paterson—Until Sept. 5, by Bd. Freeholders, Passaic Co., improving Midvale and Greenwood Lake Rd. to West Milford Twp. W. Botbly, clk.

N. J., Union—Until Sept. 4, by City Council, repaving and improving portions Gardner St. About $15,000. T. F. Bowe, city engr.

Md., Towson—Until Sept. 6, by Baltimore Co., building 1-mi. Falls Rd., concrete. H. J. Gallagher, clk.

Fla., Kissimmee—(Official)—Until Sept. 17, by J. L. Ocerstreet, clk., Osceola Co., building road from Kissimmee to Loughman, Dists. Nos. 1 and 2, brick. Noted July 12.

Miss., Yazoo City — Until Sept. 4, by Comrs. Yazoo Co., Dist. No. 1, improving roads involving 6.9-mi. grubbing 80,000 cu. yd. grading, installing 200 lin.ft. 12-in., 300 ft. 15-in., 200 ft. 18-in. and 150 ft. 24-in. culvert pipe, 13 cu.yd. plain and 392 cu.yd. rein.-con.

La., Cameron—(Official)—Until Sept. 22, by Cameron Co. Bd. Supers., Rd. Dist. No. 1, grading, bridging and metalling road in Hackberry, 5.5 mi. T. H. Mandell, Lake Charles, engr. Noted Aug. 9.

O., Cincinnati..Until Sept. 4, by C. F. Hornberger, dir. pub. ser., improving and paving portions Maple Leaf Ave. F. Krug, city engr.

O., Cleveland—Until Sept. 5 (change of date) by city grading, draining, curbing and paving portion East 141st St. R. Hoffman, city engr. Noted July 19.

Mont., Butte—(Official)—Until Sept. 5, by C. H. Tracy, city clk., repaving streets in Dist. No. 243, vitr. block or wood block, $21,901; No. 244, same material, $16,901; No. 245, bitulithic or asphaltic concrete, $8304; W. H. Ellis, city engr. Noted Aug. 16.

Mo., St. Louis—Until Sept. 7, by Bd. Pub. Ser., paving portions Varrellmann, Ethel, and Colorado Aves.; also building sewers in Glaise Creek Sewer Dist. No. 18. E. R. Kinney, pres.

Idaho, Wallace—Until Sept. 10, by D. H. De Long, city clk., paving portions several streets, including concrete gutters. About $13,000.

Washington—Until Sept. 10, by State Highway Comn., Olympia, grading, draining and surfacing roads as follows: Stevens Co., State Rd. No. 22, 6 mi.; Clarke Co., Pacific Highway, 3.6 mi.; Kittias Co., Sunset Highway, 2 mi.; Columbia Co., Inland Empire Highway, .6 mi.; Walla Walla Co., Inland Empire Highway, 5½ mi.

Wash., Ephrata—Until Sept. 5, by Grant Co. Comrs., graveling 3½-mi. highway north of Coulee City.

Oregon—Until Sept. 5, by State Highway Comn., Salem, building 3 units Pacific Highway in Douglas Co.

California—(Official)—Until Sept. 11, by State Highway Comn., 515 Forum Bldg., Sacramento, grading state highway, in Humboldt Co., 7.2 mi. A. B. Fletcher, highway engr.

Cal., San Jose—Until Sept. 4, by Bd. Supervs. Santa Clara Co., improving Bodfish Mill Rd., Dist. No. 1; Santa Clara and Alviso Rd., Dist. No. 4. H A. Pfister, co. clk.

Cal., Ventura—(Official)—Until Sept. 6, by Ventura Co., paving and grading Main St., 1.42 mi. concrete, 16 ft. wide, 4 in. thick; surfacing Telegraph and Nordhoff Rds., concrete, 1,193,000 sq.ft. J. B. McCloskey, clk.

Cal., Visalia—Until Sept. 15, by Bd. Superv., Tulare Co., paving 8 mi. road in Tulare-Paige Div., 8 mi. in Exeter-Merryman Div., 9 mi. in Dinuba-Kingsburg Div., concrete.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Massachusetts**—State Highway Comn. let contract building highway in Sagus, Malden and Melrose to Rowe Contg. Co., Malden, $30,494. Noted Aug. 16.

Massachusetts — State Highway Dept., Boston, received low bids paving section Fitchburg Highway, from R. E. Bull, Fitchburg, $22,313; R. F. Hudson, Melrose, $27,038; C. E. Horne, Millbury, $30,026; section Littleton Highway, J. C. Collins, Andover, $17,170; Framingham Constr. Co., Framingham, $19,970. Noted Aug. 16.

Mass., Boston — (Dorchester) — City received low bids paving Dorchester Ave. from B. E. Grant, 101 West Cedar St., $27,835; J. F. Lynch, 143 Tonawanda St., $32,629; West Roxbury Trap Rock Co., Grove and Centre St., West Roxbury, $32,958.

Mass., Malden—City received low bids, Aug. 16, paving 4200-sq.yd. granite block pavement on 6-in. concrete base, from Simpson Bros., 166 Devonshire St., Boston, $3.95 per yd. C. W. Dolloff & Co., 20 Central St., Boston, $4.45 per sq.yd.

N. Y., New York—R. C. Harris, comr. docks, Pier "A" Battery Pl., received low bids Contr. No. 1572, paving Marginal St. between 44th and West 47th St., granite block, concrete foundation, from J. J. B. La Marsh, Inc., 26 Court St., Brooklyn, $44,926; Rosentahl Eng. & Contr. Co., Inc., 145 Hooper St., Brooklyn, $45,936; M. J. O'Hara, New York, $46,656. Noted Aug. 16.

★**N. J., Bayonne**—City let contract paving West 39th St., asphalt, to T. S. Crichfield, 54 5th St., Hoboken, $25,000. Noted July 12.

N. J., Jersey City—Hudson Blvd. Comrs. received low bid resurfacing Hudson Blvd. between Central R.R. of New Jersey near 8th St. to 36th St., Bayonne, from C. T. Cavanaugh, 34 W. 55th St., Bayonne, $12,000. Noted Aug. 9.

★**N. J., North Bergen** — (Weehawken P. O.)—Hudson Co. Park Comn., Jersey City, let contract paving walks North Hudson Co. Park, bituminous concrete, to Clinton Constr. Co., 306 Charles St., West Hoboken, $70,500. Noted July 19.

★**Pa., Brownsville**—Town let contract paving, curbing and grading New Water St. to Crosson Co., Brownsville, $30,706. Noted Aug. 9.

★**Pa., Dubois**—City let contract repaving North Brady St. to T. Munro, Dubois. Noted July 12.

★**Pa., Erie**—City let contract paving East Ave., to Mayer Bros. Constr. Co., Commerce Bldg. About $16,230.

Pa., Phila.—Dept. Pub. Wks. received low bids paving League Island Park, 45,000 sq.yd. asphalt and 40,000 sq.yd. bituminous macadam, from E. H. Vare, Lincoln Bldg., $185,920; portions 10 streets, asphalt, Barbour Asphalt Co. and Phila. Paving and Constr. Co., 1345 Arch St., $49,100; portions Wolf, Wood and 18th Sts., wood block, Anderson & Snyder and E. C. Fish & Co.

Streets and Roads (Continued)

★**Pa., Phila.**—City let contract roadbed on Germantown Rd. and Willow Grove Pike to Ambler, Davis & Co., Denckla Bldg.

★**Va., Staunton**—(Official)—City let contract paving Middlebrook Ave. to W. Larner Co., Staunton, $10,000. Noted June 14.

★**Tenn., Savannah**—(Official)—Highway Comn. let contract building following roads in Hardin Co.: 8 mi. to Childus & Smith, Hamburg, $9500; 6 mi. to E. Begbie, Olmens Hill, $9500; 6 mi. to J. L. Ledbette, Right, $9000. Noted Aug. 2.

★**Ky., Paducah**—McCracken Co. let contract paving and improving roads to L. E. Figg, Louisville. About $200,000.

★**O., Lancaster**—(Official)—City let contract paving portion West Wheeling St. to Wilson & Beckler, Lancaster. About $20,-338. Noted Aug. 16.

★**O., Lima**—City let contract paving portions High St., wood block, High, North West, Baxter, South West, North Sts. asphalt, to Andrews Asphalt Co., 1413 Holmes Bldg.; portions Buckeye, Baker, and Court Alleys, brick, to Summers & Hardin, 225 Holland St. Noted July 26.

★**O., Medina**—City let contract paving and grading Prospect, South Bway., Smith Rd. and North Court St., vitr. brick, concrete base; setting curbs, building storm sewers, culverts, drains and retaining walls to Buckeye Eng. Co., Norwich. Noted Aug. 2.

★**O., Oxford**—(Official)—Village let contract paving High St. to L. P. Meredith, Richmond, Ind. About $17,000. Noted Aug. 16.

★**O., Sand Springs**—City let contract paving 30,000 yd. asphaltic concrete in Dist. No. 2, to F. P. McCormick, St. Louis, Mo. About $79,300. Noted Aug. 9.

★**O., Toledo**—City let contract repaving Stickney Ave. to Russell & Jennison Co., $63,224; Oak St. and car tracks to H. P. Streicher Co., Terminal Bldg., $56,302 and $36,797 respectively; improving Valleywood Dr. to Asphalt Block Paving Co., 842 Ohio Bldg., $8995. Noted June 14.

Ind., Huntington — (Official) — Bd. Co. Comrs., Huntington Co., let contract gravel road to S. H. Palmer, R. R. No. 5, Huntington. About $17,000. Noted July 26.

Ind., Indianapolis—Bd. Pub. Wks. received low bid paving streets (a) asphalt, (b) bituminous concrete, as follows: 43rd St., Republic Constr. Co., 1614 Merchants Bank Bldg., (a) $4.35, (b) $4; Union Asphalt Constr. Co., 308 Amer. Central Life Bldg., $5.03, (b) $4.67; American Constr. Co., 108 North Delaware St., (a) $5.22. Noted Aug. 9.

★**Ind., South Bend**—(Official)—City let contract paving Miami St. to Western Constr. Co., Phœnix Bldg., Iowa City, Ia., Eddy St. and Mishawaska Ave., sheet asphalt, to A. H. White Co., 1600 Railway Exchange Bldg., Milwaukee, Wis., $184,500. Noted Aug. 23.

Mich., Escanaba—Town received low bid paving portions Stephenson Ave. (a) crushed stone, (b) bitulithic, from General Contr. Co., 1254 Plymouth Blvd., (a) $2. (b) $1.69; C. Hall & Co., Duluth, (a) $2.10, (b) $1.73. Noted Aug. 16.

★**Illinois**—State Highway Dept., Springfield, let contract paving Grandview Rd. to A. J. Parrish, Paris, $16,389.

★**Ill., Danville**—(Official)—Bd. Local Improv. let contract paving portion Robinson St. to J. C. Poel, Danville, $11,355. Noted Aug. 9.

★**Ill., Hillsboro**—City let contract paving Hamilton, Brailey, Springfield Rd. and Water St. to Sell & Koehler, 317 Mueller Bldg., Peoria. Noted Aug. 23.

★**Ill., Jacksonville**—City let contract paving in loop district, creosoted wood block, to J. E. Bretz, [illegible], Springfield, $34,454. Noted Aug. 9.

★**Ill., Pontiac**—(Official)—City let contract paving Hazel and Cross Sts. to H. Lobb & Son, Pontiac, $17,500. Noted Aug. 9.

★**Wis., Oconto**—City Council let contract 28,000 sq.yd. asphalt paving, curbing and guttering to White County Co., Iron Ex. Bldg., Milwaukee. About $[illegible].

★**Wis., Racine**—City let contract paving portions West Prospect St., asphalt, to Western Improv. Co., [illegible] per sq.yd., curb and gutter [illegible].

★**Ia., Burlington** — (Official) — City let contract paving 1 mi. Bluff Rd. to Bond Hucke, Burlington, $11,018; portion Main St. to Burlington Constr. Co., Burlington, $2.09 per sq.yd. Noted Aug. 16.

Ia., Des Moines—City received low bids paving Beaver Ave. (a) brick with bituminous filler, (b) brick with bituminous filler, (c) concrete from C. W. Wagner Co., Union Station (a) $256,330, (b) $262,435, (c) $230,077; Akin & Slutter, Corning, (a) $225,892, (b) $238,092, (c) $199,936; S. J. Krage Sioux City, (c) $157,741.

★**Ia., Rock Island**—Rock Island Bd. Local Improvs. let contract paving portion 6th Ave., asphaltic concrete and building boulevard on same to McCarthy Improv. Co., 220½ Main St., Davenport, $2.05 per yd., concrete curb and gutter, $0.65, excava., $1.40, curbing, $0.43.

★**Miss., Bemidji**—Betrami Co. Comrs. let contract grading and paving Jefferson Highway to Leet Bros. About $11,232.

★**Minn., Duluth**—Bd. Pub. Ser. let contract improving portion Faribault St. to A. A. Bodin & Sons. About $10,000. Noted June 14.

★**Kan., Great Bend**—City let contract asphaltic concrete paving to M. R. Ammerman, Salina, $40,000. Noted Aug. 9.

Neb., Central City—City let contract paving Dist. No. 1, Trinidad asphalt, to E. D. Tyner Constr. Co., Central City, $1.84 per sq.yd.

★**Mont., Billings**—(Official)—City let contract paving 7360 sq.yd. in Dist. No. 157 to Warren Constr. Co., Billings. About $20,-818. Noted Aug. 9.

★**Mo., Caruthersville**—(Official)—City let contract paving portions West 6th St., tarvia filled macadam with concrete curbs and gutters to J. H. Hinerman Co., Springfield, $89,000. Noted July 26.

★**Mo., Sedalia**—Sedalia Twelve Mi. Special Rd. Dist., Pettis Co., let contract graveling roads to Wm. Imhauser, 82c.

☆**Okla., Bristow**—City let contract paving to Park-Moran Paving Co., Okmulgee. About $10,947.

★**Okla., Sapulpa**—City let contract paving 27 blocks to Parker Washington Co., Oklahoma, $84,000.

★**N. M., East Las Vegas**—City let contract building bitulithic pavement on several streets to Morton Bros. About $80,000.

★**Idaho, Lewiston**—Nez Perce Co. Comrs., Lapwai Valley Highway Dist., let contract grading lateral highway from Sweetwater to Webb Ridge, 5 mi., to H. Kester, Lewiston.

★**Idaho, Lewiston**—City received low bids paving Dist. No. 11, from C. M. Payne, 724 East Mission St., Spokane, $25,541; Dole & Son, Lewiston, $25,829. Noted May 24.

★**Idaho, Wallace**—City let contract paving Improv. Dists. Nos. 6 and 8, 15, 754 sq.yd., 2-in. bitulithic surface, 3-in. macadam base, to H. J. Kaiser, 312 Colby Bldg., Everett, Wash., $1.52 per yd. Noted Aug. 23.

★**Wash., Mt. Vernon**—Skagit Co. Comrs. let contractpaving Cook Rd., one course concrete, to Grant & Ervig, Everett. About $59,105. Noted Aug. 16.

★**Wash., Seattle**—(Official)—King Co. Comrs. let contract Kirkland-Houghton Rd. to Moraine Gravel Co., 304 Ry. Ex. Bldg. About $11,700. Noted Aug. 9.

★**Wash., Seattle**—Bd. Pub. Wks. let contract paving Roy St. to James Constr. Co., [illegible] Ave. N., $[illegible]. Noted Aug. [illegible].

★**Wash., Tacoma**—City let contract paving portion Pacific Ave. to Independent Paving Co., 2601 Railroad Ave., Seattle, $12,065. Noted June 28.

Cal., Las Angeles—City received low bid paving in 32 Improv. Dist. No. 1 concrete, bituminous surface from [illegible], $15,-848; [illegible], $17,300; [illegible], $18,[illegible]. Contractors all of Los Angeles.

★**Cal., Redding**—Conners, Green & Co., [illegible] have awarded contract concrete pave[illegible] mi. state highway to A. Anderson Hauling. Noted June 21.

Cal., Sacramento—City received low bid [illegible] Riverside Rd. from Fruitridge Canal Co. [illegible] Bathrick, Bellamy, $14,[illegible]; Plymouth, Hall Bros. & Affleck, 649 Bauer Bldg., Los Angeles, $13,[illegible].

★**Cal., San Diego**—City let contract paving Sect. 1, Linda Vista Rd. to serial [illegible] ment No. 1, Engineering, $11,30[illegible]. [illegible] Wyroad Co., Engineering and Contract Building. Noted Aug. [illegible].

★**Cal., San Jose**—Stein-Olsen Co. let contract macadamizing Lincoln and Park Aves. to E. Walnut, [illegible] St., $[illegible]; Alameda Rd. to E. Alameda, $[illegible]; Hume St., [illegible]; Minnesota Rd. to Bascom, Dunbar Construction Co., San Francisco, $[illegible]. Noted June 21.

★**Cal., Santa Barbara**—City let contract paving portions [illegible] St., excavating, cement and stone curbs, gutters, pipe sewers and storm drains to [illegible] Construction Co., Pacific Electric Bldg., Los Angeles. About $[illegible]. Noted Aug. 2.

Cal., Taft—City received low bids Warrenite paving and constructing cement curbs and sidewalks on all streets, from Federal Constr. Co., Fresno. About $167,115.

Cal., Tulare—City received low bids paving 2.3 mi. streets, concrete, from W. A. Kettlewell & Sons, Kingsburg. About $39,-000. Noted July 12.

Cal., Visalia—Tulare Co. received low bid paving 2.3 mi. streets connecting county and state highway from W. A. Kettlewell & Sons, Kingsburg, $39,000.

★**N. S., Glasgow**—City let contract [illegible] sq.yd. bitulithic pavement to Warren Bituminous Paving Co. of Ontario, Ltd., Toronto. About $15,000.

RAILWAYS—STEAM & ELECTRIC

Proposed Work

Georgia—N. P. Pratt, 38 Auburn Ave., Atlanta, and associates plan to build railway from Clermont to property of Pyrites & Chemical Corp. on Chestatee River, 9 mi.

Ohio—Toledo Ry. & Light Co., Toledo, will double-track Dorr St. Line in connection with paving to be done by city. About $90,000. J. M. Enright, Toledo, mgr. rys.

Iowa—Chicago, Rock Island & Pacific R.R. will improve right-of-way between Cedar Rapids and West Liberty relaying 80-lb. rails over 40 mi. of main line with 100-lb. rails; about $100,000. Company also plans to improve line between Vinton and Manly; $175,000. C. A. Morse, Chicago, ch. engr.

Colorado—William V. Shenk, Globe, Ariz., represents syndicate which proposes to build electric railway from southwestern part of Colorado through Arizona and northern Mexico extending to Gulf of California. Project includes huge dam on Colorado River 60 mi. from Arizona-Utah line, 200,000-hp. hydro-electric plant and port on gulf. Preliminary work will cost about $500,000 and entire project $50,000,000.

New Mexico—H. M. Gray, Las Cruces, and associates [illegible] railway between Las Cruces and El Paso, Tex., about 44 mi., to run through irrigated portion of Rio Grande Valley.

Arizona—Southern Pacific Co. will [illegible] Buck line from Stockton 2 mi. west of Palm and 4 mi. east of Tulare. W. Bissell Flood Bldg., San Francisco, ch. engr.

California—See "Miscellaneous" Blythe.

California—Oakland, Antioch & Eastern Ry. and Western Pacific R.R. have entered into agreement whereby latter will finance construction of branch to tap [illegible] Vaca Valley to extend from point on [illegible] Antioch & Eastern main line from Montezuma to Suisun. Connections will be made with branch Northern Electric Ry. Aloul Bissell, H. A. Mitchell, [illegible] from and one part of former, T. J. Wyche, San Francisco, ch. engr. of latter.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Indiana**—[illegible] let contract 3rd Dist. [illegible] Terminal Junction and Depot, 1.4 mi. to P. Clifford & Son, Valparaiso, about $[illegible].

★**Missouri**—[illegible] & Eagle Mfg. Co., Wellsville, let contract 2nd Dist. Pike Drive, 2.25 mi. to site [illegible], via Lincoln Club, to Clinton Co. Comrs., Clinton, Mo. Bids Received [illegible] W. Lonsdale, City Engr.

EXCAVATION AND DREDGING

Proposed Work

Ill., Mt. [illegible]

Ill., Lexington—Lexington Ayer Harness Organ, [illegible] Aug. 16 [illegible] & Mitchell Construction Co., Joliet, [illegible].

N. D., Grand Forks—Dick, Grand Forks Co. and Dickson [illegible] Co., Fargo, [illegible].

Mo., St. Louis—[illegible] Co., [illegible] Bldg., [illegible] Co., [illegible] Bldg., [illegible] Co., [illegible] Bldg., [

Construction and Dredging (Continued)

Wash., Walla Walla—Irrigation—Residents of Walla Walla Irrigation Dist. plan to remodel system in west end of Walla Walla Co. on Snake River. Bonds for $125,000 [illegible] 7%.

Ore., Corvallis—Drainage—Oak Creek D. D., Benton Co., had plans prepared. About $21,350.

Cal., Blythe—Ditches—See "Miscellaneous."

Cal., Imperial—Irrigation—Geo. H. Reed, [illegible] granted permit by State Water Comm., San Francisco, to divert 37 second feet of water from New River for irrigation. Plans include earth dam and ditch 5 mi. long. About $1,500,000.

Cal., Willows—Irrigation—Jacinto Irrigation Dist., Glenn Co., will construct system to irrigate 20,000 acres land.

Ont., Ojibway—Canal—See "Miscellaneous."

B. C., Victoria—Irrigation—Dept. of Lands plans to install system to be fed by pipe line 27 mi. up north fork of Kettle River to reclaim 3000 acres of Grand Fork Valley. About $500,000.

BIDS DESIRED

Tenn., Trenton—(Official)—Dredging—Until Sept. 8, by Bd. Dir. D. D. No. 4, Gibson, Crockett and Madison Cos., for dredge work and clearing of right-of-way, consisting of 13 contracts. L. T. Berthe, Charleston, Mo., engr.

Ia., Estherville—Ditch—Until Sept. 4, by J. J. Klopp, co. aud., for D. D. No. 120, Emmet Co.

Ia., Hampton—Drainage—Until Sept. 12, by E. D. Haecker, aud. Franklin Co., for D. D. No. 52 requiring 56,850-ft. 6-, 7-, 8-, 10-, 12-, 14-, 18-, 20-, 22-, 24-, 30- and 32-in. tile, 499 ft. 22-in. sewer pipe, 1 bulkhead, 9 catch basins, etc.; D. D. No. 58 requiring 77,425 ft. 6-, 7-, 8-, 10-, 12-, 14-, 16-, 18-, 20-, 22-, 24- and 26-in. tile, 1 bulkhead, 18 catch basins, etc.; D. D. No. 55 requiring 72,750 ft. 6-, 7-, 8-, 10-, 12-, 14-, 15-, 16-, 18-, 22-, 24-, 26-, 28- and 34-in. tile, 1 bulkhead, 7 catch basins, 53 junctions, etc.; D. D. No. 54 requiring 40,280 ft. 6-, 7-, 8-, 10-, 12-, 15-, 16-, 18- and 28-in. tile, 620 ft. open ditch, lowering and relaying 400 ft. 28-in. tile, 1 bulkhead, catch basins, etc. G. H. Mack, Hampton, engr.

Minn., Walker—Ditch—Until Sept. 10, by C. B. Bacon, co. aud., for Judicial Ditch No. 6, Cass and Wadena Cos., requiring 70,234.8 cu.yd. excava. on main ditch and 18,724.1 cu.yd. on 3 laterals, 3 16-ft. steel and wood bridges, 1 5 x 36-in. x 26-ft. corrugated metal culvert; about $13,058. R. A. Dahms, Park Rapids, engr. Noted May 3.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Ill., Paxton**—(Official)—Redredging—Cloud & Thompson, attys., Paxton, let contract redredging main ditch, Union D. D., length 59,745 ft., yardage 209,086 cu.yd., to Richland Contr. Co., Richland, 12c. Noted Aug. 9.

Wis., Madison—Ditch—Dane Co. received bids for Prairie Ditch, [illegible] 178,150 cu.yd. excava. from Schultz & Post, South 24 Channel Blvd Constr. Co., Grand Rapids, Minn., Dredging Co., Madison, J. W. [illegible], Hudson, Ind., Carpenter & Daly, Chicago, W. J. Dillon, Hudson, Ind., Wisconsin Drainage Co.; [illegible], both Bay, Indiana; P. Hoyt, Madison, engr.

★**Ia., Sac City**—(Official)—Drainage—[illegible] Co. let contract Sept. 1 of Big Cedar Ia. D. No. 141, Buena Vista, Pocahontas and Calhoun Cos., to W. M. Lang, Carroll [illegible] Aug. 1, 1921, and Sept. 1, 1922, and Sept. 1, 1923, for 4 and 5 [illegible] Co., 401 Amer. Trust Bldg., Omaha, Neb. Sept. 1, 1922, for 10, 11, 12, 13 and 14 Northeast Constr. Co., Elkhart, Ind., Aug. 15. Noted Aug. 16.

★**Minn., Center City**—Ditches—Chicago Co. let contract for 40 mi. ditches to Ellis Young & Pentecost, 218 Merchants Bank Bldg., St. Paul. $45,000.

★**Minn., Detroit**—Ditch—Becker Co. let contract Judicial Ditch No. 1, requiring [illegible] cu.yd. excava. to Haar Bros. Freeze-[illegible]

★**Minn., Mora**—(Official)—Ditch—Kanabec Co. let contract Ditch No. 11 to Hood Constr. Co., Grand Rapids, Wis., $23,781, and Commerce Constr. Co., Grand Rapids, Minn., $14,111. Noted Aug. 16.

Minn., New Ulm—Ditch—Brown Co. received low bid [illegible] Co. to Dem. & Luft-derbolder, [illegible] Noted July 26.

★**N. D., Fargo**—Drainage—Cass Co. let contract to D. No. 21-A requiring 148,000 cu.yd. excavation to W. J. Hoy & Co., 709 Metropolitan Life Bldg., St. Paul.

★**N. D., Fargo**—Drainage—Cass Co. let contract to D. No. 14-B requiring [illegible] cu.yd. excava. to W. J. Hoy & Co., 709 Metropolitan Life Bldg., St. Paul; Lawrence Constr. Co., Kindred Ave., Grand Rapids, Minn.; Northwestern Drainage Co., Grand Rapids, Wis.

★**Idaho, Twin Falls**—Canal Work—Twin Falls Canal Co. let contract 10 concrete structures on Lower Line Canal to R. W. Faris, 1021 Harrison Blvd., Boise, $38,293; 5 structures to C. H. Mull, Twin Falls, $5650; enlarging canal to J. W. Monarch, 1414 North 7th St., $11,950. Noted Aug. 9.

★**Ore., Prineville**—Irrigation—Ochoco Irrigation Dist., Crook Co., let contract 15½ mi. canal and project dam on system which will irrigate 22,000 acres of land when completed, to Twohy Bros., 219 East 60th St., Portland. Project will cost about $900,000.

Cal., Richmond—Dredging—City received low bids dredging harbor and filling in behind bulkhead from Richmond Dredging Co., Monadnock Bldg., $18,722; American Dredging Co., 255 California St., $39,500; San Francisco Bridge Co., New Bank Bldg., $40,546, both of San Francisco.

★**Que., St. Maurice River**—Dredging—Dept. Pub. Wks. of Dominion Government let contract dredging 146,000 cu.yd. to La Cie de Entreprises Industrielle, Levis, about $15,000.

INDUSTRIAL WORKS

Proposed Work

Mass., Worcester—Worcester Machine Screw Co., Beacon St., plans 5-story, brick factory. Cutting, Carleton & Cutting, 44 Front St., archts.

N. Y., Brooklyn—Lancastershire Realty Co., 44 Court St., soon receives bids, rein.-con. or struc. steel, automobile service station. About $450,000. Shampan & Shampan, 772 Bway., archts.

N. Y., Buffalo—J. Dodd Packing Co., 741 William St., had plans prepared by Henschien & McLaren, archts., 37 West Van Buren St., Chicago, 5-story, 65 x 175-ft. brick and concrete plant. $120,000.

N. Y., Buffalo—New York Central R.R. had plans prepared for 60 x 500-ft. freight terminal, rein.-con., Curtiss and Clark Sts. About $250,000. G. W. Kittredge, Grand Central Terminal, New York City, ch. engr.

N. Y., Brooklyn—Hutwelker & Briggs Co., 14 Hall St., having plans prepared by G. M. Landon, archt., 103 Park Ave., New York City, 4-story addition to cold-storage building, west side Hall St. near Flushing Ave. About $50,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Boston—Chas. J. Huntley, 17 Yarmouth St., soon lets contract 6-story, 61 x 110-ft. public garage. J. Marsden Parks, 46 Pritchard Ave., Somerville, archt.

★**Mass., Cambridge**—Sears, Roebuck & Co., Chicago, let contract, 5-story, 50 x 100-ft. rein.-con. factory, to W. M. Bailey, 88 Broad St., Boston

★**N. Y., Brooklyn**—Long Island State Hospital Comn., Capitol, Albany, let contract store house and cold-storage building, Clarkson St., to Modern Constr. Co., 927 Bway, New York City, $50,000.

★**N. Y., New York**—Loft Candy Co., Broome and Centre Sts., let contract alterations and addition to factory, 398 Broome St. to J. H. Carl & Co., 510 1st Ave., $80,-660.

★**Pa., Phila.**—G. P. Wetherill & Co., 114 North Front St., let contract 4-story, 37 x 78-ft., brick and concrete plant to H. H. Wehmeyer, 1004 West Lehigh Ave. Noted Aug. 9.

★**O., Akron**—C. W. Boshau, 2352 East Mill St. let contract garage, brick, 62 South High St., to Harbaugh Constr. Co., [illegible] Ohio Bldg. $80,000.

★**O., Cleveland**—American Shipbuilding Co., West 54th St., let contract boiler and engine houses, brick and concrete, to De Hamel Constr. Co., 604 Sweetland Bldg., [illegible]

★**Ind., Indianapolis**—Van Camp Packing Co., 600 Kentucky St., let contract packing plant and warehouse to Bedford Stone & Constr. Co., 810-15 Fletcher Savings Trust Bldg. About $120,000.

★**Ill., Chicago**—Illinois Miniature Division of Natl. Lamp Wks., of General Electric Co., 501 Jefferson St., let contract 3-story, 84 x 245-ft. and 1-story, 42 x 42-ft. factory, warehouse and power house to Wieboldt Contsr. Co., 1534 West Van Buren St. About $60,000

Tex., Houston—Empire Gas & Fuel Co., 1304 Carter Bldg., recently secured site on ship channel and will soon let contract for refinery. About $2,000,000. Company will also build pipe line to Gainesville connecting it with Producers Refining Co., a subsidiary.

BUILDINGS

Proposed Work

N. Y., Cobleskill—School—Schoharie State School of Agriculture having plans prepared 2-story, brick and steel addition. About $55,000. D. B. Frisbie, Middleburgh, pres. bd. trustees.

N. Y., Gloversville—Bank—Fulton Co. Trust Co., 51 North Main St. plans, brick and stone, 10 North Main St. About $50,-000.

N. Y., Herkimer—Hospitals—Herkimer Co. Bd. Supervs. having plans prepared by Pember & Champaigne, archts., 24 James St., Albany, 3 turberculosis hospitals, Salisbury Centre. About $85,000.

N. Y., New York—Theater and Office—J. J. Schubert, 225 West 44th St., plans, at 1567-69 Bway. About $50,000. H. J. Knapp, 116 East 16th St., archt.

N. Y., New York—(Official)—Exchange—New York Telephone Co., 15 Dey St., soon lets contract, 3-story, 56 x 94 ft., brick. About $125,000. McKensie, Voorhees & Gelmin, 1123 Bway, archts. Noted July 12.

B. C., Rossland—School—Bd. Educ. plans, 2-story, brick. About $75,000. J. Bowman, archt., 914 Yorkshire Bldg., Vancouver, soon receives bids.

BIDS DESIRED

Conn., Bridgeport—School—Until Sept. 10, by Bd. Educ., on Steuben St. Leonard Asheim, 211 State St., archt.

Conn., Waterbury—School—Until Sept. 4, by Bd. Educ., Grove and Pine Sts. About $530,000. T. A. Walsh, 51 Leavenworth St., archt.

N. Y., Albany—(Official)—City Hall—Until Sept. 5, by Bd. Contr. and Supply, brick, city hall and police headquarters. W. H. Van Guysling, 1 Clinton Sq., archt. Noted July 26.

Pa., Chester—Bank—Until Sept. 5, by Natl. Ex. Bank, 1-story, brick and rein.-con. Mawbury & Uffinger, 56 Liberty St., New York City, archt.

Pa., Uniontown—Until Sept. 4, by Y. M. C. A., for 4-story, 76 x 90 ft. building. About $150,000. D. M. Hertzog, pres. H. W. Altman, 1st Natl. Bank Bldg., archt.

W. Va., West Liberty—Dormitory—Until Sept. 4, by State Bd. Control, Charleston, dormitory at State Normal School. F. Harris, Schmulbach Bldg., Wheeling, archt.

O., Akron—(Official)—High School—Until Sept. 10, by J. F. Barnhart, clk bd. educ., in Firestone Park. T. R. Ridley, Cottage Pl., archt.

O., Ironton—Hotel—Until Sept. 5, by Ironton Hotel Co., Citizens Natl. Bank Bldg., 5-story, 32 x 132-ft. Noted July 12.

O., Upper Sandusky—School—Until Sept. 13, J. F. Stoker, clk. bd. educ., R. F. D. 2, Nevada. Howard & Merriam, 8 East Broad St., Columbus, archts.

Ind., Lafayette—Theater—City plans, on 7th and Main St. About $150,000. T. Bauer, mayor.

N. B., Bathhurst—College—Until Sept. 15, by Sacred Heart College, brick. About $250,000. R. A. Frechette, 30 Bonnacord St., Moncton, archt. Noted Aug. 2.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Boston—School—Bd. Educ. received low bids erecting Michael Anglo School, Charter St. and Phipps Pl. from J. Slotnick, 10 Lawrence St., Chelsea, $166,-973; J. Bowen Co., 194 Dudley St., Roxbury, $171,600; Murphy Constr. Co., 7 Water St., $189,576. Noted Aug. 9.

★**Mass., Lowell**—Church—First Church of Christ Scientist, 1482 Middlesex St., let contract to E. S. Barlow, 25 Huntington Ave., Boston. About $75,000.

★**N. Y., Astoria**—School—St. Josephs Congregation let contract, 4-story, Grand and 14th Aves., to Peter Cleary, 15 Marion St., Brooklyn. About $60,000. Noted June 7.

★**N. Y., Brooklyn**—Theater—J. H. Ward, 226 Henry St., let contract to Jardin Co., Inc., 507 5th Ave. About $50,000.

★**N. Y., Cohoes**—High School—Bd. Educ. let contract, 2-story, 60 x 150-ft., brick and stone, to Schaefer Constr. Co., 5 West 31st New York City, $120,000. Noted May 31.

★**N. Y., New York**—Club House—G. Ehret, 233 East 92nd St., let contract alteration to 4-story, 90 x 125-ft. brick and stone club house, Park Ave. and 59th St., to Whatron-Greene & Co., 22 William St., $50,000.

★**N. Y., New York**—Restaurant and Office—T. Healy, Columbus Ave. and 66th St., let contract alteration, 2-story, 100 x 125-ft., 2527-2537 B'way., to Post & McCord, 101 Park Ave., $50,000.

Buildings (Continued)

★**N. Y., Potsdam**—School—Bd. Educ. let contract addition to Normal School, to Bradley & Weed, 200-5th Ave., New York City. About $150,000. Noted Aug. 2.

★**N. Y., Poughkeepsie**—Theater—Stratford Theatre Co., 93 Hooker 9ve., let contract 1-story, 55 x 134 ft. to E. V. Anderson, 39 Market St. About $90,000.

★**N. Y., Watertown**—School—Bd. Educ. let contract alteration and addition, Boon St., to T. J. & J. F. Ward, 109 Ten Eyeck St., $60,000. Noted Aug. 9.

★**N. Y., Yonkers**—School—Bd. Educ. let contract, 3-story, 70 x 170 ft., to P. Sarubbi, 12 North Bway. About $330,000. Noted July 5.

★**Pa., Bradford**—Church—First Presbyterian Congregation let contract 40 x 108-ft. church and 40 x 54-ft. sunday school to E. N. Unruh, Bradford. About $100,000.

★**Pa., Dravosburg** — High School — Bd. Educ. let contract, 2-story, to J. G. Fullman, East End Trust Bldg., Phila., $70,000.

★**Pa., Lansdowne**—Home—St. Vincent's Home let contract, 3-story, 235 x 320-ft. steel and rein.-con. addition to Melody & Keating, 1322 Race St., Phila., $50,000. Noted Aug. 9.

★**Va., Lynchburg**—Y. M. C. A., Lynchburg, let contract 4-story, 50 x 116-ft. building to W. K. Barger, Peoples Bank Bldg. About $100,000. Noted Aug. 23.

★**Ga., Atlanta**—Transportation—Brown-Randolph Co., Marietta and North Forsyth Sts., let contract, 8-story, to Gude & Co., Grant Bldg. About $500,000.

★**Canton** — Office — United Alloy Steel Corp., Belden Ave. and 10th St. N.E., let contract, brick, steel and concrete, to F. W. Mettler, Guardian Bldg., Cleveland, $100,000.

★**O., Washington, C. H.**—School—Bd. Educ. Union Twp. let contract, 2-story, 74 x 36 ft. and 21 x 21 ft. addition, to E. Mast, 100 Greenwood Ave., Zanesville. About $50,000. Noted July 26.

Ind., Anderson—Lodge—B. P. O. E. received low bid, 2-story, 70 x 100-ft., from D. Eshelman & Son, 126 West 5th St., $67,-865. Noted July 5.

★**Ind., Ft. Wayne**—Y. M. C. A. let contract 7-story, rein.-con., stone and brick, to Indiana Eng. Co., 528-30 Lincoln Life Bldg., $225,000. Noted July 12.

Mich., Detroit—Hotel—Louis Duscoff, 481 Franklin St., let contract 4-story, brick and steel, Brainard St., to Natl. Bldg. Constr. Co., 60 Lafayette Bldg.

★**Ill., Chicago**—Chapel and Convent—Sisters of Poor Clares let contract, 2- and 3-story, brick, 5245-59 West 105th St., to J. Gebhardt & Sons, 1825 Orchard St. About $130,000.

★**Ill., Rock Island**—Hospital—St. Anthonys Hospital let contract to C. J. Larkin, Rock Island. About $200,000. Noted Aug. 2.

★**Wis., Milwaukee**—School—State Bd. Industrial Educ. let contract Central Continuation School to G. E. Kahn, 688 Kachet Ave. About $200,000. Noted July 2.

★**Wis., Watertown**—Hospital—Sisters St. Mary let contract to Mallow & Kaddatz, Watertown, $120,000.

★**Ia., Mason City**—High School—Bd. Educ. let contract, Washington High School, to H. F. Jones, Mason City. About $78,-000. Noted July 26.

★**Minn., Warroad** — High School — Bd. Educ. let contract, 58 x 64 ft., to Laurence Constr. Co., 624 Plymouth Bldg., Minneapolis. About $60,000. Noted July 19.

★**Neb., York**—(Official)—High School—Bd. Educ. let contract, 2-story, 80 x 100-ft., brick, stone, and rein.-conc., to Olson & Johnson, 638 1st Natl. Bank Bldg., Omaha, $117,405. Noted Aug. 16.

★**S. D., Aberdeen**—Dormitory—Northern Normal School let contract, Lincoln Hall, to Madsen Constr. Co., Plymouth Bldg., Minneapolis. About $50,000.

★**Mo., St. Louis**—Theater and Office—Vaudeville Theater Co., 705 Olive St., let contract alterations to Federal Constr. Co., 812 Olive St., $75,000.

★**Tex., Waco**—Auditorium—Waco Cotton Palace let contract to H. J. Ainsworth, Waco, $51,063.

★**Idaho, Kellog**—Store and Theater—J. McConnell and E. Mehmed, Kellogg, let contract, 2-story, 100 x 135 ft., brick, to O. W. Anderson, Spokane. About $40,000.

★**Ore., Portland**—Dwelling, Fourth, Myrtle and Alders Sts., let contract 4-story reinforcing to Bingham & McCulloch, Cast Bldg. About $55,000.

★**Cal., Oxnard**—Bank and Office—1st Natl. Bank Bldg. let contract [illegible] to Los Angeles Planing Mill Co., 1812 Industrial St., Los Angeles. About $75,000.

FEDERAL GOVERNMENT WORK

Proposed Work

Ga., West Point—Post Office—J. A. Wetmore, superv. archt., treas. dept., rejected all bids as they were in excess of appropriation. Noted Aug. 23.

BIDS DESIRED

Conn., New London — Dredging — Until Sept. 4, by Bureau of Yards and Docks (F. R. Harris, ch.) Navy Dept., Wash., about 135,000 cu.yd., at U. S. submarine base.

Md., Annapolis — Dredging — Until Sept. 10, by Bureau of Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., in channel at rifle range, U. S. Naval Academy.

Wash., D. C.—Coast Guard—Until Sept. 25, by Navy Dept., U. S. Coast Guard Headquarters, new building and accessories at Coast Guard Station No. 166. Noted July 12; advertised in this issue.

Wash., D. C. — Air Compressors — Until Sept. 4, by Bureau of Yards and Docks (F. R. Harris, ch.), Navy Dept., 2 motor and 2 engine-driven 2-stage air compressors having capacity of 500 cu.ft. per min.

Va., Cape Henry—Building—Until Sept. 18, by Secy. of Agriculture, Wash., 3-story brick building for Weather Bureau; advertised in this issue.

Miss., Vicksburg — Levee Work — Until Sept. 4, by 3rd Mississippi River Dist., Box 404, about 1,100,000 cu.yd. levee work; advertised in this issue.

Mich., Detroit—Backfilling—Until Sept. 4 by U. S. Eng. Office, Detroit, backfilling walls of 4th lock, Marys Falls, Canal.

Idaho, Twin Falls—Post Office—Until Oct. 1, by J. A. Wetmore, superv. archt., treas. dept., Wash.

Hawaii, Pearl Harbor — Storehouse — Until Sept. 10, by Bureau of Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., rein.-con.

P. R., El Cayey—Building—Until Sept. 3, by Bureau of Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., for radio buildings at high-power radio station.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Conn., New London**—Storehouse—Bureau of Yards and Docks, Navy Dept., Wash., let contract to R. H. Arnold Co., 1025 Vermont Ave., Wash., D. C., $119,600. Noted Aug. 9.

★**N. Y., New York**—Electric Lighting System—Bureau of Yards and Docks, Navy Dept., Wash., let contract system in structural shop to L. K. Comstock, 30 Church St., $10,490. Noted Aug. 9.

★**Pa., Harrisburg** — Storehouse—Bureau of Yards and Docks let contract to James L. Stuart, 233 Oliver Ave., Pittsburgh, and not J. L. Stewart Co., 30 Church St., New York City. About $400,000. Noted Aug. 16.

Pa., Phila.—Quarters for Radio Operators—Bureau of Yards and Docks, Navy Dept., Wash., received low bids (work complete), from Hogg Constr. Co., 1634 Sansom St., $16,656, and W. W. Austin & Co., Transportation Bldg., $16,747. Noted Aug. 9.

Pa., Pittsburgh—Post Office—J. A. Wetmore, superv. archt., treas. dept., received only bid remodeling and extension from W. H. Fissell, 1328 Bway., New York City, $110,000.

S. C., Port Royal—Officers' Quarters—Bureau of Yards and Docks, Navy Dept., Wash., received low bids from W. T. Hadlow, 831 Park St., Jacksonville, $7477; J. A. Jones, Charlotte, $10,676; Artley Co., 121 Bull St., Savannah, $11,800. Noted Aug. 16.

Ia., Cherokee—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., received low bids Aug. 22 from Johnson County Co., Fargo, $42,547; [illegible] Constr. Co., 360 Smith La Salle St., Chicago, $55,362; J. H. Wise, 1401 City Natl. Bank, Omaha, $55,730. Noted July 19.

Kan., Eldorado—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., received low bids from Johnson Constr. Co., Fargo, $43,187; Chas. A. Bland, [illegible]; F. A. Steinegger Constr. Co., Victoria Bldg., St. Louis, $57,588. Noted July 19.

★**Mo., St. Louis**—Levee Work—Mississippi River Comm., 1913 International Life Bldg., for contract to excavate and [illegible] Hunt & Co., Illinois to Commerce [illegible] Noted July 26.

★**Mont., St. Ignatius**—[illegible] Noted June 21.

★**Wash., Puget Sound**—[illegible] Bureau of Yards and Docks, Navy Dept., Wash., let contract to A. W. Quiest & Co., New Times Bldg., Seattle, $505,211. Noted Aug. 23.

★**Wash., Puget Sound**—(Bremerton P. O.)—Torpedo Station—Bureau of Yards and Docks, Navy Dept., Wash., let contract to Parker & Loftus, Bremerton, $23,912. Noted Aug. 30.

MISCELLANEOUS

Proposed Work

Bulkhead — Jersey City, N. J. — City Comrs. plan, concrete, at foot of Hornell St. About $60,000. F. A. Dolan, city clk.

Harbor Improvement—Jersey City, N. J.—City Comn. authorized appropriation of $147,300 for improvement and development of waterfront along Hackensack River at foot Yale Ave. C. A. Van Keuren, city engr.

Elevated Railway—Philadelphia, Pa. (Official)—W. S. Twining, dft. dept. [illegible] transit, received to bids Aug. 21 steel framework, bridges, concrete floors, etc., for Frankfort Elevated Ry. Noted Aug. 16.

Dry Dock—Charleston, S. C.—Valk & Murdock Co., foot Calhoun St., plan huge sectional floating dry dock at plant on Cooper River, about 440 ft. long with beam of 100 ft.

River Terminals—Memphis, Tenn.—Citizens voted $500,000 bond to build river terminals. J. H. Weatherford, city engr. Noted Aug. 9.

Subway—Ft. Wayne, Ind.—Lake Shore & Michigan Southern Ry. plans, at Elizabeth St. G. C. Cleveland, Cleveland, ch. engr.

Pipe Line—Houston, Tex.—See "Industrial Works."

Incinerator — Okmulgee, Okla.—Citizens voted $30,000 bonds to build incinerator. M. N. Coles, city engr. Noted July 26.

Dock—Tacoma, Wash.—Council plans $145,000 bond issue to build dock. When completed same will cost $240,000, there being $105,000 available for work now. W. C. Raleigh, city engr.

Levees, Etc.—Blythe, Cal.—[illegible] Protection Dist. retained J. C. Allen, Van Nuys Bldg., Los Angeles, as engineer for the constructing levees, [illegible] miles, railways, etc., also to purchase railway equipment, steam shovels, scrapers, fresnoes, etc. Project to cost about $1 [illegible]

Subway—Aurora, Ont.—City and West Church Connors and Toronto and York Highway Comn. plan subway on Yonge St., 15 ft. high. E. A. James, Toronto, engr.

Docks, Etc.—Oilbway, Ont.—Canada Steel Corp., subsidiary of U. S. Steel Corp., filed plans with Dominion Government for preliminary work of building docks, etc. Plans include total expenditure thereof necessary to construct [illegible] ft. wide and [illegible] ft. deep. Company plans to build docks, [illegible] steel also [illegible] docks on river [illegible] with marine ways and wharves. About $[illegible]

Incinerator—Sarnia, Ont.—City plans to install. Also [illegible] J. S. Board, engr.

BIDS DESIRED

Duct Line—[illegible] Until Sept. 5 by Pub. Ser. Comn., 110 Fulton St., New York City, for duct line for part of Eastern Pkway. Rapid Transit R.R.

Retaining Wall—Lebanon, O.—(Official)—Until Sept. 15 [illegible] of Warren Co. Comrs., rein.-con., on Rd. No. 31. Noted Aug. 16.

Dam and Retaining Walls—Marshalltown, Ia.—Until Sept. 18 by J. F. Wilson, city clk., [illegible] Noted Aug. 16.

Dock—[illegible] Noted Aug. 2.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

[illegible]

SEARCHLIGHT SECTION

Contracts To Be Let

PROPOSALS

Bids received until Sept. 4, 1917.

Montgomery Bridge

Montgomery, Pa.

Sealed proposals for the construction of a reinforced concrete bridge over the West Branch of the Susquehanna River at the foot of Second Street in the Borough of Montgomery, Pennsylvania, will be received by the Board of Commissioners of Lycoming County, Pennsylvania, at the office of their Chief Clerk, until 12 o'clock, noon, on September 4th, 1917. At the same place, the proposals will be publicly opened and read at 2 o'clock P. M.

The bridge as contemplated will be about one thousand (1000) feet long, and will consist of nine (9) open spandrel arches, three of the arches will be 101 feet span, and the remainder will be 93 feet.

Bids will be asked at the same time for a concrete viaduct approximately four hundred (400) feet long on the Montgomery side, adjacent to the bridge.

Prospective bidders may secure copies of the plans and specifications, including form of proposal, from L. O. Bower, Chief Clerk, of the County Commissioners at his office in the Court House, Williamsport, Pennsylvania, by making a deposit of twenty-five dollars ($25.00), which sum will be refunded to all bidders upon return of the plans and specifications in good order, and to all other Contractors returning same before date on which bids are received.

A certified check for the sum of ten thousand ($10,000 00) dollars, payable to H. B. Achenbach, Treasurer of Lycoming County, must accompany each proposal, both of which must be enclosed in a sealed envelope, and marked, "THE PROPOSAL FOR THE CONSTRUCTION OF THE MONTGOMERY BRIDGE" and must be delivered to L. O. Bower, Chief Clerk, County Commissioners' Office, Court House, Williamsport, Pennsylvania.

The right is reserved by the Commissioners to reject any and all bids, or to accept any bid they may deem to the best interests of the County.

Attest:

L. O. BOWER, Chief Clerk.
CHARLES W. MYERS,
JOSEPH H. NICELY,
JOHN G. DURRWACHTER,
County Commissioners.

M. C. KRAUSE, Engineer,
335 Pine Street, Williamsport, Pa.

PROPOSALS FOR LEVEE WORK.—Office of Third Mississippi River District, U. S. Box 163, Vicksburg, Miss.—Sealed proposals will be received here until 11 o'clock a.m., Sept. 4, 1917, and then publicly opened, for constructing about 1 [illegible] cubic yards of levee work. Information on application.

TREASURY DEPARTMENT, Supervising Architect's Office, Washington, D. C., August 15, 1917.—Sealed proposals will be opened in this office at 2 p.m. September 17, 1917, for the construction of two additional timbers and the repairing and [illegible] of timber piers, buffers at the wharf of the Quarantine Station at Tampa Bay, Florida. Drawings and specifications may be obtained from the Custodian at Tampa Bay, Florida, or at this office, on the direction of the Acting Supervising Architect. Jas. A. Wetmore, Acting Supervising Architect.

Official Proposals

Price, $3.60 an inch—Copy can be received until Wednesday, 10 a. m. for issue mailed the next day

PROPOSALS

Bids received until September 4, 1917.

State Highway Work

PENNSYLVANIA STATE HIGHWAY DEPARTMENT,
Harrisburg, Pa.

Sealed proposals will be received at said office until 10 a. m., September 4, 1917, when bids will be publicly opened and scheduled, and contracts awarded as soon thereafter as possible for the reconstruction of 6513 linear feet of Vitrified Block Pavement, 16 feet wide, situated in Washington Township, Fayette County, Route No. 247; 1,270 linear feet of Vitrified Block Pavement, 26 feet wide, situated in Swatara Township, Dauphin County, State-aid Application No. 570; 13,007 linear feet of Vitrified Block Pavement, 16 feet wide, situated in Manor Township, Armstrong County, State-aid Application No. 397; 5,800 linear feet of Vitrified Block Pavement, 16 feet wide, situated in Clinton Township, Butler County, Bureau of Township Highways Authorization No. 319; 6,537 linear feet of reinforced Concrete Pavement, 16 feet wide, situated in Foster Township, McKean County, Route No. 96; 6,537 linear feet of Reinforced Concrete Pavement, 16 feet wide, situated in Moreland and Abington Townships, Montgomery County, State-aid Application No. 648; 9,878 linear feet of Vitrified Block Pavement, 16 feet wide, situated in East Taylor Township, 11,070 linear feet of Vitrified Block Pavement, 16 feet wide, situated in Jackson and East Taylor Townships, and 11,975 linear feet of Vitrified Block Pavement, 16 feet wide, situated in Jackson Township, all in Cambria County, Route No. 52; 16,852 linear feet of Vitrified Block and Reinforced Concrete Pavement, 16 feet wide, situated in South Fayette Township, Allegheny County, Route No. 108; 19,318 linear feet of Vitrified Block and Reinforced Concrete Pavement, 16 feet wide, situated in Cecil and North Strabane Townships, Washington County, Route No. 108; 5,900 linear feet of Reinforced Concrete and Vitrified Block Pavement, 16 feet wide, situated in East Bethlehem Township, Washington County, Route No. 268; 11,857 linear feet of Reinforced Concrete Pavement, 16 feet to 20½ feet wide, situated in Hanover Township, Lehigh County, Route No. 159, and 7,821 linear feet of Bituminous Pavement, 18 feet wide, situated in South Abington Township, Lackawanna County, Route No. 9; also, for the grading and drainage of 9,299 linear feet of roadbed, 24 feet to 26 feet in width, situated in Moon and Hopewell Townships, Beaver County, State-aid Applications Nos. 254 and 294. Plans and specifications may be seen at office of State Highway Department, Harrisburg, 1001 Chestnut Street, Philadelphia, and 904 Hartje Building, Pittsburgh, Pa. Full particulars and information on application to Frank B. Black, State Highway Commissioner.

PROPOSALS

Bids received until Sept. 4, 1917.

Duboistown Bridge

Duboistown, Pa.

Sealed proposals for the construction of a reinforced concrete bridge over the West Branch of the Susquehanna River between the foot of Arch Street in West Williamsport and the foot of what will be High Street in the Borough of Duboistown, Pennsylvania, will be received by the Board of Commissioners of Lycoming County, Pennsylvania, at the office of their Chief Clerk, until 12 o'clock, noon, on September 4th, 1917. At the same place, the proposals will be publicly opened at 2 o'clock P. M.

The bridge as contemplated, will be about 1500 feet long and will consist of thirteen (13) open spandrel arches, of ninety-eight (98) feet clear span.

Prospective bidders may secure copies of the plans and specifications, including form of proposals, from L. O. Bower, Chief Clerk of the County Commissioners, at his office in the Court House, Williamsport, Pennsylvania, by making a deposit of twenty-five ($25.00) dollars, which sum will be refunded to all bidders upon return of plans and specifications in good order, and to all other contractors returning same before date on which bids are received.

A certified check for the sum of ten thousand ($10,000.00) dollars payable to H. B. Achenbach, Treasurer of Lycoming County, must accompany each proposal, both of which must be enclosed in a sealed envelope and marked, "Proposal for the Construction of the Duboistown Bridge" and must be delivered to L. O. Bower, Chief Clerk, County Commissioners' Office, Court House, Williamsport, Pennsylvania.

The right is reserved by the Commissioners to reject any and all bids, or to accept any bid they may deem to the best interests of the County.

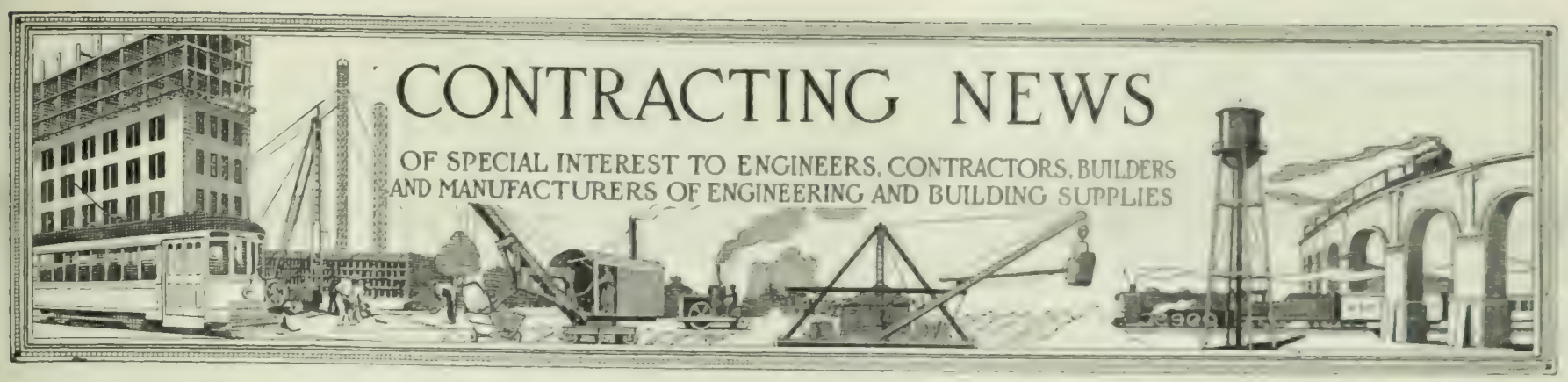
Attest:

L. O. BOWER, Chief Clerk.
CHARLES W. MYERS,
JOSEPH H. NICELY,
JOHN G. DURRWACHTER,
County Commissioners.

M. C. KRAUSE, Engineer,
335 Pine Street, Williamsport, Pa.

PROPOSALS FOR DREDGING.—Engineer Office, U. S. Army, 405 Custom House, San Francisco, Cal.—Sealed proposals for dredging part of point off Dos Rios Island and vicinity near mouth of Sacramento River will be received here until 10 a.m., Sept. 5, 1917, and then opened. Information on application.

PROPOSALS will be received by the Navy Department at U. S. Coast Guard Headquarters, Washington, D. C., until 2 P. M., September 25, 1917, and publicly opened immediately thereafter for constructing new buildings and accessories at Coast Guard Station No. 166, Wash Woods, N. C. All proposals should be inclosed in sealed envelope and marked "Proposal for Station No. 166, to be opened at 2 P. M., September 25, 1917," addressed to the "Captain Commandant, U. S. Coast Guard, Washington, D. C." Blank proposals, specifications and other information will be furnished upon application to District Superintendent, Seventh District, Coast Guard, Elizabeth City, N. C.; Keeper, Coast Guard Station No. 166, Deals, N. C., or to U. S. Coast Guard Headquarters. E. P. Bertholf, Captain Commandant.



Price advances are indicated by **heavy type**; declines by *italics*.

PIG IRON

Below are the present quotations with a comparison of a month and a year ago.

	Sept. 1, 1917	One Month Ago	One Year Ago
CINCINNATI			
No. 2 Southern foundry	$49.90	$49.90	$16.90
No. 2 Southern Ohio	56.26	56.26	19.26
NEW YORK			
No. 2X Northern foundry	*52.50*	54.25	19.50
No. 2 plain Northern foundry	*52.00*	53.75	19.25
No. 2 Southern foundry†	*52.25*	52.75	19.25
BIRMINGHAM			
No. 2 Southern foundry	47.00	47.00	14.00
CHICAGO			
No. 2 Northern foundry	55.00	55.00	18.00
No. 2 Southern foundry	54.00	....	....
PITTSBURGH			
Bessemer iron*	*52.95*	55.95	21.95
Basic iron*	*50.95*	53.95	18.95

*These prices include the freight charge from the valley to the Pittsburgh district. †Delivered Tidewater, New York.

RAILWAY SUPPLIES

STEEL RAILS—The following quotations are per ton f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh		Chicago*	
	Sept. 1, 1917	One Year Ago	Sept. 1, 1917	One Year Ago
Standard bessemer rails	$38.00	$33.00	$38.00	$33.00
Standard openhearth rails	40.00	35.00	40.00	35.00
Light rails, 8 to 10 lb.	83.00 to 84.00	50.00	**95.00 to 100.00**	43.00
Light rails, 12 to 14 lb.	82.00 to 83.00	49.00	**95.00 to 100.00**	42.00
Light rails, 25 to 45 lb.	75.00 to 80.00	47.00	**95.00 to 100.00**	40.00

*Activity in rails principally governmental

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh				San
	Sept. 1, 1917	One Year Ago	Chicago	St. Louis	Francisco
Standard railroad spikes, ⅝ in. and larger	$7.00	$2.65	$5.00	$5.75	$5.75
Track bolts	7.00	3.25	6.25	Premium	7.30
Standard section angle bars	3.65	2.00	4.50	Premium	4.65

RAILWAY TIES—For fair-sized orders, the following prices per tie hold:

	Material	6 In. x 8 in. by 8 Ft.	7 In. x 9 in. by 8 Ft. 6 In.
New York	Yellow Pine	$1.06 to 1.11	$1.25
St. Louis	No. 1 White Oak	1.00	.75
Chicago	White Oak	.97	.82
San Francisco	Green	.77	1.01
San Francisco	Creosoted	1.20	1.62

PIPE

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh, as per basing card of July 2, 1917:

BUTT WELD

Steel Inches	Black	Galvanized	Iron Inches	Black	Galvanized
¾ to 3	49%	35½%	¾ to 1½	33%	17%

LAP WELD

2	42%	29½%	2	26%	12%
2½ to 6	45%	32½%	2½ to 4	28%	15%
7 to 12	42%	28½%	4½ to 6	28%	15%
13 and 14	32½%		7 to 12	25%	12%
15	30%				

BUTT WELD, EXTRA STRONG PLAIN ENDS

¾ to 1½	47%	33½%	¾ to 1½	33%	18%
2 to 3	48%	35½%			

LAP WELD, EXTRA STRONG PLAIN ENDS

2	40%	28½%	2	27%	14%
2¼ to 4	43%	31½%	2½ to 4	28%	17%
4½ to 6	42%	30½%	4½ to 6	28%	16%
7 to 8	38%	24½%	7 to 8	20%	8%
9 to 12	45%	19½%	9 to 12	15%	3%

From warehouses at the places named the following discounts hold for steel pipe:

Black	New York	Chicago	St. Louis
¾ to 3 in. butt welded	38%	44.8%	34 27%
3½ to 6 in. lap welded	18%	18.8%	27 27%
7 to 12 in. lap welded	10	15.8%	21

Galvanized	New York	Chicago	St. Louis
¾ to 3 in. butt welded		27.8%	19
3½ to 6 in. lap welded	List	24.8%	13.2
7 to 12 in. lap welded	List	20.8%	6.2

Malleable fittings, Class B and C, from New York stock sell at 5 and 5% from list prices. Cast iron standard sizes 34 and 5%.

CAST-IRON PIPE—The following are prices per net ton for carload lots:

	New York							
	Sept. 1, 1917	1 Mo. Ago	One Yr. Ago	Birmingham	Chicago	St. Louis	San Francisco	Dallas
4 in.	$68.50	$68.50	$33.50	$63.00	$68.50	*$61.00*	**$76.00**	**$72.00**
6 in. and over	65.50	65.50	30.50	60.00	65.50	*61.00*	73.00	69.00

Gas pipe and 16-ft. lengths are $1 per ton extra.

CLAY DRAIN TILE—The following prices are per 1000 lin. ft.:

	New York					
Size, In.	Sept. 1, 1917	One Year Ago	St. Louis	Chicago	San Francisco	Dallas
3	$35.00	$24.80	$18.40	$15.00	$26.25	$19.80
4	51.00	33.95	20.70	18.00	33.75	28.10
5	65.00	47.50	28.75	23.00	48.75	
6	90.00	59.75	40.25	27.00	67.50	45.95
8	130.00	100.00	74.75	55.00	....	85.75

SEWER PIPE—The following prices are in cents per foot for carload lots:

	New York					
Size, In.	Sept. 2, 1917	One Year Ago	St. Louis	Chicago	San Francisco	Dallas
3	*$0.09*	$0.0725		$0.09	$0.075	$0.1032
4	*.09*	.0725		.10	.10	.1032
5	*.1495*	.12		.135	.125	.1548
6	*.1495*	.12	$0.12	.15	.15	.1548
8	*.277*	.165	.165	.21	.2256	.215
10	*.3255*	.24	.23	.315	.30	.301
12	*.4185*	.30	.33	.405	.40	.387
15	*.558*	.405	.50	.54		.559
18	*.725*	.57	.75	.75	.75	.731
20	*.93*	.675	.90	.90	.9625	.86
22	*1.24*	.90	1.13	1.20	1.155	1.118
24	*1.395*	.975	1.28	1.35	1.375	1.29
27	*2.08*	1.665	1.30			1.945
30	*2.304*	2.035	1.70			2.365
33	*3.06*	2.625	2.25			3.05
36	*3.485*	2.94	2.50			3.44

	Kansas City	Los Angeles	New Orleans	Boston	Denver
3	*$0.19*	$0.06	**$0.056**	*$0.111*	$0.07
5	*.135*	.10	**.0875**	*.1065*	.17*
8	.18	.18	**.16**	*.249*	.19
12	.36	.32	**.3145**	*.4995*	.41
24	1.35	1.25	**1.20**	*1.665*	1.14
36	3.25			*3.885*	2.105

*6-in. †30-in.

ROAD AND PAVING MATERIALS

ROAD OILS—Following are prices in tank cars 8000 gal. minimum f.o.b. places named:

	Sept. 1, 1917 Quotation	One Month Ago Gallon
New York, 40-50% asphalt	.*	6½c
New York, 60-70% asphalt	.*	7c
New York, dust layer	.*	7½c
New York, binder	.*	8½c
St. Louis, 45-50% asphalt	6c	6c
Chicago, 15-20% asphalt	6½c	
Chicago, dust layer	8½c	
Chicago, binder	12½c.	....
Dallas, 40-50% asphalt	6c	7c
Dallas, 60-70% asphalt	7c	8c
Dallas, 75-90% asphalt	8c	
San Francisco, 75-90% asphalt	$1.09 bbl. (42 gal.)	$1.09 bbl.

*Road oils are extremely scarce in New York and no quotations are available.

ASPHALTUM—Price per ton in barrels and bulk in carload lots:

	Brand	Barrels	Bulk
New York	Texaco	$	
Chicago			
St. Louis			
San Francisco		14	11.50
Dallas			10.00
Denver		21.00	
Denver		21.00	
Kansas City		20.00	

PAVING STONE—

New York	Sunbeam	$
	Dolge Sunbeam	
	Lyon	
Boston		
Chicago	Alsop	
	Alsop	
Kansas City		
San Francisco	Basalt Rock Co.	

WOOD BLOCK PAVING—

	Size of Block	Treatment	Per Sq.Yd
New York*	3½	16	$2.00
New York*	4	16	2.25
Chicago	4	16	1.85
Chicago	City specifications		1.70
St. Louis	3½	16	
	City specifications		2.00
	Other specifications		1.60
Boston	4	20	2.62
Kansas City	4	16	2.25
New Orleans	4	16	2.85

*Very scarce.

FLAGGING—

		Sept. 1, 1917
New York	Bronx	$0.17 sq.ft.
	Manhattan	.18 sq.ft.
	Queens 5 ft. square	.19 sq.ft.
Chicago	18 in. wide	.75 lin.ft.
San Francisco	Basalt 4x7x8 in.	57.50 per M

CURBING—Prices per linear foot are as follows:

New York	5 x 16	$0.45
	5 x 20	.50
Chicago	6 x 18	.60
St. Louis	5 x 16 square edge	.72
	5 x 16 half nose	.78
San Francisco	5 x 16	.75
	5 x 20	.85

CONSTRUCTION MATERIALS

SAND AND GRAVEL—Price for cargo or carload lots is as follows, per cu.yd.:

	Gravel				Sand	
		1½ In.		¾ In.		
	Paving	Sept. 1 1917	One Yr. Ago	Sept. 1. 1917	One Yr. Ago	Sept. 1. 1917	One Yr. Ago
New York	$1.25	$1.25	$1.00	$1.35	$1.10	$0.50	$0.50
Chicago	1.40	1.40	1.15	1.40	1.15	1.10	1.15
St. Louis		1.08	.70	1.08	.70	1.08	.60
Dallas		1.50		1.50		1.10	
San Francisco		1.00	1.25	1.00	1.25	1.00	1.20
New Orleans		1.90		2.25		1.25	
Denver		1.70		1.70		.95	
Kansas City		2.00		2.25		.60	
Boston		1.50		1.60		.80	
Los Angeles		.85		.85		.55	

Fine White Sand—St. Louis:

Pacific.....$5.00 per ton Ottawa.....$7.00 per ton

CRUSHED STONE—Price for cargo or carload lots is as follows, per cu.yd.:

	1½ In.		¾ In.	
	Sept. 1. 1917	One Year Ago	Sept. 1. 1917	One Year Ago
New York	$1.10	$0.90	$1.25	$0.95
Chicago	1.40	.95	1.40	.95
St. Louis	1.35	1.00	1.35	1.00
Dallas	1.42			
San Francisco	1.00	1.25	1.00	1.25
Denver	1.70		1.40	
Boston	1.40		1.40	
Kansas City	1.60		1.70	
Los Angeles	.95		.95	

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 300-Lb. Barrel	
	Finished	Common	Finished	Common
New York	$16.50	$13.25	$2.10	$1.90
Chicago	15.00	12.00	1.90	
St. Louis	12.00	10.75		
Dallas	20.00	15.00		
San Francisco—				
Washington hand	17.00			1.65
California hand	13.50			

ROSENDALE NATURAL CEMENT—Price to dealers for 500 lb. or over, f.o.b., including bags:

New York $1.15

30c. allowed for bags.

PORTLAND CEMENT—These prices are for barrels in carload lots (excluding bags):

	Sept. 1, 1917	One Month Ago	One Year Ago
New York	$2.32	$2.22	$1.75
Jersey City	2.16	2.16	1.66
Boston	2.77	2.77	1.92
Chicago	2.31	2.31	1.86
Pittsburgh	2.31	2.31	1.81
Cleveland	2.44	2.44	1.94
Detroit	2.40	2.40	1.90
Indianapolis	2.44	2.44	1.99
Toledo	2.44	2.44	1.99
Milwaukee	2.43	2.43	1.98
Minneapolis	2.68	2.68	2.13
Duluth	2.51	2.51	2.06
Omaha	2.43	2.43	1.94
Cedar Rapids	2.54	2.54	2.05
Des Moines	2.49	2.49	1.95
St. Louis	2.45	2.45	1.85
San Francisco	2.30	2.30	
Helena	2.75	2.30	2.30
Los Angeles	2.30	2.15	
New Orleans	2.58	2.58	
Kansas City	2.77	2.39	
St. Paul	2.48	2.63	

TRIANGLE MESH REINFORCEMENT—Price per 100 sq.ft. in carload lots:

PLAIN 4-IN. x 4-IN. MESH

Style Number	Nominal Area per Foot Width	Pittsburgh	New York	Chicago	St. Louis	Dallas	San Francisco
032	0.032	$0.89	$0.91	$0.93	$0.94	$1.06	$1.27
049	0.049	1.13	1.18	1.20	1.34	1.50	1.63
058	0.058	1.43	1.47	1.49	1.50	1.68	2.01
063	0.063	1.82	1.89	1.91	1.92	2.17	2.62
126	0.126	2.31	2.39	2.42	2.44	2.74	3.32
153	0.153	2.75	2.86	2.88	2.91	3.27	3.96
180	0.180	3.16	3.27	3.31	3.34	3.76	
245	0.245	4.17	4.33	4.36	4.41	4.96	
287	0.287	4.82	5.00	5.04	5.10	5.72	6.94
336	0.336	5.56	5.80	5.85	5.92	6.66	

PLAIN 4-IN. x 8-IN. MESH

036P	0.036	.69	.71	.72	.73	.82	....
053P	0.053	.97	1.01	1.02	1.03	1.16	....
072P	0.072	1.26	1.30	1.32	1.33	1.50	....
097P	0.097	1.62	1.68	1.70	1.71	1.93	....
049R	0.049	.97	1.01	1.02	1.03	1.15	1.97
067R	0.067	1.26	1.30	1.32	1.33	1.50	2.35
089R	0.089	1.62	1.68	1.70	1.71	1.93	2.88

Made in 16-, 20-, 24-, 28-, 32-, 36-, 40-, 44-, 48-, 52- and 56-in. width in rolls 150-, 200- and 300-ft. lengths.

Galvanized runs about 10% higher than plain.

EXPANDED METAL LATH—Prices per 100 yd. for painted are as follows:

Carload

Gage	Weight	New York Sept. 1, 1917	New York One Year Ago	Chicago	St. Louis	San Francisco	Dallas
27	233	$31.00	$18.00	$31.00	$34.00	$29.00	$32.00
26	250	32.05	19.00	32.00	35.00	30.25	....
25	300	33.15	20.00	33.00	....	....	....
24	340	34.25	21.00	34.00	37.00	33.00	36.00
22	450	36.45	24.00	36.00	....	....	....

About 10% additional for smaller quantities.

BARS, CONCRETE REINFORCING—The following quotations are per 100 lb.:

ROLLED FROM BILLETS

In.	Mill Shipment	Warehouse: New York Sept. 1, 1917	New York One Year Ago	St. Louis	Chicago	San Francisco	Dallas
¾ and larger	*	$5.10	$3.25	$4.736	$4.50	$6.00	$4.75
⅝	*	5.15	3.35	4.786	4.55	6.05	4.80
½	*	5.20	3.40	4.836	4.60	6.10	4.85
⅜	*	5.35	3.65	4.986	4.75	6.25	5.00
¼	*	5.60	4.00	5.236	5.00	6.50	6.00

*Mill quotations on actual specifications.

ROLLED FROM RAILS

	Dallas	St. Louis	Chicago
¾ in. and larger	$4.75	$4.00	$4.50
⅝	4.80	4.05	4.55
½	4.85	4.10	4.60
⅜	5.00	4.25	4.75
¼	6.00	5.00	5.00

BRICK—The price per 1000 in cargo or carload lots is as follows:

	Common: Sept. 1, 1917	One Month Ago	One Year Ago	Paving: Brick	Block
New York	$8.50	$8.50	$7.75	....	....
Boston	13.25	13.25	....	....	$25.00
Chicago	8.00	8.00	6.00	$16.00	24.00
St. Louis, salmon	8.00	7.00	9.00	18.00	....
St. Louis, selected	10.00	10.00	9.00	....	....
Denver	8.00	8.00	....	....	14.00
Los Angeles	7.50	....	....	....	28.00
San Francisco	10.00	10.00	10.00	....	....
Dallas	8.10	8.10	....	22.00	22.50
New Orleans	9.00	9.00	....	....	*10.50
Kansas City	11.00	11.00	....	....	20.00

*Silica brick for foundations.

HOLLOW TILE—Hollow building tile price per block in cents:

	New York Sept. 1, 1917	New York One Year Ago	Chicago	St. Louis	San Francisco	Dallas
4x12x12	$0.0925	$0.065	$0.079	$0.054	$0.0825	$0.07
6x12x12	.1295	.091	.12	.066	.11	.09
8x12x12	.15725	.11	.135	.09	.1275	.12
10x12x12	.185	.13	.16	.15	.20	.15
12x12x12	.23125	.1625	.20	.18	.22	.18

	4x12x12	8x12x12	12x12x12
Boston	$0.0957	$0.171	$0.2266
Kansas City*	.0595	.1125	.1575
Denver	.09	.17	.25
New Orleans	.0892	.1417	.1863
Los Angeles*	.05	.10	.165

*In quantities of 1000.

STRUCTURAL MATERIAL—The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Pittsburgh	New York Sept. 1, 1917	New York 1 Yr. Ago	St. Louis	Chicago	San Francisco	Dallas
Beams, 3 to 15 in.	$4.50	$5.25	$3.25	$5.05	$5.00	$7.75	$6.00
Channels, 3 to 15 in.	4.60	5.25	3.25	5.05	5.00	7.75	6.00
Angles, 3 to 6 in., ¼ in. thick	4.50	5.25	3.25	5.05	5.00	7.75	6.00
Tees, 3 in. and larger	4.50	5.30	3.30	5.05	5.05	7.75	6.00
Plates	10.00	10.00	4.00	10.05	10.00	10.00	9.00

RIVETS—The following quotations are per 100 lb.:

STRUCTURAL

	Mill, Pittsburgh	Warehouse: New York	Chicago	St. Louis	San Francisco	Dallas
¾ in. and larger	$5.25	$7.00	$5.50	$5.55	$7.15	$8.40
CONE HEAD BOILER						
¾ in. and larger	5.35	7.10	5.60	5.65	7.25	8.50
⅝ and ½	5.50	7.25	5.75	5.80	7.40	8.65
½ and ⅜	5.85	7.60	6.10	6.15	7.75	9.00

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York, St. Louis, Chicago and San Francisco:

	1-Ply c.l.	1-Ply l.c.l.	2-Ply c.l.	2-Ply l.c.l.	3-Ply c.l.	3-Ply l.c.l.
No. 1 grade	$1.25	$1.40	$1.45	$1.60	$1.75	$1.90
No. 2 grade	1.10	1.25	1.25	1.40	1.50	1.65

Asbestos asphalt-saturated felt (14 lb. per square) costs $6.50 per 100 lb.

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $1.85 per roll in carload lots and $2.10 for smaller quantities.

Shingles, red and green slate finish, cost $4.75 per square in carloads, $5 in smaller quantities, in Philadelphia.

ROOFING MATERIALS—Prices per ton f.o.b. New York or Chicago:

	Carload Lots	Less Than Carload Lots
Tar felt (14 lb. per square of 100 sq.ft.)	$61.00	$62.00
Tar pitch (in 400-lb. bbl.)	15.00	16.50
Asphalt pitch (in barrels)	29.00	30.50
Asphalt felt	60.00	62.00

SHEETS—Price in cents per pound:

Blue Annealed	Large Lots, Pittsburgh	St. Louis	Chicago	San Francisco	New York — Sept. 1, 1917	New York — One Yr. Ago
No. 10	8.00 to 9.00	10.05	10.00	11.00	10.00	4.25
No. 12	8.05 to 9.05	10.10	10.05	11.05	10.05	4.30
No. 14	8.10 to 9.10	10.15	10.10	11.10	10.10	4.35
Black						
Nos. 18 and 10	7.80 to 8.80	10.15	9.80	11.07	10.30	3.45
Nos. 22 and 24	7.85 to 8.85	10.20	9.85	11.12	10.35	3.50
No. 26	7.90 to 8.90	10.25	9.90	11.12	10.40	3.55
No. 28	8.00 to 9.00	10.35	10.00	11.37	10.50	3.65
Galvanized						
No. 10	9.00 to 10.00	10.95	10.70	....	....	....
No. 12	9.10 to 10.10	10.95	10.70	12.15	....	4.10
No. 14	9.10 to 10.10	10.95	10.70	12.15	....	4.10
Nos. 18 and 20	9.40 to 10.40	11.15	11.00	12.45	11.40	4.40
Nos. 22 and 24	9.55 to 10.55	11.30	11.15	12.59	*11.55*	4.55
No. 26	9.70 to 10.70	11.45	11.20	12.74	*11.70*	4.70
No. 28	10.00 to 11.00	11.75	11.50	13.03	*12.00*	5.00

LINSEED OIL—These prices are per gallon:

	New York — Sept. 1, 1917	New York — One Year Ago	Cleveland — Sept. 1, 1917	Cleveland — One Year Ago	Chicago — Sept. 1, 1917	Chicago — One Year Ago
Raw in barrels	$1.26	$0.75	$1.30	$0.75	$1.27	$0.75
5-gal. cans	1.36	.85	1.40	.85	1.37	.85

WHITE AND RED LEAD in 500-lb. lots sell as follows in cents per pound:

	Red — Sept. 1, 1917 Dry	Red — Sept. 1, 1917 In Oil	Red — 1 Year Ago Dry	Red — 1 Year Ago In Oil	White — Sept. 1, 1917 Dry and In Oil	White — 1 Yr. Ago Dry and In Oil
100-lb. keg	13.25	13.50	10.50	11.00	13.00	10.50
25- and 50-lb. kegs	13.50	13.50	10.75	11.25	13.25	10.75
12½-lb. keg	13.75	14.00	11.00	11.50	13.50	11.00
1- to 5-lb. cans	15.25	15.50	12.50	12.50	15.50	12.50

LUMBER*—Price per M in carload lots:

Square Edge and Sound Green

	Southern Pine — New York — 20 Ft. and Under	Southern Pine — New York — 22-24 Ft.	Southern Pine — Chicago — 20 Ft. and Under	Southern Pine — Chicago — 22-24 Ft.	Yellow Pine — St. Louis — 20 Ft. and Under	Yellow Pine — St. Louis — 22-24 Ft.
3x 4 to 8x 8	$33.75	$34.75	$31.75	$32.75	$28.75	$29.75
3x10 to 10x10	35.75	36.75	33.75	34.75	30.75	31.75
3x12 to 12x12	38.75	39.75	36.75	37.75	33.75	34.75
3x14 to 14x14	41.75	42.75	39.75	40.75	36.75	37.75
3x16 to 16x16	46.75	47.75	44.75	45.75	41.75	42.75
3x18 to 18x18	51.75	52.75	49.75	50.75	46.75	47.75
4x20 to 20x20	56.75	57.75	54.75	55.75	51.75	52.75

Over 24 ft.—Add $1 for each additional 2 ft. in length up to 40 ft. for sizes 12 x 12 and under; for sizes over 12 x 12 add $2. For merchantable add $2 to sizes 10 x 10 and under. For prime add $2 to the price of merchantable for all sizes.

*Prices from Lumberman's Bureau.

Rough Douglas Fir, No. 1 Common—More than carload lots in San Francisco:

Size in Inches	15 Ft. and Under	16 to 24 Ft.	25 to 32 Ft
3 and 4x4	$23.00	$24.50	$25.50
3 and 4x6 and 8	23.00	23.50	24.50
6x6 to 8x8	23.50	24.50	24.50
3 and 4x10	23.00	24.50	25.50
6 and 8x10	24.00	25.00	25.00
10x10	24.00	24.00	26.00
3 and 4x12	24.00	24.50	25.50
6 and 8x12	24.50	23.50	23.50
10 and 12x12	24.00	24.00	26.00
3 and 4x14	24.00	26.00	27.00
6 and 8x14	25.50	26.50	26.50
7 and 9x14	26.50	27.50	27.50
10 and 12x14	25.00	25.00	27.00
14x14	24.00	24.00	26.00
3 and 4x16	25.00	27.50	28.50
6 and 8x16	27.00	28.00	28.00
7 and 9x16	28.00	29.00	29.00
10 and 12x16	26.00	26.00	28.00
14 and 16x16	24.00	24.00	26.00
3 and 4x18	26.00	29.00	31.00
6 and 8x18	27.50	30.00	30.00
7 and 9x18	28.50	31.00	31.00
10 and 12x18	27.00	27.00	29.00
14 and 16x18	25.00	25.00	27.00
18x18	26.00	26.00	28.00
3 and 4x20	28.00	30.50	32.50
6 and 8x20	29.50	32.00	32.00
10 and 12x20	28.00	28.00	30.00
14 and 16x20	26.00	26.00	28.00
18 and 20x20	27.00	27.00	29.00

Yellow Pine—Dallas. Price per M:

2x4 to 2x12—12 to 16 ft. long	$37.50
2x4 to 2x12—10, 18 and 20 ft. long	35.00
2x4 to 2x12—22 and 24 ft. long	37.50
4x4, 4x6, 6x6, 8x8, 3x8	45.00
8x10, 10x10, 3x10	40.00
12x12, 3x12	40.00

	1 In. Rough 10 In. x 16 Ft. and Under — Y P	1 In. Rough 10 In. x 16 Ft. and Under — Fir	1 In. Rough 10 In. x 16 Ft. and Under — Hemlock	1 In. T and G 10 In. x 16 Ft — Y P	1 In. T and G 10 In. x 16 Ft — Fir
Kansas City	$44.00	$44.50	$43.00	$52.00	
New Orleans	38.00			36.00	
Denver	....	30.00	30.00	....	$30.00

Note—In Los Angeles only fir hemlock and redwood used. Hemlock base is $35, fir is $30. In Boston the lumber market is demoralized.

	8 x 8 In. x 20 Ft. and Under — Y P	8 x 8 In. x 20 Ft. and Under — Fir	8 x 8 In. x 20 Ft. and Under — Hemlock	8 x 8 In. x 20 Ft. and Under — Spruce	12 x 12 In. 20 Ft. and Under — Y P	12 x 12 In. 20 Ft. and Under — Fir
Kansas City	$39.00	$43.00	$35.00	....	$45.00	$45.00
New Orleans	28.00				38.00	
Denver	....	30.00	....	$24.50		32.00

NAILS—The following quotations are per keg from warehouse:

	Pittsburgh	St. Louis	Chicago	San Francisco	Dallas
Wire	$4.00	$4.00	$4.45	$4.60	$4.45
Cut	4.65	5.00	4.60	6.15	....

MISCELLANEOUS

FREIGHT RATES—On finished steel products in the Pittsburgh district, including plates, structural shapes, merchant steel, bars, pipe fittings, plain and galvanized wire nails, rivets, spikes, bolts, flat sheets (except planished), chains, etc., the following freight rates are effective in cents per 100 lb.:

Boston	21.5	New Orleans	30.7
Buffalo	11.6	New York	19.5
Chicago	18.9	Pacific Coast (all rail)	75.0
Cincinnati	15.8	Philadelphia	18.5
Cleveland	10.5	St. Louis	23.6
Denver	68.6	St. Paul	32.9
Kansas City	43.6		

WATER TREATMENT CHEMICALS—Prices per pound are as follows:

	New York	Chicago
Sulphate of alumina (iron free), in 400-lb barrel	$0.045	....
Hypochlorite of lime (bleaching powder), in 700-lb. drums	.03	$0.0375 to .04
Soda ash, in 400-lb. bbl	.05	0375 to .04
Liquid chlorine (spot orders)	.175	16 to 18

Lime is quoted separately, on next page.

CONTRACTORS' MISCELLANEOUS SUPPLIES

STEEL SHEET PILING—The following price is base per 100 lb. f.o.b. Pittsburgh, with a comparison of a month and a year ago:

Sept. 1, 1917	One Month Ago	One Year Ago
$4.50 to $5.00	$4.50 to $5.00	$2.50

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York	St. Louis	Chicago	San Francisco
Galvanized	10—2½%	10—2½%	10—2½%	15%
Bright	20—2½%	20—2½%	20—2½%	10%

MANILA ROPE—For rope smaller than ⅝-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ⅝-in., 8 ft.; ¾-in., 6; ⅞-in., 4½; 1-in., 3½; 1⅛-in., 2 ft. 10 in.; 1¼-in., 2 ft. 4 in. Following is price per pound for ⅝-in. and larger, in 1200-ft. coils:

Boston	$0.34	Kansas City	$0.41½
New York	33½	New Orleans	.31
Chicago	31½	Los Angeles	.30
Denver	4½		

EXPLOSIVES—Price per pound in 200-lb. lots at cities named:

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	Gelatin 80%
New York	....	$0.30½	$0.33½	....
Boston	....	....	.33¼	$0.40¾
Kansas City	$0.19	.31¼	.32¼	.42¼
New Orleans	....	.24¼	.29¼	....
Los Angeles	.19	.25	.32½	....
Chicago	.18¾	.22¾	.33¾	.42
St. Louis	.17¼	.19½	.25½	.38½
Denver	.18	.24½	.31¼	.41½
Dallas	.24	.28	.38	.48

OLD MATERIAL—The prices following are per gross ton paid to dealers and producers in New York. In Chicago and St. Louis the quotations are per net ton and cover delivery at the buyer's works, including freight transfer charges:

	New York — Sept. 5, 1917	New York — One Month Ago
Heavy melting steel scrap	$[illegible]	$[illegible]
No. 1 railroad wrought	[illegible]	[illegible]
Steel rails	[illegible]	20.00
No. 1 machinery cast	[illegible]	34.00
Machine shop turnings	[illegible]	[illegible]
Cast borings	19.00 to 20.00	[illegible]
Railroad malleable cast	[illegible]	33.00

	Chicago — Sept. 5, 1917	Chicago — One Month Ago
No. 1 railroad wrought	$[illegible]	$[illegible]
Steel rails	[illegible]	[illegible]
No. 1 machinery cast	[illegible]	[illegible]
Machine shop turnings	[illegible]	[illegible]
Cast borings	[illegible]	[illegible]
Railroad malleable cast	[illegible]	[illegible]

	St. Louis — Sept. 5, 1917	St. Louis — One Month Ago
Heavy melting steel scrap	$[illegible]	$[illegible]
No. 1 railroad wrought	[illegible]	[illegible]
Steel rails	[illegible]	14.00
No. 1 machinery cast	[illegible]	[illegible]
Machine shop turnings	[illegible]	[illegible]
Cast borings	[illegible]	[illegible]
Railroad malleable cast	[illegible]	[illegible]

*Per gross ton.

Proposals

For Proposals Advertised See Pages 84 to 92 inclusive

WATER-WORKS

Bids Close		See Eng. News-Record
Sept. 10.	Cumberland, Md. ..... Adv. Aug. 16 to 30.	Aug. 16
Sept. 10.	Tonawanda, N. Y. ..... Adv. Sept. 6.	Sept. 6
Sept. 11.	New York, N. Y. ..... Adv. July 12 to Aug. 23.	July 12
Sept. 12.	Kansas City, Mo. ..... Adv. Aug. 23 and 30.	Aug. 23
Sept. 13.	Cleveland, O.	Aug. 30

SEWERS

Sept. 11.	Montclair, N. J. ..... Adv. Sept. 6.	Sept. 6
Sept. 11	Clinton, Ia.	Sept. 6
Sept. 11	Oklahoma, Okla.	Sept. 6
Sept. 15.	Hillsboro, Ill.	Aug. 16
Sept. 12.	Springfield, Ohio	Sept. 6
Sept. 17.	Cleveland Heights, O.	Aug. 30

BRIDGES

Sept. 8.	Martinsburg, W. Va.	Sept. 6
Sept. 10.	Omaha, Neb.	Aug. 23
Sept. 10.	Akron, O.	Aug. 23
Sept. 10.	Bryan, O.	Aug. 30
Sept. 10.	Scarsdale, N. ..... Adv. Sept. 6.	Sept. 6
Sept. 11.	Lynn, Mass. ..... Adv. Sept. 6	Sept. 6
Sept. 11.	Modesto, Cal.	Aug. 30
Sept. 11	Bradentown, Fla	Aug. 16
Sept. 12	Youngstown, Ohio	Sept. 6
Sept. 13.	Excelsior Springs, Mo	Aug. 30
Sept. 15	Guthrie, Okla.	Aug. 30
Sept. 15.	Jacksonville, Ore.	Sept. 6
Sept. 17	Woonsocket, R. I. ..... Adv. Sept. 6.	Sept. 6
Sept. 18.	Santa Ana, Cal.	Sept. 6
Sept. 20.	Du Bois, Pa.	Sept. 6
Sept. 20	Butler, Pa. ..... Adv. Sept. 6.	Sept. 6
Oct. 2.	Albany, N. Y. ..... Adv. Sept. 6.	Sept. 6

STREETS AND ROADS

Sept. 10.	Washington	Aug. 30
Sept. 10	Wallace, Idaho	Aug. 30
Sept. 10.	Cherokee, Ia.	Sept. 6
Sept 10	Mankato, Minn.	Sept. 6
Sept. 10	Louisa, Ky.	Sept. 6
Sept. 10	Trenton, N. J.	Sept. 6
Sept. 10	Quincy, Mass.	Sept. 6
Sept. 11	Concordia, Kan.	Sept. 6
Sept. 11	Sacramento, Cal.	Aug. 30
Sept. 11	Buffalo, Minn.	Sept. 6
Sept. 12	Kansas City, Mo.	Sept. 6
Sept. 12	Springfield, Ohio	Sept. 6
Sept. 12.	Indianapolis, Ind.	Sept. 6
Sept. 12	Rhode Island ..... Adv. Sept. 6	Sept. 6
Sept. 14	Parkersburg, W. Va.	Sept. 6
Sept. 15	Visalia, Cal.	Aug. 30
Sept. 16.	Pocatello, Idaho	Sept. 6
Sept. 17.	Indianapolis, Ind.	Sept. 6
Sept. 18	Morrison, Ill.	Sept. 6
Sept. 19	Seattle, Wash.	Aug. 23
Sept. 19	Hohenwald, Tenn.	Aug. 23
Sept. 19	Albany, N. Y. ..... Adv. Sept. 6	Sept. 6
Sept. 20	New York, N. Y.	Sept. 6
Sept. 21.	Charleston, W. Va.	Sept. 6
Sept. 23	Fairmont, Ia.	Aug. 30
Sept. 24	Mobile, Ala.	Sept. 6
Sept. 24	Livingston, Ala.	Sept. 6
Sept. 25	Carrollton, Ala.	Sept. 6
Sept. 30	Indianapolis, Ind.	Sept. 6
Oct. 1	Lincoln, Neb.	Sept. 6
Oct. 16	Cape May, N. J.	Sept. 6

EXCAVATION AND DREDGING

Sept. 10	Walker, Minn.	Aug. 30
Sept. 10	Walker, Minn.	Sept. 6
Sept. 10	Carrollton, Ia.	Sept. 6

Close Bids		News-Record See Eng.
Sept. 12.	New York, N. Y.	Sept. 6
Sept. 12.	New Orleans, La.	Aug. 23
Sept. 12.	Hampton, Ia.	Aug. 30
Sept. 15.	Angola, Ind.	Sept. 6
Sept 18.	Moorhead, Minn.	Sept. 6
Sept. 21.	Modesto, Cal.	Sept. 6
Sept. 21.	Paxton, Ill.	Sept. 6
Oct. 2.	St. Cloud, Minn.	Aug. 2
Oct. 2.	Urbana, Ill.	Sept. 6

INDUSTRIAL WORKS

Sept. 12.	Ogdensburg, N. Y. ..... Adv. Sept 6.	Sept. 6

BUILDINGS

Sept. 7.	Albany, N. Y. ..... Adv. Aug. 16 to Sept. 6.	Aug. 23
Sept. 10.	Bridgeport, Conn.	Aug. 30
Sept. 10.	Akron, O.	Aug. 30
Sept. 10.	El Paso, Tex.	Sept. 6
Sept. 10.	Crawfordsville, Ind.	Sept. 6
Sept. 12.	Virginia, Minn.	Sept. 6
Sept. 13.	Upper Sandusky, Ohio	Aug. 30
Sept. 13.	Letts, Ia.	Sept. 6
Sept. 15.	Oklahoma, Okla.	Aug. 16
Sept. 15.	Spirit Lake, Ia.	Aug. 9
Sept. 15.	Bathhurst, N. B.	Aug. 30
Sept. 15.	Cleveland Heights, Ohio (Warrensville P. O.)	Sept. 6
Sept. 21.	Chester, Pa.	Sept. 6

FEDERAL GOVERNMENT WORK

Sept. 10.	Annapolis, Md.	Aug. 30
Sept. 10.	Pearl Harbor, Hawaii	Aug. 30
Sept. 10.	Norfolk, Va.	Sept. 6
Sept. 10.	Philadelphia, Pa.	Sept. 6
Sept. 10.	Detroit, Mich.	Sept. 6
Sept. 11.	Vicksburg, Miss. ..... Adv. Sept. 6.	Sept. 6
Sept. 12.	Vicksburg, Miss. ..... Adv. Sept. 6.	Sept. 6
Sept. 12.	Raton, N. M.	Aug. 23
Sept. 12.	Long Island City, N. Y.	Aug. 9
Sept. 17.	Tampa, Fla.	Sept. 6
Sept. 12.	Wilmington, Del.	Sept. 6
Sept. 24.	Farmington, N. M.	Sept. 6
Sept. 26.	Memphis, Tenn. ..... Adv. Sept. 6.	Sept. 6
Oct 30.	Key West, Fla. ..... Adv. Sept. 6.	Sept 6
Oct 1.	Cleveland, Ohio	Sept. 6
Oct 2.	San Francisco, Cal.	Sept. 6
Oct. 4.	St. Peter, Minn.	Sept. 6
Sept. 18.	Cape Henry, Va. ..... Adv. Aug. 30 and Sept 6.	Aug. 30
Sept. 21.	Kendallville, Ind. ..... Adv. Aug. 16 and 23.	Aug. 16
Sept. 25.	Washington, D. C. ..... Adv. Aug. 30.	Aug. 30
Oct. 1.	Twin Falls, Idaho	Aug. 30

MISCELLANEOUS

Sept 8.	Creek Improvements—Lancaster, O.	Sept. 6
Sept. 10.	Dam and Retaining Walls—Marshalltown, Ia.	Aug. 30
Sept. 10.	Retaining Wall—Lebanon, O.	Aug. 30
Sept. 10.	Dock—Georgetown, Wash.	Aug. 30
Sept. 10.	Piling—Columbus, O.	Sept. 6
Sept. 10.	Dock—Seattle, Wash.	Sept. 6
Sept. 10.	Garbage Incinerator—Waukegan, Ill. ..... Adv. Sept. 6.	Sept. 6
Sept. 11.	Electric Work — Farmingdale, N. Y. ..... Adv. Sept. 6.	Sept. 6
Sept. 12.	Freight Conveyors — Albany, N. Y. ..... Adv. Sept. 6.	Sept. 6
Sept. 17.	Retaining Wall — Newton, N. J.	Sept. 6
Sept. 19.	Flood Protection—Corning, N. Y. ..... Adv. Sept. 6.	Sept. 6
Sept. 20.	Retaining Wall — Dayton, O.	Sept. 6
Sept. 25.	Harbor Improvements — Mobile, Ala.	Sept. 6

Where name of official is not given, inquiries should be addressed to City Clerk County Clerk or corresponding official

WATER-WORKS

Proposed Work

N. Y., Hempstead—Town sold $200,000 bonds to build waterworks system in North Hempstead. C. E. Remsen, superv.

N. J., Little Falls—(Official)—City rejected bids building pumping station. B. A. Stanley, supt. Noted Aug. 23.

O., Hubbard—Village sold $12,000 bonds to build waterworks system. W. H. Willard, supt.

Kan., Junction City—City Comrs. plan to extend water main on West 10th and East Chestnut Sts., also 6-in. line on Calhoun St. to connect dead ends.

Kan., Towanda—City having plans prepared by F. E. Devlin, engr., Eldorado, for building waterworks system.

S. D., Centerville—(Official)—City defeated $20,000 bond issue to install waterworks system. Noted Aug. 16.

Okla., Coyle—(Official)—City sold $13,000 bonds to improve waterworks system. W. Erkman, clk. Noted Aug. 23.

Okla., Dewar—(Official)—City sold $20,000 bonds to extend water-works. Noted Aug. 23.

Okla., Oklahoma — (Official) — City will not spend $10,000 to build waterworks and connecting wells. J. W. Bennett, supt. Noted Aug. 23.

Colo., Greeley—(Official)—City sold $150,000 bonds to build water-works system. W. A. Hotchkiss, clk.

Idaho, Sandpoint—City plans to build water-works system. M. Henderson, supt.

Wash., Waitsburg—City voted $50,000 bonds to build waterworks system. Noted Aug. 2.

B. C., Vancouver—City having plans prepared extending water mains 20,000-ft. to Roche Point to serve Robert Dollar plant. About $26,000. J. L. Breckon, supt.

BIDS DESIRED

N. Y., Tonawanda—(Official)—Until Sept. 26, by M. W. Simson, city clk., furnishing and laying intake pipe in Niagara River; advertised in this issue. Noted Apr. 19.

N. J., East Orange—Until Sept. 10, by Bd. Water Comrs., for laying water mains. R. M. Roper, 436 Main St., act. secy.

PRICES AND CONTRACTS AWARDED—

(★Indicates award of contract)

★**Pa., Loretto**—Bethlehem Steel Co., South Bethlehem, let contract building reservoir and observation tower to Richardson Constr. Co., Connell Bldg., Scranton, $100,000.

★**Md., Cumberland**—(Official)—City let contract 7,000,000 gal. reservoir in Ridgedale Addition to Cumberland Contr. Co., Cumberland, $67,545. Noted Aug. 2.

★**Va., Lechall**—Newport News Light & Water Co., Newport News, let contract filter plant to Roberts Filter Mfg. Co., 6th St. and Columbia Ave., Darby, $500,000.

★**O., Akron**—(Official)—City let contract laying 7200-ft. of 30-in. c.i. pipe with connections and lines, constructing manholes, replacing paving and appurtenant work to Gessner Co., Toledo, $32,608.

★**Ill., Chicago**—City let contract building deep well to B. Geiger, 37 West Van Buren St., $23,737. Noted Aug. 9.

★**Wis., Clintonville**—(Official)—City let contract laying 4000-ft. water mains to Meirswa Constr. Co., Oshkosh, $2.40 for 6-in. main and $2.08 for 4-in.

★**Minn., Lake Crystal**—Village let contract, water mains to A. Larson, Lake Crystal, $30,000.

★**Mont., Glasgow**—(Official)—City let contract improving water and sewerage systems to Empire Constr. Co., Minot, as follows: 6-in. c. i. pipe, $2.85 per ft., specials, 10c. per lb. hydrants, $85 each gate valves, $50 each, 10-in. vitr. pipe, $1.65 per ft., manholes, $70 each, catchbasins, $75 each, flush tanks, $210.

Water-Works (Continued)

★**Mo., Monett**—(Official)—City let contract building 1,000,000-gal. rein.-con reservoir to M. E. Gillioz, Monett, without roof, $14,598, with roof, $18,464. Noted Aug. 23.

Colo., Otis—(Official)—City received low bid building water-works system, including deep well, wrought-iron water pipe, castings, tees, elevated tank and tower, from Gordon & Suglok Constr. Co., Century Bldg., Denver, $20,000. Noted Aug. 23.

SEWERS

Proposed Work

Mass., East Boston—(Boston P. O.)—Dept. Pub. Wks., Boston, soon lets contract sewer in Faywood Ave. E. F. Murphy, comr.

O., Dayton—City plans to improve Sanitary Sewer Dist. No. 3, portions Alton and Baltimore Sts. and Notre Dame Ave. F. O. Eichelberger, city engr.

O., Mansfield—City plans improving Bartley Ave. by building 8-in. sanitary sewer, including flush tanks and manholes. W. J. Hazelton, city engr.

O., Toledo—City plans election in November to vote on $3,000,000 bond issue to build sewage plant. H. McKechnie, city engr.

Ia., Des Moines—City Council plans to build sewerage system to connect Des Moines with Valley Junction. About $300,000. Karl Kastberg, city engr.

Kan., Pittsburg—City having plans prepared by Black & Veatch, engrs., 507 Interstate Bldg., Kansas City, Mo., building sewage disposal plant. About $75,000. Noted May 17.

Neb., Omaha—(Official)—City to sell $20,000 bonds to build sewers. J. A. Bruce, city engr. Noted Aug. 23.

Okla., Boynton—Council passed ordinance authorizing $20,000 bond issue to build sewerage system. J. F. Wolfinger, chn.

Okla., Sentinel—(Official)—City defeated $15,000 bonds for improving sewerage system. Noted July 12.

Ore., Portland—City having plans prepared for building East 63rd and Halsey Sts. sewerage system to care for Rose City Park Dist. About $163,000. P. H. Dater, city engr.

Cal., Los Angeles—City having plans prepared installing sewers in East Hollywood Dist. A. C. Hansen, city engr.

Cal., San Diego—City plans sewerage system involving 18-mi. concrete pipe from 6- to 20-in. at Camp Kearny. G. Cromwell, city engr.

BIDS DESIRED

N. J., Montclair—(Official)—Until Sept. 11 by H. Trippett, town clk., storm sewer portion Church St.; advertised in this issue.

O., Springfield—Until Sept. 12, by City, installing sewers in Linwood, Columbus, Water and Mt. Vernon Sts. C. E. Ashburner, city mgr.

Ia., Clinton—(Official)—Until Sept. 11 by City Clk., building sanitary sewer in portions 11th Ave. J. G. Thorne, city engr.

Okla., Oklahoma—Until Sept. 11, by C. F. Semmelbeck, city clk., building lateral sewerage system. G. V. McClure, city engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Conn., New Canaan**—(Official)—City let contract building filter beds, and sewage disposal plant to E. W. Schreve, Bridgeport, $14,960.

★**Conn., Orange**—Town let contract building sanitary sewers in Prospect Beach Sect. to Acme Eng. Co., Hartford. Noted May 31.

N. Y., Long Island City—(Official)—Bids were received by M. M. Connolly, boro. pres., Aug. 29, for sewers and appurtenances in (a) Junction Ave., (b) Sackett St., (c) Guion Ave., (d) North Villa St., (e) Fulton Pl. and North Morris Ave., (f) Myrtle Ave., as follows: Ajax Drainage Contg. Corp., 60 Herkimer St., Bklyn., (a) $37,943, (b) $10,880, (d) $29,952, (e) $15,603; Peace Bros., 20 Main St., Flushing, (a) $31,417, (b) $26,964, (c) $15,353; Murphy Bros., 963 East 43rd St., Bklyn., (c) $15,556, (f) $21,766; Green Contg. Co., 734 Verona Ave., (b) $21,605; J. L. Sigretto, 1459 Woodhaven Ave., Woodhaven, (e) $14,377. Noted Aug. 23.

★**N. J., Avalon**—Boro. let contract building lateral sewer to Seaman & Lefferts Stone Harbor, $10,000.

★**Pa., Waynesboro**—City let contract storm sewers to H. K. Gerhart, Waynesboro, $10,000.

★**O., Ashland**—See "Streets and Roads."

★**Ind., Gary**—City let contract building sewer in Dist. No. 38 to J. Apostle, Gary, $11,822. Noted June 28.

★**Ia., Conrad**—City let contract building sewers to Cole Bros., Ames, $16,840.

★**Ia., Council Bluffs**—(Official)—City let contract installing sewers to E. A. Wickham & Co., 19 Scott St., $1.10 for 10-in. sewer, 98c. for 8-in., 67c. for 6-in. and 45c. for manholes.

★**Ia., Marshalltown**—(Official)—City let contract building sanitary sewer to Anderson & Empire, Marshalltown, $20,000. Noted Aug. 23.

★**Ia., Milford**—City let contract building 4½-mi. 8-15-in. sewers to R. N. Kruse, Spencer, $39,014. Noted Aug. 9.

★**S. D., Watertown**—City let contract sewers in 2nd, 3rd, 4th, 5th and 6th Sts. to W. M. Danforth, 707 Germania Life Bldg., St. Paul. About $16,900.

★**Mont., Glasgow**—See "Waterworks."

★**Tex., San Antonio**—(Official)—City let contract sewage pumping plant to McKenzie Constr. Co., 605 Bedell Bldg., $30,000. Noted July 19.

★**Okla., Commerce**—City let contract laying 6, 8, 10 and 12-in. pipe and building sewage disposal plant to Municipal Excavator Co., 200 East Main St., Oklahoma. $24,000 and $2500 respectively. Noted July 12.

★**Cal., Los Angeles** — See "Streets and Roads."

BRIDGES

Proposed Work

Me., Bath—State Highway Comn., Cumberland and Sagadahoc Cos., plan bridge over New Meadows River. About $13,000.

N. J., New Brunswick—A. Fox, Middlesex Co. engr. preparing plans for new draw bridge over Raritan River, Albany St.

Pa., Norristown—Montgomery and Chester Cos. plan to improve inter-county bridge over Schuylkill River, between iron borough and Mont Clare.

Ga., Savannah — Savannah - Altamaha Bridge Co., recently incorporated with $100,000 capital stock, plans to build bridge from Savannah across Altamaha River. Address M. B. Lane, 26 Gaston St. Noted July 19.

Fla., Bradentown—See "Streets and Roads."

Fla., Miami—See "Streets and Roads."

Fla., West Palm Beach—See "Streets and Roads."

Tenn., Knoxville — City sold $150,000 bonds to build viaduct and approaches. Southern Ry. will bear part of cost of work. J. B. McCalla, city engr. W. H. Wells, Wash., D. C., ch. engr. ry.

Tenn., Memphis—City sold $25,000 bonds to build wagonway and approaches to J. T. Harahan bridge. J. H. Weatherford, city engr.

O., Lorain—Council plans traffic bridge over Black River in southern part of city. C. M. Osborne, city engr.

Wis., Prairie du Chien—Prairie du Chien & Wyalusing Bridge Co. rejected bids building 700-ft. rein.-con. toll bridge over Wisconsin River. About $50,000. J. H. Brantz, St. Paul and Manakota, Minn., engr. Noted Aug. 23.

Minn., Walker—Cass Co. Comrs. authorized $11,000 bond issue to build bridges.

Mo., Liberty—See "Streets and Roads."

Tex., Beaumont—Chamber of Commerce and City Council plan to build new toll bridge over Neches River. About $200,000. C. L. Scherer, city engr.

Okla., Atoka—Atoka Co. voted $30,000 bonds to build bridges and roads. Noted Aug. 9.

BIDS DESIRED

Mass., Lynn—(Official)—Until Sept. 11 by [illegible] Newhall supt. water and water works, City Hall, rein.-con. bridge and approaches on Ipswich River Sta.; advertised in this issue.

R. I., Woonsocket—(Official)—Until Sept. 17, Bd. Aldermen, building rein.-con. bridges, Contr. Nos. 1, 2 and 3, advertised in this issue.

N. Y., Albany—(Official)—Until Sept. 15 by W. W. Wotherspoon, supt. pub. wks., Capitol, constructing bascule bridge over Lock No. 1, Calvert St. Feeder, Barge Canal, Sec. 1, Contract No. 141; advertised in this issue.

N. Y., Scarsdale—(Official)—Until Sept. 10, by Bronx Pkway Comn. J. Downer, engr. secy., 2 rein.-con. arch bridges, Contr. No. 24; advertised in this issue.

Pa., Butler—(Official)—Until Sept. 20 by Pennsylvania Pub. Svc. Comn., Harrisburg, steel bridge with concrete abutments on Main St., advertised in this issue.

Pa., Du Bois—(Official)—Until Sept. 20, by City, for bridge over Sandy Lick Creek on Brady St. About $15,000. G. A. Flink, 301-3 Commonwealth Trust Bldg., Harrisburg, engr.

W. Va., Martinsburg—(Official)—Until Sept. 8 by Berkely Co. building 80 ft. rein.-con. bridge over Opequon Creek.

Ala., Carrolton—See "Streets and Roads."

O., Youngstown—(Official)—Until Sept. 12, by Dir. of Pub. Ser., improving east approach to East Federal St. bridge, building temporary trestle and paving viaduct, wood block. F. M. Lillie, city engr.

Ore., Jacksonville—(Official)—Until Sept. 15, by Jackson Co. Court, 126-ft. wooden bridge over Big Applegate River. G. A. Gardner, clk. Noted Aug. 16.

Cal., Santa Ana—Until Sept. 18, by Bd. Supervs. Orange Co., rein.-con. bridge on Hiatt St., ½ mi. south La Habra.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Boston—See "Streets and Roads."

★**N. Y., Albany**—(Official)—W. W. Wotherspoon, supt. pub. wks., let contract highway bridge over Lock 27, Clyde River, Barge Canal Contr. No. 148, Lyons, to Lathrop, Shea & Henwood, Elliott Sq., Buffalo, $68,770. Noted July 26.

N. Y., Albany—(Official)—W. W. Wotherspoon, supt. pub. wks., received low bids substructure, superstructure and approaches of bascule bridge over Tonawanda Creek, Tonawanda and North Tonawanda, Barge Canal Contr. No. 147, from Scherzer Rolling Lift Bridge Co., Monadnock Blk., Chicago, $232,986; Lupfer & Remick, Elliott Sq., $240,820; Lathrop, Shea & Henwood, Elliott Sq., $257,046, both of Buffalo. Noted July 26.

★**N. Y., Utica**—Bd. of Contr. let contract rein.-con. bridge over Reals Creek on Trenton Ave. to Wm. F. Cogley, Utica, $11,436.

★**Va., Covington**—Alleghany Co. let contract concrete bridges to Carpenter & Major, Clifton Forge, $33,000.

★**S. C., Camden**—(Official)—Kershaw Co. let contract building bridge over Wateree River to Austin Bros., 156 Greenwood Ave., Atlanta, Ga., $93,000. Noted Aug. 23.

★**Mich., Iron River**—City let contract concrete bridge over Iron River on Genesee St. to B. W. Hicks, Norway, and J. W. Hoose, Iron Mountain, about $25,000.

★**Kan., Kansas City**—City and Leeds Ry. let contract rein.-con. bridge over Blue River, 3 spans 320 ft. long and 80 ft. wide to Clinton Constr. Co., 310 Mass Bldg.

Mo., St. Louis—(Official)—City received low bids bridging [illegible] Broadway at Lafayette Park from Hayden & Hayward, $84,150; Hoffman Bros. Const. Co., $85,540; Wisconsin Concrete Co., $151 Delmar Blk., $[illegible]. Noted Aug. [illegible].

★**Ark., Arkansas City**—Dierks Co. let contract new draw bridge in Missouri Pacific Ry. Bridge over Arkansas River to Missouri Valley Bridge Co., Dierks, Ark., and Kaw River, Kansas City, Mo.

★**Ark., Augusta**—See "Streets and Roads."

★**Tex., Dallas**—See "Streets and Roads."

★**Wash., South Bend**—County Board let contract 4 concrete bridges. Latter design, to C. G. Huber, Central Bldg., Seattle, $[illegible]. Noted July 28.

★**Wash., Spokane**—(Official)—Board of County Comrs. let contract steel viaduct over Spokane River, Harvard Rd. to Dishman Hills, Co. [illegible] to Seattle-Portland, $11,488. Noted Aug. 16.

★**Ore., Canyon City**—City let contract reinforcing concrete bridges to Canon Bridge Co., Ry. Ex. Bldg., Portland, $13,000.

★**Ore., St. Helens**—Columbia Co. let contract for [illegible] bridges over Pittsburg Creek to L. O. Harvey, Portland, $16,000.

★**Cal., Los Angeles**—Bd. Pub. Wks. let contract rein.-con. bridge over Branch of Pacific Electric Ry. at West Park and Stanford Way to W. M. Anderson, 1400 Western Ave., $[illegible].

★**Cal., Rio Vista**—Bd. Supervs. Sacramento Co. let contract for [illegible] bridges over Cosumnes River, Elk Grove-Florin Rd. to Cosumnes River, Elk Grove-Florin Rd. to Calvine Rd., Sacramento and Cosumnes River, Calvine Rd. to Elk Grove-Florin Rd., Sacramento Co., to Pacific Bridge Co., Crocker Bldg., San Francisco, $[illegible]. Noted Aug. 16.

Bridges (Continued)

Cal., Sacramento — (Official) — State Highway Comn., 515 Forum Bldg., Sacramento, received bids, Aug. 20, Cottonwood Creek Bridge on State Highway in Shasta Co., Div. 2, Route 3, from Tieslau Bros., $28,850; Duncanson-Harrelson Co., Chronicle Bldg., $36,484; A. H. Vogt, Sharon Bldg., $37,930, all of San Francisco. Noted Apr. 19.

★**Cal., Stockton**—City Council let contract constructing 54-in. concrete culvert in bed of Miner Channel to Frank C. McIntyre, Stockton. About $28,480.

STRUCTURAL STEEL WORK

Proposed Work

Ga., Savannah—See "Bridges."
Tenn., Knoxville—See "Bridges."
Tenn., Memphis—See "Bridges."
O., Lorain—See "Bridges."
Minn., Walker—See "Bridges."
Tex., Beaumont—See "Bridges."
Okla., Atoka—See "Bridges."

BIDS DESIRED

Pa., Butler—See "Bridges."
Pa., Du Bois—See "Bridges."
O., Youngstown—See "Bridges."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., Albany—See "Bridges."
★**Ark., Arkansas City**—See "Bridges."
★**Wash., Spokane**—See "Bridges."

REINFORCED CONCRETE

Proposed Work

Tenn., Jackson—See "Industrial Works."
Wis., Prairie Du Chien—See "Bridges."
Ore., Baker—See "Miscellaneous."
Cal., Los Angeles—See "Industrial Works."
Cal., San Diego—See "Sewers."

BIDS DESIRED

R. I., Woonsocket—See "Bridges."
Mass., Lynn—See "Bridges."
N. Y., Scarsdale—See "Bridges."
N. J., Newton—See "Miscellaneous."
W. Va., Martinsburg—See "Bridges."
O., Dayton—See "Miscellaneous."
Cal., Santa Ana—See "Bridges."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Utica**—See "Bridges."
★**Va., Covington**—See "Bridges."
★**Ill., Galesburg**—See "Industrial Works."
★**Mich., Iron River**—See "Bridges."
★**Kan., Kansas City**—See "Bridges."
★**Mo., Kansas City**—See "Bridges."
★**Mo., Monett**—See "Water-Works."
Mo., St. Louis—See "Bridges."
★**Ark., Augusta**—See "Streets and Roads."
★**Wash., South Bend**—See "Bridges."
★**Ore., St. Helens**—See "Bridges."
★**Cal., Los Angeles**—See "Bridges."
★**Cal., Los Angeles**—See "Streets and Roads."
Cal., Sacramento—See "Bridges."
★**Cal., Stockton**—See "Bridges."

STREETS AND ROADS

Proposed Work

Massachusetts—State Highway Comn., 14 State House, Boston, rejected bids paving Lattimer Highway, New Ash. Noted Aug. 30.

Massachusetts — (Official) — State Highway Comn., Boston, received no bids building asphalt state highway in Kingston. Noted Aug. 23.

N. J., Camden—City Council plans widening Stiles St. and paving alleys in rear of Belleview and Kaighn Aves., concrete. C. E. Farnham, city engr.

N. J., Garwood—City Council plans macadamizing curbing and guttering Centre St. and [illegible] Hazel Ave. between Locust and Myrtle Aves. Address A. Conklin, mayor.

N. J., Jersey City—City Council plans paving West side pl., granite block pavement. C. Van Kuren, city engr.

N. J., Morristown—Oak Hills Co. & Mountain Lakes Assn., Morris Co., plans to improve several streets and roads, including drainage. About $[illegible]

N. J., Newark—Bd. Pub. Wks. plans to improve Paterson-Hamburg Turnpike. About $186,500. M. R. Sherrard, city engr.

N. J., Paterson—Bd. Pub. Wks. plans to pave East Main St., concrete, Grand St., bituminous concrete. A. V. Livingston, clk. H. J. Hardjes, city engr.

N. J., Union—Town plans to pave 18th and 19th Sts., and Lincoln Pl. T. F. Bowe, city engr.

Va., Front Royal—Bd. Supervs. of Warren Co. sold $10,000 bonds to build public road from Browntown to Bentonville, South River Dist.

W. Va., Stealey Heights—(Clarksburg, P. O.)—Town election Sept. 11, to vote on $20,500 bond issue to improve and pave Davis St. and Duncan Ave. L. D. Mitchell, mayor.

N. C., Bridgetown—Council passed ordinance to issue $12,000 bonds to pave portions Bridge St., brick. I. Lewis, clk.

N. C., Clinton—Sampson Co. Comrs. plan $75,000 bond issue to improve roads.

N. C., Yanceyville—Caswell Co. Comrs. plan to issue $85,000 bonds to build roads; one to connect Yanceyville and Danville, Va.

Fla., Bradentown—Manattee Co. plans to vote on $115,000 bond issue for road and bridge work.

Fla., Miami—Dade Co. voted $140,000 bond issue for roads and bridges. Hobart Crabtree, engr. Noted Aug. 16.

Fla., West Palm Beach—Palm Beach Co. Comrs. soon lets contract following improvements in Lake Worth: Paving 2 mi. road, $75,000; building 2100-ft. seawall, $25,000; building bridges, $25,000. Address H. C. Fugate and Z. F. Potter.

Miss., Tunica—Tunica Co. Comrs. rejected bids building 41-mi. gravel road. New bids. Noted July 26.

Tenn., Memphis—City Comn. voted to recurb and repave portion Union Ave., asphalt, opening 3rd St., building new street between Union and Beale Aves.; also to recurb and repave portion Front St., $15,189. J. H. Weatherford, city engr.

Ky., Henderson—City soon receives bids paving, curbing and guttering Adams and Alvasia Sts. W. Hopkins, city engr.

O., Batavia—Clermont Co. sold $21,350 bonds to improve roads. C. S. Earles, aud. Noted Aug. 16.

O., Bryan—Williams Co. to sell $117,500 bonds, Sept. 8, to improve roads. G. C. Beucler, co. aud.

O., Cleveland—Cuyahoga Co. plans widening portion Harvard Rd. W. A. Stinchcomb, co. engr.

O., Cleveland—City plans paving and improving portions West 32nd, Altoona, Ashland, Peach, West 44th, West 68th, Hodgson, Dover, Almira, Cobb, West 95th, East 100th Sargent, Atticue, Pennant and Maxim Sts. E. Hoffman, city engr.

O., Columbus—(Official)—Citizens voted $5,000,000 bonds to improve streets. H. Maetzel, city engr. Noted Aug. 9.

O., Tiffin—Seneca Co. will sell $23,000 bonds to improve roads. J. E. Hershberger, co. aud.

Ind., Crown Point—Lake Co. to sell $48,000 bonds Sept. 10 to improve roads. M. J. Brown, co. treas.

Ill., Lockport—Citizens voted to macadamize, curb and gutter portion 9th St.; also macadamize State St. About $14,000.

Ill., Springfield—Sangmon Co. plans to hard surface 41-mi. roads. About $1,000,000. E. H. White, co. highway supt.

Wis., Janesville—Janesville Co. plans to build road from here to Beloit, 1½-mi. with state aid. C. Moore, co. highway comr.

Wis., Park Falls—City voted $30,000 bond issue to pave streets.

Wis., Stevens Point—City plans $17,000 bond issue to improve streets.

Wis., West Allis—Bd. Pub. Wks. soon receives bids grading 50th, 52nd, 53rd and 54th Aves. E. G. Orbert, city engr.

Ia., Davenport—City Council plans $25,000 bond issue for paving and grading streets. A. R. Boudinot, city engr.

Ia., Iowa City—Johnson Co. plans paving roads between Iowa City and Coralville, brick, with Federal aid.

Kan., Great Bend—City plans to pave Williams Ave., asphalt concrete. S. A. Newcombe, city engr.

Kan., Wichita—City plans to pave portions 12th, 10th and Green Sts., also Bort, Woodrow Central and Chautauqua Aves. H. D. Lester, clk.

Neb., Columbus—City sold $30,000 bonds to pave streets.

Neb., Lincoln—Lancaster Co. Comrs. plan paving Lincoln-Omaha Rd. from Lincoln to Waverly.

N. D., Hillsboro—Traill Co. soon receives bids building 7-mi. roads with state aid. G. D. Olson, co. aud.

Mont., Butte—City Council plans repaving portion Main and Wyoming Sts. and several streets in down-town districts. J. J. Armstrong, city engr.

Mont., Great Falls—City plans to pave and build sidewalks and curbs on 1st Ave., 6th and 7th Sts. L. B. Evenson, city engr.

Mo., Liberty—Clay Co. voted $12,500 bond issue to complete driveway on Siloam Springs Pagoda and construct bridge. Address Co. Comrs.

Mo., Springfield — Greene Co. election Sept. 12 to vote on $10,000 bond issue to improve roads in Galloway Special Rd. Dist. L. Luster, atty. Noted Aug. 30.

Ark., Ashdown—Little River Co. plans 11-mi. sand-clay road in to Walnut Bayou. About $26,000.

Ark., Ft. Smith—City soon lets contract repaving portions North 2nd St. M. H. Reed, city engr.

Ark., Little Rock—Prairie Co. Comrs. rejected bids to construct 8-mi. concrete and 14-mi. gravel road. New bids. About $235,000. Noted July 19.

Tex., Boston—Bowle Co. Comrs. appropriated $15,000 to build 10-mi. highway from Texarkana to Red River.

Tex., Corsicana—Comrs. Court of Navarro Co. plans election, Sept. 20, to vote on $80,000 bond issue for good roads in Rice Precinct.

Tex., Wolfe City—Hunt Co., Rd. Dist. No. 2, voted $100,000 bonds to build roads. Noted July 26.

Okla., Atoka—See "Bridges."

Okla., Tulsa—Tulsa Co. plans $100,000 bond issue to build and improve roads. L. Cline, co. clk.

Colo., Denver—Boulder and Adams Co. Comrs. plan paving 5-mi. of Federal Blvd., north of city limits. About $40,000.

Colo., Sterling—Comrs. Logan Co. plan to build 25 mi. road extending from Peetz to state line on north. Address W. E. Henning, Peetz.

New Mexico—State Highway Comn., Santa Fe, soon receives bids to build Gallup-Farmington, Alamogordo-Newman, Hondo-Meseafero and Amarillo-Roswell Rds.

N. M., Albuquerque—Bernalillo Co. plans to build La Tijera Rd. with Federal and State aid. About $24,000.

N. M., Las Vegas—City plans paving portion 6th St., and installing storm sewerage system. T. H. Benjamin, city clk.

Idaho, Lewiston—City Council rejected bids grading, curbing and sidewalks in Dist. No. 11. New bids. Noted Aug. 30.

Idaho, Nez Perce—City Council created Improv. Dists. Nos. 4, 5 and 6 and plans to build concrete sidewalks within city limits. About $15,000.

Idaho, Twin Falls—Twin Falls Co. plans election in Buhl Highway Dist. soon to vote on $250,000 bond issue to build roads.

Utah—State Highway Dept., Ogden, soon lets contract building 45-mi. highway from Castlegate to Duchesne and 9.6-mi. from Ogden to Hooper, with State and Federal aid. About $77,400 and $31,300 respectively.

Utah, Salt Lake City—City Council plans paving and improving portions Plum St. S. Q. Cannon, city engr.

Washington — State Highway Comn., Olympia rejected bids clearing, grading, draining and surfacing section No. 21 State Rd. New bids. Noted Aug. 2.

Wash., Seattle—Bd. Pub. Wks. had plans prepared grading 13th Ave. About $17,784. A. H. Dimock, city engr.

Oregon—State Bd. Control, Salem, sold $400,000 bonds for highway work. Noted July 26.

Ore., Astoria—Council passed ordinance paving and redecking portions Franklin, 26th, 32nd and 23rd Sts. J. McLear, city engr.

Ore., Coquille—(Official)—Coos Co. Court rejected only bid for macadamizing road between Empire and South Inlet bridge New bids. L. W. Oddy, co. clk. Noted Aug. 16.

Ore., Enterprise—City Council plans paving streets in business district. About $15,000

Ore., Eugene—Lane Co. will build North Fork Highway between here and Florence. H. W. Libby, co. engr.

Cal., Fresno—City to sell $10,000 bonds Sept. 17 to improve Inyo St. B. E. Kronkite, city engr.

Cal., Glendale—City plans to improve portions Bway., macadam and asphalt. About $80,000.

Streets and Roads (Continued)

BIDS DESIRED

Mass., Quincy—Until Sept. 10, by Bd. Pub. Wks., paving Smith St., granite block on concrete base. P. F. O'Brien, city engr.

Rhode Island—(Official)—Until Sept. 12, by State Bd. Pub. Rds., Providence, rebuilding section East Main Rd., Portsmouth Twp.; advertised in this issue.

N. Y., Albany—(Official)—Until Sept. 20, by E. Duffey, state highway comr., 55 Lancaster St., building and improving highways in various counties; advertised in this issue.

N. J., Cape May Court House—Until Oct. 16, by Cape May Co. Bd. Freeholders, for building gravel road in Lower Twp., involving 59,000 sq.yd. surfacing and 180,000 cu. yd. embankment. F. W. Fowkes, Sea Isle City, clk. L. M. Rice, Wildwood, co. engr.

N. J., Trenton—Until Sept. 10, by Mercer Co. Twp. Comn., improving Hopewell-Woodsville Rd. D. M. Voorhee, clk.

Pa., Pittsburgh—(Official)—Until Sept. 14, by Allegheny Co. Comrs. grading and paving Round Hill Rd., Forward Twp., 12,500 ft. and Scotia Howard Rd., Jefferson Twp., 9250 ft. J. P. Moore, controller.

W. Va., Charleston — (Official) — Until Sept. 21, by P. T. Board, city mgr., paving and curbing streets and alleys involving 17,000 ft. curb and gutter, and 27,000 sq.yd. paving. M. J. McChesney, city engr. Noted Aug. 16.

W. Va., Parkersburg — (Official) — Until Sept. 14, by City, paving, steel grading and curbing portions Ann, Charles, George, Spring 29th and 22nd Sts., sand gravel, 3-in. concrete base. Depot St., concrete. About $46,000. W. M. Hall, city engr. Noted Aug. 30.

Ala., Carrolton—Until Sept. 25, by Pickens Co., grading and paving 50 mi. road, sand, clay, gravel, pipe and bridges. G. E. Hauser, 1st Natl. Bank Bldg., Columbus, Miss., engr.

Ala., Eutaw—Until Sept. 24, by Greene Co. Comrs., grading and building road from here to Five Points. About $25,000.

Ala., Livingston—Until Sept. 24, by Sumter Co. Comrs., grading and draining 4.7-mi. state trunk road No. 7 between Livingston and Gainesville

Ky., Louisa—Until Sept. 10, by M. A. Hay, clk. Lawrence Co., improving inter-county road from here to Sandy Hook, including 13,122-cu.yd. excava., 264-ft. 12-24-in. pipe, 4324-lb. reinforcing steel.

O., Springfield—Until Sept. 12, by City improving and paving portions Mulberry, Western Grand, Kenton, Mountain, Stanton and Southern Sts. M. J. Bahin, city engr.

Ind., Indianapolis—Until Sept. 12, by Bd. Pub. Wks., paving and grading Julian Ave., wooden blocks, asphalt, bituminous concrete or brick on 6-in. gravel concrete base. B. J. T. Jeup, city engr.

Ind., Indianapolis—(Official)—Until Sept. 17, by Bd. Pub. Wks., grading and paving portions California, Washington and Court Sts., wood block, asphalt, bituminous concrete or brick laid on 6-in. foundation, 24 ft. wide. J. A. Rink, pres.

Ill., Morrison—(Official)—Until Sept 18, by V. N. Taggett, supt. highways, Whiteside Co., 16,046 sq.yd. gravel or gravel and macadam roadway in Albany. Noted Aug. 23.

Ia., Cherokee—Until Sept. 10, by Cherokee Co. surfacing and graveling 5½-mi. Marcus-Southern Rd. W. O. Dailey, co. aud.

Minn., Mankato — (Official) — Until Sept 10, by N. Moe, engr., Blue Earth Co., gravelling Mapleton Rd., 4½ mi.

Neb., Lincoln—Until Oct. 1, by Lancaster Co., paving 5.6-mi. concrete, brick or asphalt road in Dist. No. 19. About $150,000 A. E. Sutherland, clk.

Mo., Kansas City—(Official)—Until Sept. 12, by Bd. Park Comrs. paving portions Paseo Rd. T. C. Harrington, sec.

Idaho, Pocatello—Until Sept. 16, by A. R. Dawson, city clk., resurfacing pavements, L.I.D. No. 22, 5406 sq.yd. J. H. Giles, city engr.

Cal., Santa Ana—Until Sept. 18, by Orange Co. Bd. Supervs., grading 1000 lin.ft. and excavating 4600 cu.yd. on Brea-Olinda Rd. Noted July 19.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Massachusetts**—(Official)—State Highway Comm., Boston, let contract building Egremont West Boylston Rd. to R. H. Newell Co., Uxbridge, $44,817. Noted Aug. 2.

★**Mass., Boston**—City let contract paving Dorchester Ave., granite block, to B. E. Grant, 27 School St., $27,835. Noted Aug. 30.

★**Mass., Boston**—City let contract paving portion Commonwealth Ave., 3-in. sheet asphalt, including building bridge, to M. A. Sullivan, 35 Melville Ave., Dorchester, $119,975. Noted Aug. 2.

Connecticut—C. J. Bennett, state highway comr., Hartford, received low bids following road improvements: Hamden and Cheshire Twps., Hamden-Cheshire Rd., 28,906 ft. concrete, Sperry Eng. Co., 82 Church St., New Haven, $127,529; L. Suzio Constr. Co., State and Brooke Sts., Meriden, $130,168; L. C. Fay Constr. Co., 281 Main St., Springfield, Mass., $151,277; Stratford Twp., 7300 lin.ft. Hassam or rein.-conc., Barnum Ave., Connecticut Hassam Paving Co., 902 Chapel St., New Haven, $40,602; Waterford Twp., 3500 lin.ft. grading, Niantic Rd., F. Arrigoni & Bro., 605 Main St., Middletown, $9383, L. C. Fay Constr. Co., 281 Main St., Springfield, Mass., $10,732. Noted Aug. 16.

★**Conn., New Haven**—City let contract paving Wallace St. to Franklin Constr. Co., 52 Vanderbilt Ave., New York City, $17,000; Crown, Gearge and Oak Sts., to Union Paving Co., Schenectady, N. Y., $20,734.

N. Y., New York—M. M. Marks, boro pres., received low bids, (a) regulating and repaving portions 31st St., (b) portions East 79th St., sheet asphalt on concrete foundation, from Cleveland Trinidad Paving Co., Flushing, L. I., (a) $20,255, (b) $11,582, Sicilian Asphalt Paving Co., 41 Park Row, (a) $20,336, (b) $11,725, Asphalt Constr. Co., 2197 Madison Ave., (a) $20,342, (b) $11,051.

★**N. Y., Niagara Falls**—City let contract repaving Chilton Ave., asphaltic concrete, to McKinney-McGuire Constr. Co., Gluck Bldg., $11,615.

★**N. Y., Syracuse**—City let contract surfacing portions West Gennessee St., to Warner-Quinlan Co., 224 Union Bldg., $14,752, portions South West St., vitr. block, to F. J. Baker, 319 University Blk., $28,169.

★**N. Y., Yonkers**—City let contract grading and regulating portion Hart Ave. to J. J. Cotalis, 811 Clover St., $19,500.

★**N. J., Elizabeth**—(Official)—Bd. Freeholders, Union Co., let contract paving various streets and avenues to Wolden Contr. Co., Keeling, $28,191. Noted Aug. 16.

★**N. J., Newark**—(Official)—Bd. Freeholders Essex Co. let contract improving Little Falls Rd. to Francisco Bros, Ridge Rd., Little Falls, $38,614. Noted Aug. 2.

N. J., New Brunswick—Middlesex Co. Bd. Freeholders received low bids reconstructing Rahway Ave. Roosevelt, from Meagher & Smith, 102 Church St., $74,964, Utility Constr. Co., 46 Paterson St., $80,080; T. H. Riddle, $76,855. Noted Aug. 16.

★**Pennsylvania** — State Highway Dept., Harrisburg, let contract paving State Rd. No. 583, Shickshinny, to O'Brien Bros., Avoca, $51,179.

★**Pa., Chester**—City let contract paving 12,620 sq.yd. to Union Paving Co., 30th and Locust Sts., Phila., and 3420 sq.yd. Belgian block alley paving to E. H. Oliver, 603 East 9th St.

★**Pa., Erie**—City let contract paving Hess Ave., asphalt, to J. J. Doyle, 457 West 3rd St., $11,858.

★**Del., Wilmington**—New Castle Co. Levy Court let contract Sect. 6 of Lincoln Highway from Newark to Maryland State line and section from Wilmington to Marshallton to Standard Bitulithic Co., 50 Church St., New York City, $91,000 and $137,000 respectively. Noted Aug. 2.

★**Md., Baltimore**—State Highway Dept. let contract building Telegraph Rd. Extension to F. C. Gorss, Equitable Bldg. Noted July 12.

★**Va., Chatham**—Pittsylvania Co. Supervs. let contract building 18-mi. highway from Danville to Henry Co. line to J. J. Hotten-hill, Virginia. About $44,000.

★**Va., Newport News**—City let contract paving 4-mi. streets to Atlantic Bituminous Co. Virginia Ry. & Power Bldg., Richmond. About $85,000.

★**W. Va., Ceredo**—City let contract street paving to Hunt & Forbes, Ashland, about $33,000.

★**Ga., Montezuma**—City let contract paving 11,000 sq.yd. streets with topeka to Alabama Paving Co., Asset Trust Bldg. About $75,000. Noted Aug. 2.

★**Fla., West Palm Beach**—Palm Beach Co. Comrs. let contract building 7-mi. Okeechobee River Rd. to F. L. McKenzie. 2-section to E. Johnson.

★**Ala., Anniston**—Calhoun Co. Comrs. let contract widening highway from Anniston to Camp McClellan, 6-mi., to Gilbert Bros., Gadsden.

★**Ala., Headland**—Comrs. Henry Co., Abbeville, let contract 6 mi. road between here and Browns Cross Rds. to Crawley Bros., Headland.

★**Ky., Cadiz**—Trigg Co. let contract 5.3 mi. macadam road to C. McQuary, Hopkinsville, $20,000. Noted Aug. 9.

★**O., Ashland**—City let contract paving, grading, curbing and building sewers Virginia Ave. to D. Phillips, Ashland, $18,946. Noted Aug. 23.

★**O., Cincinnati**—(Official)—Hamilton Co. Comrs let contract improving Plainsville Rd. to R. E. Cash, 4234 Greenlee Ave., St. Bernard, $13,429; portion Livingston Rd. to O. E. Robinson, 4649 Hamilton Ave., $2012. Noted Aug. 2.

★**O., Cleveland**—City let contract resurfacing and improving 2 sections Clifton Rd. to Cleveland Trinidad Paving Co., 3409 Trumball St. About $55,325.

★**O., Columbus**—City let contract paving portions Orchard Lane to E. D. Sullivan & Son, Interurban Terminal Bldg. About $27,419.

★**O., Dayton**—City let contract paving Leo St. to Finke Engr. Co., Dayton, $2.70 per sq.yd. Noted Aug. 2.

★**Ind., Indianapolis**—Pub. Wks. Dept. let contract building and paving, asphalt, 4 units of highway to Ft. Benjamin Harrison to Union Asphalt Constr. Co., 308 Amer. Central Life Bldg.; Indiana Asphalt Paving Co., 25th St. and Lake Erie & Western Ry. tracks; Amer. Constr. Co., 108 North Delaware St.; Columbia Constr. Co., Indianapolis. Noted July 5.

★**Mich., Escanaba**—Town let contract paving portions Stephenson Ave., $15,970 sq.yd. bitulithic, to General Contr. Co., 1254 Plymouth Bldg., Minneapolis, $1.69 per sq.yd. Noted Aug. 30.

★**Ill., Danville**—Highway Comn. Carroll Twp. let contract paving road in Indianola, concrete and gravel, to C. E. Taggert, Martinsville. About $26,044. Noted Aug. 16.

★**Ill., Joliet**—Will Co. Comrs. let contract building hard surface road in Peotone Twp. to J. C. Poll Constr. Co., Danville, $18,000.

★**Ill., Rock Island**—City let contract paving 6th Ave. to McCarthy Improv. Co., 2nd and Percy St., $21,623. Noted Aug. 23.

Wis., Beloit—City received low bids paving White and Henry Aves. from Geo. Welch, Beloit; White Constr. Co., 1600 Ry. Ex. Bldg., Milwaukee; Williston Constr. Co., 343 South Dearborn St., Chicago. Noted July 5.

Wis., Sheboygan—City received low bid paving streets as follows: No. 289, J. Braun Constr. Co., Sheboygan, $21,084; No. 290, Pestien & Naumann, 821 Penn Ave., $23,922.

★**Wis., Washburn**—City let contract paving West Bayfield St. asphaltic concrete to C. T. Wood Co., 2628 Hennepin Ave., South Minneapolis, $2.15 per sq.yd.

★**Ia., Des Moines**—Des Moines Co. Comrs. let contract 16-mi. roads, gravel surface, 16-ft. wide, 4 mi. this fall to C. Maddy, Des Moines, $20,000.

★**Ia., Des Moines**—City let contract paving Beaver Ave. to I. Hoffman Co. and New York Ave., $18,000. Noted Aug. 30.

★**Minn., Bemidji**—[illegible] Co. let contract grading and paving Jefferson Highway to Lee's Bros. About $11,000.

★**Kan., Hoisington**—City let contract paving streets to Stamey-Marker Const. Co., Hutchinson, $45,000.

★**Kan., Wichita**—City let contract paving portions Fairmont Ave. involving 4,000 sq.yd. grading, 7,000 sq.yd. base, contract price [illegible] concrete base to Clifton Sweet Co., $1.30 per sq.yd. Noted Aug. 9.

★**Wyo., Sheridan**—(Official)—City let contract paving to Dan Yo[illegible] Warren Construction Co., Journal Bldg., Portland, Ore., $[illegible]. Noted Aug. 16.

★**Mo., Saxon**—City let contract laying streets to E. Williams Co., Quincy, Ill., $[illegible].

★**Ark., Augusta**—Woodruff Co. Circuit Court Road Improvement Dist. No. 1 let contract building road, portion Augusta Pike to Patterson to line, involving [illegible] grading, 115,000 cu.yd.; 10-ft. and 12-ft. reinforced concrete bridges, 1,000 lin.ft. 18-in. and 24-in. reinforced concrete pipe culverts, and [illegible] concrete bridges, concrete and brick walls to R. McAdam, Augusta. About $[illegible].

Streets and Roads (Continued)

★**Tex., Dallas**—County Court Dallas Co. let contract grading Coppel Rd. to Cullom, to Bavousett & Griffin 308 Federal Bldg., bridging road to U. S. Eng. & Constr. Co., Dallas; graveling Sageville Rd. to S. A. and A. B. Murdock, Dallas; paving Miller's Ferry Rd., concrete, to Vibrolithic Constr. Co., Terminal Bldg. Total cost, $150,000.

★**Okla., Clinton**—City let contract paving to Western Paving Co., 578-579 Terminal Bldg., Oklahoma. About $11,388.

★**Okla., Oklahoma**—South Oklahoma Townsite Co. let contract paving and curbing to Western Paving Co., 519 Terminal Bldg. About $18,000.

★**Utah, Logan**—City let contract paving Main St. to Olaf Nelson. About $53,000. Noted July 12.

★**Utah, Salt Lake City**—(Official)—City let contract paving and grading several streets to Strange-Maguire Paving Co., Utah Savings & Trust Bldg., $22,632. Noted Aug. 16.

★**Wash., Seattle**—Bd. Pub. Wks. let contract grading Eddy St. to Sloane Bros., Seattle, $16,707. Noted Aug. 23.

Wash., Seattle—Bd. Pub. Wks. received low bid paving Elliot Ave. from Superior Constr. Co., 1642 Lane St., $11,057.

California—State Highway Comn., Sacramento, received low bids grading and paving roads between Sacramento River and Lamoine, Shasto Co., 13.3-mi. concrete, from J. F. Fitzpatrick, Ochsner Bldg., Sacramento, $153,075. F. Roland, San Francisco, $160,145; R. Rothwell, Los Angeles, $139,695. Noted Aug. 9.

★**Cal., Calistoga**—City let contact paving several streets, concrete, to Cushing Constr. Co., 420 Macdonald Ave., Richmond. About $17,580.

Cal., Long Beach—Bd. Pub. Wks. received low bids 135,000 sq.ft. 4-in. concrete base and asphaltic pavement in 5th St. from Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., Los Angeles, $18,465.

Cal., Los Angeles—Bd. Pub. Wks. received low bid improving Franklin Ave., including 111,862 sq.ft. bituminithic paving, 4 storm drains, 9 rein.-con. culverts and cement curbs, from Bryant & Austin, 1656 Compton Ave. About $32,700.

★**Cal., Los Angeles**—City let contract improvements in Rd. Dist. No. 103, involving 6595 cu.yd. excava., 14,241 lin.ft. shaping roadbed, 3200 cu.yd. concrete pavement, 64 cu.yd. concrete culverts, and 11,420 ft. expansion joints to J. S. Miller, 1249 9th St., Santa Monica. About $16,350. Noted Aug. 30.

★**Cal., Los Angeles**—City let contract paving portion Sherman Dr., involving 12,041 ft. regrading, 12,041 ft. recultivating, tamping and oiling, 975 ft. cement curb, [illegible] ft. concrete gutter and storm drain and for reinforced bridge to W. M. Ledbetter, Pacific Electric Bldg., $13,957.

★**Cal., San Francisco**—(Official)—City let contract paving portion Silver Ave., asphalt, 6-in. concrete foundation, 2-in. asphalt surface; also Caselli and Falcon Aves., to T. H. Hutton, Call Bldg., $19,217.

RAILWAYS—STEAM & ELECTRIC

Proposed Work

New York—Niagara Plate Connecting R.R. Corp., recently incorporated with $50,000 capital stock, plans to build line from point near Hamburg to connection with South Buffalo R.R., Buffalo, about 4 mi. Address Daniel J. Benefick, Marine Bank Bldg., Buffalo.

Florida—Tatum Bros., Miami, plan railway from Miami along Miami Canal to Lake connecting to connect with other Atlantic Coast Lines or Seaboard Air Line, about 25 mi.

Alabama—Birmingham Civic Assn., Birmingham, plans 70 mi. railway from Birmingham to Warrior River. T. L. Cannon, 1612 Ave. I, chn.

Kentucky—Black Mt. R.R. Co., recently incorporated with $250,000 capital stock, plans railway from Evarts to Parsons [illegible] and Upper Lick Branch Harlan Co. Coal and Coke Co., Harlan. Address M. C. Spratt, Fidelity Bldg., Buffalo.

Ohio—Canton & Ohio River Ry. of Pittsburgh recently incorporated with 100,000 shares capital stock, plans to build line from Canton, O., to Wheeling, W. Va., via Toronto, O.

Texas—Southern Pacific Ry. plans line from Beeville to Needville, via Damon Mound, Columbia, Brazoria and Freeport, about 80 mi. W. Bush, Pacific Bldg., San Francisco, ch. engr.

Oklahoma—Oklahoma, New Mexico & Pacific Ry. plans line from Ringling to Waurika, about 37 mi. J. Ringling, 221 Institute Pl., Chicago, pres.

California—Bd. Works, San Francisco, authorized laying of tracks for Municipal Ry. from Van Ness and Market Sts. to Kearny St. About $300,000. T. A. Cashin, San Francisco, supt. ry.

California—City Comn., Pasadena, created board to appraise and secure options for right-of-way for proposed municipal interurban railway from Pasadena to Los Angeles, about 12 mi. A. C. Hansen, city engr.

EXCAVATION AND DREDGING

Proposed Work

Tenn., Trenton—Drainage—Gibson and Weakley Cos. formed new district to drain land along south fork Obion River. Address Co. Clk., Trenton.

Ill., Quincy—Drainage—Fabius River D. D. had plans prepared by Perkins Eng. Co., 38 South Dearborn St., Chicago, for improving system, Adams Co. About $73,000.

Minn., Detroit—(Official)—Ditch—J. A. Narum, aud. Becker Co. received no bids building county Ditch No. 19, involving 65,138 cu.yd. excava. Noted Aug. 16.

Minn., Ivanhoe—Ditches—Lincoln Co. will sell, Sept. 10, $50,000 bonds to build Ditch No. 30 and $65,000 for Ditch No. 35. K. A. Hansen, co. aud.

Cal., Brawley—Imperial Laguna Water Co. retained C. G. Frisbie to survey route of Canal to bring water from Laguna dam, Colorado River into Imperial Valley, about 40 mi.

Cal., Newport Beach—Dredging—City plans election to vote on $50,000 bonds for dredging harbor.

Ont., Port Arthur—Dredging—Dominion Government appropriated $130,000 dredging at new Saskatchewan Co-operative and Richardson elevators.

BIDS DESIRED

N. Y., New York—Dredging—Until Sept. 12, by R. A. C. Smith, comr. piers, docks and ferries, dredging slips, foot 55th, 56th and 57th Sts.

Ind., Angola—Ditch—Until Sept. 15, by Steuben Co. Comrs. building Oliver Shaeffer et. al. ditch, Fremont and Jamestown Twps. L. E. Smith, supt.

Ill., Paxton—Ditch—Until Sept. 21, by Ford Co. to construct ditch of Sub Dist. No. 2. Union D.D. 13,625 ft. long, and 41,164 ft. wide.

Ill., Urbana—(Official)—Drainage—Until Oct. 2, by Champaign Co., dredging Spoon River D.D. R. F. Fisher, Champaign, engr.

Ia., Carrollton—Drainage—Until Sept. 10, by Greene Co. supervs., D.D. No. 121, involving 76,670 ft. tile, 240 ft. sewer pipe.

Minn., Moorhead—(Official)—Ditch—Until Sept. 18, by A. O. Houglum, aud. Clay Co., building Co. Ditch No. 41, main ditch involves 212,832 cu.yd. excava., depth 7.2 ft. Cost $49,924 with steel bridges, $41,774 with wooden bridges.

Minn., Walker—Ditch—Until Sept. 10, by Comrs. Cass Co., for Judicial Ditch No. 6 requiring 70,234 cu.yd. excava. on main ditch, 18,724 cu.yd. on laterals, culvert bridges, etc. C. D. Bacon, co. aud.

Cal., Modesto—Irrigation—Until Sept. 21, by Modesto Irrigation Dist., enlarging main canal between Indian Hill fill and flume E; also lining 3 divisions of main canal between Salter and Rariden fill. Noted June 28.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mich., Battle Creek**—Dredging—A. Briggs drain comr., let contract dredging Potter Lake drain to Minor & Russell, Coldwater.

★**Ia., Des Moines**—Drainage—Joint D. D. No. 1, Polk and Story Cos., let contract system to Nels S. Helland & Sons, Huxley, $[illegible]. Noted Aug. 9.

★**Ia., Emmetsburg**—Drainage—D. D. No. 98, Palo Alto Co., let contracts system involving 315,000 cu.yd. excava. as follows: A. Eikwald, labor, $30,300; Cement Products Co., Spencer, tile, $44,748; Schultz, Bieck, Clarion, open work, $25,219. Noted Aug. 9.

★**Minn., Faribault**—Ditch—Rice Co. let contract Co. Ditch No. 12 to Rood Constr. Co., Grand Rapids, Wis., about $23,274. Noted Aug. 2.

★**Colo., Lamar**—Drainage—Wiley D. D., Frovers Co., let contract 9¼ mi. open ditch involving 43½ mi. 6- to 18-in. tile drain to Saylor Constr. Co., Lamar. Noted Aug. 16.

★**Cal., Lasson**—Irrigation—Baxter Creek Irrigation Dist. let contract canal and dam to Shattuck-Edinger Co., Underwood Bldg., San Francisco.

INDUSTRIAL WORKS

Proposed Work

N. Y., New York—C. Hensle, 3879 10th Ave., having plans prepared by More & Lardsiedel, archts., 148th St. and 3rd Ave., 7-story, 30 x 200-ft. garage, Riverside Dr. and 134th St. About $150,000.

N. Y., S. I., New Brighton—Tanner Cross Co., Inc., 25 Beaver St., New York City, plans 5-story, 112 x 114 ft., cereal mill and warehouse. About $125,000. A. E. Baxter Eng. Co., engrs., Elliot Bldg., Buffalo, soon receive bids.

N. J., Harrison—H. R. Worthington Co., Harrison, had plans prepared for 2 factory additions. About $200,000.

N. J., Newark—Willys-Overland Co., Newark, plans 4-story, 80 x 240 ft. rein.-con. service station, Plane and Hackett Sts. George Hooper, 35 Halsey St., archt.

Pa., Pittsburgh—Natl. Supply Co., Union Bank Bldg., having plans prepared for warehouse, Preble Ave., Adams and Delaware Sts., N. S. About $50,000.

Va., Richmond—Kingan & Co. having plans prepared for rein.-con. abattoir on Hermitage Rd. About $80,000.

Ga., Atlanta—American Agricultural Chemical Co., 625 Empire Bldg., plans 70 x 600-ft. fertilizer factory, Peatree Creek. About $50,000. E. F. Daniels, genl. mgr.

Ga., Columbus—Columbus Power Co., 2nd Ave., controlled by Stone & Webster Eng. Co., 147 Milk St., Boston, plans additional unit to power plant. About $200,000. J. S. Bleecker, genl. mgr.

Ala., Mobile—Alabama Dry Docks & Shipbuilding Co. purchased tract at Royal and Canal Sts. and had plans prepared for a shipbuilding plant.

Tenn., Jackson—Illinois Central R.R. plans to improve and enlarge its yards and shops. About $180,000. Also build concrete office and storage building. About $65,000. A. S. Baldwin, Chicago, ch. engr.

Ky., Bowling Green—Persons & Scoville having plans prepared by C. Shopbell & Co., archts., 3-story, 75 x 140-ft. warehouse.

Ky., Louisville—Kentucky Pub. Elevator Co., 14th and Gallagher Sts., plans to rebuild portion of its factory recently destroyed by fire. About $75,000.

O., Akron—Sanitary Milk Co. having plans prepared by Practical Eng. Co., engrs., 535 Akron Savings and Loan Bldg., 2-story, 60 x 110-ft. milk depot. About $85,000.

O., Canton—Pennsylvania R.R. plans large new shops and roundhouse east of Canton. A. C. Shand, Broad St., Sta., Phila., ch. engr.

O., Cleveland—American Can Co., East 40th St., recently acquired site on Payne Ave., and plans to spend about $2,000,000 to build plant.

O., Cleveland—J. R. Glover, Hippodrome Bldg., having plans prepared garage and automobile storage plant, East 46th St. About $100,000.

O., Cleveland—Grable Mfg. Co., 6565 Bway., plans 66 x 104-ft. brick steel and rein.-con. factory. Christian Schwarzenberg & Gaede, archts., 1900 Euclid Ave., soon receive bids.

O., Cleveland—Natl. Mortgage Co., 603 Rockefeller Bldg., Cleveland, soon lets contract 7-story, 100 x 300-ft. rein.-con. and structural steel warehouse, Greene and Ladd Sts. About $300,000.

O., Cincinnati—See "Buildings."

O., Cincinnati—C. Schiear Motor Car Co. plans 3-story auto warehouse, 9th and Sycamore Sts. About $125,000.

O., Dayton—Citizens Motor Car Co., Cincinnati, plans 2-story, 75 x 170-ft. garage and salesroom. About $50,000 to $100,000. J. W. Tarbill, 7th and Main Sts., pres. A. Pretzinger and E. Musselman, 1126 Reibold Bldg., archts.

Industrial Work (Continued)

O., Dayton—Cooper Medicine Co., 309 East 1st St., had plans prepared 5-story, 50 x 198-ft. factory. About $175,000. Prezinger & Musselman, 1155 Riebold Bldg., archts.

O., East Cleveland—(Cleveland P. O.)—Cleveland Motor Plow Co., Euclid Ave. and Lomb St., Cleveland, having plans prepared for plant here. About $300,000.

O., Lakewood—Lake Erie Refining Co. had plans prepared by S. H. Weis, archt., 1032 Schofield Bldg., 2-story, market house, terra cotta and granite, Clifton and West 117th Sts. About $125,000.

Ind., Hartford City—Ft. Wayne Corrugated Paper Co., Murray and Barr St., Ft. Wayne, plans 1-story power house. About $75,000. Prather Eng. Co., 662 Rockefeller Bldg., Cleveland, engrs.

Ill., Chicago—Patterson-Sargent Co., St. Clair Ave., Cleveland, plans 5-story brick warehouse and factory, 20th and Lumber Sts.

Ill., Chicago—H. Piper Co., 1619 North Wells St., soon lets contract 1-story, 43 x 105-ft. bakery. About $60,000. W. Ahlschlager, 111 West Washington St., archt.

Ill., East St. Louis—American Manufacturing Co. of Massachusetts, has purchased site and plans bagging plant here. About $500,000.

Wis., Milwaukee — Heil Co., 26th and Montana Ave., having plans prepared by Klug & Smith, engrs., Mack Blk., 1 story, 130 x 200-ft. brick and steel addition. About $100,000. J. P. Heil, vice pres. and genl. mgr.

Ia., Muscatine—Ziegle Canning & Preserving Co. plans to rebuild plant recently destroyed by fire with loss of $60,000.

Ia., Sioux City—Lessenich, Estate soon lets contract 3-story garage. About $50,000. Beuttler & Arnold, 609 Security Bldg., archts.

Ia., Waterloo—Repass Auto Co. having plans prepared by C. P. Shockley, archt., 719 Black Bldg., for rein.-con. and brick garage. About $100,000.

Ia., Waterloo—Waterloo Engine Co. plans 150 x 600-ft. foundry. About $200,000.

Minn., Hibbing—See "Miscellaneous"

Minn., Minneapolis—Marfield Grain Co., 23rd and Marshall Sts., plans to build grain elevator. About $77,000.

Minn., West Duluth—(Duluth P. O.)—Duluth Iron Wks. Co. having plans prepared by Edward & Standuhar, Glencoe Bldg., Duluth, punch shop, machine shop, blacksmith shop and office.

S. D., Sioux Falls—Sioux Falls Coffee & Spice Co., 10th St., had plans prepared 4-story, 40 x 100-ft. plant, 426 East 12th St. A. Gloege, pres.

Wyo., Caspar—Standard Oil Co. plans large addition to its refinery here.

Tex., Texarkana—Texas & Pacific Ry plans to build brick roundhouse. About $50,000. E. F. Mitchell, Dallas, ch engr

Tex., Tyler—Woldat Grocery Co., Tyler, plans large peanut manufacturing plant. About $250,000.

Okla., Bartlesville — Parsons Wholesale Grocery Co. plans 2-story building. About $50,000.

Idaho, Pocatello—Idaho Portland Cement Co., recently incorporated with $2,500,000 capital, plans cement manufacturing plant, capacity 1,000 bbl per day. W. W. McCarthy and J. T. Young, Pocatello, interested

Wash., Seattle—The Sunset Motor Co., 12th Ave. and East Pike St., had plans prepared 4-story, 60 x 112-ft. brick and concrete garage and salesroom. About $70,000. B. Johnson, 3838 Evanston Ave., archt., soon receives bids.

Wash., Spokane — Willys-Overland Co. having plans prepared brick garage and salesroom. About $150,000. V. W. Voorhees, Inc., Eitel Bldg., Seattle, archt.

Ore., Portland—Dock Comr. having plans prepared by J. M. Witherspoon, engr., 3650 Pine Grove St., Chicago, 1,000,000-bu. grain elevator.

Cal., Huntington Park—City Fire Wks. 30th St. and Central Ave., Los Angeles, having plans prepared 8-story, brick building, by Paul C. Pape, archt. Consolidated Realty Bldg., Los Angeles.

Cal., Los Angeles—Wholesale Terminal Co. plans 6-story, cold-storage plant, 7th and Central Sts., to be leased to Terminal Refrigerating Co.

Cal., Los Angeles—Wilson & Co., 1000 Lynn St., plans 4-story, rein.-con. cooling plant. About $54,000.

Ont., Toronto—Canadian Genl. Electric Co., 212 King St., W., plans new warehouse. About $100,000.

Ont., Toronto—Thor Iron Wks., Bathhurst St., having plans prepared for rein.-con. and brick factory. About $75,000.

BIDS DESIRED

N. Y., Ogdensburg—(Official)Until Sept. 12, by State Hospital Comn., Capitol, Albany, construction work for power plant, Lawrence State Hospital; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—General Electric Co., 84 State St., let contract 4-story, 80 x 34-ft. brick and rein.-con. factory, Porter Ave., N., to W. Bailey Co., 88 Broad St. About $210,000. Noted May 31.

★**Mass., New Bedford**—Paipont Co., Howland St., let contract building 4-story, 100 x 200 ft. warehouse to J. W. Bishop Co., 417 Butler Ex. Bldg., Providence, $350,000.

★**Conn., Fairfield**—Bullard Machine Tool Co., 585 Broad St., Bridgeport, let contract 5 buildings; main building, 180 x 700-ft. brick and steel, to W. R. Phillips, Newfield Bldg., Bridgeport, $1,000,000.

★**Pa., New Castle**—American Sheet & Tin Plate Co. let contract 2-story, 56 x 70-ft addition to Cuthbert Bros., Bessemer Bldg., Pittsburgh, $50,000.

N. Y., New Hampton—Comr. Correction Municipal Bldg., New York City, received low bid building power house and connecting tunnels at New York City reformatory from Frymier & Hanna, 25 West 45th St., New York City, $53,968. Noted Aug. 9.

★**Ill., Galesburg**—McCullon Bros. let contract 4-story, 57 x 150-ft., rein.-con. candy factory to Monmouth Constr. Co., 222 Bank of Galesburg Bldg., $100,000

★**Ill., Moline**—Williams & White, 3rd Ave. and 18th St., let contract forging plant to P. H. Lorenz, 7th St. and 19th Ave., $200,000.

★**Que., Shawinigan Falls** — Canadian Aloxite Co. let contract new factory to Church Ross & Co., 40 Hospital St., Montreal, $50,000.

BUILDINGS

Proposed Work

N. H., Nashua—High School—City soon lets contract, 3-story, 150 x 165-ft. About $200,000. G. H. Alley, 69 Concord St., chn. bldg. com. T. M. James, 185 Devonshire St., archt.

Mass., Middleton—Hospital—Essex Co. Comrs., Court House, Salem, had plans prepared by J. H. Bickford, archt., 110 State St., Boston, 5 2-story buildings.

Mass., New Bedford—Hospital—City having plans prepared by J. S. McIntyre, archt., Clifford Bldg.

Conn., New Haven—Station—New York New Haven & Hartford R.R. plans, 4-story, 90 x 300 ft. E. Caget, New Haven, ch. engr. Cass Gilbert, 244 Madison Ave., New York City, archt.

N. Y., Albany—Office—L. F. Pilcher state archt., Capitol Bldg., prepared plans for addition west of Capitol.

N. Y., Binghamton—School—Bd. Educ. had plans prepared by T. I Lacey & Son, archts., 1110 Press Bldg., for addition. About $50,000. M. R. F. McCarthy

N. Y., Kingston—Theater—S. Bernstein, and associates, 173 Pearl St., plan, 1- and 2-story. About $60,000. G. W. Botz, 61 John St., archt.

N. Y., New York—Hospital—Dept. Health Center and Walker Sts. had plans prepared by W. A. Austin, archt., 16 West 44th St., 3-story, Schiefflin Pl., Second Ave. and 32nd St. (Bronx Borough) to be largest contagious hospital in world

N. Y., Pomfret—Tuberculosis Hospital—Nestor Memorial Hospital having plans prepared by J. F. Warner, archt., Granite Bldg., Buffalo, 2- and 3-story, steel and concrete. About $175,000. R. H. Phillips, 804 Morgan Bldg., Buffalo, engr.

N. J., Rahway—Temple—Odd Fellows Club had plans prepared by S. Wolkomir, archt., Wineoff Bldg., 3-story, 50 x 150-ft. About $50,000.

N. J., Red Bank—School—Bd. Educ. having plans prepared by E. A. Arend, archt., Kimmenau Bldg., Asbury Park, 2-story, 75 x 150 ft., and extension 50 x 75 ft., adjoining high school. About $150,000. H. Street, pres.

Pa., Abington—High School—Bd. Educ. plans 3-story addition. About $50,000. L. Foster, secy. Hancock & Hokanson, Bailey Bldg., Phila., archts.

Pa., Ashley—High School—Bd. Educ. having plans prepared by A. Reilly, archt., Bennett Bldg., Wilkes-Barre, 2-story, 78 x 118-ft. About $100,000.

Pa., Bloomsburg—Bank and Office—Columbia Co. Trust Co. had plans prepared by V. T. Ritter, archt., First Natl. Bank Bldg., Huntington, W. Va. 4-story, 24 x 120-ft., brick and concrete.

Pa., Cambria—School—Immaculate Conception Church having plans prepared. About $60,000.

Pa., Johnstown—Junior High School—Bd. Educ. plans. About $300,000. C. H. Myer, secy. J. E. Adams, Lincoln Bldg., and G. Wild, 734 Main St., archts.

Pa., Johnstown—Hospital—Bd. Corporators of Lee Memorial Hospital having plans prepared by Henry M. Rogers, archt., Trust Bldg., Johnstown, 5-story, at 320 Main St.

Pa., Phila.—Club House and Auditorium Phila. Musical Assn. plans, 3-story, 60 x 132 ft. About $100,000. A. Hirschburg, 259 North 6th St., pres. F. E. Hahn and Max Hirschberg, 1112 Chestnut St., archts.

Pa., Phila.—Bank—Olney Bank, 5th St. and Tabor Rd., plans 1-story. About $50,000. T. Tansey, pres.

Pa., Phila.—Hotel—Bonwit Teller Co. plans improving. About $400,000. S. Rosenbaum, 13th and Chestnut Sts., mgr. LeRoy Rothschild, Juniper and Filbert Sts., archts.

Pa., Phila.—House of Correction—City soon lets contract(2- and 3-story. About $89,000. C. Oelschlager, 1613 Walnut St., archt.

Pa., Phila.—Hospital—Babies Hospital plans. About $50,000. C. A. Fife, 1018 Chestnut St., pres. Duhring, Okie & Zeigler, 1220 Chestnut St., archts.

Pa., Pittsburgh—Y. M. C. A. plans new building, 7th Ave. and Bigelow Blvd. About $1,000,000. R. W. Harbison, pres.

Del., Laurel—High School—Bd. Educ. plans 2-story. About $55,000. W. E. Hance, 204 West 24th St., Wilmington, archt.

Md., Baltimore—School—Bd. Educ. plans school, principals residence and gymnasium. About $50,000. F. Cookman Leach, archt., 323 North Charles St., soon receives bids.

Va., Norfolk—Office and Loft—Tazwell St. Realty Co., Tazwell St., had plans prepared by R. E. Mitchell, archt., Greenwood Bldg., 6-story, 130 x 144-ft. concrete. About $300,000.

W. Va., Huntington—Bank—United Savings Bank & Trust Co. having plans prepared by Bankers' Eng. Co., archts., 11 East 19th St., New York City, 10-story, rein.-con. About $250,000

Fla., Tallahassee—Dormitory and Educational—Florida State College for Women having plans prepared. About $50,000

Ala., Birmingham — Seminary — Lyon-Compton Seminary secured site at Edgewood and plans new building to be known as Birmingham Seminary. About $50,000

La., Thibodaux—Hotel—Lafourche Realty Co., recently organized, plans. About $60,000. N. T. Bourg, pres.

Tenn., Jackson—Office and Industrial Works"

Ky., Frankfort—Hotel—Capitol Hotel Co. had plans prepared, 4-story. About $75,000. C. C. and E. A. Weber, Citizens Bank Bldg., Cincinnati, archts.

O., Cincinnati—Commercial—Lorenz Brick Co. $30-Warner St. had plans prepared by G. W. Lee, archt., Times-Star Bldg., 18-story commercial building and garage, 11th and St. Clair Sts. About $500,000

O., Cincinnati—Telephone—Cincinnati & Suburban Telephone Co. will issue $1,716,000 additional stock. Part of proceeds will be used for new buildings

O., Cincinnati—Freight Terminal—Baltimore & Ohio R. R. Co. plans freight terminal here. H. Lee, Baltimore, engr.

O., Cleveland—Church—Hungarian Evangelical Lutheran Church has contract for 2-story, 50 x 100 ft. brick building. About $100,000. Kalina Lumber Co., Broadway, Ltd., owner. E. Hyde, 1360 Euclid Ave., archt.

O., Cleveland Heights—Warehouse—Hower-Manufacturing Co. has had plans prepared for 4-story, 50 x 100 ft. addition. About $100,000. E. Green, The Guardian Bldg., Cleveland, archt.

Buildings (Continued)

O., Dayton—Bank—Gem City Building & Loan Assn. having plans prepared by Schenck & Williams, archts., 591 Arcade Bldg., 1-story, 58 x 60-ft. About $100,000. C. L. Bard, 8 North Main St., mgr.

O., Lakewood—Store—J. H. Greenberg, 1291 East Blvd., secured site and plans, 4-story concrete, on Detroit St. About $50,000.

O., Rawson—Grade and High School—Bd. Educ. soon lets contract. About $60,000. McLaughlin & Hulsken, Savings Bldg., Lima, archts.

Ind., Ft. Wayne—Bank and Office—Citizens Trust Co., Berry and Clinton Sts., plans to remodel, 4-story. C. R. Weatherhogg, Hamilton Natl. Bank Bldg., archt.

Ind., Indianapolis—Hotel—Lincoln Hotel Co. having plans prepared by A. E. Metzger and Rubush & Hunter, archts., Amer. Central Life Bldg.

Ind., Lafayette—Hospital—Home Hospital Assn. had plans prepared by Schmidt, Garden & Martin, archts., 104 South Michigan Ave., Chicago, 4-story. About $90,000.

Mich., Detroit—High School—Bd. Educ. had plans prepared by Malcomson & Higginbotham, archts., 404 Moffat Bldg., for Cass Technical High School, 1, 2 and 3 units. About $125,000. C. Gadd, secy.

Mich., Detroit—Jail—Wayne Co. had plans prepared by Smith, Hinchman & Grylls, archts., 710 Washington Arcade, on Baubien St. between McComb and Clinton Sts. About $1,500,000.

Ill., Chicago—Church and Chapel—Grace Episcopal Congregation, 2001 Prairie Ave., soon lets contract rebuilding. About $200,000. B. G. Goodhue, 2 West 47th St., New York City, archt.

Ill., Chicago — Church — St. Hyacinths Congregation plans, 1-story, 130 x 210 ft. About $200,000. Rev. John Zdechlik, 3636 Wolfram St., pastor. Worthmann & Steinbach, archts., 155 North Clark St., will soon receive bids.

Ill., Chicago — Hotel — Kercher Hotel & Dodge Co. receives bids about Oct. 1, 12-story, 80 x 171-ft. About $1,150,000. W. Ahlschlager, 1740-44 Conway Bldg., archt.

Ill., Chicago—Theater, Office and Store—Jones, Linck & Schaefer, 112 South State St., had plans prepared by C. W. & G. L. Rapp, archts., 69 Washington St., brick and steel, 47th and Marshfield Sts. About $1,500,000.

Ill., Riverside—School—F. I. Bennett, 105 W. Adams St., Chicago, soon lets contract dining hall, 3 dormitories, etc. C. W. Kallal, City Hall, archt.

Ill., Rockford—Hotel—Nelson Hotel Co. having plans prepared by Miller, Fullenwider & Dowling, archts., 6 North Michigan Ave., Chicago, 7-story, 50 x 150-ft. addition. About $500,000. J. A. Oberg, Main and Chestnut Sts., mgr.

Wis., Kenosha—Store and Office—V. C. Wolff having plans prepared by R. A. Messmer & Bro., archts., Pabst Theater Bldg., Milwaukee. 6-story, 80 x 100-ft. About $150,000.

Wis., Park Falls—City Hall—Council having plans prepared by A. Messmer & Bro., archts., Pabst Theater Bldg., Milwaukee. About $85,000.

Wis., Sagole (Kaukauna P. O.)—Church—Franciscan Congregation plans 2-story, 72 x 147 ft. About $80,000. F. Peters, pastor. Foeller & Schober, 123 North Washington St., Green Bay, archts.

Wis., Wauwatosa—Children's Cottage Museum Tuberculosis Hospital soon lets contract. 2-story, 50 x 100-ft. About $60,000. D. H. Davies, Administration Bldg., Milwaukee. H. A. Messmer & Bro., Majestic Bldg., Milwaukee, archts.

Wis., Wauwatosa — Psychopathic Ward—Milwaukee Co. soon lets contract 3 buildings. About $85,000. H. A. Messmer & Bro., Majestic Bldg., Milwaukee, archts.

Ia., Des Moines—Church—Grace Methodist Congregation having plans prepared. 2-story, 124 x 148 ft. About $175,000. E. E. Higgs, pastor. J. T. Voss & L. Bldg., archt.

Ia., Dubuque—Hotel—Jule Stein-Lorimer Hotel Co., 700 Locust St., having plans prepared by L. Stevens & Co., archts., 410 South Michigan Ave., Chicago, 8-story, 60 x 140-ft., Jolling Ave. and Bluff St. About $210,000. D. H. McCarthy, mgr.

Ia., Spencer—School—Bd. Educ. plans building 2-story, recently destroyed by fire. About $70,000. F. A. Cook, secy. J. D. Chubb, 109 North Dearborn St., Chicago, archt.

Minn., Minneapolis—Bible School, Auditorium, Store and Office—North Western Missionary and Training School having plans prepared by Burner & Macomber, archts., 945 McKnight Bldg., 12-story, 132 x 250-ft. About $1,000,000.

Minn., Minneapolis—Hotel and Arcade—McMichael Investment Co. plans, 12-story, 50 x 150 ft. About $200,000. H. E. Williams, 600 Wilmac Bldg., pres.

Minn., Minneapolis—School—Bd. Educ. plans, 2-story. About $65,000. R. V. L. Haxby, Court House, archt.

Minn., Lakefield—High School—Bd. Educ., Ind. School Dist. No. 3 plans, 2-story, 120 x 120 ft. About $75,000. K. T. Snyder, 1103 Plymouth Bldg., Minneapolis, archt.

Minn., St. Cloud—Hotel and Store—Riverview Hotel Co. had plans prepared by A. J. Mille, archt., 714 Plymouth Bldg., Minneapolis, 4-story. W. A. Bach, pres.

Minn., St. Paul—Store and Office—Cushing & Driscoll, 291 Endicott Bldg., had plans prepared by R. T. Newberry, archt., 108 South Lasalle St., Chicago, brick, 6th and Peter Sts., about $1,000,000.

Minn., Virginia—High and Manual Training School—Bd. Educ. plans to build. About $375,000. C. E. Nystrom, archt., Seelwood Bldg., soon receives bids.

Kan., Garden City,—High School—Bd. Educ. plans, 3-story, 58 x 110-ft., brick. About $50,000. E. J. Dumond, clk. W. E. Hulse & Co., 1st Natl. Bank Bldg., Hutchinson, archts.

Kan., Topeka — Home — Knights and Ladies of Security plan to build. About $50,000.

Kan., Topeka — Hotel — North American Hotel Co., Omaha, Neb., plans 10-story, 9th St. and Kansas Ave. About $500,000.

Neb., Omaha—Hotel and Office—Home Builders, Brandies Theater Bldg., plans, 7-story, 110 x 120 ft., 18th and Dodge Sts. About $300,000. J. T. Allen, 224 Brandies Theater Bldg., archt.

S. D., Eden—Church—Roman Congregation plans, 1- and 2-story, 50 x 140 ft. and 32 x 34 ft., church and parish house. About $60,000. Anton Dohman, 1st Natl. Bank Bldg., archt.

Wyo., Casper—Lodge—B. P. O. E. plans. About $150,000.

Mont., Great Falls—School—Bd. Educ. plans, 2-story, 60 x 140 ft. About $165,000. Bird & Van Toylingen, archts.

Mo., St. Joseph—Maternity Hospital — City having plans prepared by Trunk & Gordon, archts., Donnell Court Bldg., on 15th and Edmond Sts. About $70,000.

Ark., Little Rock—Office—U. S. Auto Co., 20th and Main Sts., had plans prepared, 123 x 150-ft. . About $100,000. M. S. McCord, mgr.

Tex., Bryan—School—City School Bd. plans election to vote $100,000 bond issue for school.

Okla., Miami—Hospital—Baptist Hospital—Baptist Hospital Assn. plans. About $70,000. Address F. M. McConnell, supt. of Missions, Oklahoma City.

Colo., Canon City—Church—First Presbyterian Congregation plans. About $50,000. J. W. Domdley, pastor.

Utah, Beaver—Schools—Beaver Co. election soon to vote on $125,000 bond issue to build schools. Ashworth & Nelson, Provo City, archts., preparing plans.

Cal., Azusa—School—City had plans prepared by Allison & Allison, archts., Merchants Natl. Bank Bldg., Los Angeles. About $50,000.

Cal., Oakland—Exchange—Pacific States Telephone & Telegraph Co. plans, 6-story, Class "A" building.

Cal., Oakland—Hospital—Alameda Co. voted $100,000 bonds to build hospital.

Cal., San Francisco—Hotel—Ramona Hotel, Ellis St., having plans prepared by Smith & Stewart, archts., Monadnock Bldg., 3-story, rein.-con. addition. About $50,000.

Cal., San Francisco — Hotel — Stewart Hotel Co. having plans prepared for addition, by Cunningham & Politeo, archts., 1st Natl. Bank Bldg. About $150,000.

Cal., San Francisco—Office—White Investment Co., Newhall Bldg., plans, brick and concrete, Battery near California St. About $80,000.

Cal., San Francisco — Theater — Max Blumenfeld plans, 100 x 101 ft., rein.-con., Kearnby St. and Bway., to seat 2000 people. Weeks & Day, Mutual Savings Bank Bldg., archts.

Que., Quebec—School—Bd. Educ. c/o G. E. Tanguay, archt., 20 D'Aiguillon St., soon lets contract, brick and stone. About $136,000.

BIDS DESIRED

Pa., Chester—High School—Until Sept. 21, by Bd. Educ., Hoskins Bldg., 5th and Welch Sts., 5-story, 115 x 240-ft. About $400,000. C. S. Adams, 1509 Arch St., archt. Noted Aug. 2.

Pa., Uniontown—Until Sept. 4, by Y. M. C. A., 4-story, 76 x 90 ft. H. W. Altman, 1st Natl. Bank Bldg., archt. Noted May 10.

O., Cleveland—Hotel—Until Oct. 1, by Estates Improv. Co., c/o G. T. Tensbush, Union Bldg., 12-story, 65 x 150-ft., Euclid Ave. and East 59th St. About $450,000. H. T. Jeffrey, 1836 Euclid Ave., archt. Noted Aug. 23.

O., Cleveland Heights—(Warrensville P. O.)—School—Until Sept. 15, by F. Warner, archt., 718 Hippodrome Bldg., Cleveland. About $180,000. L. K. Bryan, 3867 Parkdale Ave., secy. bd. educ.

Ind., Crawfordsville—High School—Until Sept. 10, by Bd. Educ., 12-room addition. L. N. Hines, supt. R. F. Daggert, 926 Lemke Annex, Indianapolis, archt. Noted May 31.

Ind., Indianapolis—Until Sept. 30, by Antioch Baptist Congregation. N. E. Joseph, 136 South Catherwood St., pastor. W. O. Marck, Lombard Bldg., archt.

Ia., Letts—School—Until Sept. 13, by Ecklan Fugard & Knapp, archts., McKinnie Bldg., Moline, Ill., 2-story, 70 x 120-ft. About $50,000. Noted July 26.

Minn., Virginia — High School — Until Sept. 12, by Bd. Educ. About $400,000. C. E. Nystrom, Sellworth Bldg., Duluth, archt.

Kan., Concordia—High and Grade Schools—Until Sept. 11 (change of date), by Bd. Educ., brick; about $55,000. W. E. Hulse & Co., 1st Natl. Bank Bldg., Hutchinson, archts. Noted June 28.

Tex., El Paso—Cathedral—Until Sept. 10, by El Paso Consistory, Scottish Rite Masons. About $200,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Boston—Hospital—City received low bid ward building from Crowley & Hickey, 1140 Columbus Ave., Roxbury, $80,444. Noted Aug. 16.

★**Mass., Cambridge**—Store and Office—Olympia Theatre Co., 3 Tremont Row, Boston, let contract, to J. M. & C. J. Buckley Co., 164 Federal St., Boston. About $400,000. Noted May 17.

★**Pa., Phila.**—Freight House—Phila. & Reading R.R. let contract 1-story, brick and steel addition to freight house No. 4, Noble St., to A. L. Carhart, Hale Bldg., $50,000.

★**Del., Newark**—Women's Dormitory—Delaware College let contract, 4-story, 30 x 48-ft. to J. H. Wells, 112 South 16th St., Phila., $75,000. Noted Aug. 23.

★**Wash., D. C.** — (Official) — Parochial School—Holy Trinity Congregation let contract, 2-story, concrete and brick, to Boyle-Robertson Co., 2602 Wisconsin Ave., $140,000. Noted July 19.

★**La., New Orleans**—Hotel—H. C. Buckley let contract, brick, West End Rd., to J. E. Petty, Godchaux Bldg., $200,000

★**O., East Cleveland**—(Cleveland P. O.)—School—Bd. Educ. let contract addition to Chambers School to Minnick-Gibbons Constr. Co., 5309 Prospect Ave., Cleveland. About $50,000.

★**Wis., Madison**—Y. M. C. A. let contract 5-story building West Washington and South Fairchild Sts., to J. Findorff, Madison, $210,000.

★**Minn., Fairmont**—(Official)—School—Bd. Educ., East Chain Twp., let contract, to Pick & Lehman, 710 Cherokee Ave., St. Paul, $22,357. Noted Aug. 16.

★**Minn., St. Paul**—Hotel—C. J. Minor, Dayton and Virginia Aves., let contract, 11-story, brick, terra cotta and granite, to G. J. Grant Co., 902 N. Y. Life Bldg., $1,000,000

Buildings (Continued)

★**S. D., Spearfish** — Gymnasium — State Normal School let contract, 2-story, 100 x 1000-ft., to Anderson-Taylor Constr. Co., 533 Lumber Exchange, $65,000. Noted July 5.

★**Wash., Seattle**—School—Bd. Educ. let contract Whitworth School to Scherer & Carlson, University Campus. About $75,000.

★**Cal., Oxnard Bank**—First Natl. Bank let contract, 65 x 100-ft., to Los Angeles Planing Mill Co., 1812 Industrial St., Los Angeles, $55,000.

FEDERAL GOVERNMENT WORK

Proposed Work

Kan., Ft. Riley — Bridge — Constructing Quartermaster rejected bids opened Mar. 27 for replacing bridge over Republican River; same were in excess of appropriation.

BIDS DESIRED

Pa., Phila. — Dredging — Until Sept. 10, by Bureau of Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., dredging at Navy Yard.

Del., Wilmington — Jetty Work — Until Sept. 22, by U. S. Engr. Office, Old Federal Bldg., repairs to jetties at mouth Mantua Creek, N. J.

Va., Norfolk—Tank and Tower—Until Sept. 10 (change of date), by Bureau of Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., furnishing and installing 150,000 gal. elevated steel tank and tower. Noted Aug. 23.

Fla., Key West—Metal Work, etc.—Until Oct. 30, by Lighthouse Inspector; advertised in this issue.

Fla., Tampa—Dolphins, Etc.—Until Sept. 17, by J. A. Wetmore, superv. archt., treas. dept., Wash., for 2 additional dolphins and furnishing and installing complete 32 spring buffers at wharf of Quarantine Sta.

Miss., Vicksburg—Levee—Until Sept. 12, by Third Mississippi River Dist., Box 404, constructing about 1,000,000 cu.yd.; advertised in this issue.

Miss., Vicksburg—Levee—Until Sept. 12, by Third Mississippi River Dist., Box 404, constructing about 303,000 cu.yd.; advertised in this issue.

Tenn., Memphis—Machinery—Until Sept. 26, by Mississippi River Comn., 1st and 2nd Dists., Custom House; advertised in this issue.

Mich., Detroit—Lumber—Until Sept. 10, by Light House Inspector, P.O. Bldg., furnishing about 35,000 B. M. miscellaneous framing lumber for Sand Hills Light Sta.

Minn., St. Peter—Post Office—Until Oct. 4, by J. A. Wetmore, superv. archt., treas. dept., Wash.

N. M., Farmington—Bridge—Until Sept. 24, by Cato Sells, comr. Indian Affairs, Wash.

Cal., San Francisco—Wharf—Until Oct. 2, by J. A. Wetmore, superv. archt., treas. dept., Wash., rebuilding west wing at wharf at quarantine station, Angel Island.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Chatham** — Coastal Air Station — Bureau of Yards and Docks, Navy Dept., Wash., let contract to Coleman Bros., Chelsea, cost plus percentage.

Mass., Hingham — Magazine Storehouse — Bureau of Yards and Docks, Navy Dept., Wash., received low bids 2 magazine storehouses, (a) net price work complete, (b) net price work complete excepting columns, etc., as follows: Kennedy & Patterson Constr. Co., 7 Water St., Boston, (a) $106,200, (b) $104,200; T. H. Wiese, 1301 City Natl. Bank, Omaha, (a) $126,000; Howard Bros., 112 Dorchester Ave., Boston, (a) $128,875, (b) $124,875. Noted Aug. 16.

Conn., New London — Storehouse — Bureau of Yards and Docks, Navy Dept., Wash., received low bids (a) work complete, (b) alternate design, from P. J. Carlin Constr. Co., 1123 Byrd, New York City, (a) $129,800; Industrial Eng. Co., 30 Church St., New York City, (a) $141,585, (b) $130,100. Noted Aug. 9.

N. Y., New York — Electric Lighting System — Bureau of Yards and Docks, Navy Dept., Wash., received low bids from L. K. Comstock, 30 Church St., $15,450; T. F. Jackson, 99 John St., $12,600; Hatzel & Buehler, Inc., 373 4th Ave., $12,710. Noted Aug. 9.

Pa., Franklin—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., received only bid from W. H. Fissell, 1328 Bway., New York City, $98,600 limestone and $104,600 sandstone. Noted July 26.

Pa., Harrisburg—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., received low bids extension to post office from A. Wildman, 2206 North 3rd St., $58,200; Gohl & Bruaw, 310 Strawberry St., $59,198; J. L. Menough & Son, York, $69,875.

Pa., Phila.—Heating System—Bureau of Yards and Docks, Navy Dept., Wash., received low bids heating system for machine and electrical shop, Navy Yard, from Mathis Bros. Co., Archer Ave. and Canal St., Chicago, $33,892; H. L. Crook Co., Inc., 28 Light St., Baltimore, $40,467; G. R. Bullen, 600 North Howard St., Baltimore, $41,888. Noted Aug. 16.

★**Pa., Phila.**—Heating Apparatus—Bureau of Yards and Docks, Navy Dept., Wash., let contract humidifying and heating apparatus in aircraft factory at Navy Yard to Carrier Eng. Co., Land Title Bldg., $74,500.

Wash., D. C.—Magazine Storehouses—Bureau of Yards and Docks, Navy Dept., received low bids (a) 2 storehouses at Lake Denmark, N. J., (b) 1 at Ft. Mifflin, Pa., (c) 1 at St. Julians Creek, Va., (1) work complete, (2) work complete, except columns, etc., as follows: Columbus Circle Co., 51 East 42nd St., (a-1) $106,000, (a-2) $96,000; Hamilton-Chambers Co., Inc., 29 Bway., (a-1) $116,260, (a-2) $110,814; Snare & Triest, Woolworth Bldg., (a-1) $121,400, (a-2) $122,300, all of New York City; J. H. Miller, Eutaw and Franklin Sts., Baltimore, (b-1) $64,700, (b-2) $62,700; J. H. Wiese, 1301 City Natl. Bank, Omaha, (b-1) $64,750; W. W. Austine & Co., Transportation Bldg., Phila., (b-1) $98,545, (b-2) $92,925; Boyle-Robertson Constr. Co., Inc., Evans Bldg., (c-1) $66,205, (c-2) $66,125 W. H. Fissell & Co., 1328 Bway., New York City, (c-1) $106,200, (c-2) $102,200. Noted Aug. 9.

Wash., D. C.—Storehouse—Bureau of Yards and Docks, Navy Dept., received low bids storehouse at Hampton Roads, (a) work complete, (b) addition, (c) addition, as follows: Cramp & Co., Denckla Bldg., Phila., (a) $480,000, (b) $24,500, (c) $24,300; Jas. Stewart & Co., Inc., 30 Church St., New York City, (a) $487,200, (b) $25,000, (c) $28,000; Industrial Eng. Co., 30 Church St., New York City, (a) $510,000, (b) $27,000, (c) $28,000. Noted Aug. 23.

S. C., Charleston—Shell House, etc.—Bureau of Yards and Docks, Navy Dept., Wash., received low bids 1 shell house, 1 torpedo storehouse and 1 magazine building at Navy Yard and Naval Ammunition Depot, (work complete), from Simons-Mayrant Co., Charleston, $121,480; Boyle-Robertson Constr. Co., Inc., Evans Bldg., Wash., $134,051; W. T. Hadlow & Co., 831 Park St., Jacksonville, $147,000. Noted Aug. 9.

★**Fla., Key West**—Residence and Pump House—Fish Comn., Dept. Commerce, let contract residence and pump house at Marine Biological Sta. to Fuquay & Gheen, Daytona, $19,000. Noted Aug. 2.

★**Tenn., Memphis**—Aviation School—Constructing Officer, Aviation Sect., Army Signal Corps, let contract to Thomas, Harmon & Co., St. Louis, about $750,000.

★**Ky., Lancaster** — Post Office — J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to A. W. Lane, 19 South La Salle St., Chicago, $28,496. Noted Aug. 23.

★**O., Dayton**—Aviation School—Constructing Officer, Aviation Sect., Army Signal Corps let contract to Frank Hill Smith, 1035 Rebold St., about $400,000.

★**O., Lowell**—Sand and Gravel—W. P. Stokey, Major, Corps of Engrs., Cincinnati, let contract furnishing sand and gravel for repairing Dam No. 3, Muskingum River, to Marietta Sand Co., St. Clair Bldg., Marietta.

★**Tex., Ft. Worth**—Aviation School—Constructing Officer, Aviation Sect., Army Signal Corps, let contract to J. W. Thompson Co., Equitable Bank Bldg., St. Louis, cost between $1,500,000 and $2,000,000.

★**Tex., Waco**—Aviation School—Constructing Officer, Aviation Sect., Army Signal Corps, let contract to F. H. Jones, Dallas, about $750,000.

★**Tex., Wichita Falls**—Aviation School—Constructing Officer, Aviation Sect., Army Signal Corps, let contract to Gilbreth Co., Wainright Bldg., St. Louis, about $500,000.

Colo., Glenwood Springs—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., received low bids, Aug. 29, as follows: Chas. Weitz Sons, 713 Mulberry St., Des Moines, $76,000; J. H. Wiese, 1301 City Natl. Bank Bldg., Omaha, $79,790; A. Goodhan, Wahoo, Neb., $92,000. Noted Aug. 30.

MISCELLANEOUS

Proposed Work

Memorial Court—New York, N. Y.—Columbia University had plans prepared by McKim, Mead & White, archts., 101 Park Ave., for Van Anaringe Memorial Court in South Field. About $17,000.

Elimination Grade Crossings—Syracuse, N. Y.—New York Central R.R. preparing plans. G. W. Kittredge, New York, ch. engr.

Elimination of Grade Crossings—Madison, N. J.—Boro. Council authorized bond issue of $159,000.

Pier—Marcus Hook, Pa.—Texas Co. plans to extend pier at plant here 186 ft.

Creek Improvements—Norfolk, Va.—Finance Com. appropriated $20,000 improvements to Smith's Creek and $10,000 for Newton's Creek. W. H. Taylor, Jr., city engr.

Garbage Disposal Plant—Ashland, W. Va.—City plans election to vote on $250,000 bonds to build garbage disposal plant.

Marine Ways—Brunswick, Ga.—American Shipbuilding Co. will build 3 additional marine ways on river front. M. Brown, 11 Bway., New York City, vice-pres. and genl. mgr.

Seawall—Fla., West Palm Beach—See "Streets and Roads."

Pipe Line—Lexington, Ky.—Cumberland Pipe Line Co., will increase capital from $1,000,000 to $1,500,000, to enlarge and extend Irvine pipe line. H. B. Robinson, ch. engr.

Incinerator—Paducah, Ky.—(Official)—City postponed building incinerator until 1918 as there is no appropriation available for work. Noted Aug. 2.

Incinerator—Hibbing, Minn.—City purchased 80-acre site and will build incinerator and gas plant. E. D. Hawley, city engr.

Levee—Newport, Ark.—Newport Levee Dist., Jackson Co., retained Morgan Eng. Co., Goodwin Institute to prepare plans and supervise construction of levee work.

Subway—El Paso, Tex.—Citizens defeated $150,000 bond issue to build under railway tracks. G. Espy, city engr.

Park—Hugo, Okla.—City voted $15,000 bonds to build park.

Dam—Baker, Ore.—Lower Powder Irrigation Co. retained J. W. Bailey, city engr., to prepare plans for rein.-con. dam on Lower Powder River.

Harbor Improvements—Hermosa Beach, Cal.—City election Sept. 18th to vote on $100,000 bonds for harbor improvements.

BIDS DESIRED

Freight Conveyors—Albany, N. Y.—(Official)—Until Sept. 11, by W. W. Watervoom, asst. pub. wks., Capitol, furnishing and installing under Contract No. 103-A; advertised in this issue.

Flood Protection—Corning, N. Y.—(Official)—Until Sept. 18 by Ed. Pub. Wks., evaluate and recommend improvement of Meeker Run; advertised in this issue. Noted May 19.

Electric Work—Farmingdale, N. Y.—(Official)—Until Sept. 11, by Hon. W. W. Mills, Ad. Trustee, 1211 Woolworth Bldg., New York City, electric work at State Agricultural School; advertised in this issue.

Retaining Wall—Newton, N. J.—Until Sept. 17, by Bd. Freeholders, Sussex Co., 7th ave., for erection Lenox Corner Bridge Rd. to Sussex co. road.

Harbor Improvements—Mobile, Ala.—(Official)—Until Sept. 15, by H. Pillsbury, master for harbor improvements at Arlington site. About $[illegible]. W. South, city engr. Noted Aug. 23.

Piling—Columbus, O.—(Official)—Until Sept. 15 by Comr. Pub. Wks., State House Annex, driving protective piling in Olentangy River above dam at head of Ohio and Erie Canal. J. J. Miller, engr.

Retaining Wall—Dayton, O.—(Official)—Until Sept. 10 by Montgomery Co. Comrs., construct wall on Owl Creek, Miami Twp. W. H. Appling, clk.

Miscellaneous (Continued)

Creek Improvements—Lancaster, O.—Until Sept. 8 by Comrs. Fairfield Co., deepening, widening and improving channel of Rush Creek, Perry and Fairfield Cos.

Garbage Incinerator—Waukegan, Ill.—(Official)—Until Sept. 10 by City Council J. H. Marseilles, clk., advertised in this issue.

Dock—Seattle, Wash.—Until Sept. 10 by Comrs. King Co. on Duwamish Waterway to serve Pacific Oil Mills, 1816 4th St., S. About $35,000. S. J. Humes, 3rd and James Sts. co. engr. Noted May 24.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Sluice Gates—South Boston, Mass.—(Boston P. O.)—State Highway Comm. Boston, let contract to Coffin Valve Co., Wollaston, $21,500.

Piers—Albany, N. Y.—(Official)—W. W. Wotherspoon, supt. pub. wks., received low bids piers, dolphins, etc., on Gowanus Bay, Brooklyn, Terminal Contr. No. 55, from Riverside Contr. Co., 39 Cortland St., $509,-861; Snare & Triest, Woolworth Bldg., $557,343; G. W. Rogers Co., Inc., 29 Bway., $561,146; all of New York City. Noted July 26.

★Levee—Wainright, Mo.—Comrs. Callaway Co., Fulton, let contract levee to protect 1700 acres to Chas. Thompson, Omaha, about $2,000.

★Wharf—Orange, Tex.—Southern Pacific Ry. let contract 100-ft. wharf, 3rd St., to Midland Bridge Co., 504 Midland Bldg., Kansas City, Mo.

Tunnels—San Francisco, Cal.—Bd. Pub. Wks. received only bid building 18 mi. tunnels for Hetch-Hetchy Water supply project from R. C. Storrie & Co., 2379 Market St. about $9,250,000, which was rejected as too high. Noted July 19.

The City of San Juan, Porto Rico, is said to be experiencing greater building activity than at any previous time in its history, notwithstanding increased costs of labor and building materials. Not only has the war increased the cost of labor for building, but ocean freight rates have advanced enormously. As the greater part of building materials, such as cement, lumber, plumbing, electrical supplies, etc., are shipped from the United States, it may be seen that the costs of these articles are much higher than in the States.

In San Juan alone a conservative cost of building under construction or just being completed would total well over $1,250,-000. Work has been started on a five-story reinforced-concrete hotel to cost about $[illegible]. Construction will be pushed with rapidity and it is expected that the structure will be completed on July 1918. A large hospital for the Presbyterian Board of Missions has recently been completed at a cost of approximately $[illegible]. This building is also of fireproof construction throughout, and has modern conveniences and appliances. The Bureau of Public Buildings of the Insular Government has under construction in San Juan three modern school buildings costing a total of $[illegible]. This is in addition to a large number of small schools and miscellaneous Government buildings now being built in other parts of the island.

A reinforced-concrete warehouse and office building for the Porto Rico American Tobacco Co. is nearly completed at Bayamon. This, with the addition of a fifth floor to another of the company's factories, will cost $[illegible]. A complete warehouse and office for the West India Co., in Puerta de Tierra, a section of San Juan, is practically complete at an expenditure of $[illegible]. Several other smaller office buildings and port and pier improvements are under construction throughout various parts of the city. All these buildings are being constructed by local contractors and (with the exception of the hotel and the warehouse for the West India Co.) all have been designed by local architects.

A survey by United States Engineers of the Snake River, in the Northwest, was inaugurated Aug. 4 at Lewiston, Idaho. There has been no definite plan adopted as to the best method of making the river navigable for boat traffic, but steamboat navigators who are acquainted with the stream hold the view that by the construction of a series of 20 locks, one of these to be located on the Snake River and one on the Columbia, the rivers between Lewiston and the canal at Celilo can be made navigable the year round for boats up to 200 tons burden. Under this plan, four of these dams would create large electric power, while six would be mainly of the lift type and of service only from a steamboat-navigation standpoint.

BARGE CANAL WORK—ALBANY, N. Y.

Contract No. 55

Bids were received by W. W. Wotherspoon, supt. pub. wks., for Contract No. 55, constructing pier, dolphins, etc., at Gowanus Bay, Brooklyn, from (A) Riverside Contr. Co., 39 Cortland St.; (B) G. W. Rogers Co., Inc., 29 Bway.; (C) Snare & Triest, Woolworth Bldg., all New York City; (D) Lupfer & Remick, Ellicott Sq., Buffalo. The unit bids of the 3 lowest bidders were as follows:

	A	B	C
Removal of old material (lump sum)	$50.00	$120.00	$100.00
180 cu.yd. stone filling	1.00	1.80	1.50
365,600 lin.ft. foundation piles	.61	.63	.66
315 fender piles	20.00	26.00	24.00
840 M. ft.b.m. sawed lumber	72.00	86.00	86.00
214 M. ft.b.m. sawed lumber—treated	79.00	96.00	95.00
78,000 sq.ft. surface treatment of timber	.01	.022	.02½
460 cu.yd. third-class concrete	6.00	7.80	7.55
7,717 cu.yd. first-class reinforced concrete	14.75	15.00	14.50
750 cu.yd. sand-fill	.75	1.20	1.15
60 cu.ft. chipping concrete	1.00	2.20	2.00
185 lin.ft. drilling holes in exist. masonry	.50	1.20	1.15
600 lb. rigid metal conduit	.10	.12	.10
69,700 lb. steel castings	.10	.14	.14
6,900 lb. iron castings	.07	.084	.08
644,000 lb. metal reinforcement	.06	.07	.07
550,000 lb. structural steel	.06¾	.084	.08
12 spools	125.00	120.00	120.00
70 pile shoes	1.00	2.20	2.00
Extended totals	$509,861	$557,343	$561,146

Contract No. 147

Bids were received by W. W. Wotherspoon, supt. pub. wks., for Contract No. 147, constructing superstructure, substructure and approaches of bascule bridge over Tonawanda Creek on Main and Webster Sts., Tonawanda and North Tonawanda, from (A) Scherzer Rolling Lift Bridge Co., Monadnock Blk., Chicago; (B) Lupfer & Remick, Ellicott Sq.; (C) Lathrop, Shea & Henwood, Ellicott Sq.; (D) Peckham Constr. Co., $273,105, all of Buffalo. The unit bids of the 3 lowest bidders were as follows:

	A	B	C
Plans for Strauss trunnion bascule bridge (lump sum)	$7,200.00	$7,200.00	$8,000.00
5,630 cu.yd. excavation	2.20	2.40	1.00
2,960 cu.yd. forming embankment	.15	.10	.15
1,940 cu.yd. first-class reinforced concrete	14.75	14.00	13.50
1,660 cu.yd. second-class reinforced concrete	12.00	14.40	10.50
870 cu.yd. second-class conceret	8.90	10.80	8.50
740,000 lb. structural steel	.08	.089	.12½
68,300 lb. machinery	.28	.24	.34
119,000 lb. metal reinforcement	.06	.052	.06
1,370 sq.ft. concrete sidewalk	.25	.20	.30
264 lin.ft. sandstone curbing	1.10	.90	1.00
242 sq.yd. brick pavement	3.00	3.00	2.50
388 sq.yd. wood block pavement on plank base	3.00	2.58	3.00
454 sq.yd. wood block pavement on concrete base	3.00	2.68	3.00
620 lin.ft. lattice railing	3.00	3.00	5.60
256 lin.ft. galvanized steel corner bar	.40	.30	.30
2,500 lb. metal duct	.15	.16	.16
7 4 M.F.B.N. Sheeting and bracing	60.00	60.00	72.00
8 8 M.F.B.M. sawed lumber	70.00	75.00	90.00
20 9 M.F.B.M. sawed lumber creosoted	80.00	96.00	96.00
Removing building (lump sum)	10.00	10.00	10.00
Maintaining navigation (lump sum)	350.00	360.00	300.00
Maintaining highway traffic (lump sum)	12,500.00	9,600.00	12,600.00
Operator's house (lump sum)	2,000.00	1,440.00	1,200.00
Plumbing (lump sum)	600.00	600.00	500.00
Electrical equipment (lump sum)	11,500.00	13,200.00	11,000.00
Maintenance accessories (lump sum)	300.00	300.00	250.00
Cofferdams, pumping, etc. (lump sum)	36,000.00	35,500.00	34,000.00
Extended totals	$233,986	$239,821	$257,047

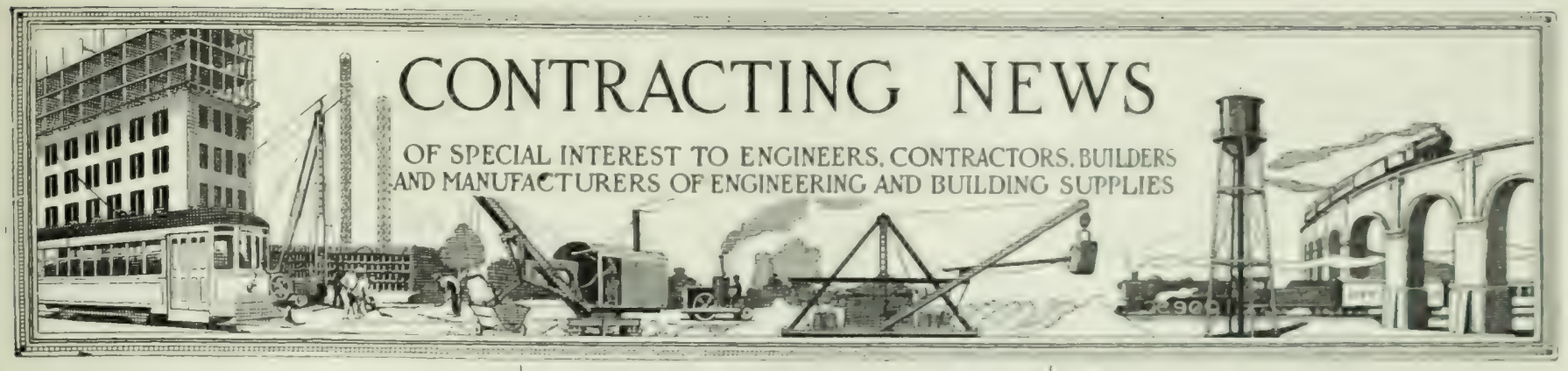
Contract No. 148

Bids were received by W. W. Wotherspoon, supt. pub. wks., Aug. 21, for Contract No. 148, constructing superstructure, substructure and approaches of highway bridge over Lock No. 27 and Clyde River on Leach St., Lyons, from (a) Lathrop, Shea & Henwood, Ellicott Sq. (awarded contract); (B) Lupfer & Remick, Ellicott Sq., both of Buffalo. The unit bids were as follows:

	A	B
11,100 cu.yd. excavation	$0.40	$0.50
23 7 M.F.B.M. sheeting and bracing	72.00	70.00
9,900 cu.yd. forming embankment	.18	.15
70 wood piles	1.50	1.25
2,140 cu.yd. second-class concrete	9.00	10.50
66 lin.ft. 16-in. vitrified pipe and specials	.60	.65
470 lin.ft. concrete curbing	1.25	1.40
870 sq.yd. waterbound macadam 9 in. thick	1.50	1.50
240 sq.yd. waterbound macadam 6 in. thick	1.20	1.20
85 cu.yd. ashlar concrete	3.00	3.50
52 lin.ft. drilling holes in existing masonry	1.50	1.50
55 sq.yd. relaying second-class stone paving	1.20	1.10
720 lin.ft. wooden fence	.35	.40
295,000 lb. structural steel	.094	.09¾
2,700 lb. metal reinforcement	.07	.07
5,800 lb. 12-in. cast iron pipe	.05	.05
220 lin.ft. lattice railing	3.60	3.60
34 6 M.F.B.M. sawed lumber (lump sum)	96.00	95.00
Concrete bents (lump sum)	45.00	40.00
Removing superstructure of bridge and the stairway (lump sum)	10.00	10.00
Cofferdams, pumping, tailing and draining (lump sum)	4,200.00	4,200.00
Extended totals	$68,770	$72,096

By an overwhelming majority the citizens of Mobile, Ala., voted on Aug. 13 to authorize the City Commission to arrange a bond issue of $[illegible],000 for the construction of a municipal water terminal. The project as designed comprises concrete wharves, piers and bulkheads, railroad connections to the water front and dredging to a depth of 30 ft. Warehouses are also included in the design but cannot be built within the present appropriation. The work will be in charge of City Engineer Wright Smith.

Minneapolis will spend $1,000,000 in new construction to increase its water supply. Eight filter beds, four of which are under construction now, will be completed about the end of 1918. When Minneapolis began treating its water-supply from the Mississippi River by mechanical filtration, in 1913, it started with 12 filter beds. In 1915 four were added, giving a filtration capacity of 56,000,000 gal. daily. The average consumption was 30,000,000 gal. daily, but during an extended dry period in 1916 the demand crept up to 59,000,000 gal.



Proposals

For Proposals Advertised See Pages 42 to 53 Inclusive

WATER-WORKS

Bids Close		See Eng. News-Record
Sept. 13.	Cleveland, O.	Aug. 30
Sept. 17.	Butte, Mont.	Sept. 13
Sept. 18.	Firebaugh, Cal.	Sept. 13
Sept. 20.	Mandan, N. D.	Sept. 13
Sept. 24.	Akron, O.	Sept. 13
	Adv. Sept. 13.	
Sept. 25.	Jersey City, N. J.	Sept. 13
Sept. 26.	North McGregor, Ia.	Sept. 13
	Adv. Sept. 13.	
Sept. 26.	North Tonawanda, N. Y.	Sept. 13
	Adv. Sept. 13.	
Sept. 25.	Bayonne, N. J.	Sept. 13
Oct. 2.	Johnstown, N. Y.	Sept. 13
	Adv. Sept. 13.	
Oct. 2.	Toronto, Ont.	Sept. 13

SEWERS

Sept. 17.	Cleveland Heights, O. (Warrensville P. O.)	Aug. 30
Sept. 17.	Butte, Mont.	Sept. 13
Sept. 17.	South Orange, N. J.	Sept. 13
Sept. 18.	Caledonia, Minn.	Sept. 13
Sept. 21.	Detroit, Mich.	Sept. 13
	Adv. Sept. 13.	
Sept. 22.	Stamford, Conn.	Sept. 13
	Adv. Sept. 13.	
Sept. 24.	Bridgeport, Conn.	Sept. 13
	Adv. Sept. 13.	
Sept. 24.	Rocky River, O.	Sept. 13
Sept. 28.	Cedar Rapids, Ia.	Sept. 13
Sept. 25.	Columbia, S. C.	Sept. 13
Sept. 29.	Hagerstown, Md.	Sept. 13
	Adv. Sept. 13.	

BRIDGES

Sept. 17.	Woonsocket, R. I.	Sept. 6
	Adv. Sept. 6.	
Sept. 17.	Eufaula, Okla.	Sept. 13
Sept. 17.	Mason City, Ia.	Sept. 13
Sept. 18.	Paducah, Ky.	Sept. 13
Sept. 18.	Santa Ana, Cal.	Sept. 6
Sept. 19.	Wausau, Wis.	Sept. 13
Sept. 20.	Rockford, Ill.	Sept. 13
Sept. 20.	Du Bois, Pa.	Sept. 6
Sept. 20.	Butler, Pa.	Sept. 6
	Adv. Sept. 6 and 13.	
Sept. 21.	St. Joseph, Mo.	Sept. 13
Sept. 24.	Los Angeles, Cal.	Sept. 13
Sept. 27.	Jersey City, N. J.	Sept. 13
Sept. 28.	Akron, O.	Sept. 13
	Adv. Sept. 13	
Oct. 2.	Albany, N. Y.	Sept. 6
	Adv. Sept. 6	
Oct. 2.	Columbus, O.	Sept. 13
	Adv. Sept. 13.	
Oct. 4.	Texarkana, Tex.	Sept. 13
	Adv. Sept. 13	

STREETS AND ROADS

Sept. 10.	Washington	Aug. 30
Sept. 10.	Wallace, Idaho	Aug. 30
Sept. 10.	Cherokee, Ia.	Sept. 6
Sept. 10.	Mankato, Minn.	Sept. 6
Sept. 10.	Louisa, Ky.	Sept. 6
Sept. 10.	Trenton, N. J.	Sept. 6
Sept. 10.	Quincy, Mass.	Sept. 6
Sept. 11.	Concordia, Kan.	Sept. 6
Sept. 11.	Sacramento, Cal.	Aug. 30
Sept. 11.	Buffalo, Minn.	Sept. 6
Sept. 12.	Kansas City, Mo.	Sept. 6
Sept. 12.	Springfield, Ohio	Sept. 6
Sept. 12.	Indianapolis, Ind.	Sept. 6
Sept. 12.	Rhode Island	Sept. 6
	Adv. Sept. 6.	
Sept. 14.	Parkersburg, W. Va.	Sept. 6
Sept. 15.	Visalia, Cal.	Aug. 30
Sept. 16.	Pocatello, Idaho	Sept. 6
Sept. 17.	Indianapolis, Ind.	Sept. 6
Sept. 17.	South Pasadena, Cal.	Sept. 13
Sept. 17.	Everett, Wash.	Sept. 13
Sept. 17.	Paris, Ill.	Sept. 13
Sept. 17.	San Bernardino, Cal.	Sept. 13
Sept. 17.	West Frankfort, Ill.	Sept. 13
Sept. 17.	Frankfort Heights, Ill.	Sept. 13
Sept. 18.	Morrison, Ill.	Sept. 6
Sept. 18.	Hohenwald, Tenn.	Aug. 23
Sept. 19.	Seattle, Wash.	Aug. 23
Sept. 19.	Riverside, Cal.	Sept. 13
Sept. 20.	Albany, N. Y.	Sept. 6
	Adv. Sept. 6 and 13.	
Sept. 20.	New York, N. Y.	Sept. 6
Sept. 20.	Newkirk, Okla.	Sept. 13
Sept. 20.	Cincinnati, O.	Sept. 13
Sept. 20.	Miami, Fla.	Sept. 13
Sept. 21.	Charleston, W. Va.	Sept. 6
Sept. 22.	Cameron, La.	Aug. 30
Sept. 22.	Racine, Wis.	Sept. 13
Sept. 24.	Eutaw, Ala.	Sept. 6
Sept. 24.	Livingston, Ala.	Sept. 6
Sept. 24.	Newburgh, N. Y.	Sept. 13
	Adv. Sept. 13.	
Sept. 25.	Indiana	Sept. 13
Sept. 25.	New Orleans, La.	Sept. 13
Sept. 25.	New Jersey	Sept. 13
Sept. 25.	Carrollton, Ala.	Sept. 6
Sept. 27.	Salt Lake City, Utah	Sept. 13
Sept. 30.	Indianapolis, Ind.	Sept. 6
Oct. 1.	Lincoln, Neb.	Sept. 6
Oct. 6.	Bowling Green, O.	Sept. 13
Oct. 11.	Oneonta, Ala.	Sept. 13
Oct. 15.	Newark, N. J.	Sept. 13
Oct. 16.	Cape May, N. J.	Sept. 6

EXCAVATION AND DREDGING

Sept. 15.	Statham, Ga.	Sept. 13
Sept. 17.	Clarion, Ia.	Sept. 13
Sept. 18.	Moorhead, Minn.	Sept. 6
Sept. 18.	Wabash, Ill.	Sept. 13
Sept. 18.	Ree Oak, Ia.	Sept. 13
Sept. 20.	Hensselaer, Ind.	Sept. 13
Sept. 21.	Modesto, Cal.	Sept. 6
Sept. 21.	Paxton, Ill.	Sept. 6
Sept. 24.	Barstow, Tex.	Sept. 13
Sept. 24.	Lewiston, Ill.	Sept. 13
Oct. 1.	Albany, N. Y.	Sept. 13
	Adv. Sept. 13	
Oct. 2.	St. Cloud, Minn.	Aug. 2
Oct. 2.	Urbana, Ill.	Sept. 6
Oct. 15.	Willmar, Minn.	Sept. 13

BUILDINGS

Sept. 15.	Spirit Lake, Ia.	Aug. 9
Sept. 15.	Bathh[illegible] st N. [illegible]	[illegible]
Sept. 15.	Kasson, Minn.	Sept. 13
Sept. 15.	Cleveland Heights (Warrensville, P. O.)	[illegible]
Sept. 17.	Abington, Pa.	[illegible]
Sept. 21.	Oroville, Cal.	[illegible]
Sept. 21.	Chester, Pa.	Sept. 6
Sept. 18.	Thiells, N. Y.	[illegible]
	Adv. Sept. 13	
Oct. 3.	Cresco, Ia.	Sept. 13
Oct. 5.	Thiells, N. Y.	Sept. 13
	Adv. Sept. 13	
Dec. 1.	Norfolk, Va.	Sept. 13

FEDERAL GOVERNMENT WORK

Sept. 17.	Tampa, Fla.	Sept. 6
Sept. 17.	Mare Island (Vallejo P. O.) Cal.	Sept. 13
Sept. 18.	Memphis, Tenn.	Sept. 13
Sept. 18.	Cape Henry, Va.	Aug. 30
	Adv. Aug. 30 and Sept. 6.	
Sept. 21.	Kendallville, Ind.	Aug. 16
	Adv. Aug. 16 and 23	
Sept. 24.	Farmington, N. M.	Sept. 6
Sept. 24.	New London, Conn.	Sept. 13
Sept. 24.	Washington, D. C.	Sept. 13
Sept. 25.	Washington, D. C.	Aug. 30
	Adv. Aug. 30.	
Sept. 26.	Memphis, Tenn.	Sept. 6
	Adv. Sept. 6 and 13.	
Sept. 28.	Key West, Fla.	Sept. 13
Sept. 28.	Washington, D. C.	Sept. 13
Sept. 28.	Boston, Mass.	Sept. 13
	Adv. Sept. 13.	
Oct. 1.	Twin Falls, Idaho	Aug. 30
Oct. 1.	Louisville, Ky.	Sept. 13
Oct. 1.	Cleveland, Ohio	Sept. 6
Oct. 2.	San Francisco, Cal.	Sept. 6
Oct. 2.	Wheeling, W. Va.	Sept. 13
Oct. 4.	Boston, Mass.	Sept. 13
Oct. 4.	St. Peter, Minn.	Sept. 6
Oct. 6.	Newport, R. I.	Sept. 13
	Adv. Sept. 13.	
Oct. 12.	Bad Axe, Mich.	Sept. 13
Oct. 15.	Denver, Colo.	Sept. 13
	Adv. Sept. 13.	
Oct. 15.	Waynesboro, Va.	Sept. 13
Oct. 30.	Key West, Fla.	Sept. 6
	Adv. Sept. 6 and 13.	

MISCELLANEOUS

Sept. 17.	Retaining Wall—Newton, N. J.	Sept. 6
Sept. 19.	Flood Protection—Corning, N. Y.	Sept. 6
	Adv. Sept. 6 and 13.	
Sept. 19.	Sewer Filtering Machine—New Bedford, Mass.	Sept. 13
	Adv. Sept. 13	
Sept. 19.	Retaining Wall—Dayton, O.	Sept. 6
Sept. 25.	Harbor Improvements—Mobile, Ala.	Sept. 6
Sept. 28.	Incinerating Plant at Crematory—Trenton, N. J.	Sept. 13
Sept. 28.	Pier—Philadelphia, Pa.	Sept. 13
	Adv. Sept. 13	
Sept. 15.	[illegible] Dayton, O.	Sept. 13
	Adv. [illegible]	

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official.

WATER-WORKS

Proposed Work

Conn., Meriden—[illegible] to install [illegible] Water Plant. [illegible] Amount [illegible]

Conn., Stratford—[illegible] N. J., Newark—[illegible] to supply [illegible] Hills [illegible] O., Sharonville—[illegible]

Miss., Charleston—[illegible] to [illegible] bonds for [illegible] system. [illegible] E. Smith, city engr.

Tenn., Knoxville—[illegible] to sell $[illegible] bonds for [illegible] improvements. [illegible] E. McCallie, city engr. Bids May 5.

O., Dayton—[illegible] to sell $[illegible] bonds to extend and improve waterworks system. [illegible] F. O. Kuhlmeyer, city engr.

[illegible]

O., Dayton—City [illegible] prepared by [illegible] engrs., [illegible] Mass. building reservoir in connection with part of city. About [illegible] Noted Aug. 23.

N. B., St. John—City [illegible] contract extending water-works, involving 5000 ft [illegible]

O., Lorain—[illegible]—City to issue $[illegible] bonds to improve water-works system. C. M. [illegible] supt.

Mich., Alma—See "Sewers."

Mich., Bessemer—See "Sewers."

Ill., East St. Louis—East St. Louis Interurban Water Co. plans to issue $1,000,000 bonds to build high-pressure main from pumphouse to Granite City. Also new settling basins.

Wis., Tomahawk—City votes to bond [illegible] and equip pumping station and install water mains. About $[illegible]. J. L. Ex[illegible], clk.

Ia., Farnhamville—City voted $10,000 bonds to build water mains.

Minn., Albert Lea—City plans reservoir, 1,500,000 gal. capacity. About $20,000. W. L. Hoxie, supt.

Minn., St. Paul—City to sell $[illegible],000 bonds Sept. 19 to build waterworks. G. [illegible], supt.

Neb., Pender—City voted $16,500 bonds for electric light and waterworks improvements. H. Brandt, supt.

Mont., Great Falls—City having plans prepared building [illegible]-in. c.-i. water main, 7 [illegible] ft. long from filter to 12th St., replacing present intake with cast-iron pipe, 700 ft. long; also 12,000 ft. storm sewer. T. B. Evanson, city engr.

Tex., Austin—City Comrs. purchased Barton Springs about 1 mi. from Austin, which have daily average output of 16,000,000 gal. water. This water supply will be brought to city by means of pumping plant and concrete conduit that will be laid part of way under bed of Colorado River. E. C. [illegible], supt.

Okla., Beaver—City plans to issue $17,600 bonds to build water-works system.

Okla., Coyle—City Council authorized $[illegible] bond issue to improve water-works system. C. M. [illegible], supt. Address the Mayor.

Okla., Granite—City voted bonds to build water-works system. H. Arnett, supt. Noted Aug. 16.

Okla., Guthrie—City [illegible] election to vote on $20,000 bond issue to build river reservoir and 1 or 2 dams. J. E. Nadley, mayor.

Okla., Indiahoma—City election Sept. 28 to vote $[illegible] bond issue to build water-works system. S. Finigan, prin.

Okla., Miami—City election soon to vote on $[illegible] to build water-works and electric-light system. S. L. Taylor, supt. Noted Aug. 27.

Okla., Shamrock—City plans to build water-works system. About $[illegible]. Municipal Water Eng. Co., 1023 State Bank Bldg., Oklahoma, engrs. Noted Aug. 22.

Okla., Waurika—City having plans prepared building dam and filtration plant. H. Treadgill, city clk. [illegible] Aug. 30. About $[illegible].

Okla., Waurika—City [illegible] $[illegible] bonds to install filtration plant and build dam.

Utah, Enterprise—See "Excavation and Dredging."

Wash., Byron—Council passed ordinance to issue $[illegible] bonds to improve light and water-works systems. E. E. Wood, clerk.

Wash., Pasco—City having plans prepared by Sverdrup Bldg., engrs., White Bldg., Seattle, for building water-works system. About $[illegible].

Cal., San Bernardino—City having plans prepared by P. C. Weeks, engr., 418 Hall of Records Bldg., Los Angeles, for extending and improving water-works system.

Cal., Sonoma—City has plans prepared for waterworks system. About $[illegible]. T. Lewis, city engr.

O., Greenville—City [illegible] let contract for water-works system. About $[illegible]. C. H. Johnson, 115 Nassau St., New York City, engr. Noted July 15.

Ont., Crowland Twp.—Twp. having plans prepared for extending water-works 1500 ft. 10-in. c.-i. pipe.

Ont., Port Dover—City having plans prepared by James, Loudon & Hertzberg, engrs., Excelsior Life Bldg., Toronto, for water works system. About $65,000.

Ont., Port Dover—City voted $65,000 bonds to build water-works system. J. Shean, clk. Noted May 31.

BIDS DESIRED

N. Y., Johnstown—(Official)—Until Oct. [illegible] by Water Comrs., for storage reservoir, earthen dam, spillway and appurtenances on Center Creek. W. E. Nathanson, city engr.; advertised in this issue.

N. Y., North Tonawanda—(Official)—Until Sept. 26, by F. C. Goltz, city clk., for 1300 ft. 4-ft. c. i. wood or concrete intake water pipe; advertised in this issue.

N. Y., Thiells—See "Buildings."

N. J., Bayonne—(Official)—Until Sept. 25, by Bd. Comrs., laying water mains and appurtenances. About $20,000. W. L. Clarkson, city engr. Noted Aug. 30.

N. J., Jersey City—(Official)—Until Sept. 25, by F. A. Dolan, city clk., furnishing and delivering c.-i. water pipe.

O., Akron—(Official)—Until Sept. 24, by C. F. Beck, dir. pub. ser., building elevated steel water tank; advertised in this issue.

Ia., North McGregor—(Official)—Until Sept. 26, for waterworks system; advertised in this issue.

N. D., Mandan—(Official)—Until Sept. 20, by City, for 2,000,000-gal. reservoir, at Missouri River pumping station, together with necessary pumping arrangement. About $600,000. Black & Griffin, Mandan, N. D., engrs.

Mo., Hamilton—(Official)—Until Sept. 17, by City, for water-works system, including 7800 cu.yd. earth excava., 217 cu.yd. concrete, sluiceway and intake pipe, centrifugal pump, 10,880 ft. 6-in. c.i. pipe, 4500 ft. c.-i. specials, 30,000 gal. wooden tank and 75-ft. steel tower, etc. E. T. Archer & Co., 609 New England Bldg., Kansas City, Mo., engrs. Noted July 26.

Cal., Firebaugh—Until Sept. 18, by C. W. Hawks, city clk., for water-works system.

Ont., Toronto—Until Oct. 2, by Wks. Dept. for stop valves, valve operating pumps and special castings for main pumping station.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**O., Akron**—(Official)—City let contract No. 85 for laying 30-in. water main in Buchtel Ave. to Gessner Co., Toledo, $32,608.

★**O., Akron**—(Official)—City let Contr. No. 80, furnishing about 200 fire hydrants, 6 to 8 in., to Rensselaer Valve Co., Ontario, $12,668; Cont. No. 86, furnishing water meters, 5000 ¾-in., 210 ¾-in. to 2-in., to Gamon Meter Co., 282 South St., Newark, N. J., $[illegible]. Noted Aug. 16.

★**Wis., Shawano**—(Official)—City let contract extending water-works system to Delos Eng. & Contg. Co., Prairie du Chien, $[illegible]. Noted Aug. 30.

★**Minn., Fairmount**—City let contract installing 3 mi. water mains to J. Rea, Fairmount.

★**Kan., Liberal**—City let contract waterworks improvement to C. H. Everett, Hutchinson, $12,405. Noted July 26.

★**Okla., Lawton**—City let contract improving and extending water-works system from here to Ft. Sill, involving 30,000 ft. 24-in. [illegible],000 ft. 14-in. and 6400 ft. 12-in. c.-i. pipe to N. S. Sherman Machine and Iron Wks., 18 East Main St., Oklahoma, $375,000. Noted Aug. 23.

★**Que., Outremont**—City let contract filter and filtration plant rein.-con. and brick, to A. Hastien, 374 Ave. de l'Epee, $[illegible],000.

SEWERS

Proposed Work

Mass., Springfield—City having plans prepared building new sewer drainage system. About $[illegible],000. C. H. Clapp, city engr.

Conn., Greenwich—(Official)—Boro voted $[illegible],000 to build sewerage system and pave [illegible]. Hiland Shaw, Boro Engr. Address Mayor, engr., C. Dutts & Church St., New York City, consult engr.

Conn., Stratford—City [illegible] plans prepared by C. Smith & Church St., New York City, for sewerage system and pumping station. About $[illegible],000. Noted Apr. 19.

N. Y., Frankfort—Town plans to build new sewage disposal plant. About $20,000. J. Garvey, clk.

N. J., Jersey City—City having plans prepared for trunk sewer from Dover below Boonton Dam. C. A. Van Keuren, city engr.

N. J., Newark—Bd. St. and Water Comrs. approved ordinance to build new sewer in Sanford Ave. M. R. Sherrard, city engr.

N. J., Princeton—Boro. having plans prepared improving sewerage system, northeast field and sewage disposal plant in northwest field. V. B. Cook, clk.

N. J., Trenton—City had plans prepared for trunk sewer from Dover to Boonton dam. J. R. Fell, Jr., city engr.

Pa., Lewisburg—Council passed ordinance to issue $25,000 bonds for sewage disposal plant. S. McComber, city engr.

Tenn., Knoxville—See "Waterworks."

Ky., Louisville—Bd. Pub. Wks. having plans prepared for sewer on Indiana Ave. D. R. Lyman, city engr.

Ky., Maysville—City election soon to vote on $100,000 bond issue to build sewerage system. J. W. Lee, mayor.

O., Akron—City plans to build sewer in portions Carpenter St. J. A. Gehres, city engr.

O., Batavia—Council passed ordinance building sewer portion Spring St. J. Boehmer, city engr.

O., Canton—Council passed ordinance building sanitary sewer portion 17th St. W. E. Sarver, city engr.

O., Canton—(Official)—City to issue $70,000 bonds to build storm water sewers. C. A. Stolberg, mayor.

O., Cleveland—City plans to install sewer in Hartley Rd. R. Hoffman, city engr.

O., Lima—City plans $225,000 bond issue to build relief sewers. C. Bryson, city engr.

O., Lorain—Council passed ordinance building sanitary sewer portion Parkview Ave. and lateral storm sewer portion 7th St. C. M. Osborne, city engr.

O., Toledo—(Official)—City election Nov. 6th to vote on $2,800,000 bond issue to build disposal and pumping plants. H. C. McClure, city engr. Noted Sept. 6.

O., Urbana—Council passed ordinance to build sanitary sewer portions Windsor Ave. E. F. Sweetman, city engr.

Mich., Alma—City voted bonds for following improvements: $40,000 sewers, $76,000 waterworks and $10,000 paving. Noted June 7.

Mich., Bessemer—City voted $150,000 bonds to build sewerage, water-works systems and pave number of streets. W. L. Guyer, supt.

Mich., Holly—City plans to build steel tank, 100,000 gal. capacity, also to install electrically operated pumps. About $15,000.

Mich., Lansing—City plans to build sewers in portions North, Fremont and Robertson Sts., involving 11,370 ft. pipe. H. W. Sparks, city engr.

Mich., Trenton—Village election soon to vote on $14,000 bond issue to build trunk sewer; plans also being prepared for surface sewer on Washington Ave. Noted June 14.

Ill., Bloomington—Council passed ordinance to build sewerage system on west side. About $18,500. E. H. Packard, city engr.

Ill., Normal—Bd. Local Improv. plans 24-in. pipe sewer in Adelaide St., 9393 ft. long. About $18,500. Mellerish & Broghill, designing engr.

Wis., La Crosse—City plans to build 3 blocks, 10 and 12-in. vitr. pipe sewers. G. Bradish, city engr.

Ia., Sioux City—Council passed resolution for sanitary sewer in portions Linn St. and Washington Ave. T. H. Johnson, city engr.

Minn., Virginia—City having plans prepared for sanitary sewerage system. E. F. Johnson, city engr.

Mont., Great Falls—See "Water-Works."

Mont., Poplar—Town to sell $25,000 bonds Sept. 25 for waterworks system. W. E. Englehart, clk. Noted Aug. 30.

Mo., Kansas City—Bd. Pub. Wks. soon lets contract sewer in Dist. No. 356, Div. No. 5. About $90,000. C. Hill, city engr.

Sewers (Continued)

Tex., El Paso—City had plans prepared for sewage-disposal plant. About $100,000. G. Espy, city engr.

Okla., Purcell—City plans to improve sewerage system. W. G. Blanchard, mayor.

Wash., Seattle—City had plans prepared building sewers in 22nd Ave., S. W., $56,933, Rainier Ave., trunk sewer, $222,640. A. H. Dimock, city engr.

Ore., Astoria—City soon lets contract building sewers on several streets. G. T. McCrean, city engr.

Ore,. Portland—City plans to build sewers in portions East 65th, East 47th, East 28th, East 37th and East 69th Sts. P. H. Dater, city engr.

BIDS DESIRED

Conn., Bridgeport—(Official)—Until Sept. 24, by Paving & Sewer Comn., Sects. 3 and 4 Northwest Sanitary trunk sewer. B. Keating, secy.; advertised in this issue.

Conn., Stamford—(Official)—Until Sept. 22, by Sanitation Comn., building sewage-disposal plant. A. L. Schavoir, chn.; advertised in this issue.

N. Y., Thiells—See "Buildings."

N. J., South Orange—Until Sept. 17, by St. & Highway Com., building storm sewer in Montrose Ave. I. T. Redfern, village engr.

Md., Hagerstown—(Official)—Until Sept. 29, by Sewerage Comn., installing main and lateral sewers in various streets. E. Le Roy Heard, secy.; advertised in this issue.

S. C., Columbia—Until Sept. 25, by City, building sanitary sewer outfall, Columbia Canal and Smith's Branch, involving 6725 ft. 18-in. and 23,000 ft. 15-in. vitr. clay pipe, 2775 ft. 18-in. and 3320 ft. 15-in. rein.-con pipe. About $50,000. T. K Legare, city engr.

O., Cleveland Heights—(Warrensville P. O.)—(Official)—Until Sept. 17, by H. H. Canfield, village clk., for brick segment block and vitr. pipe sewer in Taylor-Caledonia Sewer Dist. No. 5. F. A. Pease, Eng. Co., 804-812 Marshall Bldg., Cleveland, village engrs.

O., Rocky River—Until Sept. 24 (change of date), by F. Mitchell, city clk., constructing sewage disposal plant, sewers and flushing tank. E. Hamold, city engr. Noted Aug. 23.

Mich., Detroit—(Official)—Until Sept. 21, by Dept. Pub. Wks., extending Evans Tire and Central Aves., Morrell St. and Lynch Rd. sewers. C. F. Hubbell, city engr; advertised in this issue. Noted Aug. 16.

Ia., Cedar Rapids—Until Sept. 28, by City, sanitary sewers in 27th and 30th Sts. and 1st Ave., E., including 210 ft. 10-in., 1135 ft. 8-in., 2421 ft. 6-in. pipe, 13 manholes and 3 flush tanks. C. H. Streeter, city engr.

Minn., Caledonia—(Official)—Until Sept. 18, by Village, building 18,000 ft. 8- to 15-in. vitr. sewer and disposal tank. D. C. Merlo, recorder. J. F. Druar, 314 Commercial Bldg., St. Paul, engr. Noted Aug. 30.

Mont., Butte—(Official)—Until Sept. 17, by Silver Bow Co. Comrs., for building sanitary sewers in Special Improv. Dist. No. 1, and outlet sewer, involving 4283 lin.ft. 8-in. vitr. pipe, 8 manholes, etc. S. A. Anderson, clk.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mass., East Boston (Boston P. O.)—(Official)—Dept. Pub. Wks., Boston, let contract sewer in Faywood Ave. to F. Drinkwater, 25 Hemlock St., West Roxbury, $710,200. Noted Sept. 6.

★N. Y., Brooklyn—L. H. Pounds, boro. pres., let contract building sewers portion Vermont Ave. and Highland Blvd. to Kenmore Contg. Co., 6102 18th Ave., $14,090. Noted July 26.

★N. Y., Brooklyn—L. H. Pounds, boro. pres., let contract building sewers portion Snediker Ave. and sewer basin on Bedford Ave., northwest corner Glenwood Rd., to E. Ghelardi Contg. Co., 1217 47th St., 86% and 150% respectively. Noted Aug. 23.

★N. Y., New York—(Official)—M. M. Marks, boro. pres., let contract building sewer 91st St. between North River and Riverside Dr. to Lawrence Construction Co., 96 Eway, $10,100. Noted Aug. 17.

★O., Bedford—City let contract building sewers to Curro Bros., 1227 East [illegible] St., Cleveland. Noted June 28.

★O., Cleveland—City let contract building drainage sewer inclosing public hall property to Hoag & Dall, 518 Commercial Bldg., $100,000.

★O., Columbus—Dept. Pub. Ser. let contract relief sewer and repaving various streets to I. O. Jones, 707 Grove St., $14,444. Noted Aug. 16.

★O., Mt. Vernon—City let contract building sanitary sewers and paving portion Wooster Ave. to S. T. Knight, Columbus; Mansfield Ave. sewer to W. H. Hearn, Mt. Vernon. Noted June 28.

★Ind., Gary—City let contract building sewer in Dist. No. 38 to J. Aconcle, Gary, $13,984.

★Wis., Green Bay—City let contract laying 12-in. sewers in Norwood Ave., St. Clair and Stuart Sts. to H. O. Schaefer, and M Van Oss, Green Bay.

★Ia., Conrad—Town let contract building sewerage system, outlet and disposal plant, to Cole Bros., Ames, $16,840.

★Ia., Sheldon—City let contract sewage disposal plant to G. Gardner, Sheldon, $11,842.

★Minn., Ely—City let contract filtration plant to New York Continental Jewell Filtration Co., 15 Bway., New York City, $18,000.

★Mo., Kansas City—City let contract sewer in Dist. No. 438, Div. No. 5, to Halpin-Boyle Constr. Co., 709 Ry. Ex. Bldg., $18,438.

★Tex., McKinney—City let contract building sewage-disposal plant to Cabell & Kelly, Scollard Bldg., Dallas, $25,000.

★Okla., Henryetta — City let contract sewers in Dists. Nos. 8 and 9 to W. J. Brittain Co., Henryetta, $10,000.

★Colo., Trindad—City let contract building trunk sewer line and sewage disposal plant to Allen & Murphy, Denver, $39,485. Noted Aug. 6.

★Cal., Corcoran—See "Streets and Roads."

Cal., Los Angeles—City received low bid building vitr. pipe sanitary sewer portion Buchanan Ave. from M. Chutuk, 1516 Pleasant Ave., $35,009.

★Cal., Oakland—Bd. Co. Comrs. let contract sewage disposal plant at tuberculosis hospital, Livermore, to M. E. Fernandez, Prospect St., Hayward, $16,324.

★Ont., Romey Twp.—Twp. let contract for tile sewer drain No. 4 to C. Van Slandbrock, Blenheim, $13,964.

STRUCTURAL STEEL WORK

Proposed Work

Ala., Mobile—See "Industrial Works."

O., Cleveland—See "Industrial Works."

Neb., Omaha—See "Buildings."

Idaho, Boise—See "Bridges."

Cal., Santa Ana—See "Bridges."

Que., Cedars—See "Industrial Works."

BIDS DESIRED

Tex., Barstow—See "Excavation and Dredging."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Wash., Otis Orchards—See "Bridges."

★N. B., Florenceville—See "Bridges."

REINFORCED CONCRETE

Proposed Work

N. J., Kearney—(Arlington P. O.)—See "Industrial Works."

N. J., Newark—See "Industrial Works."

Pa., Williamsport—See "Bridges."

Ala., Mobile—See "Industrial Works."

O., Cincinnati—See "Industrial Works."

O., Cleveland—See "Industrial Works."

O., Kent—See "Industrial Works."

Ia., Davenport—See "Buildings."

Minn., Minneapolis—See "Bridges."

Neb., Omaha—See "Buildings."

Mont., Anaconda—See "Buildings."

Tex., Austin—See "Water-Works."

Tex., Corpus Christi—See "Miscellaneous."

Oregon—See "Bridges."

Que., Cedar—See "Industrial Works."

BIDS DESIRED

N. Y., Tonawanda—See "Water-Works."

Va., Norfolk—See "Building."

O., Akron—See "Bridges."

O., Columbus—See "Bridges."

Ill., Rockford—See "Bridges."

Ill., St. Joseph—See "Bridges."

Wis., Wausau—See "Bridges."

Tex., Barstow—See "Excavation and Dredging."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Ala., Albany—See "Buildings."

★Mich., Flat Rock—See "Bridges."

★Ill., Kankakee—See "Bridges."

★Wis., Racine—See "Industrial Works."

★Mo., Herculaneum—See "Miscellaneous."

★Mo., St. Louis—See "Bridges."

★Ark., Ft. Smith—See "Bridges."

★Wash., Spokane—See "Buildings."

California—See "Bridges."

★Cal., Sacramento—See "Bridges."

★Que., St. Gerard de Magella—See "Bridges."

★Ont., Fort William—See "Industrial Works."

BRIDGES

Proposed Work

Pa., New Castle—(Official)—Lawrence Co. and Mahoning & Shenango Ry. rejected bids building bridge over Neshahannock Creek, as too high. About $66,000. R. T. Sullivan, ch. engr. ry. Noted Aug. 16.

Pa., Williamsport—Ed. Cumis Lumbering Co. rejected bids building rein.-con. bridge over Susquehanna River at Duboistown and Montgomery, as too high. Noted Aug. 16.

W. Va., Fairmont—City having plans prepared by Concrete Steel Eng. Co., 21 Park Row, New York City, for rein.-con. bridge over Monongahela River.

S. C., Charleston—See "Streets and Roads."

Ala., Bay Minette—See "Streets and Roads."

Ala., Carrollton—Pickens Co. plans to build 2000-ft. concrete and steel bridge. G. E. Hauser, Columbus, Miss., engr.

Wis., Green Bay—See "Streets and Roads."

Wis., Milwaukee—City and Milwaukee Co. plan to spend $[illegible] to improve Humboldt Ave. bridge over Milwaukee River.

Minn., Minneapolis—Hennepin and Ramsey Cos. plan to sell $[illegible] bonds, Oct. 8, to build 800-ft. bridge over Mississippi River at Lyndale Ave., also approaching 1½ mi. roadway on Hennepin Co. side and 10 mi. Ramsey Co. side. Hennepin Co. to appropriate $[illegible] toward cost. Ramsey Co., 1410 Pioneer Bldg., St. Paul, engr. [illegible]

Minn., Minneapolis—City preparing plans for 158-ft. rein.-con. bridge over Lake Street. About $[illegible] W. Cornelius, city engr.

Mont., Great Falls—County Co. Commissioners to build bridges over Missouri River on 9th and 1st Sts. N. About $[illegible] and $[illegible] respectively. Bridges to be built under supervision of State Highway Dept. C. B. Mettler, state bridge engr.

Mont., Ravalli—[illegible] bridge over Bitter Root River.

Mo., Platte City—See "Streets and Roads."

Mo., St. Louis—See "Miscellaneous."

Tex., Orange—[illegible] Co. plans to build bridge over Sabine River at Adams Bluff. About $[illegible]

Okla., Ada—See "Streets and Roads."

Okla., Durant—[illegible] to build bridge over Blue River.

Okla., Haileyville—See "Streets and Roads."

Idaho, Boise—Ada County Commissioners [illegible] bridge over Boise River. [illegible] C. Boise, engr.

Wash., Olympia—[illegible] received on bids building [illegible] C. Canal [illegible] bridge over Deschutes River. [illegible] Aug. 30.

bridges (Continued)

Wash., Tacoma—City preparing plans building viaduct over Chicago, Milwaukee & Puget Sound Ry. Co. slums and yards. W. C. Raleigh, city engr.

Oregon—State Highway Comm., Salem, will soon let contract 120-ft. rein.-con. bridge over Beaver Creek, Beaver, Tillamook Co. 120-ft. Howe truss bridge over Big Applegate Creek, Jackson Co.

Cal., Santa Ana — City retained E. T. Fluharty, engr., Los Angeles, to prepare plans for new Main St. bridge, 4 40-ft. steel spans, cost, $40,000 with sidewalks, $38,200 without sidewalks; also for Hannah St. bridge over Santiago Creek.

Cal., Willows—Glenn and Colusa Cos. plan election to vote on bonds to build bridge over Sacramento River.

B. C., Victoria—Canadian Pacific R.R. asked Bd. Ry. Comrs. to approve plans for bridge over Harbor. About $30,000. W. E. Woodhouse, Montreal, ch. engr.

BIDS DESIRED

N. Y., Thiells—See "Buildings."

N. J., Jersey City—Until Sept. 27, by Bd. Freeholders Hudson Co., improving 14th St. viaduct. Noted June 28.

Ky., Paducah—(Official)—Until Sept. 18, by G. G. Singleton, co. clk., building bridge, 4 80-ft. steel spans, concrete substructure and floors. R. H. Young, engr.

O., Akron—(Official)—Until Sept. 28, by M. Rebel, clk. Summit Co., for North Hill viaduct, rein.-con. Advertised in this issue.

Ill., Rockford—(Official)—Until Sept. 20, by Winnebago Co., building 7 rein.-con. bridges involving 138.7 cu.yd. concrete, 11,218 lb. steel.

Ill., St. Joseph—(Official)—Until Sept. 21, by G. C. Farrelo, co. supt. highways, building 110-ft. steel bridge, rein.-con. abutments involving 127 cu.yd. concrete, 6500 lb. steel. Cost, $11,000. Noted Aug. 30.

Wis., Wausau—(Official)—Until Sept. 19, by city building 200 ft. rein.-con. bridge over Wisconsin River, 60 ft. wide. B. C. Gowden, city engr. Noted Aug. 30.

Ia., Mason City—Until Sept. 17, by Cerro Gordo Co., building 100-ft. pony truss bridge. R. E. Robertson, engr.

Tex., Texarkana—(Official)—Until Oct. 4, by Bd. Comrs. Red River Bridge Dist., building bridge over Red River, near Index. L. Josephus, secy.; advertised in this issue.

Okla., Eufaula—(Official)—Until Sept. 17, by J. P. Ranson, clk. McIntosh Co., building 19 bridges. About $20,666. G. W. Mitchell, co. engr.

Cal., Los Angeles—Until Sept. 24, by Los Angeles Co. Supvrs., building 4 180-ft. span timber highway bridges over San Gabriel River, Anaheim-Telegraph Rd.; 3 180-ft. span timber bridges and 1 60-ft. Howe truss over Rio Hondo Valley Blvd. A. M. McPherron, clk.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★N. Y., Yonkers—City let contract building bridge at School St. and Nepperhan River to J. O. Weston, Radford St., $28,500.

★Pa., Phila.—Pennsylvania R.R. let contract building bridge to connect Petty's Island with Camden, N. J., to A. McMullen, 145 Benz, New York City. Noted June 14.

S. C., Camden—(Official)—Kershaw Co. received low bid building bridge from Ayer & Bros., 156 Greenwood Ave., Atlanta, Ga., $93,000.

★O., Cincinnati — City let contract removing Miami and Erie Canal bridge spanning waterway and building culvert in its place to E. D. Fauver & Co., 10 and 12 Enquirer Bldg., Dayton, $17,000.

★O., Lima—City let contract building bridges to Salt Concrete Co., 427 Lemcke Bldg., Indianapolis, $17,000. Noted Aug. 23.

O., Miami—Troy Co. received low bid building concrete bridge over Stillwater River at Covington from Hannaman Bros., 1665 Kenyon Blk., Detroit, $13,168; steel bridge from Buckeye Bridge Co., Rochester, N. Y., $11,227; Central State Bridge Co., 606 Bosch St., Indianapolis, $14,523; A. S. Fox, 34 Callahan Bank Bldg., Dayton, $14,978. Noted Aug. 16.

★Mich., Flat Rock—Pennsylvania-Detroit R.R. let contract building 3 14-ft. span rein.-con. bridges over Huron River, 2 rel. above Flat Rock, to Hill Bros., London, O.

★Mich., Grand Rapids—See "Streets and Roads."

★Ill., Kankakee—Kankakee and Will Co. Comrs. let contract building rein.-con. arch bridge over Kankakee River to M. & P. Contr. Co., Evansville, Ind., $57,486. Noted Aug. 21.

Minn., Carver—Minneapolis & St. Louis R.R. let contract building bridge to Widell Co., Mankato, $55,000.

★Mo., St. Louis—City let contract building rein.-con. bridge over Bway. at Bellerive Park to Herclotz & Herchert, $64,496. Noted Sept. 6.

★Ark., Ft. Smith—City let contract building bridge over Arkansas River into Sequoyah Co. to H. C. Gass, 615 Beatty Bldg., Houston, Tex., $435,000. Noted June 7.

★Okla., Newkirk—Kay and Noble Cos. let contract building 480-ft. bridge over Salt Fork River to Monarch Eng. Co., Falls City, Neb., $22,000.

★Okla., Stillwater—Payne Co. let contract building bridges to Canton Bridge Co., Welden Ave., Canton, O.

Wash., Otis Orchards—King Co. Comrs., Seattle, received low bids building steel bridge over Spokane River, from Illinois Steel Bridge Co., 53 West Jackson Blvd., Chicago, $37,488 and Missouri Valley Bridge & Iron Co., Leavenworth, Kan., $39,980.

★Ore., Canyon City—City let contract replanking and improving 230-ft. bridge to Coast Bridge Co., Ry. Ex. Bldg., Portland, $12,800.

★California—State Highway Comm., 515 Forum Bldg., Sacramento, let contract building Cottonwood Creek Bridge on State Highway in Shasta Co. to Tieslau Bros., 221 Sharon Bldg., San Francisco, $28,850. Noted Sept. 6.

California — (Official) — State Highway Comm., Sacramento, received low bids building 3 rein.-con. bridges over (a) Castle Creek, (b) Mears Creek, (c) Flume Creek, on State Highway in Shasta Co., from Conners, Green & Co., Castella, (a) $9400, (b) $7900, (c) $2600; A. H. Vogt, Sharon Bldg., San Francisco, (a) $5900, (b) $5980, (c) $1,995; Tieslau Bros., San Francisco, (a) $6300, (b) $8000, (c) $2500.

★Cal., Sacramento—Sacramento and Amador Cos. let contract building rein.-con. bridges on Plymouth Rd. to F. A. Holdner, $21,291.

★N. B., Cambridge—Provincial Government let contract building bridge to D. C. Burpee & Son, Gibson, $12,000.

★N. B., Florenceville—Provincial Dept. of Pub. Wks. let contract building steel bridge to The Concrete Bldrs. Ltd., Church St., Fredericton.

★Que., St. Gerard de Magella—Council let contract building rein.-con. bridge to Kiel & Renaud, St. Paul de Joliette.

STREETS AND ROADS

Proposed Work

R. I., Pawtucket—City voted $25,000 bonds to repair streets. G. A. Carpenter, city engr.

N. Y., Rochester—City Council plans to build cement sidewalks, curb and pave portion Portland St. F. T. Elwood, city engr.

N. J., Camden—City Council authorized $15,000 bond issue to improve State St. L. E. Farnham, city engr. Noted June 14.

N. J., Jersey City—Hudson Co. Blvd. Comrs. rejected bids repaving Hudson Blvd. between Paterson and Hackensack Plankroads.

N. J., Jersey City—(Official) — City Comrs. received no bids July 17, paving portion Hopkins Ave., Belgian block, and Siedler St., asphalt. C. A. Van Keuren, city engr. Noted July 12.

N. J., Newark—City plans paving Renner Ave., asphalt pavement on 6-in. concrete base, also new curb on Wright St., Ave. B. and Ave. A. M. B. Sherrard, city engr.

N. J., Passaic—Bd. Comrs. plan paving Barry Pl., asphalt-bound macadam, and widening River Dr. About $16,900. C. R. Wise, city engr.

N. J., Whitehouse—Whitehouse Twp. plans to improve roads with state aid. About $15,000.

Pa., Phila.—City Council plans to widen portion Richmond Ave. C. E. Albright, city engr.

Va., Martinsville—Henry Co. Supervs. plan to build road from Martinsville to Spray, N. C., via Ridgeway.

N. C., Hendersonville—City plans to pave 3rd Ave. and Azalia St. About $65,000. G. W. Justus, Hendersonville, engr.

N. C., High Point—City plans to issue $99,000 bonds to improve streets.

N. C., Louisburg—City plans to issue $135,000 bonds to improve streets.

N. C., Smithfield—City plans to issue $70,000 bonds to improve streets.

S. C., Charleston—Charleston Co. Comrs. plan election, Oct. 10 (change of date), to vote on $275,000 bond issue for roads and bridges. Noted Aug. 2.

S. C., Charleston—(Official)—Sanitary & Drainage Comn. plans paving 8500 yd., concrete and sheet asphalt, in Charleston Co. J. W. Martin, co. engr.

Ga., Brunswick—Glynn Co. plans election soon to vote on $240,000 bond issue for road improvements.

Ga., Montezuma—City sold $25,000 bonds to pave streets. A. Pew, Atlanta, engr. Noted May 17.

Fla., Lake City—Columbia Co. Comrs. election Sept. 25 to vote on $500,000 bond issue to build roads. Noted Aug. 30.

Fla., Miami—Dade Co. Comrs. plan to build 10 mi. hard surface road in Special Rd. and Bridge Dist. No. 3. Ben Shepard, co. clk.

Fla., Tavares — Lake Co. Comrs. plan election Sept. 25 to vote on $500,000 bond issue for highway work.

Ala., Bay Minette—Baldwin Co. Comrs. plan election Sept. 17 to vote on $75,000 bond issue for road and bridge construction.

Miss., Greenville—Washington Co. Highway Comn. rejected bids resurfacing 150-mi. permanent highway, gravel. E. W. Wood, chn. J. S. Allen, ch. engr. Noted Aug. 23.

Miss., Iuka—Tishomingo Co. voted $30,000 bonds to build Muscle Shoals Highway.

La., St. Martinsville—St. Martins Parish voted $300,000 bond issue for gravel roads throughout parish.

Tenn., Knoxville—See "Water-Works."

O., Ashland—Ashland Co. will sell $165,000 bonds Sept. 17 for road improvements. H. C. Westover, co. aud.

O., Bellaire—City Council plans to pave and improve portions Plum and 35th Sts. A. J. Norton, city engr.

O., Cincinnati—City plans election to vote on $100,000 to improve streets, $50,000 for garbage incinerator and $50,000 for parks and playgrounds.

O., Cincinnati—City Council plans to improve portion Gage St. and Ward and Hill Crest. F. Krug, city engr.

O., Cleveland—City will sell $77,400 bonds Sept. 15 to improve B'way. and Cedar Ave. R. Hoffman, city engr.

O., Cleveland—City plans to build boulevard and parkway along West 25th St. and Detroit Ave., also park between Detroit Ave. and Buckley Blvd. About $200,000. R. Hoffman, city engr.

O., Cleveland Heights — (Warrensville P. O.)—City Council plans $335,000 bond issue to pave and improve several streets. H. H. Canfield, clk.

O., Columbus—City Council authorized $15,000 bond issue to pave Naghten Ave., stone block. H. Maetzel, city engr.

O., Norwalk—Huron Co. sold $31,500 bonds to improve Bellevue-Norwalk Rd.

O., Sidney—Shelby Co. sold $51,500 bonds to improve roads.

O., Willoughby—Town plans to sell $147,500 bonds to pave several streets. C. C. Jenkins, clk.

Ind., Gary—City having plans prepared to resurface Bway., wood block or sheet asphalt, Bridge St., asphalt macadam. W. P. Cottingham, city engr.

Mich., Alma—See "Waterworks."

Mich., Alma—See "Sewers."

Mich., Flint—Genesee Co. soon lets contract building gravel roads. About $50,000.

Mich., Hastings—Bd. Rd. Comrs. Barry Co. plan to build 1-mile 9-ft. state reward gravel roadway northwest of Nashville.

Mich., Kalamazoo—Bd. Superv. Kalamazoo Co. appropriated $12,500 toward highway into Camp Custer, 1¼ mi. long, 16 ft. wide, concrete. Highway will be constructed by State Highway Dept. at cost of $25,000.

Streets and Roads (Continued)

Mich., Pontiac—Oakland Co. plans to improve and pave Springfield Pike.

Ill., Amboy—City soon lets contract 6000 sq.yd. brick pavement on Mason St. About $16,000. F. W. Leake, city engr.

Ill., Murphysboro — Jackson Co. voted $340 000 bonds to build 200 mi. hard-surfaced roads.

Ill., Rock Island—City passed ordinance to pave portions 18th, 15th, West 17th Sts. and 4th Ave. W. Treichler, city engr.

Ill., Springfield—City plans paving Woodland Ave. W. D. Seeley, city engr.

Wis., Green Bay—City plans election to vote on $175,000 bond issue for road construction. F. A. Torkelson, city engr.

Ia., Burlington—City Council plans paving South Main St. About $10,642. C. E. Waterhouse, city engr.

Ia., Minden—City plans paving Main St. from business district to Louisville and Atlantic R.R. depot.

Minn., Minneapolis—Hennepin Co. Comrs. plan to sell $427,000 bonds to pave Lyndale Ave. and construct 10-mi. hard-surfaced road to connect with Jefferson Highway at Lakeville.

Minn., Minneapolis—City plans $225,000 bond issue to widen Nicollet and Hennepin Aves. F. W. Capelin, city engr.

Kan., Beloit—Mitchell Co. plans building 14 mi. concrete road from here to Sampson. F. D. Head, co. engr.

Neb., Central City — City sold $25,000 bonds to pave streets.

Neb., Columbus—City soon lets contract constructing curb, gutters and sewers. About $23,000. Noted Sept. 6.

Mont., Butte—Silver Bow Co. Comrs. plan to pave portions South Montana St., bitulithic. About $16,493.

Mo., Greenville—Wayne Co. voted $200,000 bond issue for good roads.

Mo., Platte City—Platte Co. voted $20,000 bonds to build roads and bridges in Parkville Special Rd. Dist. Noted Aug. 23.

Mo., St. Joseph—City rejected bids paving portions King Hill Ave., sheet asphalt. New bids. Noted Aug. 16.

Mo., St. Louis—See "Miscellaneous."

Arkansas—State Highway Comn., Little Rock, plans to build 2 roads. About $135,000.

Ark., Hot Springs — Garland Co. had plans prepared for 8-mi. road, partly concrete. About $90,000.

Ark., Morrillton—Conway Co. plans to build 8-mi. road between here and Perry Co. line. About $45,000.

Tex., Dallas—Dallas Co. Comrs. soon lets contract resurfacing Richardson Rd., 5 mi., and California Rd., 2½ mi.

Tex., Houston—Harris Co. soon receives bids resurfacing 236 mi. roads. About $275,000.

Tex., Oakville—Live Oak Co. issued $70,000 bonds for road work. W. W. Caves, co. judge.

Tex., Port Lavaca—Calhoun Co. Rd. Dist. No. 2 will sell $75,000 bonds to build new roads and improve old ones. Noted Aug. 23.

Tex., San Angelo—Tom Green Co. Comrs. plan $250,000 bond issue to improve roads.

Okla., Ada — (Official) — City defeated $523,000 bond issue to pave streets and build bridges. Noted Aug. 30.

Okla., Holdenville — Hughes Co. plans $34,000 bond issue to build roads and bridges in Wattunka Twp

Okla., Oklahoma—Bd. Comrs. plan improving portion 14th, 12th and 11th Sts. and Park Pl. G. V. McClure, city engr.

Idaho, American Falls—Comrs. of Highway Dist. No. 1 Power Co., plan to gravel 10-mi. main highways. About $1000 to $1500 per mi.

Idaho, Boise—Council passed resolution creating Paving Dist. No. 24, involving paving State St., $13,000. C. C. Stevenson, city engr.

Utah, Provo—Utah Co. Comrs. plan 2 sections hard-surface road, about 2½ mi. between American Fork and Pleasant Grove, and 1 on Payson Hill. Noted Aug. 30.

Ariz., Phoenix—Council passed ordinance for paving Monroe, Filmore and McKinley Sts. J. B. Girard, city engr.

Wash., Everett—Snohomish Co. soon let contract building highway from Lowell to Snohomish, about 4 mi., and from Forbes school toward Swan Trail Rd.

Ore., Albany—Linn Co. soon lets contract paving Albany-Jefferson Rd.

Ore., Warrenton—City plans election soon to vote on $45 000 bond issue for paving and improving Beach Rd.

Cal., Hanford — B. Duffield, King Co. surv. preparing plans for 6½-mi. highway.

Cal., Los Angeles—City Council plans to improve portions Ancon, 2nd and Diamond Sts. A. C. Hensen, city engr.

Cal., Stockton—San Joachim Co. plans to improve 5 mi. Borden Rd. F. E. Quail, co. surv.

Calif., Taft—City rejected bids paving, curbs and sidewalks. New bids. Noted Aug. 30.

BIDS DESIRED

N. Y., Newburgh—(Official)—Until Sept. 24, by H. Wilson, city mgr., paving and curbing Liberty St. Advertised in this issue.

New Jersey—Until Sept. 25, by State Highway Comn., Trenton, paving Nichols Ave., New Brunswick, 4000 sq.yds. surface pavement, concrete. A. Atkinson, New Brunswick, engr.

N. J., Newark—Until Oct. 15, by City, paving Vanderpool St. M. R. Sherrard, city engr.

Fla., Miami—Until Sept. 20, by City Council, paving, grading, curbing and guttering involving 24,325 lin.ft. curb, 35,040 lin.ft. gutter, 37,433 cu.yd. grading, 186,164 sq.yd. paving and 115,090 gal. road oil. W. B. Moore, city clk.

Ala., Oneonta—Until Oct. 11, by Blount Co. Comrs. grading and draining portions Huntsville Rd., 5.3 mi., including 16,862 cu.yd. excava., 50 cu.yd. rock excava., and 5 acres clearing and grubbing.

La., New Orleans—(Official)—Until Sept. 25, by W. J. Hardee, city engr., paving, installing sub-surface drains, curbs, gutter bottoms, etc., on several streets.

O., Bowling Green—(Official)—Until Oct. 6, by J. E. Shatzel, secy. bd. trustees, Bowling Green State Normal College, 3500 sq.yd. paving, 10,000 sq.yd. concrete walk, and grading. L. Brandt, 1900 Euclid Ave., Cleveland, engr.

O., Cincinnati—Until Sept. 20, by Bd. Pub. Serv., improving portion Madison Rd., wood block, paving gutters, brick and balance of roadway with bitulithic, setting granite curbs and constructing necessary addition to water mains. Noted July 26.

Indiana—By Co. Comrs. building roads as follows: Sept. 21: Columbus; 11,074 ft. and 11,294 ft. gravel roads, Flatrock and German Twps. W. H. Scott, aud. Sept. 25: Anderson; 2 rocmac roads, Monroe Twp. E. T. Flahavin, aud.

Ill., Frankfort Heights—(Official)—Until Sept. 17, by City, building 20,000 sq.yd. 6-in. concrete paving. P. B. Wilson, Marion, engr.

Ill., Paris—Until Sept. 17, by Comr. Highways, Hunter Twp., Edgar Co., constructing 3000 lin.ft. gravel road on Heelan Rd. and 3000 lin.ft. gravel on Baldwinsville-State Line Rd.

Ill., West Frankfort — (Official) — Until Sept. 17, by City, for 746 400 sq.yd. 4½-in. 1-course concrete sidewalk. Putman & Moutz, Benton, engrs.

Wis., Racine—Until Sept. 17, by Bd. Pub. Wks., paving 12,939 sq.yd. sheet asphalt, 5136 lin.ft. cement curb and gutter and 4310 lin.ft. concrete curbstone. P. H. Connolly, city engr.

Ia., Seymour—Until Sept. 11, by J. W. Lowry, city clk., building sidewalks, street crossings and alley crossings.

Okla., Newkirk—(Official)—Until Sept. 20, by City, paving, grading and curbing portion of business section. About $45 000. C. I. Pedicord, city engr. Noted Aug. 30.

Utah, Salt Lake City—Until Sept. 17, by City, grading, guttering, curbing, sidewalks and paving on Gilmer Dr. Paving Intersection No. 148 and Sidewalk Extension No. 199. S. Q. Cannon, city engr.

Wash., Everett—Until Sept. 17, by M. Westerlund and Snohomish Co., building Permanent Highways Nos. 11 and 14.

Cal., Riverside—Until Sept. 14, by Bd. Supervs. Riverside Co., improving Yorba St., Corona, involving 750 cu.yd. excava., 2280 lin.ft. shaping roadbed and 568 cu.yd. concrete paving. A. B. Pilch, co. clk.

Cal., San Bernardino—Until Sept. 17, by City Clk., improving South Arrow Head Ave., asphaltic oil wearing surface on 4-in. concrete base. F. Smith, city engr.

Cal., South Pasadena—Until Sept. 17, by V. B. Garwood, city clk., paving Fremont Ave., concrete, 216,000 ft.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Maine** — (Official) — State Highway Comn., Augusta, let contract 4.47-mi. road in Auburne to Ames D. Bridges Sons, Inc., Hazardville, Conn., $68,923.

★**Mass., Boston**—City let contract paving various streets in East Boston, Charlestown, Brighton and Dorchester, sheet asphalt, topeka, bitulithic and filbertine, to Bermudez Co., 246 1st St., Cambridge. About $223,446.

★**Conn., New Haven**—City let contract paving Adeling and Tenman Sts. and Ellisworth Ave., bituminous macadam, Oak and Spring Sts., Davenport and Whaley Aves., sheet asphalt, to C. W. Blakesless & Sons, 58 Waverly St., $99,782; Sachem and Ashmun Sts., national paving, to Franklin Contr. Co., 52 Vanderbilt Ave., New York City, $36,998; Grove St. to Union Paving Co., 119 Lafayette St., Schenectady, N. Y., $15,148; Livingston and Autumn Sts., bituminous macadam to R. D. Daly, 6 Church St., $17,944.

N. Y., Yonkers—City received low bid paving portions South B'way., asphalt block, from J. Kearns, 50 Church St., New York City, $66,749.

★**N. J., Collingswood** — (Official) — Borough let contract resurfacing and improving streets to Collingswood Home Constr. Co., Collingswood. About $27,000. Noted June 28.

★**N. J., Freehold**—Bd. Freeholders Monmouth Co., let contract building Freehold-Smithburg Rd. to Fireproof Realty and Constr. Co., 55 Magnolia St., Jersey City, $36,024; Tennet-Englishtown Rd. to W. H. Flitcroft, Farmingdale, $9664; Holmdel Rd. to C. E. Bird, Red Bank, $16,340. Noted Aug. 30.

★**N. J., Hackensack**—Bergen Co. let contract building Closter Dock Rd. to Traverire & Johnson, Main St., Closter.

★**N. J., Jersey City**—Hudson Co. Blvd. Comrs. let contract resurfacing Hudson Blvd., Bayonne, to C. T. Cavanaugh, 34 West 55th St., Bayonne, $12,000. Noted Aug. 30.

★**N. J., Linden**—Boro Council let contract paving Elizabeth Ave., concrete, to C. H. Winans, Rahway. About $14,878. Noted Aug. 30.

★**N. J., Newark**—City let contract paving Woodland Ave. to Chapman & Lawrence, Newark. About $22,752.

★**N. J., Newark**—Bd. Pub. Wks. let contract improving Paterson-Hamburg turnpike to Heyman & Goodman, 256 B'way., New York City. Noted Sept. 6.

★**N. J., New Brunswick** — (Official) — City let contract paving Hamilton Ave. and Comstock, Empire, Tileston and Condit Sts. to T. H. Riddle, 103 Church St., $43,[illegible]. Noted Aug. 16.

★**N. J., Paterson** — (Official) — Bd. Freeholders let contract paving Midland-Greenwood Lake Rd. in Passaic Co. to Scaife & Sons Co., 52 E. 42d St., N. Y. Paterson. About $15,480. Noted Aug. 9.

★**Pa., Uniontown** — (Official) — Fayette Co. let contract grading Dixon Rd. Brownsville to Allen & Matthews, Connellsville, $47,[illegible]. Noted Aug. 9.

★**Ala., Abbeville**—Henry Co. let contract grading, draining and surfacing 6 mi. state aid road to W. H. Searle & Co., Walker Springs.

★**Ala., Birmingham**—City let contract paving 2nd Ave. to Sullivan, Long & Hagerty, Bessemer, $14,000.

★**Louisiana**—State Highway Comn., New Orleans, let contract building 4 mi. Sugar Cane Highway to A. H. Young & Co., New Orleans. About $78,[illegible]. Noted Aug. 23.

★**Ky., Ludlow**—City let contract paving Hillside Avenue, Highway Improvement Commission to Hooper & Bonnell, 11 Morningside Library Bldg., Cincinnati, $47,[illegible].

Streets and Roads (Continued)

Ohio—State Highway Comm., Columbus, received low bids Sept. 7, bonding roads and bridges as follows: Adams Co., Sect. B, West Union-Hillsboro Rd., grading and paving with water-bound macadam and constructing bridges and culverts; Dalton & Dalton, Winchester, $9,211. Sect. C-2, West Union-Sinking Springs Rd., grading, paving with water-bound macadam and constructing culverts; J. M. Day & Co., Peebles, $8500; Butler Co., Sect. I, Hamilton-Middletown Rd., constructing bridges and culverts, grading roadway and paving with either monolithic brick or rein.-con., monolithic brick, T. J. Connell, Cambridge City, Ind., $76,964; rein.-con., Stroudbeck Bros., Middletown, $67,984; Sect. J, monolithic brick, T. J. Connell, Cambridge City, Ind., $81,874; Delaware Co., Sect. A, Delaware-Prospect Rd., bridges and culverts, grading roadway and paving, rein.-con., J. T. Irwin, Sandusky, $59,499; O'Bryant & Gregg, Marysville, $58,682; Delaware Blue Limestone Co., Delaware, $56,702; bituminous concrete, Federal Asphalt Paving Co., Hamilton, $63,700; Green Co., Sect. I, Wilmington-Xenia Rd., bridges and culverts, grading roadway and paving with water-bound macadam, Wilson Eng. & Constr. Co., Xenia, $55,587; Hancock Co., Sect. A-1, Ottawa-Findlay Rd., grading roadway, constructing bridges and culverts and paving, brick, W. E. Dorsey, Findlay, $47,488; asphaltic concrete, $31,498.67, C. G. Witham, Deshler, $36,500; Johnson Constr. Co., Chicago, Ill., $31,045; Gray Bros., Bowling Green, $31,494; Highland Co., Sect. H, Allensburg-Lynchburg Rd., grading, paving with water-bound macadam and building culverts; C. A. Lunsford, Hillsboro, $11,643; Mahoning Co., Sect. R-1, Akron-Youngstown Rd., grading roadway, constructing culverts and bridges and paving with water-bound macadam; L. H. Young Constr. Co., West Austintown, $12,054; Sect. P, grading roadway and paving with brick; Smith Constr. Co., Youngstown, $24,014; James McCarron & Son, Youngstown, $25,551; L. H. Young Co., $27,483; Mercer Co., Sect. E-1, Fort Recovery-Minster Rd., grading roadway, constructing bridges and culverts and paving with concrete, Burnett & Christian, Rockford, $30,069; Monroe Co., Sect. N, Ohio River Rd., grading and constructing drainage structure, Coshocton Construction Co., $13,181; V. Mango & Co., Niles, $12,100; Muskingum Co., Sect. L, Zanesville-Cincinnati Rd., grading, constructing drainage structure and paving with bituminous bound macadam, J. A. Swingle Co., Zanesville, $15,182; Pickaway Co., Sect. L-1, Lancaster-Circleville Northern Rd., grading roadway, constructing bridges and culverts and paving with water-bound macadam, W. E. Junction, Circleville, $24,930; J. S. Neff, Circleville, $27,859; Carey & McElroy, Ada, $23,722; Portage Co., Sect. V, Akron-Youngstown Rd., grading roadway, constructing bridges and culverts and paving with either bituminous macadam, concrete or monolithic brick, L. Garrett, Kent, concrete, $44,841; monolithic brick, $59,640; Preble Co., Sect. C-2, Hamilton-Eaton Rd., grading, paving with bituminous macadam and constructing culverts, H. W. Curry Co., Eaton, $8117; Hamilton & Bunger, Eldorado, $8098; Ross Co., Sect. N and O, Hallsville-Lancaster Rd., grading roadway, constructing bridges and culverts and paving with monolithic brick, Brooks-Tomlinson & Bryson, Chillicothe, Contract No. 1, $17,488; No. 2, $29,579; Shelby Co., Sect. B-1, Piqua-St. Marys Rd., grading roadway, constructing bridges and culverts and paving with either brick, monolithic brick or rein.-con., Paul Bauer & Bros., Botkins, $24,431; Putman & Shindledecker, Van Wert, $23,158; Stark Co., Sect. G, Navarre-Louisville Rd., grading roadway, constructing bridges and culverts and paving with either bituminous macadam, limestone top course of bituminous macadam, slag top course, Beigle & Wolfe Co., Youngstown, $54,882; Union Co., Sect. B, Marysville-Kenton Rd., grading roadway, constructing bridges and culverts and paving with water-bound macadam, Welch & Jones, Marysville, $25,777; D. Allen, Findlay, $27,479; A. Bumgarner, Marysville, $31,948; Allen Co., Sect. D, Elida-Lima-Shawnee Rd., grading roadway, constructing bridges and culverts and paving with water-bound macadam, C. O. Witham, Deshler, $27,500; W. D. Mustard, Ada, $27,687; C. L. Smith, Lima, $31,815; Scioto Co., Sect. A-1, Jackson-Portsmouth Rd., constructing bridges and culverts, grading and paving with brick on concrete foundation, Kelly-Ryan, Portsmouth, $35,971; Sheridan-Kirk Co., Portsmouth, $35,852.

O., Cincinnati—(Official)—City received low bids paving portion Maple Leaf Ave. from Kirkham Court to 371 West 9th St., $20,348. Noted Aug. 30.

★**O., Cleveland**—Bd. Control let contract paving portions East 125th, 127th, Hulda and Marshall Sts., to Baldwin Bros., 560 Rose Bldg., $42,782; Jefferson Rd. to Rieley Bros., 348 Arcade, $14,234; Sauer Ave. to Cleveland Trinidad Paving Co., Arcade, $11,437. Noted Aug. 23.

O., Columbus—City received low bid paving East Naghten St., from Trinidad Asphalt Paving Co., Guaranty Trust Bldg., St. Louis, $25,273.

★**O., Lakewood**—City let contract paving to Cleveland Trinidad Paving Co., 3409 Trumball St., Cleveland, as follows: Atkins Ave., $9,958; Franklin Ave., $18,039; Merle Ave., $13,438; Lark Ave., $14,924; Kenilworth Ave., $6849; Franklin Ave., $2652; Jackson Ave., $12,218; Thrush St., $11,045.

★**O., Mt. Vernon**—See "Sewers."

★**Indiana**—(Official)—Co. Comrs. let contract building road as follows: Indianapolis, improving road Warren Twp., to Hutton & Harris Constr. Co., Milford, $39,759. Madison, bituminous concrete road, Anderson Twp., Indiana Asphalt Paving Co., Indianapolis, $72,400. Valparaiso, road Center Twp., R. Damass Chisterton, $10,775. Portland, crushed stone road, Wabash Twp., L. P. Fenning, New Corydon, $8676. Rochester, 2 roads, Henry Twp., T. Johnson and D. B. Clevenger, $7875 and $11,800 respectively. Plymouth, Boggs Rd., Walnut Twp., H. L. Short, Lakeville, $5260. Logansport, gravel roads, Bethlehem Twp., O. E. Shafer, Royal Center, $1527. Jefferson, macadam road, Washington Twp., C. W. Dowdle, R. R. Jeffersonville, $4250. Greenfield, William Merlau et al., Rd., D. H. Fatout, Indianapolis, $11,499. Noted Aug. 23.

★**Ind., Leesburg**—City let contract brick paving to Grossnickle Constr. Co., Leesburg, $35,402.

★**Mich., Detroit**—City let contracts grading and paving with asphaltic concrete as follows: Detroit Asphalt Paving Co., McGraw Bldg., Hurlburt Ave., $29,097, Maplewood Ave., $17,773, Hurlburt Ave., $17,778, Cleveland St., $17,755, Waterloo Pl., $4768, Garfield Ave., $10,809, Manistique Ave., $27,103, Central Ave., $16,976, Vinewood Ave., $16,921, Bruckner Ave., $9586, Graham Ave., $8630, Harfield Ave., $7236, Hammond Ave., $6572, Burrel Pl., $5045; Cleveland Trinidad Paving Co., 3409 Trumbull St., Cleveland, Glendale Ave., $15,149, Guilloz St., $14,428, La Belle Ave., $12,318, Cortland Ave., $12,292, Oakman Blvd., $46,050, Blaine Ave., $18,886; J. A. Mercier, 216 Hammond Bldg., Conant Ave., creosoted blocks on 8-in. concrete foundation, Medina curb, $31,785.

★**Mich., Grand Rapids**—Kent Co. let contract 2-mi. concrete road including grading, culverts, and 2 concrete bridges in Plainfield and Alpine Twps. to Terbeek & Bronkhorst, Holland. About $31,994.

★**Mich., Holland**—Town let contract building 1st 9-ft. concrete highway portions Beechwood Rd. to C. Shaap, Zeeland.

★**Illinois**—State Highway Comm., Springfield, let contract paving in Pike Co., Sect. C, waterbound macadam, to Buil & Olson, 1722 Lafayette St., St. Joseph, Mo., $14,438; Cook Co., Sect. I, concrete, to Russell & Ashdown Co., Chicago Heights, $10,453; Sect. S, concrete, Chicago Heights Coal Co., Chicago Heights, $10,744.

★**Ill., Danville**—(Official)—City let contract paving Chester Ave. to Clarke Constr. Co., Danville, $13,238.

★**Ill., Rock Island**—City let contract paving, grading and curbing portion 24th St., brick, to McCarthy Improv. Co., 3rd and Perry Sts., Davenport, $2.30, 40c. and 50c. respectively.

★**Wis., Beloit**—(Official)—City let contract improving Park and Porter Aves. to G. Welch, Beloit, $45,126. Noted July 5.

★**Wis., Clintonville**—City let contract paving several streets to Garvey & Weyenberg, Appleton. About $16,000.

★**Wis., Eau Claire**—City let contract paving portion Wisconsin St. to Cast Stone Const. Co., Eau Claire, $1.48 per sq.yd.

Wis., Milwaukee—City received low bids resurfacing 11,000 sq.yd. National Ave., (a) asphalt with binder, (b) binder, (c) without binder, (d) concrete covering, from Western Constr. Co., (a) $1.68, (c) $1.47; White Constr. Co., 1600 Ry. Ex. Bldg., (b) $1.57; Badger Constr. Co., 601 3rd St., Milwaukee, $1.60; C. J. Moritz, (d) $1.34; Kroening Const. Co., 765 Majestic Bldg., (d) $1.34; Miner Constr. Co., (d) $1.10.

★**Ia., Laurens**—City let contract paving streets to Bryant Paving Co., Waterloo, $45,000.

★**Minn., Gilbert**—St. Louis Co. let contract rolling and surfacing 1-in. Eveleth Rd. to General Contg. Co., 1254 Plymouth Bldg., Minneapolis. About $20,000.

★**Mont., Judith Gap**—City let contract laying sidewalks to J. A. Gudgel Co., Kalispell, $19,955.

★**Mo., Excelsior Springs**—City let contract paving (a) Temple Ave., brick, (b) Dunbar Ave., tarvia, to Young Bros. Constr. Co., North Kansas City, (a) $2.24, (b) 80c.

★**Mo., Lexington**—Lafayette Co. let contract resurfacing 6 mi. macadam road to Albert Hood, Independence. About $20,000.

★**Mo., St. Louis**—Bd. Pub. Wks. let contract paving portion 22nd St., concrete, Missouri Ave. and Penn St., brick, grading 5th Ave. to Land Constr. Co., Ballinger Bldg., oiling portion 17th St. to Skilbred Constr. Co.; Felix St. to Metropolitan Paving Co., 7th and Olive Sts.

★**Ark., Little Rock**—City let contract paving Main, 12th and Maple Sts., Improv. Dist. No. 18 to Norton Constr. Co.

★**Ark., Nashville**—City let contract macadamizing Main St. to Hardin Constr. Co., Hot Springs, $10,000.

★**Tex., Austin**—Travis Co. let contract regraveling Manor Rd., 6 mi., to Baker Bros. & Canion, Austin, $27,000.

★**Tex., Beaumont**—City let contract resurfacing several streets to Uvalde Rock Asphalt Co., Beaumont. About $52,000 to $53,000. Noted Aug. 23.

★**Tex., Houston**—City let contract paving North Main St. to A. M. Chambers Transfer Co., 518 Walnut St. About $17,050.

★**Tex., Vernon**—City let contract paving 1 mi. West Wilbarger St., asphaltic concrete, to General Constr. Co., 506 Farmers and Merchants Bank Bldg., Fort Worth. About $30,000. Noted July 12.

★**Okla., Tecumseh**—Pottawatomic Co. Comrs. let contract building 10-mi. road to C. A. Landon, 225½ West Grand Ave., Oklahoma. About $17,250. Noted Aug. 23.

★**Colorado**—State Highway Comn., Denver, let contract grading and paving 4-mi. road to W. A. Kelly, 822 Gunter Bldg., San Antonio. About $32,000. Noted July 5.

★**Utah, Ogden**—City let contract paving in Dist. No. 126 to P. J. Moran, 52 West 2nd St., Salt Lake City, $26,373.

★**Wash., Vancouver**—Clarke Co. Comrs. let contract building Permanent Highway No. 1-A to United Contr. Co., Northwest Bank Bldg., Portland, as follows: 1st 73 stations, bitulithic, 4-in. concrete base, $26,678; stations 105 plus 60, concrete, $38,486; 73 stations, $24,112; station 105 plus 60, $34,919. Noted Aug. 23.

★**Oregon**—State Highway Comn., Salem, let contracts highway work as follows: Warren Constr. Co., Journal Bldg., Portland, Columbia River Highway from Astoria to Svenson, 14 mi., and from Westport to Svenson, 15½ mi., macadam, $84,737 from Multnomah Co. line to Scappoose, 2¾ mi., bitulithic, $36,678, John Day Highway, Wheeler Co., rock macadam, $15,714; Clark & Flippin, The Dalles, Columbia River Highway from Clatsop Co. line to Globe, 17¾ mi., macadam, $109,891; Oskar Huber, Sherlock Bldg., Portland, Coast Highway, Tillamook Co., 5 mi. grading and paving, bitulithic, $110,645.

★**Ore., Myrtle Point**—City let contract paving 4 street-improvement districts to Dean & Brown. About $10,471. Noted Aug. 23.

★**California**—(Official)—State Highway Comn., Sacramento, let following paving contracts: Contra Costa Co., between Hercules and Eckley, Div. 4, Route 14, Sect. B, to Whitlock & Gorrill, 2709 Parker St., Berkeley; Los Angeles Co., between Castaic School and Kay Ranch, Div. 7, Route 4, Sect. B, to Brashear-Burns Co., Hollywood, R. F. D. 10, Box 90, Los Angeles; Shasta Co., between Sacramento River and Lamoine, Div. 2, Route 3, Sect. C, to J. F. Fitzpatrick, 2625 P St., Sacramento. Noted Aug. 16.

★**Cal., Auburn**—City let contract paving Main St., concrete, to Flinn & Treacy, First Natl. Bank Bldg., San Francisco, $17,100. Noted Aug. 23.

Streets and Roads (Continued)

★**Cal., Corcoran**—City let contract paving Whitley Ave. and installing sewerage system to Federal Constr. Co., Sharon Bldg., San Francisco, $80,426. Noted July 26.

★**Cal., Los Angeles**—City let contract improving portion Emerald St. to Johnson & Grohs, $10,000.

★**Cal., Los Angeles**—City let contract improving Franklin Ave. to Bryant & Austin, 1656 Compton Ave. About $32,785. Noted Sept. 6.

Cal., Los Angeles—City received low bid improving 1st St. from G. H. Oswald, 405 O. T. Johnson Bldg., about $230,000. Noted Aug. 23.

★**Cal., San Diego**—(Official)—City let contract paving 22,146 sq.yd., Sect. 2, Linda Vista Rd., to John Engebretsen, 614 5th St., $75,000. Noted Aug. 9.

★**Cal., San Francisco**—Bd. Pub. Wks. let contracts paving as follows: Raymond Ave., Flinn & Treacy, First Natl. Bank Bldg.; Leland Ave. and Donahue St., H. Cummey, Hearst Bldg.; Raymond Ave., between San Bruno Ave. and Delta St., Fay Improv. Co., Phelan Bldg.; Schwerin St., T. A. Clark, 68 Post St.; Rutland and Visitacion Aves., K. Ehrhart, 660 Market St.; Cora and Delta Sts., S. F. Johnson, Pacific Bldg., 36th Ave., Owen McHugh, Russ Bldg., $29,378.

★**Que., Chicoutimi**—Town let contract 94,000 sq.yd. macadam highway to Provincial Bldg. & Eng. Co., 83 Craig St., W., Montreal, $130,000. Noted June 21.

★**Que., Quebec**—Provincial Highway Dept. let contract building road, to Provincial Bldg. & Eng. Co., 83 Craig St., W., Montreal. Noted July 5.

★**Que., St. Alphonse de Bagotiville**—Town let contract building macadam roads to Provincial Bldg. & Eng. Co., 83 Craig St., W., Montreal, $39,000.

★**Que., St. Dominquedu Jonquires**—Town let contract building macadam highway to Provincial Bldg. & Eng. Co., 83 Craig St., W., Montreal, $40,000.

★**Que., St. Hyacinthe**—City let contract new asphalt and concrete pavements to Bernard Brault, Bank of Toronto Bldg., Maisonneuve. About $136,000.

RAILWAYS—STEAM & ELECTRIC

Proposed Work

New York—New York Central R.R., New York City, applied to Pub. Ser. Comn. for permission to issue $10,000,000 bonds for improvements, etc. G. W. Kittredge, Grand Central Terminal, ch. engr.

Maryland—United Railways & Electric Co., Baltimore, plans to spend $3,000,000 to extend and improve its lines during next 4 years. T. A. Cross, 1005 Continental Bldg., Baltimore, genl. mgr.

Florida—Atlantic Coast Line R.R. purchased 40-acre site near Orlando for switching yards, etc. J. E. Willoughby, Wilmington, N. C., ch. engr.

Ohio—Mahoning & Shenango Ry. & Light Co., Youngstown, plans to issue $500,000 bonds to extend its lines. R. Montgomery, Youngstown, vice pres.

Texas—Gulf, Colorado & Santa Fe R.R., Galveston, appropriated $500,000 to improve system. F. Merritt, Galveston, ch. engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Pennsylvania**—Philadelphia & Reading R.R., Phila., let contract grading Saucon Creek, near South Bethlehem, Pa., extension to freight yard north Saucon Creek and new yards south Saucon Creek, etc., to C. P. Bower, Reading.

★**Ohio**—Columbus, Delaware & Marion Electric Ry., Columbus, let contract relocating 1½ mi. interurban tracks on North High St., to B. F. Patterson, Columbus, $35,000.

★**Kansas**—Missouri, Kansas & Texas Ry. let contract extending yards at Parsons, involving handling of 275,000 cu.yd. earth to L. J. Smith Constr. Co., Kansas City, Mo.

★**Missouri**—Missouri Pacific R.R., St. Louis, let contract grading 4 mi. track from main line of central division to Ft. Logan H. Roots, also for 4 mi. track on cantonment grounds, to J. J. Ball, Little Rock, Ark. About $100,000. Track laying to be done by company's forces.

★**Oklahoma**—Osage Co. and Atchison, Topeka & Santa Fe Ry. let contract track laying, grading, bridging, surfacing, fencing and building necessary appurtenances on line from Bowden to Fairfax, Okla., to Maney Bros. & Co., 304 Empire Bldg., Oklahoma.

★**California**—Bd. Pub. Wks., San Francisco, let contract building outer tracks on Municipal Ry., Market St. above Van Ness Ave., to J. N. Smith, San Francisco, $36,960.

★**California**—Atchison, Topeka & Santa Fe R.R. let contract building 2nd track between Goffs and Bagdad Stations, to Sharp & Fellows Contr. Co., Central Bldg., Los Angeles, $1,600,000.

EXCAVATION AND DREDGING

Proposed Work

Ga., Athens—Drainage—Beaver Dam D. D. No. 1 plans to drain 1600 acres. About $35,732. C. M. Straham, Athens, engr.

Ga., Athens—Drainage—Clarke Co. organized Shoal Creek D.D. No. 2 to drain 450 acres. Will soon receive bids for 8-mi. ditch; floating dipper dredge work. About $13,179. W. D. Alexander, Charlotte, N. C., engr.

Minn., Benson—Ditch—Swift Co. rejected bids building Judicial Ditch No. 4. S. B. Goodhue, engr. Noted Aug. 23.

Minn., Glenwood—Ditch—Pope Co. rejected bids building Co. Ditch No. 15, involving 129,705 cu.yd. excava. About $14,269. Noted Aug. 16.

Minn., Marshall—Ditch—Lyon Co. receiving bids about Nov. 1 building Co. Ditch No. 2, involving 157,000 cu.yd. dry land work. E. R. Shepard, co. aud.

Minn., Morris—Dredging—Stevens Co. receiving bids in October dredging Ditch No. 2, involving 200,000 cu.yd. excavation. C. R. Wollthan, aud.

Tex., Ennis—See "Miscellaneous."

Utah, Enterprise—Enterprise Reservoir & Canal Co. having plans prepared by L. M. Winsor, engr., for irrigation system, dam and reservoir.

Ore., Talent—Irrigation—Talent Irrigation Dist., Jackson Co., voted $600,000 bonds to build irrigation dist.

Cal., Newport Beach—See "Miscellaneous."

Cal., Orland—Ditch—Glenn Co. voted $220,000 bonds for lining 70-mi. ditches with concrete, Orland project.

Cal., Susanville—Canals—Long Valley Irrigation Dist., Lassen Co., preparing plans for building canals to irrigate 28,000 acres. C. E. Grunsky, engr.

B. C., Revelstoke—Dredging—See "Miscellaneous."

Ont., Port Arthur—Dredging—Dominion Government appropriated $130,000 for dredging new Saskatchewan Co-operative and Richardson elevators on north waterfront.

BIDS DESIRED

N. Y., Albany—(Official)—Until Oct. 9, by W. W. Wotherspoon, supt. pub. wks., improving New York State Canals; advertised in this issue.

Ga., Statham—Drainage—Until Sept. 15, by T. J. Sikes, chn. Barbers Creek D.D., Barrow Co., 10-mi. open ditch involving 211,000 cu.yd. excava. W. D. Alexander, Charlotte, N. C., engr.

Ind. Rensselaer—Ditch—Until Sept. 20, by C. J. Hobbs, comr., building Guy Barnard, et al. Ditch, Cause 136, main ditch, 110,400 ft. long, involving 997,452 cu.yd. excavation.

Ill., Lewiston—Drainage—Until Sept. 24, by West Matanzas Drainage & Levee Dist., Fulton Co., laying 7200 ft. 8-in. tile, Lateral No. 1 2200 ft. 18-in. tile, Lateral No. 2; 4200 ft. 16-in. tile, Tile Ditch No. 4. J. H. Wehner, comr. Noted Aug. 30.

Ill., Wabash—(Official)—Drainage—Until Sept. 18, by Drainage Comrs. Wabash Co., repairing and excavating drainage ditches, D.D. No. 15. F. P. Bosecker, comr.

Ia., Clarion—Drain—Until Sept. 17, by F. E. Osier, and Wright Co. building Drain No. 172, involving 15,624 ft. 6- to 30-in. tile.

Ia., Clarion—Drain—Until Sept. 17, by F. E. Osier, and Wright Co. building Drain No. 167, involving 45,600 ft. 6- to 12-in. tile.

Ia. Red Oak—Ditch—Until Sept. 18, by F. Archer and Montgomery Co. building Drainage Ditch No. 1, 8.48 mi. long, involving 307,187 cu.yd. excava., Ditch No. 2, 81,140 cu.yd. excava.

Minn., Walker—Ditch—Until Oct. 1, by C. D. Bacon, and Cass Co., building Judicial Ditch No. 8, involving 15,000 cu.yd. excava., bottom width 4 to 6 ft.; Judicial Ditch No. 9, Cass and Wadena Cos., 114,480 cu.yd. excava., bottom width 4 to 6 feet.

Minn., Willmar—Ditch—Until Oct. 15, by Kandiyohi Co., Co. Ditch No. 37, 17½ mi. long, involving 400,000 cu.yd. excavation. S. Nelson, aud.

Tex., Barstow—Irrigation—Until Sept. 24, by Ward Co. Water Improv. Dist. No. 2, building irrigation canal approximately 70,000 cu.yd. excava., 6 rein.-con. falls involving 111 yd. 1-2-4 concrete, 2564 lb. reinforcing steel with 24-yd. earth excava., 44-yd. back fill. A. H. [illegible], Barstow, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. C., Winston-Salem**—(Official)—Forsyth Co. D.D. No. 1 let contract building drainage system involving 20-mi. canal to Siginon Reinhardt & Rutledge, Stanley, $49,100. Noted Aug. 16.

★**Mich., Saginaw**—Drain—Saginaw Co. let contract digging, cleaning out and widening Swan Creek Drain, to Woolman Constr. Co., Sandusky, Mich.

★**Ill., Cullom**—Livingston Co. let contract building D.D. No. 2, involving 18,643 ft. 8- to 30-in. tile to E. Karr, Paxton and D. G. Cooper, Gibson.

★**Ia., Boone**—Drainage—Boone Co. let contract building Drain No. 137 as follows: Tile to McHose Sand and Tile Co., Boone, $21,000; labor to A. A. Rose, Boone, $16,000.

★**Ia., Emmetsburg**—Drainage—Palo Alto Co. let contract building D.D. No. 98 involving 315,000 cu.yd. excava. and 106,180 ft. 6- to 36-in. tile to A. Eikwold, Emmetsburg and Schultz & Bieck, Clarion.

★**Minn., Breckenridge**—Ditch—Wilkin County let contract building Co. Ditch No. 30 to J. Durzenskin, Barnesville.

★**Minn., Crookston**—Ditch—Polk Co. let contract Co. Ditch No. 119 to Union Drainage Co., Crookston, $21,485.

★**Minn., New Ulm**—Ditch—Brown Co. let contract building Ditch No. 33, involving 131,220 cu.yd. excava. and 171,851 ft. 6- to 32-in. tile to F. Aufderheide, New Ulm, and Mulgrew Sons Co., Dubuque, Ia. Noted Aug. 30.

★**Minn., Owantonna**—Ditch—M. J. Parcher, aud. Steele Co., let contract building Co. Ditch No. 5, involving 84,238 cu.yd. excava. to Ideal Cement Tile Co., and Williams & Colloway, both of Owantonna. About $51,450. Noted Aug. 9.

★**Minn., Red Lake Falls**—Ditch—Red Lake Co. let contract building ditch to J. C. Parker, Bemidji, $25,242.

★**Minn., Willmar**—Ditch—Kandiyohi Co. let contract Co. Ditch No. 38 to Minnesota Constr. Co., 339 Plymouth Bldg., Minneapolis, $21,695.

★**Wyo., Worland**—Drainage—Washable Co. let contract laying 75,000 ft. 8- to 18-in. tile, Worland Bench D.D., to Linstrom & Oren, Worland.

★**Ark., Perry**—Drainage—Perry and Conway Cos. let contract building Cypress D.D. to E. H. Hahn, 833 Saving Trust Bldg., Little Rock, $65,000.

★**Cal., Richmond**—Dredging—City let contract dredging harbor and filling in behind bulkhead to Richmond Dredging Co., Monadnock Bldg., $44,500. Noted Aug. 30.

INDUSTRIAL WORKS

Proposed Work

N. H., Portsmouth—Rockingham County Light & Power Co., 12 Pleasant St., had plans prepared by H. M. Hope, engr., 131 Devonshire St., Boston, for addition to power plant. About $150,000.

Mass., Boston—E. J. Seibel, 14 Thomas St., has received bids for 4-story brick and concrete garage, Charles St. About $[illegible]. Eng. F. A. Norcross, 48 Cornhill St.

N. Y., Brooklyn—Hartridge & Briggs Co., 14 Hall St., had plans prepared by O. M. Langdon, archt., 261 Park Ave., New York City, 4-story, 62 x 100 ft. addition to cold storage plant and packing house. About $[illegible].

N. Y., Buffalo—[illegible] Parking Co., 785-91 William St., has taken preparation by Hamlin & Mellard, archts., 30 Van Buren St., Chicago, 4-story brick and stone auto packing house and office building, Fillmore Ave. and William St.

N. Y., New York—[illegible], Wm. J. Palmer St., plans [illegible] for extensions and improvements.

N. J., Kearney—(Arlington P. O.)—[illegible] Meter Co., Highland Park, Mich., having plans prepared for a 4-story, 100 x 450 ft. [illegible] extension, steel frame, [illegible] Cement Gun and Hardware Floors Co., Flatiron Bldg., New York, engr.

Industrial Works (Continued)

N. J., Newark—Crocker-Wheeler Co., 57 Film St., plans 3-story, 100 x 100-ft. factory, rein.-con., 4th Ave. and 12th St. About $[illegible].

N. J., Plainfield—W. Scott Printing Machine Co., South Ave., had plans prepared by Levering & Garrigues, archts., 552 West 23rd St., New York City, for an addition to its plant. About $100,000.

Pa., Phila.—W. Lee, 6th Ave. and Arch St., had plans prepared by Ballinger & Perrot, archts., 17th and Arch Sts., 2-story ice manufacturing plant and storage building, 10th and Callowhill Sts. About $[illegible].

N. C., Navassa—Morris Fertilizer Co., 801 3rd Natl. Bank Bldg., Atlanta, having plans prepared by P. S. Gilchrist, engr., Charlotte, 3 buildings, 150 x 200-ft., 175 x 350-ft., 80 x 100-ft., mill and brick construction. About $125,000.

Ga., Atlanta — American Agricultural Chemical Co., Empire Bldg., plans 6 buildings. About $50,000. E. F. Daniel, 625 Empire Bldg., mgr.

Ala., Mobile—Gulf, Mobile & Northern Ry. plans 3 piers and warehouses, rein.-con. and steel. About $1,000,000. B. V. Wright, Laurel, Miss., ch. engr.

O., Akron—Sanitary Milk Co. receives bids about Dec. 1, 2-story, 60x110-ft. milk depot. About $85,000. Practical Eng. Co., 535 Akron Savings & Loan Bldg., archts.

O., Berea—New York Central and Cleveland, Cincinnati, Chicago & St. Louis R.R. plan large yards and buildings here. C. A. Paquette, Cincinnati, ch. engr.

O., Canal Fulton—Fulton Pitt Car & Mfg. Co., Canal Dover, increased its capital stock from $150,000 to $400,000 and will enlarge its plant.

O., Cincinnati—P. W. Drackett & Sons Co., Pickering Bldg., had plans prepared by R. E. Rostrom, archt., Pickering Bldg., for concrete chemical plant Spring Grove Ave. and Winton Pl. About $150,000.

O., Cleveland—General Electric Co., Nela Park, plans 145 x 266-ft. steel and concrete [illegible] factory and warehouse, 1131 East 152nd St. About $160,000. G. H. Johnson, 1125 Citizens Bldg., archt.

O., Cleveland—Standard Oil Co., East Ohio Gas Bldg., soon lets contract concrete and steel printing plant at 715 Hamilton Ave. About $75,000. A. J. Watterson, East Ohio Gas Bldg., archt.

O., Columbus — Davis-Watkins Dairymen's Mfg. Co., 19 South La Salle St., Chicago, incorporated with $4,500,000 capital stock, plans large branch warehouse here.

O., Dayton—Citizens Motor Car Co., 7th and Main Sts., soon lets contract 2-story 75 x 175-ft. garage and salesroom. About $75,000. A. Pretzinger and E. Musselman, 1126 Riebold Bldg., archts.

O., Kent—Mason Tire & Rubber Co. had plans prepared rein.-con. factory addition. About $150,000. W. C. Owen, 1906 Euclid Ave., Cleveland, archt., soon receives bids.

O., Wellington—Security Tire & Rubber Co., Cleveland, incorporated with $1,000,000 capital, plans factory here.

Ind., Miller—International Airship Corp., Gary, plans 1-story, 100x100-ft. factory and power house near Lake Michigan. About $250,000. W. H. Penyn, Jr., archt., 122 South Michigan Ave., Chicago, soon receives bids.

Mich., Battle Creek—W. D. Farley, 37 East Main St., R. J. Owen, 303 Post Bldg., and H. S. Kneeland, 47 Orchard St., plan 2-story, 111 x 218-ft. public garage. About $[illegible]. W. J. Morehouse, 343 South Dearborn St., Chicago, archt.

Mich., Detroit—Leonard Storage Co., 596 Jefferson St., East Detroit, plans 5-story, 100x100-ft. brick warehouse on Woodward Ave. About $[illegible]. S. H. Dunford, c/o owner, archt.

Mich., Detroit—Newton Roof Co., 1057-63 14th Ave., had plans prepared by Mildner & Eisen, archts., 934 Hammond Bldg., 5-story, 140 x 340-ft. packing plant. T. E. Newton, pres.

Ill., Chicago—Fitzpatrick Bros. had plans prepared for soap factory. About $[illegible]. J. J. Fitzpatrick, 1316 West 22nd St., pres. W. O. Uffendell, 39 South State St., archt., soon receives bids.

Ill., Chicago—Hotel La Salle Co. had plans prepared for 7-story, 80 x 140-ft. garage and storage building. J. W. Stevens, Madison and La Salle Sts., pres. Holabird & Roche, 104 South Michigan Ave., archts., soon received bids.

Ill., Chicago—Robb Motor Co., c/o A. P. Dippold, archt., 4747 Cottage Grove Ave., plans to build public garage. About $50,000.

Ill., Chicago—Louis Schentnitz, Jackson Blvd., plans 7-story brick factory, 1032 Kingsburg St. About $150,000. J. P. Coning Eng. Co., 30 North La Salle St., engrs.

Ill., Peoria—Mackemer Motor Co., 715 Main St., plans 2-story, 100 x 150-ft. garage, 7th and Franklin Sts. About $50,000. B. L. Hulsebus, archt., 1001 Jefferson Bldg., soon receives bids.

Wis., Milwaukee—A. F. Gallun & Sons Co., 1000 North Water St., plans addition and alterations to plant. About $75,000. Brust & Philip, 506 Free Press Bldg., archts.

Wis., Milwaukee—Shafrin-Schmitz & Co., 3102 Cherry St., plans 3-story, 40x42-ft. brick and concrete warehouse. L. J. Laskin, Archt., 310 Caswell Blk., soon receives bids.

Wis., Milwaukee—Welch Investment Co., Germania Bldg., soon lets contract 5-story, 75x150-ft. rein.-con. and brick garage and service station, 704-708 Grand Ave. About $60,000. H. C. Hengels, 1st Natl. Bank Bldg., archt.

Ia., Sioux City—Armour & Co., 215 Douglas St., plans improvements to packing plant. About $500,000. J. E. O'Hern, Chicago, genl. supt.

Mont., Anaconda—Y. M. C. A. rejected bids for 2-story, 98x126-ft. rein.-con. building. About $200,000. New bids.

Okla., Oklahoma—Kansas City Wholesale Oil Co. plans oil-compounding factory here. About $100,000. J. N. Bowen, 509 Main St., Kansas City, Mo., mgr.

Que., Cedars—(Official)—Cedars Rapids Hydro-Electric Development Co. having plans prepared by Unit Constr. Co., engrs., Title Guaranty Bldg., St. Louis, Mo., 70 x 130 x 600-ft. steel and rein.-con. addition to power house.

Que., Maisonneuve — Tetrault Shoe Co., 331 Demontigny St., E., Montreal, plans factory here, brick and rein.-con. About $150,000.

Ont., Tilbury—Hessco Electric Co., 210 Adelaide St., W., plans 5-factory buildings, brick and rein.-con. About $200,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. H., Claremont**—Sullivan Machinery Co. let contract 3-story, 80 x 121-ft. rein.-con. factory, also 2 smaller additions to J. H. Mendell Eng. & Constr. Co., 208 Granite St., Manchester.

★**Mass., New Bedford**—National Spun Silk Co., Trenton, N. J., let contract 4-story silk mill to B. F. Smith Co., 22 Mason Lumber Yards, Newell Ave., Pawtucket. About $400,000.

★**Mass., New Bedford**—New Bedford Gas & Edison Light Co., Ft. Coffin St., let contract 60 x 90 ft., brick, concrete and steel addition to power plant to Stone & Webster Eng. Corp., 147 Milk St., Boston, $500,000.

★**N. Y., Flushing**—New York & Queens Electric Light & Power Co., 444 Jackson Ave., Long Island City, let contract 2-story, 94 x 103-ft. substation to J. H. Deeves & Bro., 103 Park Ave., New York City, $50,000. Noted Aug. 23.

★**N. Y., New York**—Todd Shipyard Corp., 15 Whitehall St., let contract 3-story, 100 x 150-ft. storage building, brick, 3rd Ave., near 24th St., to G. E. Tilt & Co., 90 West Bway., $72,000.

★**N. Y., S. I., New Brighton**—Tanner Gross Co., Inc., 25 Beaver St., New York City, let contract, 3-story, 112 x 120-ft. cereal mill and warehouse, to Industrial Eng. Co., 30 Church St., New York City, $125,000. Noted Aug. 30.

★**N. J., Plainfield**—W. Scott Printing Machine Co., South Ave., let contract factory, storage and office buildings to Levering & Garrigues, 552 West 23rd St., New York City, $100,000. Noted Sept. 6.

★**O., Cincinnati** — Laidlow Works of Worthington Pump & Machinery Co., 1504 1st Natl. Bank Bldg., let contract 6-story, 60 x 80-ft. addition, Elmwood Pl., and Carthage Ave., to B. Baldwin, 72 Perry Bldg., $100,000. Noted June 21.

★**O., Cleveland**—Colonial Woolen Mills Co., West 65th and Barber Sts., let contract 3-story 80x100-ft. brick factory to H. G. Slatmeyer Constr. Co., 203 Lakeside Ave. Noted Aug. 16.

★**O., Cleveland**—Gillman Printing Co., 625 St. Clair Ave., let contract remodeling 4-story factory to H. G. Slatmeyer Constr. Co., 203 Lakeside Ave. About $65,000.

★**O., Cleveland**—E. H. Hahn, West 65th St., let contract 60x120-ft. brick factory to H. G. Slatmeyer Constr. Co., 203 Lakeside Ave. About $50,000.

★**O., Cleveland**—Lang Body Co., Garfield Bldg., let contract 1- and 3-story, 60 x 160-ft. concrete and steel aeroplane plant, 3080 West 106th St. to Fath Constr. Co., 5703 Euclid Ave., $75,000.

★**O., Cleveland**—National Malleable Castings Co., let contract power house, boiler room and carpenter machine shop, Quincy Ave. and Woodmill Rd., to F. W. Mark Constr. Co., 344 Leader-News Bldg., $90,000.

★**O., Dayton**—Cooper Medicine Co., 309 East 1st St., let contract 5-story, 50 x 196-ft. factory to F. A. Requarth Co., Monument Ave. and Sears St., $175,000. Noted Sept. 6.

★**Mich., Huron**—Grand Trunk R.R., c/o J. B. Gaut, supt. constr., 112 Adams St., Chicago, let contract 1-story, 160x365-ft. freight-car repair shop to J. Stewart Co., Westminster Bldg., Chicago, $150,000.

★**Ill., Galesburg** — McCollum Bros., 75 South Chamber St., let contract 3-story, 40 x 57-ft. candy factory to Monmouth Galesburg Constr. Co., Galesburg, $60,000.

★**Wis., Milwaukee**—Globe Seamless Steel Tube Co., 37th Ave. and Burnham St., let contract 1-story, 50x500-ft. brick, steel and concrete tube shop addition to Riesen Bros. Co., 1008 1st Natl. Bank Bldg.

★**Wis., Racine**—Chicago, Racine & Milwaukee R.R. let contract 6-story, 50 x 156-ft. rein.-con. factory for dock, storage and light manufacturing purposes to G. W. Stiles Constr. Co., 209 South La Salle St., Chicago.

★**Ia., Cedar Rapids**—National Oats Co. let contract 3 warehouses and storage tanks, 6-story, brick and rein.-con., to McDonald Eng. Co., 547 Monroe St., Chicago. $1,000,000.

★**Cal., Los Angeles**—Stauffer Chemical Co., 624 California St., San Francisco, let contract 1-story, 116x240-ft. brick and concrete chemical factory to Leonard & Peck, H. W. Hellman Bldg., Los Angeles. About $100,000.

★**Ont., Fort William**—Davidson-Smith Co., Grain Ex. Bldg., let contract 1-story, rein.-con. grain elevator to Barnett & McQueen, 203 Cuthbertson Blk. About $100,000.

★**Ont., Fort William**—N. M. Paterson Co., Grain Ex. Bldg., let contract rein.-con. grain elevator with 500,000 bu. capacity to Fegles-Bellows Co., Grain Ex. Bldg. About $200,000.

BUILDINGS

Proposed Work

Mass., Northampton—College—Smith College plans, 2-story, 45 x 80-ft. About $65,000.

Conn., Hartford—School—Bd. Educ. had plans prepared by Whiton & McMahon, archts., 36 Pearl St., 2-story addition. About $75,000. A. Mason, secy.

Conn., South Norwalk — School — Bd. Educ. having plans prepared by W. H. Beers, archts., 17 Madison Ave., New York City, 2-story 50 x 100-ft. brick and stone Flax Hill Rd. About $50,000.

N. Y., Binghamton—Freight House—Delaware, Lackawanna & Western R.R. had plans prepared, freight house, team yards, and new trackage system on Henry St., between Fayette and Liberty Sts. About $200,000. G. J. Ray, Hoboken, N. J., ch. engr.

N. Y., Buffalo—Museum—Buffalo Society of Natural Science plans 2-story. About $200,000. Green & Wicks, 110 Franklin St., archts.

N. Y., Long Island City—Theatre—Wilmer & Vincent Theater Co., 33 West 42nd St., New York City, having plans prepared by E. C. Horn & Sons, archts., 1467 Bway., New York City, 2-story, 158 x 268-ft., Jackson Ave. About $160,000.

N. Y., New York—Hotel—H. C. Butler c/o W. A. White & Sons, 46 Cedar St., had plans prepared by Ford, Butler & Oliver, archts., 101 Park Ave., for alterations to 6-story, 197 x 205-ft. brick hotel, 4th Ave. between 32nd and 33rd Sts. About $60,000.

N. Y., New York—Office—New Jersey Zinc Co., 55 Wall St., plans, 7-story, Front St. and Maiden Lane. H. J. Hardenburgh, 17 West 34th St., archt.

Buildings (Continued)

N. Y., New York—Store—R. H. Macy & Co., 6th Ave., 34th and 35th St., plans 17-story addition, 149-151 West 34th and 146-148 West 35th Sts. About $500,000. R. D. Kohn, 56 West 45th St., archt.

N. Y., Rochester—Fire House—Bd. Contract & Supply, City Hall, plans brick and steel fire house on Franklin St. J. A. Crane, city clk. About $50,000.

N. Y., Syracuse—School—Bd. Educ. had plans prepared by G. Wright, archt., Union Bldg., and H. C. Allen, city engr., rebuilding Porter School. About $150,000. G. M. Fairchild, pres.

N. Y., Whitesboro — High and Grade School—Bd. Educ. plans. About $80,000. J. Edwards, pres.

N. J., Freehold—Hospital—Bd. Freeholders acquired 104 acres land and plan to build tuberculosis hospital on site to cover about 30 acres.

N. J., Jersey City—School—City Comn. appropriated $180,000 for School No. 4, 8th St. M. M. Fagan, City Hall, comr. bldgs.

N. J., Linden—School—Bd. Educ. having plans prepared by J. N. Pierson & Sons, archts., Raritan Bldg., Perth Amboy, 2 additions to School No. 2, Wood Ave. About $50,000. F. McGilvray, pres.

N. J., Paterson—School—Bd. Educ. had plans prepared, 3-story, 200x200-ft., on B'way. About $375,000. H. B. Crosby, 1st Natl. Bank Bldg., archt.

Pa., McKeesport—Club—L. O. O. M. No 41 had plans prepared by J. A. Lohman & Sons, archts., Monesseh, 3-story, 41 x 100-ft. About $50,000.

Pa., Phila. — (Official) — Bank — Guarantee Trust & Safe Deposit Co., 421 Chestnut St., having plans prepared by Peuckert & Wunder, archts., 310 Chestnut St., 1-story, brick, stone and concrete, 9 South 52nd St.

Pa., Phila.—Office—Mellon Estate plans 8-story steel, concrete and brick, 1710-12 Market St. Sutton & Stephenson, 1317 Washington St., archts.

Pa., Phila.—Theater and Store—D. Berg, Delaware Ave., and Tasker St., had plans prepared for alterations to 4- and 6-story, 90 x 200-ft. building. About $100,000. H. J. Krapp, 114 East 16th St., New York City, archt.

Pa., Uniontown—Church and Parsonage—St. John Baptist Congregation had plans prepared, 1-story, 45 x 106-ft. About $50,000. V. Dorba, 100 Walnut St., pastor. H. C. Frank, House Bldg., Pittsburgh, archt.

Md., Baltimore — Theatre — Homewood Amusement Co., c/o G. A. Finch, 1127 Munsey Bldg., plans, 1-story, 73 x 125-ft. About $150,000. Blake & Zink, Equitable Bldg., archts.

Va., Clifton Forge—Chesapeake & Ohio R.R. Y. M. C. A. had plans prepared, 2-story, 100 x 125-ft. building. About $50,000. E. D. Foster, secy. L. E. Jallade, 37 Liberty St., New York City, archt.

Ky., Covington — Schools — City election Nov. 6th, to vote on $250,000 bond issue to build schools. W. A. Shore, business director.

O., Cleveland—Hotel—Tenbusch Realty Co., 1836 Euclid Ave., plans, Euclid Ave. and 59th St. About $500,000. H. T. Jeffery, 406 Union Bldg., archt.

O., Cleveland — Jail — Cuyahoga Co. to vote, Nov. 6, on $1,250,000 bond issue to build jail.

O., Cleveland—Orphanage—Loyal Sons of Italy plans to build. About $300,000.

O., Cleveland—Store, Office and Market—E. A. Stotter pres. Lake Erie Refining Co., 809 Leader News Bldg., had plans prepared by S. H. Weis, archt., 1032 Schofield Bldg., 2-story, terra cotta and tile, Clifton Blvd. and West 117th St. About $125,000.

O., Cleveland—Terminal — Pennsylvania R.R. plans to build in vicinity of Woodland Ave. and East 79th St. About $2,000,000 to $3,000,000. A. C. Shand, Broad St. Sta., Phila., ch. engr.

O., Cleveland—Theater—A. A. Silberberg, Cleveland, plans, 42x165-ft., at West 85th St. About $65,000. A. F. Janowitz, Permanent Bldg., archt.

O., Cleveland — Theater — Stark Amusement Co., c/o S. Silberberg, 533 The Arcade, had plans prepared, 1-story, 42 x 160-ft. moving picture theater. About $50,000. F. Janewitz, Permanent Bldg., archt.

O., Columbus—School—Bd. Educ. plans $2,000,000 bond issue for new schools and additions to old ones.

O., Dayton—Bank, Store and Office—Germania Bldg. Assn. had plans prepared, 9-story, 80 x 99-ft. C. Gohn, 207 North Lexington Ave., chn. bldg. com. Peters, Herman & Brown, 1126 Reibold Bldg., archts., will soon receive bids.

O., Norwood — High School — Bd. Educ. plans to sell $120,000 Sept. 24, to build high school. H. Ryland, clk.

Mich., Detroit—Club, Store and Apartment—Chinese Syndicate had plans prepared by Wheelock & Shank, archts., 64 Randolph St., 4-story, 125 x 200-ft. About $60,000.

Ill., Champaign—Hotel—C. F. Hamilton, Neil and Church Sts., had plans prepared. About $300,000. H. H. Richards, 327 South La Salle St., archt., will receive bids about Sept. 25.

Wis., Milwaukee — Hospital—Milwaukee Co. plans children's hospital addition to Muirdale Sanitarium. About $90,000.

Ia., Davenport—Club House—Lend-a-Hand Club had plans prepared by Clausen & Krause, archts., Central Bldg., 3-story, 120x123-ft., Main St., rein.-con. About $125,000.

Ia., Des Moines—Bath House and Pools—City having plans prepared by F. E. Wetherell, archt., 202 Youngerman Bldg. About $250,000.

Ia., Des Moines—College—Northern Iowa Baptist Assn. plans. About $1,500,000.

Minn., Minneapolis — School — Bd. Educ. having plans prepared by Rose & Harris, engrs., Auditorium Bldg., addition and alteration. About $65,000.

Minn., Owatonna—High School—Dist. Q, Bd. Educ. soon lets contract, 4-story. About $150,000. N. Jacobson, Owatonna, archt. Noted Apr. 26.

Minn., South St. Paul—Exchange—Northwestern Telephone Co., 39 East 5th St., St. Paul, receives bids about Sept. 18, 2-story, 42x70-ft. brick and rein.-con. About $60,000. A. H. Stem, 601 Endicott Bldg., St. Paul, archt.

Kan., Manhattan—Hotel—R. G. Gillett plans 3-story, 50x150-ft addition. About $50,000.

Neb., Blair—Store—Rudge & Guenzel, 11th and O St., plans 6- and 7-story, 130x142-ft., brick, on North St. About $500,000. G. H. Ellsworth, 1923 Cherry St., archt.

Neb., Franklin—Hotel—Nebraska Bldg. & Investment Co. had plans prepared by J. W. Salmon, archt., Orpheum Bldg., Lincoln, 3-story. About $50,000. J. Schaff, 120 South 12th St., pres.

Neb., Omaha—Store, Office and Theater—World Realty Co., 15th and Douglas Sts., having plans prepared, 4-story, 100x132-ft., rein.-con. or steel. About $200,000. W. R. McFarland, 1410 Farnam St., secy.

Neb., Omaha — Telephone — Nebraska Telephone Co., 18th and Douglas Sts., had plans prepared, 15-story, 92x132-ft., brick and tile. About $750,000. G. B. Prinz, 1033 Omaha Natl. Bank Bldg., archt.

N. D., Minot—Bank and Office—Brush-McWilliams Co. had plans prepared by Tulgren & Son, archts., 1st Natl. Bank Bldg., Milwaukee, 6-story, 25 x 140-ft. About $50,000. H. J. Halvorson 46 Main St., South Minot, vice-pres.

Mo., Kansas City — Parochial School — Parochial School for Dominican Fathers had plans prepared, 2-story, 100 x 128-ft. About $85,000. White & Dean, 311 Bellefontaine St., archts., soon receive bids.

Mo., St. Louis—See "Miscellaneous."

Mo., St. Louis—Church—Maplewood Baptist Congregation plans to build on 160x168-ft. site in Zephyr Hills, Maplewood Dist. About $50,000.

Wash., Seattle—School—School Dist. No. 1 plans addition, 4715 46th Ave., S. About $75,000. E. Blair, Central Bldg., archt.

Ore., Portland—Medical School—University of Oregon soon lets contract. About $115,000. Lawrence, Holford, Whitehouse and Foulhoux, archts. Noted July 5.

Cal., San Francisco—Schools—City election Nov. 27 to vote on $2,500,000 bond issue to build schools. James Rolph, Jr., mayor.

BIDS DESIRED

N. Y., Thiells—(Official)—Cottages—Until Sept. 28 by F. A. Vanderlip, pres. bd. mgrs., Letchworth Village, building 8 cottages; advertised in this issue.

N. Y., Thiells—(Official)—Home—Until Oct. 5 by F. A. Vanderlip, pres. bd. mgrs., building attendent's home and service building, underground piping and conduit, underground sewer and water connections, bridge over creek; advertised in this issue.

Pa., Abington—(Official)—High School—Until Sept. 17, by Bd. Educ., for 3-story addition. About $50,000. Heacock & Hokanson, 1218 Chestnut St., Phila., archts. Noted Aug. 30.

Va., Norfolk—(Official)—Office and Loft—Until Dec. 1, by R. E. Mitchell, archt., Greenwood Bldg., 6-story 130x144-ft. concrete, for Tazwell Realty Co., Tazwell St. About $300,000. Noted Aug. 30.

O., Cleveland Heights—(Warrensville P. O.)—Grade and High School—Until Sept. 15, by F. Warner, archt., 718 Hippodrome Bldg., Cleveland. About $180,000. L. K. Bryan, 3867 Parkdale Ave., Cleveland, secy. bd. educ.

Ind., Vincennes—Church—Until Sept. 15, by First M. E. Congregation, 3-story, 67 x 115-ft. About $75,000. L. C. Bentley, 416 Perry St., pastor. L. H. Osterhage, 2nd Natl. Bank Bldg., archt. Noted July 12.

Ia., Cresco—School—Until Oct. 3 (new bids), by Bd. Educ., 2-story, brick and rein.-con. G. L. Lockhart, 391 Endicott Bldg., St. Paul, archt. Noted July 5.

Minn., Kasson—High School—Until Sept. 15, by N. E. Beard, clk. bd. educ., 2-story. About $75,000. N. Jacobson, Owatonna, archt. Noted Aug. 9.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—School—Bd. Educ. let contract, 3-story, 120x176-ft., brick, to J. Slotnik, 10 Lawrence St., Chelsea. About $166,973. Noted Aug. 16.

★**Conn., Waterbury**—(Official)—School—Bd. Educ. let contract to Mill Eng. & Constr. Co., Lilley Bldg., $539,916. Noted Aug. 30.

★**N. Y., New York**—Church and Parish House—5th Ave. Baptist Church, 6 West 46th St., let contract, alteration, 1½-story, 80 x 98-ft., brick and stone, to M. Eidlitz & Son, 30 East 42nd St., $75,000.

★**N. Y., New York**—Theater and Office—Jason Bldg. Co., 225 West 44th St., let contract, 5-story, 100 x 111-ft. to Margolies Constr. Co., 19 East 33rd St., $50,000. Noted Aug. 9.

★**N. J., Hillside**—School—Bd. Educ. let contract school on Roosevelt St. to Chas. Flocken, 681 Newark Ave., Elizabeth. About $51,000.

★**Pa., Swarthmore** — Dormitory — Mary Lyons School let contract, 3-story, 45x100-ft. and 45x75-ft. to Flounders Bros., 126 East 6th St., Media. About $75,000.

★**N. C., Raleigh**—(Official)—Administration, Kindergarten, etc.—Bd. Dir. State School for Blind let contract to W. B. Bassow, Raleigh, $140,000. Noted Aug. 16.

★**Ala., Albany**—Exchange—Southern Bell Telephone & Telegraph Co., 78 South Pryor St., Atlanta, Ga., let contract, 2-story, rein.-con., to Baxter Bros., Huntsville, $50,000.

★**Mich., Champion**—High School—Bd. Educ. let contract, 2-story, 75x154-ft. rein.-con. and brick, to Foster Constr. Co., 833 Caswell Bld., Milwaukee. About $100,000. Noted Aug. 9.

★**Mich., Ishpeming**—Hospital—Cleveland Cliffs Iron Co. let contract, 2-story, 55 x 154-ft. brick and rein.-con., to W. Rosenthal & Co., 59 East Jackson Blvd., Chicago, $100,000. Noted July 19.

★**Ia., Peterson**—School—Bd. Educ. let contract, 2-story, 72 x 104-ft., to G. A. Shannon & Co., Newell, $48,000.

Minn., Faribault—School—State received low bid 2-story, 40 x 110-ft. cottage at School for Feeble-Minded Girls, from H. J. Frandsen, 510 Hale St., St. Paul, $54,719. Noted Aug. 23.

★**Minn., Minneapolis**—Church—Church of Incarnation, 39th St. and Pleasant Ave., contract to H. Kelly & Co., 1439 South 3rd St., St. Paul. About $115,000.

★**Neb., Lincoln**—(Official)—Social Science—J. S. Dales, care University, let contract to W. J. Ambrosmacher Co., 2039 Washington St., $114,445. Noted Aug. 16.

★**Neb., Omaha**—Club—Omaha Athletic Club let contract, 8-story, 117x181-ft., below title, to J. J. Haughey & Co., 618 South 14th St., $400,000.

TUNNEL—SAN FRANCISCO, CAL.

Contract No. 25

Bids were received by Bd. Pub. Wks., Aug. 22, for constructing tunnel aqueduct in mountain division of Hetch Hetchy Water Supply Project, from (A) R. C. Storrie & Co., 1870 Market St.; (B) Healy-Tibbitts Constr. Co., 9 Main St.; (C) Lindgren Co., 42 1st St. All bids were rejected as they exceeded the estimate. The unit bids were as follows:

	A	B	C
Section "A":			
23,725 lin.ft. lining in Tunnel No. 1	$83.00	$88.00	.....
400 cu.yd. additional excavation in Tunnel No. 1	10.00	9.00	.....
400 cu.yd. additional concrete in Tunnel No. 1	15.00	19.00	.....
100 cu.yd. excavation in open cut	8.00	3.00	.....
50 cu.yd. concrete in open cut	15.00	19.00	.....
10,000 lb. reinforcing steel	.10	.12	.....
100 weepers	20.00	5.00	.....
Section "B":			
9,768 lin.ft. lining in Tunnels Nos. 2, 3, 4 and 5	90.00	.....	.....
200 cu.yd. additional excavation in Tunnels Nos. 2, 3, 4 and 5	10.00	.....	.....
200 cu.yd. additional concrete in Tunnels Nos. 2, 3, 4 and 5	15.00	.....	.....
14,971 lin.ft. standard lined tunnel	90.00	.....	.....
300 cu.yd. additional excavation in Tunnels Nos. 6, 7 and 8	10.00	.....	.....
300 cu.yd. additional concrete in Tunnels Nos. 6, 7 and 8	15.00	.....	.....
200 lin.ft. constructing adits	30.00	.....	.....
600 cu.yd. concrete for sealing adits	15.00	.....	.....
100 cu.yd. excavation in open cut	8.00	.....	.....
50 cu.yd. concrete in open cut	15.00	.....	.....
10,000 lb. reinforcing steel	.10	.....	.....
100 weepers	20.00	.....	.....
Section "C":			
12,300 lin.ft. lining in Tunnel No. 9	94.00	.....	$115.32
800 cu.yd. additional excavation in Tunnel No. 9	10.00	.....	10.00
700 cu.yd. additional concrete in Tunnel No. 9	15.00	.....	30.00
12,392 lin.ft. standard lined tunnel (part of Tunnel No. 10)	94.00	.....	115.32
900 cu.yd. additional excavation	10.00	.....	10.00
800 cu.yd. additional concrete	15.00	.....	30.00
7,900 lin.ft. standard lined tunnel	94.00	.....	115.32
350 cu.yd. additional excavation	10.00	.....	10.00
150 cu.yd. additional concrete	15.00	.....	30.00
14,152 lin.ft. standard lined tunnel (part of Tunnel No. 11)	94.00	.....	115.32
1,000 cu.yd. additional excavation	10.00	.....	10.00
1,000 cu.yd. additional concrete	15.00	.....	30.00
2,500 lin.ft. standard lined tunnel	94.00	.....	115.32
200 cu.yd. additional excavation	10.00	.....	10.00
200 cu.yd. additional concrete	15.00	.....	30.00
Constructing Shaft No. 1, 613-ft. deep	250.00	.....	146.00
Constructing Shaft No. 2, 784-ft. deep	250.00	.....	141.00
400 cu.yd. concrete for sealing shafts	15.00	.....	25.00
50 lin.ft. constructing adits	30.00	.....	100.00
150 cu.yd. concrete for sealing adits	15.00	.....	25.00
100 cu.yd. excavation in open cut	8.00	.....	8.00
50 cu.yd. concrete in open cut	15.00	.....	25.00
20,000 lb. reinforcing steel	.10	.....	.08
500 weepers	20.00	.....	4.00
Extended totals Section "A"	$1,983,725	$2,101,950	.....
Extended totals Section "B"	2,258,560	.....	.....
Extended totals Section "C"	4,991,386	.....	$5,916,222
Extended grand totals	9,233,671	.....	.....

FEDERAL GOVERNMENT WORK

Proposed Work

R. I., Newport—Storage Buildings—Bureau Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., received no bids building 3 fleet storage buildings, at Naval Station.

N. Y., New York—Dredging—U. S. Engr. Office, Army Bldg., 39 Whitehall St., received bids opened June 30, dredging in Sleepy Hollow Creek, Tarrytown and Peekskill harbors, N. Y. Noted July 12.

BIDS DESIRED

Mass., Boston—(Official)—Lighting Fixtures—Until Sept. 18 by J. A. Wetmore, supervising archt., treas. dept., Wash., furnishing and installing in U. S. appraisers' stores, advertised in this issue.

Mass., Boston—Seawall—Until Oct. 4 by U. S. Engr. Office, building at Ft. Warren, Boston Harbor.

R. I., Newport—(Official)—Wharf Extension—Until Oct. 6 by U. S. Engr., Newport, pile and timber estimates, Ft. Greble, P. I.; advertised in this issue.

Conn., New London—Crane—Until Sept. 28 by Bureau Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., furnishing one 30-ton revolving crane.

Wash., D. C.—Lumber—Until Sept. 28, by Constr. Q. M., furnishing 145,000 ft. Douglas fir bridge lumber, O. P. Newton, constr.

Wash., D. C.—Storage—Until Sept. 14 by Bureau Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., building for storage of smokeless.

Va., Waynesboro—Post Office—Until Oct. 15, by J. A. Wetmore, superv. archt., treas. dept., Wash.

W. Va., Wheeling—Power House—Until Oct. 3, by U. S. Engr. Office, Wheeling, at Dam No. 14, Ohio River.

Fla., Key West—Tent Houses—Until Sept. 28 by J. A. Wetmore, supervising archt., treas. dept., tent houses for U. S. Marine Hospital.

Tenn., Memphis—Levee Work—Until Sept. 18, by Mississippi River Comn., 1st and 2nd Dists., furnishing 70,000 cu.yd. earthwork, Upper St. Francis Levee Dist.

Ky., Louisville—Lock Gates—Until Oct. 1, by U. S. Engr. Office, furnishing and building gates for Lock No. 43, Ohio River.

Mich., Bad Axe—Post Office—Until Oct. 12, by J. A. Wetmore, superv. archt., treas. dept., Wash.

★N. Y., New York—Automatic Sprinkler System—Bureau Yards and Docks, Navy Dept., Wash., let contract to General Fire Extinguisher Co., 275 West Exchange St., Providence, R. I., $64,405.

Colo., Denver—(Official)—Movable Crest, Service Bridge, Hoist Cars, etc.—Until Oct. 15, by U. S. Rec. Ser., Denver, for Dobson Dam, Milk River Project, Montana; advertised in this issue.

Cal., Mare Island—(Vallejo P. O.)—Grading—Until Sept. 17 by Bureau Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., grading at Navy Yard.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Me., Portland—Dredging—U. S. Engr. received low bids dredging Portland Harbor, from Maryland Dredging & Contr. Co., 1515 Fidelity Bldg., Baltimore, 15.8c. per cu.yd.; Coastwise Dredging Co., 1001 Bk. Com. Bldg., Norfolk, 17.4c.; Bay State Dredging & Contr. Co., 247 Atlantic Ave., Boston, 18.3c.

★Mass., Boston — Automatic Sprinkler System—Bureau Yards and Docks, Navy Dept., Wash., let contract to General Fire Extinguisher Co., 275 West Exchange St., Providence, R. I., $22,245.

★Mass., Hingham—Magazine Storehouse—Bureau Yards and Docks, Navy Dept., Wash., let contract building 2 magazine storehouses to Kennedy & Peterson Constr. Co., 7 Water St., Boston, $109,800. Noted Sept. 6.

★Conn., New London—Submarine Base, Dredging, etc.—Bureau Yards and Docks, Navy Dept., Wash., let contract building submarine base, dredging and removing piers and bulkhead to T. A. Scott Co., Inc., 292 Pequot Ave., $86,520. Noted Aug. 30.

★N. Y., New York—Dredging—U. S. Engr. Office, Army Bldg., 39 Whitehall St., let contract dredging Hudson River to American Pipe & Constr. Co., 112 North Broad St., Phila., $96,720. Noted May 17.

★N. Y., New York—Dredging—U. S. Engr., 39 Whitehall St., New York City, let contract dredging in Staten Island Sound to G. H. Breymann, 17 Battery Pl., $100,792. Noted June 21.

Pa., Phila.—Extension to Quartermaster's Depot—Bureau Yards and Docks, Navy Dept., Wash., received low bids from F. W. Marks Constr. Co., Finance Bldg., $226,226; Cramp & Co., Denckla Bldg., $227,700; Turner Concrete Steel Co., 1713 Sansom St., $229,500. Noted Aug. 9.

Wash., D. C.—Emergency Hospital—Bureau Yards and Docks, Navy Dept., received low bid, at Annapolis, from J. Walters Bldg. Co., 23 East Centre St., $96,000; Price Constr. Co., 210 Maryland Trust Bldg., $111,500; J. H. Miller, Eutaw and Franklin St., all of Baltimore, $137,600. Noted July 12.

★Wash., D. C.—Magazine Storehouses—Bureau Yards and Docks (F. R. Harris, ch.), Navy Dept., let contracts as follows: 1 at St. Juliens Creek, Va., to J. H. Wiese, 1301 City Nat'l. Bank Bldg., Omaha, $64,750; 1 at Ft. Mifflin, Pa., J. H. Miller, Miller Bldg., Baltimore, $62,700; 2 at Lake Denmark, N. J., Circle Constr. Co., 51 East 42nd St., New York City, $196,000. Noted Sept. 6.

★Wash., D. C.—War Dept. let contract nitrate plant to be constructed somewhere in Virginia to J. G. White Engr. Corp., 43 Exchange Pl. About $4,000,000. Engineers of this company and government engineers are now in the field surveying for site.

Wash., D. C.—Refuse and Garbage—L. Brownland, Comr. Dist. of Columbia, received low bids Sept. 5, collecting and disposing of miscellaneous refuse and garbage, etc., (a) price for 1 year, (b) price each year for 5 consecutive years, from M. R. Ready, 26th and Benning Rd., (a) $74,500, (b) $64,500; J. W. Bean, 4th and M St., (a) $74,800; (b) $64,000. Noted Aug. 16.

★S. C., Charleston—Shell House, etc.—Bureau Yards and Docks, Navy Dept., Wash., let contract shell house, torpedo storehouse and magazine building at Navy Yard and Naval Ammunition Depot to Simons-Mayrant Co., 18 Broad St., Charleston, $117,080. Noted Sept. 6.

Ga., Forsyth—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., received low bids Sept. 6, from J. H. Wilder, Columbus Rd., Macon, $30.917; W. J. Brent, 506 Bd. Trade Bldg., Norfolk, $41,518; A. Blair, 11 South Lawrence St., Montgomery, Ala., $45,734. Noted Aug. 2.

MISCELLANEOUS

Proposed Work

Pier—Chester, Pa.—Harbison-Walker Refractories Co. having plans prepared, new pier foot Welsh St.

Piers — Cornwells, Pa. — Traylor Shipbuilding Co. plans to build 5 piers.

BIDS DESIRED

Sewer Flushing Machine—Mass., New Bedford—(Official)—Until Sept. 19, by G. H. Nyes, city engr.; advertised in this issue.

Incinerating Plant or Crematory—Trenton, N. J.—(Official)—Until Sept. 28, by City, building addition to present crematory. D. B. La Barre, dir. pub. safety.

Pier—Phila., Pa.—(Official)—Until Sept. 28, by Dept. Wharves, Docks and Ferries, 552 Bourse Bldg., on Delaware River at Penn Treat Park. Plans and specifications on file at this office. G. S. Webster, dir.; advertised in this issue. Noted Aug. 9.

Flood Control Works — Dayton, O. — (Official)—Until Nov. 15, by E. M. Kuhns, secy. bd. dir. Miami Conservancy Dist., building dams and appurtenances; advertised in this issue.

Flood Control—Dayton, O.—(Official)—Until Nov. 15, by Bd. Dir. Miami Conservancy Dist., flood control works at Dayton and Hamilton. E. M. Kuhns, secy.; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Duct Line—Brooklyn, N. Y.—Pub. Ser. Comn., 120 Bway., New York City, received low bids for duct line for part of Eastern Pkway. Rapid Transit R.R., from W. G. Cooper, 220 Bway., $38,697; Rodgers & Haggerty, 103 East 125th St., both of New York City, $40,524; Knight & De Micco, 2353 Washington Ave., $40,950. Noted Aug. 30.

Miscellaneous (Continued)

Retaining Wall—Ft. Wayne, Ind.—Bd. Pub. Wks. received low bids, on Syp Run Ave., from Moellering Constr. Co., Murray St., $10,617; and Indiana Eng. Co., $11,725.

★Ore Bins and Trestles—Herculaneum, Mo.—(Official)—St. Joseph Lead Co. let contract building ore bin and rein.-con trestle to Unit Constr. Co., Title Guaranty Bldg., St. Louis, $150,000.

Sea Wall—Corpus Christi, Tex. — City soon lets contract, rein.-con. About $1,000,000. R. Murray, mayor.

Pier—San Francisco, Cal.—State Board Harbor Comrs. received low bids pier, foot Montgomery St., from Healy-Tibbits Constr. Co., 9 Main St., $328,920 and $318,993; J. D. Hannah, Chronicle Bldg., $356,950, $336,950; Clinton Constr. Co., 2391 Clay St., $388,250, $368,000.

Pipe Line—Tracy, Cal.—Dir. West Side Irrigation Dist. received low bids installing 2½ mi. wood-stave pipe line from Pacific Tank and Pipe Co., 318 Market St., $79,300; Redwood Manufacturing Co., Hobart Bldg., both of San Francisco, $80,500.

SECRETARY OF AGRICULTURE ANNOUNCES APPORTIONMENT FOR FISCAL YEAR ENDING JULY 30, 1919

The Secretary of Agriculture has announced the apportionment of $14,550,000 of Federal funds to be used in the fiscal year ending June 30, 1919, by the several states in the construction and maintenance of rural post roads, as follows:

Alabama	$313,456 47
Arizona	205,540 58
Arkansas	250,018 47
California	456,167 23
Colorado	257,278 92
Connecticut	92,216 45
Delaware	24,411 99
Florida	170,723 88
Georgia	403,909 45
Idaho	182,471 55
Illinois	658,323 48
Indiana	406,230 18
Iowa	434,653 61
Kansas	429,131 88
Kentucky	292,984 62
Louisiana	203,755 29
Maine	144,807 42
Maryland	130,871 43
Massachusetts	221,261 85
Michigan	435,356 37
Minnesota	425,865 40
Mississippi	268,751 60
Missouri	508,603 98
Montana	298,520 89
Nebraska	319,445 25
Nevada	193,229 82
New Hampshire	62,610 11
New Jersey	177,357 22
New Mexico	238,634 55
New York	749,674 20
North Carolina	342,556 47
North Dakota	229,585 91
Ohio	558,043 42
Oklahoma	346,489 34
Oregon	236,332 74
Pennsylvania	690,145 78
Rhode Island	34,972 38
South Carolina	215,014 08
South Dakota	243,175 61
Tennessee	340,663 51
Texas	876,986 70
Utah	170,763 17
Vermont	68,128 92
Virginia	298,120 77
Washington	216,530 19
West Virginia	159,713 89
Wisconsin	382,707 20
Wyoming	185,805 78
Total	$14,550,000 00

TUNNEL—NEW YORK, N. Y.

Bids were received by Bd. of Water Supply, Sept. 11, for constructing Shandaken Tunnel, 18 mi. long, for carrying water from Schoharie Reservoir to Esopus Creek near Alleben, N. Y., from (A) Degnon Contr. Co., 68 Hunterspoint Ave., Long Island City; (B) Booth & Flinn, Ltd., 17 Battery Pl.; (C) P. McGovern & Co., Ave. A and 60th St. The tunnel will be of horseshoe shape, 11½ ft. high by 10¼ ft. wide, and will be lined with concrete; also 8 shafts. The work was divided into two portions, "North" and "South," and bids were received covering the entire tunnel and for portions. The Degnon Contr. Co. and P. McGovern submitted bids on portions as well as on the entire job. The unit bids were as follows:

Item	Description	Unit	Quantity: North Portion	Quantity: South Portion	Quantity: Total	A	B	C
1	Sinking shafts in earth	cu.yd.	600	300	900	$20 00	$40 00	$40 00
2	Sinking shafts in rock	cu.yd.	9,700	17,000	26,700	40 00	40 00	40 00
3	Rock excavtion in tunnel	cu.yd.	250,000	315,000	565,000	11 20	13 60	11 00
4	Enlargement of shafts and tunnel in rock	cu.yd.	300	400	700	12 00	15 50	9 00
5	Earth excavation in tunnel	cu.yd.	0	3,200	3,200	10 00	40 00	12 00
6	Enlargement in earth	cu.yd.	0	100	100	20 00	40 00	8 00
7	Furnishing steel roof support	lb.	275,000	350,000	625,000	03	05	04
8	Erecting steel roof support	lb	250,000	325,000	575,000	01	02	015
9	Permanent timbering	M ft.b.m.	100	225	325	70 00	80 00	75 00
10	Temporary timbering	M ft.b.m.	200	250	450	80 00	60 00	75 00
11	Pumping during construction	million ft.-gal.	750,000	750 000	1,500,000	10	30	10
12	Drainage channels	Lin.ft. of shaft and tunnel	43,530	55,170	98,700	2 00	1 00	2 00
13	Forms for shaft lining	Shaft ft	1,320	2,000	3,320	8 00	4 00	20 00
14	Forms for tunnel lining	Tunnel ft.	42,327	53,180	95,507	4 00	2 00	2 [illegible]
15	Concrete in shafts	cu.yd.	3,500	5,500	9,000	12 00	8 75	12 [illegible]
16	Concrete in tunnel	cu.yd.	82,000	103,000	185,000	9 00	8 75	6 7[illegible]
17	Excess concrete	cu.yd.	500	500	1,000	..	....	.
18	Dry packing in tunnel	cu.yd.	1,100	1,600	2,700	3 00	75	2 00
19	Drilling 1¼-in. or smaller holes	lin.ft.	600	1,800	2,400	30	.20	25
20	Drilling 1¾-in. to 2½-in. holes	lin.ft.	600	1,000	1,600	40	35	30
21	Steel pipe for grouting, etc.	lin ft	18,000	22,000	40,000	20	35	30
22	Making connections for grouting	connection	2,700	3,300	6,000	1 00	3 00	1 50
23	Sand for grout	ton	5,000	6,000	11,000	1 50	2 00	1 50
24	Mixing and placing grout	cu.yd.	10,000	12,000	22,000	4 00	10 50	1 50
25	Earth excavation for roads	cu.yd.	41,000	3,000	44,000	1 50	6 00	2 50
26	Rock excavation for roads	cu.yd.	13,500	500	14,000	3 50	6 00	7 50
27	Extra earth excavation	cu.yd.	10,000	60,000	70,000	1 50	6 00	10 00
28	Extra rock excavation	cu.yd.	24,000	4,000	28,000	3 50	6 00	7 50
29	Refilling and embanking	cu.yd.	10,000	25,000	35,000	90	1 00	[illegible]
30	Removal of soil	cu.yd.	2,000	4,000	6,000	75	1 00	75
31	Surface dressing of earth	cu yd	2,000	4,000	6,000	1 25	1 00	1 2[illegible]
32	Timber not in tunnel	M ft.b.m.	100	100	200	50 00	80 00	90 [illegible]
33	Concrete in unreinforced parts of open-cut aqueduct	cu.yd.	0	1,500	1,500	10 00	8 75	5 00
34	Concrete in gate-chambers and walls	cu.yd.	4,500	3,000	7,500	10 00	8 75	5 00
35	Reinforced concrete not in tunnel	cu.yd.	380	580	960	15 00	8 75	6 20
36	Finishing concrete floors	sq yd.	800	120	920	50	2 00	2 70
37	Portland cement	bbl.	195,000	250,000	445,000	2 50	2 75	1 [illegible]
38	Steel for reinforcing concrete	lb	30,000	35,000	65,000	.08	06	.06
39	Structural steel	lb	240,000	90,000	330,000	.06	.07	[illegible]
40	Steel picket fencing	lb	0	16,500	16,500	.06	.10	.12
41	Miscellaneous iron and steel	lb	23,000	7,000	30,000	.12	.10	[illegible]
42	Galvanizing	lb.	75,000	25,000	100,000	.04	.04	[illegible]
43	Miscellaneous metals	lb	2,000	1,000	3,000	.80	.50	1 00
44	Caring for metal work	lb.	45 000	1,000	46,000	.025	.04	.03
45	Cast-iron and welded steel pipe	lb.	130,000	15,000	145,000	.06	.10	[illegible]
46	Tile pipe, 6 in. and less	lin.ft.	9,000	1,000	10,000	.20	[illegible]	[illegible]
47	Tile pipe, 8 to 12 in	lin ft	2,500	4,000	6,500	80	1 75	1 [illegible]
48	Tile pipe, 12 to 18 in	lin ft	200	100	[illegible]	1 50	5 00	2 [illegible]
49	Bluestone wall masonry	cu.yd.	200	350	[illegible]	4 [illegible]	10 00	1[illegible]
50	Grouted bluestone paving	cu.yd.	0	650	[illegible]	4 00	10 00	7 [illegible]
51	Dry rubble masonry and pitching	cu.yd.	600	400	1 000	[illegible]	[illegible]	3 00
52	Crushed stone, gravel and sand	cu yd	1,000	500	1,500	2 [illegible]	[illegible]	2 [illegible]
53	Tunnel muck road surfacing	cu yd	1,200	1,000	2,200	1 25	[illegible]	1 [illegible]
54	Bituminous macadam surfacing	sq yd	900	200	1 [illegible]	[illegible]	[illegible]	1 [illegible]
55	Reinforced- concrete ladders	lin ft	40	20	[illegible]	[illegible]	[illegible]	[illegible]
56	Excavating masonry	cu ft	500	500	1,000	1 [illegible]	75	[illegible]
57	Dressing masonry	sq ft	100	100	[illegible]	[illegible]	[illegible]	[illegible]
58	Shaft houses	house	3	4	7	5,000 00	3,500 00	[illegible]
59	Intake Chamebr superstructure	lump sum.	1	0	1	40 000 00	50 000 00	[illegible]
60	Cranes in intake chamber	lump sum	1	0	1	10,000 00	[illegible]	12,000 00
61	Wooden fences and guard-rails	lin ft	8,000	1 100	9 100	[illegible]	1 [illegible]	[illegible]
62	Man-proof fence	lin ft	10,000	17,000	27,000	75	75	2 25
63	Medical and surgical aid	Practitioner-month	84	84	[illegible]	[illegible]	[illegible]	[illegible]
64	Sanitary services	month	84	84	84	300 00	2,000 00	2,000 00
65	Chlorinated lime	lb	15 000	15,000	30,000	[illegible]	[illegible]	[illegible]
66	Liquid chlorine	lb	20,000	30,000	50,000	[illegible]	[illegible]	[illegible]
67	Chlorine dosing machines	machine	4	5	9	1 500 00	3 500 00	1,500 00
68	Locker houses	house	3	4	7	5,000 00	[illegible]	7 500 00
69	Section offices	office	1	1	2	[illegible]	[illegible]	[illegible]
70	Cleaning up	lump sum	1	1	1	[illegible]	[illegible]	[illegible]
	Extended totals					[illegible]	[illegible]	[illegible]

SEARCHLIGHT SECTION

Contracts To Be Let

PROPOSALS

Bids received until October 9, 1917.

Barge Canal Improvements

STATE OF NEW YORK
OFFICE OF SUPERINTENDENT OF PUBLIC WORKS.
Albany, N. Y.,
September 7th, 1917.

Sealed proposals will be received by the undersigned at his office in the Capitol at Albany, N. Y., until twelve o'clock noon of Tuesday, October 9th, 1917, at which place and hour they will be publicly opened and read, for improving the New York State canals pursuant to the provisions of Chapter 147 of the Laws of 1903, and of the acts amendatory thereof and supplementary thereto, and Chapter 570 of the Laws of 1915, as follows:

1

CONTRACT NO. 83.
Erie Canal—Sections 10 and 11.

For completing the canal at Tonawanda and removing a guard-lock and coffer-dam near Sulphur Springs.

Sheets 1 to 6 inclusive.

2

CONTRACT NO. 163.
Erie Canal—Sections 9 and 10.

For raising Spier's Road bridge, completing crests of spillways and other work between Rochester and Lockport.

Sheets 1 to 5 inclusive.

3

CONTRACT NO. 164.
Erie Canal—Section 8.

For completing the construction of the canal at certain locations between Lyons and Newark and for constructing a retaining dam at Macedon.

Sheets 1 to 9 inclusive.

And for the construction of barge canal terminals pursuant to the provisions of Chapter 746 of the Laws of 1911, and of the acts amendatory thereof, as follows:

4

TERMINAL CONTRACT NO. 15-M.

Electrical equipment and machinery for operating and lighting the Utica Terminal [illegible].

Contract plans, sheets 1-11, inclusive.

Plans may be seen and detailed specifications, engineer's estimate of quantities, proposal blanks, form of contract and bonds required and other information for proposers may be had at the office of the Superintendent of Public Works at Albany, N. Y., at the office of the Assistant Superintendent of Public Works for the Middle Division at Syracuse, N. Y., at the office of the Assistant Superintendent of Public Works for the Western Division at Rochester, N. Y., and at the canal office, Spaulding's Exchange, Buffalo, N. Y.

Copies of detailed plans of drawings may be obtained from the State Engineer and Surveyor at Albany, N. Y., upon payment to him of the cost of producing them.

Monthly estimates will be paid of ninety per centum (9[illegible] per cent.) of the work done at the contract price. Every proposal for said work must be accompanied by a money deposit in the form of a draft or certified check upon some good banking institution in the city of Albany or New York, issued by a national or state bank (or trust company in the case of terminal contract) in good credit within the state and payable at sight to the Superintendent of Public Works for five per centum (5 per cent.) of the amount of the proposal.

The person whose proposal shall be accepted will be required to execute a contract and furnish bonds within ten days from the date of notice of award delivered to him or them in person or mailed to the address given in the proposal.

Upon execution of the contract and approval of bonds, the certified check or draft will be returned to the proposer unless the same shall have been presented for collection prior to such time, in which case the amount of the deposit will be refunded by the Superintendent of Public Works.

The deposits of bidders other than the one to whom the award of contract shall be made will be returned immediately after the award has been made.

The bond required for the faithful performance of each contract shall be in such sum as shall be fixed by the Superintendent of Public Works, which sum shall not be less than twenty per centum (20 per cent.) of the estimated cost of the work according to the contract price, and an additional bond, known as the labor bond, in the sum of ten per centum (10 per cent.) of the amount of the estimated cost of the work according to the contract price, will be required as security that the contractor will pay in full at least once in each month all laborers employed by him upon the work specified to be done in the contract.

In the event that more than one surety company is offered as surety on said bonds co-insurance only will be accepted.

Each proposal must be addressed to the Superintendent of Public Works, Albany, N. Y., and must be endorsed on the envelope with the name of the construction for which the proposal is made.

Award, if made, will be made to the person or persons whose proposals shall be lowest in cost to the State for doing the work, and which shall comply with all provisions required to render it formal. Before any award shall be made the lowest bidder will be required to satisfy the Superintendent of Public Works of his ability to provide suitable equipment and materials for the proper performance of the work.

The right is reserved to reject all proposals and readvertise and award the contract in the regular manner if, in the judgment of the undersigned, the interests of the state will be enhanced thereby.

W. W. WOTHERSPOON,
Superintendent of Public Works.

Official Proposals

Price, $3.60 an inch—Copy can be received until Wednesday, 10 a.m., for issue mailed the next day.

PROPOSALS

PROPOSALS FOR MACHINERY.—Office, Mississippi River Commission, 1st and 2nd Districts, Customhouse, Memphis, Tenn.—Sealed proposals will be received here until 11 A.M., Sept. 26, 1917, and then publicly opened, for furnishing and delivering Boiler Feed Pump, Feed Water Heater, Centrifugal Sand Pump, Engines and Single Drum Hoist. Information on application.

PROPOSALS

Bids received until September 20, 1917.

Highway Work

OFFICE OF THE STATE COMMISSION OF HIGHWAYS.
Albany, N. Y.

Sealed proposals will be received by the undersigned at their office No. 55 Lancaster St., Albany, N. Y., at one o'clock on Thursday, the 20th day of September, 1917, for the construction and completion of highways in the following counties:

Albany (One highway, 0.12 Mi.).
Hamilton (One highway, 4.54 Mi.).
Montgomery (One highway, 7.10 Mi.).
Niagara (Two highways, 0.61 and 8 Mi.).
Oneida (One highway, 0.70 Mi.).
Onondaga (One highway, 2.37 Mi.).
Suffolk (One highway, 3.87 Mi.).
Westchester (One highway, 1.75 Mi.).
Wyoming (One highway, 6.99 Mi.).

And also for the following repair contracts:—

Cattaraugus (One contract—resurfacing).
Monroe (One contract—resurfacing).
Oswego (One contract—surface treatment).

Maps, plans, specifications and estimates may be seen and proposal forms obtained at the office of the Commission in Albany, N. Y., and also at the office of the Division Engineer in whose division the roads to be improved are located. The addresses of the Division Engineers and the counties of which they are in charge will be furnished upon request.

The especial attention of bidders is called to "General Information for Bidders" on the itemized proposal, specifications and contract agreement.

EDWIN DUFFEY, Commissioner.
I. J. MORRIS, Secretary.

Bids received until September 24, 1917.

Street Paving

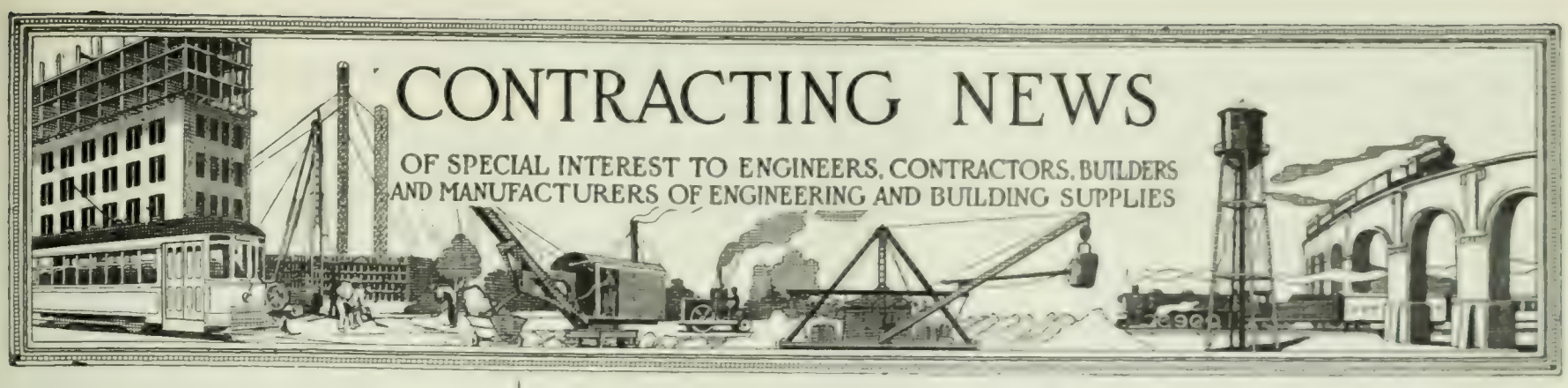
Newburgh, N. Y.

Sealed proposals will be received by the undersigned up to four o'clock, P.M., 24th of September, 1917, for the paving and curbing of Liberty Street, Newburgh, N. Y., in either vitrified brick, asphalt block or bitulithic — approximately 8075 square yards. Certified check of $1000 to accompany each bid. Right reserved to reject bids.

HENRY WILSON, City Manager,
Newburgh, N. Y.

PROPOSAL FOR CONSTRUCTIION OF WHARF EXTENSION—Office of U. S. Engineer, Newport, R. I.—Sealed proposals will be received here until 12 o'clock noon, October 6, 1917, and then opened, for construction of pile and timber extension to wharf at Fort Greble, R. I. Further information on application.

TREASURY DEPARTMENT, Supervising Architect's Office, Washington, D. C., Sept. 7, 1917—Sealed proposals will be opened in this office at 3 P.M. September 28, 1917, for furnishing and installing interior lighting fixtures in the United States appraisers' stores at Boston, Mass., in accordance with drawings and specifications, copies of which may be had at this office. Proposals are desired only from those qualified to produce work of the highest grade, both artistically and mechanically, and the right is reserved to refuse to send the drawings and specification to or to receive proposals from anyone who, in the opinion of the Supervising Architect, is not so qualified. JAS. A. WETMORE, Acting Supervising Architect.



Proposals

For Proposals Advertised See Pages 79 to 85 Inclusive

WATER-WORKS

Bids Close		See Eng. News-Record
Sept. 24.	Akron, O.	Sept. 13
	Adv. Sept. 13.	
Sept. 25.	Jersey City, N. J.	Sept. 13
Sept. 26.	North McGregor, Ia.	Sept. 13
	Adv. Sept. 13 and 20.	
Sept. 26.	North Tonawanda, N. Y.	Sept. 13
	Adv. Sept. 13 and 20.	
Sept. 25.	Bayonne, N. J.	Sept. 13
Oct. 1.	St. Paul, Minn.	Sept. 20
Oct. 2.	Johnstown, N. Y.	Sept. 13
	Adv. Sept. 13 and 20.	
Oct. 2.	Lewisburg, O.	Sept. 20
	Adv. Sept. 20.	
Oct. 2.	Toronto, Ont.	Sept. 13
Oct. 10.	Polk, Pa.	Sept. 20

SEWERS

Sept. 22.	Stamford, Conn.	Sept. 13
	Adv. Sept. 13.	
Sept. 24.	Bridgeport, Conn.	Sept. 13
	Adv. Sept. 13 and 20.	
Sept. 24.	Rocky River, O.	Sept. 13
Sept. 24.	Summit, Ill.	Sept. 20
Sept. 24.	Appleton, Wis.	Sept. 20
Sept. 25.	St. Joseph, Mich.	Sept. 20
Sept. 27.	Cleveland, O.	Sept. 20
Sept. 27.	Newark, N. J.	Sept. 20
Sept. 28.	Cedar Rapids, Ia.	Sept. 13
Sept. 25.	Columbia, S. C.	Sept. 13
Sept. 29.	Hagerstown, Md.	Sept. 13
	Adv. Sept. 13.	
Oct. 8.	Stratford, Conn.	Sept. 20
	Adv. Sept. 20.	

BRIDGES

Sept. 24.	Los Angeles, Cal.	Sept 13
Sept. 24.	Greenfield, Ind.	Sept. 20
Sept. 25.	Preston, Minn.	Sept. 20
Sept. 25.	Enid, Okla.	Sept. 20
Sept. 27.	Jersey City, N. J.	Sept. 13
Sept. 27.	Mankato, Minn.	Sept. 20
Sept. 28.	Akron, O.	Sept. 13
	Adv. Sept. 13.	
Oct. 1.	Indiana	Sept. 20
Oct. 1.	Elkins, W. Va.	Sept. 20
Oct. 2.	Reading, Pa.	6Sept. 20
	Adv. Sept. 20.	
Oct. 2.	West Palm Beach, Fla.	Sept. 20
Oct. 2.	Woodbine, Ga.	Sept. 20
Oct. 2.	Olympia, Wash.	Sept. 20
Oct. 2.	Albany, N. Y.	Sept. 6
	Adv. Sept. 6 and 13.	
Oct. 2.	Columbus, O.	Sept. 13
	Adv. Sept. 13.	
Oct. 4.	Texarkana, Ark.	Sept. 13
	Adv. Sept. 13.	
Oct. 5.	Corydon, Ind.	Sept. 20
Oct. 9.	Walker, Minn.	Sept 20
Oct. 20.	Pennsylvania	Sept. 20

STREETS AND ROADS

Sept. 22.	Cameron, La.	Aug. 30
Sept. 22.	Racine, Wis	Sept 13
Sept. 24.	Eutaw, Ala.	Sept. 6
Sept. 24.	Livingston, Ala.	Sept 6
Sept. 24.	Newburgh, N. Y.	Sept. 13
	Adv. Sept. 13 and 20.	
Sept. 24.	Cincinnati, O.	Sept 20
Sept. 24.	St. Paul, Minn.	Sept. 20
Sept. 24.	Wentworth, N. C.	Sept 20
Sept. 25.	Indiana	Sept 13
Sept. 25.	New Orleans, La.	Sept 13
Sept. 25.	New Jersey	Sept 13
Sept. 25.	Linden, N. J.	Sept 20
Sept. 25.	The Dalles, Ore.	Sept 20
Sept. 25.	Charleston, S. C.	Sept. 20
	Adv. Sept. 20.	

Close Bids		News-Record See Eng.
Sept. 26.	Cleveland, O.	Sept. 20
Sept. 26.	Michigan	Sept. 20
Sept. 26.	Hamilton Square, N. J.	Sept. 20
Sept. 27.	Salt Lake City, Utah	Sept. 13
Sept. 27.	Weehawken, N. J.	Sept. 20
Sept. 27.	Newark, N. J.	Sept. 20
Sept. 27.	Steubenville, O.	Sept. 20
Sept. 28.	Brooklyn, N. Y.	Sept. 20
Sept. 28.	Bryan, O.	Sept. 20
Sept. 28.	Indiana	Sept. 20
Sept. 29.	Russellville, Ala.	Sept. 20
Sept. 30.	Indianapolis, Ind.	Sept. 6
Oct. 1.	Lincoln, Neb.	Sept. 6
Oct. 1.	Miami, Fla.	Sept. 20
Oct. 1.	Indiana	Sept. 20
Oct. 1.	Oroville, Cal.	Sept. 20
Oct. 2.	Indiana	Sept. 20
Oct. 2.	Maryland	Sept. 20
	Adv. Sept. 20.	
Oct. 3.	Indiana	Sept. 20
Oct. 4.	Carrollton, Ala.	Sept. 20
Oct. 5.	Indiana	Sept. 20
Oct. 6.	Bowling Green, O.	Sept. 13
Oct. 8.	California	Sept. 20
Oct. 9.	Pennsylvania	Sept. 20
	Adv. Sept. 20.	
Oct. 11.	Newton, N. J.	Sept. 20
	Adv. Sept. 20.	
Oct. 11.	Oneonta, Ala.	Sept. 13
Oct. 13.	Wedowee, Ala.	Sept. 20
Oct. 15.	Newark, N. J.	Sept. 13
Oct. 16.	Cape May, N. J.	Sept. 6
Oct. 16.	Pennsylvania	Sept. 20

EXCAVATION AND DREDGING

Sept. 24.	Barstow, Tex.	Sept. 13
Sept. 24.	Lewiston, Ill.	Sept. 13
Sept. 25.	Fairmont, Minn.	Sept. 20
Sept. 25.	Storm Lake, Ia.	Sept. 20
Sept. 27.	Slayton, Minn.	Sept. 20
Sept. 28.	Slayton, Minn.	Sept. 20
Sept. 28.	Muncie, Ind.	Sept. 20
Oct. 1.	Le Sueur, Minn.	Sept. 20
Oct. 2.	Clarksdale, Miss.	Sept. 20
Oct. 2.	St. Cloud, Minn.	Aug. 2
Oct. 2.	Urbana, Ill.	Sept. 6
Oct. 3.	Anoka, Minn.	Sept. 20
Oct. 5.	Savannah, Ga.	Sept. 20
Oct. 9.	Albany, N. Y.	Sept. 13
	Adv. Sept. 13 and 20.	
Oct. 10.	Lafayette, Ind.	Sept. 20
Oct. 15.	Willmar, Minn.	Sept. 13

BUILDINGS

Sept. 28.	Theills, N. Y.	Sept 13
	Adv. Sept. 13 and 20	
Sept. 30.	Eden, S. D.	Sept. 20
Oct. 1.	San Francisco, Cal.	Sept 20
Oct. 2.	Castleton, N. Y.	Sept. 20
Oct. 3.	Cresco, Ia.	Sept 13
Oct. 5.	Thiells, N. Y.	Sept. 13
	Adv. Sept. 13 and 20.	
Dec. 1.	Norfolk, Va.	Sept. 13

FEDERAL GOVERNMENT WORK

Sept. 17.	Philadelphia, Pa.	Sept 29
Sept. 24.	Farmington, N. M.	Sept. 6
Sept. 24.	New London, Conn.	Sept. 13
Sept. 24.	Washington, D. C.	Sept. 13
Sept. 24.	New Orleans, La.	Sept. 20
Sept. 25.	Washington, D. C.	Sept. 20
Sept. 25.	Washington, D. C.	Aug. 30
	Adv. Aug. 30.	
Sept. 26.	Memphis, Tenn.	Sept. 6
	Adv. Sept. 6 to 20	
Sept. 28.	Key West, Fla.	Sept. 13
Sept. 28.	Washington, D. C.	Sept. 13
Sept. 28.	Boston, Mass.	Sept. 13
	Adv. Sept. 13 and 20	
Sept. 29.	Memphis, Tenn.	Sept. 20
	Adv. Sept. 20.	
Oct. 1.	Twin Falls, Idaho	Aug. 30
Oct. 1.	Lewisville, Ky.	Sept. 13
	Adv. Sept. 13 and 20.	
Oct. 1.	Cleveland, Ohio	Sept. 6
Oct. 1.	Kuahua, H. T.	Sept. 20
Oct. 1.	Philadelphia, Pa.	Sept. 20

Close Bids		News-Record See Eng.
Oct. 1.	Washington, D. C.	Sept. 20
Oct. 2.	San Francisco, Cal.	Sept. 6
Oct. 2.	Wheeling, W. Va.	Sept. 13
	Adv. Sept. 13 and 20.	
Oct. 2.	Galveston, Tex.	Sept. 20
Oct. 2.	San Francisco, Cal.	Sept. 20
	Adv. Sept. 20.	
Oct. 4.	Boston, Mass.	Sept. 13
	Adv. Sept. 13 and 20.	
Oct. 4.	St. Peter, Minn.	Sept. 6
Oct. 6.	Newport, R. I.	Sept. 13
	Adv. Sept. 13 and 20.	
Oct. 12.	Bad Axe, Mich.	Sept. 13
Oct. 15.	Denver, Colo.	Sept. 13
	Adv. Sept. 13.	
Oct. 15.	Waynesboro, Va.	Sept. 13
Oct. 15.	El Paso, Tex.	Sept. 20
	Adv. Sept. 20.	
Oct. 23.	Andalusia, Ala.	Sept. 20
Oct. 24.	Bakersfield, Cal.	Sept. 20
	Adv. Sept. 20.	
Oct. 26.	Mt. Carmel, Ill.	Sept. 20
Oct. 28.	Waterloo, N. Y.	Sept. 20
Oct. 30.	Key West, Fla.	Sept. 6
	Adv. Sept. 6 and 13.	

MISCELLANEOUS

Sept. 25.	Harbor Improvements — Mobile, Ala.	Sept. 6
Sept. 26.	Station Finish —Brooklyn, N. Y.	Sept. 20
Sept. 28.	Incinerating Plant or Crematory—Trenton, N. J.	Sept. 13
Sept. 28.	Pier—Philadelphia, Pa.	Sept. 13
	Adv. Sept. 13 and 20.	
Oct. 1	Station Finish Brooklyn, N. Y.	Sept 20
Oct. 2	Garbage Incinerator Sharon, Pa.	Sept. 20
Oct. 8	Elevated Railway—Brooklyn, N. Y.	Sept. 20
Oct. 17.	Pier—Manhattan Beach, Cal.	Sept 20
Nov. 15.	Flood Control—Dayton, O.	Sept. 13
	Adv. Sept. 13 and 20	

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official.

WATER-WORKS

Proposed Work

N. Y., New York—Bd. Water Supply received low bid (Andrew Turnel, on part of Schoharie watershed development for New York City water supply, from Degnon Contr. Co. of Huntington, Long Island City, $11,175,000. Heath & Flint, Ltd. 17 Battery Pl., $10,374,000. P. J. McGovern & Co. 24 East 42nd St., $14,500,000. Noted July 13.

Ga., Savannah—City election Oct. 2 to vote on $444,000 bond issue to rehabilitate water-works. J. Pope, supt. Noted June 14.

O., Cleveland—(Official)—Council passed ordinance to issue $500,000 bonds to improve and enlarge water system. C. P. Salvia, supt.

O., Hamilton—City will sell $15,000 bonds Sept. 16 for improving water system. E. E. Erb, sec. Noted Aug. 29.

Kan., Ashland—City to issue $18,000 bonds for water-works improvement. A. W. Dawes, supt.

Kan., Towanda—City voted $41,000 bonds to improve water-works system. A. C. Gardner, city. Noted Aug. 1.

Water-Works (Continued)

Mont., Geraldine—City election Oct. 12 to vote on $41,500 bond issue to build water-works system.

Mo., Galena—City election Oct. 2 to vote on $100,000 bond issue to build water-works system.

Tex., Abilene—City lets contract in January for 5,000,000-gal. storage reservoir, walls, floors and 12 mi. 24-in. concrete pipe and 8 mi. c.-i. pipe. About $500,000. W. A. Kinsolving, city engr.

Colo., Greeley—(Official)—City will improve water system by day labor. Work involves cement dam about 150 ft. long, extension of intake line and replacing 4 mi. wood-stave pipe with Matheson joint natural coating pipe. Bonds for $150,000 sold for work. M. Seaman, supt. Noted Sept. 6.

Utah, Brigham—City election soon to vote on $60,000 bond issue to improve water-works system. F. Y. Jensen, supt.

Wash., Seattle—City had plans prepared for water mains in East Marginal Way, $80,000; portion Alki Ave., $72,518; trunk sewer for same district, $55,152. A. H. Dimock, city engr.

Ont., Burlington—Council passed bylaw to issue $17,339 bonds for water-works. P. Pawson, secy.

Ont., York Twp.—Council had plans prepared 6-in. water main on Glenholme Ave., cost $9599, also 12-in. c.-i. main on St. Johns Rd. from Runnymede to Langmuir, $18,081.

Alta., Lethbridge—Councils of Lethbridge and Hardieville plan to extend water system from one town to other. About $15,000.

BIDS DESIRED

Pa., Polk—(Official)—Until Oct. 10, by Bd. Trustees of State Institution for Feebleminded of Western Pennsylvania, rapid sand filter plant and motor-driven centrifugal pumps in connection with water supply; advertised in this issue.

O., Lewisburg—(Official)—Until Oct. 2, by G. Wilson, supt., extending water-works system; advertised in this issue. Noted July 26.

Minn., St. Paul—(Official)—Until Oct. 1, by Bd. Control, Room 15, Court House, for 50,000- or 75,000-gal. steel tank on 75- or 100-ft. steel tower, rein.-con. or brick stack, and garage additions to power house. J. F. Druar, 314 Commercial Bldg., cons. engr. Noted Sept. 13.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Pa., Mountsville**—City let contract water-works system to P. Sheirick, Mountsville. Noted June 21.

Md., Cumberland—Evitts Creek Water Co., Cumberland, received low bid addition to filtration plant from [illegible] Co., Fulton Bldg., Pittsburgh. About $75,000 to $80,000. Noted Aug. 16.

★**Wis., Portage**—City let contract filtration system for water-works to Pittsburgh Filter Mfg. Co., Farmers Bank Bldg., Pittsburgh, $12,000.

★**Mont., Poplar**—City let contract water-works system to C. H. Kelley, Kalispell, $17,824.

★**N. B., Woodstock**—City let contract filtration plant to New York Continental Jewel Filtration Co., 15 Broad St., New York City, $44,848, subject to approval of plans by Provincial Board of Health of Canada. Let to Fraser & Company of Canada, Ltd., 701 Power Bldg., Montreal, $15,250. Noted June 28.

SEWERS

Proposed Work

N. J., Bayonne—City plans sewer in portions West 47th St. W. L. Clarkson, city engr.

Pa., Lebanon—City had plans prepared for sewage-disposal plant. P. H. Conrad, City engr.

S. C., Spartanburg—City will let $40,000 bonds to extend sewerage system. Reid Teal, city engr. Noted June 14.

Ky., Ashland—City plans to repair and extend sewerage system and disposal plant. F. Cumbering, city engr.

O., Marion—See "Streets and Roads."

O., Shepard—City to issue $[illegible] bonds for sewage connections. H. Mosier, city engr.

Mich., Detroit—City plans to purchase 16 acres on Connors Creek for sewage-treatment plant. About $98,000. C. F. Hubbell, city engr.

Mich., Grand Rapids—(Official)—Bd. Pub. Wks. soon receives new bids for southwest sewerage system. About $160,000. W. S. Moore, city engr. Noted Apr. 19.

Wis., Appleton—City plans to install new sewer in Nawada St. A. C. Remley, city engr.

Neb., Fremont—City plans sewage disposal plant. About $100,000. L. M. Roessler, city engr.

Mo., Kansas City—Bd. Pub. Wks. rejected bids for sewer in Dist. No. 356. About $90,000. Noted Sept. 13.

Okla., Bristow—City voted $12,000 for sewers and water-works extensions. T. B. Gibson, city clk. Noted Aug. 9.

Wash., Seattle—See "Water-Works."

Wash., Seattle—See "Streets and Roads."

Wash., Spokane—Council passed ordinance for 4th Ward trunk sewer in Dist. No. 5. About $10,300. M. Macartney, city engr.

Cal., Long Beach—See "Miscellaneous."

Cal., Los Angeles—City voted $150,000 bonds to build sewerage system to connect with main sewer near Lincoln Park. Communities of El Sereno, Newton Park, Sierra Vista, Sierra and part of Rose Hill will be benefited by same. A. C. Hensen, city engr. Noted Aug. 23.

Ont., Toronto—City plans sewer on Yonge St. About $105,000. R. C. Harris, comr. wks.

BIDS DESIRED

Conn., Bristol—(Official)—Until Sept. 25, by T. B. Steele, city clk., rebuilding sewer beds, etc.; advertised in this issue.

Conn., Stratford—(Official)—Until Oct. 8, by Bd. Sewer Comrs., for 11 mi. of 8- to 30-in. pipe sewers, sewage disposal works, etc.; advertised in this issue.

N. J., Newark—(Official)—Until Sept. 27, by Water Comrs., sewer in Sandford Ave., 500 ft. 30-in. concrete pipe sewer, 240 ft. vitr. salt glazed pipe sewer, 12 catch basins, and 5 manholes. M. R. Sherrerd, city engr. Noted Sept. 13.

O., Cleveland—Until Sept. 27, by City, installing sewers in East 171st and Searsdale Sts. R. Hoffman, city engr.

Mich., St. Joseph—(Official)—Until Sept. 25, by C. J. McMullen, city clk., for sewage-disposal plant. W. J. Cleary, city engr.

Ill., Summit—(Official)—Until Sept. 24, by Bd. Local Improvs. for sewerage system. L. F. Kennedy, clk.

Wis., Appleton—Until Sept. 24, by E. L. Williams, city clk., sewers in portions Mason, Virginia and Brewster Sts. A. C. Remley, city engr.

Minn., St. Paul—(Official)—Until Oct. 1, by H. W. Austin, purch. agent, storm-water sewer on Fairview, Summit, Macalester and Pascal Aves.; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—Bd. Pub. Wks. let contract sewers, Rutherford Ave., Charleston St. and alleys to T. J. O'Connell, 10 Radcliffe Rd., Brighton.

★**Conn., Bridgeport**—Paving and Sewer Comn. let contract Northwest Sanitary trunk sewer, Dewey St., to Brennan & Fohey, Portchester, N. Y. Noted Sept. 13.

N. Y., New York—D. Mathewson, boro. pres., received low bid sewer in (a) Boston Rd. between Harper and Boller Aves,. (b) between Bollar and Corsa Aves., from Anita Constr. Co., 2975 Marion Ave., (a) $124,842, (b) same amount. O. Daniels Co., Woolworth Bldg., (b) $134,796. Lawrence Contg. Co., 240 Walton Ave., (a) $117,873, (b) $116,872. J. M. Starrton & Co., 762 East 165th St., (a) $98,564.

★**N. Y., Scotia**—City let contract sewage-disposal plant to E. B. Edgar, 737 Brandywine Ave., Schenectady, about $12,000. Noted Aug. 16.

N. J., Highland Park—(New Brunswick P. O.)—City received low bid for 5 mi. sanitary sewers and appurtenances from McGovern & Barnwell, New Brunswick, $51,977.

★**Pa., Phila.**—City let contract, addition to sewage disposal plant to F. W. Mark Contg. Co., 1428 Penn Sq., $90,000.

★**Md., Cumberland**—(Official)—City let contract sanitary sewer on Boulevard and storm sewer in Mary St. to Vang Constr. Co., 3rd Natl. Bank Bldg., $12,316 and $23,919, respectively. Noted Aug. 9.

★**N. C., Durham**—See "Streets and Roads."

★**O., Cleveland Heights**—(Warrensville P. O.)—(Official)—City let contracts installing segment block and vitr. pipe storm sewers as follows: Sect. 1, Gould & Maybach, 823 East 150th St., $16,566; Sect. 2, A. Marro, 2276 East 105th St., $14,903; Sect. 3, Haddad-Mall Co., Schofield Bldg., $64,297; all of Cleveland. Noted July 19.

★**O., Lancaster**—City let contract for sewer, grading, paving, curbing and retaining wall to Wilson & Beckler, Lancaster, $20,338.

★**Ill., Hillsboro**—(Official)—City let contract sewer extensions to Grabbe Granitoid Co., Alton, $14,544. Noted Aug. 16.

★**Ia., Medford**—City let contract for sewers and sewage-disposal plant to P. N. Kruse, Spencer, $39,014.

★**Ia., Seymour**—City let contract 22,000 ft. of 6- to 12-in. sewers to Moore-Seig Constr. Co., 1126½ East 4th St., Waterloo, and Cumstock & Hanson, Cedar Rapids, $13,307 and $8586, respectively; for sewage-disposal plant to Ward & Weighton, 516 Davidson Bldg., Sioux City, $16,800. Noted Aug. 30.

★**Ia., Sheldon**—City let contract 4 filter beds, 50x150-ft., and 1 sludge bed, 30x50-ft.; also repairing dosing chamber, to G. Gardner Sheldon, $11,842.

★**Ia., Sioux City**—City let contract laying storm sewer in 22nd and Jennings St. to W. B. Carter Constr. Co., Sioux City, $15,000.

★**Minn., Long Lake**—City let contract sewage-disposal plant to M. J. O'Neill, 60 East 6th St., St. Paul.

★**Minn., St. Paul**—City let contract Jefferson Cretin sewer to O'Neill & Preston, 60 East 6th St., $49,945. Noted Aug. 16.

★**Tex., Elgin**—City let contract sewer to H. W. Cardwell Contg. Co., Texarkana, Ark., about $12,000.

★**Okla., Oklahoma**—City let contract sewerage and water-works systems to A. F. Binnus, 225½ West Grand Ave., $18,000.

★**Utah, Logan**—City let contract sewer in Sewer Dist. No. 5 to Parrott Bros. Constr. Co., Newhouse Bldg., Salt Lake City, $19,694.

★**Cal., Corcoran**—City let contract installation of sewerage system and paving on Whitley Ave. to Federal Constr. Co., Sharon Bldg., San Francisco, $80,702. Noted July 19.

★**Cal., Livermore**—City let contract sewage-disposal plant at tuberculosis hospital to M. E. Fernandez, Prospect St., Hayward. About $16,324.

BRIDGES

Proposed Work

Pa., Phila.—Pennsylvania R.R. plans to build bascule bridge over Darby Creek and Crum River, rein.-con. bridge over Ridley River. A. C. Shand, Broad St. Sta., Phila., ch. engr.

Miss., Winona—Montgomery Co. supervs. plan to build 30 4 x 4 to 30-ft. rein.-con. bridges. G. E. Hauser, Columbus, engr.

O., Cleveland—See "Industrials Works."

Ind., Anderson—Madison Co. prepared plans 192-ft. bridge with 30-ft. roadway over White River on 9th St. Council appropriated $80,000 for project.

Ind., Ft. Wayne—Allen Co. Comrs. appropriated $100,000 to build Stafe St. bridge, $20,000 for 4th St. bridge and $40,000 for other bridges throughout county.

Ill., Decatur—Macon Co. plans to build bridge. About $50,000.

Minn., Fond du Lac—St. Louis Co. Comrs., Duluth, receiving bids about Nov. 1 building 600-ft. rein.-con. bridge. About $85,000.

Ark., Little Rock—City soon receives bids building Red River Bridge. Bonds for $260,000 to be sold for project. H. Levinson, city engr.

Okla., Purcell—McClain Co., Golsby Twp., voted $13,500 bonds to build bridges.

Bridges (Continued)

Cal., Riverside—City plans to build new rein.-con. bridge over Santa Ana River. About $45,000.

BIDS DESIRED

Pennsylvania—(Official)—Until Oct. 10, by State Highway Comn., Harrisburg, building bridges in various counties as follows: 3 in Clearfield County; 8 Jefferson; 3 Washington; 1 Greene; 2 Fayette; 1 Erie; 4 Crawford; 2 Berks; 3 Lancaster; 2 Sullivan; 1 Montour; 2 Columbia; 2 Northampton; 1 York; 3 Indiana; 3 Susquehanna; 4 Monroe; 1 Wayne; 6- to 36-ft. spans. W. D. Uhler, engr.

Pa., Reading—(Official)—Until Oct. 2, by Berks Co., building 3-span concrete bridge over Saucony Creek, Kutztown Boro., C. J. Rhode, co. controller; advertised in this issue.

W. Va., Elkins—Until Oct. 1, by Randolph Co., Comrs. building rein.-con. bridge over Dry Forks, 60 ft. long with 14-ft. roadway. T. Tritt, clk.

Fla., West Palm Beach—(Official)—Until Oct. 2, by Palm Beach Co. Comrs., building two 60-ft. Scherzer rolling lift steel bridges over F. E. C. Canal, at Delray and Boynton. R. F. Goodman, co. engr.

Indiana—By Co. Comrs. building bridges as follows: Oct. 1; Brazil; building Drake, Francis, Beamer and Cutshall bridges. W. O. Graeser, aud. Oct. 3: Huntington; repairs to South Jefferson St. bridges. O. E. Eviston, aud.

Ind., Corydon—Until Oct. 5, by Harrison Co., building Hottle Ford Bridge. S. C. Mauck, aud.

Ind., Greenfield—(Official)—Until Sept. 24, by Hancock Co., buidling flat-top rein.-con. bridge. C. Boone, co. engr.

Minn., Preston—Until Sept. 25, by J. Dunford, aud., Fillmore Co., building two 40-ft. through girder bridges, one 30-ft. span beam concrete bridge, one 20-ft. girder span, one 6-ft. extension to arch bridge, north of Mabel.

Minn., Walker—Until Oct. 9, by Cass Co., building 120-ft. bridge over Girl River, 18-ft. roadway. A. W. Moulster, Pine River, engr.

Kan., Mankato—Until Sept. 27, by Jewell Co., building 19 bridges. A. Bonecutter, clk.

Okla., Enid—(Official)—Until Sept. 25, by O. W. York, clk. Garfield Co., for 31 bridges, plans include building 20 20- to 60-ft. rein.-con. span bridges, etc. About $60,000. B. F. Lewis, co. engr. Noted Aug. 23.

Okla., Guthrie—Until Sept. 25, by Logan Co., building 19 rein.-con. bridges. About $33,000. A. A. Leer, clk.

Wash., Olympia—Until Oct. 2, by Olympia Co., building rein.-con. bridge over Des Chutes waterway; also paving 10 blocks Harrison St. About $129,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., Scarsdale—(Official)—Bronx Pkway. Comn. received low bids, 2 rein.-con. arch bridges, Contr. No. 24, from R. R. Ames, 5 Adrain St., Rochester, $13,950; N. Fagnani Bros., Inc., Tucahoe, $14,015; Crownbar Constr. Co., Inc., 120 Bway., New York City, $14,602. J. Downer, engr. and secy. Noted Sept. 6.

★**N. J., Newark**—Bd. Freeholders Essex Co. let contract building rein.-con. I-beam bridge over Peckman River, Little Falls Rd., to A. Mathews, 31 Clinton St., $10,449. Noted Aug. 2.

★**O., Columbus**—Franklin Co. Comrs. let contract building bridges over Olentangy River, 3rd and Lane Ave., to Marion Constr. Co., Ruggery Bldg., Marion, and E. Elford, 104 North 3rd St., $156,578 and $153,813, respectively; removing present Lane Ave. bridge and building substructure for new Refugee Park bridge to Capitol Constr. Co., $8390 and $14,898 respectively. Noted Aug. 30.

O., Youngstown—(Official)—Dir. Pub. Ser., received low bids improving east approach to East Federal St. bridge, from S. H. De Groot, $23,622; J. McCarron, 733 Mahoning Ave., $24,275; V. Heasley, 262 Lincoln Ave., $30,464. Noted Sept. 6.

★**Ind., Boonville**—Warrick Co. let contract building 16 steel bridges to International Steel & Iron Co., 1144 Edson St., Evansville, $15,713.

★**Ind., Hammond**—Lake Co. Comrs., Crown Point, let contract building Scherzer lift steel bridge over Calumet River to C. L. Phillips, 134 South La Salle St., Chicago, $85,000.

★**Wis., Milwaukee**—Milwaukee Co. let contract rein.-con. bridge over Menomonee River, on Blue Mound Rd., to Schneider Stone Co., Menomonie Falls, $16,775.

★**Idaho, Swan Valley**—Bonneville Co. Comrs., Idaho Falls, let contract building new Snake River Bridge to W. H. Perham, St. Anthony, $22,500.

STRUCTURAL STEEL WORK

BIDS DESIRED

Ga., Woodbine—See "Bridges."
Fla., West Palm Beach—See "Bridges."
Minn., St. Paul—See "Water-Works."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Ind., Boonville**—See "Bridges."
★**Ind., Hammond**—See "Bridges."
★**Cal., Sacramento**—See "Buildings."

REINFORCED CONCRETE

Proposed Work

Pa., Phila.—See "Bridges."
Del., Wilmington—See "Industrial Works."
W. Va., Huntington—See "Buildings."
Miss., Winona—See "Bridges."
Wis., Sheboygan—See "Industrial Works."
Minn., Duluth—See "Bridges."
Cal., Los Angeles—See "Buildings."
Cal., Riverside—See "Bridges."
Cal., Sacramento—See "Buildings."

BIDS DESIRED

W. Va., Elkins—See "Bridges."
Ind., Greenfield—See "Bridges."
Ind., Lafayette—See "Buildings."
Minn., St. Paul—See "Water-Works."
Okla., Enid—See "Bridges."
Okla., Guthrie—See "Bridges."
Wash., Olympia—See "Bridges."
Cal., Manhattan Beach—See "Miscellaneous."
Cal., San Francisco—See "Buildings."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Brooklyn**—See "Buildings."
N. Y., Scarsdale—See "Bridges."
★**N. J., Newark**—See "Bridges."
★**Wis., Milwaukee**—See "Bridges."
★**Cal., Sacramento**—See "Buildings."
Cal., San Diego—See "Miscellaneous."

STREETS AND ROADS

Proposed Work

Mass., Malden—City plans to pave 1⅛ mi. Salem St. E. H. Estey, city engr.

N. Y., Amsterdam—Council approved appropriation of $30,000 to be used for street paving. C. G. Messinger, city engr.

N. Y., Rochester—Council plans to pave and improve portion Front, Grove, Primrose, Gregory, Cypress, Werner, University, Minnesota, Winton, Camden and Alpha Sts. F. T. Elwood, city engr.

New Jersey—State Highway Comn., Trenton, plans to improve highway between Trenton and Camp Dix, Wrightstown. About $75,000. R. A. Meeker, state highway engr.

N. J., Bayonne—City rescinded contract let to W. T. S. Crichfield, 54 5th St., Hoboken, paving portion 49th St. New bids. Road to be 30 ft. instead of 46 ft. wide. Noted Aug. 30.

N. J., Hackensack—Bd. Freeholders Bergen Co. authorized $[illegible] Lodi road to build and improve county roads.

N. J., Highland Park—(New Brunswick P. O.)—Boro. Council will receive bids grading 8th and 1st Aves., Magnolia and Montgomery Sts. Address E. Page, 2nd Ave.

N. J., Jersey City—City soon receive bids paving Central Ave., granite block. About $30,000. C. A. Van Kuren, city engr.

N. J., Newton—Sussex Co. preparing plans improving Stanhopeadenburg Rd. About $25,000. W. Harden, co. engr.

N. J. South Orange—Township Committee plans macadam pavement and cement gutter on Walton Ave. and Wyoming St. I. T. Redfern, town engr.

N. J., Trenton—Bd. Freeholders Mercer and Monmouth Cos., Freehold, plans to rebuild 5 mi. Old York Rd. Address F. McCullough, Trenton.

Pennsylvania—State Highway Comn., Harrisburg, plans to build 8-mi. state road from Quarryville to Oxford.

Pennsylvania—State Highway Comn., Harrisburg, rejected bids road work in Cambria Co. East Taylor and Jackson Twps.; Washington Co., Cecil and North Strabane Twps.; Allegheny Co., South Fayette Twp.; Lehigh Co., Hanover Twp., Armstrong Co., Manor Twp.; Butler Co., Clinton Twp.; Montgomery Co., Abington, Upper Moreland and Upper Dublin Twps.; Somerset Co., Somerset Twp. and Centre Co., Bellefonte Boro. Noted Aug. 23.

Pa., Brownsville—Boro. plans grading and paving portions 2nd and 18th Sts. Noted Apr. 12.

Pa., Carnegie—Boro. authorized grading, paving and curbing 6th Ave., with paving block, concrete gutter and curb. O. B. Highley, boro. engr.

Pa., Monessen—City plans paving, grading and curbing Leeds and Linden Aves. and 10th St. A. W. Johns, city engr.

Pa., Punxsutawney—Boro. plans to improve West Mahoning St. and pave portions Mitchell and South Main St., brick. R. S. Van Renseler, engr.

Va., Bristol—G. M. Warren, mayor, vetoed sale of $20,000 bonds to improve streets. Noted Aug. 16.

Va., Claredon—Alexandria Co. rejected bid improving Cherrydale Rd. New bids. Noted Aug. 9.

Va., Gate City—Scott Co. plans to grade 5-mi. Bristol-Lexington Highway. E. V. St. Matin, co. engr. Noted May 24.

Va., Goochland—Goochland Co. plans to improve road from state farm to court house, 4 mi.

Va., Graham—City appropriated $10,000 to build 2 mi. waterbound macadam road.

Va., Williamsburg—City plans paving Duke of Gloucester St., 18 ft. wide, York St. and Richmond Ave., 15 ft. wide. About $20,000. J. M. Henderson, mayor.

W. Va., Edgewood—(Wheeling P. O.)—Council sold $54,000 bonds to improve streets.

W. Va., Elmgrove—City voted $[illegible] bonds to pave several streets. Noted July 12.

W. Va., Stealey Heights—(Clarksburg P. O.)—Town voted $15,000 bonds, pave, grade and curb portions Stealey and Decar Aves., Davis St. and alleys, brick and concrete. L. D. Mitchell, mayor. Noted Sept. 6.

N. C., Durham—City plans to pave 50,000 yd. streets. H. W. Knuffner, city engr.

N. C., Louisburg—Franklin Co. Comrs. will vote Oct. 2 on $20,000 bond issue for roads in Gold Mine Twp. J. D. Alston, clk.

N. C., Marion—North Cove Twp. McDowell Co. issued $[illegible],000 bonds to build 2½ mi. road from Marion Twp. line to Solid near Spruce Pine, connecting with road leading to Linville City Twp.

N. C., Nashville—City plans to pave 11,800 sq. yd. streets, asphalt and 10,000 blvd. concrete. H. M. Lee, Box 187, city engr.

Fla., Lake City—(Official)—Columbia Co. Comrs. plan construction 2 [illegible] at Hale, to vote on $[illegible],000 bond issue to build roads. Noted Sept. 13.

Fla., McClenny—Baker Co. will sell $[illegible],000 bonds for road improvements to Special Rd. Dist. No. 1.

La., St. Martinsville—St. Martin's Co. [illegible],000 bonds. Oct. 15 to [illegible]. Noted Sept. 13.

Ky., Harlan—Harlan Co. plans to build [illegible] Mt. Pisgah. W. Pennebaker, [illegible].

Ky., Murray—Calloway Co. plans to build road from Murray to Dexter Cross Roads, Co. line with state aid. About $[illegible].

O., Bryan—(Official)—Williams Co. sold $11,[illegible] bonds for improving roads. M. C. Bowers, co. aud. Noted Sept. 6.

O., Cincinnati—Council passed ordinance to issue $[illegible],000 bonds to construct [illegible] viaduct. Freeman St. P. Krug, city engr.

Streets and Roads (Continued)

O., Cincinnati—Council pased ordinance to improve and pave Hamilton, Seager and Colerain Sts. F. Krug, city engr.

O., Marion—City Council plans to pave, build sidewalks and install sewers on several streets. About $25,000. H. H. Noyes, city engr.

O., Tiffin—Seneca Co. sold $50,000 bonds to improve roads. J. E. Hershberger, aud. Noted Sept. 6.

Ind., Crown Point—(Official)—Lake Co. sold $48,000 bonds to improve roads. M. J. Brown, treas. Noted Sept. 6.

Ind., Richmond—Wayne Co. appropriated $10,000 to improve Petersburg Turnpike.

Mich., Grand Haven—Park Twp., Ottawa Co., plans election soon to vote on $40,000 bond issue to build Alpena Rd. from Central Park to Macatawa.

Mich., Howell—Town voted $13,000 bonds to improve Detroit-Lansing Highway.

Mich., Kalamazoo—Kalamazoo Co. Rd. Comrs. soon lets contract building trunk line highway from Yorkville east to east side of Gull Lake and Turners resort.

Ill., Cairo—Bd. Local Improvs. plans to improve Cedar, Pine and 20th Sts. by paving and installing sewers. About $28,000. G. F. Dewey, city engr.

Ill., Chicago—State Highway Dept. and Federal Government appropriated $614,000 to build Dixie Highway from here to Danville through Will, Kankakee and Iroquois Cos., who will pay remaining one-fourth of estimated cost. Under plan Will Co. will pay $26,500, Kankakee, $67,200 and Iroquois, $94,500.

Ill., Chicago—Illinois Valley Way Assn. plans to build highway from here to Springfield, passing through Joliet, Morris, Ottawa, La Salle, Spring Valley, Depue, Bureau, Peoria and Mason City. State Highway Dept. and Federal Government appropriated $2,215,000 toward project. W. J. Reardon, Pekin, and C. E. Schuremam, Green Valley, interested.

Ill., Decatur—State Highway Comn., Springfield, appropriated $35,000 to build roads in Macon Co.

Ill., Elgin—City soon lets contract paving River St. and north end Douglas Ave. About $32,000. M. H. Brightman, city engr.

Ill., Pontiac—Bd. Supervs. Livingston Co. plan to build 3 mi. hard-surfaced roads, Newton, Charlotte and Graymont Twps. About $36,850. State appropriated $18,425 toward cost.

Wis., Green Bay—Brown Co. voted $175,000 bonds to build and repair roads.

Wis., Milwaukee—City Council plans widening portion Oklahoma Ave. About $101,337. G. Stahl, city engr.

Minn., Minneapolis—City plans to issue $325,000 bonds to widen portion 9th St. F. W. Capen, city engr.

Neb., Lincoln—City soon receives bids paving in Dists. 381 and 398, including Legro Ave., Washington and 31st Sts. A. Talbot, city engr.

Neb., Omaha—County rescinded contract let to W. E. Callahan, 1514 City Natl. Bank Bldg., for 1 mi. paving. New bid. Noted Aug. 16.

Neb., Omaha—City plans to pave 26th St. (asphaltum cement), 24th St. (sheet asphaltum and Jackson St. brick). J. A. Beno, city engr.

S. D., Aberdeen—Brown Co. Comrs. voted $10,000 bonds to improve roads.

Mont., Butte—City plans to build sidewalks, crosswalks, curbs, etc. in Floral Park Addition. About $71,739. J. J. Armstrong, city engr.

Missouri—State Highway Comn., Jefferson City, plans to build highway from East St. Louis to Springfield. About $1,415,000.

Mo., Fredericktown—Madison Co. election Nov. 28 to vote on $100,000 bonds to build 3 hard-surfaced roads from Granite City to Alton, East St. Louis to Springfield and East St. Louis to Terre Haute, Ind.

Mo., St. Joseph—City plans to grade Jefferson and 28th Sts., build sidewalks on 22nd St. and pave Marion, Market and 31st Sts., asphaltic concrete. C. P. Hoff, city engr.

Mo., Stanberry — City Council passed resolution to pave portions Park and High Sts.

Arkansas—State Highway Comn., Little Rock, prepared plans 49 mi. roads, Chatfield, Edmondson and Proctor Twps., earth and gravel; about $185,000; also 7 mi. from Searcy to Smyrna, $45,000.

Ark., Fayettsville — Washington Co. Comrs. had plans prepared building 6-mi. road from Rogers to Huntsville. About $10,000.

Ark., Paragould—Greene Co. Comrs. plan to build 11-mi. road from Walcott to Cache River. About $60,000.

Ark., Texarkana—Miller Co. having plans prepared for road through county to Louisiana State line.

Tex., Albany—Shackelford Co. and State Highway Comn. having plans prepared for Ft. Worth to Roswell Highway. About $110,000. Noted May 4.

Tex., Fort Worth—Tarrant Co. Comrs. plan to build 5-mi. tarvia pike 21 ft. wide from city limits to Nine-Mile bridge. About $15,000.

Tex., Orange—Orange Co., Precinct No. 4, election Oct. 9, to vote on $30,000 bonds to build roads.

Tex., Paris—City election Oct. 9 to vote on $20,000 bond issue for paving and widening streets. Address the Mayor.

Tex., Snyder—Scurry Co. plans election Oct. 13 to vote on $100,000 bonds for building roads.

Colo., Denver — City plans to improve streets, Dists. Nos. 4 and 15. About $73,500. H. F. Meryweather, city engr.

New Mexico — State Highway Dept., Santa Fe, plans to build roads in Quay Co. Plans include Ozark Trail from Tucumcari to Montoya, 22 mi., $95,075; road from Tucumcari to Endee, 3 mi., $10,576; and 1 from Tucumcari to Glenco, $4180; Federal aid will be obtained. J. A. French, state highway engr.

Idaho, Grangeville — (Official) — City voted $35,000 bonds to build roads. W. W. Brown, treas.

Utah—(Official)—State Highway Dept., Ogden, will build Post Rd. project by force account, under supervision of State Rd. Comn. Highway will be built from Castlegate to Duchesne and from Ogden to Hooper. About $77,400 and $31,300 respectively. Noted Sept. 6.

Wash., Seattle—City council plans improving portions 14 streets and avenues and constructing sewers in same. A. H. Dimock, city engr.

Oregon—State Highway Comn., Salem, estimates cost building 18 mi. Central Oregon Highway between Rain Rock and Upper North Fork Valley, at $100,000.

Oregon—State Highway Comn., Salem, rescinded contract let to Oregon-Hassam Paving Co., Bd. Trade Bldg., Portland, for 5 mi. paving north and south of Marion on Pacific Highway. New bids. Noted Aug. 9.

Ore., Woodburn—City plans grading and laying rockolite paving on East Cleveland Ave. About $15,000.

Cal., Corona — City and Riverside Co., Riverside, plan to improve Santa Ana Canyon Rd. from Corona to Orange Co. line.

Cal., Long Beach—See Miscellaneous."

Cal., Riverside—(Official)—Bd. Supervs. Riverside Co. receiving bids about Nov. 1, grading and surfacing 21 mi. road gravel. R. W. Waterman, R. D. 1 No. 2, co. engr.

Cal., Susanville—Lassen Co. election Oct. 2 to vote on formation highway district comprising supervisorial Dists. Nos. 1, 2 and 3. Bond issue of $60,000 is proposed. State legislature appropriated like amount for project.

Ont., Erieau—City plans to build 1 mi. concrete roadway. P. Shillington, clk.

Ont., Windsor—Council passed by-law for widening alley between Ouellette and Ferry. About $13,920. M. A. Dickinson, city clk.

BIDS DESIRED

N. Y., Brooklyn—Until Sept. 28, by M. M. Connolly, boro. pres. (Queens Boro.), regulating and repaving portion Jamaica Ave., asphaltic concrete on relaid block foundation.

N. J., Hamilton Square—(Official)—Until Sept. 26, by W. C. R. Hart, town clk., improving Maple Shade Rd., macadam surface, on macadam foundation, 4980 sq.yd. F. W. Tooker, engr.

N. J., Linden—Until Sept. 25 by Boro. paving portion Elizabeth Ave., concrete. C. H. Smith, clk.

N. J., Newark—Until Sept. 27, by Bd. St. and Water Comrs., flagging sidewalks, South St., paving 14,000 sq.yd. asphalt, 2700 sq.yd. cement granite block, Geneva, North 6th and North Canal Sts. M. R. Sherrard, city engr. Noted Aug. 23.

N. J., Newton—(Official)—Until Oct. 11, by Bd. Freeholders Sussex Co., grading Ross' Corner Sussex Rd.; advertised in this issue.

N. J., Weehawken—(Bergen)—Until Sept. 27, by Township Com., improving Bulls Ferry Rd. and 31st St. About $30,000.

Pennsylvania — (Official) — Until Oct. 9, by State Highway Dept., Harrisburg, rebuilding roads in Cambria, Lackawanna, Washington, Allegheny, Lehigh, Butler, Westmoreland, Montgomery and Venango Cos., vitr. block and rein.-con. F. B. Black, comr.; advertised in this issue.

Pennsylvania—(Official)—Until Oct. 16, by State Highway Dept., rebuilding roads in Greene, Armstrong, Somerset and Center Cos. F. B. Black, comr.

Maryland—(Official)—Until Oct. 2, by State Rds. Comn., 601 Garrett Bldg., Baltimore, highways in Frederick and Allegany Cos.; advertised in this issue.

S. C., Charleston—(Official)—Until Sept. 25, by J. W. Martin, engr., Sanitary and Drainage Comn., 39 Broad St., paving 8500 sq.yd. concrete or asphalt; advertised in this issue. Noted Sept. 13.

Fla., Miami—Until Oct. 1, by J. F. Canova, city clk., paving, grading, rolling, scarifying and oiling Ocean Dr.

Ala., Carrollton—Until Oct. 4, by Pickens Co. Highway Comn., grading, graveling, fencing and hauling and placing concrete pipes on following roads: Carrollton and Pickens Rd., 7 mi.; State line to Pickensville, 10 mi.; Reform-McShas Rd., 10 mi.; McShas State line Rd., 12 mi.; involving 150,000 cu.yd. grading; 40,500 cu.yd. graveling; 500 stations clearing and grubbing; 3500 lin.ft. pipe and 100,000 ft. bridging. G. E. Hauser, Columbus, engr.

Ala., Russellville—Until Sept. 29, by A. J. Earle, city engr., certain grade work, gravel paving and culvert work.

Ala., Wedowee—Until Oct. 13, by Randolph Co., Comrs., grading, draining and surfacing 3½ mi. State Trunk Rd. No. 19, between Rock Mills and Georgia State line; involving 16,000 cu.yd. earth excava., 1000 cu.yd. solid rock excava. and 5000 cu.yd. top soil.

O., Bryan—(Official)—Until Sept. 28, by Comrs. Williams Co., building 1.94 mi. public highway in Springfield Twp. About $18,584 for bank run gravel and $23,202 for waterbound macadam. G. C. Beucler, aud.

O., Cincinnati—(Official)—Until Sept. 24, by E. VonBargen, purch. agt., 60,000 gal. coal tar bituminous binder for repairing bituminous and macadam streets. F. Krug, city engr.

O., Cleveland—Until Sept. 26, by City, paving Ivanhoe Rd. grade elimination. R. Hoffman, city engr.

O., Steubenville—Until Sept. 27, by G. W. Borden, dir. pub. ser., paving portion Oregon Ave. J. N. Leach, city engr.

Indiana—By Co. Comrs. building roads as follows: Sept. 29: Anderson; 2 gravel roads, Union, Jackson and Stoneycreek Twps. E. T. Flahavin, aud. Frankfort; building 4775 ft., 1345 ft., 5337 ft. gravel roads, Perry and Forest Twps. E. Spray, aud. Oct. 1: Newport; 2 gravel roads, Vermillion Twp. L. F. Wright, aud. Oct. 2: Monticello; road, Monon and Honey Creek Twps. A. G. Fisher, aud. Rensselaer; 2 stone roads, Barkly Twp. J. P. Hammond, aud. Goshen; concrete road, Concord Twp. A. R. Bemenderfer, aud. Vincennes; 12,144 ft. gravel road, Johnson Twp., 14,100 ft. Harrison Twp. J. I. Muent-

Streets and Roads (Continued)

zer, aud. Oct. 3: Bloomfield; 3 macadamized roads, Jefferson, Fairplay and Stockton Twps. G. E. Kidd, aud. Columbia; 13,508 ft. gravel road, Washington Twp. T. A. McLaughlin, aud. Oct. 5: Corydon; 2 stone roads, Webster, Boone and Harrison Twps. S. C. Mauck, aud.

Michigan—(Official)—Until Sept. 26, by F. F. Rogers, state highway comr., Lansing, building 5.983 mi. waterbound macadam road, Laketown Twp.

Washington—(Official)—Until Oct. 1, by State Highway Comn., Olympia, clearing, grading, draining and surfacing State Rd. No. 21, between Clifton and Charleston in Mason and Kitsap Cos., 10 mi., 6 mi. State Rd. No. 22, from Myers Falls, Stevens Co., and sections of Olympic and Pacific Highways. Noted Sept. 6.

Wash., Olympia—See "Bridges."

Ore., The Dalles—(Official)—Until Sept. 25, by Wasco Co. Court, grading, ditching, draining and macadamizing The Dalles-Dufur Sect. and Dufur-Kingsley Sect. of The Dalles-California Highway; also Seven Per Cent Route a.d Dry Creek Route of The Dalles-Mosier Rd.

California—Until Oct. 8, by State Highway Comn., 515 Forum Bldg., Sacramento, paving 7.7 mi. in Butte Co.; 16 mi. in Marin Co. and 12.4 mi. in Sonoma Co., concrete. A B. Fletcher, engr.

Cal., Oroville—Until Oct. 1, by C. F. Belding, clk., Butte Co., improving roads in Dist. No. 2.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Massachusetts**—(Official)—State Highway Comn., Boston, let contract building roads, Egremont-Sheffield Twp., to F. Fay & Co., Springfield. Noted Aug. 2.

★**Massachusetts**—(Official)—State Highway Dept., Boston, let contract paving Littleton Highway to Framingham Constr. Co., Framingham. Noted Aug. 30.

Mass., Boston — City received low bids surfacing 36,161 sq.yd. on Beacon, North Russell, Maverick Sq., Harvard, Bowdoin and South Sts. and Brighton Ave., from Bermudez Co., 246 1st St., $111,542; Rowe Contg. Co., Boston, $116,044; Warren Bros. Co., 142 Berkeley St., $112,786.

Rhode Island—(Official)—State Bd. Pub. Rds., Providence, received low bids rebuilding section East Main Rd., Portsmouth Twp., from A. Price, Narragansett Pier, $67,161; J. McCormick, 315 Taunton Ave., East Providence, $68,727; Lane Constr. Co., 37 Colony St., Meriden, Conn., $74,386. Noted Sept. 6.

★**Connecticut** — State Highway Dept., Hartford, let contract 5½ mi.concrete road in Cheshire and Hamden Twps., to Sperry Eng. Co., 82 Church St., New Haven, $127,529. Noted Sept. 6.

★**Conn., New Haven**—Permanent Paving Comn. let contract paving portion Hamilton St., to Union Paving Co., 119 Lafayette St., Schenectady, N. Y., $12,077.

★**N. Y., Brooklyn**—Dept. Parks let contract paving Ft. Hamilton Ave., Ocean Pkway., to 72nd St., asphalt, to Brooklyn Alcatraz Asphalt Co., 407 Hamilton Ave., $128,271.

N. Y., Brooklyn — (Official) — L. H. Pounds, boro. pres., received low bids regulating and restoring pavement within area intersected by Dean St. and Nostrand Ave., from Rosenthal Eng. Contg. Co., Inc., 165 Hooper St., $30,148.

N. Y., New York—(Official)—D. Mathewson, boro. pres. (Bronx Boro.), received low bids grading, curbing, guttering, paving and repaving streets as follows: East 138th St., S. S. Davis, 437 East 139th St., $12,106, Fredburn Constr. Co., $13,792. Davney Asphalt Paving Co., 52 Vanderbilt Ave., $13,888; Sacket Ave., Fred Schneider, Westchester Ave. and Bronx Rd., $10,612. Bebalso & Baldo, 1481 Hoe Ave., $45,375. Oscar Daniels Co., Woolworth Bldg., $45,641; University Ave., Uvalde Asphalt Paving Co., 1 Bway., $16,648. Asphalt Constr. Co., 2197 Madison Ave., $17,133. Noted Aug. 30.

★**N. J., Camden**—Street Com. let contract paving Federal St. to John M. Kelly Contr. Co., 432 Market St. About $3.90 per sq.yd.

★**N. J., East Rutherford**—(P. O., Rutherford)—(Official)—City let contract paving Park Ave., granite block, to Jannarane Contr. Co., Belleville, $12,000. Noted Aug. 23.

★**N. J., New Brunswick**—Bd. Freeholders Middlesex Co., let contract paving Rahway Ave., to Meagher & Smith, 211 Market St., Perth Amboy, $74,964. Noted Sept. 6.

★**Pennsylvania**—(Official) — State Highway Comn., Harrisburg, let contract 7821 ft. bituminous concrete road in Lackawanna Co., South Abington Twp., to H. B. Sproul Constr. Co., Inc., 1055 Division St., Peekskill, N. Y., $51,218; 6513 ft. vitr. block pavement, Fayette Co., Washington Twp., Vicenzo Di Giorno, Fayette City, $45,825; grading and draining 9299 ft. road, Beaver Co., Hopewell and Moon Twps., W. S. Morrison, New Brighton, $18,851; 23,546 ft. rein. cement concrete road White and Big Beaver Twps., P. F. Connolly, Reality Bldg., Elmira, N. Y., $145,199. Noted Aug. 23.

Pennsylvania — (Official) — State Highway Comn., Harrisburg, received low bids paving 1270 ft. vitr. block pavement on road in Dauphin Co., Swarara Twp., from Stucker Bros. Constr. Co., Russ Bldg., Harrisburg, $17,857; F. J. Reilly, Lancaster, $18,184; paving 8367 ft. rein. con. road in Foster Twp., Route 96, Sect. 1, Lawrence Schultze & Sons, Fredonia, N. Y., $43,777; Jos. McCormick and Bro., 717 West 11th St., Erie, $48,116; P. F. Connolly, Reality Bldg., Elmira, N. Y., $42,232. Noted Aug. 23.

★**Pa., Williamsport** — City let contract paving Market St. bridge, creosoted wood block floor, to Busch & Stewart, Trust Bldg., $15,682.

★**Md., Baltimore**—City let contract paving Weldon Ave. and Ailsa Terrace, sheet asphalt, to F. Novak, $7740; several streets and alleys, recut granite blocks, to P. Reddington & Sons, $28,848. Noted Aug. 16.

Md., Towson—Baltimore Co. Comrs. received low bid building 1 mi. Falls Rd., concrete, from T. F. Mullan, 4001 Greenmount Ave., Baltimore, $22,574. Noted Aug. 30.

★**Va., Hampton**—Elizabeth City Co. let contract building concrete road from Hampton to Newport News to Hunter & Tignor, Hampton, $60,000.

★**N. C., Durham**—(Official)—City let contract improving streets, lake sheet asphalt, combined curb and 30-in. gutter; also concrete storm pipe sewer to Ely Constr. Co., Charlotte, $136,151.

★**Fla., Jacksonville** — City let contract paving Adams and Parker Sts,. brick, to Wilson Constr. Co., Clark Bldg., Jacksonville, $1.30 and $1.27 per sq.yd.

★**Miss., Indianola**—Sunflower Co. let contract building 25 mi. gravel roads to W. A. Morrison, Grenada. Noted Aug. 2.

★**Miss., Tunica**—Tunica Co. Comrs. let contract building 41 mi. gravel roads to N. A. Dawson, 801 Guntel Bldg., San Antonio, Tex., $220,000. Noted July 26.

★**Miss., Yazoo City**—Yazoo Co. Highway Comn. let contract 7 mi. grading to Edgar Bros. Co., Canton. About $50,000. Noted Aug. 30.

★**Louisiana**—State Highway Comn., New Orleans let contract building 33 mi. road, Rd. Dist. No. 1, Coupee Parish, to Grisby Constr. Co., $125,000. Noted Aug. 16.

★**La., Amite**—Bd. Supervs. Tangipahoa Parish Rd. Dist. No. 4, let contract building Kentwood and Tangipahoa Rds. to T. G. Womack, Kentwood, $13,428 and $11,250 respectively. Noted Aug. 16.

★**O., Lancaster**—See "Sewers."

★**Ind., Anderson**—Madison Co. Comrs. let contract paving Meridian Ave. to Indiana Asphalt Paving Co., 25th St. and Lake Erie & Western Ry. tracks. About $72,400.

★**Ind., Michigan City**—City let contract paving portion Vail St. asphaltic concrete to Municipal Contr. & Supply Co., $1.04 per sq.yd.

★**Mich., Caro**—Tuscola Co. let contract building 3 mi. 16-ft. concrete trunkline highway in Akron Twp. to Hess Bros., Akron. About $37,000.

★**Mich., Detroit**—Bd. Pub. Wks. let contract paving, grading, curbing and laying 6-in. concrete foundation in Mackie, McKinstry and Konkel Aves. and Lisbon St.; to F. Porath & Son, 305 Free Press Bldg., $32,802; Clarendon Ave., to J. Porath, 34 McGraw Bldg., $26,903; Alleys Nos. 849, 850, 851, 852, 853, 854 and 855, Otis Cement Constr. Co., 806 Hammond Bldg., $30,437. Mercier and Yale Sts., St. Jean, Chalmers, Dickerson, Burns, Avery, Marlborough, Newport and Eastwood Aves., asphaltic concrete, Amherst curbstone, to Detroit Asphalt Paving Co., McGraw Bldg., $146,771; La Salle Gardens, asphaltic concrete, W. B. Brady Constr. Co., $10,733; Collingwood Ave., Cleveland Trinidad Paving Co., 3409 Trumball St., Cleveland, $28,668.

★**Mich., Grand Rapids**—(Official)—Kent Co. let contract road from Belmont to Plainfield to Golden & Boter 25 Market Ave., N. W., $18,800.

★**Illinois** — (Official) — State Highway Comn., Springfield, let contract building 50,206 ft. earth road, Sects. I and J, Tazewell Co., to Cameron Joyce & Co., Keokuk, Ia.; 6210 ft. brick road, Sect. F, Edgar Co., to A. J. Parrish, Paris; Sect. F, Effingham Co., to Parham Constr. Co., 3029 Waverly Pl., East St. Louis.

★**Ill., Chicago**—City let contract paving 18 blocks, asphaltic concrete, on East Side, to Chicago Heights Coal Co., Chicago Heights. About $80,000.

★**Ill., Flora**—(Official)—City let contract improving main, 2nd and Locust Sts. to R. R. Havshman, Sullivan, $33,659.

Ill., Galesburg—City received low bid paving North Seminary St., from J. B. McAuley, 13-15 Commercial Bldg., $20,967. Noted Aug. 2.

★**Ill., Springfield**—City let contract improving portion Carpenter St. to H. Nelch & Son, 9212 Jackson St., $.87 per sq.yd paving, 60c. per ft. curbing.

★**Ia., Davenport**—Bd. Pub. Wks. let contract paving portions Fenwood, Mound, Wilkes, 16th, Judson, Vine, Glaspell and Henry Sts., to Central Eng. Co., 809 Putnam Bldg., $10,117.

★**Ia., Mason City**—City let contract paving 3 mi. road from Mason City to Clear Lake to Bryant Asphalt Paving Co., Black Hawk Bldg., Waterloo, $1.62 per sq.yd. Noted June 28.

Minn., Duluth—St. Louis Co. received low bid scarifying, rolling and surfacing 1 mi. 11th Rd. from General Contr. Co., 1254 Plymouth Bldg., Minneapolis, $20,000.

★**Minn., Gilbert**—(Official)—Village Trustees let contract resurfacing 15,000 sq.yd. streets, warrenite, to General Contg. Co., 1254 Plymouth Bldg., Minneapolis.

★**Minn., Mankato**—(Official)—Blue Earth Co. let contract graveling 4½ mi. Mapleton Rd. to M. E. Runke, Mapleton. Noted Sept. 6.

★**Minn., St. Paul**—City let contract lug wood paving blocks to Kettle River Co., Minneapolis, $1.74 per sq.yd.

★**Kan., Ottawa**—City let contract, paving portion Cedar St. to N. E. Stucker, $12,308.

★**Neb., Kearney**—City Comrs. let contract paving 1st, 2nd and 5th Aves., 23rd and 24th Sts., to Union Paving and Constr. Co., St. Joseph, Mo., $1.67 per sq.yd. Noted June 14.

★**Mo., Joplin**—City let contract resurfacing 5,146 sq.yd. Wall St., brick and 4847 ft. 5th St. to Spencer Road Oil Co., 801 Chestnut Ave. Noted Aug. 9.

★**Mo., Kansas City**—(Official)—Bd. Park Comrs. let contract paving portion Paseo Rd. to McTernan Halpin, 25th and Grand Ave., $1.37 per sq.yd. Noted Sept. 6.

★**Mo., Kennett**—City let contract improving portions Washington Ave. and College St., involving 14,068 sq.yd. paving, 18,814 lin.ft. curbing, 1444 lin.ft. 6- to 12-in. sewer pipe, 1189 cu.yd. grading and 460 lin.ft. concrete headwalls to Carrigan & Workman, Kennett.

★**Mo., St. Joseph**—City let contract paving portion King Hill Ave. to Metropolitan Paving Co., 7th and Olive Sts. Noted Sept. 13.

★**Ark., Arkadelphia** — City let contract macadamizing Main St. to Harding Constr. Co., Arkadelphia, $10,000.

★**Okla., Ardmore**—City let contract to Ardmore County Co., Ardmore, paving A St., $14,557, B St., $16,445, and D St., $14,940.

Streets and Roads (Continued)

★**Wash., Ferndale**—City let contract paving 3rd and other streets to C. Lind, Bellingham, $116,479.

Wash., Seattle—King Co. Comrs. received low bids building Automobile highway No. 11-C from A. L. Clark Co., c o Washington Paving Co., L. C. Smith Bldg., $14,753; H. J. Kaiser, 317 Colby Bldg., Everett, $15,000. Noted Aug. 16.

★**Wash., Seattle**—City let contract paving Ballard Ave. in Salmon Creek Co., 1532 Lake St., Seattle. About $11,457. Noted Sept. 6.

★**Oregon**—State Highway Comm., Salem, let contract finishing Columbia River Highway, Bridges to be omitted, from Oakland to Yoncalla to Warren Constr. Co., Journal Bldg., Portland, $44,867; from Comstock to Lewis Hale & Sellers, Eugene, $57,946; Leona to Lane Co. line, S. S. Schaal, Roseburg, $20,787. Noted Aug. 30.

★**Ore., Astoria**—City let contract paving portion Franklin Ave. to Birch & Jackson, Astoria, $12,500. Noted Sept. 6.

Ore., Portland—City received low bids building streets, Rose City Park Dist., gravel-bitulithic, from Warren Constr. Co., Journal Bldg., Portland, $20,391 and O. Huber, Sherlock Bldg., $21,231.

California—(Official)—State Highway received low bids grading 10.8 mi. highway in Shasta Co., from Holland Constr. Co., Granger Bldg., San Diego, $27,642; W. M. Ledbetter, Pacific Electric Bldg., Los Angeles, $27,478; C. L. Hyde Constr. Co., Spreckels Bldg., San Diego, $27,833; grading 4.5 mi. in San Diego Co., Palmer & McBryde, Hooker & Lent Bldg., San Francisco, $80,141; Hultgren Bothwell, Los Angeles, $90,777; Tieslau Bros., San Francisco, $61,304. Noted Aug. 23.

California—State Highway Comm., Sacramento, received low bids 7.2 mi. grading in Humboldt Co. from A. Robinson and R. R. Smith, Fortuna. About $48,407. Noted Aug. 30.

★**Cal., Long Beach**—Bd. Pub. Wks. let contract improving 7th and Elm Sts. to Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., Los Angeles, grading 17.5c. per sq.ft., curbing, 35c. per lin.ft., guttering 23c. per sq.ft., sidewalks, 12c. per sq.ft. and pipes and culverts at $1000. Noted Sept. 6.

★**Cal., San Bruno**—Bd. Trustees let contract for street work to Chas. J. Linderen, Burlingame. About $43,238.

Cal., San Jose—Santa Clara Co. received low bids improving Redwood Mill Rd. from Kanze Const. Co., $47,—; Spring Constr. Co., Solano and Colusa Sts., Berkeley, $47,-730; F. E. Ritchie Sharon Bldg., San Francisco, $45,—; Santa Clara and Alviso Rd., Splitrock Improv. Co., Underwood Bldg., San Francisco, $43,476; Santa Clara and Alviso Rd., F. E. Ritchie Sharon Bldg., San Francisco, $48,480; Noted Aug. 16.

★**Cal., Santa Barbara**—City let contract 12,500 sq.ft. concrete paving, 4485 lin.ft. concrete curbs, 5015 sq.ft. concrete walk, 10,186 sq.ft. concrete gutter, 7 catch basins and sprinkler system to State Bd. to Equalize—Wilson Co., Pacific Electric Bldg., Los Angeles, $47,—; 10,000 sq.ft. concrete paving, 1561 lin.ft. concrete curbs, 14,121 sq.ft. concrete walk and 195 lin.ft. drain, Mt. Vernon Ave. to La Vina St. to G. R. Curtis, 1219 Chapman Bldg., Los Angeles, $7,117. Noted Aug. 24.

★**Cal., Vallejo**—City let contract improving streets to central portion of city to Wheeler Canon Co., Vallejo, $61,—.

Cal., Ventura—Bd. Supvrs. Ventura Co. received low bid 1,110,000 sq.ft. concrete paving on Ventura-Hueneme Road, Consolidated Paving Co., Consolidated Bldg., Los Angeles, $15,—. Noted Aug. 16.

★**Cal., Yreka**—Siskiyou Co. let contract building 5 mi. Forest-Grove-Kuna Rd. to A. Anderson, Yreka, $11,—.

★**Ore., Shawnigan Falls**—City let contract grading La Grande septic to J. D. Shawnigan Falls, $11,—.

★**Ore., Shawnigan Falls**—City let contract grading La Grande septic to J. D. Lapointe, $6250; O. Ricard, $5290; A. Giguere, $4700.

★**Ore., Three Rivers**—City let contract paving 12 ft. wide concrete pavement in Fairfield & Pacific Co., Lambert City, Wash. About $11,—. Noted July 26.

RAILWAYS—STEAM & ELECTRIC

Proposed Work

Massachusetts—New York, New Haven & Hartford R.R. plans to widen and improve South Boston cut. About $1,000,000. E. Gagel, New Haven, ch. engr.

Florida—Jacksonville & Seashore Electric Association plans to build 25-mi. line from Jacksonville to seashore, via proposed new highway bridge over St. Johns River, St. Elmo. W. Acosta, Herkimer Bldg., Jacksonville, secy.

Kentucky—Black Mountain R.R., recently incorporated with $200,000 capital stock, plans to build 10-mi. line from Pineville to confluence of Puckett's Creek and Chunk Lick Branch in Harlan, to tap coal fields of Bell and Harlan Cos. J. O. Watson, Fidelity Bldg., Fairmount, W. Va., M. C. Spratt, Buffalo, and J. S. Lambert, Fredonia, N. Y., incorporators.

Minnesota—Cuyuna Southern Ry., recently incorporated with $100,000 capital stock, plans to build line from Deer Wood to Mississippi River, St. Paul. C. Adams, Deer Wood, pres.

Montana—Northern Pacific R.R. plans to build 28-mi. line from Rapelje to Hesper, to be known as Lake Basin Branch. H. E. Stevens, St. Paul, ch. engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Kentucky**—Illinois Central R.R. let contract rebuilding lines in Paducah to G. W. Katterjohn, Paducah, $24,000.

★**Montana**—Great Northern Ry. let contract grading and double-tracking 26 mi. between Cut Bank and Blackfoot to Porter Bros., Spokane, $100,000.

★**Washington**—Chicago, Milwaukee & St. Paul R.R. let contract building 5½-mi. spur from Greendale to American Lake cantonment, Camp Lewis, to C. Matson & Son, Tacoma, $80,000.

EXCAVATION AND DREDGING

Proposed Work

Mich., Grand Rapids—Drainage—Comrs. Kent Co., Grand Rapids, Iona Co., Ionia and Barry Co., Hastings, will soon receive bids building Coldwater River drain, Kent Co., about 18 mi. H. B. Patterson, drainage comr.

Minn., Duluth—Ditch—St. Louis Co. soon receives bids building Co. Ditch No. 11, Canosin region. About $12,800. O. Haldin, co. aud.

Minn., Ivanhoe—(Official)—Ditch—Lincoln Co. sold $50,000 bonds to build Ditch No. 30 and $65,000 for Ditch No. 35. K. A. Hansen, co. aud. Noted Sept. 6.

Ark., Jonesboro—Drainage—Cache River D. D. plans to build main ditch, 25 mi. long, 125 ft. wide, 30-mi. laterals, 25 to 45 ft. wide, to drain 110,000 acres, Craighead, Lawrence and Jackson Cos. J. R. Rhyme, Corning, engr.

Ore., Grants Pass—Irrigation—Grants Pass Irrigation Dist. election Oct. 4 to vote on $290,000 bond issue to install system for district covering 5250 acres, involving 35-mi. main canal, laterals, flumes, tunnels, etc. G. A. Harrison, engr. Noted June 28.

Ore., Medford—Irrigation—Talent Irrigation Dist. votes $240,000 bonds for waterworks system from Hyatt Prairie source of supply in Cascade Mts., near Green Springs.

Cal., Oakdale—Oakdale Irrigation Dist. plans to spend $60,000 to concrete canals and replace flume.

BIDS DESIRED

Miss., Clarksdale—Drainage—Until Oct. 2, by Coahoma Co. Drainage Comm., cleaning and repairing 38 mi. canals, involving 170,000 cu.yd. excavation. Hopson Bayou D. D. L. W. Dashburn, engr.

Ind., Muncie—(Official)—Ditch—Until Sept. 15 by Delaware Co. Auditor, building William D. Smith Joint Ditch, involving 42,878 cu.yd. excavation, 1600 ft. 14-in. and 2300 ft. 18-in. shale tile. Address O. G. Weir, Anthony Blk.

Ia., Storm Lake—Drainage—Until Sept. 27 by Buena Vista Co. Auditor, building Buena Vista Co. Ditch No. 166, involving 58,000 cu.yd. excavation and 144,222 ft. 6- to 24-in. tile. W. W. Bennett, aud.

Minn., Anoka—Ditch—Until Oct. 3, by Anoka Co., building Co. Ditch No. 60, 16,100 ft. long, branches 12,840 ft. long, cost $28,-371; repairing Co. Ditch No. 41, involving 68,646 cu.yd. excavation, $18,178. C. S. Piper, co. aud.

Minn., Fairmont—Ditch—Until Sept. 25 by Martin Co., building Judicial Ditch No. 77, involving 29,325 ft. 6- to 26-in. tile. About $22,649. H. C. Nolte, co. aud.

Minn., Le Sueur—Ditch—Until Oct. 1, by T. F. Dunn, Aud. Le Sueur Co., building Co. Ditch No. 45, involving 156,545 cu.yd. excavation. About $22,830.

Minn., Slayton—(Official)—Ditch—Until Sept. 27 by E. V. O'Brien, aud. Murray Co. building Judicial Ditch No. 19, involving 101,000 ft. 6- to 26-in. tile, cost, $44,542; Co. Ditch No. 6, 32,700 ft. 6- to 28-in. tile, $15,315.

Minn., Slayton—(Official)—Ditch—Until Sept. 28 by E. V. O'Brien, aud Murray Co., building Judicial Ditch No. 24, Murray and Cottonwood Cos., involving 9985 ft. 6- to 18-in. tile. Cost, $3533; Co. Ditch No. 54, 25,800 ft. 6- to 18-in. tile, $6776.

Ont., Port Maitland—Dredging—Until Sept. 25, by R. C. Desrochers, secy. Bd. Pub. Wks., Ottawa, dredging Grand River Channel.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., New York**—(Official)—Dredging—City let contract dredging slips, foot 55th, 56th and 57th Sts. to Coastwise Dredging Co., 17 Battery Pl., $92,400. Noted Sept. 6.

★**Tenn., Trenton**—Canal—4th Dist. Drainage Comn. let contract 17 mi. drainage canal, Gibson, Crockett and Madison Cos., to N. C. McGinnis & Co., Exch. Bldg., Memphis, $153,000.

★**Ia., Hampton**—(Official)—Drainage—Franklin Co. let contracts building drainage districts, (a) labor, (b) material as follows: Lehigh Sewer Pipe and Tile Co., Ft. Dodge, D. D. No. 52, (a) $24,215; N. K. Pederson, Coulter, (b) $10,480; Leheigh Clay Products Co., Leheigh, D. D. No. 54, (a) $12,487, No. 55, (a) $34,699; J. P. Zander, Coulter No. 54, (b) $7211; A. A. Hamrey, Forest City, No. 55, (b) $14,917; Hawkeye Constr. Co., Webster City, D. D. No. 58, (a) $24,490; James Slattery, Dows, (b) $15,800. Noted Aug. 30.

★**Ia., Webster City**—Drainage—Hamilton and Webster Cos., Ft. Dodge, let contract tile for joint drain No. 204-248 to Natl. Sewer Pipe Co., Webster City, $10,138; labor to H. A. Tegat, $5995.

★**Minn., Walker**—(Official)—Ditch—Comrs. Cass Co. let contract Judicial Ditch No. 6, requiring 70,234 cu.yd. excavation on main ditch 18,724 cu.yd. on laterals, culverts, bridges, etc., to Road Constr. Co., Grand Rapids, Wis., 11.95c. per cu.yd. Noted Sept. 6.

INDUSTRIAL WORKS

Proposed Work

Mass., Boston—Coleman & Gilbert, 351 Huntington Ave., plan 3-story, 91 x 110-ft. brick and concrete garage, Boylston and Ipswich Sts. About $150,000.

R. I., Providence—Packard Motor Car Co., 189 Auburn St., rejected bids, 2-story, 189 x 200-ft. garage and salesroom. About $175,000. Albert Kahn and Ernest Wilby, 58 West Lafayette Blvd., Detroit, Mich., archts.

N. Y., Dunkirk—Atlas Crucible Steel Co. plans rolling mill, machine shop, storeroom, transformer station, laboratory, time office and other additions.

N. Y., New York—Falkenau & Hamershlag, Inc., 51 East 42nd St., had plans prepared by S. Katz, 405 Lexington Ave., for 2-story, 100 x 149-ft. brick garage and store. About $110,000.

N. Y., S. I., Clifton—Pouch Terminal Co., Clifton, had plans prepared by Concrete Steel Co., 42 Bway., New York City, for 7-story factory.

Pa., Phila.—American Ice Co., 6th St., plans 2-story ice-manufactury plant, 10th and Callowhill Sts. About $250,000.

Pa., Phila.—Crew-Levick Co., Land Title Bldg., plans 1-story, 72 x 72-ft. dry house; 1-story, 45 x 70-ft. workhouse, 2-story, 72 x 96-ft. cooper shop; 2-story, 30 x 72-ft. pump and tank house and 2-story, 70 x 325-ft. paint shop on Pettys Island, Delaware River.

Industrial Works (Continued)

Pa., Phila.—T. Cusack & Co., 18th and Nonble Sts., having plans prepared by M. H. Dickinson, archt., Empire Bldg., 1- and 2-story, 80x200-ft. factory.

Pa., Pittsburgh—D. Kellerman, Pile St., plans 3-story brick warehouse. About $70,000.

Del., Wilmington—Wilmington & Philadelphia Traction Co., 7th and Orange Sts., plans 1-story, 54 x 64-ft. rein.-con. addition to plant at 18th and Buena Vista Sts. About $55,000.

Ky., Pineville—Detroit Elk Co. plans portland cement plant. About $1,000,000. C. C. Winters, Mancourt-Winters Coal Co., Dime Bank Bldg., Detroit, interested.

O., Akron—L. G. Federman, 86 South Main St., had plans prepared by Fichter & Brooker, archts., 2nd Natl. Bank Bldg., for 4-story, 39 x 92-ft. warehouse, 44 South Summit St.

O., Akron — Northern Ohio Traction & Light Co., Hamilton Bldg., soon lets contract boiler house, warehouse, meter laboratory and club house. Franz Warner, 718 Hippodrome Annex Bldg., Cleveland, archt.

O., Akron—Williams Fdry. & Machine Co., 60 Cherry St., plans 5-story, 50x275-ft. addition.

O., Cleveland—City Council plans to issue $3,300,000 bonds for ice plant, building improvements, at Warrensville Farm, park extension and improvements to high level bridge.

O., Cleveland — National Lamp Works, 1131 East 152nd St., had plans prepared by G. H. Johnson, Citizens Bldg. for warehouse and factory. About $160,000.

O., Dayton—Cooper Medicine Co., 309 East 1st St., had plans prepared for 5-story, 50x196-ft. factory. About $175,000. Pretzinger & Musselman, 1155 Riebold Bldg., archts., will receive bids.

O., Sandusky—Lake Erie Dry Dock & Eng. Co., incorporated with $1,600,000 capital stock, plans factory here. C. Bright, 299 Bway., New York City, and others, interested.

Mich., Grand Rapids—E. B. Hayes Axle Co., 571 High St., Oshkosh, Wis., plans 100x400-ft. factory near Fuller Sta. About $100,000.

Mich., Muskegon—People's Mill Co. plans to rebuild plant recently destroyed by fire with loss of $150,000. M. Frost, pres.

Wis., Green Bay—Oneida Motor Truck Co. plans 2-story, 125x475 ft. brick and steel factory. About $55,000. Foeller & Schober, 123 North Washington St., archts.

Wis., Milwaukee—American Autobody Co., 531 Caswell Blk., plans 4-story, 200x300-ft. rein.-con. factory. About $80,000.

Wis., Milwaukee—Weyenberg Shoe Co., Hubbard St. and Reservoir Ave., plans 7-story, 50 x 200-ft. addition and 24 x 60-ft. wing. H. J. Esser, Camp Bldg., engr.

Wis., Sheboygan—Northern Furniture Co., South Waten and North Jersey Sts., plans 6-story, concrete addition to factory. About $75,000.

Ia., Dubuque—Sterns Tire & Tube Co. of Iowa plans 2-story, 100 x 150-ft. rubber factory. About $80,000.

Ia., Waterloo—Union Mills having plans prepared by M. B. Cleveland, archt., 1st Natl. Bank Bldg., brick and rein.-con. warehouse and grain-drying plant. About $100,000.

Minn., Minneapolis—Albert Lea Sprayer Co., 309 West Main St., plans 5-story, 54x110-ft. factory.

Minn., Minneapolis—Foster Robe & Tanning Co. plans 3-story, 42 x 35 ft. tannery and fur factory. About $55,000.

Minn., Minneapolis—B. F. Nelson Mfg. Co., 501 N. E. East St., plans 3-story, 38 x 46-ft. brick and rein.-con. paper mill. About $50,000.

Minn., Minneapolis—Republic Creosoting Co., 822 Plymouth Bldg., plans 3-story, 100 x 150-ft. rein.-con. and brick factory, power house and office. About $...,000.

Mo., St. Louis — Montague Chemical Works, 1800 South 2nd St., St. Louis, plans new plant. About $...,000.

Idaho, Idaho Falls—East Idaho Rail Co. plans initial expenditure of $60,000 and ultimate expenditure of $125,000 for gas plant here. W. D. Wilcox, pres.

Cal., Bay Point—Pacific Coast Shipbuilding Co., 175 Stewart St., San Francisco, recently organized, plans steel shipbuilding plant near Bay Point. About $1,500,000. H. T. Scott, mgr.

Ont., Markham—Canada Cereal Co. receives bids about Mar. 15 for flour mill. About $100,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., South Boston**—(Boston P. O.)—Boston Wharf Co., 259 Summer St., let contract 6-story, 90 x 128-ft. brick warehouse on Farnsworth St., to F. C. Alexander, 294 Washington St.

★**N. Y., Buffalo**—Ericson Mfg. Co., 1100 Military Rd., let contract brick and steel addition to J. W. Cowper Co., Fidelity Bldg., $50,000.

★**N. Y., Syracuse**—Continental Can Co., 1016 East Water St., let contract factory, East Water St. and University Ave., to Thompson & Binger, Inc., 280 Madison Ave., New York City, $60,000.

★**N. J., East Orange**—Crocker Wheeler Co., Ampere, let contract addition to plant to American Concrete Steel Co., 27 Clinton St., Newark, $165,000.

★**Pa., Phila.** — Lanston Monotype Co., 25th and Locust Sts., let contract 5-story, 44 x 122-ft. plant to W. Steele & Sons, 1600 Arch St., $85,000. Noted Aug. 16.

★**Pa., Phila.**—West Phila. Stock Yards Co., Race and 13th Sts., let contract 3-story, 75x135-ft. fireproof factory to W. C. Doll & Co., Abbott Bldg., $138,000.

★**Pa., Phila**—T. Wharton, Graus St., let contract 1-story, 81 x 242-ft. factory and office building to Crowell-Lundoff-Little Constr. Co., 52nd and Grays Ave., Cleveland, $60,000.

★**O., Cleveland**—Lang Body Co., Garfield Bldg., let contract brick and steel factory and office, 3086 West 106th St. to Fath Constr. Co., 5103 Euclid Ave. About $75,000.

★**O., Cleveland** — Morgan Lithographing Co., St. Clair Ave., let contract 3-story factory, Payne Ave. and East 17th St., to Crowell-Lunduff-Little Constr Co., 1951 East 57th St., $200,000. Noted Aug. 9.

O., Columbus—Bd. Trustees, State University, received low bid power plant to be built at University from E. H. Latham, Columbus Savings & Trust Bldg., $85,159.

★**O., Columbus**—Commercial Improv. Co., 3rd and Spring Sts., let contract 1- and 2-story fireproof garage and warehouse to E. Elford, 104 North 3rd St., $50,000.

★**O., Kent**—Mason Tire & Rubber Co. let contract 2-story, brick and concrete factory to A. A. Lane Constr. Co., 820 Columbia Bldg., Cleveland, $100,000. Noted Sept. 13.

★**Ill., Chicago**—Chicago & Northwestern R.R. let contract 1-story brick shops, 800 North Crawford Ave., to C. W. Gindell Co., 3333 South La Salle St. About $100,000.

★**Wis., Milwaukee** — International Harvester Co. of America, 606 South Michigan Ave., Chicago, let contract 80 x 240-ft. core building, 784 Park St., to Dahlman Constr. Co., 912 Majestic Bldg., Milwaukee, $100,000.

★**Ia., Cedar Rapids**—Quaker Oats Co. let contract, 6-story, brick and rein.-con. warehouse and storage tanks to Leonard Constr. Co., 332 South Michigan St., Chicago. About $125,000. Noted June 21.

★**Ia., Des Moines** — Hubbell Bldg. Co., Hubbell Bldg., let contract brick garage, to A. H. Neuman, Hubbell Bldg. About $65,000.

★**Ia., Sioux City**—Lesemich Estate let contract, 3-story, brick and rein.-conc. automobile sales building, 5th and Pearl Sts., to B. E. Short, 420 Court St. About $65,000. Noted Sept. 6.

★**Minn., South St. Paul**—Armour & Co., 307 West South Water St., Chicago, let contract packing plant to Blome-Sinek Constr. Co., City Hall Sq. Bldg., $5,000,000.

★**N. B., St. John**—City let contract dock, Slip No. 5 to Kane & Ring, 884 Prince William St., $50,000.

★**Ont., London** — Battle Creek Toasted Corn Flakes Co., Dundas St., let contract addition to plant to Arrathoon & Holmes, Excelsior Life Bldg., Toronto, $75,000.

★**Ont., Tillsonburg**—Mable Leaf Hosiery Co., Ltd., let contract factory to A. C. Symmond, 605 Talbot St., St. Thomas, $50,000.

BUILDINGS

Proposed Work

Mass., Ayer—Bathing Pavilion and Bathhouse, Hat—Camp Devens Camp, ... Camp Arnold, plans ... About $20,000.

Mass., Cambridge—High and Latin School—Bd. Educ. plans additions and alterations. About $100,000. Newhall & Blevins, 9 Park St., Boston, archts.

Mass., Middleton—(Local)—Hospital—Essex Co. Comrs., Court House, Salem, will receive bids in November for 3 2-story buildings. J. H. Bickford, 110 State St., Boston, archt. Noted Sept. 6.

Conn., Norwich—Ward—State Hospital for Insane plans, 3-story, 40 x 285 ft. About $130,000. T. E. Erdman, supt. Cudworth & Thompson, Thayer Bldg., archts.

Conn., South Norwalk—School—Bd. Educ. had plans prepared by W. H. Beers, archt., 17 Madison Ave., New York City, 2-story, 50 x 100 ft. About $50,000.

N. Y., Buffalo—Y. M. C. A. plans 4-story, 105 x 182-ft. building, Auburn Ave. and Grand St. About $250,000. W. E. Holler, secy.

N. Y., New York—Store and Theater—S. Bloom plans, brick and terra cotta, 215-223 West 42nd St. P. R. Pereira and E. De Rosa, 150 Nassau St., archts.

N. Y., New York—Theater and Office—J. J. Schubert, 225 West 44th St., had plans prepared by H. J. Knapp, archt., 116 East 16th St. About $50,000. Noted Aug. 30.

N. Y., Rochester—Church and Parish House—Lutheran Congregation of the Redeemer plans, 2-story. About $90,000. A. A. Ritcher, 31 North 6th St., Reading, Pa., archt.

N. Y., Syracuse — Theater, Store and Office—Keith & Albee, 1564 Bway., New York City, plan, 10-story, 118 x 147 ft. and 72 x 120 ft. About $500,000. W. T. Lamb, 644 8th Ave., New York City, soon receives bids.

N. J., Red Bank—School—Bd. Educ. plans 2-story. About $60,000. F. M. Truex, 1170 Bway., New York City, archt.

N. J., Woodbury — School — State Bd. Educ. plans to build State Normal School, Gloucester Co. About $500,000. F. H. Bent, Trenton, state archt.

Pa., Fairview—Wards, Etc.—State Commission for Treatment of Criminal Insane soon receives bids wards and connecting corridors at hospital. About $80,000. J. M. Shirk, 421 Chestnut St., Phila., archt. Noted July 26.

Pa., Lebanon—High School—City School Dist. to sell $250,000 bonds Oct. 1st, to build high school.

Pa., McKeesport—Clubhouse—Y. M. C. A. acquired Dunshee property, Ringgold and Sinclair Sts., and plans to build. About $300,000.

Pa., Pittsburgh—Church—Fourth Methodist Protestant Congregation had plans prepared Frankstown Ave. and Bennett St. About $100,000. C. M. Lippincott, pastor.

Pa., Uniontown—Memorial—Grand Jury plans Soldiers' and Sailors' Memorial. About $150,000.

W. Va., Huntington—Bank and Office—Union Bank & Trust Co. plans ..., rein.-con. 4th Ave. and 5th St. About $... to $... A. F. Dewey, Huntington, arch.

O., Akron—School—Bd. Educ. has contract about Oct. 10 for addition. About $90,000. T. R. Bailey, College Pl., archt.

O., Cleveland—Auditorium and Convention Hall—City having plans prepared, 1-story, ...x...-ft. About $1,... F. A. Bates, city archt. Walker & Weeks, 1... Euclid Bldg., cons. archts.

O., Cleveland—Bathhouse—... having plans prepared to be built at Gordon Park. About $40,000. A. Bots, city archt.

O., Cleveland—Market—J. P. Snyder Co., Lessee, Ninth Arcade, had plans prepared for 2 ... Wm. ... 100 ... Bldg., 1-story, 100 x 200 ft., Clifton Blvd. and West 117th St. About $...,000.

O., Cleveland—School—Bd. Educ. plans addition to Fleming School, North Eld. Ave. About $...,000.

O., Cleveland—School—Heights Board of Education, Noble Rd. and ... Ave., D. Owen, ...

O., Cleveland—Police and Reformatory—... plans. W. ... Euclid Ave. About $...,000. P. ... Co., 1... Bldg., city ...

O., Columbus—Y. M. C. A. had plans prepared for building, 2-story and ... Ave. About $100,000. J. W. Dooling, gen. mgr.

Buildings (Continued)

O., Deshler—Grade and High School—Bd. Educ. plans, 2-story, 70 x 117 ft. About $50,000. C. W. Beelman, 812 2nd Natl. Bank Bldg., Toledo, archt.

O., East Cleveland—(Cleveland P. O.)—Hospital—Village sold $[illegible] bonds for 3-story, steel, concrete and stone. C. Ammerman, Williamson Bldg., clk. W. Hirsh, 1361 Swetland Bldg., archt.

O., Ironton—Hotel Auditorium and Store—Ironton Hotel Co., c/o A. H. Harting, lead plans prepared by Howard & Merriam, archts., Citizens Bank Bldg., Columbus, 5-story, 142x181-ft. About $125,000.

Mich., Detroit—Schools—Bd. Educ. plans additions to following schools: Russel, $160,000; Grenell, $120,000; Stephens, $100,000; Columbian, $160,000; Hely, $50,000; School for Crippled Children, Russell and Clairpointe Sts., $100,000.

Mich., Port Huron—Armory—Chamber of Commerce plans. About $60,000.

Ill., Abington—School—Bd. Educ. soon lets contract, 2-story. About $50,000. M. S. Martin, Hannibal Bldg., archt.

Ill., Chicago—Hospital—Illinois Steel Co. plans, 1-story, at South Works. About $[illegible]. E. J. Buffington, 208 South La Salle St., pres. Schmid, Garden & Martin, archts., 104 South Michigan Ave., soon receives bids.

Ill., Chicago—Hospital—West End Hospital plans, 4-story, 34 x 50 ft. About $50,000. B. H. Breakstone, 30 North Michigan Ave., supt. D. Saul Klafter, archt., 64 West Randolph St., soon receives bids.

Ill., Chicago—Theater, Store and Office—Peoples Theater Co., 4717 South Ashland Ave., plans, 2-story. About $250,000. C. W. & G. L. Rapp, archts., 69 West Washington St., soon receive bids.

Wis., Milwaukee — Church — Evangelical Lutheran Bethany Congregation plans, 68 x 100-ft. brick. About $50,000.

Wis., Wausau—School—Bd. Educ. plans, 2-story, 197 x 200-ft. addition to Longfellow grade school. About $50,000. Harvey Swarthout, 214 3rd St., archt.

Ia., Dubuque—Auditorium and Gymnasium—Sisters of Charity, B. V. M., 1018-26 South Seeley Ave., plan. About $75,000.

Ia., Earlham—School—Bd. Educ. plans, 2-story. About $125,000. Proudfoot, Bird & Rawson, 810 Hubbell Bldg., Des Moines, archts.

Ia., Sioux City—Hospital—Samaritan Hospital Assn., c/o W. P. Manley, chn., having plans prepared by Beuttler & Arnold, archts., 609 Security Bldg., 3-story, brick, rein.-con. and steel. About $200,000.

Ia., Spirit Lake—Hotel and Administration—Knight Templars of Iowa, c/o C. Huttenlocker, [illegible] bldg. com. Des Moines, and D. L. Clark, Newton, having plans prepared by C. A. Dieman & Co., archts., 408 Granby Bldg., Cedar Rapids, 3-story, 32x360-ft., stucco and rein.-con. About $80,000.

Ia., Waverly—Dormitory and Administration—Evangelical Lutheran Synod of Iowa plans addition to Wartburg Seminary. About $100,000.

Minn., Anoka—Chapel and Assembly—State Bd. Control had plans prepared by C. H. Johnston, archt., 715 Capital Bank Bldg., St. Paul, 2-story, 50 x 120 ft., as addition to State Asylum. About $75,000.

Minn., Duluth — Office — Interstate Express & Transfer Co., 106 Alworth Bldg., plans 50 x 100-ft. About $50,000.

Kan., Lawrence—Liberal Arts—State University soon lets contract, 4-story, terra cotta and rein.-con. About $225,000. C. H. Chandler, State House, Topeka, archt.

Kan., Pittsburg—Normal School—State plans [illegible]-story, brick, terra cotta stone and rein.-con. About $[illegible],000. C. H. Chandler, State House, Topeka, archt.

N. D., Bismarck—Historical Museum—North Dakota Historical Society Bldg. Assn. plans. About $50,000. Curator Gilmore, State Historical Museum, interested.

Mont., Billings—Hotel—Billings Brewing Co. soon lets contract, Montana Ave. and 24th St. About $10,000.

Mont., Helena — [illegible] — Montana Wesleyan University plans girls' dormitory. About $50,000.

Mo., St. Louis—Hotel—Federal Hotel Co. plans, 8th and Locust St. About $200,000.

Mo., St. Louis—Temple—Masonic Lodge plans. About $500,000.

Tex., Waco—Hotel—T. G. Dockery, 1627 North 5th St., having plans prepared by R. E. Lane, archt., Providence Bldg., 4-story, 70 x 105-ft. About $60,000.

Utah, Beaver — (Official) — Beaver Co. election Sept. 25 to vote on $125,000 bonds to build schools. Nelson & Ashworth, archts., F. & M. Bank Bldg., Provo City, soon receives bids. Noted Aug. 30.

Wash., Olympia—High School—Bd. Educ. having plans prepared by Heath & Gove, archts., National Realty Bldg., Tacoma, and J. Wohleb, archt., Talcott Bldg., 3-story, 12th and 13th Sts. About $100,000.

Wash., Tacoma—High School—Bd. Educ. having plans prepared by Heath & Gove, archts., Natl. Realty Bldg., and J. Wohleb, Talcott Bldg., Olympia. About $100,000.

Ore., Portland — Office — Failing Estate, 5th and Alder St., having plans prepared by Whidden & Lewis, archts., Wilcox Bldg., for alterations. About $200,000.

Cal., Los Angeles—Bank and Office—J. Benton Van Nuys having plans prepared by Morgan, Walls & Morgan, archts., Van Nuys Bldg., 8-story, 60 x 155-ft. rein.-con. brick and terra cotta, between 7th and 8th Sts.

Cal., Los Angeles—Office—A. B. Cohn, 219 South Main St., had plans prepared by W. S. Garrett, archt., Currier Bldg., 13-story, 50x58-ft., rein.-con., 940 South B'way.

Cal., Sacramento — Temple — Masonic Temple Assn. plans, 3-story, steel and concrete, 12th and J Sts. About $297,887.

Cal., San Diego—City Hall—City plans to build. H. Albright, San Diego, archt.

BIDS DESIRED

N. Y., Castleton—High School—Until Oct. 2, by Bd. Educ., 2-story, 42 x 100 ft. About $50,000. Loth & White, 130 State St., Albany, archts.

Ga., Savannah—School—Until Oct. 5, by A. Dorsey, gov., State Capitol, for negro agricultural, industrial and normal school.

Ind., Lafayette — Hospital — (Official)—Until Oct. 10, by R. E. Schmidt, Garden & Martin, archts., 104 South Michigan Ave., 4-story, rein.-con. About $100,000. Noted Sept. 6.

S. D., Eden — (Official) — Church—Until Sept. 30, by Roman Congregation, 1- and 2-story, 50 x 140-ft. and 32 x 34-ft. church and parish house. About $70,000. W. Eckle, pastor. A. Dohman, 1st Natl. Bank Bldg., archt. Noted Aug. 30.

Cal., San Francisco—(Official)—Hotel—Until Oct. 1, by Smith & Stewart, archts., Claus Spreckels Bldg., building 7-story rein.-con. addition to Ramona Hotel, Ellis St. About $60,000. Noted Aug. 30.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Me., Portland**—Theater—Nickel Amusement Co., 565 Congress St., let contract 2-story, 129 x 132-ft., brick and steel, to Forgione & Romano, Fidelity Bldg., $100,000. Noted Aug. 23.

★**Mass., Mattapan**—Nurses' Home—Boston State Hospital let contract, 3-story, Harvard St., to R. D. Kimball Co., 6 Beacon St., Boston. $70,000. Noted Aug. 9.

Mass., Springfield—School—Bd. Educ. received low bid, Washington and Woodlawn Sts., from L. S. Wood, 14 Stockbridge St., Springfield. About $150,000.

★**N. Y., Albany**—Church—First Congregational Church let contract, 1½-story, 65 x 96 ft., to Wm. Sayles & Son, 266 Hudson Ave. About $60,000.

N. Y., Albany—Laboratory—H. M. Biggs, comr. state health dept., received low bids, from Feeney & Sheehan Bldg. Co., 164 Montgomery St. About $127,000. Noted Aug. 23.

★**N. Y., Brooklyn** — Office — New York Dock Co., 44 Whitehall St., New York City, let contract, 3-story rein.-con. Freeman and Joralemon Sts. to Turner Constr. Co., 242 Madison Ave., New York City.

★**N. Y., New York**—Medical School—Columbia University, c/o N. M. Butler, 116th St. and Bway., let contract, 7-story, 49 x 358 ft., brick, to L. P. Fluhrer, 200 West 42nd St. About $50,000.

★**N. Y., Rochester**—Junior High School—Bd. Educ. let contract, 3-story, 226 x 234-ft., to Goosline & Swan Constr. Co., Powers Blk. Noted Aug. 23.

★**Pa., Phila.**—Freight House—Phila. & Reading R.R. let contract 1-story, brick and steel, Noble St., to A. L. Carhart, Hale Bldg., $50,000.

★**Pa., Phila.**—Hospital—Osteopathic Hospital let contract alteration and addition, 19th and Spring Gardens, to J. N. Gill & Co., Otis Bldg., $60,000.

★**Miss., Jackson**—Schools—Bd. Trustees let contract for 4 of 66 buildings to be built at Mississippi Training and Industrial School, to Dabbs & Wetmore, 220 2nd St., Meridian, $55,000.

★**O., Cleveland** — Freight Terminal — Cleveland & Youngstown R.R. let contract, Orange Ave. and East 12th St., to Walsh Constr. Co., Citizens Bldg., $675,000.

O., Lakewood—High School—Bd. Educ. received low bid, 3-story addition, from Crump Eng. Co., Leader-News Bldg., Cleveland, $500,000. Noted July 19.

★**Ill., Chicago**—Hotel—S. T. Cooper, 111 West Washington St., let contract, 6-story, 4647-59 Drexel Ave., to Erickson Johnson & Co., 139 North Clark St., $450,000.

★**Ill., Collinsville**—Miners Institute—Institute Com. let contract to H. Eberhardt, Collinsville, $77,439.

★**Ia., Mingo**—School—Bd. Educ. let contract, 2-story, 60 x 90 ft., brick, to W. F. Kucharo & Co., 319 Market Ave., S., Des Moines. About $50,000. Noted Aug. 16.

★**Ia., Newton**—School—Bd. Educ. let contract to P. R. Wells, Mason City, $85,000.

★**Ia., Sergeant Bluff**—School—Bd. Educ. let contract, 2-story, brick and rein.-con., to Dubel & Anderson, 514 Jackson St., Sioux City. About $75,000.

★**Ia., Sioux City**—Store—S. S. Kresge Co. let contract, 3-story, 40x45-ft., to Oberg-Pederson Co., 611 5th St., $150,000.

★**Minn., Grand Rapids**—Hospital—Itasca Co. let contract tuberculosis hospital to Everson & Utterberg, St. Paul, $50,000. Noted Apr. 12.

★**Neb., Omaha** — Theater and Store—Blank Realty Co., Des Moines, let contract, rebuilding, 2-story, 132 x 132 ft., to Calvin Zeigler, 904 South 25th Ave. About $150,000.

★**Neb., York**—High School—Bd. Educ. let contract to Olson & Johnson, 508 Montana Bldg., Missoula, Mont., $147,000.

★**S. D., Vermillion**—Women's Dormitory—South Dakota University let contract, 3-story, to N. Nelson, Stillwater, Minn., $115,000. Noted Aug. 9.

★**Mont., Great Falls**—High School—Bd. Educ. let contract junior high school to Rude & Searless, 337 Ford Bldg., $137,880. Noted June 7.

★**Okla., Tulsa**—Y. W. C. A. let contract 4-story, 90x136-ft., brick, terra cotta and rein.-con. building to Universal Constr. Co., 16 Ault-Kirkpatrick Bldg., $150,000. Noted Aug. 16.

★**Wash., Spokane**—Theater—A. Pantages let contract, rein.-con. and steel, to E. B. Newcomb, Pantages Bldg., Seattle, $150,000.

★**Cal., Bakersfield**—Office—J. A. Jastro let contract 2-story, 55x88-ft., hollow-tile, to Curre & Dulgar, Bakersfield, $83,453.

★**Cal., Coalinga**—High School—Bd. Educ. let contract to Oachen Bros., Coalinga, $80,749.

★**Cal., Modesto**—High School—Bd. Educ. Modesto Union High School Dist. let contract to E. E. Etherton, 502 Monadnock Bldg., San Francisco. About $136,750. Noted Aug. 2.

★**Cal., Sacramento** — Temple — Masonic Temple Assn. let contract, steel and rein.-con., to Mathews Constr. Co., Forum Bldg. About $297,887.

★**N. S., Sydney**—School—Bd. Educ. let contract, brick, Argyle St., to Chappell Bros. & Co., Ltd., 62 Brookland St., $53,000.

★**Man., Emerson**—Court House—City let contract, brick and stone, to Gray & Davidson, 621 Wall St., Winnipeg. About $50,000.

FEDERAL GOVERNMENT WORK

Proposed Work

N. Y., New York—Dredging—U. S. Engr., Room 710, Army Bldg., 39 Whitehall St.,

Federal Government Work (Continued)

rejected bids opened June 14, dredging Hudson River Channel, New York Harbor, as too high. Noted June 7.

N. Y., New York—Dredging—U. S. Engr., 39 Whitehall St., New York, rejected bids opened June 23, dredging Passaic River, N. J.

Pa., Franklin—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., rejected bids opened Aug. 30. Noted Sept. 6.

Pa., McKees Rocks—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., rejected bids opened Sept. 4. Work will be readvertised. Noted Sept. 13.

Pa., Phila.—Quarters for Radio Operators—Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., rejected bids opened Aug. 20. Noted Aug. 30.

Pa., Pittsburgh—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., rejected bids for remodeling and extension. Noted Aug. 30.

Del., Wilmington—Dredging—U. S. Engr., Old Federal Bldg., Wilmington, rejected bids opened June 4, dredging Murderkill and Mispillion Rivers. Noted May 17.

S. C., Port Royal — Buildings — Bureau Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., rejected bids opened Aug. 30. Noted Aug. 9.

Ia., Cherokee—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., rejected bids opened Aug. 22, as too high. Noted Aug. 30.

Tex., Galveston—Earthwork—U. S. Engr. Office, Galveston, rejected bids furnishing and placing fill, soil, sod and riprap at U. S. Reservation, Ft. Crockett. Noted May 31.

BIDS DESIRED

N. Y., Waterloo—Post Office—Until Oct. 28, by J. A. Wetmore, superv. archt., treas. dept., Wash.

Pa., Phila.—Dispensary—Until Oct. 1, by Bureau Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., building, at Navy Yard.

Wash., D. C.—Buildings—Until Sept. 25, by E. P. Bertholf, Capt. Commandant, U. S. Coast Guard, Wash., constructing new buildings and accessories. Coast Guard Sta. No. 166, Wash Woods, N. C.

Wash., D. C.—Hydraulic Pumps—Until Oct. 1, by Bureau Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., furnishing 4 motor-driven hydraulic pumps and 2 accumulators.

Ala., Andalusia—Post Office—Until Oct. 23, by J. A. Wetmore, superv. archt., treas. dept., Wash.

La., New Orleans—Electric Traveling Crane—Until Sept. 24, by Bureau Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., furnishing in machine shop.

Tenn., Memphis—Levee Work—Until Sept. 29, by Mississippi River Comn., 1st and 2nd Dists., building 1,870,000 cu.yd. earthwork, Upper St. Francis Levee Dist.; advertised in this issue.

Tenn., Memphis—(Official)—Machinery—Until Sept. 26, by Mississippi River Comn., 1st and 2nd Dists., furnishing boiler feed pump, etc.; advertised in this issue.

Ill., Mt. Carmel—Post Office—Until Oct. 26, by J. A. Wetmore, superv. archt., treas. dept., Wash.

Tex., El Paso—Laterals—Until Oct. 15, by U. S. Rec. Ser., El Paso, building laterals, Rio Grande Project. A. P. Davis, ch. engr.; advertised in this issue.

Tex., Galveston—Rip Rap—Until Oct. 2, by U. S. Engr. Office, Galveston, furnishing and delivering rip rap at Port Aransas or Rockport, Tex.; advertised in this issue.

Cal., Bakersfield—Post Office—Until Oct. 24, by J. A. Wetmore, superv. archt., treas. dept., Wash.; advertised in this issue.

Cal., San Francisco—Wharf—Until Oct. 2, by J. A. Wetmore, superv. archt., treas. dept., Wash., building west wing of wharf, Quarantine Sta., Angel Island.

H. T., Kauhua—Mine Storage Building—Until Oct. 1, by Bureau Yards and Docks (F. R. Harris, ch.) Navy Dept., Wash., D. C., steel and frame.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Conn., New London—Power Plant Equipment—Bureau Yards and Docks, Navy Dept., Wash., received low bids from Edgemore Iron Co., Edgemore, Del., $95,308; General Electric Co., River Rd., Schenectady, N. Y., $63,200 and $94,800; Babcock & Wilcox, North American Bldg., Phila., $69,511 for boilers only.

Conn., New London—Submarine Base, Dredging, etc.—Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., received low bids building submarine base, dredging and removing piers and bulkhead, (a) price per cu.yd., (b) removing coal pier, etc., from T. A. Scott Co., Inc., 292 Pequot Ave., (a) 495c. (b) $19,700, 180 days; J. S. Packard Dredging Co., 1004 Turks Head Bldg., Providence, (a) 53c. (b) $23,900, 160 days; Morris & Cumings, 17 State St., New York City, (a) $1.30, 170 days, (b) $69,000, 90 days. Noted Aug. 30.

N. Y., Long Island City—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., received low bids (a) limestone, (b) sandstone, from P. J. Carlin Constr. Co., Dauers Pk., Brooklyn, (a) $198,800, (b) $200,800; E. Diebitsch, 383 Madison Ave., New York City, (a) $210,000; C. A. Cowen Co., 30 East 42nd St., New York City, (a) $227,500, (b) $228,000. Noted Aug. 9.

★N. Y., New York—Storage Buildings—Bureau Yards and Docks, Navy Dept., Wash., let contract building 2 storage buildings to Degnon Constr. Co., 68 Hunters Pt. Ave., Long Island City. $400,000.

★N. J., Lake Denmark — Sub-surface Magazine Building—Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., let contract to Jobson-Gifford Co., 30 East 42nd St., New York City, $25,250.

★Pa., Harrisburg—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract extension to post office to A. Wildman, 2206 North 3rd St., $58,200. Noted Sept. 6.

Pa., McKees Rocks—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., received low bids, Sept. 4, from C. S. Smith, 5501 Centre St., Pittsburgh, $62,500; W. H. Fissell & Co., 1328 Bway., New York City, $72,497. Noted Aug. 2.

★Pa., Phila.—Extension to Quarter Masters Depot—Bureau Yards and Docks, Navy Dept., Wash., let contract to Cramp & Co., Denckla Blk., $224,700. Noted Sept. 13.

★Pa., Phila.—Heating System — Bureau Yards and Docks, Navy Dept., Wash., let contract heating system for machine and electrical shop, Navy Yard, to Mathis Bros. Co., Archer Ave. and Canal St., Chicago, $33,892. Noted Sept. 6.

★Pa., Phila.—Storehouse—Bureau Yards and Docks, Navy Dept., Wash., let contract to Cramp & Co., Denckla Bldg., $399,500.

Md., Annapolis—Dredging—Bureau Yards and Docks, Navy Dept., Wash., received low bids dredging at Naval Academy, from Maryland Dredging & Constr. Co., Fidelity Bldg., Baltimore, 35c. per cu.yd., 30 days; Dorsey & Miller Co., 420 Equitable Bldg., Baltimore, 45c., 75 days.

Wash., D. C.—Air Compressors—Bureau Yards and Docks, Navy Dept., received low bids furnishing at naval base at New London, Conn., and Charleston, S. C., from Ingersoll & Rand Co., 11 Bway., New York City, $10,242; Carroll Electric Co., 714 12th St., $14,050.

Wash., D. C.—Cement Walks—Comrs. received low bids building cement sidewalks, (a) 40,000 sq.yd. city walks, (b) 8,000 sq.yd. suburban walk, from W. F. Brenizer, 1777 Columbia Rd., (a) $1.53 per sq.yd., (b) $1.71; Cranford Paving Co., 2620 E St., (a) $1.61; (b) $1.79.

Wash., D. C.—Extension to Tool and Miscellaneous Shops—Bureau Yards and Docks, received low bids (a) work complete, (b) alternate, from M. A. Wells Co., Inc., 816 14th Ave., (a) $18,992, (b) $19,687; Richardson & Burgess Co., Inc., Colorado Bldg., (a) $22,300, (b) $22,000; W. E. Mooney, Evans Bldg., (a) $28,184, (b) $28,344.

Wash., D. C.—Motor-Generator Sets and Accessories—Bureau Yards and Docks, Navy Dept., received low bids furnishing at Navy Yards (a) Phila., (b) Boston, (c) Mare Island, Vallejo P. O., Cal., (d) Naval base, San Pedro, Cal., from Westinghouse Electric & Mfg. Co., 165 Bway., New York City, (a) $27,500, (b) $25,800, (c) $32,000, (d) $47,000; Allis-Chalmers Mfg. Co., West Allis, O., (a) $31,900, (b) $25,750, (c) $37,760, (d) $39,930; Ridgeway Dynamo & Eng. Co., Ridgeway, Pa., (a) $27,950, (b) $27,950, (c) $30,938, (d) $42,569.

Wash., D. C.—Naval Ammunition Depot—Bureau Yards and Docks, Navy Dept., received low bids building addition to Bldg. No. 13, St. Juliens Creek, Va., from Simmons, Hartenstein & Whitten Co., Charlotte, S. C., $10,269; Penn Bridge Co., York, Pa., $14,972.

★Va., Hampton—Garbage Incinerator—Bureau Yards and Docks, Navy Dept., Wash., let contract for garbage incinerator at Hampton Rds. to W. F. Klemp, Monadnock Blk., Chicago, $12,750.

★Va., Newport News—Warehouse—War Dept., N. D. Baker, Secy., let contract to J. G. White & Co., 43 Exchange Pl., New York City, $800,000.

Va., Norfolk—Distributing System—Bureau Yards and Docks, Navy Dept., Wash., received low bids (work complete), from Carroll Electric Co., 714 12th St., Wash., D. C., $363,317, H. E. Crook & Co., Inc., 28 Light St., Baltimore, $393,760; J. W. Danforth Co., 70 Ellicott Sq., Buffalo, $416,448.

★Va., Norfolk—Elevated Steel Tank and Tower—Bureau Yards and Docks, Navy Dept., Wash., let contract to Pittsburgh & Des Moines Steel Co., 806 Curry Bldg., Pittsburg, $16,830. Noted Sept. 6.

★S. C., Port Royal—Hospital Buildings—Bureau Yards and Docks, Wash., let contract temporary hospital buildings, at Paris Island, to McCraddy & Cheves, 4 Broad St., Charleston, cost plus 10%.

★Ga., Forsyth—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to J. H. Wilder, Columbus Rd., Macon, $30,917. Noted Sept. 13.

★Ga., Washington—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to W. J. Brent, 506 Bd. Trade Bldg., Norfolk, $39,876. Noted Sept. 13

★Fla., Key West—Filling—Bureau Yards and Docks (F. R. Harris, ch.), Navy Dept., Wash., let contract to East Coast Ry. Co., Key West, $12,000.

★Ala., Montgomery—Cement—U. S. Engr. Office, Montgomery, let contract furnishing 14,000 bbl. American portland cement to W. R. Taylor & Co., Pensacola, $12,120. Noted May 17.

★La., Lake Charles—Aviation Camp—Constructing Officer, Aviation Sect., Army Signal Corps, rescinded contract let to Janse Bros., Bellecastle and Revin St., and Bommer, Crain & Howe, both of New Orleans, and relet same to Mason & Hanger, Richmond, $1,500,000 plus percentage. Noted Sept. 13.

★La., New Orleans—Emergency Building—Bureau Yards and Docks, Navy Dept., Wash., let contract, West End Park, to J. Thatcher & Son, 201 Hennen Bldg., $19,200.

★Tenn., Memphis—Levee Work—Mississippi River Comn. let contract earthwork, St. Francis Levee Dist., to H. B. Blanks, $178,100. Noted Sept. 13.

★Tenn., Memphis—Levee Work—Mississippi River Comn., U. S. Engr. Office let contract levee work, Lower St. Francis and White River Dists., to Finch-Sorrell-Lawrance Bldg. Co., Savings Bank Bldg., $439,140 and $46,880 respectively. Noted Aug. 9.

★Mich., White River—Buildings and Laundryway—E. P. Bertholf, Capt. Commandant, U. S. Coast Guard, Wash., let contract moving, alterations, additions and repairs to station building and laundryway at Coast Guard Sta. No. 125, to Johnson & Mason, 41 Hanson St., Muskegon, $6,749. Noted Aug. 9.

★Kan., Eldorado—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to Johnson Constr. Co., Fargo, N. D., $41,491. Noted Aug. 30.

★Ark., Rodgers—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to C. Wells & Son, 118 Mulberry St., Des Moines, Ia., $41,998. Noted Sept. 13.

★Tex., Dallas—Aviation Camp—Constructing Officer, Aviation Sect., Army Signal Corps, let contract to Hedrick Constr. Co., 405 Hughes Bldg., $750,000 plus percentage.

Federal Government Work (Continued)

★**Tex., Houston**—Aviation Camp—Bureau Yards and Docks, Navy Dept., Wash., let contract to American Construction Co., 411 Gulf Bldg., $[illegible] pile foundations.

★**Colo., Glenwood Springs**—Post Office—J. A. Wetmore, supervising archt. treas. dept., Wash., let contract to C. Weitz & Sons, 713 Mulvane St., Des Moines, Ia., $76,290. Noted Sept. 6.

N. M., Raton—Post Office—J. A. Wetmore, supervising archt., treas. dept., Wash., received low bids, from G. A. Shaul, Seneca, Kan., $54,195; W. O. Neil & Son, Faribault, Minn., $58,740; W. D. Lovell, 1415 Southeast 8th St., Minneapolis, $63,850. Noted Aug. 14.

Hawaii, Pearl Harbor—Storehouse—Bureau Yards and Docks, Navy Dept., Wash., receives low bid (a) work complete, (b) deduct for one 16-ft. bay, from Hamilton Carpenters Co., New York City, (a) $129,-[illegible], (b) deduct $10,960. Noted Aug. 30.

MISCELLANEOUS

Proposed Work

Stadium—New York, N. Y. — Trustees New York City College plans, 136th St. and Amsterdam Ave. About $12,000.

Transmission Line — Johnstown, Pa. — Penn Central Electric Co., Johnstown, plans to build line to Carrolltown.

Subway—Phila., Pa.—Smith Hauser & Maclease, Inc., 18 East 41st St., New York City, recently awarded Contr. No. [illegible], totaling $2,250,000, and Phila. Subway Constr. Co., 712 Lincoln Bldg., Contr. No. 104, totaling $2,900,000, have refused to accept same. The work will be readvertised and split up into small parts. Keystone State Constr. Co., 704-9 Penn Bldg., has accepted its contracts, amounting to about $10,200,000. Noted Aug. 2.

Bulkhead—Annapolis, Md.—City soon let contract High and Dock St. G. Vansant, engr.

Floating Dry Dock—Charleston, S. C.—Vale & Murdock Co. plans to build, 440 ft. long. About $300,000. Address H. Calhoun.

Wharf—Mobile, Ala.—Louisville & Nashville R.R. plans to build 404 ft. long, 2 units, continuous bucket conveyor type, delivery chutes capable of 36-ft. vertical adjustment, 25-ft. horizontal sway. W. H. Courtenay, Louisville, Ky., ch. engr.

Park—O., Cleveland — See "Industrial Works."

Diking—Omaha, Neb.—Douglas Co. plans to dike Elkhorn River.

Tunnel, Incinerator, Etc.—St. Louis, Mo. City proposes election to vote on $18,-[illegible] bond issue: $6,650,000 to be used for building tunnel under River des Peres, $250,000 for [illegible] plants, $100,000 street material, $1,000,000 southern approach to free bridge, $500,000 streets and viaducts, $150,000 Municipal Hospital, [illegible] and other municipal improvements. E. B. Kilroy, pres. bd. pub. wrks. Noted Feb. 15.

Pipe Line—Damon Mound, Tex.—Rio Bravo Oil Co., subsidiary of Southern Pacific Lines, Southern Pacific Bldg., Houston, plans to lay 11 mi. 6-in. pipe line from Damon Mound to Pledger and will also install railroad loading racks at Pledger.

Lake—Ennis, Tex.—City soon lets contract enlarging lake, work involves 20,000-cu.yd. excava.

Drydock—Galveston, Tex.—J. P. McDonough, of McDonough Iron Works, plans to build drydock. About $500,000.

Diking — Kalama, Wash. — Cowlitz Co. approved plans diking Improv. Dist. No. 5 to protect 7000 acres. G. J. Poysky, engr.

Seawall, etc. — Long Bach, Cal. — City Council plans to build combined rein.-con. sea wall, sidewalk, center wall, end walls, steps, lighting standards, sheridized conduits and vitr. pipe sewers on Seaside Blvd. A. De Ring, city engr.

Harbor Improvements—Newport Beach, Cal.—City plans election to vote on $50,000 bonds to improve harbor from East Newport to 24th St. also for dredging at mouth.

River Improvements—Ottawa, Ont.—Dominion Government appropriated $12,500 for diversion of Little Pembina River into Pelican Lake. R. C. Desrochers, secy. dept. pub. wks.

Harbor Improvements—Port Hope, Ont. —Dominion Government appropriated $13,-500 for harbor improvements.

River Improvements, Etc. — Revelstoke, B. C.—Dominion Government appropriated $134,000 for Fraser River improvements; $100,000 dredging north arm Fraser River; $20,000 for extension of wing dam.

BIDS DESIRED

Elevated Railway—Brooklyn, N. Y.—Until Oct. 8, by New York Municipal Railway Corp., building 3rd rail and appurtenances on Culver Line. Address Ch. Engr., 85 Clinton St.

Station Finish—Brooklyn, N. Y.—Until Sept. 26, by Pub. Ser. Comn., 120 Bway., New York City, station finish for 11 stations on Culver Rapid Transit R.R. and certain other work at Bay Pkway. Sta. of Bway.-4th Ave. subway.

Garbage Incinerator—Sharon, Pa.—(Official)—Until Oct. 2, by C. B. Lartz, boro. secy., building odorless garbage incinerating plant.

Pier—Manhattan Beach, Cal.—(Official) —Until Oct. 17, by City, building rein.-con. pier. About $70,000. M. M. Murray, city engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Shaft—New York, N. Y. — Pub. Ser. Comn., 120 Bway., received low bids building shaft No. 2, Route No. 26, part of Queensboro Subway Rapid Transit Ry., from I. J. Stander Co., 118 East 28th St., $65,000; Subway Contg. Co., 165 Bway., $90,185; J. O'Leary, 411 East 42nd St., $[illegible]. Noted Aug. 23.

Bulkhead — Jersey City, N. J. — City Comrs. let contract concrete, at foot of Howell St., to Stillman-Delehanty-Ferris Co., 26 Exch. Pl., $61,750. Noted Aug. 30.

★**Levee—Krotz Springs, La.**—State Bd. Engrs., Baton Rouge, let contract building 90,000 cu.yd. Krotz Springs south levee, St. Landry Co., to Dameron-White Co., Ltd., New Orleans, $26,000.

Levee Work—New Orleans, La.—(Official)—Bd. Levee Comrs., Orleans Levee Dist., let contract 165,000 cu.yd. earthwork, etc., Lower Beka New Levee, 5th Dist., to T. O. Hatard, 320 Opelousas Ave., $24,403. Noted Aug. 23.

Levee—Plaquemine, La.—Pontchartrain Levee Bd. received low bids building 19,000 cu.yd. new levee, Iberville Parish and 90,-000 cu.yd., St. John's Parish from Dameron-White Co., Ltd., New Orleans, $225,000.

★**Breakwater—Kenosha, Wis.**—City let contract building 1400 lin.ft. breakwater to protect lake shore property, to Greiling Bros., Walker St., Milwaukee, $58,800. Noted Aug. 2.

★**Levee—Gregory Landing, Mo.**—J. P. Foley, secy. Gregory D. D., let contract 180,000 cu.yd. levee work to McWilliams Northern Dredge Co., 15c. per cu.yd.

Dam—San Diego, Cal.—(Official)—City received low bids building cyclopean rein.-con. dam, Lower Otay site, from Wurster Constr. Co., Spreckles Bldg., $420,135; H. G. Fenton, Owl Drug Bldg., $450,000; J. Kennedy, Washington Bldg., Los Angeles, $586,-737. Noted Aug. 23.

BUILDING OPERATIONS FOR AUGUST

Following is a list of contracts awarded, published by the F. W. Dodge Co. for New England, New York, New Jersey, Pennsylvania, Maryland, Delaware, District of Columbia, Virginia, Ohio, West Virginia, Illinois, Indiana, Iowa, Wisconsin, Michigan, Minnesota, North and South Dakota, and portions of Missouri and eastern Kansas from Jan. 1 to Sept. 1:

Jan. 1 to Sept. 1, 1917	$1,156,176,155
Jan. 1 to Sept. 1, 1916	838,024,922
Jan. 1 to Sept. 1, 1915	598,619,600
Jan. 1 to Sept. 1, 1914	531,915,200
Jan. 1 to Sept. 1, 1913	616,067,000
Jan. 1 to Sept. 1, 1912	558,820,000
Jan. 1 to Sept. 1, 1911	539,256,313
Jan. 1 to Sept. 1, 1910	589,175,910

NEW YORK AND NORTHERN NEW JERSEY

Jan. 1 to Sept. 1, 1917	$212,328,000
Jan. 1 to Sept. 1, 1916	145,085,500
Jan. 1 to Sept. 1, 1915	101,629,000
Jan. 1 to Sept. 1, 1914	91,632,000
Jan. 1 to Sept. 1, 1913	196,256,000
Jan. 1 to Sept. 1, 1912	169,247,000
Jan. 1 to Sept. 1, 1911	165,930,000
Jan. 1 to Sept. 1, 1917	180,359,500

Contracts for the larger territory covered for August amount from $165,574,155 against $159,200,000 for July and $206,541,-000 for June. For the smaller territory contracts for August amount to $25,498,000 against $31,549,000 for July and $27,387,-000 for June. In both territories quoted the contracts awarded show a fair average against the two previous months, with no dropping off the work.

Could you handle another contract?

PERHAPS for a road? Or a bridge? Or a sewer? Or any one of the multitude of items listed in this week's *Contracting News Section*?

Then read that Section carefully.

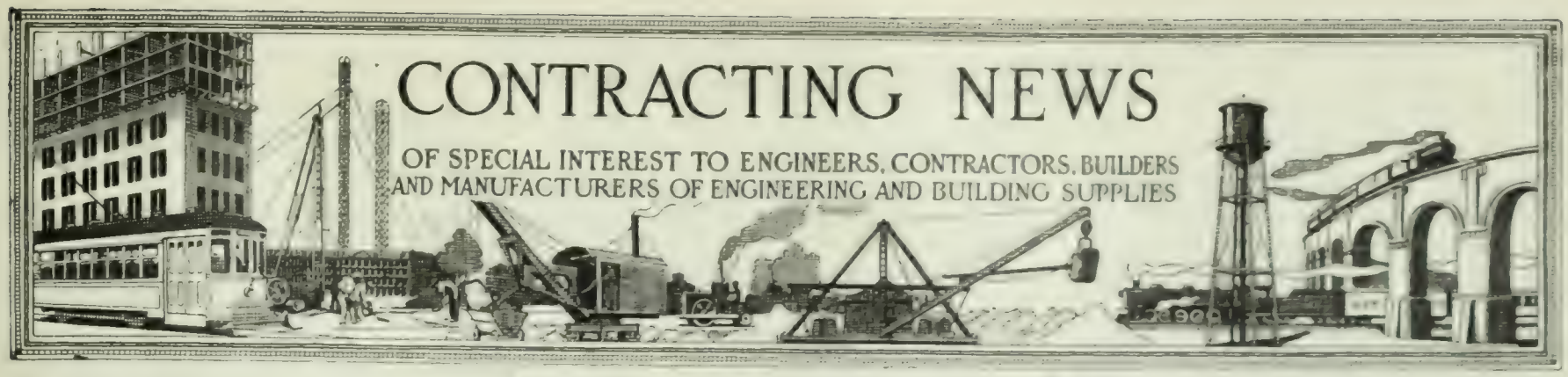
It takes over one hundred men to provide those items—one hundred trained correspondents whose job is to call upon city officials, engineers, architects, etc., the country over, to learn of all proposed work.

Summed up, this means that there are one hundred men working for *your* benefit.

Are you actually benefitted?

There is just one way to do it, you know:

Read the Contracting News Section



Proposals

For Proposals Advertised See Pages 46 to 51 Inclusive

WATER-WORKS

Bids Close		See Eng. News-Record
Oct. 1.	St. Paul, Minn.	Sept. 20
Oct. 2.	Johnstown, N. Y.	Sept. 13
	Adv. Sept. 13 to 27.	
Oct. 2.	Lewisburg, O.	Sept. 20
	Adv. Sept. 20 and 27.	
Oct. 2.	Toronto, Ont.	Sept. 13
Oct. 10.	Polk, Pa.	Sept. 20
	Adv. Sept. 20 and 27	

SEWERS

Sept. 29.	Hagerstown, Md.	Sept. 13
	Adv. Sept. 13.	
Oct. 1.	Huntington, W. Va.	Sept. 27
Oct. 1.	Middleton, O.	Sept. 27
Oct. 2.	Ada, Okla.	Sept. 27
Oct. 5.	Roselle, N. J.	Sept. 27
Oct. 8.	Stratford, Conn.	Sept. 20
	Adv. Sept. 20.	
Oct. 13.	Cuyahoga Falls, O.	Sept. 27
Oct. 14.	Pleasantville, N. J.	Sept. 27
Oct. 16.	Wabash, Minn.	Sept. 27

BRIDGES

Oct. 1.	Indiana	Sept. 20
Oct. 1.	Elkins, W. Va.	Sept. 20
Oct. 1.	Hays, Kan.	Sept. 27
Oct. 1.	Indiana	Sept. 27
Oct. 2.	Indiana	Sept. 27
Oct. 2.	Westmoreland, Kan.	Sept. 27
Oct. 2.	Reading, Pa.	6Sept. 20
	Adv. Sept. 20 and 27.	
Oct. 2.	West Palm Beach, Fla.	Sept. 20
Oct. 2.	Woodbine, Ga.	Sept. 20
Oct. 2.	Olympia, Wash.	Sept. 20
Oct. 2.	Albany, N. Y.	Sept. 6
	Adv. Sept. 6 to 27	
Oct. 2.	Columbus, O.	Sept. 13
	Adv. Sept. 13.	
Oct. 3.	Lyndon, Kan.	Sept. 27
Oct. 4.	Texarkana, Ark.	Sept. 13
	Adv. Sept. 13.	
Oct. 4.	Indiana	Sept. 27
Oct. 4.	Algona, Ia.	Sept. 27
	Adv. Sept. 27.	
Oct. 5.	Corydon, Ind.	Sept. 20
Oct. 6.	Indiana	Sept. 27
Oct. 8.	Minneapolis, Minn.	Sept. 27
Oct. 9.	Walker, Minn.	Sept. 20
Oct. 13.	Weston, W. Va.	Sept. 27
Oct. 16.	Glenville, W. Va.	Sept. 27
Oct. 20.	Pennsylvania	Sept. 20
Oct. 20.	Charleston, W. Va.	Sept. 27
Oce. 23.	Ft. Dodge, Ia.	Sept. 27
	Adv. Sept. 27.	

STREETS AND ROADS

Sept. 28.	Hartford, Conn.	Sept. 27
	Adv. Sept. 27.	
Sept. 29.	Granite City, Ill.	Sept. 27
	Adv. Sept. 27.	
Oct. 1.	Lincoln, Neb.	Sept. 6
Oct. 1.	Miami, Fla.	Sept. 20
Oct. 1.	Indiana	Sept. 20
Oct. 1.	Oroville, Cal.	Sept. 20
Oct. 1.	Bad Axe, Mich.	Sept. 27
Oct. 1.	Finch, Ont.	Sept. 27
Oct. 1.	Bismarck, N. D.	Sept. 27
Oct. 1.	Westfield, N. J.	Sept. 27
Oct. 2.	Massachusetts	Sept. 27
Oct. 2.	Indiana	Sept. 20
Oct. 2.	Maryland	Sept. 20
	Adv. Sept. 20 and 27.	
Oct. 2.	Jersey City, N. J.	Sept. 27
Oct. 3.	Charleston City, Mo.	Sept. 27
Oct. 3.	Elyria, O.	Sept. 27
Oct. 3.	Cleveland, O.	Sept. 27
Oct. 3.	Indiana	Sept. 20
Oct. 4.	Carrollton, Ala.	Sept. 20
Oct. 4.	Newark, N. J.	Sept. 27
Oct. 5.	Indiana	Sept. 20
Oct. 5.	Jefferson City, Mo.	Sept. 27
Oct. 6.	Bowling Green, O.	Sept. 13
Oct. 6.	West Allis, Wis.	Sept. 27
Oct. 8.	California	Sept. 20
Oct. 8.	Mendota, Ill.	Sept. 27
Oct. 9.	Pennsylvania	Sept. 20
	Adv. Sept. 20 and 27.	
Oct. 9.	Modesta, Cal.	Sept. 27
Oct. 11.	Newton, N. J.	Sept. 20
	Adv. Sept. 20 and 27.	
Oct. 11.	Oneonta, Ala.	Sept. 13
Oct. 12.	Stealey Heights, W. Va. (Clarksburg P. O.)	Sept. 27
Oct. 13.	Wedowee, Ala.	Sept. 20
Oct. 15.	Newark, N. J.	Sept. 13
Oct. 16.	Cape May, N. J.	Sept. 6
Oct. 16.	Pennsylvania	Sept. 20
Oct. 24.	Paterson, N. J.	Sept. 27
Nov. 5.	Pikeville, Ky.	Sept. 27

EXCAVATION AND DREDGING

Oct. 1.	Le Sueur, Minn.	Sept. 20
Oct. 1.	Estherville, Ia.	Sept. 27
Oct. 2.	Clarksdale, Miss.	Sept. 20
Oct. 2.	St. Cloud, Minn.	Aug. 2
Oct. 2.	Urbana, Ill.	Sept. 6
Oct. 3.	Anoka, Minn.	Sept. 20
Oct. 5.	Savannah, Ga.	Sept. 20
Oct. 5.	Pittsfield, Ill.	Sept. 27
Oct. 9.	Albany, N. Y.	Sept. 13
	Adv. Sept. 13 to 27.	
Oct. 8.	Marshall, Minn.	Sept. 27
Oct. 10.	Willmar, Minn.	Sept. 27
Oct. 10.	Lafayette, Ind.	Sept. 20
Oct. 15.	Willmar, Minn.	Sept. 13
Oct. 20.	Waterford, Cal.	Sept. 27
Nov. 9.	St. Cloud, Minn.	Sept. 27

BUILDINGS

Sept. 28.	Theills, N. Y.	Sept. 13
	Adv. Sept. 13 and 20.	
Sept. 30.	Eden, S. D.	Sept. 20
Oct. 2.	Castleton, N. Y.	Sept. 20
Oct. 2.	Clay Center, Neb.	Sept. 27
Oct. 2.	Buffalo, N. Y.	Sept. 27
Oct. 2.	Newark, N. J.	Sept. 27
Oct. 3.	Cresco, Ia.	Sept. 13
Oct. 5.	Thiells, N. Y.	Sept. 13
	Adv. Sept. 13 and 20.	
Oct. 15.	New York, N. Y.	Sept. 27
Oct. 17.	Wichita, Kan.	Sept. 27
Oct. 20.	Oxford, O.	Sept. 27
Dec. 1.	Norfolk, Va.	Sept. 13

FEDERAL GOVERNMENT WORK

Sept. 29.	Memphis, Tenn.	Sept. 20
	Adv. Sept. 20.	
Oct. 1.	Twin Falls, Idaho	Aug. 30
Oct. 1.	Louisville, Ky.	Sept. 13
	Adv. Sept. 13 to 27.	
Oct. 1.	Cleveland, Ohio	Sept. 6
Oct. 1.	Kuahua, H. T.	Sept. 13
Oct. 1.	Philadelphia, Pa.	Sept. 20
Oct. 1.	Washington, D. C.	Sept. 20
Oct. 1.	New Orleans, La.	Sept. 27
Oct. 1.	Newport, R. I.	Sept. 27
Oct. 1.	Pensacola, Fla.	Sept. 13
Oct. 2.	San Francisco, Cal.	Sept. 6
Oct. 2.	Wheeling, W. Va.	Sept. 13
	Adv. Sept. 13 to 27.	
Oct. 2.	Galveston, Tex.	Sept. 20
	Adv. Sept. 20 and 27.	
Oct. 2.	San Francisco, Cal.	Sept. 20
	Adv. Sept. 13 to 27.	
Oct. 4.	Boston, Mass.	Sept. 13
	Adv. Sept. 13 to 27.	
Oct. 4.	St. Peter, Minn.	Sept. 6
Oct. 4.	New Orleans, La.	Sept. 27
	Adv. Sept. 27.	
Oct. 6.	Newport, R. I.	Sept. 13
	Adv. Sept. 13 and 20.	
Oct. 8.	Pensacola, Fla.	Sept. 27
Oct. 8.	Ft. Mifflin, Pa.	Sept. 27
Oct. 8.	Washington, D. C.	Sept. 27
Oct. 12.	Bad Axe, Mich.	Sept. 13
Oct. 15.	Denver, Colo.	Sept. 13
	Adv. Sept. 13.	
Oct. 15.	Waynesboro, Va.	Sept. 13
Oct. 15.	El Paso, Tex.	Sept. 20
	Adv. Sept. 20.	
Oct. 15.	Philadelphia, Pa.	Sept. 27
Oct. 15.	Denver, Colo.	Sept. 27
Oce. 15.	El Paso, Tex.	Sept. 27
Oct. 23.	Andalusia, Ala.	Sept. 20
Oct. 24.	Bakersfield, Cal.	Sept. 20
	Adv. Sept. 20 and 27.	
Oct. 26.	Mt. Carmel, Ill.	Sept. 20
Oct. 28.	Waterloo, N. Y.	Sept. 20
Oct. 30.	Key West, Fla.	Sept. 6
	Adv. Sept. 6 and 13.	
Oct. 30.	Farmville, Va.	Sept. 27
Nov. 1.	Kenton, O.	Sept. 27

MISCELLANEOUS

Oct. 1.	Station Finish	Sept. 20
	Brooklyn, N. Y.	
Oct. 2.	Garbage Incinerator	Sept. 20
	Sharon, Pa.	
Oct. 8.	Elevated Railway—Brooklyn, N. Y.	Sept. 20
Oct. 17.	Pier—Manhattan Beach, Cal.	Sept. 20
Oct. 23.	Pier—New York, N. Y.	Sept. 27
	Adv. Sept. 27.	
Nov. 15.	Flood Control—Dayton, O.	Sept. 13
	Adv. Sept. 13 to 27.	

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official.

WATER-WORKS

Proposed Work

Mass., Springfield—City Council voted $70,000 bond issue to extend water mains on Holmes Rd. F. H. Clarke, city engr.

N. J., Pompton—Pompton Water Comm. plans laying water mains through Midvale and Wanaque. Alone $100,000.

La., Westwego—A Mayor, Circles meeting to organize company to install water system here. Funds for $ to be sold for work.

Tenn., Lebanon—City election Oct. 6 to vote on $ bond issue to build waterworks and electrolight plant. Voted June 21.

Ky., Poor Fork—See Industrial Water.

O., Newark—City plans to vote on $ bond issue for water filtration plant, gal. capacity. C. H. Wells, city engr.

O., Toledo—See Sewers.

O., Woodville—City Council is to vote on $ bond issue to install waterworks system.

O., Wooster—Co. residents will vote on $ improving water works by building dam on Apple Creek and laying pipe. Alvah Hunter, co. c. Olympia, city engr. Voted May 19.

Water-Works (Continued)

Ill., Alton—Illinois Glass Co., 2nd and Wabash Sts., lets contract filtration plant. About $30,000.

Ia., Atlantic—City receives bids about Oct. 1 for water storage basin, 1,250,000 gal. capacity. J. H. Mayne, Merriam Blk., Council Bluffs, engr. Noted Aug. 30.

Ia., Lohrville—Council authorized $10,000 bond issue to build water-works system.

Kan., Galena—City election soon to vote on $190,000 bond issue for filtration plant. H. C. French, clk.

Kan., La Crosse—Council passed ordinance to issue $22,000 bonds for water-works system.

Neb., Ord—City election soon to vote on $30,000 bond issue for enlarging water and electric light plants. W. Sorenson, comr.

N. D., Minot—City soon lets contract 3,000,000-gal. rein.-con. reservoir and water mains. E. J. Thomas, city engr.

Mont., Eureka—City to sell $16,000 bonds to install gravity water system, 1,000,000 gal. capacity. Noted June 14.

Mont., Phillipsburg—City to sell $10,000 bonds Oct. 8 for water-works system. J. J. Tausman, supt. W. Neu, clk. Noted Aug. 2.

Mont., Poplar—Town to sell $25,000 bonds Oct. 1 for water-works system. W. E. Inglehart, clk. Noted Sept. 13.

Mo., Joplin—City election Oct. 2 to vote on $100,000 bond issue for water-works system. J. J. McAfee, city engr.

Tex., Valera—Gulf, Colorado & Santa Fe Ry. appropriated $117,487 to build reservoir and pipe line. F. G. Pettibone, Galveston, genl. mgr.

Okla., McAlester—City election soon to vote on bond issue for water-works system. F. D. Pittman, supt.

Okla., Miami—See "Sewers."

Okla., Woodward—City defeated $42,000 bond issue for water-works and electric light systems. F. H. Kilburn, supt. Noted Aug. 16.

Idaho, Hailey—City election soon to vote on $90,000 bond issue for water-works system and power plant. J. Vernon, engr.

Idaho, Kirie—City voted $17,000 bonds for water-works system.

Utah, Monticello—Blue Mountain Irrigation Co., owners Monticello light and water-works systems, plans $60,000 bond issue for improvements.

Ore., Joseph—City having plans prepared extending water pipe line and other improvements to water-works system. W. S. Hagwell, supt.

Cal., El Centro—City election Oct. 30 to vote on $55,000 bond issue to build filtration plant. C. H. Field, supt. Noted Aug. 2.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., New York**—(Official)—Bd. Water Supply, Municipal Bldg., let contract Shaft-less Tunnel to Degnon Contg. Co., 6th Hunters Point Ave., Long Island City, $12,138,-[illegible]. Noted Sept. 20.

★**N. Y., Rochester**—City let contract water-main extensions and suction pipe in several streets to W. E. Kinsey & Co., 108 Livingston Bldg. About $[illegible].

★**Pa., Aspinwall**—See "Streets and Roads."

★**Md., Cumberland**—Evitts Creek Water Co., Cumberland, let contract filtration plant to Pitt Constr. Co., 1207 Fulton Bldg., Pittsburgh, $77,[illegible]. Noted Sept. 16.

★**Va., Newport News**—Newport News Light & Water Co. let contract installing new filter plant to Roberts Filter Co., Darby, Pa., $100,000.

★**Miss., Marks**—See "Sewers."

O., Dayton—City received low bid for steel and rein.-con. pressure pipe from E. H. Smith, 1015 Rethold St., $[illegible]. Jacob Hunt Constr. Co. 1st and Wayne Sts., $[illegible]. Miami Constr. Co., 30 Home St., $[illegible]. Noted Sept. 13.

★**Minn., Duluth**—City let contract for water and gas mains to Jens Meldrum Shipyards to Pasteur Co., 711 Lumber Bldg. and Roberts & Parry. About $[illegible].

★**Minn., Ogilvie**—Village let contract water-works system to Tiderman Bros., 345 Scandinavian Bank Bldg., St. Paul, $36,000. Noted Sept. 27.

★**Mont., Ronan**—City let contract water-works system to C. H. Kelley, Kalispell, $21,800. Noted Aug. 30.

★**Mont., Toston**—City let contract water-works system to Monarch Constr. Co., 3 Michigan Bldg., Bozeman, $16,000.

★**Mo., Hamilton**—City let contract water-works system to O'Neil Constr. Co., Leavenworth, Kan., $31,000. Noted Sept. 13.

SEWERS

Proposed Work

N. H., New Boston—City sold $10,500 bonds for extending sewers.

N. Y., Batavia—City voted $80,000 bonds to repair sewage-disposal plant and improve parks. R. F. Clark, city engr.

N. Y., Canisteo—Canisteo Tanning Co., Canisteo, submitted plans to State Conservation Comn. for large sewage-purifying plant to purify sewage before it goes into Canisteo River.

N. Y., New York—Queens Sewer Bureau had plans prepared for drainage sewer, Rockaway Coast Sect. About $1,000,000. J. W. Blake, engr.

N. Y., Sea Cliff—Sea Cliff Water Co., Sea Cliff, plans to install sewage-disposal plant. E. M. Ledden, 404 4th Ave., New York City, secy.

N. J., Dover — City plans trunk sewer through Rockaway Valley from Dover to Boonton Reservoir to protect Jersey City's water supply. G. E. Jenkins, city engr.

N. J., Paterson—Bd. Pub. Wks. plans sewer in East 19th St. H. J. Hordes, city engr.

Pa., Lansford—City election in November to vote on $50,000 bond issue to build sewers, parks and pave streets. J. B. Warriner, city engr.

Pa., West Chester—Boro. had plans prepared for extension Howell Run disposal plant. N. R. Bambo, boro. engr.

Fla., St. Augustine—See "Bridges."

Fla., Zolfo—Town voted $15,000 bonds for extending sewerage system.

Ky., Poor Fork—See "Industrial Works."

O., Cincinnati—(Official)—City to sell $920,000 bonds Oct. 15 to build Millcreek trunk sewer and sewers in Madisonville, Westwood, Clifton, Avondale and other districts. F. Krug, city engr. Noted Aug. 23.

O., Elyria—City plans to issue $40,000 bonds for sewers and paving. C. M. Theobald, city engr.

O., New Boston—City sold $10,500 bonds for sewer extensions.

O., Toledo—(Official)—City lets contract about Dec. 1, 6-mi. 42 to 72-in. sewers and pumping plant. H. C. McClure, city engr. Noted Sept. 13 under "Waterworks."

Mich., Lansing—City plans sewer portions Sheridan St. H. W. Sparks, city engr.

Mich., St. Clair Heights—(Detroit P. O.)—City election soon to vote on $10,000 bond issue to install sewerage system and $25,000 for incinerator.

Ill., Chicago—Sanitary Dist. of Chicago having plans prepared by H. I. Steffa, engr., for Calumet Sewage Pumping Sta., 90 x 133 ft., 127th St. and Indiana Ave. A. Smyth, 910 South Michigan Ave., pres.

Minn., St. Cloud—City plans laying storm sewer to proposed plant of Pan Motor Co., also sewer from Mississippi River to 8th and 16th Sts. About $55,000 and $50,000 respectively. R. E. Borrowman, city engr.

Neb., Oakland—City voted $35,000 bonds for sewers.

Neb., Omaha—City plans to build sewer system south of 6th Ave. About $78,084. W. Townsend, city engr.

Tex., Austin—City election Oct. 2 to vote on $225,000 bond issue to install Imhoff tank-trickling filter plant, $50,000 for storm sewers and paving and $10,000 fire alarm system. M. C. Welborn, city engr. Noted Aug. 16.

Tex., Ft. Worth—City plans to install sewage disposal plant. About $350,000. F. J. Von Zuben, city engr.

Tex., Nacogdoches—City soon lets contract installing sewerage system. About $46,000.

Okla., Miami—City election soon to vote on $200,000 bond issue; $80,000 to be used for storm sewers, $20,000 sanitary sewers and $45,000 for water mains. A. L. Sailors, supt.

Wash., Spokane — City had plans prepared for 5 lateral sewers. About $13,500. M. Macartney, city engr.

Ore., Portland—City will install sewerage system in Frost Ave., East Deering. About $40,000. E. M. Hunt, city engr.

Ont., Windsor—City had plans prepared by M. E. Brian, engr., sewers in portions Moy and Hall Sts. About $28,000.

BIDS DESIRED

N. J., Pleasantville—Until Oct. 15, by City Council, for sewerage system and disposal plant. About $125,000. Remington & Voxbury, 6th and Market Sts., Camden, engrs. Noted Aug. 23.

N. J., Roselle—Until Oct. 5, by Boro., for 924 lin.ft. 8-in. stoneware pipe sewers in 10th Ave. and Oak St., 1147 ft. in 5th Ave., 300 ft. in Meadow St. J. L. Bauer, Elizabeth, co. engr.

W. Va., Huntington—Until Oct. 1, by City Comrs., building sewers portions Richmond St. and several alleys; also paving, grading and curbing certain streets. A. B. Maupin, city engr.

O., Cuyahoga Falls—(Official)—Until Oct. 13, by W. F. Williston, village clk., for Hotel Ave. lateral sewerage system, including 7500 cu.yd. earth excava., 300 cu.-yd. rock trench excava., 22 manholes and 2 mi. 6-12-in. sewer pipe. E. D. Barstow, village engr. R. W. Pratt, Hippodrome Bldg., Cleveland, cons. engr.

O., Middletown—(Official)—Until Oct. 1, by City Comn., tile storm and sanitary sewer, and house connections on portion Plum St. J. Kunz, clk. W. C. Morrison, city engr. Noted May 24.

Minn., Wabasha—Until Oct. 16, by City for extending sewerage system. J. F. Druar, 312 Commercial Bldg., St. Paul, engr.

Okla., Ada—(Official)—Until Oct. 2, by City, for sewage disposal plant, including Imhoff tank, contact beds, etc., also constructing lateral sewer Dist. No. 6, involving about 3315 ft. 10-in. and 13,890 ft. 8-in. vitr. sewer pipe. W. E. Conger, clk. Benham Eng. Co., Colcord Bldg., Oklahoma, engrs.

Cal., San Diego—(Official)—Until Oct. 1, by A. H. Wright, city clk., for rein.-con. storm drain. G. Cromwell, city engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Leominster**—City rejected bids for sewage-disposal plant. Will build by day labor. Noted July 12,

N. Y., Brooklyn—L. H. Pounds, boro. pres. received low bid sewage pumping station and superstructure, sewers and appurtenances, from Fryner & Hanna, 25 West 45th St., New York City, $45,837.

★**N. Y., New York** — (Official) — D. Mathewson, boro. pres. (Bronx Boro.), let contract sewer, portions Boston Rd., to J. M. Stanton & Co., 762 East 165th St., $98,564. Noted Sept. 20.

N. Y., New York—M. M. Marks, boro. pres., received low bids (a) receiving basins, inlets and remodelled basins on 7th Ave. extension from Leroy St. to Greenwich Ave., (b) Varick St., from Leonard to Carmine St., from E. J. McLaughlin, 337 East 134th St., (a) $11,070, Walton Contg. Co., 147 East 125th St., (a) $12,320, (b) $15,084; Burnside Contg. Co., 270 Burnside Ave., (a) $12,560, (b) $11,485; Gasperini & De Blasio, (b) $15,017.

★**N. Y., Rochester**—Bd. Contract & Supply let contract Cantilever Gantry crane and transfer table for main sewage disposal plant to Seneca Eng. & Co., Montour Falls.

★**N. J., Ocean City**—City let contract 1500 ft. 24-in. c.-i. pipe storm water drain in 12th St. to Smith-Porter Co., $14,000.

★**Pa., Pittsburgh**—Dept. Pub. Wks. let contract sewers, grading, paving and curbing to Booth & Flynn, 1942 Forbes St., $21,-803; and Manella Constr. Co., 1507 North Lang Ave., $10,804.

★**Miss., Marks**—City let contract sewerage system and extending water-works to P. W. Seay, Hattiesburg, $25,000.

★**O., Fostoria**—See "Streets and Roads."

O., Springfield — City received low bid sewer portion North Fountain Ave., from P. Gaffrey, 609 Linden Ave., $10,480.

Sewers (Continued)

★**Ill., Elgin**—(Official)—City let contract sewerage system in River and other streets to E. M. Scheflow, Elgin, $14,975. Noted June 21.

★**Ill., Rockford**—Bd. Local Improvs. let contract sewer in portion Crosby St., $31,040.

★**Minn., Caledonia**—City let contract sewerage system to E. T. Sykes Co., 2317 Pleasant Ave., Minneapolis, $42,974. Noted Sept. 13.

★**Minn., Dodge Center**—Village let contract sewerage system to Moore-Seig Constr. Co., 1126½ East 4th St., Waterloo, Ia., $32,550. Noted Aug. 23.

Minn., Ogilvie—See "Water-Works."

Minn., St. Paul—City received low bid storm sewer, portion Fairview St., from O'Neill & Preston, 60 East 6th St., $87,400.

★**S. D., Beresford**—City let contract 3-mi. sewers to Tanebust Bros., Sioux Falls, $25,058. Noted Apr. 19.

★**Mo., Kansas City**—City let contract Troost Ave. truck line sewer to M. Walsh, Kansas City, $165,000.

★**Mo., Kansas City**—City let contract southeast sewerage system to Halpin & Boyle, Ry. Ex. Bldg., $119,000.

★**N. M., Las Cruces**—City let contract new college sewer district to Las Cruces Lumber Co., Las Cruces, $10,000.

★**Idaho, Emmett**—City let contract sewerage system to C. Helmer, Twin Falls, $31,449. Noted June 21.

Ore., Astoria—City received only bid Scow Bay sewerage system from West Coast Constr. Co., Warrenton, $50,000.

Ore., Astoria—City received low bid building Sewer Dist. No. 3 from Coluccio & Moceri, 1642 Lane St., Seattle, $43,900. Noted Sept. 13.

Ore., Portland—City received low bid for sewer in Klickitat St. and East 65th sewerage system, vitr. pipe. J. F. Shea, 583 Johnson St., $26,460.

Cal., San Diego—City received low bid sewerage system, Ocean Beach Dist., from J. Kennedy, Washington Bldg., Los Angeles, $92,394. Noted June 21.

BRIDGES

Proposed Work

R. I., Woonsocket—(Official)—Bd. Aldermen rejected bids building rein.-con. bridges, Contr. Nos. 1, 2 and 3. F. H. Mills, engr. Noted Sept. 6.

N. Y., Rochester—City plans to build new bridge over Barge Canal harbor on Clarissa St. About $300,000. State to bear part of cost. F. T. Elwood, city engr.

N. J., Bellemead—Philadelphia & Reading Ry. submitted plans to Bd. Freeholders Somerset Co., Somerville, for improvements here to include new bridge, elimination of grade crossings, etc. About $120,000. S. T. Wagner, Phila., ch. engr.

N. J., Trenton—Pennsylvania R.R. plans bridge on Brunswick Pike over Delaware and Raritan Canal, Bakers Basin. A. C. Shand, Broad St. Sta., Phila., ch. engr.

Pa., Middletown—Boro., Pennsylvania R. R. A. C. Shand, Broad St. Sta., Phila., ch. engr., Middletown Car Co., State Highway Dept., and Dauphin Co. Comrs., Harrisburg, had plans prepared new bridge over Wilson St. About $48,000.

Pa., Uniontown—Fayette Co. will build 8 concrete bridges over streams in various sections of county; 3 to be located along Connellsville-Pennsville Rd. About $50,000.

Fla., St. Augustine—City election in November to vote on $2,000,000 bond issue, proceeds to be used for arch bridge, 1500-ft. long, 42 ft. wide; sewerage system; concrete sea wall, water front improvements, etc.

La., Shreveport—Levee Bd. Caddo Co. plans to build Cross Bayou and Tim Morings draw span bridges. Address Secy. Levee Bd., Shreveport.

Ky., Paducah—(Official)—McCracken Co. rejected bids building bridge 4 80-ft. steel spans, concrete substructure and floor. R. H. Young, engr. Noted Sept. 13.

O., Cincinnati—See "Streets and Roads."

Ill., East St. Louis—Municipal Bridge Comn. plans to widen Free Bridge 19th St. and Piggott Ave. About $10,000. St. Louis and East St. Louis Interurban System to appropriate toward cost. E. F. Harper city engr.

Ill., Quincy—See "Streets and Roads."

Neb., Center—Knox Co. receiving bids about Oct. 20, building 180-ft. steel span over Verdigris River. G. E. Johnson, Lincoln, bridge engr.

Neb., Gering—Scottsbluff Co. receiving bids about Oct. 20, building 600 ft. rein.-con. bridge over North Platte River. G. E. Johnson, Lincoln, state bridge engr.

Neb., North Platte—Lincoln Co. receiving bids about Oct. 20 building 600 ft. rein.-con. bridge over Platte River. G. E. Johnson, Lincoln, state bridge engr.

Mo., Linn—See "Streets and Roads."

Okla., Holdinville—See "Streets and Roads."

Wash., Port Orchard—Kitsap Co. Comrs. receiving bids about Oct. 1 building rein.-con. bridge. About $20,000.

BIDS DESIRED

W. Va., Charleston—Until Oct. 20, by Kanawha Co., building steel highway bridge over Elk River, near Big Chimney. F. G. Burdette, co. engr.

W. Va., Glenville—Until Oct. 16, by Gilmer Co., building bridge over Steer Creek, rein.-con. and stone abutments. N. E. Rymer, clk.

W. Va., Weston—Until Oct. 13, by Lewis Co., building rein.-con. bridge over Polk Creek. L. Troxell, clk.

Indiana—Until Oct. 1 by Clay Co. Comrs., Brazil, building Drake, Francis, Beamer and Cutshall bridges. W. O. Graeser, aud.

Until Oct. 2 by Wabash Co. Comrs., Wabash, building concrete flat top bridge, Lafontaine Twp. F. P. Kircher, aud.

Until Oct. 6 by Jay Co. Comrs., building and repairing 2 bridges, Wayne and Madison Twps. J. Bonifas, aud.

Ia., Algona—(Official)—Until Oct. 4, by E. H. Beardsley, aud. Kossuth Co. building bridge over Des Moines River; advertised in this issue.

Ia., Ft. Dodge—(Official)—Until Oct. 23, by City building rein.-con. viaduct, North 3rd St. W. L. Tang, clk.; advertised in this issue.

Minn., Minneapolis—Until Oct. 8, by Comrs. Hennepin Co., for bridge over Minnesota River on Lyndale Ave., 800 ft. long. Work includes 7.5 mi. roadway on Hennepin Co. side and 10 mi. on Dakota Co. side. Bids will be asked on 4 types of bridges. Hennepin Co. will sell $427,500 bonds for work and Dakota Co. $22,500. Toltz Eng. Co., 1410 Pioneer Bldg., St. Paul, engrs. Noted Sept. 13.

Kan., Hays—Until Oct. 1 by Ellis Co., building 60-ft. steel truss bridge. G. H. Brown, clk.

Kan., Lyndon—Until Oct. 3, by Osage Co., building 20 bridges and culverts. E. Olcott, clk. C. C. Jones, Burlingame, engr.

Kan., Westmoreland—Until Oct. 2, by Pottawatomie Co., building 5 rein.-con. bridges. J. B. Claywell, clk. I. E. Taylor, engr.

Mo., Jefferson City—See "Streets and Roads."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Me., Gardiner**—City, Kennebec Co. and State let contract building highway bridge to T. Stuart & Sons, Newton, Mass., $55,900.

★**Mass., Lynn**—(Official)—R. J. Newsom, supt. water-works, let contract rein.-con. bridge and approaches at Ipswich River Sta. to J. W. Sheehan, 585 Weston Ave., Lynn, $10,095. Noted Sept. 6.

★**N. Y., Albany**—(Official)—W. W. Weatherspoon, supt. pub. wks., let contract Strauss Trunnion bascule bridge over Tonawanda Creek between Tonawanda and North Tonawanda to Scherzer Rolling Lift Bridge Co., 52 West Jackson Blvd., Chicago. About $233,986. Noted Sept. 6.

Pa., Butler—(Official)—Pennsylvania Pub. Ser. Comn., Harrisburg, received low bids steel bridge with concrete abutments on Main St., from Independent Bridge Co., Beaver and Rebecca Sts., Pittsburgh, $198,687; C. M. Haggart Co., Pittsburgh, $[illegible]278; Penn Bridge Co., Beaver Falls, $[illegible]596. Noted Sept. 6.

★**Pa., Reading**—Carpenter Steel Co., 3 Exeter St., let contract building 3 span rein.-con. bridge over Exeter St. to L. H. Focht & Son, 520 Court St., $[illegible].

★**Va., Fairmont**—Marion Co. Court let contract building 85-ft. rein.-con. bridge over Fox Paw Creek to Mc[illegible]th County Co., 715½ 4th St., Marietta, O., $11,900.

★**S. C., Camden**—Kershaw Co. let contract steel bridge over Wateree River to Austin Bros., 156 Greenwood Ave., Atlanta, Ga., $93,000. Noted Sept. 13.

★**O., Dayton**—See "Streets and Roads."

★**Illinois**—(Official)—State Highways Comn., Springfield, let contract building Sugar Creek Bridges Nos. 1, 2, 3 and 4, between Sheridan Twp., Logan Co. and Mason City Twp., Mason Co., to Decatur Bridge Co., East Eldorado St., Decatur, $12,287.

★**Mo., Excelsior Springs**—City let contract building bridges over Henrie Ave. and Fishing Creek to Western Bridge Co., Harrisonville. About $10,000. Noted Aug. 30.

★**Ont., Oakville**—City let contract building Tansley bridge, 600-ft. long, 18 ft. wide, to N. McLeod, Toronto, $60,000.

★**Ont., Tansley**—Council let contract rein.-con. bridge to N. McLeod, Ltd., Kent Bldg., Toronto, $60,000. Noted June 7.

STRUCTURAL STEEL WORK

Proposed Work

Neb., Center—See "Bridges."

BIDS DESIRED

W. Va., Charleston—See "Bridges."

Kan., Hays—See "Bridges."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**S. C., Camden**—See "Bridges."

REINFORCED CONCRETE

Proposed Work

R. I., Woonsocket—See "Bridges."

N. Y., Buffalo—See "Industrial Works."

N. J., Atlantic City—See "Miscellaneous."

N. J., Newark—See "Industrial Works."

Pa., Uniontown—See "Bridges."

Fla., Dunnellon—See "Industrial Works."

Neb., Gering—See "Bridges."

Neb., North Platte—See "Bridges."

N. D., Minot—See "Water-Works."

Wash., Port Orchard—See "Bridges."

N. S., Annapolis, Royal—See "Miscellaneous."

Ont., Ottawa—Office—See "Buildings."

Bids Desired

W. Va., Weston—See "Bridges."

Indiana—See "Bridges."

Ia., Ft. Dodge—See "Bridges."

Kan., Westmoreland—See "Bridges."

Cal., San Diego—See "Sewers."

Cal., Waterford—See "Excavation and Dredging."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Lynn**—See "Bridges."

★**Pa., Reading**—See "Bridges."

★**Va., Fairmont**—See "Bridges."

★**O., Dayton**—See "Water-works."

★**Mich., Grand Haven**—See "Streets and Roads."

★**Cal., San Diego**—See "Miscellaneous."

★**Cal., Woodland**—See "Excavation and Dredging."

Ont., Tansley—See "Bridges."

STREETS AND ROADS

Proposed Work

R. I., Providence—City plans to curb [illegible]ons President and Yale Aves., Reid, Orinda, Lakeview, Waterman, and Whitford Sts. M. H. Brownell, city engr.

N. Y., Buffalo—City plans to repave portion Humboldt Pkway. O. H. Norton, city engr.

N. J., Belvidere—Warren Co. plans improving road from Blairstown to Stewartsville, 7½ mi. macadam. About $[illegible].

N. J., Elizabeth—[illegible] Freeholders, Union Co. plan state highways in portion Chestnut St. Bonds. About $[illegible].

N. J., Paterson—[illegible] Freeholders, Passaic Co. plan to pave [illegible]ilbe Camp Rd., [illegible] of Preakness, etc. engr.

N. J., Vailsburg—(Newark P. O.)—City plans to pave Stanford Ave., Coyle St., and South Orange Ave.

Pa., South Brownsville—(Official)—Boro. plans grading and paving portions [illegible]nd 18th Sts.

Va., Bristol—(Official)—City to sell $[illegible]00 bonds, part [illegible] for street improvements. C. Bolen, clk. Noted Sept. 24.

Streets and Roads (Continued)

Va., Norfolk—Norfolk-Carolina Highway Assn., recently organized, plans to build highway to connect Norfolk and Elizabeth City, N. C. E. Wolcott, Seaboard National Bank Bldg., Norfolk, pres.

Va., Richmond—City plans to improve streets, roadbeds and sidewalks. About $5,000. C. E. Belting, city engr.

W. Va., Charleston—Kanawha Co. sold $90,000 bonds to build hard roads in Loudon Dist. G. Copehaver, pres. co. court. Noted May 17.

W. Va., Stealey Heights—(Clarksburg P. O.)—City to sell $15,000 bonds Oct. 12 paving Stealey, Hartland, Magnolia and Lynn Aves., 4th and Traction Sts., brick and concrete. L. A. Hess, recdr. Noted Sept. 20.

S. C., Greenville—Greenville and Spartanburg Co. Comrs., Spartanburg, plan to build new road from Greenville to Spartanburg, via Reidville. A. Tull, Spartanburg, engr.

Georgia—State Highway Comn., Atlanta, plans to build Atlanta-Macon Highway. About $180,000. T. E. Patterson, chn.

Ga., Decatur—De Kalb Co. plans to improve Shallowford Highway leading to Camp Gordon in return for reconstruction of Peachtree Rd., which will be financed by U. S. Government.

Ga., West Point—City sold $20,000 bonds to pave streets. Noted June 28.

Ala., Mobile—Mobile Co. election soon to vote on $400,000 bond issue to build roads.

Miss., Biloxi—City defeated $40,000 bond issue to improve streets. Noted Aug. 23.

La., New Iberia—City election Oct. 16 to vote on $75,000 bond issue to build good roads.

La., Shreveport—Caddo Parish Police Jury plans paving 5-mi. road. Address Parish Engr., Shreveport.

La., Thibodaux—Lafourche Parish election Oct. 23 to vote on $25,000 bond issue to build roads, Rd. Dist. No. 3.

Tenn., Murfreesboro—City plans to improve portion West Main St. About $25,000.

Tenn., Nashville—City election Sept. 27 to vote on $180,000 bond issue to open, widen, extend, and pave streets and alleys and $25,000 to build gutters. W. W. Southgate, city engr.

Ky., Poor Fork—See "Industrial Works."

O., Cincinnati—Cuyahoga Co. Comrs. passed ordinance to appropriate $152,131 for road improvement and $45,918 for bridges.

O., Cincinnati—City passed ordinance to pave portion Harrison Ave. F. Krug, city engr.

O., Elyria—See "Sewers."

O., Lima—City plans improving north and West High, Main, Kosh, Pierce, Baker and Bocarre Alleys, South West, Marmet and Lafayette Sts. About $40,000. C. Bryson, city engr.

O., Napoleon—Henry Co. sold $113,950 bonds to improve roads.

O., Youngstown—Council passed ordinance to issue $25,000 bonds to widen East Federal St. F. M. Lillie, city engr.

Ind., Evansville—Vanderburg Co. sold $11,000 bonds to improve roads. W. Terrell, co. treas.

Ind., Ft. Wayne—Allen Co. to sell $40,000 bonds to improve highways. W. R. Rauke, treas.

Ill., Belleville—St. Clair Co. plans to pave portion East St. Louis-Springfield Rd. About $15,000.

Ill., Butler—City plans to pave portions North Main, North Delaware, South Delaware, East Jackson and Lane Sts.

Ill., Carlinville—Macoupin Co. election about Dec. 1 to vote on $150,000 bonds to complete St. Louis-Springfield road (Rte. 4) through county.

Ill., Edwardsville—Madison Co. election Nov. 20 to vote on $[illegible] bonds for highways.

Ill., Galesburg—Knox Co. voted $10,512 bonds to meet state amount alloted to county to build state aid road.

Ill., Geneva—Rd. Supervs. Kane Co. to appropriate $[illegible] paving Lincoln Highway from Cook Co. line to Fulton, 100 mi.

Ill., Lewistown—Fulton Co. Supervs. plan to build state aid road between St. David and Bryant.

Ill., Murphysboro—Jackson Co. defeated $340,000 bond issue to build roads. Noted Sept. 13.

Ill., Quincy—Adams Co. Supervs. voted $30,000 for street and bridge improvements. L. Boyer, supt. highways.

Ill., Springfield—Sangamon Co. election Nov. 6 to vote $500,000 bond issue to build state and Federal aid roads.

Ill., Toledo—Cumberland Co. election Oct. 23 to vote on $95,000 bond issue to pave National Rd.

Wis., Stevens Point—City soon lets contract paving Whiting St. and Seth Ave., concrete, 4800 ft., 15 ft. wide; $17,000 bonds sold for work. F. M. Playman, chn. st. comn. Noted Sept. 6.

Ia., Iowa City—City plans paving Newton Rd., 7800 sq.yd. brick or bituminous, 54 lin.ft. cement curb. About $26,000. S. M. Hands, engr.

Ia., Marion—Linn Co. plans paving and grading roads. About $276,000. H. R. Churchill, co. aud.

Ia., Waterloo—Bd. Supervs. Blackhawk Co. voted $100,000 for surfacing roads with gravel. This amount, together with state and federal aid, and other contributions will make about $244,000 available for road work during next 2 years.

Kan., Hutchinson—Reno Co. plans $3,000,000 bond issue to build 154 mi. hard surface roads, monolithic brick.

Mo., Linn—Osage Co. election Oct. 16 to vote on $200,000 bonds to build roads and bridges.

Ark., Ft. Smith—City soon lets contract paving North 10th and South 9th Sts., asphaltic concrete, 5-in. concrete base, 250-ft. concrete curb. About $20,000. W. H. Evans, city engr.

Ark., Magnolia—Columbia Co. Comrs. had plans prepared by State Highway Comn., Little Rock, 14 mi. roads, from here to Waldo and Lafayette Co. line. About $65,000.

Ark., Marion—Crittendon Co. plans to build 10-mi. road from Earle to Heafer, to be known as Improv. Dist. No. 2.

Ark., Waldron—Scott Co. Comrs. had plans prepared by State Highway Comn., Little Rock, for 32-mi. road to extend to Oklahoma state line, and Waldron and Sebastian Co. line. About $75,000.

Tex., Angleton—Brazoria Co., Freeport Rd. Dist. No. 23, voted $200,000 bonds to pave roads, tarvia.

Tex., Austin—See "Sewers."

Tex., Barstow—Ward Co. Rd. Dist. No. 1, election Oct. 13 to vote on $60,000 bond issue to build streets.

Tex., Corsicana—Navarro Co., Richland Rd. Dist., voted $80,000 bonds build highway to connect Richland with Colorado-Gulf Highway. Noted Aug. 30.

Tex., Corsicana—Navarre Co. Comrs. voted $200,000 bonds for roadwork in Rd. Dist. No. 1. Noted Aug. 30.

Tex., Daingerfield—Morris Co., Omaha Precinct, voted $35,000 bonds to build roads.

Tex., Eastland—Eastland Co. voted $130,000 bonds to build roads in Dist. No. 1. Noted Aug. 30.

Tex., Harlingen—City sold $10,000 bonds to build roads.

Tex., Jasper—Jasper Co. election Oct. 13 to vote on $250,000 bond issue for roadwork.

Tex., Palestine—Anderson Co., Rd. Dist. No. 2, voted $20,000 bonds to improve roads. Noted Aug. 30.

Tex., Port Lavaca—(Official)—Calhoun Co. Rd. Dist. No. 2 plans new election, Oct. 20, to vote on $75,000 bond issue to build and improve roads. Former election declared invalid. Noted Sept. 13.

Tex., San Angelo—Tom Green Co. election Oct. 20 to vote on $200,000 bond issue to improve roads. Noted Sept. 13.

Tex., Sinton—San Patrico Co. Comrs. plan road in Dist. No. 3. About $70,000. F. L. Clendenning, secy. rd. dist.

Okla., Ardmore—Carter Co. voted $200,000 bonds for good roads.

Okla., Ardmore—Carter Co., Hewett Twp., to issue $70,000 bonds to build roads.

Okla., Ardmore—Council passed ordinance to issue $17,300 bonds to improve streets. A. B. Payne, city engr.

Okla., Holdenville—Hughes Co. Comrs. voted $73,000 bonds for roads, bridges and culverts in Loustin Twp.

Idaho, Bonners Ferry—Boundary Co. voted $70,000 bonds for highway work. Noted Aug. 23.

Idaho, Burley—City election Oct. 2 to vote on $42,000 bond issue for paving and other improvements. E. C. Davis, clk.

Utah, Beaver—City election soon to vote on $50,000 bond issue to build roads.

Washington—State Highway Comn., Olympia, plans improving 27 mi. Blewett Pass with county and Federal aid. About $70,500 available for work now.

Washington—State Highway Comn., Olympia, rejected bids, paving 2 mi. Sunset Highway. Noted Aug. 30.

Wash., Aberdeen—City plans boulevard along Chehalis River. About $57,000. L. D. Kelsey, city engr.

Wash., Bellingham—Whatcom Co. Comrs. receive bids about January, paving 36-mi. road, 1- or 2-course concrete. About $400,000 to $500,000. Chas. Lindberry, co. engr.

Wash., Ellensburg—City plans paving 3 highways, from business district to city limits. About $35,000. A. Edwards, city engr.

Wash., Seattle—King Co. Comrs. rejected bids building Auburn-Enumclaw Highway No. 11-C. Noted Sept. 20.

Wash., Seattle—City had plans prepared paving portions 6th Ave., $37,966; Utah Ave. and Forest St., $48,793. A. H. Dimock, city engr. Noted Apr. 19.

Oregon—State Highway Dept., Salem, plans grading 10.8 mi. road between Myrtle Creek and Dillard, Douglas Co., 4.9 mi. Wolf Creek Hill, Josephine Co., both projects on Pacific Highway. About $173,648 and $83,600 respectively. U. S. Government aid to be asked for work.

Oregon—State Highway Comn., Salem, plans to build Lower Columbia River Highway, through Hood, Wasco and Sherman Cos. Comrs. will sell $500,000 of $6,000,000 bonds voted for highway work last June for this portion of highway. Noted Aug. 2.

Oregon—State Highway Comn., Salem, rejected bids, 33-mi. highway. Noted Aug. 23.

Ore., Canyon City—Grant Co. election soon to vote on $35,000 bond issue to build roads.

Ore., Gold Beach—Curry Co. plans to issue $100,000 bonds for highway work.

Ore., Toledo—Lincoln Co. election Oct. 2 to vote on $200,000 bond issue for road work. Noted Aug. 23.

Cal., Exeter—City having plans prepared by W. D. Watt, engr., paving Visalia Rd., Orange and Filbert Aves., South D, E, F and Pine Sts. About $5 per running foot pavement 50 ft. wide and $1.75 for pavement 16 ft. wide.

Cal., Los Angeles—City Council passed ordinance to improve portions Reseda, Ventura and Wilton Sts. A. C. Hansen, city engr.

Cal., Los Angeles—City rescinded contract let to W. M. Ledbetter, Pacific Electric Bldg., improving Sherman Dr. New bids. Noted Sept. 6.

Cal., Riverside—(Official)—Riverside Co. lets contract in January for 14 mi. graded and surfaced roads. R. W. Waterman, Blythe, engr., road dist. improv. Nos. 2 and 3.

Cal., San Diego—City had plans prepared paving portion Utah St., concrete. About $23,659. G. Cromwell, city engr.

Cal., Santa Barbara—Santa Barbara Co. lets contract about Oct. 1, improving ½ mi. road connecting Santa Rosa with State Highway.

Cal., Visalia—Tulare Co. having plans prepared following division of highway system: Tulare-Lindsay; Porterville-Worth; Lindsay-South; Merryman-Lemon Cove; Porterville-Woodville; Yettem-Elderwood; and Elderwood-Woodlake.

BIDS DESIRED

Massachusetts—(Official)—Until Oct. 2, by State Highway Comn., Boston, for 5000-ft. highway in Stockbridge Twp.

Conn., Hartford—(Official)—Until Sept. 28 by C. J. Bennett, state highway comr., building roads in various twps; advertised in this issue.

N. J., Jersey City—(Official)—Until Oct. 2, by Bd. Comrs. paving Central Ave., involving 30,035 sq.yd. asphalt and 20-in. c.i. water mains, cost, $105,643; also resurfacing and repaving Congress St., Belgian block. C. A. Van Kuren, city engr. Noted Sept. 20.

Streets and Roads (Continued)

N. J., Newark—Until Oct. 4, by Bd. St. & Water Comrs., paving portions Johnson Ave., asphalt, 6-in. concrete foundation. M. R. Sherrard, city engr.

N. J., Paterson—Until Oct. 24, by Bd. Freeholders Passaic Co. improving 2½ mi. Union Ave. from Paterson to Little Falls. G. Ferguson, co. engr.

N. J., Westfield—Until Oct. 1, by City improving East Broad St., bituminous macadam shoulders and treating pavement with liquid asphalt. A. W. Vois, city engr.

W. Va., Huntington—See "Sewers."

W. Va., Stealey Heights—(Clarksburg P. O.)—Until Oct. 12, by City paving, grading, and curbing portion Stealey and Duncan Aves. and Davis St. and alleys, brick and concrete. About $15,000. L. D. Mitchell, mayor. Noted Sept. 20.

Ky., Pikeville—Until Nov. 5, by City, for street paving. About $30,000.

O., Cincinnati—Until Oct. 2, by E. Von Bargen, purch. agt., for 30,000-gal. coal-tar bituminous binder for laying bituminous concrete pavements.

O., Cleveland—Until Oct. 3, by City, grading, draining, curbing and repaving 2 portions Woodhill Rd. R. Hoffman, city engr.

O., Elyria—(Official)—Until Oct. 3, by M. M. Wilcox, dir. pub. serv., paving portions Grant, Ohio and other streets. C. M. Theobald, city engr. Noted June 14.

Mich., Bad Axe—Until Oct. 1 by F. Bluette, clk., Fair Haven Twp., Hudson Co., 5-mi. trunk line macadam road, 16 ft. wide.

Ill., Granite City—(Official)—Until Sept. 29, by Morriss Realty Co., grading a Subdivision, 65,000 yd.; advertised in this issue.

Ill., Mendota—Until Oct. 8, by Bd. Local Improv., brick pavement, 5-in. concrete foundation and cement grout filler on various streets. About $36,100. C. Wedner, city clk.

Wis., West Allis—Until Oct. 6 by City grading Lincoln Ave. and George St. E. G. Orbert, city engr.

N. D., Bismark—Until Oct. 1, by C. L. Burton, city aud., 6550 yd. creosoted wood block, bitulithic or sheet asphalt paving.

Mo., Charleston—(Official)—Until Oct. 3, by City Clk., paving streets involving 9725 cu.yd. excav., 16,807 lin.ft. curb, 3126 sq. yd. 1-course concrete pavement, 27,683 sq. yd. 4-in. concrete base and 27,683 2-in. asphaltic concrete, wearing surface, 800 lin. ft. concrete header and changing 24 manhole tops in sanitary sewerage system. Noted July 5.

Mo., Jefferson City—(Official)—Until Oct. 5, by Cole Co. Court, for new public road leading to New Decatur Bridge; also 2 side-road connections, Sects. 25 and 26, Twp. 43, Range 14; road in Sect. 27, Twp. 44h, Range 11, including several concrete culverts and laying vitr.-pipe culverts. E. F. C. Harding, co. highway engr. Noted Aug. 9.

Cal., Modesto—Until Oct. 9, by H. Benson, clk. Stanislaus Co., building 16.67 mi. concrete pavement, 2.28 mi., Hickman-Thalheim Rd., 8.22 mi. Waterford Rd., and 5.57 mi. Oakdale-Waterford Rd.

Cal., Visalia—Until Oct. 5, by G. R. Prestidge, Clk., Tulare Co., building Dinuba-Kingsburg, Exeter-Merryman, Tulare-Paige and Porterville-Woodville divisions county highway system.

Ont., Finch—Until Oct. 1, by Dundas, Stormont and Glengarry Cos., Finch, for 60 mi. roads. J. G. Cameron, co. rd. supt.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Me., Bangor**—City let contract for 1-mi. stone-base gravel-surface road to M. Hughes, Bangor, $11,510.

Massachusetts—State Highway Comm., Boston, received low bid section highway in Raynham, from J. McCormick, 315 Taunton Ave., $10,848.

★**Mass., Boston**—City let contract surfacing 36,161 sq.yd. sheet asphalt, on South, Harvard, Beacon, North Russel and Bowdoin Sts., Brighton Ave. and Maverick Sq., to Bermudez Co., 246 1st St. About $111,542. Noted Sept. 20.

★**Mass., Brighton** — (Boston P. O.) — Dept. Pub. Wks., Boston, let contract artificial stone sidewalks on Brooks, Holton, Fairbanks, Mapleton and Market Sts., to J. F. Lynch, 47 Claybourne St., Dorchester, $13,899.

★**Rhode Island**—State Rd. Pub. Wks., Providence, let contract rebuilding section East Main Rd., to J. McCormick, 315 Taunton Ave., bituminous macadam, East Providence, $68,727. Noted Sept. 20.

N. Y., Albany—E. Duffey, state highway comr., 55 Lancaster St., received low bids building roads, various counties, as follows: Rd. No. 5590, Lewiston Hgts.-Lewiston, Niagara Co., 0.61 mi., F. E. Dean, Youngstown, $21,482; Rd. No. 1315, Cambria-Wilson, Niagara Co., 8 mi., Elmer J. Latus, Albany, $62,560; Rd. No. 5547, Whitesboro-Carey Corners, Oneida Co., 0.70 mi., Wm. P. McDonald Constr. Co., Lakeland, Fla., $20,732; Repair Contr. No. 1127, Road No. 5044, Mexico-Union Sq., Part 1, Oswego Co., Floyd H. Wells, Savannah, $10,359, Richard Hopkins, Troy, $10,845. Noted Sept. 6.

N. Y., New York—(Official)—M. M. Marks, boro. pres., received low bids regulating and paving West 123d St., sheet asphalt on concrete foundation, from Cleveland Trinidad Paving Co., Flushing, L. I., $10,204; Asphalt Constr. Co., 297 Madison Ave., $10,207; Davney Asphalt Co., 52 Vanderbilt Ave., $10,539.

★**N. Y., Yonkers**—City let contract paving portions South Bway., asphalt block, to J. Kearns, 50 Church St., New York City, $60,000. Noted Sept. 13.

★**N. J., Lodi**—Boro. let contract paving and curbing North Main St. to Dyer, Kane & Co., 12 Lexington Ave., Passaic, $12,124.

★**Pa., Aspinwall**—City let contract paving and improvements at Aspinwall Pumping Sta. to J. F. Casey, Oliver Bldg., Pittsburgh, $19,000.

★**Pa., Hughestown** — Boro. let contract paving Parsonage St. to O'Brien Bros., Avoca, $24,935.

★**Pa., Phila.**—Dept. Pub. Wks. let contract improving streets as follows: McNichol Paving Co., 1723 Cherry St., portion Northeast Blvd., $110,484; E. H. Vare, Lincoln Bldg., League Island Park, $45,900, Passyunk Ave., $10,217; Phila. Paving Co., and Cunningham Paving & Constr. Co., both of 1345 Arch St., portions Upland and 68th Sts.; Barbour Asphalt Co., Woolworth Bldg., New York City, Courtland, Louden, 57th, Warrington, Willows, and 7th Sts., $49,100; 28th St., Mack Paving & Constr. Co., Sedley St. Noted Aug. 30.

★**Pa., Pittsburgh**—See "Sewers."

★**Va., Rustburg**—Bd. Supervs. Campbell Co. let contract building 11-mi. bituminous macadam road to McKinney Bros., Inc., Peoples Bank Bldg.; J. R. Ford & Co., 1223 Foyd Ave., Virginia Constr. Co., Peoples Bank Bldg.; W. T. Jones, 216 7th St.; S. B. Bennington, 911 Cabell St., all of Lynchburg.

W. Va., Parkersburg — (Official) — City received low bids paving Ann, Spring and Charles Sts., from Graham Bros., 516 Julian St., George, 20th, 22nd and Covert Sts., Kennedy & Son, Parkersburg. Noted Sept. 6.

★**N. C., Louisburg**—City let contract 40,000 sq.yd. paving to A. G. Lassiter & Co., Oxford, $135,000. Noted Sept. 13.

★**S. C., Spartanburg** — Spartanburg Co. Highway Comn. let contract 8.8-mi. top soil road to Blankenship & Son. About $124,500 available for work.

★**Ala., Birmingham**—City let contract to Vibrolithic Constr. Co., Terminal Bldg., Dallas, paving portion Ballard Ave., $11,706. Englewood Ave., portions, $6981; Bishop Ave., $9171; Texas Bitulithic Co., Praetorian Bldg., Dallas, Tex., Holmes St., $23,946. Forney Ave., $26,746; Brantley-Lanham Paving Co., Knight St., $11,278; Standard Eng. Co., 113 Martin St., Dallas, Tex., 7th St., $11,786.

★**Miss., Carthage**—Leake Co. Edinburg Rd. Dist. let contract 19.78 mi. gravel road to Cunningham & Tate, Brookeville. Noted June 14.

★**La., Amite** — Tangipahoa Parish Rd. Dist. let contract 13.3 mi. gravel and dirt highway from Fluker to Mississippi state line to S. A. Gano, $70,000.

★**La., New Orleans**—City let contract shell road on portion Madrid St. and Franklin and Paris Ave. to H. Reynolds, Mahon Blanche Bldg. Noted Aug. 23.

★**Tenn., Cleveland**—City let contract paving streets to West Constr. Co., 18th and Market St., Chattanooga, $14,138.

Tenn., Hohenwald—Lewis Co. Comm. received low bid 30-mi. road, involving 12,000 cu.yd. excav., from Humphrey & Schenderman, Hohenwald; $100,000 available for work. Noted Aug. 23.

★**Ohio**—State Highway Comn., Columbus, let following road contracts: Thos. Dalton, Winchester, Adams Co.; T. J. Connell, Cambridge City, Ind., 2 sections Hamilton-Middleton Rd., monolithic brick, Butler Co., $77,000 and $82,000 respectively; Delaware Blue Limestone Co., Delaware, Sect. "A," Delaware-Prospect Rd., $56,000; Wilson Engr. Co., Xenia, Hancock Co., $36,500; L. H. Young, West Austintown, Akron-Youngstown Rd., Mahoning Co., $25,000; Burnett & Christian, Rockford, Mercer Co., $30,000; B. Mango, Niles, Monroe Co., $12,000; J. A. Single, Zanesville, Muskingum Co., $15,000; J. S. Neff, Circleville, Lancaster-Circleville Rd., $22,000; L. Garrett, Kent, portion Akron-Youngstown Rd., concrete, $47,000; Brewer, Tomlinson & Brewer, Chillicothe, Ross Co., $43,000; L. Putnam, Van Wert, Piqua Rd., Shelby Co., rein.-conc., $23,000; Seiple & Wolfe, Youngstown, Sect. "G," Ravenna Rd., Stark Co., bitulithic macadam limestone top, $54,000; S. Baughman, Marysville, Union Co., $33,000; L. Smith, Leipsic, Allen Co., $25,000; Kelley Bros., Portsmouth, Jackson-Portsmouth Rd., Scioto Co., $25,000; J. C. Devine Co., Alliance, portion Lincoln Highway in Columbiana Co., Madison Twp., $108,000. Noted Sept. 13.

★**O., Cincinnati**—City let contract paving portion Maple Leaf Ave. to Kirchner Constr. Co., 221 West 9th St., $19,510. Noted Sept. 13.

★**O., Dayton** — City let contract paving East 3rd St., to E. Ryan, Springfield, $20,226; removal of bridge at canal, substitution of culvert, and paving Keowee St. to T. P. Strack, 31 Goodale Bldg., Cincinnati, $47,085.

★**O., Fostoria**—City let contract grading, paving, curbing and building sewers to Modern Constr. Co., Fremont; Brubaker & Peter, Fostoria; Bugler & Anderson, Fostoria; about $47,395.

O., Hamilton—City received low bids paving Main St. and Grand Blvd., from Andrews Asphalt Paving Co., Reutschler Bldg., Federal Asphalt Paving Co., 316 Reutschler Bldg., A. Wirtz Transfer Co., 5th and Maple Sts. Noted June 14.

★**O., Newark**—City let contract paving Neal Ave., Evans and St. Clair Sts., to Federal Asphalt Paving Co., 316 Reutschler Bldg., Hamilton, $23,376.

O., Springfield—City received low bids paving streets (a) sheet asphalt, (b) trinidad, (c) aztex or texico, (d) asphaltic concrete as follows: R. J. Kavanaugh, portion Kenton St., (a) $7878; (b) $7945. Stanton Ave., (a) and (b) $24,969; (c) $22,549; Fountain Ave., (a) $24,994; (b) $25,440; Southern Ave., (d) or (c) $5342. (b) $5465; Mulberry St., (c) $19,069; (b) $19,365; Western Ave., (a) or (c) $36,721; (b) $37,721; Grand Ave., (c) $16,132; (b) $16,696; (d) $13,297. J. McHugh, 1240 South Penn St., Phila., Kenton St., (c) $8125; (b) $8195; Mulberry St., (a) or (c) $18,929; (b) $19,299; Western Ave., (c) $37,363; (b) $33,913; Grand Ave., (a) or (c) $15,988; (b) $16,181. Caffrey & Cooney, portions Fountain Ave., (a) or (c) $24,994. Noted Sept. 6.

Ind., Indianapolis—City received low bid paving portion South Capitol Ave., from Marion Co. Constr. Co., 1[illegible] South West St., $9.10 per lin.ft. asphalt and stratified limestone, $9.75, asphalt and granite curb, $9.60, brick and stratified limestone curb; $9.75, brick and granite curb.

★**Ind., South Bend** — City let contract paving Dubail Ave., Mexican asphaltic concrete, to A. H. White Constr. Co., [illegible] Ry. Ex. Bldg., $11,434. Noted Aug. 2.

★**Mich., Detroit**—Bd. Pub. Wks. let contract to Detroit Asphalt Paving Co., McGraw Bldg., paving, grading and curbing Maxwell Ave., asphaltic concrete, $18,41[illegible] Ferry Ave., $17,8[illegible]; F. Orath & Son, 102 Free Press Bldg., Lafayette Ave., $44,630; Livernois Ave., 1-course concrete, $24,441; Ohio Cement Constr. Co., $46; Hammond Bldg., paving various alleys, $17,8[illegible].

★**Mich., Grand Haven**—Ottawa Co. let contract [illegible] concrete road, including grading, culverts and 2 concrete bridges to Plaisfield and Allegan Twps. to Terbush & Bronkhorst, $31,994.

★**Ill., Chicago**—Cook Co. Comrs. let contract bridging Western Ave. [illegible] and High Twps., to J. A. Stubbins, 111 West Washington St., $14,124; Cicero Ave. Rd. Highway Twp., to P. O'Sullivan, 100 Sawyer Ave., La Grange, $18,[illegible].

Streets and Roads (Continued)

Ill., Elgin—(Official)—City received low bid paving Douglas Ave., 4500 sq.yd. asphaltic concrete, from McCarthy Improv. Co., [illegible] Main St., Davenport, Ia., $9695; River St., 7450 sq.yd. brick, Illinois Hydraulic Stone and Constr. Co., $23,162. Noted Sept. 20.

★**Ill., Frankfort Heights**—(Official)—City let contract 20,000 sq.yd. 6-in. concrete paving to Western States Constr. Co., 782½ Brandeis Bldg., Omaha, $48,898. Noted Sept. 13.

★**Ill., Rockford**—City let contract paving portion Greenwood Ave., macadam, to F. K. Carrico, 1109 Kilburn Ave., $18,839.

★**Wis., Ashland**—City let contract paving West 9th St., bitulithic, to General Contg. Co., Plymouth Bldg., Minneapolis, $[illegible].

★**Wis., Chippewa Falls**—Bd. Pub. Wks. let contract paving portions North Main and Willow Sts. to Cast Stone Constr. Co., Eau Claire. Noted Aug. 23.

★**Ia., Des Moines**—Polk Co. let contract paving 58th St., monolithic brick, to Akin & Flutter, Des Moines, $201,132.

★**Ia., Ottumwa**—(Official)—City let contract concrete paving to J. C. Blunk, Ottumwa, $2.40 per sq.yd.

★**Minn., Duluth**—City let contract paving portions Central Pl. to A. N. Nelson, Duluth, $11,292.

★**Kan., Great Bend**—(Official)—City let contract paving Williams Ave., 20,000 sq. yd. asphaltic concrete, to Watts & Amerman, Salina, $35,000. Noted Sept. 6.

★**Kan., Independence**—City let contract paving portions 3rd St., concrete base, 1 layer brick and asphalt filler, to J. K. Shinn, Neodesha, $60,256.

★**Neb., Ashland**—City let contract paving, to Abel Constr. Co., 318 Terminal Bldg., Lincoln, $39,920.

★**Neb., Central City**—City let contract paving in Dist. No. 2, asphalt, to E. D. Tyner Constr. Co., $25,000.

★**Mont., Butte**—City let contract to R. Metcalf, Butte, paving portions Main St., creosoted wood block, $23,868. Wyoming St., $15,882. Noted Sept. 6.

★**Mont., Ronan**—City let contract macadamizing and curbing streets and installing conduits to Markus & Covell, Ronan, $17,506.

★**Tex., Dallas**—City let contract to Vitrolithic Constr. Co., Terminal Bldg., paving portions Ballard, Englewood and Bishop Aves., $1.82 per sq.yd.; Texas Bitulithic Co., Praetorian Bldg., Holmes St. and Forney Ave., $2.30 per sq.yd.; Bramley-Lanham Paving Co., Knight St., $0.98 per sq.yd.; Standard Eng. & Contg. Co., 118 Martin St., 7th St., $11,788.

★**Idaho, Wallace**—(Official)—City let contract paving in Dist. No. 7 to H. J. Kaiser, 312 Colby Bldg., Everett, Wash. About $13,000. Noted Aug. 30.

Washington—State Highway Comr., Olympia, received low bids 5-mi. Inland Empire Highway, from C. N. Pentecost, Walla Walla, $[illegible], G. L. Stubbler, Uniontown, $34,812. Noted Aug. 30.

Oregon—State Highway Comr., Salem, let contract road from Oregon City to Canby, 8 mi., to Oregon-Hassam Paving Co., Bd. Trade Bldg., Portland, $145,321.

★**California**—(Official)—State Highway Comr., Sacramento, let contract grading roads to San Diego Co. to W. M. Ledbetter, Pacific Electric Bldg., Los Angeles, $27,643; Shasta Co., Palmer & McBryde, Hooker & Lent Bldg., San Francisco, $39,541. Noted Sept. 13.

★**Cal., Richmond**—City let contract improving Standard Ave. to L. L. Page, 8th and Bissell Sts., $18,385.

★**Cal., San Bernardino**—(Official)—City let contract paving South Arrow Head Ave. to Highway Constr. Co., Highland, about 11c. per sq.ft., curbing 36c. per lin.ft. Noted Sept. 13.

★**Cal., San Jose**—(Official)—Santa Clara Co. let contract improving Berryessa Mill Rd., Dist. No. 1, Santa Clara and Alviso Rd. Dist. No. 4, to Runze Contg. Co., Mesa Hotel, San Francisco, $45,496. Noted Sept. 20.

Cal., San Jose—Santa Clara Co. received low bids improving San Aguino Rd., (a) topeka, (b) Minerets, (c) oil macadam, from Raisch Jennes Co., Anzerais Bldg., (a) $22,345; F. M. Challenger, (b) $16,865; F. R. Ritchie, Chronicle Bldg., San Francisco, (a) $17,865; Western Constr. Co., (c) $16,600; B. Ransome, Grand Ave. and Harrison St., Oakland, (a) $20,800, (c) $16,584.

Cal., South Pasadena—(Official)—City received low bids paving Fremont Ave., concrete, from J. E. Haddock, 357 North Chester St., Pasadena, $20,369; J. M. Montgomery, Alhambra, $21,816; T. I. Breitenstein, 465 Van Wyck St., Pasadena, $22,980. Noted Sept. 13.

RAILWAYS—STEAM & ELECTRIC

Proposed Work

Pennsylvania—Pennsylvania R.R. plans to enlarge classification yards and local shops, also build 20 mi. new tracks, increase car-storage facilities, etc., in Columbia. About $3,000,000. A. C. Shand, Broad St. Sta., Phila., ch. engr.

Ohio—H. L. Doherty & Co., 60 Wall St., New York City, plans building electric railway from Toledo to Ft. Wayne, Ind., via Waterville, Grand Rapids, Napoleon, Defiance and other cities.

New Mexico—G. Estes, Deming, N. M., and associates, made surveys for 450 mi. railroad from Columbus to Farmington.

Texas—Gulf & Northern Ry., recently incorporated by B. F. Bonner, 1900 Main St., R. F. Redfield, 816 Gray Ave., and G. E. Davidson, all of Houston, and others, plans 24 mi. railroad from Burkeville to Bleakwood.

California—Pacific Electric Ry., Los Angeles, plans 13-mi. extension from Redlands to Yucaipa. J. M. McMillan, Los Angeles, genl. mgr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Idaho**—Oregon-Washington R.R. & Navigation Co., Portland, let contract Pine Creek extension to Grant Smith & Co., Fernwald Bldg., Spokane, Wash., $400,000.

EXCAVATION AND DREDGING

Proposed Work

Ga., Athens — (Official) — Drainage — Beaver Dam D. D. No. 1 soon receives bids for district to drain 1600 acres. About $35,732. H. H. Hampton, comr. C. M. Straham, Athens, engr. Noted Sept. 13.

Ga., Athens—(Official)—Drainage—Clarke Co. soon lets contract building Shoal Creek D. D. No. 2 to drain 450 acres, involving 6¾-mi. ditch, floating dipper dredge. R. E. Johnson, comr. W. D. Alexander, Charlotte, N. C., engr. Noted Sept. 13.

La., Monroe — Drainage — Quachita Co. election Nov. 20 to vote on $400,000 bonds to install system to drain 94,000 acres, involving 70 mi. ditches and 3,000,000 cu.yd. excav.

Minn., Madison—Ditch—Joint Bds. Comrs. of Lake, Minnehaha and McCook Cos. plan to build immense ditch to reclaim farm land in 3 counties. About $98,000. Address Clk., Lake Co., Madison.

Minn., Marshall — (Official) — Ditches—Lyon Co. soon lets contract constructing Co. Ditch No. 37, about $20,269; No. 38, $12,390 and No. 16, $39,356. O. H. Sterk, engr.

Minn., Marshall—(Official)—Ditch—Lyon Co. made surveys building Co. Ditch No. 29, all tile. About $50,000. O. H. Sterk, engr.

Minn., St. Peter—Ditch—Nicollet Co. will build Co. Ditch No. 29 to cost $13,000. W. H. Holtz, aud.

Wash., Seattle — Drainage — Carnation Products Co., Stuart Bldg., soon receives bids for system to drain 800 acres, involving 40,000 yd. excavation and building of dyke. About $12,000. C. H. Kiehl, Central Bldg., engr.

Wash., Seattle — Drainage — King and Pierce Co. Comrs., Tacoma, plan election Oct. 20 to vote on formation proposed joint drainage district to drain 14,000 acres, partly in King and Pierce Cos.

Cal., Bakersfield—Irrigation — Kern Co. Farm Bureau appointed committee to have charge of movement for impounding flood waters of Kern River to irrigate several hundred thousand acres in Kern Valley.

Cal., El Centro—Irrigation—Dir. Imperial Irrigation Dist. directed C. K. Clarke, ch. engr., to make surveys and report on feasibility of building canal to carry 1200 sec.-ft. from main canal at point near Hanlon Heading to point near Siphon Drop on U. S. R. A. canal in California; also for canal to carry 8000 sec.-ft. from main canal near Hanlon Heading to U. S. R. A. canal near Laguna. Noted June 7.

Cal., Susanville—Irrigation—Honey Lake Valley Irrigation Dist., Lassen Co., plans system to irrigate 33,150 acres. About $43.90 per acre. L. F. Dozier, secy. W. L. Wales, engr.

BIDS DESIRED

Ill., Pittsfield—Canals—Until Oct. 5, by Comrs. Sny Island Levee D. D., building 3½-mi. canals, 30-ft. bottom, involving levee and auxiliary side ditches and 358,500 cu. yd. excav. H. Koeller, comr.

Ia., Estherville—Ditch—Until Oct. 1, by Emmet Co., building D. D. No. 108, involving 57,640 cu.yd. 6- to 30-in. tile. J. J. Klopp, aud.

Minn., Marshall—Ditch—Until Oct. 8, by Lyon Co., building Judicial Ditch No. 16, involving 56,317 ft. 5- to 30-in. tile, $38,267; No. 37, 29,156 ft. 5- to 24-in. tile, $7601; No. 38, 29,861 ft. 5- to 24-in. tile, $11,655.

Minn., St. Cloud—Ditches—Until Nov. 9, by Stearns Co., building Co. Ditches Nos. 42 and 43. N. Thomey, co. aud.

Minn., Willmar—Ditch—Until Oct. 10, by S. Nelson, aud.; Kandiyohi Co., building Co. Ditch No. 40. Noted Aug. 23.

Cal., Waterford—(Official)—Irrigation—Until Oct. 20, by Waterford Irrigation Dist., constructing drops, flumes, checks, side wastes, spills and siphons, involving placing of about 135,000 ft. B. M. of timber, 240 cu.yd. concrete 1040 sq.yd. cement plaster lining, 610 lin.ft. metal flume, 552 lin.ft. 36-in., 2330 ft. 30-in., 500 ft. 16-in. and 300 ft. 12-in. concrete pipe. J. R. Browder, secy.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Ga., Statham** — (Official) — Drainage—Barbers Creek D.D., Barrow Co., let contract 10 mi. open ditch to Thompson & Moseley, Inc., Atlanta. About $18,781. Noted Sept. 13.

★**Fla., Tallahassee** — Excavation — Bd. Comrs. Everglades D. D., Leon Co., let contract 6,000,000 cu.yd. earth and rock excav. from Miami Canal and 1,500,000 cu. yd. from South New River Canal to Bowers Southern Dredging Co., 914 Amer. Natl. Bank Bldg., Galveston, Tex.

★**La., Abbeville**—Ditches—Vermilion Co. let contract building drainage ditches involving 475,000 cu.yd. excav. to Angers & Masterpay, Kaplan.

★**Ia., Clarion**—(Official)—Drain—Wright Co. let contract building Drain No. 167 to McHose Sand and Tile Co., Boone, $44,295; No. 172 to G. F. Widman, Webster City, $14,455. Noted Sept. 13.

★**Ia., Red Oak**—(Official)—Ditch—Montgomery Co. let contract building Drainage Ditch No. 1 to O. P. Herrick, 810 Obs Bldg., Des Moines, $53,000. Noted Sept. 13.

★**Minn., Madison**—Ditches—Lacqui Parle Co. let contract Ditch No. 44 to Slater & Walden Bros., Madison, $21,000; No. 4 to Kohler Contg. Co., Frazee, open work, $0.1017 per cu.yd. C. Nelson, tile, $25,250. Noted Aug. 23.

★**Minn., Moorhead** — (Official)—Ditch—Clay Co. let contracts building Co. Ditch No. 41 as follows: excav. to King & Eichmiller, Frazee, $34,981; bridges to Jardine & Anderson, Fargo, N. D., $9189. Noted Sept. 6.

★**Minn., Olivia**—Ditch—Renville Co. let contract building judicial ditch as follows: main ditch to Northwestern Drainage Co., Grand Rapids, Wis., 91c. per cu.yd., Sect. No. 1, Lawrence Constr. Co., Grand Rapids, 101c., Sect. No. 2, Rood Constr. Co., Grand Rapids, Wis., 101c., tile work, Kircher Bros., Olivia, $149,750.

★**Minn., Worthington** — (Official)—Ditch—Nolbes Co. let contract Judicial Ditch No. 10 to J. J. Parish, Worthington. About $17,485.

★**Cal., Modesto**—Irrigation—Modesto Irrigation Dist. let contract enlarging main canal to H. E. McCaulay, $26,875. Noted Sept. 6.

★**Cal., Woodland** — Irrigation—Reclamation Dist. No. 108, Yolo and Colusa Cos., let contract concrete intake at Wilkins Slough, clearing of slough and ditching to Pacific Dredging Co., Flatiron Bldg., San Francisco. About $40,000.

INDUSTRIAL WORKS

Proposed Work

R. I., Providence—Eastern Film Co., 1100 Elmwood Ave., plans to rebuild film plant. About $60,000.

Industrial Work (Continued)

R. I., Providence—Portsmouth Constr. & Drydock Co., recently incorporated with $500,000 capital stock, plans shipbuilding plant. W. C. Cabell, 36 Cranston St., C. Moore, 221 Thames St. and Walter Curry, Chapel Pl., all of Newport, incorporators.

N. Y., Brooklyn—R. Freedman, 4185 Fulton St., had plans prepared for 1-story, 157 x 220-ft. brick garage, Tilden Ave. About $50,000. E. C. Georgi, 4185 Fulton St., archt.

N. Y., Brooklyn—Humboldt Coal & Ice Co., 169 Meserole Ave., had plans prepared by L. F. J. Weiher, archt., 271 West 125th St., New York City, for 1-story, 125 x 127-ft. brick garage, Humboldt and Scholes Sts. About $75,000.

N. Y., Brooklyn — Rosevale Realty Co. plans 4-story garage. L. Rosenberg, 189 Montague St., pres. Volckening & Holler, 82 Wall St., New York City, archts.

N. Y., S. I., Milliken—Downey Shipbuilding Corp., 120 Bway., New York City, purchased site formerly owned by Milliken Bros. and plans 120x400-ft. machine shop. About $75,000. W. Downey, pres.

N. Y., Buffalo—Keystone Warehouse Co., 541 Seneca St., had plans prepared for 5-story, rein.-conc. warehouse on Jefferson St. About $387,000.

N. J., Newark—American Can Co., 129 Bway., New York City, having plans prepared, 3-story, 100 x 300-ft. rein.-con. addition to plant on McWhorter St.

N. J., Newark—Butterworth-Judson Co., Ave. R, had plans prepared for 1-story, 67 x 225 ft. and 2-story, 45 x 234-ft. additions to plant. About $130,000.

N. J., Newark — Newark Gear Cutting Machine Co., 69 Prospect St., had plans prepared for 4-story, 45 x 50-ft. addition to plant. H. E. Eberhardt, pres.

Pa., Chester—Chester Shipbuilding Co., Market St. Wharf, acquired entire block of property at Front and 2nd Sts. and plans to extend shops and shipways.

Pa., Columbia—See "Railways."

Md., Baltimore—Maryland Metal Cross Tie Co., Munsey Bldg., plans 1-story, 200x400-ft. factory. About $100,000. T. W. Price, Woolworth Bldg., New York City, engr.

Va., Norfolk—American Chain Co., 430 Water St., subsidiary of American Chain Co., Bridgeport, Conn., plans new plant here. About $250,000.

Va., Norfolk—Linde Air Products Co., 30 East 42nd St., New York City, plans new plant here. Neff & Thompson, Seaboard Bank Bldg., Norfolk, archts.

Va., West Norfolk — Hampton Roads Shipbuilding & Drydock Co., 110 Bush St., Norfolk, acquired site here and plans new plant including shipways, machine shops, riveting works, etc. G. W. Feaga, pres.

Ga., Brunswick—See "Miscellaneous."

Fla., Dunnellon — Dunnellon Phosphate Co. plans rein.-conc. plant here. About $500,000.

Tenn., Nashville—See "Miscellaneous."

Ky., Poor Fork—United States Steel & Coke Co., 309 4th Ave., Cleveland, subsidiary of United States Steel Corp., plans to develop mines and build town here containing water supply, electric lighting and sewerage systems, sidewalks, tenements, schoolhouses and theaters. About $2,000,000.

O., Cleveland—American Auto Trimming Co., 880 East 72nd St., purchased site on Taft Ave. and plans 6- or 8-story factory.

O., Cleveland — G. H. Ritchie, Akron, plans to build automobile building at East 40th and Windsor Sts. About $75,000.

Ind., Richmond—Vulcan Spring Co., recently incorporated with $500,000 capital stock, plans to build 75x100-ft factory. T. B. Jenkins, pres.

Mich., Detroit — Air-O-Flex Automobile Corp., 570 Penobscott Bldg., recently incorporated with $2,500,000 capital stock, plans to build new plant.

Mich., Detroit — Ben Siegel, c/o Ben Siegel Co., 159 Woodward Ave., plans 10-story, 75x100-ft. garage. A. Kahn and E. Wilby, archts., Marquette Bldg., soon receives bids.

Ill., Chicago—Inter Ocean Refining Co., 171 North Green St., plans refinery and general distributing plant on 40-acre site at Joliet Rd. and West 54th St. About $325,000.

Ill., Chicago—Union Specialty Machine Co., 300 West Kinzie St., plans 8-story factory.

Ill., Mattoon—Illinois Central R.R. plans roundhouse. About $100,000. A. D. Baldwin, 135 East 11th St., Chicago, ch. engr.

Wis., Green Bay—Oneida Motor Truck Co., Green Bay, soon lets contract 125 x 475-ft. plant, office building and transformer station. About $150,000. Foeller & Schober, 123 North Washington St., archts. Noted Sept. 20.

Wis., Madison—Cruiser Motor Car Co., 611-612 Gay Bldg., incorporated with $250,000 capital stock, plans factory. W. D. Curtis, 1102 Spraight St., pres.

Wis., Milwaukee — City plans to build power house at sewage disposal plant. About $700,000. T. C. Hatton, City Hall, ch. engr. sewerage comn.

Wis., Milwaukee — Cutler-Hammer Mfg. Co., 12th St. and St. Paul Ave., plans manufacturing and engineering building. About $250,000. H. J. Esser, Camp Bldg., archt.

Ia., Waterloo—Waterloo & Cedar Falls Union Mill Co. soon receives bids 3-story, 90x120-ft. grain elevator, warehouse and storage building. About $75,000 to $100,000. R. Leavitt, 4th and Water Sts., pres. M. B. Cleveland, 1st Natl. Bank Bldg., archt.

Minn., Minneapolis — Gas Products Co., 617 Plymouth Bldg., plans new carbon manufacturing plant. About $100,000.

Neb., Omaha—Omaha St. Ry. Co., Merchants' Natl. Bank Bldg., purchased site at 25th and Cummings Sts., and plans to build car house. About $100,000. A. H. Hogland, St. Paul, Minn., ch. engr.

Mo., Kansas City—Kansas City Light & Power Co., 1500 Grand Ave., has purchased 25-acre site on Missouri River, on which it plans to build a plant; main building, 266 x 600-ft., cost, $4,000,000, final structure, including equipment, $10,000,000, contract for work will soon be awarded. Sargent & Lundy, archts., Jackson and Michigan Blvds., Chicago, prepared plans.

Tex., Houston — Tidewater Milling Co., Houston, recently incorporated with $250,000 capital stock, plans new rice mill on ship canal. About $200,000. B. N. Garrett, 1110-1112 Union Natl. Bank Bldg., interested.

Tex., Texas City—Texas Resources Development Co., Texas City, increased capital stock from $4,400,000 to $6,000,000 and plans to build large iron and steel plant. H. H. Dickson, 1503 Fannin St., and R. S. Sterling Investment Co., 1603 Carter Bldg., both of Houston, interested.

Wash., Seattle—Alaska Gastineau Gold Mining Co., Alaska, representing eastern capital, plans large steel plant with subsidiary enterprises on Puget Sound. About $25,000,000. B. L. Thane, genl. mgr.

Wash., Seattle—Erickson Shipbuilding Co., Seattle, purchased 12-acre site on Duwamish Waterway and plans shipbuilding plant.

Wash., White Salmon — Northwestern Electric Co., Pittock Blk., Portland, Ore., plans large hydroelectric plant on White Salmon River. About $400,000. B. C. Condit, Portland, ch. engr.

Ore., Portland—Comm. of Pub. Docks soon lets contract for 1,000,000-bu. grain elevator. A. Hegardt, engr.

Cal., Los Angeles—Community Mfg. Co., Merritt Bldg., recently incorporated with $3,000,000 capital stock, plans new plant at San Fernando Blvd. and Southern Pacific R.R., including machine shop, assembling factory, drop forging plant, steel foundry, warehouse and office building.

Cal., San Diego — United States Steel Shipbuilding Co., Title Insurance Bldg., Los Angeles, recently incorporated with $3,000,000 capital stock by B. F. Graham, Title Insurance Bldg., and others, plans to build marine ways and machine shops here; also expend about $50,000 in dredging.

Cal., Wilmington—Wilmington Shipbuilding Co., 621 Investment Bldg., Los Angeles, leased property in east basin here, and plans new shipbuilding plant. About $500,000.

New Foundland, Harbor Grace — New Foundland Shipbuilding Co. had plans prepared by G. F. Pawling & Co., engrs., 1418 South Penn Sq., Phila., Pa., for shipbuilding plant. About $500,000.

Ont., Hamilton — Canadian Cotton Co., 352 McNab St., N., plans new factory addition. About $60,000.

Ont., London — H. J. Haley, St. Louis, plans to build rubber goods factory here. About $100,000.

Ont., Oshawa—Richmond Mfg. Co., 183 George St., Toronto, plans new plant here. About $60,000.

Ont., Sault Ste Marie—International Paper Co. plans to build pulp paper plant here. About $250,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Holyoke**—Deane Works, subsidiary of Worthington Pump & Machinery Corp., 200 Devonshire St., Boston, let contract 2-story, 150 x 154-ft. to Casper Ranger Co., 20 Bond St., Holyoke.

★**Pa., Phila.**—Baldwin Locomotive Wks., Broad and Spring Garden Sts., let contract 1-story locomotive shop addition on 15th St. to McClintic-Marshall Co., Pottstown. About $60,000.

★**Pa., Phila.**—Hires Condensed Milk Co., 913 Arch St., let contract 1-story, 150 x 642-ft. brick, steel and rein.-con. factory to J. L. Lewis, 38 Wall St., Binghamton. About $250,000.

Pa., Phila.—Philadelphia General Hospital, 34th St., received low bid for power plant from Standard Constr. Co., Drexel Bldg., $238,600.

***Pa., Phila.** — Taylor-Wharton Iron & Steel Co., 25th and Washington Sts., let contract 1-story, 120 x 289-ft. forge shop, 52nd St. to Crowell-Lundoff-Little Co., 1951 East 57th St., Cleveland. About $75,000.

★**Va., Glenlyn**—Appalachian Power Co., Bluefield, W. Va., let contract steam driven electric generating station on New River, between Virginia and Norfolk & Western R.R., to Hancock & Son, 1st Natl. Bank Bldg., Lynchburg. About $1,000,000. Noted May 10.

★**Ky., Clinton**—Illinois Central R.R. let contract new roundhouse and shop buildings to T. S. Leake & Co., 608 South Dearborn St., Chicago. About $100,000.

★**O., Akron**—W. J. Frank, I. O. O. F. Bldg., let contract 2-story, 70 x 200-ft. garage to Carmichael Constr. Co., 526 Hamilton Bldg. About $57,000.

★**O., Columbus**—Ohio State University let contract brick and steel powerhouse to E. H. Latham. About $85,000. Noted Aug. 16.

★**Mich., Detroit**—Ford Motor Co., Miller Rd., let contract blast furnaces on River Rouge, near here, to G. A. Fuller Co., 540 Penobscot St. About $20,000,000.

★**Mich., Detroit** — Standart Bros., Ltd., West Woodbridge St., let contract 6-story, brick, steel and stone warehouse to W. E. Wood Constr. Co., 1805 Ford Bldg.

★**Ill., Chicago**—American Car & Foundry Co., 2801-49 South Kilbourn Ave., let contract 4-story, brick factory to Mueller Constr. Co., 179 West Washington St. About $50,000.

★**Wis., Milwaukee**—Globe Steel Tube Co., Burnham St., let contract 1-story, 50x480-ft. cooling room addition to J. C. Morrison, 625 49th Ave. About $50,000.

★**Wis., Milwaukee**—International Harvester Co., 606 South Michigan Ave., Chicago, let contract 2-story, 51x240-ft. core building to Dahlman Constr. Co., 312 Majestic Bldg. About $100,000.

★**Wis., Milwaukee** — Monarch Mfg. Co., Milwaukee, let contract new factory to Tullgren & Sons, 1816 Grand Ave. About $200,000.

★**N. D., Grand Forks**—Northern Packing Co., Grand Forks, let contract cooler and manufacturing plant, abattoir and power house to Splady, Allen & Smith, 1021 Plymouth Bldg., Minneapolis. About $175,000.

★**Utah, Ogden**—Globe Milling & Grain Co., Ogden, let contract grain elevator and flour mill to J. H. Waugh, Ogden. About $500,000.

★**Cal., Los Angeles**—H. L. Arnold, 401 West 7th St., let contract 2- and 3-story brick automobile building to Milwaukee Bldg. Co., 1705 Pabst Bldg., Milwaukee. About $425,000.

★**Cal., San Francisco**—Warehouse Investment Co. let contract 4-story, 137½ x 275-ft. warehouse to Lindgren & Co., Monadnock Bldg. About $175,000.

★**Ont., Hamilton**—Steel Co. of Canada, Harvey Lane, let contract coke oven plant to Wilputte Coke Oven Corp., 8 Church St., New York City. About $1,500,000 or $1,650,000.

★**Ont., Jordan Harbor**—Provincial Paper Pulp Wks. let contract new power house to Toms Constr. Co., Keen Bldg., Toronto. About $30,000.

Industrial Work (Continued)

★**Ont., London** — Battle Creek Toasted Corn Flakes Co., Ltd., Dundas St., let contract mill and factory addition to Architect & Holmes Excelsior Life Bldg., Toronto. About $75,000.

★**Ont., Walkerville**—Maxwell Motor Car Co., Woodward and Warrent Sts., Detroit, Mich., let contract new plant here to Canadian Bridge Co., Walkerville. About $140,000.

★**Sask., Saskatoon**—T. Eaton Co., Saskatoon, let contract brick and steel warehouse to Hazleton & Wains, 609 Electric Ry. Bldg., Winnipeg. About $125,000.

BUILDINGS

Proposed Work

N. H., Claremont—Hospital—G. H. Stowell Hospital plans. About $50,000. R. Clipston Sturgis, 120 Boylston St., Boston, archt.

Mass., Weymouth—Almshouse—Bd. Selectmen plan to rebuild almshouse recently destroyed by fire. About $50,000. J. W. Eldredge, supt.

Conn., Bridgeport—Lodge—Loyal Order of Moose plans to build at 651 State St. About $400,000.

N. Y., Albany—School—Bd. Educ. plans, 2-story. About $50,000. Fuller & Robinson, 95 State St., archts.

N. Y., Brooklyn—Nurses' Home—Carson C. Peck Memorial Hospital having plans prepared by Ludlow & Peabody, archts., 101 Park Ave., New York for 3-story, 60 x 100-ft., Troy Ave. and Crown St. About $50,000.

N. Y., Buffalo — Hospital — City Council plans $100,000 bond issue to complete West Farm Hospital.

N. Y., Glassboro—School—Bd. Educ. plans, 2-story. About $75,000. S. D. Beckett, 29 State St., pres. Mellett & Stewart, 30 North 3rd St., Camden, archts.

N. Y., Hague—Foxon Graphite Co., represented by J. Rodgers & Co., 25 Broad St., New York City, plans to build mining mill. About $500,000.

N. Y., New York—Home—Y. W. C. A. having plans prepared by L. E. Jallade, archt., 37 Liberty St. for home, Lenox Ave. and 124th St. About $300,000.

N. Y., New York—Theater—B. S. Moss, 7th Ave., plans on Bway. and 181st St., with seating capacity of 3000.

N. Y., Patchogue—Clubhouse—Patchogue Lodge, No. 1327 B. P. O. E., plans 3-story, 60 x 150 ft., hollow tile, Main St. and Maple Ave. About $50,000. Tooker & Marsh, 101 Park Ave., New York City, archts.

N. Y., Peekskill — School — E. Benjamin, 18 East 17th St., New York City, plans agricultural school to include about 20 buildings. E. L. Shire, 373 4th Ave., New York City, archt.

N. Y., Poughkeepsie—Hotel—H. S. Duncan & Syndicate, Hotel Continental, 1450 Bway., New York City, plans brick and stone, Main and Washington Sts.

N. Y., Rochester — Fire House — City plans. About $55,000. F. S. Pifer, City Hall, asst. to comr. and supply. J. R. Yates, 715 Granite Insurance Bldg., archt.

N. Y., Schenectady—School—Bd. Educ. plans addition to Union School, South College St. About $80,000.

N. Y., Syracuse—Business—W. A. Schuyler, City Bank Bldg., plans 1- or 4-story, fireproof, Salina St.

N. Y., Whitesboro—High School—Bd. Educ. plans to build in Dist. No. 2. About $40,000. A. P. Lansing, Sherman Bldg., Watertown, archt.

N. J., Red Bank — School — Bd. Educ. plans, Lenox Ave. and Drake Ave., 2-story, 75 x 75-ft. brick addition with 50 x 75-ft. extension. About $150,000. E. A. Arend, Shinnath Bldg., Asbury Park, archt.

Pa., Chester — Clubhouse — Knights of Columbus plan, Penn St. and 5th St. About $75,000. Thos. Leahy, 3rd bldg. com. C. W. Brazer, Crozer Bldg., archt.

Va., Danville—Dormitory—Dan River Cotton Mills, Inc., plans brick dormitory for girls. About $150,000. H. E. Sheppard, Schofield Bldg., Hearn & Carswell, Masonic Bldg., archts.

W. Va., Keystone—Administration, State Preparatory School plans. About $80,000. J. S. Lakin, 418 Capitol St., Charleston, prepares plans and supply. A. Davis, 1717 Sansom St., Phila., archt.

W. Va., Morgantown — Infirmary — Monongahela Co. plans. About $60,000. J. C. Hupp, engr. and supt. C. Jacobs Plumbing Bldg., archt.

Ky., Poor Fork—See "Industrial Works."

O., Akron—Hotel—Park Hotel Co., Akron, had plans prepared by Mills & Millspaugh, archts., 49 North High St., Columbus, 10-story, fireproof. About $350,000.

O., Canton—Infirmary—Stark Co. election soon to vote on $100,000 bond issue to purchase land and erect infirmary.

O., Cincinnati—Court House — Hamilton Co. election Nov. 6 to vote on $500,000 to build courthouse. A. Reinhart, clk.

O., Cleveland — Bank — Cleveland Trust Co. plans 1-story, 37 x 90 ft. Perry Branch Bank. About $50,000. F. H. Goff, Euclid Ave. and East 9th St., pres. G. B. Post & Sons, Schofield Bldg., archts.

O., Cleveland—Bathhouse—City plans. About $300,000. A. Bernstein, dir. pub. ser.

O., Columbus — Aviation School — Ohio State University received $80,000 from State Emergency Bd., to build army aviation school buildings, including barracks, laboratory and machine gun range.

O., Columbus—Hospital—City having plans prepared by Richards, McCarty & Bulford, archts., Hartman Bldg., on Livingston Ave. About $175,000.

O., Defiance — Hall — Defiance College plans new building to be known as Tenzer Science Hall. About $50,000.

O., Defiance—School—City voted $200,000 to build new school.

O., Lima—Office—Hoover & Bond Co., 18 Pu. Sq., recently acquired site at 28-30 Public Sq. and plan 8-story building. About $126,000.

O., Sandusky — Hospital — Good Samaritan Hospital having plans prepared by E. F. Stevens, archt., 9 Park St., Boston, 3-story. W. H. Bishop, chn. bldg. com.

O., Toledo — Exchange — Bell Telephone Co., Toledo, plans branch exchange, Erie St. and New York Ave. About $70,000. A. J. Mellen, dist. mgr.

Ind., Indianapolis — Clubhouse — Indianapolis Athletic Club plans, 8-story, Vermont and Meridian Sts. About $500,000. H. L. Bass & Co., Hume-Mansur Bldg., archts.

Ind., Logansport—Bank and Office—Citizens' Loan & Trust Co. plans, 3-story. About $150,000. M. M. Minnick, 11 Market St., pres. C. J. Horn, Stettner Bldg., archt.

Ind., Terre Haute—Clubhouse—Trustees of State Normal School plan to build. About $100,000.

Mich., Flint — Hospital — Genesee Co. plans $100,000 bond issue for tuberculosis hospital.

Ill., Chicago — Sanitarium — Sisters of Sacred Heart having plans prepared, 8-story, 156 x 190-ft., Lakeview and St. James Sts. About $800,000. Worthem & Steinbach, 6235 South Halsted St., archts.

Ill., Chicago—School and Assembly Hall—Bd. Educ. plans, 3-story, 50x80-ft. and 100x125-ft. About $700,000. P. B. Coffin, 7 South Dearborn St., bus. mgr. A. F. Hussander, 7 South Dearborn St., archt.

Ill., East St. Louis—Monsanto Chemical Co., 1800 North 2nd St., St. Louis, Mo., plans plant. About $1,000,000. J. F. Queeny, pres. Brenneke & Fay, 1204 Fullerton Bldg., St. Louis, Mo., engrs.

Ia., Boone — Home — Boone Co. election Oct. 15 to vote on $95,000 bond issue to build home. J. R. Curry, aud.

Ia., Dyersville—Hospital—Bd. Supervs. will sell $75,000 bonds to build tuberculosis hospital.

Minn., St. Paul—Church—St. Lukes Congregation plans, 1-story, 128 x 280 ft. About $100,000. J. C. Byrne, 871 Summit Ave., pastor. J. T. Comes, 1005 5th Ave., Pittsburgh, Pa., archt.

Minn., Shakopee — Reformatory — State Bd. Control plans reformatory for women. About $100,000. J. R. Nichols, Minneapolis, archt.

Kan., Wichita—Newspaper and Office—J. Elmer Reese, 3005 East Douglas Ave., plans, 10-story, on North Market St. About $700,000.

Kan., Wichita—School—Bd. Educ. plans to vote on $125,000 bond issue to build schools.

Neb., Omaha—School—City plans election to vote on $2,000,000 bonds for new schools and additions to old ones.

Mont., Butte—City Hall and Auditorium—City plans $500,000 bond issue to build. T. H. Maloney, mayor.

Mo., Fulton—Chapel—Westminster College plans. About $50,000.

Tex., Amarillo—Hotel—Bd. of City Development plans to build. About $250,000. P. A. Whaley, secy.

Tex., Bryan—High School—City election Oct. 18 to vote on $90,000 bond issue to build school. Noted Aug. 30.

Colo., Colorado Springs — Bank — First Natl. Bank plans. About $300,000 to $500,000.

Colo., Denver — Church — Washington Park Community Congregation plans, 2-story, 100 x 100-ft. About $50,000. Marion & Norton, archts., 215 Chamber of Commerce Bldg., soon receive bids.

Wash., Medical Lake—School—Custodial School plans. About $80,000. Julius Zittel, Jamieson Bldg., Spokane, archt.

Wash., Olympia — Office — State Capitol Comn. plans to build on new capitol site. About $400,000.

Wash., Spokane—Home—L. W. Hutton, Hutton Bldg., retained Whitehouse & Rice, archts., Hutton Bldg., to prepare plans for Orphans' Home near here. About $100,000 or $200,000.

Cal., Los Angeles—Terminal—Southern Pacific Co. (W. Hood, San Francisco, ch. engr.), Pacific Electric Ry., (J. McMillan, Los Angeles, genl. mgr.), and Salt Lake R.R., (H. C. Nutt, genl. mgr.), plan large joint terminal here. Under plans numerous grade crossings will be eliminated.

Cal., San Francisco—Theater—J. R. Saul, 502 Cement St., plans, rein.-con. About $85,000. W. H. Weeks, 75 Post St., archt.

Cal., Santa Barbara—Hotel—California Hotel Corp., 437 South Bway., Los Angeles, plans to build. About $600,000. D. M. Linnard, mgr. Myron Hunt, 1017 Hibernian Bldg., Los Angeles, archt.

Ont., Ottawa — Office — Blackburn Bros., Ottawa, soon let contract, 4-story, rein.-conc. About $60,000. Millson & Burgess, Union Bank Bldg., archts.

Man., Brandon — Asylum — Provincial Government rejected bids to build addition to Brandon Asylum. About $100,000.

BIDS DESIRED

N. Y., Buffalo—Library—Until Oct. 2, by Comr. Parks and Pub. Bldgs., for library, clinic rooms and public bathhouse, Amherst and Grant Sts. About $80,000. Noted June 28.

N. Y., New York — (Official) — Theater and Office—Until Oct. 15, by H. J. Knapp, archt., 116 East 16th St., for J. J. Schubert, 225 West 44th St. About $50,000. Noted Sept. 20.

N. J., Newark—Fire House—Until Oct. 2, by City, 2-story, Sanford Ave. and Palm St. About $100,000. F. Grad, Amer. Natl. Bank Bldg., archt. Noted July 26.

O., Oxford—Chemistry—Until Oct. 20, by Bd. Trustees, Miami University. F. L. Packard, 16 East Broad St., Columbus, archt.

Kan., Wichita—Church—Until Oct. 17, by O. A. Noyle, secy. bd. trustees, 125 North Rock Island Ave., 1-story, 100 x 130 ft. brick. About $85,000. J. Gaisford, Goodwyn Inst. Bldg., Memphis, Tenn., archt.

Neb., Clay Center—Court House—Until Oct. 2, by E. Frisch, co. clk. About $100,000. W. F. Gernandt, State Bank Bldg., Omaha, archt. Noted June 7.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—Hospital—City let contract 2-story, brick addition to City Hospital, to John Bowen Co., 184 Dudley St., Roxbury. About $75,000. Noted Sept. 6.

★**Mass., Springfield**—School — Bd. Educ. let contract, 2-story, 78 x 171-ft., brick, to L. S. Wood, 14 Stockbridge St. About $150,000. Noted Sept. 20.

★**Conn., Hartford**—Office — Travelers Insurance Co., 700 Main St., let contract to Marc Elditz & Son, 30 East 42nd St., New York City. About $1,000,000.

★**Conn., New Haven**—Station—New York, New Haven & Hartford R.R. let contract, 4-story, to Thompson Starrett Co., 51 Wall St., New York City, $800,000. Noted Sept. 6.

N. Y., New York—(Official)—School—Bd. Educ. received low bids addition and alterations to P. S. No. 45, East 189th St., Bronx Boro., from Dennis E. Conners, 64 West 88th St., $81,650.

Buildings (Continued)

★**N. Y., New York** — Theaters — Selwyn Co., 1451 Bway., let contract 3 theaters on sites at 215 to 223 and 229 to 231 West 42nd St. to Solomon Bloom, 1476 Bway.

★**N. Y., Poughkeepsie**—School—Bd. Educ. let contract, 2-story, 140 x 160-ft. brick, to be known as Warring School, Smith St., to C. Van Aken, 191 Elmendorf St., Kingston, about $50,000. Noted June 28.

★**N. J., Morristown**—Hospital—Memorial Hospital let contract to Sturgis Bros., Trust Co. Bldg., and Reeve & Burr, Morris St. About $65,000. Noted Aug. 2.

★**Pa., Abington**—High School—Bd. Educ. let contract 2-story, 55 x 92-ft. addition to Harry Murphy, Abington. About $50,000. Noted Sept. 13.

★**Pa., Phila.**—School—Bd. Educ. let contract addition to school on 55th St., to Warren-Moore & Co., Colonial Trust Bldg. About $115,400.

★**Pa., Phila.** — Show Room — Overland Motor Co., 323 North Broad St., let contract 2-story, 33 x 115-ft., to Cramp & Co., 4 North 11th St. About $55,000.

★**Miss., Columbia**—Training School—Bd. Trustees of Mississippi Industrial Training School let contract 2 brick dormitories, administration building and superintendent's home, to Dabbs & Wetmore, 2220 2nd St., Meridian. About $55,000.

★**O., Akron** — Bank — Central Savings & Trust Co. let contract, remodeling, to Carmichael Constr. Co., 526 Hamilton Bldg. About $80,000.

★**O., Harrod**—School—Bd. Educ. let contract, brick, to L. G. Foltz & Sons, 621 Farwood Ave., Columbus. About $50,000.

★**Ia., Iowa City**—Hospital — State Bd. Educ. let contract to Theo. Stark & Co., Cedar Rapids. About $150,000. Noted Aug. 23.

★**Ia., Letts**—School—Bd. Educ. let contract 2-story, 70 x 120-ft. brick, to Max Midlestein, Cedar Rapids. About $52,400. Noted Sept. 6.

★**Minn., Grand Rapids**—Hospital—Itaska Co. let contract, 2-story, 36x121-ft., to Evenson-Utterberg Constr. Co., 741 Plymouth Bldg., Minneapolis. About $60,000.

★**Minn., Tower**—High School—Bd. Educ. let contract to Hugh Fawcett, Hunters Park, Duluth. About $61,999.

★**Kan., Concordia** — High and Grade School—Bd. Educ. let contract, 2-story, brick and rein.-con. to Rand Bros., Concordia. About $60,000. Noted Sept. 6.

★**Neb., Omaha** — Hotel — Commercial Realty Co., c/o. H. A. Wolf, 514 Ware Blk., let contract 10-story, 66x132-ft., rein.-con. and brick, on 16th and Harney Sts., to Selden-Breck Constr. Co., 537 Keeline Bldg. About $400,000.

★**Mont., Butte**—Y. M. C. A. let contract 6-story, 98x125-ft., rein.-con. and brick building to Nelson & Pederson, 309 Electric Power Bldg. About $181,453.

★**Mo., Kansas City**—Office—McPike Drug Co., 7th and Central Sts., let contract 5-story, 50 x 86-ft., brick, on 7th St., to Latimer & Benning, 612 Mass Bldg. About $50,000.

★**Tex., San Antonio**—Asylum—Bd Mgrs. Southwestern Insane Asylum let contract 2-story, 116 x 231 ft. dining-room, 2-story, 39 x 94-ft. dormitory and 2-story, 54 x 94-ft. stable to Weston & Kroeger, West Crockett and Navarro Sts. About $145,000.

★**Wash., Spokane**—Store—Crescent Co., Spokane, let contract to Porter Bros., Old Natl. Bank Bldg. About $1,000,000.

FEDERAL GOVERNMENT WORK

Proposed Work

N. Y., Long Island City—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., rejected bids opened Sept. 12. Noted Sept. 20.

Wash., D. C.—Warehouse—U. S. Government will build large warehouse on site of old Southern Ry. freight yards, Maryland Ave. between 12th and 14th Sts.

BIDS DESIRED

R. I., Newport—Dispensary—Until Oct. 1, by Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., building at Naval Sta.

Pa., Ft. Mifflin—Mine Storage Building—Until Oct. 8, by Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash.

Pa., Phila.—Foundry, etc.—Until Oct. 15, by Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., building foundry, machine and electrical shop at Navy Yard.

Wash., D. C.—Steel Towers—Until Oct. 8, by Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., furnishing 2 200-ft. steel towers, at Naval Sta., West Indies.

Va., Farmville — Post Office — Until Oct. 30, by J. A. Wetmore, superv. archt., treas. dept., Wash.

Fla., Pensacola—Concrete Road and Culvert—Until Oct. 1, by Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., at Naval Sta.

Fla., Pensacola—Seaplane Pier — Until Oct. 8, by Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., at Naval Sta.

La., New Orleans — Electric Traveling Crane—Until Oct. 1, by Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., furnishing for machine shop.

La., New Orleans—Levee Work—Until Oct. 4 by U. S. Engr. Office, Queen and Crescent Bldg., New Orleans, building 4,343,000 cu.yd. earthwork, Lower Tensas, Atchafalaya, Lafourche, Barataria, Pontchartrain and Lake Borgne Dists., advertised in this issue.

O., Kenton—Post Office—Until Nov. 1, by J. A. Wetmore, superv. archt., treas. dept., Wash.

Colo., Denver — Excavators — Until Oct. 15, by U. S. Rec. Ser., Denver, furnishing dragline excavators. F. E. Weymouth, ch. of constr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**R. I., Newport**—Crane—Bureau Yards and Docks, Navy Dept., Wash., let contract furnishing 20-ton crane at power plant to Manning & Moore, 119 West 140th St., New York City, $18,950.

Conn., New London—Ordnance Storage Buildings, etc.—Bureau Yards and Docks, Navy Dept., Wash., received low bids, 5 ordnance storage buildings and 1 machine shop, at U. S. Submarine Base, (a) work complete, (b) net price 3 buildings, (c) net price machine shop complete from R. H. Arnold, Woodward Bldg., Wash., D. C., (a) $91,730, (b) $42,416, (c) $21,758; Austin Co., Union Ave., Bridgeport, (a) $106,910, (b) $52,350, (c) $24,946; Snare & Triest, Woolworth Bldg., New York City, (a) $107,660, (b) $49,800, (c) $32,800.

★**Conn., New London**—Power Plant Equipment—Bureau Yards and Docks, Navy Dept., Wash., let contract turbo-generators to General Electric Co., River Rd., Schenectady, N. Y., $94,800; boilers to Babcock & Wilcox Co., North Amer. Bldg., Phila., $69,511; pumps and fans to E. J. Smith, 30 Church St., New York City, $51,925; feed-water heaters to Natl. Pipe Bending Co., 110 River St., New Haven, $2400; condensing equipment and service heaters to Alberger Pump and Condenser Co., 140 Cedar St., New York City, $48,835; traveling cranes, screens and Monorail hoist to Carroll Electric Co., 714 12th St., Wash., D. C., $47,825. Noted Sept. 20.

★**N. Y., Bay Shore**—Timber Seaplane Hangar—Bureau Yards and Docks, Navy Dept., Wash., let contract, Naval Air Sta., to T. B. Thomas, 1st Natl. Bank Bldg., $13,287.

★**N. Y., Brooklyn**—Warehouse—Bureau of Yards and Docks, Navy Dept., Wash., let contract to Degnon Contg. Co., 68 Hunterspoint Ave., Long Island City. About $240,000.

★**Pa., Phila.**—Coal Handling Plant—Bureau Yards and Docks, Navy Dept., Wash., let contract to Gerrard-Conners Constr. Co., 140 Cedar St., New York City, $115,818.

Pa., Phila. — Dredging — Bureau Yards and Docks, Navy Dept., Wash., received low bids dredging at Navy Yard, from H. T. Taylor Co., Inc., 1515 Fidelity Bldg., Baltimore, 45c. per cu.yd.; Asso. Dredging Co., Marine & Merchant Bldg., Phila., 47½c.

Va., Cape Henry—Building—Navy, Agriculture, Wash., received low bids, 3-story brick building for Weather Bureau, from R. E. Johnson, Virginia Beach, $18,998, time, 120 days; De Rito Bros., Weehawken, N. J., $18,988, 150 days; J. [illegible], Mercer Ave., Petersburg, Va., [illegible], 160 days. Noted Aug. 23.

★**Va., Norfolk** — Coal-Handling Plant — Bureau Yards and Docks, Navy Dept., Wash., let contract to R. H. Beaumont, Drexel Bldg., Phila., $84,260.

★**Va., Norfolk** — Distributing System — Bureau Yards and Docks, Navy Dept., Wash., let contract outside tunnel and tunnel piping, also outside piping system to Carroll Electric Co., 714 12th St., Wash., D. C., $172,000 and $92,700 respectively; outside electrical conduit system and piping system for structural shop to H. C. Crook & Co., 2 Light St., Baltimore, $44,734 and $54,000 respectively. Noted Sept. 20.

MISCELLANEOUS

Proposed Work

Parks—Batavia, N. Y.—See "Sewers."

Elevated Railway — Brooklyn, N. Y. — Pub. Ser. Comn., 120 Bway., New York City, rejected bids building Route 49, Sect. 3, Culver Rapid Transit R.R., from point near Ave. X to Sheepshead Bay. Noted July 19.

Sea Wall—Atlantic City, N. J. — City plans to issue $350,000 bonds to build rein.-con. seawall near Longport, concrete piling base, about 1½ mi. long.

Elimination of Grade Crossings—Bellemead, N. J.—See "Bridges."

Parks—Lansford, Pa.—See "Sewers."

Sea Wall and Water Front Improvements—St. Augustine, Fla.—See "Bridges."

Garbage Incinerator—St. Clair Heights, Mich.—(Detroit P. O.)—See "Sewers."

Fire Alarm System — Austin, Tex. — See "Sewers."

Elimination of Grade Crossings—Los Angeles, Cal.—See "Buildings."

Marine Ways—San Diego, Cal.—See "Industrial Works."

BIDS DESIRED

Pier—New York, N. Y.—(Official)—Until Oct. 23, by W. W. Wotherspoon, supt. pub. wks., Capitol, Albany, building pier foot West 53rd St., Terminal Contract No. 38; advertised in this issue.

Station Finish—New York, N. Y.—Until Oct. 1, by Pub. Ser. Comn., 120 Bway., completion of construction and station finish of Brooklyn and Manhattan loop and 4th Ave. subway parts of Bway.-4th Ave. Rapid Transit R.R., Boros. of Brooklyn and Manhattan.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Wharf—Onset, Mass.**—Town of Wareham let contract public wharf here to Frank Taylor, 190 Kempton St., New Bedford, $10,000.

★**Dam—New Haven, Conn.**—Park Bd. let contract at Mill River Park, to C. W. Blakeslee, 58 Waverly St., $68,000.

★**Duct Line—Brooklyn, N. Y.**—Pub. Ser. Com., 120 Bway., New York City, let contract duct line for part of Eastern Parkway Rapid Transit R.R. to W. G. Cooper Inc., 50 Bway., New York City, $38,697. Noted Sept. 13.

Subway—Buffalo, N. Y.—City received low bid subway under tracks Pennsylvania R.R. from Peckham Constr. Co., Mutual Life Bldg., $47,000.

★**Riveting Tower—Phila., Pa.**—Baldwin Locomotive Works, 15th and Spring Garden Sts., let contract 44 x 74 ft. to McClintic-Marshall Co., Morris Bldg., $60,000.

★**Tunnel—Columbus, O.**—Ohio State University let contract to M. P. Sweets Co., Columbus. About $115,000. Noted Aug. 16.

★**Dam and Retaining Walls—Marshalltown, Ia.**—City let contract, rein.-con., over channel south of river at Center St., to P. Peterson & Co., Marshalltown. About $18,500. Noted Aug. 30.

★**Dam—San Diego, Cal.**—City let contract over-pass rein.-con. dam, Lower Otay site, to Wooster Contg. Co., Spreckels Bldg., $470,135. Noted Sept. 20.

★**Pier—San Francisco, Cal.**—State Board Harbor Comrs. let contract at [illegible] to Healy-Tibbitts Constr. Co., 9 Main St., $418,970. Noted Sept. 13.

★**Dam—Bedford, Que.** — Bedford Light Co., Ltd., [illegible] to South Africa [illegible] River in Bay Isle. About $[illegible]. C. O. [illegible], engr.

SEARCHLIGHT SECTION

Contracts To Be Let

PROPOSALS

Bids received until October 2, 1917.

Canal Improvements

STATE OF NEW YORK, OFFICE OF SUPERINTENDENT OF PUBLIC WORKS

Albany, N. Y., August 29th, 1917.

Sealed proposals will be received by the undersigned at his office in the Capitol at Albany, N. Y., until twelve o'clock noon of Tuesday, October 2nd, 1917, at which place and hour they will be publicly opened and read, for improving the New York State canals pursuant to the provisions of Chapter 147 of the Laws of 1903, and of the acts amendatory thereof and supplementary thereto, and Chapter 570 of the Laws of 1915, as follows:

CONTRACT NO. 167.

Oswego Canal—Section 1.

For constructing a bascule bridge below Lock No. 1 at Culvert street, Phoenix.

Sheets 1 to 8 inclusive.

Plans may be seen and detailed specifications, engineer's estimate of quantities, proposal blanks, form of contract and bonds required and other information for proposers may be had at the office of the Superintendent of Public Works at Albany, N. Y.; at the office of the Assistant Superintendent of Public Works for the Middle Division at Syracuse, N. Y.; at the office of the Assistant Superintendent of Public Works for the Western Division at Rochester, N. Y., and at the canal office, Spaulding's Exchange, Buffalo, N. Y.

Copies of detailed plans or drawings may be obtained from the State Engineer and Surveyor at Albany, N. Y., upon payment to him of the cost of producing them.

Monthly estimates will be paid of ninety per centum (90 per cent.) of the work done at the contract price. Every proposal for said work must be accompanied by a money deposit in the form of a draft or certified check upon some good banking institution in the city of Albany or New York, issued by a national or state bank in good credit within the state and payable at sight to the Superintendent of Public Works for five per centum (5 per cent.) of the amount of the proposal.

The person whose proposal shall be accepted will be required to execute a contract and furnish bonds within ten days from the date of notice of award delivered to him or them in person or mailed to the address given in the proposal.

Upon execution of the contract and approval of bonds the certified check or draft will be returned to the proposer unless the same shall have been presented for collection prior to such time, in which case the amount of the deposit will be refunded by the Superintendent of Public Works.

The deposits of bidders other than the one to whom the award of contract shall be made will be returned immediately after the award has been made.

The bond required for the faithful performance of each contract shall be in such sum as shall be fixed by the Superintendent of Public Works, which sum shall not be less than twenty per centum (20 per cent.) of the estimated cost of the work according to the contract price, and an additional bond, known as the labor bond, in the sum of ten per centum (10 per cent.) of the amount of the estimated cost of the work according to the contract price, will be required as security that the contractor will pay in full at least once in each month all laborers employed by him upon the work specified to be done in the contract.

In the event that more than one surety company is offered as surety on said bonds, co-insurance only will be accepted.

Each proposal must be addressed to the Superintendent of Public Works, Albany, N. Y., and must be endorsed on the envelope with the name of the construction for which the proposal is made.

Award, if made, will be made to the person or persons whose proposal shall be lowest in cost to the state for doing the work and which shall comply with all provisions required to render it formal. Before any award shall be made the lowest bidder will be required to satisfy the Superintendent of Public Works of his ability to provide suitable equipment and materials for the proper performance of the work.

The right is reserved to reject all proposals and readvertise and award the contract in the regular manner if, in the judgment of the undersigned the interests of the State will be enhanced thereby.

W. W. WOTHERSPOON,
Superintendent of Public Works.

PROPOSALS

Official Proposals

Price, $3.60 an inch—Copy can be received until Wednesday, 10 a.m., for issue mailed the next day.

Bids received until October 2, 1917.

Three Span Slab Concrete Bridge

COUNTY CONTROLLER'S OFFICE

Reading, Pa., Sept. 12, 1917.

Sealed proposals will be received at this office up to 10 o'clock a.m. Tuesday, October 2nd, 1917, for the erection of a three span slab concrete bridge over the Saucony Creek at the Borough of Kutztown, Berks County, Pa. Plans and specifications can be had at the County Commissioners' office at Reading, Pa., for which a deposit of five dollars must be made, which will be refunded when the same are returned.

All bids must be accompanied with a certified check equal to 10% of the aggregate amount of the bid. The right is reserved to reject any or all bids.

CYRUS J. RHODE, County Controller.

PROPOSALS FOR SEAWALLS—U. S. Engr. Office, Boston, Mass.—Sealed proposals for construction of seawalls at Fort Warren, Boston Harbor, Mass., will be received here until 12 M., October 4, 1917, and then opened. Further information on application.

PROPOSAL FOR CONSTRUCTION OF WHARF EXTENSION—Office of U. S. Engineer, Newport, R. I.—Sealed proposals will be received here until 12 o'clock noon, October 6, 1917, and then opened, for construction of pile and timber extension to wharf at Fort Greble, R. I. Further information on application.

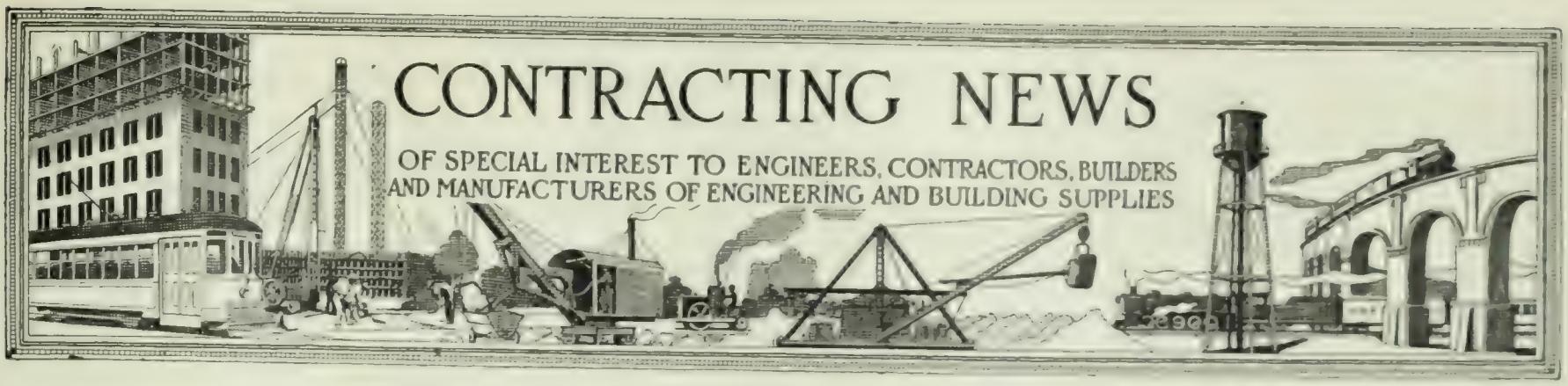
PROPOSALS

Bids received until October 9, 1917.

Pavement Reconstruction

Harrisburg, Penn.

Pennsylvania State Highway Department, Harrisburg, Penn.—Sealed proposals will be received at said office until 10 a.m., Oct. 9, 1917, when bids will be publicly opened and scheduled and contracts awarded as soon thereafter as possible for the reconstruction of 9878 linear feet of Vitrifield Block Pavement, 16 ft. wide, situated in East Taylor Township, Cambria County, and 11,070 linear feet of Vitrified Block Pavement, 16 feet wide, situated in Jackson and East Taylor Townships, Cambria County, both on State Highway Route No. 52; 5900 linear feet of Reinforced Concrete and Vitrified Block Pavement, 16 feet wide, situated in East Bethlehem Township, Washington County, State-Aid Application No. 738, 19,318 linear feet of Vitrified Block and Reinforced-Concrete Pavement, 16 feet wide, situated in Cecil and North Strabane Townships, Washington County, on State Highway Route No. 108, and 16,852 linear feet of Vitrified Block and Reinforced-Concrete Pavement, 16 feet wide, situated in South Fayette Township, Allegheny County, on State Highway Route No. 108; 11,857 linear feet of Reinforced-Concrete Pavement 16 feet to 20½ feet wide, situated in Hanover Township, Lehigh County, on State Highway Route No. 159; 5800 linear feet of Vitrified Block Pavement, 16 feet wide, situated in Clinton Township, Butler County, State-Aid Application No. 417; 6537 linear feet of Reinforced-Concrete Pavement, 16 feet wide, situated in Abington, Upper Moreland and Upper Dublin Townships, Montgomery County, State-Aid Application No. 648; 7857 linear feet of Vitrified Block Pavement, 16 feet wide, situated in Cornplanter Township, Venango County, State-Aid Application No. 681; 6562 linear feet of Reinforced-Concrete Pavement, 16 feet wide, situated in Moosic and Old Forge Boroughs, Lackawanna County, State-Aid Application No. 487 and No. 442, and 2540 linear feet of Vitrified Block Pavement, 16 feet wide, situated in East Huntingdon Township, Westmoreland County, State-Aid Application No. 324. Sealed prosopals also will be received until 10 a.m., Oct. 16, 1917, when bids will be opened and scheduled and contracts awarded as soon thereafter as possible for the reconstruction of 13,007 linear feet of Vitrified Block Pavement, 16 feet wide, situated in Manor Township, Armstrong County, State-Aid Application No. 397; 6675 linear feet of Vitrified Block Pavement, 16 feet wide, situated in Somerset Township, Somerset County, State-Aid Application No. 739; 2454 linear feet of Vitrified Block Pavement, 16 feet and 20 feet wide, situated in Bellefonte Borough, Centre County, State-Aid Application No. 456, and 18,083 linear feet of Vitrified Block Pavement, 16 feet wide, situated in Morgan and Franklin Townships, Greene County, on State Highway Route No. 268. Plans and specifications may be seen at office of State Highway Department, Harrisburg, 1001 Chestnut Street, Philadelphia, and 904 Hartje Building, Pittsburgh, Pa. Full particulars and information on application to J. Denny O'Neil, State Highway Commissioner.



Price advances are indicated by **heavy type**; declines by *italics*.

PIG IRON

Below are the present quotations with a comparison of a month and a year ago.

	Oct. 1, 1917	One Month Ago	One Year Ago
CINCINNATI			
No. 2 Southern foundry	....	$49.90	$17.40
No. 2 Northern foundry	....	56.26	20.26
NEW YORK			
No. 2X Northern foundry	....	52.50	19.50
No. 2 plain Northern foundry	....	52.00	19.25
No. 2 Southern foundry†	....	52.25	19.50
BIRMINGHAM			
No. 2 Southern foundry	....	47.00	14.50
CHICAGO			
No. 2 Northern foundry	*$33.00*	55.00	18.50
PITTSBURGH			
Bessemer iron*	*36.30*	52.95	22.95
Basic iron*	*33.00*	50.95	19.95

*These prices include the freight charge from the valley to the Pittsburgh district. †Delivered Tidewater New York

Note—On Sept. 24 the President approved the new schedule of steel prices, that of pig iron being set at $33. Cincinnati, New York and Birmingham are not quoting prices until the differentials have been determined by the Government.

RAILWAY SUPPLIES

STEEL RAILS—The following quotations are per 100 lb. f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh		Chicago	
	Oct. 1, 1917	One Year Ago	Oct. 1, 1917	One Year Ago
Standard bessemer rails	$38.00 to 60.00	$33.00	$38.00	$33.00
Standard openhearth rails	40.00 to 60.00	35.00	40.00	35.00
Light rails 8 to 10 lb.		50.00	95.00	43.00
Light rails, 12 to 14 lb.		49.00	95.00	42.00
Light rails, 25 to 45 lb.	75.00	47.00	95.00	40.00
Rerolled rails	75.00 to 80.00	....	....	

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh	Chicago	St. Louis	San Francisco	Dallas
Standard railroad spikes	$2.65	$3.00	$3.75	$4.25	$3.75
Track bolts	3.25	6.25	Premium	8.80	Premium
Standard section angle bars	2.00	4.50	Premium	4.65	Premium

	New York	Chicago	St. Louis
Standard railroad spikes	$7.00 to 8.00	$7.00	$7.75
Track bolts	7.00 to 8.00	6.25	Premium
Standard section angle bars	3.75 to 4.00	4.50	Premium

RAILWAY TIES—For fair-sized orders, the following prices per tie hold:

	Material	7 In. x 9 in. by 8 Ft. 6 In.	6 In. x 8 in. by 8 Ft.
New York	Yellow Pine	$1.32	$1.06 to 1.11
St. Louis	No. 1 White Oak	1.00	.75
Chicago	White Oak	.97	.82
San Francisco	Green	.97	.77
San Francisco	Creosoted	1.85	1.37

PIPE

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh, basing card in effect July 2, 1917, for iron and May 1 for steel:

BUTT WELD

Steel Inches	Black	Galvanized	Iron Inches	Black	Galvanized
¾ to 3	49%	35½%	⅜ to 1½	33%	17%

LAP WELD

2	42%	29½%	2	26	12
2½ to 6	45%	31½%	2½ to 4	28	14
7 to 12	42%	28½%	4½ to 6	28	14
13 and 14	32½		7 to 12	25%	12
15	30%				

BUTT WELD, EXTRA STRONG PLAIN ENDS

¾ to 1½	47%	34½%	⅜ to 1½	33	18%
2 to 3	48%	35%			

LAP WELD, EXTRA STRONG PLAIN ENDS

2	40	28½	2	27	14
2½ to 4	43	31½	2½ to 4	29%	17
4½ to 6	42	30	4½ to 6	28%	16%
7 to 8	38%	24½	7 to 8	20	8
9 to 12	33%	19½	9 to 12	15	3

From warehouses at the places named the following discounts hold for steel pipe:

Black	New York	Chicago	St. Louis
¾ to 3 in. butt welded	38	42.5%	34 27%
3½ to 6 in. lap welded	18%	38.8%	31 27%
7 to 12 in. lap welded	10%	35.8%	31 27%

Galvanized	New York	Chicago	St. Louis
¾ to 3 in. butt welded	22	27.5	19 27%
3½ to 6 in. lap welded	List to 20%	24.8%	14 27%
7 to 12 in. lap welded	List	20.8%	6 27%

Malleable fittings Class B and C from New York stock sell at 5 and 5% from list prices. Cast iron threaded 35%, 34 and 5%.

CAST-IRON PIPE—The following are prices per net ton for carload lots:

	New York Oct. 1, 1917	New York 1 Mo. Ago	New York One Yr. Ago	Birmingham	Chicago	St. Louis	San Francisco	Dallas
4 in.	$68.50	$68.50	$34.50	$63.00	$68.50	$63.00	$76.00	$72.00
6 in. and over	65.50	65.50	31.50	60.00	65.50	60.50	73.00	69.00

Gas pipe and 16-ft. lengths are $1 per ton extra.

CLAY DRAIN TILE—The following prices are per 1000 lin.ft.:

Size, In.	New York Oct. 1, 1917	New York One Year Ago	St. Louis	Chicago	San Francisco	Dallas
3	$35.00	$23.00	$18.40	$15.00	$26.25	$21.55
4	51.00	32.45	20.70	18.00	34.75	30.60
5	65.00	45.00	28.75	23.00	48.75	
6	90.00	56.55	40.25	27.00	67.50	50.02
8	130.00	95.80	74.75	55.00	....	90.09

SEWER PIPE—The following prices are in cents per foot for carload lots:

Size, In.	New York Oct. 1, 1917	New York One Year Ago	St. Louis	Chicago	San Francisco	Dallas
3	$0.093	$0.078		$0.09	$0.075	$0.1081
4	.093	.078		.10	.10	.1032
5	.1395	.117		.15	.125	.1548
6	.1395	.117	$0.12	.15	.15	.1548
8	.217	.182	.165	.21	.225	.215
10	.3255	.273	.23	.315	.30	.301
12	.4185	.351	.33	.405	.40	.387
15	.558	.468	.50	.54	....	.559
18	.775	.650	.75	.75	.75	.741
20	.93	.780	.90	.90	.862	.86
22	1.24	1.04	1.13	1.20		1.118
24	1.395	1.17	1.28	1.35	1.375	1.3
27	2.08	1.755	1.30		....	1.55
30	2.304	1.944	1.70		....	1.86
33	3.06	2.61	2.25		....	2.05
36	3.485	2.972	2.50		....	3.44

	Boston	St Paul	Kansas City	Denver	Los Angeles	Seattle
3	*$0.099*	$0.084	$0.10	$0.07	$0.06	$0.075
5	.1485	.126	.135	.12	.10	.132
8	.231	.175	.18	.19	.18	.21
12	.3465	.315	.36	.31	.32	.375
24	1.485	1.35	1.35	1.14	1.125	
36	3.69	2.84	3.15	2.10		

ROAD AND PAVING MATERIALS

ROAD OILS—Following are prices in tank cars 8000 gal minimum f.o.b. places named:

	Oct. 1, 1917 Gallon	One Month Ago Gallon
New York, 40-50% asphalt	....c.*	....c.
New York, 60-70% asphalt	....c.*	....c.
New York, dust layer	....c.*	....c.
New York, binder	....c.*	....c.
St. Louis, 40-50% asphalt	6c.	5c.
Chicago, 15-20% asphalt	6½c.	6½c.
Chicago, dust layer	8½c.	8½c.
Chicago, binder	11½c.	11½c.
Dallas, 40-50% asphalt	7c.	6c.
Dallas, 60-70% asphalt	8c.	7c.
Dallas, 75-90% asphalt	9c.	8c.
San Francisco, 75-95% asphalt	$1.90 (42 gal.)	$1.90 (42 gal.)

*Road oils continue to be extremely [illegible] at New York.

ASPHALTUM—Price per ton in carload and bulk in carload lots:

	Bland	Package	Bulk
New York	Texas	$20.00	
Chicago	Mexican	20.00	16.00
St. Louis	Mexican	20.00	18.50
St. Louis	Standard	21.00	17.00
San Francisco	California	16.50	14.50
Dallas	Texas and Mexican		25.00
Seattle		18.00	
Denver	California	14.00	
Denver	Texas	14.00	
Kansas City	Trinidad	19.00	

PAVING STONE—

		Oct. 1, 1917
New York	Manhattan	$2.10
	Other boroughs	2.00
Boston	Granite	2.00
Chicago	Small [illegible]	1.80
	Large [illegible]	1.90
St. Paul		1.75
Seattle	Granite	2.00
Kansas City	Granite	2.00

FLAGGING—

		Oct. 1 1917
New York	Bronx	$0.17 sq. ft.
	Manhattan	.18 sq. ft.
	Queens, 5 ft. square	.19 sq. ft.
	5x20 ft. cross walk	.30 sq. ft.
Chicago	18 in. wide	.75 lin. ft.

WOOD BLOCK PAVING—

	Size of Block	Treatment	Per Sq. Yd.
New York	3½	16	$2.00
	4	16	2.25
	4	16	1.85
Chicago	City specifications		1.70
St. Louis	3½	16	1.80
Seattle	4	16	1.50
Kansas City	4	16	2.50
St. Paul	Minneapolis specifications		2.00

CURBING—Prices per linear foot are as follows:

New York	5 x 16	$0.45
	5 x 20	.50
Chicago	6 x 18	.60
St. Louis	6x18 square edge	.72
San Francisco	5 x 16	.75
	5 x 20	.85

CONSTRUCTION MATERIALS

SAND AND GRAVEL—Price for cargo or carload lots is as follows, per cu.yd.:

		Gravel				Sand	
		1½ In.		¾ In.			
	Paving	Oct. 1 1917	One Yr. Ago	Oct. 1. 1917	One Yr. Ago	Oct. 1 1917	One Yr. Ago
New York		$1.25*	$1.00	$1.35*	$1.10	$0.50	$0.50
Chicago		1.40	.90	1.40	.90	1.40	.85
St. Louis		1.08	.70	1.08	.70	1.08	.60
Dallas		1.50	....	1.50	....	1.35	....
San Francisco		1.00	1.25	1.00	1.25	1.00	1.20
San Francisco	....	1.00	1.00	1.00	1.00	1.00	1.00
Seattle	....	.55	....	.55	....	.55	....
Boston	....	1.50	....	1.60	....	.80	....
St. Paul		1.10		1.40		.50	
Kansas City		2.00		2.25		.60	
Denver	....	1.40	....	1.40	....	.95	....
Los Angeles	....	.85	....	.85	....	.35	....

*Nominal.

Fine White Sand—St. Louis

Pacific.....$5.00 per ton Ottawa.....$7.00 per ton

CRUSHED STONE—Price for cargo or carload lots is as follows, per cu.yd.:

	1½ In.		¾ In.	
	Oct. 1. 1917	One Year Ago	Oct. 1. 1917	One Year Ago
New York	$1.15	$0.90	$1.25	$1.00
Chicago	1.40	.90	1.40	.90
St. Louis	1.35	1.00	1.35	1.00
Dallas	1.11		1.49	
San Francisco	1.00	1.25	1.00	1.25
Boston	1.40	....	1.40	....
St. Paul	1.00	....	1.10	....
Kansas City	1.60	....	1.70	....
Seattle	1.40	....	1.40	....
Los Angeles	.95		1.00	....
	1.10	....	1.10	....

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 300-Lb Barrel	
	Finished	Common	Finished	Common
New York	$16.50		$2.10	....
Chicago	13.00	12.00	1.90	....
St. Louis	12.00	....	....	10.75
Dallas	20.00	15.00	....	....
San Francisco	18.00		1.65	....

ROSENDALE NATURAL CEMENT—Price to dealers for 500 bbl. or over, f.o.b., including bags:

New York $1.15

Not quoted for Sale.

PORTLAND CEMENT—These prices are for barrels in carload lots, including bags:

	Oct. 1, 1917	One Month Ago	One Year Ago
New York	$ ..	$2.22	$1.72
Kansas City	2.15	2.15	1.60
Boston	2.27	2.27	1.92
Chicago	2.21	2.21	1.86
Cleveland	2.31	2.31	1.81
Cincinnati	2.44	2.44	1.94
Detroit	2.40	2.40	1.95
Indianapolis	2.38	2.38	1.99
Pittsburgh	2.40	2.40	1.99
Milwaukee	2.33	2.33	1.98
Minneapolis	2.48	2.48	2.13
Omaha	2.51	2.51	2.06
Peoria	2.33	2.33	1.98
Cedar Rapids	2.48	2.48	2.09
Davenport	2.40	2.40	2.04
St. Louis	2.45	2.45	1.85
Dayton	2.30	2.30	
San Francisco	2.30	2.30	2.30
Dallas	2.40	2.15	
Los Angeles	2.30	2.30	
Seattle		2.54	
Kansas City	2.44		
St. Paul	2.38	2.48	
Seattle	....	....	

TRIANGLE MESH REINFORCEMENT—Price per 100 sq.ft. in carload lots:

PLAIN 2-IN. x 4-IN. MESH

Style Number	Sectional Area Square Inches per Foot Width	Weight per Square	New York	Chicago	St. Louis	Dallas	San Francisco
[illegible]	[illegible]	[illegible]	$1.04	$0.93	$1.04	$1.06	1.27
040	0.040	1.13	1.18	1.16	1.34	1.53	
068	0.068	1.82	1.40	1.49	1.50	1.68	2.04
093	0.093	1.82	1.80	1.91	1.92	2.17	2.62
[illegible]	[illegible]	2.31	2.39	[illegible]	2.44	2.74	2.96
1-3	0.113	[illegible]	[illegible]	[illegible]	2.91	3.27	3.32
[illegible]	[illegible]	[illegible]	[illegible]	3.27	3.31	3.34	3.76
245	0.241	4.[illegible]	4.[illegible]	4.[illegible]	4.41	4.96	4.65
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5.04	5.10	5.72	6.04
336	0.336	[illegible]	[illegible]	5.85	[illegible]	6.66	

PLAIN 4-IN. x 8-IN. MESH

036P	0.036	.69	.71	.72	.73	.82	....
053P	0.053	.97	1.01	1.02	1.03	1.16	....
072P	0.072	1.26	1.30	1.32	1.33	1.50	....
097P	0.097	1.62	1.68	1.70	1.71	1.93	....
049R	0.049	.97	1.01	1.02	1.03	1.15	1.97
067R	0.067	1.26	1.30	1.32	1.33	1.50	....
089R	0.089	1.62	1.68	1.70	1.71	1.93	....

Made in 16-, 20-, 24-, 28-, 32-, 36-, 40-, 44-, 48-, 52- and 56-in. width in rolls 150-, 200- and 300-ft. lengths.

Galvanized runs about 10% higher than plain.

EXPANDED METAL LATH—Prices per 100 yd. for painted are as follows:

		Carload					
		New York					
Gage	Weight	Oct. 1, 1917	One Year Ago	Chicago	St. Louis	San Francisco	Dallas
27	233	$31.00	$18.00	$31.00	$34.00	$29.00	$32.00
26	250	32.05	19.00	32.00	35.00	30.25	....
25	300	33.15	20.00	33.00	....	....	35.00
24	340	34.25	21.00	34.00	37.00	33.00	36.00
22	450	36.45	24.00	36.00	....	....	....

About 10% additional for smaller quantities.

BARS, CONCRETE REINFORCING—The following quotations are per 100 lb.:

ROLLED FROM BILLETS

		Warehouse				
		New York				
In.	Mill Shipment	Oct. 1, 1917	One Year Ago	St. Louis	Chicago	San Francisco	Dallas
¾ and larger	.... *	$5.10	$3.35	....†	$4.50	$6.50	$4.75
⅝	.... *	5.15	3.45	....†	4.55	6.55	4.80
½	.... *	5.20	3.50	....†	4.60	6.60	4.85
⅜	.... *	5.35	3.75	....†	4.75	6.75	5.00
¼	.... *	5.60	4.10	....†	5.00	7.00	6.00

*Mill quotations on actual specifications.

†No quotations; market nominal on Government price.

ROLLED FROM RAILS

	Dallas	Chicago
¾ in. and larger	$4.75	$4.50
⅝	4.80	4.55
½	4.85	4.60
⅜	5.00	4.75
¼	6.00	5.00

BRICK—To contractors the price per 1000 in cargo or carload lots is as follows:

	Common			Paving	
	Oct. 1, 1917	One Month Ago	One Year Ago	Brick	Block
New York	$8.25	$8.50	$7.00	$32.00	$38.00
Boston	13.25	13.25	....	....	25.00
Chicago	8.00	8.00	6.00	16.00	24.00
St. Louis, salmon	8.00	8.00	7.75	18.00	....
St. Louis, selectel	10.00	10.00	10.50	....	....
Denver	8.00	8.00	....	....	14.00
Los Angeles	6.50	7.50	....	....	28.00
San Francisco	10.00	10.00	10.00	....	....
Dallas	8.60	8.10	....	22.00	22.50
New Orleans	....	9.00	....	....	....
Kansas City	11.00	11.00	....	....	20.00
St. Paul	8.70	....	....	....	27.00
Seattle	9.00	....	....	....	28.75

HOLLOW TILE—Hollow building tile price per block in cents:

	New York				
	Oct. 1, 1917	One Year Ago	Chicago	St. Louis	San Francisco
4x12x12	$0.0925	$0.070	$0.079	$0.054	$0.0825
6x12x12	.1295	.098	.12	.066	.11
8x12x12	.15725	.119	.135	.09	.1275
10x12x12	.185	.140	.16	.15	.20
12x12x12	.23125	.1750	.20	.18	.22

	4x12x12	8x12x12	12x12x12
Boston	$0.0957	$0.171	$0.2266
St. Paul	.055	.153	.138
Kansas City	.0585	.1125	.1575
Denver	.09	.17	.25
Los Angeles	.055	.10	.165
Seattle	.06	.10	.16

STRUCTURAL MATERIAL—The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

		New York				
	*Pittsburgh	Oct. 1, 1917	1 Yr. Ago	St. Louis	Chicago	San Francisco	Dallas
Beams, 3 to 15 in.	(3.00)	$5.25	$3.35	$5.05	$5.00	$7.75	$6.00
Channels 3 to 15 in.	(3.00)	5.25	3.35	5.05	5.00	7.75	6.00
Angles 3 to 6 in., ¼ in. thick	(3.00)	5.25	3.35	5.05	5.00	7.75	6.00
Tees, 3 in and larger	(3.00)	5.30	3.40	5.05	5.05	7.75	6.00
Plates	(3.25)	10.00	4.00	10.05	10.00	10.50	9.00

*Government price.

RIVETS—The following quotations are per 100 lb.:

	STRUCTURAL	Warehouse				
	Mill, Pittsburgh	New York	Chicago	St. Louis	San Francisco	Dallas
¾ in. and larger	$5.25	$7.00	$5.50	$5.55	$7.15	$8.50
	CONE HEAD BOILER					
¾ in. and larger	5.35	7.10	5.60	5.65	7.25	8.60
⅝ and ½	5.50	7.25	5.75	5.80	7.40	8.65
⅜ and ¼	5.85	7.60	6.10	6.15	7.75	9.00

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York, St. Louis, Chicago and San Francisco:

	1-Ply		2-Ply		3-Ply	
	c.l.	l.c.l.	c.l.	l.c.l.	c.l.	l.c.l.
No. 1 grade	$1.15	$1.40	$1.45	$1.60	$1.75	$1.90
No. 2 grade	1.10	1.25	1.25	1.40	1.50	1.65

Asbestos asphalt-saturated felt (14 lb. per square) costs $6.50 per 100 lb.

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $1.[illegible] per roll in carload lots and $2.10 for smaller quantities.

Shingles, red and green slate finish, cost $4.75 per square in carloads, $5 in smaller quantities, in Philadelphia.

ROOFING MATERIALS—Prices per ton f.o.b. New York or Chicago:

	Carload Lots	Less Than Carload Lots
Tar felt (14 lb. per square of 100 sq.ft.)	$61.00	$62.00
Tar pitch (in 400-lb. bbl.)	15.00	16.50
Asphalt pitch (in barrels)	29.00	30.50
Asphalt felt	60.00	62.00

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill:

Blue Annealed	Large Lots, Pittsburgh	St. Louis	Chicago	San Francisco	New York
No. 10	8.00	10.05	10.00	11.00	10.00
No. 12	8.05	10.10	10.05	11.05	10.05
No. 14	8.10	10.15	10.10	11.10	10.10
Black					
Nos. 18 and 20	7.80	10.15	9.80	11.07	10.30
Nos. 22 and 24	7.85	10.20	9.85	11.12	10.35
No. 26	7.90	10.25	9.90	11.12	10.40
No. 28	8.00	10.35	10.00	11.57	10.50
Galvanized					
No. 10	8.50	10.95	10.70	....	10.80
No. 12	8.60	10.95	10.70	12.15	10.90
No. 14	8.60	10.95	10.70	12.15	10.90
Nos. 18 and 20	8.90	11.15	11.00	12.45	11.25
Nos. 22 and 24	9.05	11.30	11.15	12.59	11.55
No. 26	9.20	11.45	11.20	12.74	11.70
No. 28	9.50	11.75	11.50	13.03	12.00

LINSEED OIL—These prices are per gallon:

	New York Oct. 1, 1917	New York One Year Ago	Cleveland Oct. 1, 1917	Cleveland One Year Ago	Chicago Oct. 1, 1917	Chicago One Year Ago
Raw in barrels	$1.23	$0.73	$1.30	$0.77	$1.27	$0.75
5-gal. cans	1.33	.83	1.40	.87	1.37	.85

WHITE AND RED LEAD in 500-lb. lots sell as follows in cents per pound:

	Red Oct. 1, 1917 Dry	Red Oct. 1, 1917 In Oil	Red 1 Year Ago Dry	Red 1 Year Ago In Oil	White Oct. 1, 1917 Dry and In Oil	White 1 Yr. Ago Dry and In Oil
100-lb. keg	12.25	12.50	10.50	11.00	12.00	10.50
25- and 50-lb. kegs	12.50	12.75	10.75	11.25	12.25	10.75
12½-lb. keg	12.75	13.00	11.00	11.50	12.50	11.00
1- to 5-lb. cans	14.25	14.50	12.50	12.50	14.50	12.50

LUMBER*—Price per M in carload lots:

Square Edge and Sound Green

	Southern Pine New York 20 Ft. and Under	Southern Pine New York 22-24 Ft.	Southern Pine Chicago 20 Ft and Under	Southern Pine Chicago 22-24 Ft.	Yellow Pine St. Louis 20 Ft and Under	Yellow Pine St. Louis 22-24 Ft
3x 4 to 8x 8	$32.75	$33.75	$30.75	$31.75	$27.75	$28.75
3x10 to 10x10	32.75	38.75	35.75	36.75	32.75	33.75
3x12 to 12x12	41.75	42.75	39.75	40.75	36.75	37.75
3x14 to 14x14	43.75	44.75	41.75	42.75	38.75	39.75
3x16 to 16x16	46.75	47.75	44.75	45.75	41.75	42.75
3x18 to 18x18	51.75	52.75	49.75	50.75	46.75	47.75
4x20 to 20x20	56.75	57.75	54.75	55.75	51.75	52.75

Over 24 ft.—Add $1 for each additional 2 ft. in length up to 40 ft. for sizes 12 x 12 and under; for sizes over 12 x 12 add $2. For merchantable add $2 to sizes 10 x 10 and under. For prime add $2 to the price of merchantable for all sizes.

*Prices from Lumberman's Bureau.

Rough Douglas Fir, No. 1 Common—More than carload lots in San Francisco:

Size in Inches	15 Ft. and Under	16 to 24 Ft.	25 to 32 Ft
3 and 4x4	$24.00	$25.50	
3 and 4x6 and 8	24.00	24.50	$25.50
6x6 and 8x8	24.50	25.50	25.50
3 and 4x10	24.00	25.50	26.50
6 and 8x10	25.00	26.00	27.00
3 and 4x12	24.00	25.50	26.50
6 and 8x12	25.50	26.50	26.50
10 and 12x12	25.00	25.00	27.00
3 and 4x14	25.00	27.00	28.00
6 and 8x14	26.50	27.50	27.50
7 and 9x14	27.50	28.50	28.50
10 and 12x14	26.00	26.00	28.00

Yellow Pine—Dallas. Price per M:

2x4 to 2x12—12 to 16 ft long	$32.50
2x4 to 2x12—10, 18 and 20 ft long	35.00
2x4 to 2x12—22 and 24 ft. long	37.50
4x4, 4x6, 6x6, 8x8, 3x8	37.50
8x10, 10x10, 3x10	40.00
12x12, 3x12	40.00

	8 x 8 In. x 20 Ft. and Under Y.P.	Fir	Hemlock	Spruce	12 x 12 In. 20 Ft. and Under Y.P.	Fir
Boston				$40.00		
Kansas City	$39.00	$34.00	$34.00		$41.00	$34.00
Seattle	21.00	21.00	21.00	21.00	21.00	21.00
Los Angeles		30.00	30.00			30.00
San Francisco		24.00	24.00			24.00
St. Paul		38.00	31.50			34.00
Denver	....	30.00	....	27.50	....	30.00

	1 In Rough 10 In. x 16 Ft and Under Y.P.	Fir	Hemlock	2 In T and G 10 In. x 16 Ft Y.P.	Fir
Boston					
Kansas City	$42.00	$18.50	$27.00	$41.00	
Seattle	21.00	21.00	21.00	21.00	$21.00
Los Angeles	30.00	30.00			
San Francisco	....	24.00	24.00		24.00
St. Paul	....	34.00	34.00	50.00	30.00
Denver	....	30.00	30.00		30.00

*Market demoralized, tending upward.

NAILS—The following quotations are per keg from warehouse:

	Pittsburgh Mill	St. Louis	Denver	Chicago	San Francisco	Dallas
Wire	$4.00	$4.00	$4.00	$4.45	$4.60	$4.45
Cut	4.65	5.00	5.00	4.60	6.15	....

MISCELLANEOUS

FREIGHT RATES—On finished steel products in the Pittsburgh district, including plates, structural shapes, merchant steel, bars, pipe fittings, plain and galvanized wire nails, rivets, spikes, bolts, flat sheets (except planished), chains, etc., the following freight rates are effective in cents per 100 lb.:

Boston	21.5	New Orleans	30.7
Buffalo	11.6	New York	19.5
Chicago	18.9	Pacific Coast (all rail)	75.0
Cincinnati	15.8	Philadelphia	18.7
Cleveland	10.5	St. Louis	23.6
Denver	68.6	St. Paul	34.9
Kansas City	43.6		

WATER TREATMENT CHEMICALS—Prices per pound are as follows:

	New York	Chicago
Sulphate of alumina (iron free) in 400-lb barrel	$0.045	....
Hypochlorite of lime (bleaching powder) in 700 lb. drums	.03	$0.0375
Soda ash, in 400-lb. bbl.	.05	.0375
Liquid chlorine	.175	.16

Lime is quoted separately, on p. 140.

CONTRACTORS' MISCELLANEOUS SUPPLIES

STEEL SHEET PILING—The following price is base per 100 lb. f.o.b. Pittsburgh, with a comparison of a month and a year ago:

Oct. 1, 1917	One Month Ago	One Year Ago
$4.50 to $5.00	$4.50 to $5.00	$2.50 to $2.60

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York	St. Louis	Chicago	San Francisco
Galvanized	10—2½%	10—2½%	10—2½%	10%
Bright	20—2½%	20—2½%	20—2½%	15%

MANILA ROPE—For rope smaller than ⅝-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ⅝-in., 8 ft.; ¾-in., 6; ⅞-in., 4½; 1-in., 3½; 1⅛-in., 2 ft. 10 in.; 1¼-in., 2 ft. 4 in. Following is price per pound for ⅝-in. and larger, in 1200-ft. coils:

Boston	$0.34	Kansas City	$0.33½
New York	33½	Los Angeles	50
Chicago	31½	Seattle	43½
St. Paul	34	Denver	34

EXPLOSIVES—Price per pound in small lots at cities named:

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	Gelatin 80%	Black Powder
New York		$0.26½	$0.34½		$2.50*
Boston			.36¼	$0.43¾	
Kansas City	$0.20	.26¼	.33¼	.43¾	
New Orleans		.25¼	.30¼		
Los Angeles	.19	.25	.32½		
Seattle	.37	.49½	.62½	.81½	
Chicago	.18¾	.24¾	.31¾	.41	
St. Paul	.20	.26½	.33¾		2.65*
St. Louis	.16¼	.20¼†	.29½	.39½	2.15*
Denver	.19	.25¼	.32¼	.42¼	
Dallas	.25	.29	.39	.49	

*25-lb. kegs. †No local demand.

POLES—Prices on Western red cedar poles:

	New York	Chicago	St. Louis	Denver
	$2.85	....	52.62	33.47
6 in. by 30 ft	$7.59	$4.94	$4.94	$4.37
7 in. by 30 ft	7.40	6.60	6.60	5.80
7 in. by 35 ft	10.20	9.00	9.00	8.00
8 in. by 35 ft	12.20	10.90	10.90	9.65
7 in. by 40 ft	11.45	11.00	11.00	9.75
8 in. by 40 ft	13.75	13.10	13.10	10.80
8 in. by 45 ft	18.50	16.70	16.70	14.80
8 in. by 50 ft	21.85	19.45	19.45	17.25

OLD MATERIAL—The prices following are per gross ton paid to dealers and producers in New York. In Chicago and St. Louis the quotations are net cut for and cover delivery at the buyers' works, including freight transfer charges:

	New York Oct. 1, 1917	New York One Month Ago
Heavy melting steel scrap	$28.50 to 29.50	$27.00 to 28.00
No. 1 railroad wrought	39.00 to 40.00	38.00 to 40.00
Stove plate	20.00 to 25.00	18.00 to 19.00
No. 1 machinery cast	30.00 to 31.00	30.00 to 31.00
Machine shop turnings	18.00 to 19.00	16.00 to 18.00
Cast borings	20.00 to 21.00	18.50 to 20.00
Railroad malleable cast	32.00	30.00 to 32.00

	Chicago Oct. 1, 1917	Chicago One Month Ago
No. 1 railroad wrought	$36.00	$36.00
Stove plate	19.00	19.00
No. 1 machinery cast	34.00	34.00
Machine shop turnings	17.00	17.00
Cast borings	17.00	17.00
Railroad malleable cast	34.00	30.00

	St. Louis Oct. 1, 1917	St. Louis One Month Ago
No. 1 railroad wrought	$37.00	$36.00
Stove plate	16.00 to 17.00	15.00
No. 1 machinery cast	32.00 to 33.00	30.00
Machine shop turnings	13.00 to 14.00	14.00
Cast borings	19.00 to 20.00	18.00
Railroad malleable cast	31.00 to 32.00	30.00

Proposals

For Proposals Advertised See Pages 56 to 59 inclusive

WATER-WORKS

Bids Close		See Eng. News-Record
Oct. 10	Polk, Pa. Adv. Sept. 20 and 27.	Sept. 20
Oct. 12	Pender, Neb.	Oct. 4
Oct. 16	Caldwell, Kan.	Oct. 4
Oct. 19.	Akron, O. Adv. Oct. 4.	Oct. 4

SEWERS

Oct. 8	Stratford, Conn. Adv. Sept. 20.	Sept. 20
Oct. 11.	Cleveland, O.	Oct. 4
Oct. 12.	North Bergen, N. J. (Weehawken P. O.)	Oct. 4
Oct. 13.	Cuyahoga Falls, O.	Sept. 27
Oct. 14.	Pleasantville, N. J.	Sept. 27
Oct. 16.	Wabash, Minn.	Sept. 27
Oct. 17.	Grosse Point, Ill. Adv. Oct. 4	Oct. 4
Oct. 18.	Santa Barbara, Cal.	Oct. 4
Oct. 25	St. Joseph, Mich. Adv. Oct. 4.	Oct. 4

BRIDGES

Oct. 6.	Indiana	Sept. 27
Oct. 8.	Minneapolis, Minn.	Sept. 27
Oct. 8.	Challis, Idaho	Oct. 4
Oct. 8.	Highland Park, N. J.	Oct. 4
Oct. 8.	Nez Perce, Idaho	Oct. 4
Oct. 8.	Woodbridge, N. J.	Oct. 4
Oct. 9.	Walker, Minn.	Sept. 20
Oct. 9.	Okanogan, Wash.	Oct. 4
Oct. 10.	Cleveland, O.	Oct. 4
Oct. 10.	Germantown, O.	Oct. 4
Oct. 12.	Somerville, N. J.	Oct. 4
Oct. 13.	Weston, W. Va.	Sept. 27
Oct. 15.	Tallahassee, Fla.	Oct. 4
Oct. 15.	California	Oct. 4
Oct. 16.	Tampa, Fla.	Oct. 4
Oct. 16.	Glenville, W. Va.	Sept. 27
Oct. 17.	Butler, Pa. Adv. Oct. 4.	Oct. 4
Oct. 20	Pennsylvania	Sept. 20
Oct. 20.	Charleston, W. Va.	Sept. 27
Oct. 23	Ft. Dodge, Ia. Adv. Sept. 27 and Oct. 4.	Sept. 27

STREETS AND ROADS

Oct. 8	California	Sept. 20
Oct. 8.	Mendota, Ill.	Sept. 27
Oct. 8	Louisiana	Oct. 4
Oct. 9	St. George, S. I., N. Y.	Oct. 4
Oct. 9.	Pennsylvania Adv. Sept. 20 to Oct. 4.	Sept. 20
Oct. 9.	Modesta, Cal.	Sept. 27
Oct. 10.	Brooklyn, N. Y.	Oct. 4
Oct. 10.	Little Rock, Ark.	Oct. 4
Oct. 11.	Newton, N. J. Adv. Sept. 20 and 27.	Sept. 20
Oct. 11.	Oneonta, Ala.	Sept. 13
Oct. 12.	Ohio	Oct. 4
Oct. 12.	Stealey Heights, W. Va. (Clarksburg P. O.)	Sept. 27
Oct. 13	Wadsworth, Ala.	Sept. 20
Oct. 14	Newark, N. J.	Sept. 13
Oct. 15	Cape May, N. J.	Sept. 6
Oct. 16	Pennsylvania	Sept. 20
Oct. 16	Billings, Mont.	Oct. 4
Oct. 16.	Johnson, Tenn.	Oct. 4
Oct. 22.	Clarendon, Ark.	Oct. 4
Oct. 24.	Paterson, N. J.	Sept. 27
Oct. 24	Santa Barbara, Cal.	Oct. 4
Nov. 4	Pikeville, Ky.	Sept. 27

EXCAVATION AND DREDGING

Oct. 6	Lawrenceville, Ill.	Oct. 4
Oct. 8	Marshall, Minn.	Sept. 27
Oct. 8.	Belvue, Wash.	Oct. 4
Oct. 9.	Albany, N. Y. Adv. Sept. 13 to Oct. 4.	Sept. 13
Oct. 9.	Boone, Ia.	Oct. 4
Oct. 10	Willmar, Minn.	Sept. 27
Oct. 10	Lafayette, Ind.	Sept. 20
Oct. 13	Cleveland, Minn.	Oct. 4
Oct. 15.	Willmar, Minn.	Sept. 13
Oct. 15	Havana, Ill.	Oct. 4
Oct. 16.	St. Peter, Minn.	Oct. 4
Oct. 19	Macksburg, Minn.	Oct. 4
Oct. 20	Waterford, Cal.	Sept. 27
Oct. 22.	Pine Lake, Minn.	Oct. 4
Oct. 22.	Rockport, Ind.	Oct. 4
Oct. 24.	Lemon Center, Minn.	Oct. 4
Nov. 9.	St. Cloud, Minn.	Sept. 27

Bids Close		See Eng. News-Record
Oct. 9.	Cincinnati, O.	Oct. 4
Oct. 15.	New York, N. Y.	Sept. 27
Oct. 15.	Beaumont, Tex.	Oct. 4
Oct. 17.	Wichita, Kan.	Oct. 4
Oct. 18.	Red Bank, N. J.	Oct. 4
Oct. 20.	Oxford, O.	Sept. 27
Oct. 23.	Ft. Wayne, Ind.	Oct. 4
Oct. 23.	Smith Center, Kan.	Oct. 4
Oct. 24.	Abilene, Kan.	Oct. 4
Nov. 25.	Middletown, Mass.	Oct. 4
Dec. 1.	Norfolk, Va.	Sept. 13

FEDERAL GOVERNMENT WORK

Oct. 6.	Newport, R. I. Adv. Sept. 13 to Oct. 4.	Sept. 13
Oct. 8.	Pensacola, Fla.	Sept. 27
Oct. 8.	Ft. Mifflin, Pa.	Sept. 27
Oct. 8.	Washington, D. C.	Sept. 27
Oct. 8.	New Orleans, La.	Oct. 4
Oct. 8.	Indian Head, Md.	Oct. 4
Oct. 8.	Philadelphia, Pa.	Oct. 4
Oct. 12.	Bad Axe, Mich.	Sept. 13
Oct. 15.	Denver, Colo. Adv. Sept. 13.	Sept. 13
Oct. 15.	Waynesboro, Va.	Sept. 13
Oct. 15.	El Paso, Tex. Adv. Sept. 20.	Sept. 20
Oct. 15.	Philadelphia, Pa.	Sept. 27
Oct. 15.	Denver, Colo.	Sept. 27
Oce. 15.	El Paso, Tex.	Sept. 27
Oct. 15.	Ft. Mifflin, Pa.	Oct. 4
Oct. 15.	Detroit, Mich. Adv. Oct. 4.	Oct. 4
Oct. 23.	Andalusia, Ala.	Sept. 20
Oct. 24.	Bakersfield, Cal. Adv. Sept. 20 and 27.	Sept. 20
Oct. 26.	Mt. Carmel, Ill.	Sept. 20
Oct. 28.	Waterloo, N. Y.	Sept. 20
Oct. 30.	Key West, Fla. Adv. Sept. 6 and 13.	Sept. 6
Oct. 30.	Farmville, Va.	Sept. 27
Oct. 31.	Brooklyn, N. Y.	Oct. 4
Oct. 31.	Hollidaysburg, Pa. Adv. Oct. 4.	Oct. 4
Nov. 1.	Kenton, O.	Sept. 27
Nov. 1.	Detroit, Mich. Adv. Oct. 4.	Oct. 4
Nov. 2.	Cincinnati, O. Adv. Oct. 4.	Oct. 4
Nov. 2.	Valparaiso, Ind.	Oct. 4
Nov. 5.	Burlington, N. C.	Oct. 4

MISCELLANEOUS

Oct. 8.	Elevated Railway—Brooklyn, N. Y.	Sept. 20
Oct. 17.	Dike—Bernalilo, N. M.	Oct. 4
Oct. 17.	Pier—Manhattan Beach, Cal. Adv. Oct. 4.	Oct. 4
Oct. 23.	Pier—New York, N. Y. Adv. Sept. 27 and Oct. 4.	Sept. 27
Nov. 15.	Flood Control—Dayton, O. Adv. Sept. 13 to 27.	Sept. 13

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official.

WATER-WORKS

Proposed Work

N. Y., Tonawanda—(Official)—City received no bids furnishing and laying intake pipe in Niagara River. New bids. Noted Sept. 6.

Pa., Newport—Lebanon Valley Water Supply Co. having plans prepared 5,000,000-gal. reservoir in Sand Hill, North Lebanon Twp. About $250,000.

W. Va., Fairmont—City plans 6,000,000-gal. reservoir, 4-stage centrifugal pump and filtration plant. About $40,000. S. B. Miller, city engr.

N. C., Wilson—Town plans to issue $50,000 bonds to extend water-works system. W. M. Trotter, city engr.

Tenn., Knoxville—City sold $800,000 bonds to build water, sewer, school, and street improvements in 4 former suburban municipalities. Noted Sept. 13.

Ky., Lawrenceburg—City election in November to vote on $15,000 bond issue to build filtration plant.

Ky., Murray—City issued 20,000 bonds for water-works and electric light systems.

O., Sebring—City election in November to vote on $125,000 bond issue to purchase water-work system and build filtration plant.

Mich., Jackson—City election in November to vote on $50,000 bond issue for pumping station. A. W. D. Hall, city engr.

Wis., Niagara — City to issue $35,000 bonds for water-works and sewerage systems. Noted Aug. 16.

Ia., Traer—City plans to improve water-works system, installing large mains and tank. About $25,000. F. F. Stoake, supt.

Tex., El Paso—City plans to install 2,000,000-gal. pumping station. About $75,000. G. Espy, city engr.

Tex., Lockney — City plans waterworks system. H. E. Elrod, Interurban Bldg., Dallas, engr.

Tex., Seymour—City sold $12,000 bonds to build water-works system.

Okla., Hunter—Town plans to issue $25,000 bonds for water-works system.

Okla., Miami—City election Oct. 16 to vote on $45,000 bond issue, water main extensions. A. L. Sailors, supt.

Okla., Wapanucka—City election soon to vote on $20,000 bond issue for water-works and electric light systems. Dr. B. L. Neville, mayor. Noted Apr. 26.

Colo., Ft. Morgan—City election Nov. 6th to vote on $25,000 bond issue to improve water-works system. G. O. Cox, supt.

Idaho, Driggs — City to issue $10,000 bonds to improve water-works system.

Utah, Brigham—City having plans prepared by H. S. Kleinschmidt, engr., Salt Lake City, for water-works improvements. Noted Sept. 20.

Nev., Reno—J. B. Holly, Humboldt Bank Bldg., San Francisco, plans to bring water supply from Dog Creek, Sierra Co., Cal., Plans include storage dam, 10 ft. high and pipe line 14 mi. long. About $250,000.

Ariz., Williams—Town election soon to vote on $75,000 bond issue for water-works and electric light systems. L. Stover, supt.

Wash., Waitsburg — City having plans prepared by G. L. Sawyer, engr., White Bldg., Seattle, water-works system. About $50,000. Noted Sept. 6.

Ore., Rainier—City plans filtration plant, 20,000,000 gal. capacity. About $20,000. L. C. Kelsey, Selling Bldg., Portland, engr.

Cal., Martinez—City plans to install water-works system and sewers. About $200,000.

Cal., Seal Beach—See "Sewers."

Cal., Sonoma—(Official)—City election soon to vote on $45,000 bond issue for water-works system. T. Lewis, city engr.

Cal., Tropico—City election Oct. 10th to vote on $50,000 bond issue, water-works system. A. Campbell, supt.

B. C., Prince Rupert—City plans to extend water mains. About $10,000. E. A. Woods, city clk.

BIDS DESIRED

O., Akron—(Official)—Until Oct. 19, by C. F. Beck, dir. pub. ser. contr. No. 89, 17,460-ft. 4-16in. c.-i. water pipe; advertised in this issue.

Ill., Grosse Point—(Official)—Until Oct. 17, by Village, for c.i. water pipe, etc. Windes & Marsh, Winnetka, engrs; advertised in this issue.

Kan., Caldwell—(Official)—Until Oct. 16, by H. W. Baker, city clk., for water-works and electric-light improvements, including brick power station and concrete reservoir, 500-g.p.m. motor-driven centrifugal pumps and laying 3-mi. c.-i. pipe. Burns & McDonnell, 402 Inter-State Bldg., Kansas City, Mo., engrs.

Neb., Pender—Until Oct. 12, by City, Installing water-works and electric-light plants. Henningson Eng. Co., Omaha, engrs. Noted Sept. 13.

Water-Works (Continued)

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., New York—(Official)—Report of contract awarded for Shandaken tunnel to Degnon Contg. Co., 68 Hunters Point Ave., Long Island City, published in last week's issue was incorrect. Bids are still under advisement. Noted Sept. 20.

★**N. J., Bayonne** — (Official) — City let contract laying water mains and appurtenances to C. P. Kavanaugh, Inc., $27,924. Noted Sept. 13.

★**N. C., Belmont**—City let contract water-works system to J. R. McCrary Co., Atlanta, Ga. $20,000 bonds lately issued.

O., Akron—(Official)—City received low bids building elevated steel water tank Chicago Bridge & Iron Wks., 37 West Van Buren St., Chicago, 8-post tower, $30,500, 6-post tower, $29,200; Pittsburgh-Des Moines Steel Co., Curry Bldg., Pittsburgh, segmental bottom, $30,950, hemispherical bottom, $31,150; A. Tufts, Candler Annex, Atlanta, Ga., rein.-con. $30,000. Noted Sept. 13.

★**Ia., North McGregor**—City let contract water-works system to Vogelberg & Udelhofen, Potosi, Wis., $10,367. Noted Sept. 13.

★**Minn., Townsend**—City let contract water-works system to Monarch Constr. Co., Bozeman, Mont.

★**Mo., St. Louis**—City let contract furnishing material, excavating, examining, and inspecting 285,000 lin.ft., 6 20-in. c.i. water mains to National Water Main Cleaning Co., 50 Church St., New York City, 17c. and 19c. per lin.ft.

★**Tex., Throckmorton**—City let contract earth dam, 1,500,000 gal. to Stamford Constr. Co., Stamford. Noted Aug. 23.

★**Wash., Seattle**—Bd. Pub. Wks. let contract laying water mains in Michigan St. and others to S. A. Moceri, $11,924.

SEWERS

Proposed Work

N. Y., Buffalo—City plans sewers in portions Phyllis, Bailey, Davidson, Millicent, Hastings Aves., and Suffolk St. G. H. Norton, city engr.

N. J., Woodbury—City having plans prepared sewerage system and sewage disposal plant.

Pa., Hazleton—City had plans prepared sewage-disposal plant. About $50,000. B. E. Youngman, city engr.

Pa., South Bethlehem—Council passed ordinance authorizing $55,000 bond issue for building sewers and improving streets. R. M. Brady, boro. engr.

Va., Richmond—City plans sewer in Lee Dist. About $40,000. C. E. Bolling, city engr.

S. C., Columbia—(Official)—City rejected bids, sanitary sewer outfall, Columbia Canal and Smith's Branch. Noted Sept. 13.

Ga., Columbus—(Official)—City defeated at election $177,000 bonds to improve sewers. Noted May 24.

Tenn., Knoxville—See "Water-Works."

O., Akron—See "Streets and Foads."

O., Bellevue—City soon lets contract sewerage system portions Main St. L. C. Herrick, city engr.

O., Cincinnati—City election Nov. 6, to vote on $500,000 bond issue to build sewers. F. Krug, city engr.

O., Cincinnati—City plans sewer in portions Minion Ave. R. Hoffman, city engr.

O., Cleveland—City election Nov. 6 to vote on $300,000 bond issue for sewers. R. Hoffman, city engr.

O., Cleveland Heights—(Warrensville P. O.)—Village plans sewer and water connections in 11 streets. About $46,000. H. H. Canfield, Clk.

O., Dayton—City plans sanitary sewers in Mt Auburn Dist. E. O. Eichelberger, city engr.

O., Hamilton—City plans sewers in portions Hanover and 11th Sts and Shuler Ave. F. F. Weaver, city engr.

O., Lima—City election in Nov. to vote on $155,000 bond issue to build relief sewers. C. Bryson, city engr. Noted Sept. 13.

O., Piqua—City plans sewers in portions Vine St. and several alleys. A. Schroeder, city engr.

O., Salem—City having plans prepared for sewer in portions Park St. B. M. Finch, city engr.

O., Tiffin—City plans sewers in portions Hedges St. and Grand Ave. J. I. Obenlander, city engr.

Ind., Laporte — City having plans prepared southside trunk sewerage system. About $237,781. L. D. Goddard, city engr.

Ind., Logansport—City had plans prepared, southeast dist. sewer. About $15,430. H. H. Thompson, city engr.

Mich., Grand Rapids—City having plans prepared by Hoad & Decker, engrs., Ann Arbor, sewage-disposal plant.

Mich., St. Clair Heights—(Detroit P. O.)—City voted $10,000 bonds, sewerage system. Noted Sept. 27.

Ill., Knoxville—City plans disposal plant, including concrete sedimentation tank, sand filter beds, dosing apparatus, under drains and sludge beds. About $29,500. Noted May 10.

Ill., Rockford—Council passed ordinance to build sewers in portions Stanley and North Madison Sts. and Hoffman Blvd., sidewalks on 4th and 5th Aves., Cedar, West, and South Winnebago Sts. E. Main, city engr.

Ill., Rock Island—City having plans prepared sewerage system in Hill Dist. W. Treichler, city engr.

Wis., Niagara—See "Water-Works."

Minn., St. Paul—City plans sanitary sewerage system in West St. Anthony Park. About $56,764. O. Clausen, city engr.

Tex., Navasta—City plans to install sewerage system.

Tex., Texarkana — City voted $50,000 bonds for septic tank for sewerage system. About $100,000; Arkansas side of city will pay half. O. Yenglin, city engr.

Okla., Miami—City election Oct. 16 to vote on $20,000 issue for sanitary sewers, and $80,000 for storm sewers. Noted June 28.

Colo., Greeley—Council passed ordinance for creation new sewer districts.

Ariz., Glendale—City had plans prepared by A. Holmquist, engr., sewerage system. About $30,000. Noted June 21.

Wash., Grandview—City plans to install sewerage system.

Cal., Martinez—See "Water-Works."

Cal., Seal Beach—City election soon to vote on $45,000 bond issue to build sewerage and water-works systems.

Ont., St. Catherines—City had plans prepared sewerage system portion Western Hill. W. P. Near, city engr.

BIDS DESIRED

N. J., North Bergen (Weehawken P. O.)—Until Oct. 12, by Town Com., sewer in Tounelle Ave. About $20,000.

O., Cleveland Until Oct. 11, by City, installing sewer, portion East 12th St. R. Hoffman, city engr.

Mich., St. Joseph—(Official)—Until Oct. 25, by C. J. McMullen, city clk., for sewage disposal plant advertised in this issue. Noted Sept. 20.

Mont., Billings—See "Streets and Roads."

Cal., Santa Barbara—See "Streets and Roads."

Cal., Santa Barbara—Until Oct. 18, by A. C. Hall city clk., outfall sewerage system. About $81,000. Compiled & Gilbreath, 1412 Hollingsworth Bldg., Los Angeles, engrs. Noted Aug. 9.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Conn., Bridgeport**—City let contract West sanitary trunk sewer, including 2,000 ft. 15-in., 700 ft. 18-in. and 1,000 ft. 24-in. tile pipe, to L. Perrotta, 30 Winthrop St., Hartford.

★**Conn., Stamford**—Town let contract sewage-disposal plant to Frank Palmer, Stamford. Noted Sept. 13.

★**N. C., Belmont**—City let contract, sanitary sewerage system to J. B. McCrary Co., Atlanta, Ga., $20,000. Noted Aug. 23.

★**La., Lafayette**—City let contract sanitary sewers and sewage disposal plant to F. C. Youmans Co., Houston, $80,817. Noted Aug. 30.

Ind., Hammond—City received low bids for pump, Calumet Ave. sewer, from United Constr. Co., $22,100; Nejdl & Greenwald, Robertsdale, $26,000.

★**Ill., Summit**—(Official)—City let contract improving sewerage system to F. J. Lambert, Summit, $15,802. Noted Sept. 20.

★**Wis., Milwaukee**—City let contract sewer in portion Lake St., to Wisconsin Constr. Co., 1000 Humboldt Ave., $100,113. Noted June 28.

★**Mo., Kansas City**—City let contract, sewer in Dist. No. 176 to Halpin-Dwyer Constr. Co., Kansas City, $119,000. Noted Sept. 13.

★**Ore., Astoria**—City let contract Scow Bay sewer to Coluccio & Moceri, 1642 Lane St., Seattle, $43,900. Noted Sept. 27.

★**Cal., San Diego**—City let contract sanitary sewerage system, Ocean Beach Dist., to J. Kennedy, Washington Bldg., Los Angeles, $92,394. Noted Sept. 27.

★**Cal., Santa Barbara**—City let contract 12-in. vitr. pipe sewers in Salsipuedes St., and 14 inlets to J. T. Cornwall, Santa Barbara, $18,128.

★**Que., Verdun**—City let contract building sewers and sidewalks to M. J. Stack Paving & Contg. Co., Ltd., 167 McCord St., $50,000.

★**Ont., Toronto**—Bd. Control let contract Rosedale Creek sewer from high level pumping station to Russell Hill Rd. to Godson Contg. Co., Ltd., Manning Chambers, $150,000. Noted Aug. 30.

★**Ont., Toronto**—(Official)—City let contract sewer on Yonge St. as follows: Sect. 1, McDonald & Nicholson, $24,100; Sects. 2 and 3, Commissioner of Wks., $66,900 and $12,815, respectively. Noted Sept. 20.

BRIDGES

Proposed Work

N. Y., Bronx—Dept. Bridges, Municipal Bldg., having plans prepared by Stoughton & Stoughton, archts., 96 5th Ave., for steel and iron bridge over Bronx Pkway. About $250,000.

Del., Wilmington—New Castle Co. plans to build new rein.-con. bridge on Washington St. About $150,000.

Va., Newport News — Washington-Newport News Steel Line plans to build several bridges, including double-leaf bascule span over James and Nansemond Rivers to connect Newport News to Pig Point; also over southern branch Elizabeth River, near Navy Yard. F. S. Gannon, 55 Liberty St., New York City, [illegible]

Va., Richmond — City preparing plans [illegible] steel and iron bridge, 18-ft. over all, over James River, 9th St. C. B. Bolling, city engr.

Fla., Jacksonville—See "Streets and Roads."

Ind., Anderson—(Official)—Madison Co. receiving bids about February 1st for concrete bridge [illegible] over White River on 31st St. About $85,000. Noted Sept. 20.

Mich., Detroit—City election Nov. 6 to vote on $2,000,000 bonds to build steel Belle Isle [illegible] bridge proper, 2200 ft., bridge and approaches 3500 ft., width of roadway 55 ft., sidewalks 11 ft. each side. 55 ft. 10 ft. maximum grade, minimum grade [illegible]

Ill., Lewiston—See "Streets and Roads."

Okla., Sapulpa—See "Streets and Roads."

Wash., Pullman—City plans election to vote on $11,000 bonds to build reinforced concrete bridge over Missouri Flat Creek. Noted February.

Cal., Porterville — City voted $15,000 bonds to build bridge over Packer channel. Noted Aug. 16.

Ont., Cardinville—City [illegible] prepared by W. P. Pennington, engr., for new reinforcement bridge. About $[illegible]

Bridges (Continued)

BIDS DESIRED

N. J., Somerville—Until Oct. 12, by Bd. Freeholders, Somerset Co., repairing Voorhees, Everett, Hunts Hill and School House bridges. J. Dunlighty, Jr., co. engr.

N. J., Woodbridge—Until Oct. 8, by Bd. Freeholders Middlesex Co., New Brunswick, building reinforced bridge over Sucker Brook. A. B. Fox, co. engr.

Pa., Butler—(Official)—Until Oct. 17, by Pennsylvania Pub. Ser. Comn., Harrisburg, building steel bridge on Main St.; advertised in this issue.

Ky., Columbus — See "Streets and Roads."

Wash., Okanogan—Until Oct. 9, by J. D. Hubbard, Clk., Okanogan Co., building 390-ft. Howe Truss and bridge, timber and pile trestle approaches, over Okanogan River near Ellisford Sliding. H. E. Smith, co. engr.

California—(Official)—Until Oct. 15 by State Highway Comn., Sacramento, building 120-ft. rein.-con. bridge over Castle Creek, 45-ft. bridge over Mears Creek, 30-ft. bridge over Flume Creek. A. B. Fletcher, highway engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Cayuga**—New York Central R.R., New York City, let contract rein.-con. bridge at Barge Canal crossing to Walsh Constr. Co., 141 West 3rd St., Davenport, Ia., $30,000.

N. J., Jersey City—Bd. Freeholders Hudson Co., received low bid improving 14th St. viaduct from Nolan & Hornung Constr. Co., West Hoboken, $62,471. Noted Sept. 13.

★**Ky., Owensboro**—Daviess Co. let contract building 16 bridges to Vincennes Bridge Co., Vincennes, Ind., and Champion Bridge Co., Wilmington, O., $80,000.

★**Mich., Mason** — See "Streets and Roads."

★**Ill., St. Joseph**—(Official)—Champaign Co., Urbana, let contract 110-ft. steel bridge, as follows: superstructure to Joliet Bridge & Iron Co., Joliet, $9768; substructure to Bresse Road Supply Co., $2789. Noted Sept. 13.

★**Wis., Wausau**—City let contract building 200-ft. rein.-con. bridge over Wisconsin River to Wausau Iron Works, Wausau, $75,-000. Noted Sept. 13.

★**Okla., Norman**—Cleveland Co. let contract building 2 rein.-con. and 2 steel bridges to Oklahoma Bridge Co., 222 Baltimore Bldg., Oklahoma, $11,741.

★**Wash., Bellingham** — Council let contract rein.-con. deck bridge over Whatcom Creek at Dupont and Prospect Sts., to C. G. Huber, Central Bldg., Seattle, $11,-569. Noted July 12.

Cal., San Diego—Bd. Supvrs., San Diego Co., received low bid building rein.-con. bridge over Los Penasquitos Creek on State Highway from F. Staffger, Owl Drug Bldg., $13,-997.

STRUCTURAL STEEL WORK

BIDS DESIRED

Pa., Butler—See "Bridges."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Okla., Norman**—See "Bridges."

REINFORCED CONCRETE

Proposed Work

N. Y., Rochester—See "Industrial Works."
N. J., Newark—See "Industrial Works."
Pa., Pittsburgh—See "Industrial Works."
Del., Wilmington—See "Bridges."
Del., Wilmington—See "Miscellaneous."
Fla., Jacksonville—See "Streets and Roads."
Ind., Anderson—See "Bridges."
Mich., Detroit—See "Bridges."
Wis., West Allis—See "Industrial Works."
Wash., Pullman—See "Bridges."
Cal., Azusa—See "Miscellaneous."
Cal., Los Angeles—See "Industrial Works."
N. S., Annapolis Royal—See "Miscellaneous."
Que., Cartierville—See "Bridges."

BIDS DESIRED

N. J., Woodbridge—See "Bridges."
Kan., Caldwell—See "Water-Works."
California—See "Bridges."
Cal., Manhattan Beach—See "Miscellaneous."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Cayuga**—See "Bridges."
★**Wash., D. C.**—See "Federal Government Work."
★**Ga., Atlanta**—See "Industrial Works."
★**Wis., Wausau**—See "Bridges."
Minn., Minneapolis—See "Buildings."
★**Okla., Norman**—See "Bridges."
★**Okla., Tulsa**—See "Buildings."
★**Wash., Bellingham**—See "Bridges."
Cal., San Diego—See "Bridges."

Road Builders

There is an important message from the Commanding Officer of the 23rd Engineers—the new highway construction regiment—to you. On pages 625 and 626 of this issue.

Read It

STREETS AND ROADS

Proposed Work

Mass., South Boston—(Boston P. O.)—City approved order to lay out and construct portion Alger St. About $36,000.

N. Y., Albany—E. Duffey, state highway comr., 55 Lancaster St., received no bids, building and improving highways in various counties. Noted Sept. 6.

N. Y., Buffalo—City plans paving portion Walnut St., asphalt on concrete foundation. G. H. Norton, city engr.

N. Y., Johnson City—Village plans paving portions Willow St., Corliss, Grand and Carhart Aves., concrete.

New Jersey—(Official)—State Highway Comn., Trenton, rejected paving 4000 sq.yd. surface pavement, concrete. New bids. Noted Sept. 13.

N. J., Burlington—Burlington and Florence twps. plan to improve 4 mi. River Rd. Address E. E. Mount.

N. J., Jersey City—City plans improving portions De Kalb Ave., Van Cleef St. and Germania Ave., bituminous, concrete base; Dwight St., asphalt, concrete base. C. A. Van Kuren, city engr.

N. J., West New York—(Weehawken P. O.)—Town plans paving and improving portion Van Buren Pl. About $10,000.

Pennsylvania — State Highway Comn., Harrisburg, plans highway between Phila. and Morrisville; also 10-mi. cement road in Lawrence Co. F. B. Black, state highway comr.

Va., Abingdon — Washington Co. having plans prepared for road connecting Big Creek and Fish Dam Sections.

Va., Richmond—Henrico Co. plans to appropriate $10,000 to improve Petersburg turnpike.

N. C., Charlotte—City election Oct. 10 to vote on $275,000 bond issue to improve roads.

N. C., Northwilkesboro—Town Council authorized $60,000 bond issue to improve streets.

N. C., Raleigh—City sold $50,000 bonds to improve streets. E. R. Pace, city engr.

S. C., Gaffney—Cherokee Co. Highway Comrs. will receive bids in February or March for road work through county including portions of National Highway. About $225,000 available from proceeds of bond issue and $17,000 from Federal Aid. Noted Apr. 19.

Fla., Jacksonville—City and Duval Co. plan to issue bonds for improving and widening county road from city limits to state camp; also building concrete bridges at 104th St. and over McGirts and Trout Creeks. G. D. Ackerly, city clk. L. L. Meggs, chn. co. bd.

Fla., Kissimmee—Osceola Co., St. Cloud Dist. plans organizing road and bridge district and issuing $275,000 bonds to build concrete highway from here to Barcoosee and from Ashton to east co. line.

Fla., Pensacola—Escambia Co. Bd. of Comrs. will create road district comprising 12 precincts of the city and plans election to vote on bond issue to pave navy yard road between Bayou Chico and Bayou Grande. About $90,000.

Fla., Quincy—City election Oct. 9 to vote on $18,000 bond issue to pave streets.

Ala., Bay Minette — Baldwin Co. voted $75,000 bonds to build roads. Noted Sept. 13.

Ala., Montgomery—County Bd. of Revenue plans to improve roads between here and Camp Sheridan. About $20,000 will be expended. R. H. Jones, pres.

Tenn., Knoxville—See "Water-Works."

Tenn., Ridgely—City plans walks on both sides of principal streets; $10,000 bonds voted for work.

Ky., Central City—City plans to improve, with state aid, Broad and other streets, macadam and rock asphalt.

O., Akron—City plans paving, grading, curbing, building walks and sewers on portions West North and Grand Sts., South Martha, East and Rhodes Aves. E. A. Zeisloft, city engr.

O., Ashland—Ashland Co. sold $168,000 bonds to improve Market Rd. No. 3 and 10, inter-county highway Nos. 140 and 142. H. C. Westover, co. aud. Noted Sept. 13.

O., Bay Village—(Official)—Village to sell $18,000 bonds Oct. 15 to improve streets. A. L. Miller, clk.

O., Cleveland—Council passed ordinance to issue $30,000 bonds to improve portions 9th St. R. Hoffman, city engr.

O., Columbus—City Council passed ordinance to improve and pave portion 11th Ave. H. Maetzel, city engr.

O., Columbus—City plans to issue $200,-000 additional bonds for street improvements. H. Maetzel, city engr. Noted Sept. 6.

O., Lakewood—City election in Nov. to vote on $500,000 bond issue to repave Clifton Blvd., Detroit Ave. and West Madison Ave. E. A. Fisher, city engr.

O., London—City election Nov., to vote on $30,000 bond issue to pave various streets. M. McCafferty, city engr. Noted July 19.

O., Troy—Miami Co. to sell $23,500 bonds Oct. 29 to build, improve and repair portion Miami St. C. N. Peters, aud.

Ind., Columbus—(Official)—Bartholomew Co. rejected bids building 22,368 ft. gravel roads, Flatrock and German Twps. W. H. Scott, aud. Noted Sept. 13.

Mich., L'Anse—Baraga Co. soon lets contract, 40 and 50-mi. highways. About $400,000. M. Boetsch, clk.

Mich., St. Clair Heights—(Detroit P. O.)—City voted $30,000 bonds to pave streets.

Ill., Lewiston—Fulton Co. plans to spend $150,000 to build roads and bridges.

Ill., Rockford—Winnebago Co. election soon to vote on $145,000 bond issue to improve road from here to Boone Co. line.

Ill., Savana—Mason Co. plans to build hard-surface road, 15 ft. wide. About $16,-000. State to appropriate half of sum.

Ill., Sullivan—Village plans paving State, B'way. and County Sts., vitr. brick, 3-in. concrete foundation. About $76,000.

Ill., Waukegan—City plans paving portion Market St., brick, to a width of 25 feet. About $38,093. M. J. Douthitt, city engr.

Wis., Green Bay—Brown Co. sold $175,-000 bonds to build roads. R. B. Vickery, co. clk. Noted Sept. 20.

Ia., Des Moines—City plans paving portions Carpenter Ave. A. Hands, city engr.

Ia., Seymour — (Official) — City received no bids building sidewalks, street and alley crossings. J. W. Lowry, city clk. Noted Sept. 13.

Minn., Stillwater—Washington Co. plans to build State Rd. No. 3 with state aid; about $15,000.

Kan., Ft. Scott—Bourbon Co. plans to build Richard Rd., from Hornaday Bridge to Glenn Campbell farm, 6 mi.

Kan., Kansas City—Wyandotte Co. plans to repave Parallel Rd., 2½ mi.; Kaw Valley Rd., 5½ mi. O. K. Williamson, co. engr.

Streets and Roads (Continued)

Neb., Holdrege—City soon lets contract paving portions East and West Aves. About $10,000.

Mont., Great Falls—City plans paving, grading, draining, etc., 6th St. About $26,000. L. B. Evenson, city engr.

Mo., Benton—Scott Co. sold $50,000 bonds to build roads. Noted Aug. 23.

Mo., New London—Ralls Co. election defeated $250,000 bond issue for building 150-mi. hard surface roads. Noted Aug. 30.

Mo., Springfield—Green Co. voted $10,000 bonds to improve 15-mi. road in Galloway Special Rd. Dist. L. Luster, atty. Noted Sept. 6.

Arkansas—State Highway Dept., Little Rock, had plans prepared for Jefferson Highway from Harrison to Newton Co. line.

Ark., Prescott—Nevada Co. Comrs. had plans prepared by State Highway Comn., Little Rock, for road from Prescott to Little Missouri River, 8 mi., gravel. About $47,000.

Texas—State Highway Dept., Austin, plans short-line highway between Antonio and Houston.

Tex., Beaumont—Jefferson Co. plans to build Beaumont-Houston Rd., running from here to Liberty Co. line, via China and Nome; to be part of Jefferson Highway from New Orleans, La., to Winnipeg, Can. Also road from Voth through Beaumont to Port Arthur and Sabine. This road will connect with others leading into Kansas City, Mo. State Highway Comn. will pay part of cost of work.

Tex, Burnet—Burnet Co. election Oct. 20 to vote on $100,000 bonds to build roads, Precinct No. 4.

Tex., Clairmont—Kent Co., Precinct No. 1, voted $100,000 bonds to build roads.

Tex., Galveston—City plans to fill crest on boulevard between 25th and 39th Sts., mudshell on sand bedding. About $57,500. A. Willits, city engr.

Tex., Omaha—City voted $35,000 bonds for street improvements. Address the Mayor.

Tex., Palestine—Anderson Co. secured R. Q. Mills highway and plans to build. The road will extend from Corsicana to Comanche. Noted Sept. 27.

Tex., Seminole—Gaines Co. election soon to vote on $250,000 bonds to build good roads.

Tex., Victoria—City plans paving streets; $100,000 bonds recently voted for work.

Okla., Hugo—Choctaw Co. plans election Oct. 13 to vote on $50,000 bond issue for improving roads in Wilson Twp. Noted June 7.

Okla., Sallisaw—Sequoyah Co. election Oct. 22 to vote on $18,000 bond issue for roads and bridges in Paw Paw Twp. and $20,000 bond issue for some work in Campbell Twp.

Okla., Sapulpa—Creek Co. election soon to vote on $800,000 bond issue to build roads and bridges.

Idaho, Cœur d'Alene—Kootenai Co., Fourth of July Canyon, created highway improvement district and plans to vote on $25,000 bond issue, which, together with $50,000 from Federal Government, $50,000 from state and $50,000 from Shoshone Co., makes total of $150,000 for work in district.

Utah, Salt Lake City—Lincoln Highway Assn. plans road over Great Salt Lake Desert to connect road leading into Nevada near Deep Creek Mountains. About $15,700.

Wash., Cheney—City election Oct. 8th to vote on bond issue to improve 36 blocks.

Wash., Colfax—Whitman Co. Comrs. plan Ewan-St. John highway, 23 mi. hard surface. About $200,000.

Wash., Everett—(Official)—Snohomish Co. rejected bids building permanent highways Nos. 32 and 33. M. Weatherbee, co. aud. Noted Sept. 13.

Wash., Pullman—City plans election soon to vote on $11,350 bond issue for paving streets and bridges.

Wash., Ritzville—Adams Co. Comrs. plan to build permanent highway from here to Grant co. line.

Wash., Seattle—City had plans prepared paving Elliott Ave., 524,000 yd. earthwork, 42,000 sq.yd. 5-in. concrete base, asphalt, 14,000 sq.yd. 6-in. concrete base, 1900 sq.yd. asphalt top, 38,000 sq.yd. concrete paving, 6-in. base, 66,000 sq.yd. 6-in. concrete base, brick block, 24,000 sq.yd. 7-in. concrete base, etc. About $700,000. A. H. Dimock, city engr.

Ore., Klamath Falls—City plans to pave Conger Ave., ½ mi., including 5-ft. concrete walks along one side. About $25,765.

Cal., Colusa—Colusa Co. had plans prepared highway between Princeton, Colusa and Grimes, 27 mi., 10 ft. wide, concrete. About $200,000.

Cal., Los Angeles—City rejected bids improving 1st St. New bids. A. C. Hansen, cty engr. Noted Sept. 13.

Cal., Richmond—City plans improving portions 19th St. A. C. Faris, clk.

Cal., Tulare—City rejected bids paving 2.3 mi., concrete. Noted Aug. 30.

BIDS DESIRED

N. Y., Brooklyn—(Official)—Until Oct. 10, by L. H. Pounds, boro. pres., regulating and paving, asphalt, 6-in. concrete base, portion roadway Hopkinson, Thatford and 20th Aves., Montgomery, Van Brunt, 68th and 78th Sts., regulating and repaving, grade 1 granite, 6-in. concrete base, portion Van Brunt St., regulating, curbing where necessary, and paving, asphalt, 6-in. concrete base portion 80th St.

N. Y., S. I., St. George—Until Oct. 8, by C. D. Van Name, boro. pres., repaving Old Manor Rd.

N. J., Highland Park—Until Oct. 8, by boro. grading 8th Ave., 1st Ave., Magnolia and Montgomery Sts. R. B. Craig, clk. Noted Sept. 20.

Fla., Tallahassee—Until Oct. 15, by Leon Co. Comrs., Woodville Rd., 6 mi. rock; Chaires and Capitola Rd., to Jefferson Co. line, 4 mi., sand clay. B. E. Reed, co. engr.

Fla., Tampa—Until Oct. 16, by W. P. Culvreath, clk. Hillsborough Co. Comrs. to construct 54 mi. hard surface roads through Pasco, Polk, Manatee and Pinellas Cos.

Louisiana—(Official) — Until Oct. 8, by State Highway Dept., New Orleans, following highway work: Baton Rouge-New Orleans Rd., Ascension Parish, 27.48 mi.; Lafayette-New Iberia and Lafayette-Crowley Rds., Lafayette Parish, 12.2 mi. D. Buie, state highway engr.

Tenn., Johnson—Until Oct. 16, by W. O. Dyer, city mgr., paving and installing sewer, Dist. No. 24, 11,440 sq.yd. paving, 8580 lin.ft. curb and gutter, 8630 6- to 8-in. sewers; Dist. No. 32, 7473 sq.yd. paving, 5680 lin.ft. curb and gutter, 5780 6-8-in. sewers and 1200 lin.ft. storm sewers; Dist. No. 33, 3540 sq.yd. paving, 2896 lin.ft. curb and gutter, 2608 6- 8-in. sewers; Dist. No. 34, grading, 3000 sq.yd. paving, 2692 lin.ft. curb and gutter, 2426 6- 8-in. sewers. P. T. McDonald, city engr.

Ohio—Until Oct. 12 by State Highway Dept., Columbus, building roads in various counties as follows:

O., Cleveland—Until Oct. 10, by City improving and paving portions Edgewater Cliff Drive, West Blvd., West 82nd and West 105th St. R. Hoffman, city engr.

Columbus, Ohio—The Ohio Highway Department will open bids October 12 for the following work: Ashland Co. Sect. "A," Columbus-Wooster Rd., monolithic brick, 1.54 mi., cost $44,170; Sect. "A," Ashland-Norwalk Rd., monolithic brick, 4.72 mi., $11,057; Sect. "G," Savannah-Vermillion Rd., monolithic brick, 4.08 mi., $84,646; Clermont Co., Sect. "K-1," Cincinnati-Chillicothe Rd., water-bound macadam, 2.04 mi., $19,403; Sect. "N-1," Milford-Hillsboro Rd., water-bound macadam, 0.98 mi., $11,398; Darke Co., Sect. "A-1," Dayton-Greenville Rd., concrete, 2.63 mi., $66,180; Highland Co., Sect. "K," Hillsboro-Piketown Rd., bituminous macadam, 2.40 mi., $22,729; Huron Co. Sect. "L," Bellevue-Norwalk Rd., monolithic brick 1.68 mi. $43,618; Knox Co., Sect. "K," Columbus-Wooster Rd., reinforced, 1.61 mi., $49,693; Lucas Co., Sect. "J," Toledo-Napoleon Rd., concrete-macadam, 4.48 mi., $73,334; Sect. "K," Toledo-Napoleon Rd., concrete-macadam, 3.73 mi., $85,801; Mahoning Co. Sect. "F," Youngstown-Lowellville Rd., brick, 1.45 mi., $43,791; Sect. "Y," Canfield-Poland Rd., water-bound macadam, 1.88 mi., $17,888; Morgan Co. Sect. "H," McConnellsville-Athens Rd., water-bound macadam, 3.15 mi., $44,457; Seneca Co., Sect. "A," Tiffin-Fostoria Rd., brick, 1.55 mi., $44,400; Stark Co., Sect. "B-3," Canton-New Franklin Rd., brick, 1.17 mi., $44,483; Summit Co. Sect. "U," Arkon-Canton Rd., brick, 2.08 mi., $84,591; Sect. "N-1," Cleveland-Massillon Rd., brick, 1.80 mi., $57,854; Wayne Co., Sect. "Q," Wooster-Canal Dover Rd., monolithic brick, 1.17 mi., $23,823; Sect. "A," Wooster-Millersburg Rd., monolithic brick, 0.88 mi., $16,074; Sect. "A," Orrville-Southern Rd., monolithic brick, 2.35 mi., $53,121; Williams Co., Sect. "L," Bryan-Pioneer Rd., water-bound macadam or bituminous macadam, 3.81 mi., $69,763; Jefferson Co., Sect. "N-2," Steubenville-Cambridge Rd., brick, 1.83 mi., $71,719.

O., Germantown—Until Oct. 10, by village, paving West Market St., tarvia bound macadam, and combined curb and gutter. C. A. Eby, clk.

Kan., Columbus—Until Oct. 18, by L. Mobley, chn. Cherokee Co. Comrs., 10-mi. benefit dist. road, involving 33,261 cu.yd. excav., 1 16-ft., 3-span concrete bridge and 25 concrete culverts. C. M. Cooper, co. engr. Noted Aug. 23.

Mont., Billings—Until Oct. 16, by J. M. Bresnahan, city clk., 13,360 sq.yd. paving, together with concrete gutters and sewers in Impvt. Dist. No. 29. E. M. Schneckenberger, city engr.

Mo., Stanberry—(Official)—Until Oct. 8, by C. A. Greenice, city clk., paving, curbing and building gutters, portions Park and Locust Sts. Black & Veatch, Inter-State Bldg., Kansas City, Mo., engrs. Noted Sept. 20.

Ark., Clarendon—Until Oct. 22, by Monroe Co. Rd. Impvt. Dist., Mo., for 22-mi. road through Brinkley forming part Little Rock-Memphis Highway, including 88,000-cu.yd grading, 34,500-cu.yd. gravel, 7000-cu.yd concrete, 111,000-sq.yd. bituminous carpet, 1800-cu.yd. rein.-con. in bridges and 1000-lin.ft. pipe culverts. Parkes Eng. Co., Citizens Bank Bldg., Pine Bluff, engrs. Noted May 10.

Ark., Little Rock—(Official)—Until Oct. 10, by City, paving 40,000 sq.yd., asphalt or concrete, Impvt. Dist. No. 261. Lund & Hill, 527 Southern Trust Bldg., engrs.

Idaho, Challis—Until Oct. 8, by E. J. Michaels, clk. Custer Co., widening slope Double Springs Pass Rd.

Idaho, Nez Perce—Until Oct. 8, by Lewis Co. Comrs. building 8500 ft. of 16-ft. highway known as Nezperce-Green Creek highway. J. B. White, clk.

Cal., Santa Barbara—Until Oct. 24, by A. C. Hall, city clk., improving Salsipuedes and Carpenteria Sts., including 6-in. concrete pavements, oil and screenings surfaces, 6-, 8- and 12-in. vitr. pipe sewers, 24-in. concrete pipe drains, etc. A B Cook, city engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Massachusetts**—State Highway Dept., Boston, let contract for road in Ashby to D. J. Damon, Ashby, $24,614.

Massachusetts—State Highway Dept., Boston, received low bids for roads in Egremont and Sheffield, from Perini & Co., Ashland, $52,315; L. C. Fay & Co., 318 Main St., Springfield, $54,310; Hemlin & Nelson, Salem, $56,426. Noted Aug. 30.

Massachusetts—State Highway Dept., Boston, received low bids for following highways: (a) Braintree, (b) Dorchester, (c) Westford: E. C. Sargent, Adams Bldg., Quincy, (a) $17,719; W. F. Lund & Sons, Quincy, (a) $18,076; Perini & Co., Ashland, (b) $22,455, (c) $16,483; Middlesex Concrete Co., Medford Hillside, (b) $23,185; J. E. Watkins, Amesbury, (c) $16,612.

★**Mass., Malden**—(Official)—City let contract 4189 sq.yd. granite block pavement on concrete base to Simpson Bros., 144 Devonshire St., Boston. Noted Aug. 16.

★**Mass., Springfield**—City let contract paving North End and Abbey St. bridges to Jennison-Wright Co., Detroit, Mich., $19,000.

Connecticut—State Highway Comn., Hartford, received low bids following road work: Branford Twp., 1.81 mi. 16-ft. macadam pavings, Short Beach Rd., 0.81 mi., $14,889; 16-ft. macadam paving, Montowese St. and Indian Neck Rd., from C. W. Blakeslee & Sons, 78 Wayside St., New Haven, (a) $48,874 (b) $54,318, (c) $58,063; L. Basile, Center Co., State and Broad Sts., Meriden, (a) $44,691 (b) $50,791, (c) $54,883; Stratford Twp., $7,209 lin. ft. concrete or Hassam paving, Hassam Ave., Connecticut Hassam Paving Co., 307 Chapel St., New Haven, $10,518; Maher & Brennan, 188 Church St., New Haven, $43,344; Waterbury Twp., $180 lin.ft. gravel road, Hotchkiss and Waterbury Co., 1 Hallock St., Ft. Terrington, $18,000; H. Sanford Osborn,

Streets and Roads (Continued)

Redding Ridge, $30,349, Mascetti & Holley, 741 South Main St., Torrington. $30,716. North Haven Twp., 2966 lin.ft. concrete paving Quinnipiac Ave., R. D. Daley Co., 6 Church St., New Haven, $8,250; C. W. Blakeslee & Sons, 58 Waverly St., New Haven, $8288. Maher & Sprague, 185 Church St., New Haven, $9222. Noted Sept. 27.

N. Y., Brooklyn—(Official)—M. M. Connolly, boro. pres. (Queens Boro.), received low bids regulating and repaving portion Jamaica Ave. from Uvalde Asphalt Paving Co., 1 B'way., New York City, $93,783; Borough Asphalt Co., 1301 Metropolitan Ave., $83,084. Noted Sept. 20.

N. Y., Buffalo—City received low bid repaving Wohler Ave., asphalt, from German Rock Asphalt Co., Inc., Morgan Bldg., $22,980.

★**N. Y., Rochester**—City let contract asphalt paving to Ribstein-Holler Co., 16 State St., Main St., $15,311; Chilli Ave., $14,344. Rochester Vulcanite Pavement Co., Exchange Pl. Bldg., Penhurst St., $21,155. Noted Aug. 23.

N. Y., Rochester—City received low bids paving Werner Park, asphalt, from Rochester Vulcanite Pavement Co., Exchange Pl. Bldg., $12,168, and Whitmore, Rauber & Vincinus, 279 South St., $12,618. Noted Aug. 23.

★**N. J., East Orange**—City let contract paving Woodland Ave., asphalt block, to Chapman & Lawrence, 26 Clinton St., Newark, $30,000.

★**N. J., East Orange**—City let contract resurfacing portion South Clinton St., bituminous concrete, to Uvalde Asphalt Paving Co., 1 Bway., New York City. Noted June 14.

★**N. J., Jersey City**—Bd. Freeholders, Hudson Co., Jersey City, and Essex Co., Newark, let contract repaving bridge on Lincoln Highway over Passaic River to R. J. Emmer, Weehawken. About $29,000.

★**N. J., Kearny**—(Arlington P. O.)—Town Council let contract paving Midland Ave., warrenite on concrete foundation, to Maher & McNicholas, Passaic Ave.

N. J., Newark—City received low bids paving (a) North 6th St., 11,100 sq.yd. asphalt, 6-in. concrete foundation; (b) Geneva St., 2900 sq.yd. asphalt, 6-in. concrete foundation; (c) North Canal St., 2700 sq.yd. granite, concrete foundation; from Newark Paving Co., 133 1st St., (a) $33,-[illegible], (b) $14,[illegible], (c) $15,285. Northern Constr. Co., Wiss Bldg., (a) $36,244, (b) $10,459; Standard Bitulithic Co., Essex Bldg., (a) $36,066, (b) $16,210; R. Sangiovanni, 80 Hoyt St., (c) $16,210; A. J. Milmoe, 83 Littleton Ave., (c) $16,297. Noted Sept. 20.

★**Pennsylvania**—(Official)—State Highway Comr. let contract 1 roads, McKeon Co., to Larson & Pascuzzi, Kane, $144,250; L. Schultz & Sons, Fredonia, N. Y., $43,777. Noted Aug. 28.

★**Pa., Phila.**—Bureau Highways let contract asphalt paving to Mack Paving & Constr. Co., Nicetown Lane and Whitaker Ave., and Barber Asphalt Co., Land Title Bldg., $14,[illegible] and $17,950 respectively.

Md., Elkton—Cecil Co. received low bid [illegible] mi. concrete road from Milford Corner to Elk Mills from E. R. Sutton, $[illegible].

★**W. Va., Edgewood**—(Wheeling P. O.)—(Official)—City let contract [illegible] sq.yd. paving 2-in. warrenite, 6-in. concrete foundation, to Atlantic Bitulithic Co., Va. Railway and Power Bldg., $[illegible]. Noted Sept. 20.

★**W. Va., Parkersburg**—City let contract paving [illegible] and Ellis Sts., to Kennedy & Son, Parkersburg. About $[illegible] and $[illegible], respectively. Noted Sept. 13.

★**N. C., Charlotte**—Mecklenburg Co. let contract building roadway to Camp Green, to Nail Constr. Co., 5 East 6th St., Chattanooga, Tenn. Noted Aug. 16.

S. C., Charleston—(Official)—City received low bids paving [illegible] sq.yd. concrete from General Road & Bridge Constr. Co., 709 Union Natl. Bank Bldg., Columbia, $1.41 per sq.yd.; General Contract Co., 14 Broad St., $1.43; McCready Bros. & Cooper, Inc., 4 Broad St., $1.55. Noted Sept. 19.

★**Fla., Kissimmee**—[illegible] Co. Comrs. let contract road from Kissimmee to Polk Co. line to be connected with Polk Highway between Jacksonville and Tampa, 278 mi., brick, asphalt, gravel, 14 ft. wide, from Kissimmee to fair grounds, balance 9 ft. wide, to Alabama Paving Co., American Trust Bldg., Birmingham.

★**Fla., Miami**—City let contract paving portions Waddell and 14th Sts., and Biscayne Dr., Contr. No. 16, also Le Gro, H and Columbia Aves., Contr. No. 17, to Municipal Constr. Co., Empire Bldg., Atlanta, Ga., $31,857 and $42,228 respectively; curbing and guttering on same contracts to J. F. Morgan & Co., $13,320 and $38,339 respectively; paving, grading and guttering in Miramar to Freedlund Constr. Co., Miami, $43,839. Noted Sept. 13.

★**Ala., Eutaw**—(Official)—Green Co. Comrs. let contract building road from here to Five Points to F. D. Harvey & Co., Memphis, Tenn. Noted Sept. 6.

★**Tenn., Hohenwald**—(Official)—Lewis Co. Comn. let contract paving 30 mi. road to Humphrey & Schenderman, Hohenwald. $16,500. Noted Sept. 27.

★**Ky., Owensboro**—Fiscal Court Daviess Co., let contract to Miller & Woodruff, paving Ware St., $15,562, Graves Lane, $20,-108, Pleasant Valley, $12,348; all of river gravel. M. G. Moore, Hopkinsville, Livermore, Henderson, Boonville, Curdsville, Hardinsburg, Ware, Graves Lane, Pleasant Valley and Hardinburg Rds., concrete, $24,-708. Noted Aug. 23.

★**O., Cleveland**—Bd. Control let contract improving and paving portion East 141st St., to Gould & Maybach, 823 East 150th St., intersections of Fairmount, Fairchild, Wilbus and East 107th Sts., to Baldwin Bros. Co., Rose Bldg., about $13,000. Noted Aug. 30.

★**O., Hudson**—City let contract paving College, Bolden and Prospect Sts., bitulithic or concrete foundation, to Warren Bros., 142 Berkeley St., Boston, Mass., $27,000.

★**Ind., Anderson**—(Official)—Madison Co. let contract building 2 rocmac roads, Monroe Twp., to J. R. Reason & Co., Pendleton, $29,275; Sullivan & Sullivan, Alexandria, $38,250. Noted Sept. 13.

Ind., Indianapolis—Bd. Pub. Wks. received low bids paving 46th St., (a) asphalt (b) bituminous concrete, from Republic Constr. Co., 1614 Merchants Bank Bldg., (a) $4.85 (b) $4.65; American Constr. Co., 108 North Delaware St., (a) $5.05, (b) $4.80.

★**Michigan**—(Official)—State Highway Comn., Lansing, let contract gravel road from Homer to Mt. Haley Twp. to Peterson, Guilding & Allsuede, Sanford, $23,950.

★**Mich., Judith Gap**—City let contract cement sidewalks, 34 blocks, to J. A. Gudgel & Co., Kalispell, Mont., $20,000.

★**Mich., Mason**—Ingham Co. let contract grading road 9½ mi. and constructing culvert to C. V. Walker, Fremont, $63,460.

★**Ill., Danville**—Vermilion Co. let contract paving in Carroll Twp. and village of Indianola, bituminous asphalt, to M. H. Lewis, Hoopeston, $50,000.

★**Wis., Racine**—(Official)—City let contract paving to Western Impvt. Co., 840 Racine St., $2.25 per sq.yd. sheet asphalt. Noted Sept. 13.

★**Minn., Minneapolis**—(Official)—City will widen portion 9th and 8th Sts. by day labor. About $236,539, and $200,000 respectively. Noted Sept. 20.

★**Minn., Minneapolis**—City will grade, surface and build walks and curbs on portions Park Rd. by day labor. About $125,-000. F. W. Cappelin, city engr.

Kan., Columbus—Cherokee Co. received low bids for Blake Rd. from E. F. Wilcox, Kansas City, $55,416; D. E. Dorsey, Weir City, $[illegible].

★**Neb., Omaha**—Douglas Co. Comrs. let contract resurfacing West Dodge Rd. to Bauer & Johnson, 45½c. per sq.yd.

★**Arkansas**—State Highway Comn., Little Rock, let contract road to Camp Pike, warrenite, to M. D. L. Cook, 315 Southern Trust Bldg. About $[illegible].

★**Tex., Hereford**—City let contract building 4 blocks pavement, concrete base, asphalt filler, to Jordan Paving Co., Plainview, Tex. About $[illegible].

★**Tex., New Braunfels**—City let contract paving streets to Uvalde Rock Asphalt Co., San Antonio, $[illegible].

★**Tex., Victoria**—City let contract paving 60,581 yd. rock asphalt, to Uvalde Rock Asphalt Co., 411 Sewearingen-McCraw Bldg., San Antonio, $[illegible]. Noted Aug. 21.

Okla., Ada—City received low bids paving portions East Main St., blocks, from Western Paving Co., Oklahoma City, $1.98 per sq.yd., Bert Hahn Constr. Co., Ada, $2.07. E. P. McCormick, Tulsa, $2.11.

★**Colo., Denver**—(Official)—Boulder and Adams Co. Comrs. let contract paving 5-mi. Federal Blvd., north of city limits, tarvia, Finley method application, to Kelly & Sheeley, $40,000. Noted Sept. 6.

★**Ariz., Phoenix**—City let contract paving, grading, curbing, guttering and installing sewers on East Moreland St. to Southwestern Contr. Co., Phoenix.

Wash., Seattle—King Co. Comrs. received low bid grading and graveling road between Renton and Renton Junction from E. J. McQuaide, Seattle, $14,083. Noted Aug. 23.

★**Wash., Seattle**—City let contract paving Latona and 14th Ave. to R. G. Stevenson, 1327 Ewing St. About $27,601 and $8153 respectively; Valley St., to F. N. Badolato, $9462; grading Court St. and other streets to Espeland Bros., $13,615.

★**Wash., Vancouver**—Clarke Co. Comrs. let contract paving 7800 ft. of Fourth Plain Rd., involving 16 ft. bitulithic on 4-in. concrete base, to United Constr. Co., Northwest Bank Bldg., Portland, Ore. About $27,027. Noted July 5.

★**California**—(Official)—State Highway Comn., Sacramento, let contract 7.2 mi. grading in Humboldt Co., between Del Rio and Fortuna, to A. Robinson & R. R. Smith, Fortuna. Noted Sept. 20.

★**Cal., San Francisco**—City let contract concrete sidewalks on Chestnut St. to F. O'Shea, San Francisco, about 17c. per sq. ft., improving Alvarado St. to J. M. Smith, 407 11th St.; about $1.50 per cu.yd., excava.; $2.90 per ft., 8-in. sewer; $80 each, brick manhole; $0.85 per ft., armored concrete curbs; $0.14 per sq.ft. concrete sidewalks; $0.41 per sq.ft. vitr. brick pavement; $0.25 per sq.ft. asphalt pavement; improving Flood Ave. and Clayton St. to Flinn & Treacy, 1st Natl. Bank Bldg. About $0.80 per ft., concrete curb; $0.26 per ft., asphalt pavement; $0.45 per sq.ft. basalt-block pavement; $1.25 per ft., granite curbs; $0.14 per sq.ft., concrete sidewalks.

★**Cal., Ventura**—Bd. Superv. let contract surfacing 1,193,000 sq.ft. concrete pavement on Telegraph Rd. to Rooney-Wyckoff Co., Consolidated Realty Bldg., Los Angeles. About $22,667. Noted Sept. 20.

★**Que., Verdun**—See "Sewers."

★**Que., Yamachiche**—Village let contract macadam paving to A. Carrier, Ste. Tite, $20,000.

★**Ont., Windsor**—City let contract resurfacing Bruce St. to Merlo, Merlo & Ray, 296 Windermere Rd., Walkerville, $14,467.

RAILWAYS—STEAM & ELECTRIC

Proposed Work

Pennsylvania—Pennsylvania R.R. plans to extend its yards at Marietta, including 7 pairs of tracks, about 1 mi. A. C. Shand, Broad St., Sta., Phila., ch. engr.

Georgia—Savannah Electric Co., plans trolley line from Savannah to Port Wentworth. About $100,000. H. C. Foss, Savannah, genl. mgr.

Florida—Jacksonville, Miami & Tampa Interurban Ry. prepared plans for line to connect Jacksonville, Pablo Beach, St. Augustine, Daytona, Miami, Sanford, De Land, Orlando, Kissimmee, Bartow, Lakeland, Tampa and other points. W. S. Alyea, St. Cloud, Fla., gen. mgr.

Kentucky—Lousiville & Nashville R.R. made surveys for 7-mi. extension on Catron's Creek and 1-mi. Slater's Fork, to develop coal mines of Kentemia Corp. W. H. Courtenay, Louisville, ch. engr.

Wisconsin—Minneapolis, St. Paul & Sault Ste. Marie Ry. plans to build line from Rugby Jct., Schleisingerville P. O., to Milwaukee; also build passenger depot and freight house in Milwaukee. About $6,000,000. C. N. Kalk, Minneapolis, ch. engr.

Idaho—Pella-Leffler Short Line Ry., recently incorporated with $300,000 capital stock, plans to build line from Pella to junction on Wabash Ry., about 4½ mi. P. H. Van Gorp, Pella, pres.

Utah—Salt Lake & Utah R.R. plans to build line from Salt Lake City to Eureka, about 50 mi. F. D. Nauman, Salt Lake City, ch. engr.

Washington—See "Industrial Works," Tacoma.

California—See "Miscellaneous," Blyth.

Railways—Steam and Electric (Continued)

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Pennsylvania** — (Official) — Carnegie Steel Co. let contract building 5-mi. double track railroad from Bull Run on Monongahela & Southern branch of Pennsylvania R.R. across deep gulches and through hills to coke plant at Clairton to Gillespie Steel Co., Westinghouse Bldg., Pittsburgh. Work involves 1,200,000 cu.yd. excava., 75,000 cu.yd. concrete and 1700 ft. double-track tunnel.

★**Montana**—Big Hole R.R., Anaconda, let contract building 20-mi. line to connect Divide with mines of Elkhorn Mining Co., to Clifton, Applegate & Toole, 2 North Cedar St., Anaconda.

EXCAVATION AND DREDGING

Proposed Work

Miss., Biloxi—Dredging—City plans to appropriate $25,000 or $30,000 for dredging Back Bay Channel.

Ky., Dixon—Ditch—Webster Co. Drainage Bd. soon receives bids building 4 mi. ditch including dredge work. About $25,000. W. C. Hardwick, vice pres.

Ill., Lewiston — (Official) — Drainage — West Matanzas Drainage & Levee Dist., Fulton Co. received no bids laying 7200 ft. 8-in. tile, Lateral No. 1, 2200 ft. 18-in. tile, Lateral No. 2; 4200 ft. 16-in. tile Ditch No. 4. J. H. Wehner, comr. Noted Sept. 13.

Ark., Jonesboro—(Official)—Drainage—Cache River D. D. receiving bids about Nov. 10, building main ditch, 25 mi. long, 125 ft. wide, 30-mi. laterals, 25- to 45-ft. wide, to drain 110,000 acres, Craighead, Lawrence and Jackson Cos. J. R. Rhyme, Corning, engr. Noted Sept. 20.

Mo., Ash Grove—Excavation—Ash Grove Portland Cement Co. plans to build 20-acre artificial lake. About $60,000.

Mo., Poplar Bluff—Drainage—Inter River D.D. had plans prepared by Morgan Eng. Co., Goodwyn Institution, Memphis, Tenn., for 210-mi. canals and 50-mi. levee to drain 114,000 acres in southeastern Missouri, involving 8,000,000 cu.yd. excav., 2,500,000 cu. yd. levee embankment. About $1,240,000.

Idaho, Idaho Falls—Drainage—City plans to establish drainage district along Sand and Willow Creeks to eliminate flood waters. About $90,000.

Ore., Medford—Irrigation—City voted to establish Medford Irrigation Dist. involving 24,000 acres Rogue River Valley.

Cal., Merced—Irrigation—Merced Co. plans to establish districts to build irrigation and drainage systems. Address E. G. Adams, Livingston.

Cal., Olinda—Irrigation—Happy Valley Irrigation Dist. plans election to vote on $80,000 bonds to extend canal system.

Cal., Richmond—Dredging—City plans to spend $400,000 to improve harbor, $200,000 will be used for dredging, other half for bulkheading, rip rapping and filling. H. D. Chapman, city engr.

Cal., San Diego—Dredging—See "Federal Government Work."

BIDS DESIRED

Ind., Rockport—Ditches—Until Oct. 22, by Spencer Co., building ditches involving 187,000 cu.yd. excav. H. Wells, supt. constr.

Ill., Havana—Ditches—Until Oct. 15, by 3d. Comrs. Garden Special D. D., Mason Co., building ditches, involving 194,342 cu.yd. excavation. J. F. Kreiling, comr.

Ill., Lawrenceville—Ditch—Until Oct. 6, by Lawrence Co. Comrs., rebuilding 6 mi. old ditch, involving 50,000 cu.yd. excava., also 2 mi. new ditch, involving 72,000 cu.yd. excav. G. C. Harvey, Mt. Carmel, engr.

Ia., Boone—Drain—Until Oct. 9 by Ed Supervs. Boone Co., building Drain No. 68, involving 20,270 ft. 6- to 24-in. tile. J. R. Curry, aud.

Minn., Elbow Lake—Drain—Until Oct. 27, by C. M. Nelson, aud., Grant Co., building Drain No. 29, main open ditch, 21 mi. long, bottom width 6 and 8 ft., average depth 1 to 12 ft., involving 124,225 cu.yd. excav., 14,700 ft. 6- to 32-in. tile. H. Dunaway, co. engr.

Minn., Gaylord—Ditch—Until Oct. 12 by Sibley Co., Henderson, building Judicial Ditch No. 8 involving 37,171 ft. 7- to 12-in. tile. About $33,581. F. Heppenstedt, aud.

Minn., Lesueur Center—(Official)—Ditch—Until Oct. 24 by T. F. Dunn, Lesueur Co. aud., building Co. Ditch No. 45, involving 156,545 cu.yd. excav. About $22,830.

Minn., Mankato—Ditch—Until Oct. 19, by Blue Earth Co., building Co. Ditch No. 50, involving 84,432 cu.yd. excav., 81,790 ft. 8- to 38-in. tile. C. L. Kennedy, aud. R. H. Allison, engr.

Minn., St. Peter—Ditch—Until Oct. 16, by Nicollet Co., building Co. Ditch No. 29, involving 26,610 ft. 6- to 20-in. tile. About $10,082. W. H. Holz, co. aud.

Kan., Belvue—Ditches—Until Oct. 8 by Bd. Dir. Bellevue D.D. building drainage ditches and change of channel, Lost and Welch Creek River Dists. V. R. Parkhurst, 627 Kansas Ave., Topeka, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Ill., Paxton**—Ditch—Ford Co. let contract building ditch, subdistrict No. 2, Union D. D., to W. F. Sturenburg, De Kalb, 0.179c. per ft.

★**Cal., Meridan**—Drainage — Sacramento River West Side Levee Dist. and Rec. Dist. No. 70, let contract clearing strip through Butte Slough, to Kenyon & Whitman, Forum Bldg., Sacramento, $100,000.

Cal., Oakdale—Canals—Oakdale Irrigation Dist. will spend $35,000 to build concrete canals and replace flume. Work will be done by day labor. Noted Sept. 20.

INDUSTRIAL WORKS

Proposed Work

R. I., Woonsocket—Tips Motor Co., recently incorporated with $400,000 capital stock, plans to build factory. M. Tips and others, incorporators.

Conn., Bridgeport — United States Airplane Co., recently incorporated, plans to build plant. About $500,000.

N. Y., Brooklyn—R. Freedman, 4185 Fulton St., had plans prepared by E. C. Georgi, archt., 4185 Fulton St., for 1-story, 157 x 220-ft. garage. About $50,000.

N. Y., Brooklyn—Lewis Constr. Co., 361 Fulton St., had plans prepared by S. Millman & Sons, archts., 1780 Pitkin Ave., for 1-story, 105 x 148-ft. brick garage, on Ocean Parkway. About $65,000.

N. Y., Buffalo — Standard Oil Co., 26 Bway., New York City, plans warehouse at Atlas Works, 1103 Elk St. About $100,000.

N. Y., New York—Empire Trust Co. had plans prepared for 4-story, 54 x 94-ft. brick garage at 51-5 Lexington Ave. About $75,000. L. W. Baldwin, 120 Bway., pres. P. J. McKeown, 217 Bway., archt.

N. Y., New York—Fifth Ave. Coach Co., 10 East 102nd St., had plans prepared by J. C. McGuire, engr., 50 Church St., for 4-story, 200 x 400-ft. factory, 133rd St. and Bway. Noted Sept. 27.

N. Y., New York—Schencke Piano Co., 273 Rider Ave., plans 3- to 5-story, 62 x 90-ft. factory, 137th St. and Willow Ave. About $75,000. A. E. Davis, 258 East 138th St., archt.

N. Y., Rochester—Bausch & Lomb Optical Co., 1635 St. Paul St., had plans prepared 5-story, 120 x 400-ft. rein.-con. factory, St. Paul, Lowell and Martin Sts.

N. J., Newark — Newark Gear Cutting Machine Co., 69 Prospect St., plans 4-story, 42 x 50-ft. machine shop, office and pattern storage building. H. F. Eberhardt, archt.

N. J., Newark—J. Oschwald, Plum and Hackett Sts., plans 2-story, 65 x 120-ft. rein.-con. automobile service station. About $35,000.

N. J., West New York—(Weehawken P. O.)—New Process Rubber Co., 488 Bergenline Ave., recently incorporated, plans to build automobile tire factory. About $50,000.

Pa., Phila.—F. A. Poth & Sons, 3d & Girard Ave., contract for factory, 44 x 80-ft. brick addition. About $18,000. F. J. Poth, 3d and Girard Aves., pres. Chas. Cooper, 1421 Chestnut St., archt.

Pa., Pittsburgh — American Locomotive Co., Seymour and Beaver Sts., plans 1- and 2-story steel and concrete paint and erecting shops. About $47,000.

Pa., Pittsburgh—J. Muller & Son Plastering Co., 148 40th St., plans 4-story steel and concrete addition to plant on 40th and Hatfield Sts.

Pa., Pittsburgh—National Supply Co., Union Bank Bldg., plans to build warehouse, Preble Ave., Adams and Delaware Sts. About $50,000.

Pa., Pittsburgh—Pennsylvania Chocolate Co., 5850 Center St., plans 6-story factory addition at 5850 Center Ave. S. S. Marion, 5 South Front St., pres. Ballinger & Perrot, archts., 17th and Arch Sts., receive bids about Oct. 10.

Pa., Reading—Reading Ry. plans roundhouse. About $175,000. S. T. Wagner, Old Colony Bldg., ch. engr.

Md., Sharptown — Eastern Shore Shipbuilding Corp. plans shipbuilding plant. About $150,000. R. R. Livingston, 2 Rector St., New York City, pres. Hamilton & Chambers Co., 29 Bway., New York City, archt.

W. Va., Parkersburg—Kahn & Fieldman, 25 Madison Ave., New York City, recently incorporated, plans 2-story, 50 x 500-ft. silk mill here.

Ala., Mobile—See "Miscellaneous."

La., Shreveport—Republic Oil & Refining Co. plans to establish oil-refining plant here. About $250,000.

Tenn., Kingsport—White Oak Veneer & Lumber Corp. plans to rebuild plant recently destroyed by fire. Loss, $50,000.

Tenn., Nashville—See "Miscellaneous."

O., Cincinnati—P. W. Drackett & Sons Co. plans 2- or 4-story, 75 x 200 ft. and 2- or 4-story, 40 x 80 ft. chemical plant, Spring Grove Ave. P. W. Drackett, Pickering Bldg., pres. R. E. Bostrum, archt., Pickering Bldg., soon receives bids.

O., Cincinnati—Rapid Electrotype Co., Canal St., increased its capital stock from $50,000 to $150,000 and plans factory, McMicken Ave.

O., Cincinnati—Westerington Pump Co., 1504 1st Natl. Bank Bldg., plans 1-story, 50 x 208 ft. machine shop. About $60,000. Austin Co., 1470 Euclid Ave., Cleveland, archts.

O., Cleveland—Cleveland Electric Illuminating Co. plans 1-story, 82 x 122-ft. and 180 x 193-ft. power house at 150 E. 10th St. About $150,000. S. Scoville, Illuminating Bldg., pres. P. L. Cobb, 408 Illuminating Bldg., engr.

O., Cleveland—Cleve. Brass Powder Co., 1120 East 132nd St., increased its capital stock from $50,000 to $150,000 and plans 2-story, 30x100-ft. factory.

O., Cleveland—A. P. Schraner Pattern Works Co., 430 Prospect Ave., N. W., whose factory was recently destroyed by fire, having plans prepared by F. M. Class, archt., for 2- and 3-story, brick and concrete factory, Pave Ave., N. E., and East 33rd St. About $50,000.

O., Lorain—Cleveland Steel Co., Lorain, plans large steel manufacturing plant on site of steel mills on east side of Black River.

Mich., Detroit—Vernor & Co., 611 and West Lafayette Aves., having plans prepared for paving and mill storage plant, steel frame, 1 story & basement, 120x300 ft. Also 1 story, 100x200 ft. Estimated cost $100,000.

Ill., Chicago—C. J. Ballegeer, 710-8 South Dearborn St., will build 2-story, 105 x 141-ft. garage, bowling alley and billiard parlor. About $110,000.

Wis., Eau Claire—Standard Oil Co. plans to build plant. About $150,000.

Wis., Grand Rapids—Johnson Milling Co. retained W. E. Fox, engr., to prepare plans for hydro-electric power plant and dam on Wisconsin River. About $100,000.

Wis., Superior—Superior Iron Works & Manufacturing Co. will erect machine shop, 100x200 ft., and boiler shop, 100x200 ft., to build marine engines. Wm. Claudsen, 1414 Hammond Ave., Superior, engr.

Wis., West Allis—Bucyrus Mfg. Co., 36th Ave. and Lapham St., plans 1-story, 100x600 ft. machine addition to factory. About $85,000. Irwin & Prince, Pere Marquette Bldg., Milwaukee, archts.

Wash., Kirkland—Pacific Ft. Venner & Box Board Co., Puget Sound, Seattle, having plans prepared for 1-story factory and dock. About $100,000.

Wash., Tacoma—Chicago, Milwaukee & St. Paul R.R. plans extension to ammonia plant in connection with installation of the Solvay process. About $400,000. C. F. Loweth, Chicago, Ill., engr.

Cal., Arcata—Central California Transportation Co. plans concrete pier. About $100,000.

Industrial Work (Continued)

Cal., Los Angeles—Pioneer Commercial Auto Co. having plans prepared by L. A. Smith, archt., 621 Investment Bldg., 2-story, 97x234-ft., reinforced garage, 18th and Figueroa Sts. About $75,000.

Cal., Redwood City—New York, San Francisco & Hongkong Steamship Co. purchased 14-acre site for shipbuilding plant.

Que., Montreal—Dominion Shoe Mfg. Co., 111 Commissioners St. E., soon lets contract for shoe factory. About $125,000. M. Dufresne, 186 La Salle Ave., Maisonneuve, archt.

Ont., Copper Cliff—Canadian Copper Corp. will increase its capital stock to $10,000,000 and plans 3000-ton mill.

Ont., Hamilton—American Can Co., Emerald St., N., soon lets contract for addition to factory. About $125,000. K. Bethune, engr.

Ont., Toronto—Imperial Munitions Bd., Royal Bank Bldg., King and Yonge Sts., plans factory on Wallace Ave. About $100,000.

BIDS DESIRED

Ky., Covington—(Official)—Until Nov. 30 by City for franchise right and privilege to build, operate and maintain power houses, poles, etc. L. L. Applegate, recdr.; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., West Springfield**—Gilbert-Barker Mfg. Co., Union St. and Cold Spring Ave., let contract 40x90-ft. concrete, brick and steel addition for power plant to H. Wales Lines Co., Meriden, Conn., $75,000.

★**Conn., Hartford**—G. Fox & Co., Church and Pratt Sts., let contract 8-story, 44x120-ft. and 43x55-ft. concrete warehouse and boilerhouse to J. Stewart & Co., Inc., 30 Church St., New York City. $100,000.

★**N. Y., Lockport**—United Paper Board Co., 171 Madison Ave., New York City, let contract 1-story, 35 x 100 ft. power house to Curran & Swartout, 440 Granite Bldg., Rochester.

★**N. Y., Syracuse** — Crucible Steel Co., West Fayette and Magnolia Sts., let contract brick and steel factory addition to J. D. Taylor Constr. Co., 115 South Salina St. About $65,000.

★**N. J., Passaic** — New York Belting & Packing Co., 31 Chambers St., New York City, let contract 4-story, 75 x 250-ft. brick and reinforcement factory to J. W. Ferguson Co., 952 Market St., Paterson. Noted Aug. 23.

★**Ga., Atlanta**—Georgia Ry. & Power Co. let contract 3-story, 60 x 160-ft. reinforcement warehouse to A. V. Gude, Grant Bldg., $50,000.

★**O., Columbus**—Commercial Impvt. Co., Commerce Bldg., let contract 1-story factory, 3rd and Spring Sts., to E. Lyford, 104 North 3rd St., $30,000.

★**Ill., Chicago**—Chicago Short Line R.R. let contract roundhouse, repair shop and office to J. H. Pruessen, 3311 South Lawndale Ave. About $10,000.

★**Ill., Chicago** — Fitzpatrick Bros. Soap Co. let contract 3- 3½ and 4-story soap factory to Strombeck-Becker Bros., 3029 South Halsted St. About $90,000.

★**Ill., Lyons**—International Refining Co., 327 South Michigan Ave., Chicago, will build factory on refining plant, Joliet Rd. and West 4th St., near Lyons, for day labor. About $400,000. E. J. Reid, engr.

★**Wis., Sheboygan**—Northern Furniture Co., South Water and South Jersey Sts., let contract 5-story concrete addition to Wm. Guenther & Sons Co., 1621 Huron Ave. Noted Sept. 20.

★**Ia., Des Moines**—Standard Oil Co. let contract 2-story warehouse, garage, barn and filling station to F. Wentz Co., 713 Mulberry St. About $250,000.

Minn., Minneapolis—See "Buildings."

★**Neb., Omaha**—J. F. Fitzgerald, 249 Bee Bldg., let contract 1-story, 125x132-ft. garage, 16th and Leavenworth Sts., to Gehnke & Strauss, 1516 Farnam St. About $150,000.

★**Mo., Kansas City**—Kansas City Light & Power Co., Grand Ave., let contract foundation of $4,000,000 unit to new $10,000,000 power plant to Foundation Co. of New York, 238 B'way., New York City. Noted Sept. 27.

★**Tex., San Antonio**—Southern Ice & Cold Storage Co., 110 Guenther St., let contract building factory to York Mfg. Co., York, Pa., $165,000.

★**Colo., Denver**—Gas & Electric Co. let contract 1-story, 60 x 160-ft. boiler house and stack to H. H. Kerry, 152 Washington St. About $56,000.

★**Ariz., Tempe**—Tempe Milling Co., Mill Ave., let contract 3-story, 40 x 75-ft. warehouse, 4-story, 40 x 40 ft. mill building, 5-story, 20 x 40 ft. bins, etc. to J. C. Steel, 1013 West Jefferson St.

★**Cal., Orange**—Santiago Orange Growers Assn. let contract 143 x 170-ft. precooling and packing plant, West Palm St., to H. C. Clarke Co., 1101 East 5th St., Los Angeles, $50,059. Noted May 17.

★**Ont., Hamilton**—Armour & Co., let contract brick ice plant, Wentworth St., to Piggott Healey Co., 36 James St., S., $50,000.

BUILDINGS

Proposed Work

Mass., Haverhill—Hospital—Gale Hospital had plans prepared by H. Colby, archt., for addition. About $56,000. Dr. H. M. Crittenden, secy.

Mass., Somerville — High School — Bd. Educ. had plans prepared 2-story, 80 x 86 ft. About $90,000. G. E. Whitaker, chn. W. T. Littlefield, 9 Hamilton Pl., Boston, archt.

Conn., Middletown — Hospital Wards — State soon receives bids. About $125,000. H. S. Noble, Hartford, supt. Johnson & Bruns, Inc., 26 State St., Phila., Pa., archts.

N. Y., Allegheny—Science Hall—St. Bonaventure College plans, 4-story, 60 x 140 ft. brick. About $50,000.

N. Y., Binghamton—School—Bd. Educ. plans altering and repairing Oak St. School, 2-story. About $50,000. E. J. Kelly, supt. C. M. Carlton and L. J. Kaley, O'Neill Bldg., archts.

N. Y., Buffalo—Freight Station—Pennsylvania R.R. plans, 30 x 420 ft., Louisiana and Carroll Sts. About $150,000. A. C. Shand, Broad St. Sta., Phila., ch. engr.

N. Y., Glens Falls—Library and Park—Crandall Trust, c/o O. G. Smith, 178 Glen St., plans improvement. About $75,000. C. A. Platt, 101 Park Ave., New York City, archt.

N. Y., Jamestown — Temple — Masonic Temple Assn. plans 6-story. F. Bush, chn. A. J. Bodker, 62 West 45th St., New York City, archt.

N. Y., Rochester—Club House—Knights of Columbus plan, 3 story, 90 x 200 ft. brick and steel. About $150,000. Gordon & Madden, Sibley Bldg., archts.

N. Y., Syracuse—Laboratory—Syracuse University plans, 5-story, 40 x 120 ft. brick and steel. About $125,000. J. R. Day, chancellor. E. A. Hallenbeck, 307 Maple St., archt.

N. J., Asbury Park — Church — First Methodist Episcopal Congregation plans rebuilding. About $100,000. L. K. Willman, Grand and 2nd Aves., pastor. L. E. Smith and H. F. Warren, 2 West 47th St., New York City, archts.

N. J., Camden—High School—Bd. Educ. had plans prepared by C. S. Adams, archt., 3-story. About $500,000.

N. J., Red Bank — School — Bd. Educ. plans 2-story, 75 x 123-ft. About $100,000. R. A. Strong, pres. E. A. Arend, Kinmouth Bldg., Asbury Park, archt.

N. J., Red Bank—Store—C. Lewis, 324 Broad St., had plans prepared. About $50,000.

Pa., Bloomsburg—Bank and Office—Columbia County Trust Co. having plans prepared by V. T. Ritter, archt., 1st Natl. Bank Bldg., Huntington, W. Va., for 4-story, 24 x 120 ft.

Pa., Chester—(Official)—Club House—Knights of Columbus receiving bids about January, 3-story, 60x60-ft., about $50,000. C. W. Brazer, Crozer Bldg., archt. Noted Sept. 27.

Pa., Olney—(Phila. P. O.)—Bank—Olney Bank plans 1-story, 40 x 80 ft. About $75,000. T. Tansey, 5th St. and Tabor Rd., pres. Bothwell & Crugger, Olney Park, Phila, archts.

Pa., Olyphant — Church — St. Patrick's Congregation had plans prepared by J. J. Howley, archt., Scranton. About $50,000.

N. C., Charlotte—High School—Bd. Educ. plans 2-story, 150 x 225 ft. About $150,000. J. F. Leitner, archt., Healy Bldg., Atlanta, Ga., soon receives bids.

N. C., Greensboro — Bank and Office — American Exchange National Bank, having plans prepared, 10-story. About $200,000.

Ga., Atlanta — Sunday School — Grace Methodist Episcopal Congregation having plans prepared. About $75,000. W. McElreath, chn. bldg. com.

Tenn., Knoxville—Schools—See "Water-Works."

Ky., Louisville—Hotel—Central Hotel Co. plans 8-story, steel; 150 rooms. Joseph & Joseph, Republic Bldg., archts.

O., Akron—Hospital—Akron City Hospital plans 7 additional units, brick, steel and concrete. About $750,000.

O., Cincinnati—School—Bd. Educ. had plans prepared, 2-story, concrete and stone, 3042-72 Durrell Ave. About $200,000.

O., Cleveland—Schools, Hospital, etc.—City election Nov. 6, to vote on $3,000,000 bond issue to build schools, $1,000,000 for hospital and sanitariums and $1,250,000 for jail.

O., Cleveland—Schools—Bd. Educ. had plans prepared by W. R. McCornack, archt., East 6th St. and Rockwell Ave., additions to Mt. Pleasant and Chesterville Schools. About $71,400 and $67,800 respectively.

O., Columbus—Hospital—Children's Hospital, Miller Ave. and Franklin Park, having plans prepared for hospital in Livingston Park. Richards, McCarthy & Balford, Hartman Bldg., archts.

O., Columbus—Hotel—Grant Realty Co. soon lets contract 12-story, brick and terra cotta, Town St. and Grant Ave. About $280,000. M. Peterman, Hartman Bldg., archt.

O., Columbus—Schools—City plans $3,500,000 bond issue to build, improve and enlarge various high and elementary schools.

O., London—Penitentiary—Penitentiary Comn. plans 2-story. About $3,000,000. S. J. Black, Upper Sandusky, secy. Richards, McCarty & Bulford, Hartman Bldg., Columbus, archts.

O., Norwalk—School—Bd. Educ. having plans prepared by J. E. Scott, archt., for 2-story. About $115,000. J. A. Sipher, pres.

O., Plymouth—High and Grade School—City plans election soon to vote on $50,000 bond issue for 2-story. C. S. Walker, clk. bd. educ. Althaus & Jones, Market Bldg., Mansfield, archt.

Mich., Detroit—Y. W. C. A. soon lets contract 10-story building, Adams Ave. and Witherell St.

Ill., Chicago—Hotel—Blackstone Co., 50-58 East 7th St., plans 21-story, brick. About $1,000,000. Marshall & Fox, engrs.

Ill., Chicago—Office—Old Colony Insurance Co., 37 West Van Buren St., plans 16-story, 50 x 166-ft., 166-72 West Jackson Blvd.

Ill., Chicago — School and Hall — St. Bartholomew's Parish plans, Addison St. and Lavergne Ave. About $50,000. Rev. W. O'Shea, pastor.

Wis., Green Bay—School—City Council passed ordinance to issue $175,000 bonds for rebuilding Whitney School, recently destroyed by fire.

Wis., Milwaukee—Depot and Freight House—See "Railways."

Wis., Milwaukee — Hospital — Columbia Hospital receiving bids in December for 2nd unit, Hartford and Maryland Aves. About $250,000. F. L. Sivyer, chn. executive com. Schuchardt & Judell, 428 Jefferson St. archts.

Buildings (Continued)

Wis., Wales—Infirmary—State plans addition to State Tuberculosis Sanitarium. About $100,000. M. J. Tappins, secy. bd. control. A. Peabody, Capitol Bldg., Madison, archt.

Ia., Grand View—(Des Moines P. O.)—School—Grand View Dist. plans, 2-story, 60 x 140 ft., brick. About $70,000. H. V. Stineman, secy. Keffer & Jones, 610 Youngerman Bldg., Des Moines, archts.

Ia., Spencer—School—Bd. Educ. plans alterations and additions. About $70,000. F. A. Cook, secy. J. D. Chubb, 109 North Dearborn St., Chicago, archt.

Neb., Lincoln—Hotel—Nebraska Bldg. & Investment Co., 130 South 13th St., plans 12-story, 108 x 150-ft. stone, steel and rein.-con. About $500,000. R. E. Schaaf, pres. J. W. Johnson, Security Mutual Life Bldg., archt.

N. D., Fargo—High School—Bd. Educ. plans altering and repairing. About $70,000. R. Guthrie, secy. W. B. Ittner, archt., Bd. Educ. Bldg., St. Louis, Mo., receives bids about Nov. 15.

Mo., Kansas City—School—Dominican Fathers plan 100 x 128 ft. school, auditorium and gymnasium. About $60,000. White & Dean, archts., 31 Bellefontaine St., soon receives bids.

Tex., San Antonio — Temple — Scottish Rite Masons rejected bids, 104 x 1151ft., brick and steel. About $180,000. New bids. W. H. McCullough, 420 San Antonio St., secy. Hubbell & Greene, North Texas Bldg., El Paso, archt.

Okla., Elk City—High School—School Dist. No. 6 voted $50,000 bond issue for school. Address J. G. Scott.

Okla., Oklahoma—School—City plans election to vote on $50,000 bond issue to build school.

Okla., Oklahoma — Station — St. Louis & San Francisco R.R. soon lets contract 2-story, 130 x 146-ft. brick and rein.-con. About $300,000. E. D. Levy, gen. mgr. Lebenbaum, Marx & Vigeant, 175 West Jackson Blvd., Chicago, archts.

Okla., Tulsa—Hotel—Fay D. Pickens, 1230 South Carson St., and associates, soon receive bids, 12-story. About $1,000,000.

Okla., Tulsa—Church—First Christian Congregation having plans prepared by Van Slyke & Woodruff, archts., 607 Burk Burnett Bldg., Ft. Worth, Tex., stone, brick and rein.-con. About $100,000.

Wash., Olympia—(Official)—High School—Bd. Educ. receives bids about Dec. 1, 3-story; about $100,000. J. H. Wohleb, Capitol Natl. Bank Bldg., archt. Noted Sept. 20.

Ore., Portland—School—Bd. Educ. having plans prepared, 2-story, brick, East Pine and East 16th Sts. About $175,000.

BIDS DESIRED

Mass., Middletown — (Official)—Hospital—Until Nov. 25, by Essex Co. Comrs., Court House, Salem for 5 2-story buildings. J. H. Bickford, 110 State St., Boston, archt. Noted Sept. 20.

N. J., Red Bank—School—Until Oct. 18, by Bd. Educ., 3-story. About $60,000. F. M. Truex, 1170 Broadway, New York City, archt. Noted Aug. 16.

Ind., Ft. Wayne—Hospital—Until Oct. 23 by Hamilton Co., for 2-story, 30 x 80-ft. About $50,000. W. J. Johnson, aud. C. Heatherhogg, Hamilton Natl. Bldg., archt.

Kan., Abilene—High School—Until Oct. 24, by Bd. Educ. About $90,000. A. M. Curry, clk. W. H. Sayler, Gumbel Bldg., Kansas City, Mo., archt.

Kan., Smith Center — (Official) — Court House—Until Oct. 23, by Bd. Comrs. Smith Co. About $85,000. T. W. Williamson & Co., 416 Central Natl. Bank Bldg., Topeka, archts. Noted June 21

Kan., Wichita—Church—Until Oct. 17, by First Methodist Episcopal Congregation, 1-story, 100 x 130 ft. About $85,000. J. Gaisford, Memphis, Tenn., archt.

Tex., Beaumont—Freight Depot—Until Oct. 15, by Gulf Coast Line American Trust Bldg., Neches and Bowel Sts. About $50,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Clinton**—School—St. John's Church Society let contract, 2-story, to Mc-Dermott Bros., 18 Cedar St., Worcester, $50,000. Noted Apr. 26.

★**Conn., Bridgeport**—School—Bd. Educ. let contract 2-story, 109 x 230-ft. Steuben and Gilmore Sts., to W. Martin & Son, Franklin Bldg., $232,942.

★**Conn., Hartford**—City Hall—City let contract steel work in restoration of old city hall to Berlin Constr. Co., East Berlin, $100,000.

★**N. Y., Brooklyn**—Brooklyn Training School for Girls, 1483 Pacific St., let contract 2- and 3-story 30 x 105 ft., 25 x 45 ft. and 23 x 35 ft. to E. E. Paul Co., 101 Park Ave., New York City. Noted May 10.

★**N. Y., Poughkeepsie**—School—Bd. Educ. let contract 2-story school, to be known as Warring School, Smith and Mansion Sts., to C. Van Akin, 191 Elmendorf St., Kingston. About $50,000.

★**N. Y., Rochester**—Church—Dewey Ave. Presbyterian Congregation let contract 90 x 146-ft. brick, to A. Friederick & Sons, 710 Lake Ave., $75,000.

★**N. Y., Rochester** — High School — Bd. Educ. let contract, at Exposition Park, to Gorsline & Swan Constr. Co., Power Bldg., $387,000.

★**N. J., Morristown** — High School — Bd. Educ. let contract to Reeve & Burr, Morristown. About $54,206.

★**N. J., Rahway**—Y. M. C. A. let contract new building to Carlton Co., Inc., Longacre Bldg., New York City. About $99,845.

★**Ky., Melbourne** — Administration and Mother House—Sisters of Providence let contract 3-story, 92 x 259 ft. to McDermott & Maxon Co., Builders Exch. Bldg., Cincinnati. About $200,000.

★**Ill., Chicago**—Hotel—C. Morse, Jr., 900 South Wabash Ave., let contract 9-story, 60-70 Scott St. to McLeeman Constr. Co., Chicago, $375,000.

★**Ill., Kewanee** — Hospital — City Pub. Hospital Assn. let contract 2-story, 40 x 120-ft. to F. L. Boher, Abingdon. About $75,000. Noted Aug. 23.

★**Wis., Kaukauna**—Church—St. Nicholas Congregation let contract to J. H. Geniesse Co., 820 South Jackson St., Green Bay. About $75,000.

★**Wis., West Salem**—High School—Bd. Educ. let contract to P. Nelson, La Crosse, $65,000. Noted July 26.

★**Minn., Anoka**—Chapel and Assembly—State Bd. Control let contract 2-story addition to Cameron & Co., 505 Ryan Bldg., St. Paul, $54,562. Noted Sept. 20.

Minn., Mineapolis—Hospital—Bd. Charities and Corrections, Court House, received low bids 3-story, rein-con. hospital and 1-story, 25 x 40-ft. rein.-con. power house, from R. J. Cheney & Co. 716 11th Ave., $86,748; Madsen & Peterson, 802 Plymouth Bldg., $94,200; F. G. McMillan, 2 S. E., 5th St., $94,554. Noted June 14

★**Minn., Morris**—Dining Hall and Gymnasium—West Central Agricultural Station let contract 2-story, 88 x 92-ft. to H. J. Frandsen, 510 Rice St., St. Paul. About $65,000.

★**Neb., Omaha** — Exchange — Nebraska Telephone Co., 18th and Douglas Sts., let contract 15-story, 100x132-ft., brick and tile to Lanquist & Illsley, 1100 North Clark St., Chicago. About $750,000. Noted Sept. 13.

★**S. D., Rapid City**—School—Bd. Educ. let contract 1-story, 121 x 131-ft. to Anderson-Taylor Constr. Co., 534 Lumber Ex., Minneapolis. About $57,000.

★**Tex., Carlsbad**—Dormitory—State Tuberculosis Sanitarium let contract to McGregor & Henger, 421 Mills Bldg., El Paso. About $145,360. Noted July 19

★**Okla., Tulsa**—Office—J. S. Cowden Daniels Bldg. let contract 15-story, 60 x 100-ft. rein.-con. to A. Fuller Constr. Co., 418 Dwight Bldg., Kansas City, Mo., $75,000.

★**Wash., Spokane**—Orphan's Home—L. W. Hutton, Hutton Bldg., let contract, 3-story, to P. L. Peterson, Hutton Bldg., $200,000. Noted Sept. 27.

★**Cal., Escondido**—Bank, etc.—L. B. Thompson, Chicago, let contract 1-story, 62 x 125 ft. bank store lodge hall and apartment building to Geo. Flickert, 518 West 46th Pl., Los Angeles. About $34,000.

★**Cal., Oroville**—High School—Bd. Trustees, Oroville High School, let contract to C. J. Gath, 28th and L Sts., Sacramento. About $63,500. Noted Sept. 13.

★**Que., Montreal**—Office—Provincial Government let contract 1-story addition to J. B. Gratton, 413 Labreeque St. About $75,000

★**Man., Foxwarren**—School—Battle Municipality let contract to Progress Constr. Co., Ltd., 88 Provender St., Winnipeg. About $50,000

★**Man., Winnipeg**—Office—French Syndicate, 415 Paris Bldg., let contract to Carter-Halls-Adlinger, Union Bldg., $200,000.

FEDERAL GOVERNMENT WORK

Proposed Work

Mass., Boston — Hospital — War Dept., Wash., N. D. Baker, secy., plans, 1-story. About $500,000

Mass., Leominster — Post Office — J. A. Wetmore, superv. archt., treas. dept., Wash., preparing plans. About $90,000.

N. Y., New York—Hospitals—War Dept., Wash., N. D. Baker, secy., plans to build 3 1-story hospitals. About $1,500,000.

Wash., D. C.—Hospital—War Dept., Wash., N. D. Baker, secy., plans, 1-story, in Soldier's Home Grounds. About $500,000.

Ga., Forsyth—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., allowed J. H. Wilder, Columbus Rd., Macon, to withdraw his bid. All other bids rejected. Noted Sept. 20.

Cal., San Diego—Buildings—War Dept., Wash., D. C., N. D. Baker, secy., having plans prepared by B. Goodhue, archt., 2 West 47th St., New York City, for 20 buildings, including administration building, drill hall, etc., to be erected on 732-acre site, to be reclaimed by dredging, for marine brigade post. About $600,000 available for work, $305,000 for dredging. U. S. Engr., Central Bldg., Los Angeles, soon receives bids dredging 1,250,000 cu.yd.

BIDS DESIRED

N. Y., Brooklyn—Power House—Until Oct. 31, by Bureau Yards and Docks, Navy Dept., Wash

Pa., Ft. Mifflin—Mine Storage Building—Until Oct. 15 (Extension of date) by Bureau Yards and Docks, Navy Dept., Wash. Noted Sept. 27.

Pa., Hollidaysburg — Post Office — Until Oct. 31, by J. A. Wetmore, superv. archt., treas. dept., Wash.; advertised in this issue.

Pa., Phila.—Buildings—Until Oct. 8 by Bureau Yards and Docks, Navy Dept., Wash., constructing galvanizing plant, oxy-acetylene generating plant, engine house, 2 locker houses, etc.

Md., Indian Head—Wharf—Until Oct. 8 by Bureau Yards and Docks, Navy Dept., Wash.

N. C., Burlington — Post Office — Until Nov. 5, by J. A. Wetmore, superv. archt., treas. dept., Wash.

La., New Orleans—Crane—Until Oct. 8 by Bureau Yards and Docks, Navy Dept., Wash., furnishing 10-ton bridge crane in pattern and machine shop Naval Station

Ky., Louisville—Power House—Until Oct. 31, by U. S. Engr. Office, Louisville, building at Lock No. 41, advertised in this issue.

O., Cincinnati — Maneuver Boats — Until Nov. 1, by U. S. Engr. Office, Cincinnati, building 2 steel hull maneuver boats with machinery; advertised in this issue

Ind., Valparaiso—Post Office—Until Nov. 2, by J. A. Wetmore, superv. archt., treas. dept., Wash.

Mich., Detroit—Construction Material—Until Oct. 15, by Lighthouse Inspector, 241 P. O. Bldg., Detroit, furnishing cast steel and lantern deck, about 42 tons structural steel work, cast iron for Sand Hill Light Sta.; advertised in this issue

Mich., Detroit—Construction Material—Until Oct. 15, by Lighthouse Inspector, 241 P. O. Bldg., Detroit, furnishing [illegible] ft. [illegible] about 55 M feet brick, 150 M common brick for Sand Hills Light Sta.; advertised in this issue

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Boston—Before Bureau Yards and Docks, Navy Dept., Washington, to install [illegible] Navy Yard (a) [illegible] (b) [illegible] omitted; Columbia Iron Manufacturing Co., Chicago (a) $81,975 (b) $1[illegible] C. M. Lewis,

Federal Government Work (Continued)

P. O. Box 2285, Devonshire St., (a) $32,256, (b) $4056. Hamilton & Chambers, 29 Bway., New York City, (a) $33,600, (b) $4000.

★**Mass., Hingham**—Heating Temporary Buildings—Bureau Yards and Docks, Navy Dept., Wash., let contract to Ciegnorn Co., 54 Batterymarch, Boston, $19,800.

★**Mass., Hingham**—Temporary Buildings—Bureau Yards and Docks, Navy Dept., Wash., let contract to G. A. Fuller Co., 710 Ed. Trade Bldg., Boston, $28,766.

★**Conn., New London**—Additions to Barracks—Bureau Yards and Docks, Navy Dept., Wash., let contract to R. H. Arnold Co., Woodward Bldg., Wash., D. C., $27,990.

Conn., New London — Crane — Bureau Yards and Docks, Navy Dept., Wash., received low bids furnishing 30-ton revolving crane, Naval Submarine Base, from McMyler Inter-state Co., Bedford, O., $25,500; V. R. Browning & Co., 17701 Lake Shore Bldg., Cleveland, $50,000.

★**N. Y., Brooklyn**—Steam Heating Apparatus—Bureau Yards and Docks, Navy Dept., Wash., let contract installing at Sect. Base No. 6, Navy Dept., to Hopson & Chapin Manufacturing Co., New York City, $[illegible].

N. Y., Cohoes—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., received low bids. (a) limestone, (b) sandstone, from Oscawana Bldg. Co., 101 Park Ave., New York City, (a) $80,970, (b) $85,000; W. H. Fissell & Co., 1328 Bway., New York City, (a) $86,000, (b) $92,000; Feeney & Sheehan Co., 164 Montgomery St., Albany, (a) $86,225, (b) $87,225. Noted Aug. 16.

★**Wash., D. C.**—Aviation Camp—War Dept. let contract building addition to camp at Hampton Rds. to J. G. White, Hampton, Va.

★**Wash., D. C.**—Barracks and Quarters—Quartermaster Corps, War Dept., let contract to P. F. Gormerly, Union Trust Bldg., [illegible].

Wash., D. C.—Jet Condensers and Pumping Equipment—Bureau Yards and Docks, Navy Dept., received low bids furnishing at various navy yards from Alberger Pump & Condenser Co., 140 Cedar St., E. J. Smith, 30 Church St.; A. S. Cameron Steam Pump Co., 11 Broadway, all of New York City.

★**Wash., D. C.**—Laboratory—Bureau of Standards, Wash., let contract 4-story rein.-con. to Turner Constr. Co., 242 Madison Ave., New York City. Noted June 14.

★**Wash., D. C.**—Motor-Generator Sets, Accessories—Bureau Yards and Docks, Navy Dept., Wash., let contract, furnishing at Phila. and San Pedro, Cal., Navy Yards, to General Electric Co., River Rd., Schenectady, N. Y., $41,490; electric equipment, [illegible] Mass., and Mare Island (Vallejo) [illegible] to Allis Chalmers Mfg. Co., West Allis, Wis., $11,496. Noted Sept. 20.

Wash., D. C.—Coast Guard—Navy Dept., U. S. Coast Guard Headquarters received low bid for new building and accessories at Coast Guard Station No. 101, Ware Woods, N. C., from O. W. Wiss, East Orange, N. J., $18,886, time, Aug. 15, 1918; J. W. Marshall, Elizabeth City, N. C., $26,160, time, Jan. 1, 1919; Evans & Meekins, Manteo, N. C., $21,500, time, Dec. 1, 1918. Noted Aug. 16.

★**S. C., Charleston**—Storehouse—Bureau Yards and Docks, Navy Dept., Wash., let contract to R. H. Arnold, Woodward Bldg., Wash., D. C., $[illegible]. Noted Sept. 13.

★**Fla., Black Point**—(Outside of Jacksonville)—Quartermaster Cantonment—Quartermaster Corps, War Dept., let contract to A. Hunter & Son, Jefferson Ave. and 13th St., Toledo, $1,001,000, cost plus per cent. basis.

★**Miss., Vicksburg** — Levee Work — 3rd Mississippi River Dist. let contract 1,100,000 cu.yd. levee work to C. P. Ramsey, 157 Clark St., $170,000, and N. T. & E. M. Lawrence, $[illegible] and $[illegible] each to Black Clark & Co., Scott, Minnesota Savings Bank Bldg., all of Memphis, Tenn., $130,000. Noted Aug. 30.

★**Tenn., Memphis**—Aviation Camp—War Dept. received contract let to T. Harmon & Co., and sub-let to E. A. Workham & Co., 10 Scott St., Council Bluffs, Ia.

Ky., Glasgow—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., received low bids for limestone, (b) sandstone, H. C. Mitchell, Scottsburg, (a) $40,100, (b) $40,400; C. W. Felton Constr. Co., 339 South La Salle St., Chicago, (a) $42,643; E. A. Steininger Constr. Co., Victoria Bldg., St. Louis, Mo., (a) $43,154. Noted Aug. 23.

Ind., Kendallville—Post Office—J. A. Wetmore, superv. arch., treas. dept., Wash., received low bids, Sept. 21, (a) limestone, (b) sandstone, from E. A. Steininger, Victoria Bldg., St. Louis, Mo., (a) $46,300; Schmidt Bros. Constr. Co., 105 North Clark St., Chicago, (a) $48,900; W. H. Fissell & Co., 1328 Bway., New York City, (a) $55,850, (b) $56,850. Noted Aug. 16.

★**Ill., Great Lakes** — Wiring — Bureau Yards and Docks, Navy Dept., Wash., let contract outside wiring, at Naval Training Sta., to W. A. Jackson, 37 West Vanderbilt St., Chicago, $27,150.

★**Tex., San Antonio**—Warehouse—War Dept., Wash., let contract at Naval Air Sta., to Stone & Webster, 147 Milk St., Boston, Mass.

N. M., Farmington—Bridge—Cato Sells, comr. Indian Affairs, Wash., received low bid building steel highway bridge from Monarch Engine Co., 312 17th St., Denver, Colo., $26,790 entire structure, including trestle and approaches, not including earth fill; $19,250 steel superstructure; $4895, 2 abutments, including steel piling and 2 wings; $3227 open pile trestle and approach. Noted Sept. 6.

★**N. M., Raton**—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to G. A. Shaul, Seneca, Kan., $54,195, time, 1 year. Noted Sept. 20.

Cal., Los Angeles—Fill—U. S. Engr. Office, Los Angeles, received low bid making fill involving 120,000 cu.yd. also rip rap protection therefore at San Pedro harbor, from Russell-Green-Foell Co., 2644 Compton Ave., 82c. per cu.yd. alternate bid, $75,000.

★**Cal., Mare Island** — (Vallejo P. O.) — Magazine Building — Bureau Yards and Docks, Navy Dept., Wash., let contract to Lange & Bergstrom, Sharon Bldg., San Francisco, $74,802.

★**Cal., San Francisco**—Barracks for Hospital Corps—Bureau Yards and Docks, Navy Dept., Wash., let contract to Schultz Constr. Co., 939 34th Ave., $21,309.

MISCELLANEOUS

Proposed Work

Wharf—Wilmington, Del.—City plans rein.-con., Church St. and Christiana River. About $80,000. E. M. Hoopes, Jr., city engr.

Seawall—Lake Worth, Fla.—City soon lets contract. About $25,000. H. C. Fugate, comr.

Dock—Safety Harbor, Fla.—Town plans to issue $10,000 bonds to build dock.

Piers, etc.—Mobile, Ala.—Gulf Mobile & Northern R.R. plans to build 3 piers and number of warehouses. About $1,000,000. B. V. Wright, Laurel, Miss., ch. engr.

River Terminals — Nashville, Tenn. — River Transportation Com. of Bd. of Transportation Trustees plans to build here. Project includes large warehouse. Bond issue contemplated for work. Plans will be prepared by Capt. Stewart of U. S. Engr. Office.

Transmission Line—Hazard, Ky.—Kentucky River Power Co., plans, from Hazard to Whitesburg, Blackey, Mayking, Sergent, Kona, Craftsville and La Viers, to supply several operating coal companies. R. L. Cornell, Hazard, mgr.

Subway—Ashtabula, O.—City election Nov. 6 to vote on $140,000 bonds to build subway at Center St. Cost, $340,660. New York Central R.R., G. W. Kittredge, ch. engr., Grand Central Terminal, New York City and Pennsylvania Lines West of Pittsburgh, T. Rodd, ch. engr., Pittsburgh, will appropriate 15 per cent of cost. L. A. Amsden, city engr. Noted May 31.

Icing Dock and Conveyor—Cleveland, O.—Swift & Co., 3240 West 63rd St. plans. About $19,000.

Garbage Incinerator—Norwood—O.—City plans, on Duck Creek Rd.

Garbage Incinerator—St. Clair Heights, Mich.—(Detroit P. O.)—City voted $25,000 bonds to build garbage incinerator. Noted Sept. 27.

Grandstand — Milwaukee (West Allis), Wis.—State Fair Bd. having plans prepared by A. C. Clas, archt., Colby-Abbot Bldg., for 2nd unit of grandstand to be built at State Fair Park. About $50,000. O. E. Remey, secy.

Dam—Stevens Point, Wis.—Jackson Milling Co. plans to build dam across Wisconsin River. About $500,000.

Transmission Line—Dakota, Ia.—Northern Iowa Gas & Electric Co., Humboldt, granted permission by Railroad Comrs. to build transmission line on certain roads and highways of Humboldt and Wright Cos., Clarion. D. M. Stearns, mgr.

Park Improvements—Minneapolis, Minn.—Park Bd. plans to spend $500,000 to $600,000 to improve parks.

Subway—Parsons, Kan.—City voted $67,000 bonds to build subways under tracks Missouri, Kansas & Texas Ry. on Main St. Railway to appropriate $60,000 toward cost. L. F. Lonnbladh, Dallas, ch. engr. F. W. Frye, city clk. Noted Aug. 16.

Dam—Kearney, Neb.—Central Power Co. plans, near headgates Elm Creek. J. Dowged, Grand Island, ch. engr.

Lake—Ash Grove, Mo.—See "Excavation and Dredging."

Levee Embankment—Poplar Bluff, Mo.—See "Excavation and Dredging."

Transmission System, etc.—Bells, Tex.—Texas Power & Light Co., Dallas, plans to build substation and high-tension transmission system from Bells to Whitewright. F. R. Slater, Dallas, genl. mgr.

Dam—Azusa, Cal.—United Light & Power Co., Los Angeles, plans Eastwood type rein.-con. dam, 200 ft. high, 500 ft. wide at top, 100 ft. wide at bottom, to impound 44,000 acre-feet of water, at mouth of Prairie Fork in Upper San Gabriel Canyon. G. O. Newman, Pacific Electric Bldg., Los Angeles, engr.

Levees, etc.—Blythe, Cal. — (Official) — Palo Verde Protection Dist. election in December to vote on $500,000 bonds to build levees to protect Palo Verde Valley from Colorado River floods involving 33 mi. levee equipped with railroads. Government will be asked to appropriate $500,000 toward cost. J. C. Allison, 735 Van Nuys Bldg., Los Angeles, engr. Noted Aug. 30.

Dam and Tunnel — Redding, Cal. — Dir. Happy Valley Irrigation Dist. plans election to vote on $300,000 bonds to build Missellbach dam and Hoover Creek Tunnel.

Bulkheading, etc. — Richmond, Cal.—See "Excavation and Dredging."

Dam—Annapolis Royal, N. S.—City having plans prepared by Booker & McKechnie, engrs., Davidson Bldg., Halifax, new rein.-con. dam. About $50,000.

Incinerator—Sarnia, Ont.—City receiving bids about Nov. 1. Cost, $25,000. J. S. Crawford, chn. com. Noted Aug. 30.

BIDS DESIRED

Dike—Bernalilo, N. M.—(Official)—Until Oc.t 17, by N. Montoya, clk., Sandoval Co., building dike, east bank Rio Grande at Ranchos de Albuquerque.

Pier—Manhattan Beach, Cal.—(Official)—Until Oct. 17, by City, building rein.con. pier; L. Price, clk.; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Station Finish—Brooklyn, N. Y.**—Pub. Ser. Comn., 120 Bway., New York City, let contract station finish for 11 stations on Culver Rapid Transit R.R. to P. J. Carlin Constr. Co., 1123 Bway., New York City, $731,124. Noted Sept. 20.

★**Shaft—New York, N. Y.**—Pub. Ser. Comn., 120 Bway., let contract building Shaft No. 2, Route No. 26, part of Queensboro Subway Rapid Transit Ry., to I. J. Stander & Co., Inc., 118 East 28th St., $64,149. Noted Sept. 13.

Station Finish—New York, N. Y.—Pub. Ser. Comn., 120 Bway., received low bids station finish for 8th Ave. and 162nd St. connection, Sect. 10-C; also station buildings Anderson and Jerome Aves., (Bronx Boro.), from J. S. Henderson, 30 East 42nd St., $105,880; Snare & Triest, Woolworth Bldg., $134,600.

★**Pipe Line Clairton, Pa.** — (Official) — Carnegie Steel Co. let contract manufacturing and installation 10-mi. 40-in. diameter lock bar steel pipe to carry gas from by-product coke ovens now being erected at Clairton, to Duquesne and Edgar Thompson steel plants of Carnegie Co., where transported gas will be used for fuel, to T. A. Gillespie, Westinghouse Bldg., Pittsburgh.

Miscellaneous (Continued)

Subway—Phila., Pa. — (Official) — We have been informed that Contrs. Nos. 201 and 203 have been executed by the Keystone State Constr. Co., 704-9 Penn Bldg., totaling $3,289,015. No definite action has been taken on contracts for Smith, Hauser & Mac Isaac, Inc., 18 East 41st St., New York City and Phila. Subway Constr. Co., 712 Lincoln Bldg., or on other contracts that Keystone Constr. Co. was low bidder on. The statement in our issue of Sept. 20 regarding the contracts was an error.

BUILDING THE GOVERNMENT MERCHANT SHIPS.

It is probable that 200 steel ships of uniform design from 5000 to 9000 tons deadweight each will be built for the United States Government by three concerns to whom contract for 50 such vessels was recently let by the United States Shipping Board Emergency Fleet Corporation. The actual number of ships to be built will be decided by the Government within 60 days from date of contract. The steel for the vessels will be fabricated in different mills throughout the country, and shipped to three assembling plants. The Merchants Steamship Corporation will erect 9000-ton ships at a plant at Bristol, Penn. The New York Shipbuilding Corporation (The American International Corporation) will assemble 7000 to 7500-ton boats at Hogg Island, near Philadelphia. The 5000-ton vessels will be assembled at a plant now building on the Newark Meadows, N. J., for the Submarine Boat Co.

As these three concerns will handle their contracts in the same general manner, only one of them need be considered. The Submarine Boat Co. expects to have its Newark shipways ready to operate in November or December of this year. Twenty-eights ships will be assembled at a time, and each batch should be finished in four months.

All pumping equipment is being furnished by the Worthington Co. Motors, dynamos, and electrical apparatus by the Westinghouse Electric & Mfg. Co. The machine tool requirements of the three ship assembling concerns will probably be nominal. The requirements for machine tools to handle these contracts will be restricted almost entirely to such additions as may be necessary in the existing fabricating mills.

WASHINGTON TO SPEND $9,000,000 ON ROADS AND BRIDGES IN 1918.

The annual budgets compiled by the various counties of the state show an enormous sum set aside for highway construction work, which, taken together with the sum of $1,500,000 to be expended by the State Highway Commission on road work next year, shows a probable total of $9,000,000 available next year for road improvements in this state.

The counties reporting to date are as follows:

Snohomish County—Bond issue roads, $750,000; general road and bridge fund, $105,000; three road district funds, $150,000. Total, $1,005,000. A. B. Dean, county engineer, Everett.

Clallam County—General road and bridge fund, $60,000; four road district funds, $88,000. Total, $148,000. A. J. Blackwood, county engineer, Port Angeles.

Clarke County—General road and bridge fund, $60,400; three road districts, $88,700. Total, $149,100. B. L. Dorman, county engineer, Vancouver, Wn.

Lewis County—General road and bridge fund, $84,250; road districts, $174,000. Total, $258,250. J. D. Noville, county engineer, Chehalis, Wn.

Grant County—General, $45,000; 19 road districts, $80,000. Total, $125,000. C. W. Duncan, county engineer, Ephrata.

Franklin County—General, $9000; gravel roads, $44,750; road district fund, $54,400. Total, $108,150. J. W. Ketner, county engineer, Pasco.

Pierce County—General, $300,000; five road districts, $240,000. Total $540,000. D. H. White, county engineer, Tacoma.

Okanogan County — General, $36,500; three road districts, $19,000. Total $55,500. H. E. Smith, engineer, Okanogan.

Benton County—General, $52,000; three road districts, $57,000. Total, $109,000. G. H. Heberling, engineer, Prosser, Wn.

San Juan County—General, $6000; three road districts, $13,650. Total $19,650. E. Ed Allen, county engineer, Coupeville.

Skagit County—Road and bridge fund $56,135; three road districts $104,865. Total, $161,000. W. E. Costello, engineer, Mt. Vernon.

Chelan County—Road district fund, $10,000. F. M. Berry, engineer, Wenatchee.

Whitman County—Road and bridge, $135,000; thirteen road districts, $164,000. Total, $299,000. J. M. McGraw, engineer, Colfax.

Whatcom County—Road and bridge, $100,000. Chas. Lindberry, engineer, Bellingham.

Cowlitz County—Road and bridge, $37,000; six districts, $79,200. Total, $116,200. F. C. Cheney, engineer, Kalama.

Douglas County—General, $40,500; 15 districts, $8[illegible]. Total, $129,345. R. F. Foster, engineer, Waterville.

Island County—General, $18,000; three road districts, $21,000. Total, $[illegible]. H. A. Satsel, engineer, Monroe.

Adams County—Road and bridge, $34,500; 16 districts, $99,500. Total, $134,000. O. J. DeSpain, engineer, Ritzville.

Grays Harbor County—General, $75,000; six road districts, $[illegible]. Total $[illegible]. J. [illegible], engineer, Montesano.

Mason County—General, $34,[illegible]; 8 districts, $39,[illegible]. Total $[illegible]. A. V. Allen, engineer, [illegible].

Kitsap County—General, $[illegible]; 8 road districts, $[illegible]. Total, $[illegible]. P. [illegible], engineer, Port Orchard.

King County—General, $[illegible]; 3 districts, $[illegible]; land roads, $[illegible]. Total, $[illegible]. Paul Hunter, engineer, Seattle.

Fifteen counties have yet to be heard from.

SEWAGE DISPOSAL PLANT, STOMFORD, CONN.

Bids were received by City, Sept. 22, for constructing sewage disposal plant, from (A) Frank Palmer, 131 Sound View Ave.; (B) Eaton, Brown & Simpson, Inc. The unit bids were as follows:

	A	B
Protective work and royalties (lump sum)	$26,500 00	$31,268 00
17,000 cu.yd. excavation	1.25	1 32
11,000 cu.yd. rolling embankment	65	2[illegible]
3,500 cu.yd. concrete	21 25	17 25
200,000 lb. reinforcing steel	06	069
43.5 tons cast iron B. & S. pipe	75 00	103 60
15.5 tons cast iron B. & S. specials	80 00	189 00
5.0 tons cast iron flanged pipe and specials	90 00	262 00
Gate valves (lump sum)	712 00	1,310 00
Sluice gates (lump sum)	2,327 00	791 00
Check valves (lump sum)	229 00	4 179 00
8 6-in. flap valves	17 00	17 875
2 8-in. flap valves	20 00	40.00
1,200 lin.ft. 4-in. vit. pipe	25	.20
20 lin.ft. 6-in. vit. pipe	.35	41
450 lin.ft. 8-in. vit. pipe	75	.50
700 lin.ft. 10-in. vit. pipe	1.25	66
65,000 lb. structural steel	.07	.109
20,000 lb. miscellaneous cast iron, wrought iron and steel	06	185
480 lin.ft. railings	1 25	1 84
Screen chamber superstructure (lump sum)	5,700 00	1,322 00
Laboratory building superstructure (lump sum)	7,325 00	9,852 00
13M ft b.m. lumber	50 00	149 00
2,560 sq.yd. baffles, including reinforcement	1 00	3 51
Venturi meter (lump sum)	1,650 00	2,235 00
Chlorinating apparatus (lump sum)	2,175 00	1,557 00
Automatic tide gate (lump sum)	300 00	575 00
Chemical equipment and piping (lump sum)	2,900 00	3,644 00
500 lin.ft. 2-in. water line	1 00	575
2 electric hoists	532 00	583 00
560 lin.ft. railways, steel ties, straight track	1 46	1 46
600 linft. railways, wooden ties, straight track	1 90	1 22
100 lin.ft. railways, wooden ties, curved track	2 00	1 72
9 switches	70 00	75 00
2 tip cars	195 00	204 00
2-in. water line in settling tanks (lump sum)	*1 00	1,119 00
770 cu.yd. crushed stone, sludge beds	2 75	2 54
1,600 sq.yd. macadam	1 00	1 78
Pressure water pump and motor (lump sum)	650 00	632 00
Connecting existing pumps (lump sum)	500 00	287 00
865 lin.ft. fence	1 25	52
Extended totals	$192,857	$199,699

* Item 36 of Palmer bid was given as $1.00. Explained as meaning $1.00 per lin.ft. of pipe.

DAM, SAN DIEGO, CAL.

Bids were received by City, Sept. 4, for constructing lower Otay Dam, spillway and outlet tower, from (A) Wurster Constr. Co., 654 Spreckles Bldg., (B) H. G. Fenton, 204 Owl Bldg.; (C) James Kennedy, 901 Washington Bldg., Los Angeles; (D) R. P. Shields, Amer. Natl. Bank Bldg., $612,762; (E) Twohy Bros. Co., 677 Spreckles Bldg., Los Angeles, $691,650. The unit bids of the three lowest bidders were as follows:

Schedule 1	A	B	C
12,000 cu.yd. excavation, Class 1	$0 62	$1 75	$1 13
7,500 cu.yd. excavation, Class 2	1 632	2 75	2 48
1,500 cu.yd. excavation, Class 3	53	1 75	1 13
9,000 cu.yd. excavation, Class 4	1 283	2 25	2 48
500 cu.yd. backfill	2 020	50	1 00
24,000 cu.yd. concrete	4 973	3 75	4 87
70,000 cu.yd. concrete cyclopean masonry	3 971	3 37	4 87
325 cu.yd. concrete reinforced	7 952	4 00	4 87
30,000 lb. placing reinf. steel	0141	0113	02
10,000 cu.yd. crushing rock for sand	1 08	1 00	2 00
500 lin.ft. drilling holes, core recovering	4 484	3 00	5 [illegible]
1,000 lin.ft. drilling holes—percussion	2 088	4 00	3 25
200 cu.yd. grouting under pressure	9 07	5 00	12 [illegible]
2,000 lin.ft. laying drain tile and pipe	275	20	[illegible]
10,000 lb. placing metal work	0345	05	[illegible]7
Schedule 2			
1,000 cu.yd. excavation, Class 3	54	1 00	1 13
5,250 cu.yd. excavation, Class 4	1 50	2 25	2 48
500 cu.yd. backfill	1 18	1 00	1 50
600 cu.yd. concrete	4 97	4 00	4 82
200 cu.yd. concrete cyclopean masonry	3 50	3 50	4 82
1,200 cu.yd. concrete reinforced	5 40	4 50	4 82
30,000 lb. placing reinf. steel	02	0117	02
Schedule 3			
100 cu.yd. excavation, Class 3	53	1 00	1 13
200 cu.yd. excavation, Class 4	1 40	2 25	2 48
500 cu.yd. backfill	1 00	50	1 50
270 cu.yd. concrete tunnel lining	2 [illegible]	14 00	15 00
450 cu.yd. concrete reinforced	9 [illegible]	15 00	15 00
20,000 lb. placing reinf. steel	0125	01125	01
40,000 lb. placing metal work	02	0[illegible]	0[illegible]
	A	B	C
Extended totals, Schedule 1	$197,410		$[illegible]
Extended totals, Schedule 2	$[illegible]		$[illegible]
Extended totals, Schedule 3	$[illegible]		$[illegible]
Extended grand totals	$[illegible]	$[illegible]	$[illegible]

* Contractor's estimated cost, exclusive of overhead charges and profit, which is provided for by the contractor's proposal by carrying percentage based on direct cost of work.

SEARCHLIGHT SECTION

Contracts To Be Let

PROPOSALS

Bids received until October 9, 1917.

Barge Canal Improvements

STATE OF NEW YORK
OFFICE OF SUPERINTENDENT OF PUBLIC WORKS
Albany, N. Y.,
September 7th, 1917.

Sealed proposals will be received by the undersigned at his office in the Capitol at Albany, N. Y., until twelve o'clock noon of Tuesday, October 9th, 1917, at which place and hour they will be publicly opened and read, for improving the New York State canals pursuant to the provisions of Chapter 147 of the Laws of 1903, and of the acts amendatory thereof and supplementary thereto, and Chapter 570 of the Laws of 1915, as follows:

1

CONTRACT NO. 83.

Erie Canal—Sections 10 and 11.

For completing the canal at Tonawanda and removing a guard-lock and coffer-dam near Sulphur Springs.

Sheets 1 to 6 inclusive.

2

CONTRACT NO. 163.

Erie Canal—Sections 9 and 10.

For raising Spier's Road bridge, completing crests of spillways and other work between Rochester and Lockport.

Sheets 1 to 5 inclusive.

3

CONTRACT NO. 164.

Erie Canal—Section 8.

For completing the construction of the canal at certain locations between Lyons and Newark and for constructing a retaining dam at Macedon.

Sheets 1 to 9 inclusive.

And for the construction of barge canal terminals pursuant to the provisions of Chapter 746 of the Laws of 1911, and of the acts amendatory thereof as follows:

4

TERMINAL CONTRACT NO. 15-M

Electrical equipment and machinery for operating and lighting the Utica Terminal lock.

Contract plans, sheets 1-11, inclusive.

Plans may be seen and detailed specifications, engineer's estimate of quantities, proposal blanks, form of contract and bonds required and other information for proposers may be had at the office of the Superintendent of Public Works at Albany, N. Y., at the office of the Assistant Superintendent of Public Works for the Middle Division at Syracuse, N. Y., at the office of the Assistant Superintendent of Public Works for the Western Division at Rochester, N. Y., and at the canal office, Spaulding's Exchange, Buffalo, N. Y.

Copies of detailed plans of structures may be obtained from the State Engineer and Surveyor at Albany, N. Y., upon payment to him of the cost of producing them.

Monthly estimates will be paid of ninety per centum (90 per cent.) of the work done at the contract prices. Every proposal for said work must be accompanied by a money deposit in the form of a draft or certified check upon some good banking institution in the city of Albany or New York, issued by a national or state bank (or trust company in the case of terminal contract) in good credit within the state and payable at sight to the Superintendent of Public Works for five per centum (5 per cent.) of the amount of the proposal.

The person whose proposal shall be accepted will be required to execute a contract and furnish bonds within ten days from the date of notice of award delivered to him or them in person or mailed to the address given in the proposal.

Upon execution of the contract and approval of bonds, the certified check or draft will be returned to the proposer unless the same shall have been presented for collection prior to such time, in which case the amount of the deposit will be refunded by the Superintendent of Public Works.

The deposits of bidders other than the one to whom the award of contract shall be made will be returned immediately after the award has been made.

The bond required for the faithful performance of each contract shall be in such sum as shall be fixed by the Superintendent of Public Works, which sum shall not be less than twenty per centum (20 per cent.) of the estimated cost of the work according to the contract price, and an additional bond, known as the labor bond, in the sum of ten per centum (10 per cent.) of the amount of the estimated cost of the work according to the contract price, will be required as security that the contractor will pay in full at least once in each month all laborers employed by him upon the work specified to be done in the contract.

In the event that more than one surety company is offered as surety on said bonds co-insurance only will be accepted.

Each proposal must be addressed to the Superintendent of Public Works, Albany, N. Y., and must be endorsed on the envelope with the name of the construction for which the proposal is made.

Award, if made, will be made to the person or persons whose proposals shall be lowest in cost to the State for doing the work, and which shall comply with all provisions required to render it formal. Before any award shall be made the lowest bidder will be required to satisfy the Superintendent of Public Works of his ability to provide suitable equipment and materials for the proper performance of the work.

The right is reserved to reject all proposals and readvertise and award the contract in the regular manner if, in the judgment of the undersigned, the interests of the state will be enhanced thereby.

W. W. WOTHERSPOON,
Superintendent of Public Works.

Official Proposals

Price, $3.60 an inch—Copy can be received until Tuesday, 10 a.m., for issue mailed the next day.

PROPOSALS

TREASURY DEPARTMENT, Supervising Architect's Office, Washington, D. C., June 19, 1917. Sealed proposals will be opened in this office at 3 p.m., Oct. 31, 1917, for the construction of the United States post office at Hollidaysburg, Pa. Drawings and specifications may be obtained from the custodian of the site at Hollidaysburg, Pa., or at this office in the discretion of the Supervising Architect. JAS. A. WETMORE, Acting Supervising Architect.

PROPOSALS

Bids received until October 17, 1917.

Steel Bridge

Harrisburg, Pa.

Pennsylvania Public Service Commission, Harrisburg, Pa.—Sealed proposals will be received at said office until 10 a. m., October 17, 1917, when bids will be publicly opened and scheduled, and contract awarded as soon thereafter as possible, for the construction of a steel bridge, with concrete abutments and concrete pedestals for steel supports, situated on Main Street, Butler Borough, Butler County, over the Conoquenessing Creek and the tracks of the B. & L. E. R. R. and B. & O. R. R. The main span will be 125 feet with 5 approach spans on the north and 6 on the south, making a total length of 687 feet. The roadway to be 28 feet wide and two sidewalks each 5 feet wide. Bidders may secure proper blanks upon personal application or written request to the Public Service Commission, Harrisburg, Pa., and plans may be seen there and if desired may be obtained upon payment of two dollars per set. No refund for plans returned. Plans may also be seen in the office of the State Highway Department, Harrisburg, Pa., 904 Hartje Building, Pittsburgh, Pa., 1001 Chestnut Street, Philadelphia, Pa., and Franklin Trust Co. Bldg., Franklin, Pa.

Bids received until October 23, 1917.

Reinforced Concrete Viaduct

Fort Dodge, Iowa.

Sealed proposals will be received until 9:30 o'clock a.m., October 23, 1917, for the construction of a reinforced concrete viaduct on North Third Street in the City of Fort Dodge, Iowa, in accordance with plans and specifications which may be obtained from the City Engineer upon deposit of $20. Estimated quantities, 190 tons steel, 5720 cu.yd. concrete. Certified check, $10,000.

W. L. TANG,
City Clerk.

Bids received until October 17, 1917.

Concrete Pier Construction

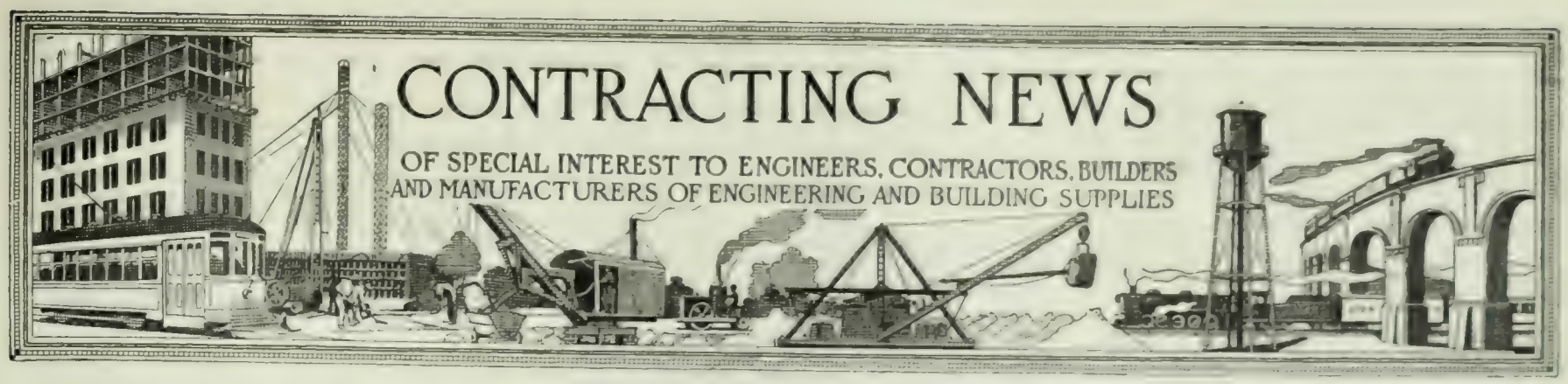
Manhattan Beach, Calif.

Sealed proposals will be received at this office until 7:30 P. M., October 17, 1917, for constructing an all reinforced concrete municipal pier, on concrete piles, about 1250 feet long, and containing about 2000 cubic yards. Information on application to the City Clerk, Manhattan Beach, California.

LLEWELLYN PRICE,
City Clerk.

SEALED PROPOSALS will be opened by the Lighthouse Inspector, 341 P. O. Bldg., Detroit, Mich., at 2 o'clock p. m., on dates indicated herein, for furnishing construction materials for Sand Hills Light Station as follows: Cast iron stairs and lantern deck, Nov. 1, 1917. Structural steelwork, approximately 20 tons, Nov. 1, 1917. Cast iron lantern, Nov. 1, 1917. Cut stone work, approximately 750 cu. ft., Oct. 15, 1917. Face brick, about 85 M, and common brick, about 150 M, Oct. 15, 1917. Separate proposals will be receied for each item. Information upon application to the above office.

U. S. ENGINEER OFFICE, Louisville, Ky.—Sealed proposals for constructing Power House at Lock No. 41, Ohio River, will be received here until 12 noon, central time, October 31, 1917, and then opened. Information on application.



Proposals

For Proposals Advertised See Pages 51 to 56 Inclusive

WATER-WORKS

Bids Close		See Eng. News-Record
Oct. 16.	Caldwell, Kan.	Oct. 4
Oct. 16.	Lockney, Tex.	Oct. 11
Oct. 19.	Akron, O.	Oct. 4
Oct. 16.	Berwyn, Ill. Adv. Oct. 11.	Oct. 11
Oct. 22.	Salem, N. J. Adv. Oct. 11.	Oct. 11
Oct. 29.	Portland, Ore.	Oct. 11

SEWERS

Oct. 14.	Pleasantville, N. J.	Sept. 27
Oct. 16.	Wabash, Minn.	Sept. 27
Oct. 16.	Bayonne, N. J.	Oct. 11
Oct. 16.	Berwyn, Ill. Adv. Oct. 11.	Oct. 11
Oct. 16.	Toronto, Ont.	Oct. 11
Oct. 16.	Wellsburg, W. Va.	Oct. 11
Oct. 17.	Brooklyn, N. Y.	Oct. 11
Oct. 17.	Grosse Point, Ill. Adv. Oct. 4.	Oct. 4
Oct. 18.	Santa Barbara, Cal.	Oct. 4
Oct. 18.	Pocatello, Idaho	Oct. 11
Oct. 18.	Baxter Springs, Kan.	Oct. 11
Oct. 25.	St. Joseph, Mich. Adv. Oct. 4.	Oct. 4

BRIDGES

Oct. 15.	Tallahassee, Fla.	Oct. 4
Oct. 15.	California	Oct. 4
Oct. 15.	Ames, Ia.	Oct. 11
Oct. 16.	Tampa, Fla.	Oct. 4
Oct. 16.	Glenville, W. Va.	Sept. 27
Oct. 16.	West Palm Beach, Fla.	Oct. 11
Oct. 16.	Baltimore, Md. Adv. Oct. 11.	Oct. 11
Oct. 17.	Butler, Pa. Adv. Oct. 4.	Oct. 4
Oct. 20.	Pennsylvania	Sept. 20
Oct. 20.	Charleston, W. Va.	Sept. 27
Oct. 20.	Big Chimney, W. Va.	Oct. 11
Oct. 23.	Fort Dodge, Ia. Adv. Sept. 27 and Oct. 4.	Sept. 27
Nov. 6.	Dallas, Tex. Adv. Oct. 11.	Oct. 11

STREETS AND ROADS

Oct. 13.	Wayne, W. Va.	Oct. 11
Oct. 15.	Newark, N. J.	Sept. 13
Oct. 15.	East St. Louis, Ill.	Oct. 11
Oct. 16.	Cape May, N. J.	Sept. 6
Oct. 16.	Pennsylvania	Sept. 20
Oct. 16.	Billings, Mont.	Oct. 4
Oct. 16.	Johnson, Tenn.	Oct. 4
Oct. 16.	Berwyn, Ill. Adv. Oct. 11	Oct. 11
Oct. 16.	South Orange, N. J.	Oct. 11
Oct. 17.	San Diego, Cal.	Oct. 11
Oct. 17.	Cornwall, Ont.	Oct. 11
Oct. 18.	Jersey City, N. J.	Oct. 11
Oct. 20.	Bonners Ferry, Idaho	Oct. 11
Oct. 20.	Bryan, O.	Oct. 11
Oct. 22.	Clarendon, Ark.	Oct. 4
Oct. 22.	Conway, Ark.	Oct. 11
Oct. 22.	Washington	Oct. 11
Oct. 22.	Ephrata, Wash.	Oct. 11
Oct. 23.	Jersey City, N. J.	Oct. 11
Oct. 24.	Paterson, N. J.	Sept. 27
Oct. 24.	Santa Barbara, Cal.	Oct. 4
Oct. 26.	Indiana	Oct. 11
Oct. 27.	Indiana	Oct. 11
Oct. 29.	Indiana	Oct. 11
Nov. 5.	Pikeville, Ky.	Sept. 27
Nov. 6.	Indiana	Oct. 11
Nov. 6.	Morgantown, W. Va. Adv. Oct. 11.	Oct. 11

EXCAVATION AND DREDGING

Oct 13.	Sioux Falls, S. D.	Oct. 11
Oct. 15.	Willmar, Minn.	Sept. 13
Oct. 15.	Havana, Ill.	Oct. 4
Oct. 16.	St. Peter, Minn.	Oct. 4
Oct. 19.	Mankato, Minn.	Oct. 4
Oct. 20.	Waterford, Cal.	Sept. 27
Oct. 22.	Elbow Lake, Minn.	Oct. 4
Oct. 22.	Rockport, Ind.	Oct. 4
Oct. 23.	Athens, Ga.	Oct. 11
Oct. 24.	Lesueur Center, Minn.	Oct. 4
Nov. 2.	Albany, N. Y. Adv. Oct. 11.	Oct. 11
Nov. 2.	Sibley, Ia.	Oct. 11
Nov. 9.	St. Cloud, Minn.	Sept. 27

BUILDINGS

Oct. 15.	New York, N. Y.	Sept. 27
Oct. 15.	Beaumont, Tex.	Oct. 4
Oct. 17.	Wichita, Kan.	Oct. 4
Oct. 18.	Red Bank, N. J.	Oct. 4
Oct. 20.	Oxford, O.	Sept. 27
Oct. 23.	Ft. Wayne, Ind.	Oct. 4
Oct. 23.	Smith Center, Kan.	Oct. 4
Oct. 23.	New York, N. Y.	Oct. 11
Oct. 24.	Abilene, Kan.	Oct. 4
Nov. 25.	Middletown, Mass.	Oct. 4
Oct. 28.	Healdsburg, Cal.	Oct. 11
Oct. 28.	Denver, Colo.	Oct. 11
Dec. 1.	Norfolk, Va.	Sept. 13

FEDERAL GOVERNMENT WORK

Oct. 15.	Wharf and Trestle — Charleston, S. C.	Oct. 11
Oct. 15.	Laboratory—Indiana Head, Md.	Oct. 11
Oct. 15.	Garbage Incinerator—Mare Island, Vallejo, P. O., Cal.	Oct. 11
Oct. 15.	Piers and Quarry Walls —New London, Conn.	Oct. 11
Oct. 15.	Hospital—Chelsea, Mass.	Oct. 11
Oct. 15.	Shore Bulkheads — Hoboken, N. J.	Oct. 11
Oct. 15.	Radio Towers—El Cayey, P. R.	Oct. 11
Oct. 15.	Building—Tiburon, Cal.	Oct. 11
Oct. 15.	Movable Crest, Service Bridge, Hoist Cars — Denver, Colo. Adv. Sept. 13.	Sept. 13
Oct. 15.	Post Office — Waynesboro, Va.	Sept. 13
Oct. 15	Laterals—El Paso, Tex. Adv. Sept. 20.	Sept. 20
Oct. 15.	Foundry, etc. — Philadelphia, Pa.	Sept. 27
Oct. 15	Excavators—Denver, Colo.	Sept. 27
Oct. 15	Mine Storage Bldg. — Ft. Mifflin, Pa.	Oct. 4
Oct. 15	Construction Materials — Detroit, Mich. Adv. Oct. 4	Oct. 4
Oct. 20	Experimental Sheet Rolling Mill — Washington, D. C.	Oct. 11
Oct. 20	Tank and Towers — Key West, Fla.	Oct. 11
Oct. 22.	Power House and Machine Shop — New London, Conn.	Oct. 11
Oct. 22.	Heating System—Philadelphia, Pa.	Oct. 11
Oct. 23.	Post Office — Andalusia, Ala.	Sept. 20
Oct. 24.	Post Office — Bakersfield, Cal. Adv. Sept. 20 and 27.	Sept. 20
Oct. 26.	Post Office — Mt. Carmel, Ill.	Sept. 13
Oct. 28.	Post Office — Waterloo, N. Y.	Sept. 20
Oct. 29.	Buildings—El Cayey, P. R.	Oct. 11
Oct. 29.	Buildings—Grand Isle, La. Adv. Oct. 11.	Oct. 11
Oct. 30.	Metal Work, etc. — Key West, Fla. Adv. Sept. 6 and 13.	Sept. 6
Oct. 30.	Post Office—Farmville, Va.	Sept. 27
Oct. 31.	Power House — Brooklyn, N. Y.	Oct. 4
Oct. 31.	Post Office—Hollidaysburg, Pa. Adv. Oct. 4.	Oct. 4
Nov. 1.	Lookout—Omaha, Neb. Adv. Oct. 11.	Oct. 11
Nov. 1.	Post Office—Kenton, O.	Sept. 27
Nov. 1.	Construction Materials — Detroit, Mich. Adv. Oct. 4.	Oct. 4
Nov. 2.	Maneuver Boats and Post Office—Cincinnati, O. Adv. Oct. 4.	Oct. 4
Nov. 2.	Post Office — Valparaiso, Ind.	Oct. 4
Nov. 5.	Post Office — Burlington, N. C.	Oct. 4
Nov. 8.	Piers, etc.—Detroit, Mich. Adv. Oct. 11.	Oct. 11
Nov. 9.	Post Office—Forsyth, Ga.	Oct. 11
Nov. 13.	Post Office—Harrisonville, Mo.	Oct. 11
Nov. 14.	Post Office—Austin, Tex.	Oct. 13
Nov. 28.	Post Office — Bellefourche, S. D.	Oct. 11

MISCELLANEOUS

Oct. 17.	Elimination Grade Crossing—Philadelphia, Pa.	Oct. 11
Oct. 17.	Dike—Bernalillo, N. M.	Oct. 4
Oct. 17.	Pier—Manhattan Beach, Cal. Adv. Oct. 4 and 11.	Oct. 4
Oct. 23	Pier—New York, N. Y. Adv. Sept. 27 to Oct. 11.	Sept. 27
Nov. 15	Flood Control—Dayton, O. Adv. Sept. 13 to 27.	Sept. 13

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official.

WATER-WORKS

Proposed Work

N. J., Ventnor — City plans to build reservoir. About $15,000. Address I. B. Sweetgart.

Water-Works (Continued)

N. J., Wharton—Bond election in November to vote on $[illegible] bond issue to install water-works system.

Pa., Bristol—See "Sewers."

Va., Riverside—City plans water-works system in North Riverside and Riverside Park. About $40,000.

Ga., Murray—City issued $20,000 bonds to install water-works and electric-light and power plant.

Miss., Charleston—City having plans prepared by X. A. Kramer, engr., Magnolia, for water-works system. About $13,500 available for work. Noted Sept. 13.

O., Cincinnati—See "Streets and Roads."

O., Cleveland—City rejected bids dismantling and re-erecting building 30,000,000-gal. De Laval centrifugal pump; auxiliaries, etc., and building structural steel platform around same, at Division Ave. pumping station, as they were too high. Noted Aug. 23.

O., Columbus—City plans to issue $10,000 bonds to improve and enlarge water mains. H. Maetzel, city engr.

O., East Youngstown—Town to sell $45,000 bonds Oct. 22 to build water-works system. Noted June 7.

O., Greenville—(Official)—City will not improve water-works this year as no bids were received for sale of $60,000 bonds. Noted Sept. 13.

Mich., Lakeview—City voted $11,500 bonds to build water-works system. L. R. Stebbins, supt.

Wis., Tomahawk—(Official)—City rejected bids to build and equip pumping station and install water mains. Noted Sept. 13.

Ia., Lohrville—(Official)—City defeated $10,000 bond election for water-works system. Noted Sept. 27.

Kan., Attica—City having plans prepared by W. B. Rollins & Co., engrs., 209 Ry. Ex. Bldg., Kansas City, Mo., for water-works system. About $12,000.

Kan., Liberal—City to issue $26,000 bonds to improve water-works system; plans include 1 well and pump, 1 concrete surface reservoir, 1 centrifugal pump for fire system, and extending and repairing distributing systems. J. Karau, clk.

Kan., McCracken—City election Oct. 23 to vote on $12,000 bond issue to build water-works system. L. L. Ryan, clk.

Mo., Galena—City having plans prepared by Burns & McDonnell, engrs., 400 Inter-State Bldg., Kansas City, for water-works system; $100,000 bonds recently voted for project. Noted Sept. 20.

Mo., Joplin—City voted $100,000 bonds to build water-works system. J. J. McAfee, city engr. Noted Sept. 27.

Mo., Kansas City—City plans to improve Turkey Creek pumping station. C. Hill, city engr.

Okla., Guthrie—City voted $32,000 bonds to extend water-works and sewerage systems. Noted Sept. 13.

Okla., Hartshorne—City election soon to vote on $17,500 bond issue to build filtration plant.

Okla., Henryetta—City election Oct. 25 to vote on $[illegible] bond issue to extend water-works system. H. M. La Wue, supt.

Okla., McAlester—(Official)—City having plans prepared for water-works system. A. H. Kendrick, city engr. Noted Sept. 27.

Okla., Ponca City—City election soon to vote on $[illegible] bond issue for water-works and sewerage systems. G. G. O'Neill, supt.

Okla., Shawnee—City plans to improve water-works. E. S. Minor, city engr.

Okla., Wapanucka—City voted $14,000 bonds to build [illegible] system. Noted Oct. 4.

Wash., Bremerton—City voted $[illegible],000 bonds to extend and improve water-works system. Noted Aug. 30.

Cal., Oakdale—Sierra & San Francisco Power Co. plans to construct reservoirs, ditches and storage dams, about $5,000,000. H. E. Jackson, genl. engr.

Cal., Santa Barbara—City sold $90,000 bonds to improve water-works system. A. B. Cook, city engr.

BIDS DESIRED

N. J., Salem—(Official)—Until Oct. 22, by W. R. Dunn, recdr., for installing 1,500,000 gal. electrically driven centrifugal pump; advertised in this issue.

Ill., Berwyn—(Official)—Until Oct. 16 by J. M. Humiston, secy. bd. local impvts., for water-supply pipes, lead water-service pipes, etc., in Wenonah, Clinton, Home, Harvey, Lombard, Wisconsin and Elliott Aves., advertised in this issue.

Tex., Lockney—(Official)—Until Oct. 16, by City, for water-works system, including 9200 ft. 6-, 8-in. c.i. pipe, 2½ tons specials, 75,000 gal. tank and tower, etc. H. E. Elrod, Interurban Bldg., Dallas, engr. Noted Oct. 4.

Ore., Portland—Until Oct. 29, by City, for 2 multi-stage turbine pumps, 1,000,000-gal. capacity, and other pumping equipment for water-works. D. Kellaher, purch. agt. P. H. Dater, city engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—City let contract laying water pipes, Commercial Causeway and Washington St., to J. T. Shea, Jr., 696 East 6th St., $13,302.

★**Conn., Morris**—City of Waterbury let contract completing diversion tunnel at Wigwam Creek reservoir here to Gray & Ireland, 17 Battery Pl., New York City, $41,000.

★**Minn., Remer**—City let contract water-works system to Badger Constr. Co., 2844 Irving Ave., S, Minneapolis, $17,800. Noted May 31.

★**S. D., McLaughlin**—City let contract water-works system to Badger Constr. Co., 2844 Irving Ave., S., Minneapolis, Minn., $25,999.

Cal., Santa Barbara—City received low bid building storage reservoir back of Mission Hill, involving 33,980 cu.yd. excav. and fill on main dam; 5068 cu.yd. excav. and fill in embankment; 16,000 lin.ft. outlet pipe line; inlet and outlet appurtenances, etc., from A. L. Pendola, 1332 Garden St. Noted Aug. 2.

SEWERS

Proposed Work

N. Y., Buffalo—City plans trunk sewers in various districts. About $400,000. G. H. Norton, city engr.

N. Y., Rochester—See "Streets and Roads."

N. J., Newark—(Official)—City rejected bids sewer in Sandford Ave., 500 ft. 30-in. concrete pipe sewer, 240 ft. vitr. salt glazed pipe sewer, 12 catch basins and 5 manholes. Noted Sept. 20.

N. J., Passaic—City plans extending sanitary sewers and building storm water sewers in 1st Ward Park (Dundee Island), also sanitary sewers in Federal St. C. P. Wise, city engr.

Pa., Bristol—City plans to build additions to sewerage system; also enlarge water-works, including pumping plant. W. H. Boardman, city engr.

Pa., Scranton—Council passed ordinance to build sewerage system in 21st Ward. W. Schunk, city engr.

Va., Riverside—City plans sanitary sewerage system, main sewer to be 2 mi. long, in North Riverside and Riverside Park. About $15,000.

W. Va., Princeton—City plans election to vote on $50,000 bond issue to extend sewerage system.

Tenn., Nashville—(Official)—City voted $1,000,000 bonds to build sewerage system. Noted Aug. 16.

O., Rocky River—Village soon lets contract sewage disposal plant and sewers. E. H. Arnold, village engr.

Ia., Waterloo—City soon lets contract for extension to sewer through Lincoln Park addition. C. A. Roby, city engr.

Minn., Kinney—Village plans election to vote on $20,000 bond issue to build sewers. R. McNair, village engr.

Minn., St. Paul—City plans to install sewer in portion Ocean St. About $27,374. O. Claussen, city engr.

Minn., St. Paul—(Official)—City rejected bids for storm water sewer on Fairview, Summit, Macalester and Pascal Aves. Noted Oct. 11.

Mo., Clayton—St. Louis Co. plans to build sewerage system to extend from eastern edge of Kirkwood to Lindenwood, 5 mi. long. About $1,000,000.

Okla., Henryetta—City election Oct. 25th to vote on $32,000 bond issue for storm-water sewers. W. H. Sullins, city clk.

Okla., Ponca City—See "Water-Works."

Wash., Lind—City had plans prepared by Sawyer Bros., engrs., White Bldg., Seattle, sewerage system, including 21,300 ft. 6- 12-in. pipe. About $30,000.

Ont., Colchester South—City plans to construct storm drains. About $10,000. J. H. Madill, clk.

Ont., London—City lets contract about Oct. 20 for new vitr. tile sewers. About $25,000. H. Brazier, city engr.

B. C., Esquilmalt—City had plans prepared by E. F. Bourne, engr., for surface drain from Skinner's flats to sea, including 30-36-in. pipe.

BIDS DESIRED

N. Y., Brooklyn—Until Oct. 17, by L. H. Pounds, boro. pres., building sewers and sewage-pumping station in Flatlands Ave.

N. J., Bayonne—Until Oct. 16, by City, building sewers and appurtenances in portions East 23rd and East 24th Sts. W. L. Clarkson, city engr.

W. Va., Wellsburg—Until Oct. 16, by Street Comn., for lateral sewers in 3rd and 4th wards. M. E. Boyd, city engr. Noted May 3.

Ill., Berwyn—(Official)—Until Oct. 16 by J. M. Humiston, secy. bd. local impvts., for vitr. tile pipe sewers, etc., in Home, Wenonah, Clinton, Harvey and Wisconsin Aves. and West 27th St.; advertised in this issue.

Ia., Ames—Until Oct. 15, by City, for storm sewers, including about 7300 ft. 10- to 15-in. pipe, 13 manholes and 47 catch basins. A. B. Maxwell, city clk.

Kan., Baxter Springs—(Official)—Until Oct. 18, by O. M. Spratt, city clk., for sewerage system, including 82,618 ft. 8- 15-in. vitr. sewer pipe, 302 8- 16-in. c.-i. pipe, together with manholes, etc. A. C. Moore, Frisco Bldg., Joplin, Mo., engr. Noted July 26.

Idaho, Pocatello—Until Oct. 18, by A. R. Dawson, city clk., for 10,000 ft. 9-in. sewers in Dist. No. 12. About $25,290. J. H. Giles, city engr. Noted July 12.

Ont., Toronto—Until Oct. 16, by T. L. Church, chn. bd. control, building Moore Park sewer drainage system. Eastern and Western sections, outlet via Glen Rd., from Park Dr. to Summerhill Ave.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., Thiells—F. A. Vanderlip, pres. bd. mgrs., Letchworth Village, received low bid sanitary underground sewer, Attendants' Home and Service Bldg., from R. T. Ford Co., 206 South Ave., Rochester, $29,484.

N. J., Trenton—City received low bid 927 ft. 60-in. concrete sewer and 3 15-in. slants, 80 ft. 15-in. pipe, 4 concrete inlets and 2 manholes and 1 concrete portal wall, from De Lucia & Gibbs, South Clinton Ave., $14,224.

★**Pa., Scranton**—City let contract, 800 lin.ft. 36-in. brick sewer and 21,050 lin.ft. 30-in. vitr. pipe sewer to M. Stipp & Sons, 435 Moir St.

★**W. Va., Huntington**—(Official)—City let contract sewers portions Richmond St. to J. Ullom, Huntington, $23,496. Noted Sept. 27.

★**N. C., Durham**—(Official)—City let contract sewerage system to Blankenship & McClelland, Charlotte, $10,442.

★**O., Cleveland**—City let contract Sect. No. 4 south intercepting sewer to Connelly Constr. Co., 437 Arcade, $163,325. Noted Aug. 16.

Sewers (Continued)

★**O., Cleveland**—(Warrensville P. O.)—Village let contract Sects. Nos. 1 and 2 of Taylor-Caledonia Sewer Dist. No. 5, to George Bros,. 1148 Boliver Rd., $29,107, and $44,728 respectively; Sect. No. 3, to Curro Bros., 1977 East 126th St., $46,687. Both contractors of Cleveland. Noted Aug. 30.

★**O., Youngston**—City let contract sewer in Albert St. to C. Harris. About $75,000. Noted June 28.

Mich., Detroit — City received low bid for Sects. Nos. 1, 2 and 3, Lynch Rd. sewer, from J. A. Mercier, 216 Hammond Bldg., $1,095,720. Noted Sept. 13.

Minn., St. Paul—City received low bid storm sewer in Fairview St. from O'Neill & Preston, 60 East 6th St., $87,400. Noted Sept. 20.

★**Neb., Oakland**—(Official)—City let contract sewerage system to Katz Constr. Co., 638 Brandeis Bldg., Omaha, $31,118. Noted Sept. 13.

★**Tex., Nacogoches** — City let contract sewerage system and disposal plant to Winslett Eldridge Co., 1001 Main St., Dallas, $40,000. Noted Sept. 27.

BRIDGES

Proposed Work

Mass., Braintree — Town having plans prepared by H. L. White, engr., Farquhar St., for bridge over Monatiquo River. About $100,000.

N. J., Mount Holly—Bd. Freeholders Burlington Co. plan to rebuild and strengthen bridges leading to Camp Dix, Wrightstown. About $10,000. J. Logan, co. engr.

N. J., Newark—See "Buildings."

Pa., Du Bois — (Official) — City rejected bids building bridge over Sandy Lick Creek, on Brady St. About $15,000. G. A. Flink, 301-3 Commonwealth Trust Bldg., Harrisburg, engr. Noted Sept. 6.

Pa., Mauch Chunk—Carbon Co. plans to build new bridge over Aquashicola Creek, at Little Gap.

Pa., Pottstown—Montgomery Co., Norristown, and Chester Co., West Chester, plans to repair Hanover St. bridge over Schuylkill River. About $32,000.

O., Akron — (Official) — Summit Co. received no bids for North Hill viaduct, rein.-con., 2790 ft. long. M. Rebel, clk. Harrington, Howard & Ash, Orear Leslie Bldg., Kansas City, Mo., engrs. Noted Sept. 13.

Wis., Clintonville—City soon lets contract building 60-ft. rein.-con. bridge, 34-ft. roadway, over Pidgeon River. About $10,000. J. Spearbraker, clk.

Neb., Westpoint—Cuming Co. receiving bids about Oct. 20 for 240-ft. bridge over Elk Horn River. G. E. Johnson, Lincoln, state bridge engr.

Que., Shawenegan Falls—Council soon lets contract for rein.-con. bridge between Shawenegan Falls and Ste. Flore. R. Rinfret, city engr.

Sask., Ft. Qu'Apelle—Provincial Government. plans to build rein.-con. bridge over river joining Echo and Katepwe Lakes, here.

BIDS DESIRED

Md., Baltimore—Until Oct. 16, by State Rds. Comn., 601 Garrett Bldg., rebuilding 1 slab bridge on State Rd. near Bacon Hill, Cecil Co. F. H. Zouck, chn.; advertised in this issue.

W. Va., Big Chimney—Until Oct. 20, by Comrs. Kanawha Co., Charleston, building steel highway bridge over Elk River, near Big Chimney. F. D. Burdette, Charleston, co. rd. engr.

Fla., West Palm Beach—(Official)—Until Oct. 16, (extension of date) by Palm Beach Co. Comrs. building 2 60-ft. Scherzer rolling lift steel bridges over F. E. C. Canal at Delfray and Boynton. R. F. Goodman, co engr. Noted Sept. 20.

Ill., East St. Louis — See "Streets and Roads."

Tex., Dallas—(Official)—Until Nov. 6, by Dallas Southwestern Traction Co., building steel bridge, concrete approaches; advertised in this issue

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., Thiells—F. A. Vanderlip, pres. bd. mgrs., Letchworth Village, received low bid building bridge over creek from P. Keeler Bldg. Co., Loudonville St., Albany, $13,797.

★**Va., Richmond**—State Highway Comn. let contract building new 80-ft. steel bridge over south fork Roanoke River, Montgomery Co., to Roanoke Iron & Bridge Co., Roanoke.

★**Ga., Woodbine**—(Official)—Camden Co. Comrs., St. Marys, let contract building steel bridge over Satilla River to Austin Bros., Greenwood Ave., Atlanta, $17,800. with substitute of Scherzer rolling lift bridge for trunnion bridge. Noted Sept. 20.

★**Fla., Bradentown** — City let contract building bridge over Manatee River, between Bradentown and Palmetto, to E. W. Parker, 402 Curry Bldg., Tampa, $57,000. Noted Aug. 16.

★**O., Columbus**—Bd. Comrs. Franklin Co. let contract building bridge over Scioto River, to Hickey & Co., Ry. Ex. Bldg., St. Louis, Mo., $584,905.

★**Kan., Mankato** — (Official)—Jewell Co. let contract building 19 bridges to Central Bridge Co., Mankato, $15,985. Noted Sept. 20.

★**N. M., Las Vegas**—San Miguel Co. let contract building 4 bridges to Missouri Valley Bridge Co., Sante Fe, N. M., $56,353.

Cal., Los Angeles—Los Angeles Co. received low bid building bridge over San Gabriel River, Anaheim-Telegraph Rd., and timber bridge over Rio Hondo Valley Blvd., from W. Ledbetter, 651 Pacific-Electric Bldg., $49,942 and $44,937 respectively. Noted Sept. 13.

★**Cal., Stockton** — See "Excavation and Dredging."

STRUCTURAL STEEL WORK

Proposed Work

N. J., Newark—See "Buildings."

BIDS DESIRED

W. Va., Big Chimney—See "Bridges."
Fla., West Palm Beach—See "Bridges."
Tex., Dallas—See "Bridges."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—See "Industrial Works."
★**Va., Richmond**—See "Bridges."
★**Ga., Woodbine**—See "Bridges."

REINFORCED CONCRETE

Proposed Work

Conn., Middletown—See "Industrial Works."
Wash., D. C.—See "Federal Government."
O., Akron—See "Bridges."
Mich., Detroit—See "Buildings."
Wis., Clintonville—See "Bridges."
Que., Shawenegan Falls—See "Bridges."
Sask., Ft. Qu'Apelle—See "Bridges."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Buffalo**—See "Industrial Works."
★**Ky., Louisville**—See "Industrial Works."

STREETS AND ROADS

Proposed Work

N. Y., Buffalo—City Council plans to pave Breckenridge St., sandstone on concrete base. G. H. Norton, city mgr.

N. Y., Rochester—City plans to pave Ringle St. and Arnett Blvd., also grade, build sidewalks and install sewers in Grand Ave., about $61,200 and $18,000, respectively. F. T. Elwood city engr.

N. J., Jersey City—City Comrs. plan to improve Stevens Ave. About $20,000. A. Van Kuren, city engr.

N. J., North Bergen—(Weehawken P. O.)—Town plans to repave and improve Courtlandt St., from Hudson Co. Blvd. to Grand Ave. About $15,000.

N. J., West Orange—Council plans paving portion Valley Rd., grouted granite block on concrete. About $60,000. C. Winston, city engr.

Pa., New Brighton—Boro. plans to grade, curb and pave portions 4th and 8th Aves. and 12th St. H. T. Barber, city engr.

Pa., Paxtang—Boro. Council plans to pave Derry St. Pike with State aid.

Va., New Kent—New Kent Co. Comrs. plan $50,000 bond issue to improve automobile highway provided Federal Government will appropriate like amount.

Va., Petersburg — City and Prince George Co., Prince George, plans widening concrete road between Petersburg and Camp Lee. County to appropriate $20,000 toward cost and city $10,000.

W. Va., Elm Grove—City voted $51,000 bond issue to pave all streets.

S. C., Columbia — City plans to issue $320,000 bonds for street improvements, parks, city market and abbatoir. L. A. Griffith, mayor.

Ga., Atlanta—Fulton Co. Comrs. plan to resurface Peachtree Rd. from city limits to Bulkhead, 2½ mi., asphaltic concrete. About $75,000.

Florida—State Highway Comn., Tallahassee, having surveys made for completing paving of National Highway through Hamilton and Columbia Cos.

Fla., Kissimmee—Osceola Co. sold $100,000 bonds to build road from Kissimmee to Loughman Dist. 2. Noted July 12.

Ala., Russellville — Franklin Co. made surveys for Jackson Highway. About $20,000.

La., East Baton Rouge—(Baton Rouge P. O.)—City will sell $50,000 bonds for improving and repairing roads. F. A. Woods, secy., police jury.

La., Point a la Hache—Plaquemines Co. plans to repair shell road from here to St. Bernard parish line. About $24,000. State Highway Dept., New Orleans, to pay half of cost of work.

Tenn., Chattanooga—Hamilton Co. plans repairing and rebuilding entire La Fayette Rd. from Rossville to Georgia Monument.

Tenn., Dyersburg—Dyer Co. court plans building 24-mi. Jefferson Davis Highway. About $250,000. State and Federal Government to contribute towards cost.

O., Cincinnati — City to sell $140,000 bonds Oct. 15 to improve portion Madison Rd., wood block; paving gutters, brick, and balance roadway with bitulithic, setting granite curbs and constructing necessary addition to water mains. Noted Sept. 13.

O., Cincinnati—City plans improving and paving Chickering, 28th, Race, Wately, Walworth and Tweed Sts. F. Krug, city engr.

O., Lima—City plans to improve portion High St., cost $15,500; Linden St., $8000; Ontario Ave., $7000; Walnut Alley, $4000; Hickory and Court alleys, $5500. C. Bryson, city engr.

Ind., Ft. Wayne — (Official) — Allen Co. sold $19,200 bonds for highway improvements. Noted Sept. 27.

Ind., Indianapolis—Marion Co. will sell $38,500 bonds for road improvements. E. G. Sourbier, co. treas.

Ind., Indianapolis—City plans to improve and pave portions Maple, Meridian, Temple and Illinois Sts., and 2 alleys. B. J. T. Jeup, city engr.

Mich., Benton Harbor—City plans to pave portion Colfax Ave. M. L. Jones, city engr.

Mich., Charlevoix—Charlevoix Co. plans to issue $200,000 bonds to improve roads.

Ill., Chicago—Cook Co. electors to vote November 6 on $1,500,000 bond issue to improve 80 mi. of roads.

Ill., Freeport—Stephenson Co. plans State Aid Highway, 9 mi. with 18-ft. roadway and 4-ft. gravel shoulder. About $58,442. M. H. Butterfield, co. surv.

Ill., Pekin—City plans to extend Court St. paving to East Bluff. Improvement R. F. Smith, city engr.

Ill., Rockford—Winnebago Co. election Oct. 30 to vote on $145,000 bond issue to build road from city limits to Illinois Central via Charles St. Rd. and Cherry Valley.

Ill., Woodstock—McHenry Co. plans to improve road from Woodstock toward Marengo, also Harvard-Alden Rd. in Harvard Twp. About $18,974.

Minn., St. Paul—City plans paving portion Bernal Ave., brick. About $18,340. O. Claussen, city engr.

Kan., Kansas City—Wyandotte Co. had plans prepared for repaving main thoroughfare. About $98,000. O. K. Williamson, engr.

Kan., Wichita—Council passed ordinance paving portions Indianola, Lawrence, Estelle and Lorraine Aves., Grimes, Kellogg, Market and English Sts., also alleys between Topeka and Emporia Aves. A. Bruce, city engr.

Streets and Roads (Continued)

Mont., White Sulphur Springs—Montana Good Roads Assn. plans to build 408-mi. "Y-G Bee Line Railway" between Yellowstone and Glacier National Park. Scott Leavitt, Great Falls, pres.

Mo., Centerville — Reynolds Co. plans $100,000 bond issue for building and improving roads.

Mo., Charleston—Mississippi Co. having plans prepared for system of gravel roads. Bonds for $375,000 sold for work. Noted Aug. 9.

Mo., Doniphan—(Official)—Ripley Co. at election Oct. 2 defeated $200,000 bond issue for improving roads. Noted Aug. 30.

Ark., Conway—(Official)—City receiving bids about Feb. 1, paving Dist. No. 8. B. G. Wilson, engr.

Texas—State Highway Dept., Austin, making preliminary surveys for roads through Cameron, Hildalgo, Brooks, Kleberg and Neuces Cos. Federal Government appropriated $800,000 for work in Texas. M. C. Welborn, div. engr.

Tex., Corsicana—Navarro Co. voted $80,000 bonds for roads in Rice Precinct, Dist. No. 12. Noted Sept. 6.

Tex., Georgetown—Williamson Co. plans paving portion Meridian Highway from Travis Co. line to Bell Co. line, bituminous macadam; with State and Federal aid. About $105,000.

Tex., Gilmer—Upshur Co. voted $25,000 bond issue for building roads.

Tex., Longview—State Highway Comn., Austin, apportioned $15,000 of Federal Government appropriation to build roads in Gregg Co.

Tex., Post—Garza Co. voted $65,000 bonds to build roads.

Tex., Sweetwater—Nolan Co. plans to improve and complete Ft. Worth-El Paso and Canadian and Del Rio Highways. About $132,179. County to appropriate $97,650 toward cost, Federal Government, $27,080; State, $7449.

Okla., Miami—City plans election Nov. 20 to vote on $350,000 bond issue for road work. Noted June 28.

Okla., Oklahoma—City soon receives bids paving portion Shields Blvd. G. V. McClure, city engr.

Okla., Ponca City—City plans paving 34 blocks, brick. C. B. Harold, clk.

Idaho—(Official)—State Highway Dept., Boise, lets contract in April, 12-mi. state highway, through Grangeville Highway Dist. About $35,000. A. H. Wetherbee, engr.

Idaho, Twin Falls—City Council soon receives bids paving alleys in L. I. D. No. 29. About $14,000. J. A. Bybee, city engr.

Wash., Davenport—Lincoln Co. Comrs. plan to spend about $65,000 to build roads.

Wash., Seattle—City had plans prepared paving Marion Ave., involving 584 cu.yd. armored concrete curb, 95,000 ft. asphalt paving 5-in. concrete base, 42,000 sq.yd. 6-in. concrete base, 14,000 sq.yd.; asphalt top, 1500 sq.yd.; concrete paving, 6-in. base, 28,000 sq.yd.; brick block paving, 5-in. concrete base, 66,000 sq.yd.; 7-in. concrete base, 24,000 sq.yd. A. H. Dimock, city engr.

Wash., Waterville—Douglas Co. will soon receive bids building Permanent Highway No. 4. About $10,000.

Ore., Dallas—Polk Co. Court had plans prepared for paving Dallas-McMinnville Rd.

Ore., Enterprise—Wallowa Co. plans to build with State and Federal aid Flora-Enterprise Rd., to be part of forest roads. About $40,000.

Ore., Gold Beach—Curry Co. having plans prepared by State Highway Dept., Salem, for road from Coos Co. line to California line. Noted Sept. 27.

Ore., Roseburg—City Council authorized paving Rose and Hamilton Sts. About $13,000.

Ore., The Dalles—Wasco Co. received bids for Celilo-Dufur part of Inland California Highway. Noted Sept. 20.

California—State Highway Comn., Sacramento, will build roads in various counties, cost to be borne by Highway Comn. and counties. (a) cost of entire road, (b) state's contribution. Watsonville-Eureka Rd., (a) $1,175,000, (b) $691,000. Pacheco Pass Rd., (a) $1,618,472, (b) $741,650. Yosemite Rd., (a) $777,581, (b) $178,650. Coalinga-San Lucas Rd., (a) $1,761,742, (b) $502,860; Famosa-Passo Robles Rd., (a) $1,339,596, (b) $448,320; San Bernardino-Barstow Rd., (a) $534,112, (b) $178,770; San Bernardino-Yuma Rd., (a) $2,260,362, (b) $756,510. A. B. Fletcher, state highway engr.

Cal., El Cajon—Town defeated $11,500 bonds building state highway through town, concrete. Noted Aug. 30.

Cal., Oroville—Butte Co. plans to pave Sacramento and Reading Aves. C. F. Belding, co. clk.

Cal., San Diego—City had plans prepared improving Park Blvd. Indiana St., and Robinson Ave. About $35,173. G. Cromwell, city engr.

Cal., San Francisco—Bd. Pub. Wks. appropriated an additional sum $400,000 for street repair work; $23,375 of amount to be spent on repaving portion Mission St. M. M. O'Shaughnessy, city engr.

Ont., Sandwich—West Township lets contract about Oct. 15 for building concrete pavement. About $30,000. J. J. Newman, David Bldg., Windsor, engr.

BIDS DESIRED

N. J., Jersey City—(Official)—Until Oct. 18, by Bd. Comrs., improving Dwight St. and De Kalb Ave.; asphalt paving on concrete base; Van Cleef St. and Germania Ave., bituminous concrete on concrete base. C. A. Van Kuren, city engr. Noted Oct. 4.

N. J., Jersey City—Until Oct. 23, by City repaving portion Tonnele Ave., wood block. C. A. Van Kuren, city engr. Noted July 12.

N. J., South Orange — (Official) — Until Oct. 16, by Twp. Com., macadam pavements, cement sidewalks and curbing on Walton Ave. and Wellesley St. I. T. Redfern, engr. Noted Sept. 20.

W. Va., Morgantown—Until Nov. 6 by Monongalia Co. Court, paving Deckers Creek Rd. in Morgan Dist., concrete or macadam.

W. Va., Wayne—Until Oct. 13, by S. J. Crum, clk. Wayne Co., road in Union Dist., and Mill Creek Rd., Butler Dist.

O., Bryan—(Official)—Until Oct. 20, by J. A. Neill, village clk., improving portion Wilson, High and Union Sts.

Indiana—By Co. Comrs. building roads as follows: Oct. 26, Marshall Co., Plymouth, 5 gravel roads, Tippecanoe, Center, German, Union and Walnut Twps. O. H. Weber, aud. Oct. 27, Grant and Huntington Cos., Marion, stone road, Van Buren Twp., Grant Co., Jefferson Twp., Huntington Co. M. McRae, aud. Oct. 29, Marion Co., Indianapolis, building and improving Southeastern Ave., Warren Twp. L. K. Fesler, aud. Nov. 6, Harrison Co., Corydon, 11,471 ft. road between Posey and Webster Twps. S. C. Mauck, aud. Nov. 6, Jasper Co., Rensselaer, 2 stone roads Marion and Barkley Twps. J. P. Hammond, aud.

Ill., Berwyn—(Official)—Until Oct. 16, by J. M. Humiston, secy. bd. local impvts., grading and paving portions Clinton, Wisconsin, Harvey and Wenonah Aves.; advertised in this issue.

Ill., East St. Louis—Until Oct. 15, by Bd. Pub. Impvts. brick paving, marginal and sandstone curb, vitr. pipe on State St.; also bridge over drainage canal. About $300,000. E. S. Harper, 1413 State St., engr.

Ark., Conway—Until Oct. 22, by Faulkner Co. Rd. Impvt. Dist. No. 1, for 9-mi. hard surface roads. W. J. Grummer, secy. B. G. Wilson, engr.

Idaho, Bonners Ferry—(Official)—Until Oct. 20, by Boundary Co. for hillside grading and building small bridges. About $63,000. J. V. Stanley, clk. Noted Sept. 27.

Washington — Until Oct. 22, by State Highway Comn., Olympia, grading and draining 12 mi. Sunset Highway. Noted Sept. 27.

Wash., Ephrata—Until Oct. 22, by Grant Co. Comrs., surfacing 3 mi. Permanent Highway No. 10, also 2 mi. Permanent Highway No. 8A. Noted Aug. 30.

Cal., San Diego—Until Oct. 17, by J. B. McLees, clk. San Diego Co., building highway near Riverview.

Ont., Cornwall—Until Oct. 17, by A. I. MacDonell, co. clk., building 60 mi. waterbound macadam or bituminous macadam roads in Stormont, Dundas and Glengarry Cos. J. G. Cameron, Finch, co. road supt.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Massachusetts**—State Highway Dept., Boston, let contract paving roads in Westford to J. E. Watkins, Amesbury, $10,483; Braintree to E. C. Sargent, Adams Bldg., Quincy, $17,719; Deerfield, B. Perini & Co., Ashland, $22,655; Egremont and Sheffield, L. C. Fay & Co., 318 Main St., Springfield, $52,315. Noted Oct. 4.

★**Massachusetts**—(Official)—State Highway Comn., Boston, let contract 5000 ft. highway in Stockbridge to Lane Constr. Corp., 37 Colony St., Meriden, Conn., $17,238. Noted Sept. 27.

★**Mass., Boston**—City let contract paving Grove St., East Boston, Museum Rd., Roxbury, and Minton St., West Roxbury, sheet asphalt and topeka, to Warren Bros., 162 Berkeley St.; about $16,800; Cliffmont St., West Roxbury, bituminous macadam to M. De Matteo, 146 Dudley St., Roslindale, about $19,827.

N. Y., Buffalo—(Official)—City received low bids paving portions Walnut St., from Erie Contg. Co., Morgan Bldg., brick, $13,000; German Rock Asphalt Co., Morgan Bldg., asphalt, $11,650; H. P. Bugard Co., standard asphalt, $12,100. Noted Oct. 4.

★**N. Y., Fulton**—City let contract 13.4 mi. paving and curbing to Pathfinder Constr. Co., $75,000. Noted Aug. 9.

★**N. Y., Tarrytown**—Bd. Trustees let contract paving Bway. to H. B. Sproul, 105 South Division St., Peekskill. Noted June 28.

★**N. J., Jersey City**—(Official)—City let contract paving Central Ave., involving 30,035 sq.yd. asphalt, and 20-in. c.-i. water main, to Clinton Constr. Co., 306 Charles St., Hoboken, 98%. Noted Sept. 27.

★**N. J., North Bergen**—(Weehawken P. O.)—Twp. let contract repaving 31st St. to Clinton Constr. Co., 306 Charles St., Hoboken, $20,761; Bulls Ferry Rd., to Nolan & Hornung, 309 Kerrigan Ave., Union, $32,320. Noted Sept. 20.

★**N. J., Princeton**—Boro. Council let contract rebuilding Stockton St., warrenite, to Reardon Co., Princeton. About $35,649. Noted July 26.

W. Va., Charleston—(Official)—City received low bid paving and curbing several streets and alleys from Central Eng. Co., Charleston, $58,688. Noted Sept. 6.

★**W. Va., Huntington**—City let contract paving portions Doullton and Olney Aves., 30th and 3rd Sts., Dixie block, to J. Ullom, $23,485.

★**Ky., Covington**—Kenton Co. Comrs. let contract paving road south from Lexington Turnpike, waterbound macadam, to J. Exterkamp, 8th and Phila. Sts. About $10,000.

★**O., Bryan**—Williams Co. Comrs. let contract road work to A. M. Acker, Bryan, Doughton Rd., 2 mi., waterbound macadam, $22,000; C. Thomas, 23 East Jackson Blvd., Chicago, Stryker Rd., macadam, $38,000; J. A. Elder, Bryan, Cassell Rd., waterbound macadam, $22,500; Brannon Constr. Co., Bryan, Mt. Pelier Rd., 2 mi., bituminous macadam, $234,000. Noted Sept. 6.

★**O., Bryan** — (Official) — Williams Co. Comrs. let contract building 1.94 mi. public highway in Springfield Twp., to Chas. Thomas, Stryker, $20,947. Noted Sept. 20.

★**O., Cleveland**—Bd. Control let contract paving and improving portion Locke Ave., to O. J. Leach, 504 Eddy Rd. About $18,416. Noted Aug. 23.

O., Cleveland—(Official)—City received low bids paving Ivanhoe Rd., grade elimination, from Rieley Bros., 348 Arcade, $24,252; and Baldwin Bros., 560 Rose Bldg., $35,436. Noted Sept. 20.

O., Cleveland — (Official) — City received low bid grading, draining, curbing and repaving Sect. 1, Woodhill Rd., from B. M. Pejsa Co., 2359 East 93rd St., $62,770; Sect. 2 from Baldwin Bros. Co., 560 Rose Bldg., $60,450. Noted Sept. 27.

★**O., Hamilton**—City let contract paving West Main St. to Federal Asphalt Paving Co., $34,481; Grand Blvd. to Andrews Asphalt Co., $50,153; both of Reutschler Bldg., Hamilton. Noted Sept. 27.

★**Indiana**—(Official)—Bd. Co. Comrs. let contract building roads various twps. as follows: Bartholomew Co., Columbus, gravel road, Washington Twp., to A. H. Fry, Columbia City, $9565; Vermilion Co., Newport, 2 gravel roads to J. Bonwell, Dana, Ind., $8594; Clinton Co., Frankfort, gravel roads Perry Twp. to W. J. Nees,

Streets and Roads (Continued)

J. C. Miller and Thompson & Kelley, all of Frankfort; Elkhart Co., Goshen, concrete road, Concord Twp. to Foley Constr. Co., 127 North Dearborn St., Chicago, $8895. Noted Sept. 20.

Ind., Indianapolis—City received low bid paving portions Gladstone Ave., asphalt, from Union Asphalt Constr. Co., 308 Amer. Central Life Bldg., $4.51 per lin.ft.

★**Michigan** — State Highway Comn., Lansing, let contract grading 9½ mi. road from Montague to New Era, to C. P. Walker, Fremont, $63,460. Noted June 21.

★**Mich., Kalamazoo**—Kalamazoo Co. Rd. Comrs. let contract building road from Yorkville to east side of Gulf Lake & Turners Resort, Dist. No. 1, to H. A. Nichols, Hastings, $23,972. Noted Sept. 20.

★**Mich., Pontiac**—Oakland Co. let contract building 3 mi. Elizabeth Lake Rd., and 2½ mi. Clawson Rd., Royal Oak twp., concrete, to Ladue & Scotten, Penobscot Bldg., Detroit, $54,961 and $54,422 respectively; 7 mi. Maple Ave., Bloomfield Twp., concrete, to Slater Constr. Co., Pontiac, $143,106.

★**Ill., Rock Island**—City let contract paving portions 15th, West 17th and 18th Sts., and 4th Ave., to McCarthy Co., 3rd and Perry Sts., Davenport, Ia. About $2.37, $2.32, $2.30, and $2.32 per sq.yd. respectively. Noted Sept. 13.

★**Ill., Springfield**—City let contract paving and curbing portions of 13th St., brick, to J. A. Pattison Co., Springfield, $1.80 per sq.yd. and 58c. per lin.ft. respectively.

★**Mont., Butte**—Silver Bow Co. let contract paving guttering, draining and curbing portion South Montana St., to J. C. Maguire, 615 Daly Bank Bldg. About $13,673. Noted Sept. 13.

★**Mo., St. Joseph**—Bd. Pub. Wks. let contract paving portion Duncan St., asphaltic concrete, to Metropolitan Paving Co., 7th and Olive Sts. Noted July 5.

★**Ariz., Phoenix**—City let contract improving portion Willetta and Van Buren Sts., Grand and 7th Aves., to Southwestern Contr. Co. About $54,000.

★**Ariz., Prescott**—Yavapai Co. let contract 5-mi. concrete highway from Jerome to Clarkdale, to Fleming & Stitzer, Prescott. About $65,000.

★**Wash., Seattle** — (Official) — King. Co. Comrs. let contract grading and graveling road between Renton and Renton-Junction, to E. J. Macquaid, 6556 3rd Ave., N. W., $14,083. Noted Oct. 4.

Wash., Seattle—City received low bids paving Beacon Ave., from J. B. Romano, 3314 16th Ave., $33.897; Superior Constr. Co., 1642 Lane St., $34,160; P. J. McHugh, 3rd and North Mercer St., $34,501.

★**Oregon**—State Highway Dept., Salem, let contract macadamizing Pacific Highway from Grants Pass to Josephine Co. line, 8 mi., to A. Anderson, Grants Pass.

★**Ore., The Dallas**—Wasco Co. Court let contract paving portion Columbia Highway between Mosier and Chenowith Creek, to Elliott Contr. Co., McKay Bldg., Portland. About $70,124. Noted Sept. 20.

Cal., Los Angeles—(Official)—City received low bid improving Sherman Dr., from W. M. Ledbetter, 1 Pacific Electric Bldg., $24,000. Former contract was rescinded and work readvertised. Noted Sept. 27.

Cal., Los Angeles—Bd. Pub. Wks. received low bid building concrete pavement, cultivating and oiling 6 mi. Reseda Ave., from G. H. Oswald, O. T. Johnson Bldg. About $140,000. Noted Sept. 27.

Cal, Los Angeles—City received bids grading and constructing bitulithic pavement, storm drains and sewers on West 1st St., from G. H. Oswald, O. T. Johnson Bldg., $213,000; Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., $222,622. Noted Oct. 4.

★**Cal., Oroville**—(Official)—Butte Co. rejected bids improving roads in Dist. No. 2. All work to be done by day labor. Noted Sept. 20.

★**Cal., South Pasadena**—City let contract improving Fremont Ave., to Montgomery & Ducey, 151 South Hill St. About $21,816. Noted Sept. 27.

★**Que., St. Alexis**—Municipal Council let contract building macadam road to Pierre Laberge, Riviere du Moulin, Chicoutimi. Noted June 21

RAILWAYS—STEAM & ELECTRIC

Proposed Work

New Jersey—See "Buildings," Newark.
Ohio—See "Industrial Works," Youngstown.

Colorado—See "Miscellaneous," Denver.
Utah—Oregon Short Line R.R. plans to spend about $1,000,000 for building 40 mi. feeder lines in northern Utah and southern Idaho. Plans provide for extension of 3.85 mi. to Baker Spur north of Brigham and 9.65 mi. from Garland to Beaver River City. Other improvements to be made in southern Idaho include branch from Menan to Annis, 2.73 mi.; Lincoln and Furth, 2 lines, 3.59 and 7.44 mi., from Collins, N. E., 7.26 mi. and Keever to Thomas, 4.55 mi. C. Stradley, Salt Lake City, ch. engr.

California—Pacific Electric R.R. plans to build electric line from Redlands to Yucaipa Valley, about 13 to 14 mi. J. McMillan, Pacific Electric Bldg., Los Angeles, genl. mgr.

EXCAVATION AND DREDGING

Proposed Work

Ala., Haynesville — Drainage — Lowndes Co. making preliminary surveys for system to drain 20,000 acres, vicinity of Letohatchie Creek. About $200,000. J. R. Scott, Sarasota and Barstow, Fla., engr.

Miss., Carrollton—Drainage—Potacocowa D.D. retained Morgan Eng. Co., engrs., Goodwyn Institute, Memphis, Tenn., to make surveys and prepare plans for system to reclaim 25,000 acres, Potacocowa Creek.

Minn., Anoka—Ditch—Anoka Co. soon receives bids building Co. Ditch No. 59. About $35,000. F. J. Armstrong, 721 Germania Life Bldg., St. Paul, engr.

Minn., Anoka—(Official)—Ditch—Anoka Co. rejected bids building Co. Ditch No. 60. Noted Sept. 20.

Minn., Fairmont—Ditch—Martin Co. had plans prepared by Jones & Curtiss, engrs., 241 Pfeiffer Bldg., for Judicial Ditch No. 82. About $50,000.

Minn., St. Cloud — Ditch — Stearns Co. plans to build Co. Ditch No. 44, 27-mi. long. About $46,000. N. Thomry, co. aud.

Minn., Slayton — (Official) — Ditches — Murray Co. rejected bids building Judicial Ditch No. 19, involving 101,000 ft. 6- to 26-in. tile, cost, $44,542; Co. Ditch No. 6, 32,700 ft. 6- to 28-in. tile, $15,315. Noted Sept. 20.

Colo., Mancos—Ditch—Dir. Summit Land & Irrigation Co. plan to build new intake ditch. About $56,000 available for work. J. W. Ritter, chn.

BIDS DESIRED

N. Y., Albany—(Official)—Barge Canal Improvements—Until Nov. 2, by W. W. Wotherspoon, supt. pub. wks., Capitol; advertised in this issue.

Ga., Athens—Drainage—Until Oct. 23, by Beaver Dam D.D. No. 1, building 13-mi. ditches along Beaver Dam Creek to reclaim 1600 acres. About $35,732. H. H. Hampton, comr. C. M. Straham, Athens, engr. Noted Sept. 27.

Ia., Sibley—Drainage—Until Nov. 2, by Osceola Co., building D.D. No. 26, involving 57,230 ft. 6- to 30-in. tile. D. W. Clayton, aud.

S. D., Sioux Falls—Drainage—Until Oct. 13, by E. H. Shonkle, aud., Minnehaha Co., cleaning and deepening 10-mi. channel D.D. Nos. 1 and 2, also cutting 2-mi. ditches, 20-ft. bottom, and straightening Big Sioux River, north of Sioux Falls, part of D.D. Nos. 1 and 2. H. M. Derr, Pierre, state engr.

Tex., Anahuac—See "Miscellaneous."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. J., Jersey City—See "Miscellaneous."

★**Ill., Pittsfield** — (Official) — Canals — Canal Const. Sny Island Levee D. D. let contract building 3½ mi. canals 70-ft. bottom, involving levee and auxiliary side ditches and 358,500 cu.yd. excav. to A. V. Wills & Sons, 517 Bhatmans Bank Bldg., St. Louis, Mo., 15c. per cu.yd. Noted Sept. 28.

★**Ia., Estherville**—Ditch—Emmet Co. let contract building D. D. No. 108 to Cement Products Co., Estherville, tile, $18,518; M. J. Ayhoard, Spencer, labor, $11,498. Noted Sept. 27.

★**Minn., Anoka** — (Official) —Ditch—Anoka Co. let contract building Co. Ditch No. 41 to K. C. Richardson, Anoka, $16,400. Noted Sept. 20.

★**Minn., Le Sueur**—(Official)—Ditch—Le Sueur Co. let contract building Co. Ditch No. 45 to V. E. McDonald, Meriden, $27,004. Noted Sept. 20.

★**Minn., Walker**—(Official)—Ditch—Cass Co. let contract building Judicial Ditch No. 8, involving 98,925.8 cu.yd. excav. and Judicial Ditch No. 9, Cass and Wadena Cos., 104,462 cu.yd. excav. to E. E. Griffith, Backus, .1045c. per cu.yd.

Cal., Modesto—Canal — Modesto Irrigation Dist. received low bids building sections concrete lining in main canal between Rariden Fill and Salter Fill, from C. E. Cotton, 16 California St., $30, 230, and Tieslau Bros., Builders' Ex., both of San Francisco, $30,492.

★**Cal., Stockton**—Canal—West Side Irrigation Dist. let contract building 40 mi. canals to Johnson Bros., Tracy and C. H. Laiklin, Manteca, $55,000; building bridge over intake canal to Jacobs & Sayles, Stockton, $2488. Noted Aug. 9.

INDUSTRIAL WORKS

Proposed Work

Conn., Middletown—Mattabosset Brewing Co., c/o S. P. Moscalitts, 84 Veteran St., Meriden, soon lets contract 5-story, 80 x 88-ft. concrete plant. About $75,000. C. H. Hottinger & Co., Rowe St., Roslindale, Mass., archts.

N. Y., Cobleskill—J. Kayser & Co., 45 East 17th St., New York City, plans to build silk factory on East Main St. About $50,000.

N. Y., New York—T. J. McCahill, 45 East 42nd St., having plans prepared by G. W. Culgin, archt., 15 Broad St., for garage at 144-148 East 41st St. About $75,000

N. Y., New York—Oval Garage Corp., 950 Ave. St. John, soon lets contract 3-story, 100x150-ft. brick and concrete garage on Whitlock Ave. and Faile St. Goldner & Goldberg, 391 East 149th St., archts. About $75,000 Noted May 24.

N. J., Garfield—(Passaic P. O.)—Passaic Bakers' Exchange plans bakery and flour warehouse, Maple Ave. and Van Winkle St. About $75,000.

N. J., Gloucester City — Pennsylvania Shipbuilding Co. having plans prepared by G. F. Pawling & Co., engrs., 1438 South Penn Sq., Phila., for several 1-story buildings. About $1,000,000.

N. J., Newark—Goodyear Tire & Rubber Co., 123 Washington St., plans 6-story, 100x250-ft. brick and concrete warehouse.

N. J., Paterson—Commonwealth Chemical Co. plans new factory East 42nd and East 43rd Sts. About $100,000. Address E. C. King.

Pa., Scranton—Industrial Bureau of Bd. Trade plans 4-story, 50 x 140-ft. incubator factory. About $100,000

Md., Baltimore—Poole Eng. Co., West of N. C. Ry. and north of Padonia Sta., had plans prepared for 150 x 500-ft. gun factory east of its Woodbury plant. About $2,000,000.

N. C., Rockingham—Steele Mills Co. plans to build additions to plant, including 1-story, 175x285-ft. weave shed. About $300,000.

S. C. Columbia—See "Streets and Roads."

Ala., Birmingham—Tennessee Coal Iron & R.R. Co., 918 Am. plans new electrically driven mills and other improvements. About $11,000,000.

La., Monroe — Vicksburg Shreveport & Pacific R.R. plans additions to shops including 9-st. x 120-ft. machine shop, blacksmith shop, etc. About $100,000. H. B. Hearn, Shreveport, Supt. Arnold Eng. Co., 105 South La Salle St., Chicago, engrs.

La., New Orleans — Southern Brewery Co., 914-32 North Johnson St., plans to rebuild bottling plant recently destroyed by fire. About $150,000

O., Columbus—Federal Chemical Co., Lincoln Bldg., Louisville, Ky., plans subsidiary plant here. About $500,000. W. Cook, engr.

O., Youngstown—Youngstown & Suburban Ry. plans power plant at Southern Park and addition to car at South Side Park; also repair shop. A. M. Hartford, 1021 East Front St., genl. mgr.

Industrial Works (Continued)

Ind., Kokomo—Kokomo Rubber Co., 1042 South Main St., will increase its capital stock from $[illegible] to $1,000,000, and plans addition to plant.

Ind., Whiting—Great Western Smelting & Refining Co., of Chicago, purchased 25-acre site between New York Ave. and Indianapolis Blvd., and plans to build plant. About $50,000.

Mich., Port Huron—Mueller Mfg. Co., 512 W. Cerro Gordo St., Decatur, Ill., plans additional factory here, including 86 x 140-ft. brass foundry, 80 x 100-ft. rod mill, power house, sheds, etc. About $400,000. A. Mueller, pres.

Wis., Ashland—Ashland Light, Power & Street Ry. Co., 212 West 2nd St., plans 1200-h.p. hydro-electric plant on falls at mouth of Montreal River. About $100,000. F. E. Winders, genl. supt.

Wis., Milwaukee — Kieckhefer Box Co., 16th St. Viaduct, plans 1-story, 190.6 x 217-ft. rein.-con. and brick addition to plant. About $50,000. J. W. Kieckhefer, pres.

Minn., Minneapolis—Electric Machinery Co., 14th Ave. and Tyler St., N. E., plans to build an addition to its plant. About $50,000.

Minn., Minneapolis—Federal Steel & Mfg. Co., 609 5th St., S., recently purchased 12 acres land and plans 3 110 x 400-ft. machine shops and 100 x 125-ft. foundry. About $500,000. F. D. McClure, pres.

Minn., Minneapolis—Minneapolis Steel & Machinery Co., 29th St., and Minnehaha Pkway., having plans prepared for addition to plant.

Minn., Minneapolis — M. Pfaum, of G. Pfaum & Sons, and B. Zimmer of Twin City Mission Furniture Co., 2285 Hamp St., plans factory, Marquette Ave., and 19th St. About $200,000.

Neb., Omaha—Emerson-Brantingham Implement Co., 1101 Jackson St., plans to build warehouse. About $90,000.

Mo., St. Louis—Monsato Chemical Co., 1800 South 2nd St., had plans prepared for a new plant. About $1,000,000. Brenneke & Fay, Fullerton Bldg., archts. Noted Sept. 20.

Tex., Houston—Texas Textile Co., recently organized with capital stock of $250,000, plans 40x120-ft. factory. About $50,000. B. N. Garrett, pres.

Okla., Vinita—Southwestern Power Co., Vinita, plans power plant here, to include string of 3 dams across Grand River. About $1,000,000.

N. M., Clovis—See "Buildings."

Wash., Spokane—Sperry Flour Co., 562 Mallon St., plans addition to plant. About $300,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—New York Shipbuilding Corp., 115 Bway., New York City, let contract steel shipbuilding plant to American International Corp., 120 Bway., New York City. About $1,000,000.

★**Mass., Brightwood**—Springfield Aircraft Corp. has taken over main building of Wason Mfg. Co., and let contract for additions to same to E. T. Ley & Co., 495-275 Main St. About $50,000.

★**N. Y., Buffalo**—Standard Oil Co., 26 Bway., New York City, let contract 5-story, 45x117-ft. reinforced concrete warehouse to H. D. Hunt Co., 52 Vanderbilt Ave., New York City. About $100,000. Noted Oct. 4.

★**Pa., Phila.**—Dept. Health and Charities let contract power house, 34th and Pine Sts., for Phila. General Hospital to Standard Steam Co., Drexel Bldg. $[illegible].

★**Ky., Louisville**—Kentucky Pub. Elevator Co., 14th and Gallagher Sts., let contract rebuilding grain elevator recently destroyed by fire, recommended to Witherspoon-Engler Co., 37 West Jackson Blvd., Chicago. $150,000. Noted Sept. 6.

★**Ill., Mattoon**—Illinois Central R.R. let contract for remodeling to J. F. Nelson & Son, 110 North La Salle St., Chicago. About $100,000. Noted Sept. 27.

★**Tex., Dallas**—E. B. Daggett let contract for 1-story brick and tile sales and warehouse to C. W. Hines Constr. Co., 706 Sumpter Bldg. About $[illegible].

★**Ont., Hamilton**—American Can Co., Emerald St. S., let contract addition to factory to W. H. Cooper, Clyde Bldg. About $[illegible].

★**B. C., Victoria**—Dominion Government let contract 1-story, 200 x 700-ft. warehouse to Grant Smith & Co., Henry Bldg., Seattle, Wash.

BUILDINGS

Proposed Work

Mass., New Bedford—Lodge—Loom Fixers' Union plans, 3-story, 70 x 78 ft. About $60,000. Geo. Newton, pres. J. I. Higgins, 44 Borden Blk., Fall River, archt.

N. Y., Brooklyn—Hospital—Beth Moses Hospital had plans prepared by Henry J. Nurick, archt., 830 Putnam Ave., 5-story, 90 x 100-ft.

N. Y., Buffalo—Depot—New York Central R.R. plans 2-story, 60 x 500-ft. rein.-con., on Curtiss St. About $250,000. G. W. Kittredge, Grand Central Terminal, New York City, ch. engr.

N. Y., Buffalo—Hospital—Mother of Mercy Hospital, c/o. Mt. Mercy Academy, 1475 Abbott Rd., plans, brick and steel. About $200,000. H. Spann, 38 Ardmore Pl., archt.

N. Y., Herkimer — (Official) — Hospitals —Herkimer Co. Bd. Supervs. lets contract about Nov. 15, for 3 tuberculosis hospitals. About $85,000. G. W. Boyle, co. purch. agt. Pember & Champagne, 24 James St., Albany, archts. Noted Aug. 30.

N. Y., New York—Infirmary—Dept. of Correction had plans prepared, 3-story, 32 x 215 ft. About $120,000. C. B. Meyers, 1 Union Sq., archt.

N. Y., Scarsdale — School — Bd. Educ. plans, 2-story. About $55,000. G. Lowell, archt., 225 5th Ave., New York City, soon receives bids.

N. Y., Troy—Laboratory — Rensselaer Polytechnic Institute plans to enlarge its laboratory. About $100,000.

N. J., Newark—Station, etc.—Erie R.R. had plans prepared for new passenger station, steel bridge and yards at 4th Ave. About $875,000. R. S. Parsons, 50 Church St., New York City, ch. engr.

N. J., North Bergen—Schools—Bd. Educ. plans to build 2 new schools. About $150,000.

N. J., Trenton — Capitol — State House Comn., Trenton, had plans prepared enlarging state capitol. About $400,000.

N. J., Wrightstown—Church—Presbyterian Synod of New Jersey, Beverly, plans to build. About $50,000. A. J. Phillips, pastor.

Pa., Phila.—Theatre—Stanley Realty Co. and Mastbaum Bros. & Fleischer, 1426 South Penn Sq., plans 1-story, 152 x 176 ft. About $700,000. Hoffman Co., archts., Finance Bldg., soon receive bids.

Pa., Wyomissing—School—Bd. Educ. plans to build vocational school; $90,000 bond issue to be voted on at November election.

Md., Baltimore—College—Morgan College plans. About $50,000. J. O. Spencer, Fulton and Edmondson Aves., pres. E. Tilton, archt., 52 Vanderbilt Ave., New York City, receives bids about Oct. 15.

W. Va., Charleston — Church — First Christian Congregation plans 1-story, 81 x 115-ft. About $60,000. W. E. Moore, 1112 Virginia St., chn. bldg. com. W. H. St. Clair, Capitol and Quarrier Sts., archt.

W. Va., Princeton—Court House—Mercer Co. Comrs. having plans prepared by A. F. Wyson, archt., 3-story, 90 x 200-ft. About $200,000.

Ala., Birmingham — Schools — Bd. Educ. plans to build high school and 5 elementary schools. Geo. B. Ward, mayor.

La., Shreveport—Hotel—T. C. Barret had plans prepared, Louisiana and Crockett Sts. About $150,000.

Tenn., Chattanooga—Chapel and Science Hall—Chattanooga University plans. About $150,000.

O., Akron—Store and Office—A. B. Smith, 188 South Main St., receiving bids about Oct. 15 for 4- or 10-story, 40x90-ft., South Main St. About $200,000. W. C. Owen & Co., 407-1900 Euclid Bldg., Cleveland, archt.

O., Cincinnati — Home — Church Federation, Union Central Bldg., plans. About $100,000.

O., Cleveland—Store and Automobile—J. Laronge, of J. Laronge Co., Williamson Bldg., purchased site on Euclid Ave. and East 66th St., and plans to build. Cost between $350,000 to $400,000.

O., Columbus — Research — State plans juvenile research building on West Broad St. About $100,000.

O., Elyria—Office—Elyria Telephone Co. will increase its capital stock from $200,000 to $350,000 and plans automatic telephone system and office building on 2nd St.

O., Gallipolis—Dormitories—Bd. Administration of State of Ohio, Oak and 94th St., Columbus, had plans prepared for 4 dormitories at Ohio Hospital for Epileptics. About $80,000. T. E. Davey, pres.

O., Springfield — School — City election soon to vote on $160,000 bond issue for school. Chas. E. Ashburner, mayor.

O., Youngstown—Club House—Ukrainian Club of Youngstown plans, 1- and 2-story, 53 x 208-ft. About $50,000. H. Lyman Ford, archt., 206 Hippodrome Bldg., Cleveland, soon receives bids.

Ind., Wabash—Hotel—Wabash Hotel Realty Co., c/o. Wabash Cabinet Co., having plans prepared by Nicol & Dietz, archts., 212 Murdock Bldg., Lafayette, 4-story. West Market and Cass Sts. About $115,000. T. F. Vaughn, chn. bldg. com.

Mich., Detroit—Store—Bigelow Co., 1070-2 Penobscot Bldg., having plans prepared by R. H. Marr, archt., Kresge Bldg., for rein.-con. store and garage at 53 East Hancock St. About $60,000.

Ill., Chicago—Bank—South West Trust & Savings Bank, 35th St. and Archer Ave., plans, 2-story, 127 x 160-ft. About $75,000. Weary & Alford, 1907 South Michigan Ave., archts.

Neb., Lincoln—Store—Magee's Clothing and Furnishings, 1109 O St., having plans prepared by E. Davis, archt., 515 Security Mutual Life Bldg., 3-story, 50x142-ft., brick and rein.-con. About $75,000.

Mo., Kansas City—Nurses' Home—Christian Hospital, 27th and Paseo Sts., plans, 3-story, 40 x 115-ft. About $75,000. H. F. Hoit, 315 East 10th St., archt.

Tex., El Paso—Schools—City plans $100,000 bond issue to build new schools.

N. M., Clovis—Office—Atchison, Topeka & Santa Fe. Ry. plans office buildings and addition to shops. About $100,000. C. F. W. Felt, Ry. Ex. Bldg., Chicago, ch. engr.

Ariz., Phoenix—Capitol—Com. of State Institutions having plans prepared by John B. Lyman, archt., Capitol Bldg., for addition to State Capitol.

Wash., Olympia—Temple—State having plans prepared by Wilder & White, archts., 50 Church St., New York City, for Temple of Justice. About $350,000.

Wash., Spokane — Infirmary — Spokane Co. Comrs. plan, at Tuberculosis Sanitarium at Edgecliff. About $80,000.

Cal., Los Angeles — Store — Harris & Frank, 437 South Spring St., having plans prepared by A. C. Martin, archt., 430 Higgins Bldg., 6-story, 115 x 150-ft. brick, rein.-con., 7th and Hill Sts.

Cal., Sacramento—Home—Chamber of Commerce plans, 7th St. About $50,000. C. C. Virden, pres.

Que., Ste. Anne De Bellevue—Hospital—Military Hospitals Comn., Drummond Bldg., Montreal, receives bids about Oct. 20, limestone and brick. About $200,000.

BIDS DESIRED

N. Y., New York — (Official) — Keeper's House—Until Oct. 23, by Bd. Water Supply, Municipal Bldg., for keeper's house, garage, etc., Silver Lake Reservoir (Borough of Richmond). C. Strauss, pres., advertised in this issue.

Colo., Denver—(Official)—Church—Until Oct. 28, by Marion & Norton, archts., 221 Chamber of Commerce Bldg., 2-story, 100 x 100-ft., concrete and brick, for Washington Park Community congregation. Noted Sept. 27.

Cal., Healdsburg — High School — Until Oct. 22, by F. McConnell, clk. bd. educ. About $90,000. W. H. Weeks, 75 Post St., San Francisco, archt. Noted July 12.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Me., Hallowell** — School — State School for Girls, Portland, let contract, 2-story, 50 x 122-ft., brick, to A. Hanson & Son, Water St., Augusta, $50,000. Noted Aug. 9.

★**Mass., Athol** — Church — Athol Methodist Episcopalian Church Society let contract to L. B. Taylor, Athol, $70,000. Noted Aug. 23.

Buildings (Continued)

Mass., Somerville—High School—Bd. Educ. received low bids, 2-story, 80x86-ft., from J. B. Byrne, Inc., 162 Sydney St., Cambridge, $68,911; J. M. Hartwell, 46 Cornhill St., Boston, $71,950. Noted Oct. 4.

★**Mass., Waltham** — Theater — W. H. Kingsbury, c/o Funk & Wilcox, archts., 120 Boylston St., Boston, let contract 1-story, 55 x 180-ft., moving picture theater, stores, office and garage, to J. J. Powers, 33 Myrtle Ave., Cambridge, $50,000.

N. Y., Thiells—Home—F. A. Vanderlip, pres. bd. mgrs., Letchworth Village, received only bid from Kelly & Kelly, 12th St., Long Island City, $116,300. Noted Sept. 13.

★**N. J., Camden** — Bank — Merchants' Trust Co., Bway. and Carman St., let contract 1- and 2-story, 40 x 90-ft., to Chas. McCaul Co., Presser Bldg., Phila. About $100,000. Noted July 12.

N. J., Newark—Fire House—City received low bid 2-story, Sanford Ave., and Palm St., from E. M. Waldron & Co., 6th St. About $50,000. Noted Sept. 27.

★**O., Cleveland** — Church — Congregation St. Casimirs Polish Church let contract, 1-story, 80 x 140-ft., to C. A. Carson Co., 6408 Euclid Ave. About $100,000.

★**Mich., Muskegon**—Bank and Office—Union National Bank, 65 West Western Ave., let contract 8-story, 66x132-ft., brick, granite and terra cotta, to Hauser-Owen-Ames Co., 40 Pere St., N. E., Grand Rapids, $350,000. Noted Apr. 26.

★**Ill., Chicago** — Armory — Dept. Pub. Wks. and Bldgs. let contract to Hansen Bros., 1166 North Clark St., $100,000.

★**Wis., Niagara**—High School—Bd. Educ. let contract, 2-story, 56 x 138-ft., to D. Hubert, Spies Bldg., Menominee, $60,000. Noted June 5.

★**Neb., Lincoln**—Store—Rudge & Guenzel, 11th and O Sts., let contract, 7-story, 130 x 142 ft. brick and rein.-con. on N St., to Olson Constr. Co., Chapin Bldg. About $500,000.

★**Ark., Conway** — Administration—Trustees State Normal School, Little Rock, let contract to G. W. Donaghey, 709 West 3rd St., Little Rock, $87,740.

★**Que., Montreal**—School—School Comn. let contract, brick and rein.-con., to J. Frenette, 324 Broeboeuf St. About $115,000.

★**B. C., Rossland**—School—Bd. Educ. let contract, 2-story, brick, to R. Monrieff, Regent Hotel, Vancouver, $65,340. Noted Aug. 30.

FEDERAL GOVERNMENT WORK

Proposed Work

N. Y., Cohoes—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., rejected bids opened Sept. 24. Noted Oct. 4.

N. Y., Yonkers—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., plans on Buena Vista Ave., from Main to Nepperhan St.

Pa., Lancaster—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., plans on block bounded by North Prince, West Chestnut, Market and Marion Sts. About $225,000.

Wash., D. C.—Machine Shop—Bureau Yards and Docks, Navy Dept., receiving bids about Oct. 15, 5-story, at Navy Yard About $1,200,000.

Wash., D. C.—Pattern Shop—Bureau Yards and Docks, Navy Dept., receiving bids about Oct. 15, 4-story, rein.-con., at Navy Yard. About $475,000

Wash., D. C.—Storehouse—Bureau Yards and Docks, Navy Dept., receiving bids about Oct. 15, 5-story, rein.-con., at Navy Yard. About $400,000.

Va., Richmond — Hospital — War Dept., Wash., will build here. N. D. Baker, secy.

Miss., Vicksburg — Levee Work — Third Mississippi River Dist., Box 404, rejected bids constructing 303,000 and 1,000,000 cu. yd. levee work. Noted Sept. 6

Mo., St. Louis — Supply Depot — War Dept., Wash., N. D. Baker, secy., plans on 2nd and Arsenal St. About $300,000.

Cal., Menlo Park—Hospital, etc.—Bureau Yards and Docks, (F. R. Harris, ch.), Navy Dept., Wash., plans building base hospital, remount station and camp proper here. About $500,000.

BIDS DESIRED

Mass., Chelsea—Hospital—Until Oct. 15, by War Dept., N. D. Baker, secy., 1-story.

Conn., New London — Piers and Quay Walls—Until Oct. 15, by Bureau Yards and Docks, Navy Dept., Wash., at Naval Sta.

Conn., New London—Power House and Machine Shop—Until Oct. 22, by Bureau Yards and Docks, Navy Dept, Wash., at Naval Sta.

N. J., Hoboken—Shore Bulkheads—Until Oct. 15, by War Dept., Wash., N. D. Baker, secy., building at Piers 1 and 2.

Pa., Phila.—Heating System—Until Oct. 22. by Bureau Yards and Docks, Navy Dept., Wash., furnishing and installing in structural shop at Navy Yard.

Md., Indian Head — Laboratory — Until Oct. 15, by Bureau Yards and Docks, Navy Dept., Wash., at Naval Sta.

Wash., D. C.—Experimental Sheet Rolling Mill—Until Oct. 20, by Bureau of Standards, Wash.

S. C., Charleston—Wharf and Trestle—Until Oct. 15, by Bureau Yards and Docks, Navy Dept., Wash., building for magazine on east side Cooper River opposite Charleston Navy Yard.

Ga., Forsyth—Post Office—Until Nov. 9, by J. A. Wetmore, superv. archt., treas. dept., Wash. Noted Oct. 4.

Fla., Key West—Tank and Tower—Until Oct. 30, by Comr. Fisheries, Dept. of Commerce, Wash., D. C., building concrete tower and tank at Biological Sta.

La., Grande Isle—Buildings—Until Oct. 29, by E. P. Bertholf, capt. commandant, U. S. Coast Guard, Wash., D. C., for new buildings and accessories for Coast Guard Sta. No. 214, Barataria Bay; advertised in this issue.

Mich., Detroit—Piers, etc.—Until Nov. 8, by U. S. Eng. Office, Detroit, building timber-crib-concrete piers and excav. of channel, East Approach, for 4th Lock, St. Mary's Falls Canal; advertised in this issue.

Neb., Omaha—Lookouts—Until Nov. 1, by J. A. Wetmore, superv. archt., treas. dept., Wash., for lookouts in U. S. Post Office, Court House and Custom House; advertised in this issue.

S. D., Bellefourche—Post Office — Until Nov. 28, by J. A. Wetmore, superv. archt., treas. dept., Wash.

Mo., Harrisonville — Post Office — Until Nov. 13, by J. A. Wetmore, superv. archt., treas. dept., Wash.

Tex., Austin—Post Office—Until Nov. 14, by J. A. Wetmore, superv. archt., treas. dept., Wash.

Cal., Tiburon — Building — Until Oct. 15, by Bureau Yards and Docks, Navy Dept., Wash., building quarters for marine guard.

Cal., Mare Island—(Vallejo P. O.)—Garbage Incinerator — Until Oct. 15, Bureau Yards and Docks, Navy Dept., Wash., at Navy Yard.

P. R., El Cayey—Radio Towers — Until Oct. 15, by Bureau Yards and Docks, Navy Dept., Wash., building 3 600-ft. radio towers at Naval Sta.

P. R., El Cayey—Buildings—Until Oct. 29, by Bureau Yards and Docks, Navy Dept., Wash., constructing 3 radio buildings at Naval Sta.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Boston—Seawall—U. S. Engr. Office received low bid building at Ft. Warren, Boston Harbor, from Bay State Dredging Co., 247 Atlantic Ave. Noted Sept. 14.

★**R. I., Newport**—Dispensary—Bureau Yards and Docks, Navy Dept., Wash., let contract, at Naval Torpedo Base, to F. T. Ley & Co., 495 Main St., Springfield, Mass., $29,700. Noted Sept. 27.

★**Conn., New London** — Crane — Bureau Yards and Docks, Navy Dept., Wash., let contract furnishing 30-ton revolving crane, Naval Submarine Base, to McMyler-Interstate Co., Bedford, O., $15,450. Noted Oct. 4.

★**Conn., New London**—Officers' Quarters—Bureau Yards and Docks, Navy Dept., Wash., let contract 2 buildings for Officers' Quarters, at Submarine Base, to R. H. Arnold Co., Woodward Bldg., Wash., D. C., $93,991.

N. Y., Brooklyn—Hydraulic Pumps, etc.—Bureau Yards and Docks, Navy Dept., Wash., received low bids (a) net price and time of completion for 2 complete plants, each consisting of 2 pumps, 1 accumulator and 1 storage tank, (b) net price and time of completion for work complete as outlined in Item 1, conforming to the intent of this specification, but with such modifications of detail as are clearly defined and described in proposal under special heading entitled "Exceptions," from E. J. Smith, 30 Church St., New York City, (b) $5[illegible],800; time, 200 days, alternate bid, $59,200, 200 days; Carroll Electric Co., 714 12th St., Wash., D. C., (b) $132,000, alternate, $127,000, time 250 days; Admiral & Co., Inc., 1 Dominick St., New York City, (b) $89,452, 250 days.

★**N. Y., Brooklyn**—Power House, Foundations—Bureau Yards and Docks, Navy Dept., Wash., let contract to Whitney Co., 101 Park Ave., New York City, $18,186. Noted Oct. 4.

Pa., Phila.—Dredging — Bureau Yards and Docks, Navy Dept., Wash., received only bid dredging in Reserve Basin, Navy Yard, from Maryland Dredging & Contg. Co., Fidelity Bldg., Baltimore, Md., 36c. per cu.yd. in place and disposal of all material. 36c. if dredged material is deposited.

Pa., Phila. — Quarters for Radio Operators—Bureau Yards and Docks, Navy Dept., Wash., received low bids from W. O. Springer, 1624 West Latimer St., $15,070; Hogg Constr. Co., 1634 Sansom St., $15,070; W. W. Austine Co., $16,010; all of Phila. Noted Sept. 20.

★**Wash., D. C.**—Cement Walks—Comrs. let contract building cement sidewalks (a) 40,000 sq.yd. city walks, (b) 30,000 sq.yd. suburban walks, to W. F. Brenizer & Co., Q and North 1st St., (a) $1.53 per sq.yd. (b) $1.71. Noted Sept. 13.

★**Wash., D. C.**—Office—War Dept., N. D. Baker, secy., let contract office building on The Mall, to G. A. Fuller Co., Munsey Bldg., Wash., D. C., $500,000, cost plus basis.

★**Wash., D. C.** — Storehouse — Bureau Yards and Docks, Navy Dept., let contract building storehouse (temporary timber construction) at Naval Operating Base, Hampton Rds., to Wise Granite & Constr. Co., Amer. Natl. Bank Bldg., Richmond, Va., $64,000.

★**W. Va., Charleston**—Projectile Plant and Air Compressors—Bureau Yards and Docks, Navy Dept., Wash., let contract to Ingersoll Rand Co., 11 Bway., New York City, $22,000

★**Ky., Glasgow**—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to H. G. Mitchell, Scottsburg, $40,500, time 12 months. Noted Oct. 4

★**Ind., Kendallville**—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to E. A. Steininger, Victoria Bldg., St. Louis, Mo., $46,300. Noted Oct. 4

★**Mich., Detroit**—Backfilling—U. S. Engr. Office, Detroit, let contract backfilling walls of 4th lock, St. Mary's Falls Canal, to O. Daniels Co., 38 South Dearborn St., Chicago, $95,580. Noted Aug. 30.

Minn., St. Peter—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., received low bids from W. D. Lavell, Minneapolis, $41,750; G. W. Stiles Constr. Co., 209 South La Salle St., Chicago, $44,343; Johnson Constr. Co., Fargo, N. D., $47,997. Noted Sept. 6.

Idaho, Twin Falls — Post Office — J. A. Wetmore, superv. archt., treas. dept., Wash., received low bids (a) [illegible]stone, from H. E. Campbell, Salt Lake City, Utah, (a) $[illegible]; (b) $[illegible]; W. D. Lovell, 1415 S. E. 8th Ave., Minneapolis, Minn., (a) $[illegible], (b) $[illegible]; C. Wells, 717 Mulberry St., Des Moines, Ia., (a) $19,[illegible] (b) $18,[illegible]. Noted Aug. 30.

★**Cal., Mare Island**—(Vallejo P. O.)—Grading—Bureau Yards and Docks, Navy Dept., Wash., let contract grading at Navy Yard, to D. O'Dea Co., San Francisco, $[illegible]. Noted Sept. 13.

★**Cal., San Francisco**—Sub Quarters—Bureau Yards and Docks, Navy Dept., Wash., let contract adding to sub quarters to Schroeder Bros., 216 Fulton St., $[illegible].

Cal., San Francisco—Wharf—J. A. Wetmore, superv. archt., treas. dept., Wash., received low bids rebuilding west wing of wharf at quarantine station, Angel Island, (a) work complete, using structural steel for cross beams, (b) complete, using rein.

...ers (c) complete, using wood for cross beams; from Thomson Bridge Co., 103 Main St. (a) $26,470, (b) $25,900, (c) $24,640; Healy-Tibbetts Constr. Co., 9 Main St., (a) $26,880, (b) $26,400, (c) $24,848; Duncanson-Harrelson Co., 1405 Chronicle Bldg., (a) $26,894, (b) $26,580, (c) $25,980. Noted Sept. 6.

★**Cal., San Pedro**—Fill—U. S. Eng. Office, 723 Central Bldg., Los Angeles, let contract 120,000 cu.yd. fill, including rip rap protection, to Russell, Green, Foell Co., 2644 Compton St., Los Angeles, $70,000. Noted Aug. 16.

H. T., Kuahua—Mine Storage Building—Bureau Yards and Docks, Navy Dept., Wash., received low bids, steel and frame, at Naval Ammunition Depot, (work complete), from Hamilton & Chambers, Inc., 20 Bway., New York City, $61,400; time 240 days. Noted Sept. 20.

★**Hawaii, Pearl Harbor**—Storehouse—Bureau Yards and Docks, Navy Dept., Wash., let contract to Hamilton Chambers Co., 29 Bway., New York City, $96,670. Noted Sept. 20.

MISCELLANEOUS

Proposed Work

Dock—Portsmouth, R. I.—Rhode Island Marine Constr. & Dry Dock Corp., capitalized at $500,000, plans to build dock here.

Grade Crossing—Trenton, N. J.—Bd. Freeholders Mercer Co. plans to build, at Moore's Sta. About $20,000.

Incinerating Plant—Trenton, N. J.—(Official)—City rejected bids building addition to present crematory. G. B. La Barre, dir. Noted Sept. 13.

Park—Columbia, S. C.—See "Streets and Roads."

Transmission Line—Jacksonville, Fla.—City Comrs. plan to extend electric-light and power-transmission lines from Jacksonville to State Camp. About $49,000.

Garbage Incinerator—New Orleans, La.—City plans. Cost, between $1,250,000 and $1,500,000. W. J. Hardee, city engr.

Incinerating Plant—Kansas City, Mo.—City rejected bids. Noted Aug. 16.

Dams—Vinita, Okla. — See "Industrial Works."

Tunnel—Denver, Colo. — Denver & Salt Lake R.R. will reorganize with $7,000,000 additional capital. Company plans 6 mi. tunnel through James Peak, 35 mi. west of Denver, shortening route to coast at least 200 mi. W. R. Freeman, 302 Boston Blk., and Chas. Boettcher, 507 Ideal Bldg., receivers.

Transmission Line—Robinette, Ore.—Cornucopia Mines Co., Cornucopia, plans 66,000 volt transmission line from Robinette to Halfway, about 12 mi. The company will also build sub-station at Halfway. About $30,000.

Transmission Line—Taylorsville, Cal.—Great Western Power Co. plans line from Veramont Sta. near Taylorsville to Walker copper mine, via Genesee mine, Genesee Valley. About 16 mi.

Breakwater—St. John, N. B.—City soon lets contract for extension to Negrotown Point breakwater. About $738,000.

BIDS DESIRED

Elimination Grade Crossing—Phila., Pa.—(Official)—Until Oct. 17, by Pennsylvania R.R., A. C. Shand, ch. engr., Broad St. Sta., Phila., abolishment grade crossing on Chestnut Hill Branch.

Dam—Anahuac, Tex.—Until Oct. 15, by Trinity River Irrigation Dist., building dam between Turtle Bay and Trinity Bay; also dredging channel from locks to connect Turtle Bay channel. J. Wooten, secy.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Station Finish—New York, N. Y.**—(Official)—Pub. Ser. Comn., 120 Bway., let contract completion of construction and station finish of Brooklyn and Manhattan loop and 4th Ave. subway parts of Bway.-4th Ave. Rapid Transit R.R., Boros. of Brooklyn and Manhattan, to D. C. Serber, 1123 Bway., $69,085. Noted Sept. 20.

★**Dam—Waterport, N. Y.**—Western New York Utilities Co. let contract water-power dam, on Orchard Creek, Clark Mills, to C. A. Ingersoll, West Centre St., Medina. $200,000.

★**Harbor Improvements — Jersey City, N. J.**—City Comn. let contract for improvement and development of water front along Hackensack River at foot Yale St., including bulkheads, dredging, etc., to Long-Broadhurst Contr. Co., Contrs. Causway, Hackensack. About $80,000. Noted Aug. 30.

★**Dock—Seattle, Wash.**—(Official)—King Co. Comrs. let contract, on Duwamish Waterway, to P. B. Church & Co., Arcade Bldg., $34,500. Noted Sept. 6.

★**Wharf Extension—Benicia, Cal.**—Benicia Shipbuilding Co. let contract to Duncanson & Harrelson, Chronicle Bldg., San Francisco, $10,000.

★**Pavilion—Manhattan Beach, Cal.**—City let contract, to W. M. Bell, 1046 W. 92nd St., Los Angeles, $19,693.

★**Docks, etc. — Ojibway, Ont.** — Canada Steel Corp., subsidiary of U. S. Steel Corp., let contract building docks, etc., including canal running through property for distance of 2500 ft., to be 200 ft. wide and 25 ft. deep, docks on banks of canal, also 1000 ft. dock on river front with marine slip and wharves, to Great Lakes Dredging Co. of Canada, Port Arthur. Cost between $25,000,000 and $30,000,000. Noted Aug. 30.

The Uni-Form Company, 10 High St., Boston, Mass., which manufactures the new system of steel forms for construction of reinforced concrete buildings, described on page 480 of the September 6th issue of "Engineering News-Record" in which system the whole form structure is of steel, being made up of channels and arch plates, coupled by bolts and spreaders, is inviting correspondence from agents in different parts of the country with a view to forming licensee connections.

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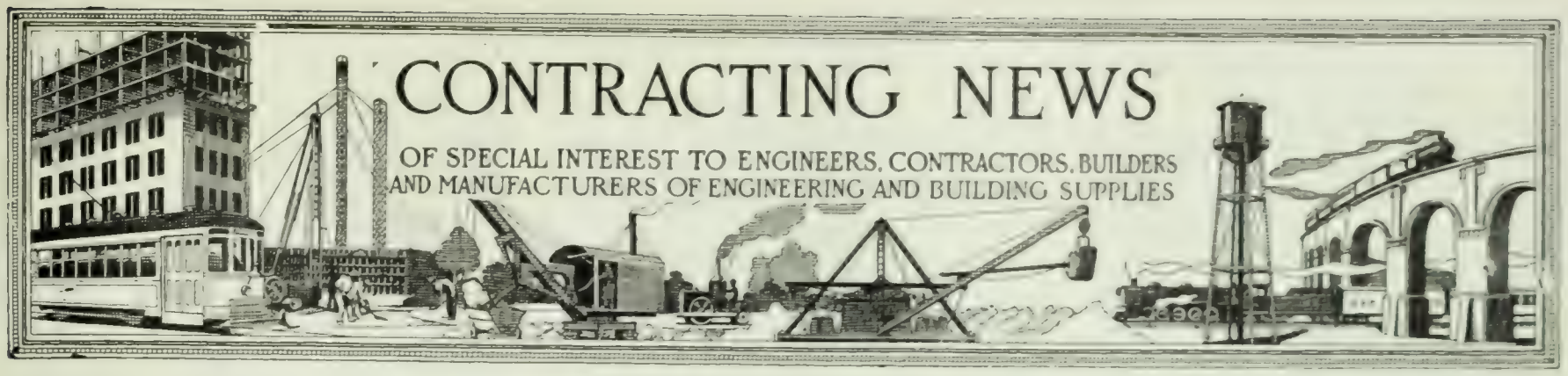
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Proposals

For Proposals Advertised See Pages 62 to 65 Inclusive

WATER-WORKS

Bids Close		See Eng. News-Record
Oct. 22.	Salem, N. J. Adv. Oct. 11.	Oct. 11
Oct. 29.	Portland, Ore.	Oct. 11
Nov. 7.	Tonawanda, N. Y.	Oct. 18

SEWERS

Oct. 22.	St. Paul, Minn.	Oct. 18
Oct. 22.	Scranton, Pa.	Oct. 18
Oct. 23.	St. Cloud, Minn.	Oct. 18
Oct. 25.	St. Joseph, Mich. Adv. Oct. 4.	Oct. 4
Oct. 26.	Lorain, O.	Oct. 18
Oct. 29.	Glendale, Ariz.	Oct. 18

BRIDGES

Nov. 2.	Richmond, Va. Adv. Oct. 18.	Oct. 18
Nov. 6.	Oswego, Kan. Adv. Oct. 18.	Oct. 18
Nov. 6.	Dallas, Tex. Adv. Oct. 11 and 18.	Oct. 11
Nov. 6.	Little Falls, Minn.	Oct. 18

STREETS AND ROADS

Oct. 22.	St. Paul, Minn.	Oct. 18
Oct. 22.	Dallas, Tex.	Oct. 18
Oct. 22.	West New York, N. J.	Oct. 18
Oct. 23.	Connecticut Adv. Oct. 18.	Oct. 18
Oct. 23.	Ohio	Oct. 18
Oct. 23.	Santa Cruz, Cal.	Oct. 18
Oct. 23.	Jersey City, N. J.	Oct. 11
Oct. 24.	Paterson, N. J.	Sept. 27
Oct. 24.	Michigan	Oct. 18
Oct. 24.	Santa Barbara, Cal.	Oct. 4
Oct. 24.	Cleveland, O.	Oct. 18
Oct. 25.	Newark, N. J.	Oct. 18
Oct. 26.	Indiana	Oct. 11
Oct. 26.	Rhode Island Adv. Oct. 18.	Oct. 18
Oct. 27.	Indiana	Oct. 11
Oct. 29.	Indiana	Oct. 11
Oct. 29.	Highland Park, N. J. (New Brunswick P. O.)	Oct. 18
Nov. 5.	Pikeville, Ky.	Sept. 27
Nov. 5.	Kansas City, Kan.	Oct. 18
Nov. 5.	Coffeeville, Miss. Adv. Oct. 18.	Oct. 18
Nov. 5.	Fayetteville, W. Va.	Oct. 18
Nov. 6.	West Orange, N. J.	Oct. 18
Nov. 6.	Indiana	Oct. 11
Nov. 6.	Morgantown, W. Va. Adv. Oct. 11	Oct. 11
Nov. 8.	Pennsylvania Adv. Oct. 18.	Oct. 18

EXCAVATION AND DREDGING

Oct. 22.	Crete, Ill.	Oct. 18
Oct. 23.	Athens, Ga.	Oct. 11
Oct. 23.	Mankato, Minn.	Oct. 18
Oct. 24.	Lesueur Center, Minn.	Oct. 4
Oct. 29.	Duluth, Minn.	Oct. 18
Nov. 1.	Papillion, Neb.	Oct. 16
Nov. 2.	Albany, N. Y. Adv. Oct. 11 and 18.	Oct. 11
Nov. 2.	Sibley, Ia.	Oct. 11
Nov. 9.	St. Cloud, Minn.	Sept. 27

BUILDINGS

Oct. 23.	Ft. Wayne, Ind.	Oct. 4
Oct. 23.	Smith Center, Kan.	Oct. 4
Oct. 23.	New York, N. Y. Adv. Oct. 11 and 18.	Oct. 11
Oct. 23.	Jersey City, N. J.	Oct. 18
Oct. 24.	Abilene, Kan.	Oct. 4
Oct. 24.	Brooklyn, N. Y.	Oct. 18
Oct. 25.	Sapulpa, Okla.	Oct. 18
Oct. 28.	Healdsburg, Cal.	Oct. 11
Oct. 28.	Denver, Colo.	Oct. 11
Oct. 29.	Trenton, N. J.	Oct. 18
Oct. 30.	Columbia, S. C.	Oct. 18
Oct. 31.	Davenport, Ia.	Oct. 18
Nov. 1.	Lawrence, Kan.	Oct. 18
Nov. 2.	Lakefield, Minn.	Oct. 18
Nov. 25.	Middletown, Mass.	Oct. 4
Dec. 1.	Norfolk, Va.	Sept. 13

FEDERAL GOVERNMENT WORK

Oct. 20.	Experimental Sheet Rolling Mill — Washington, D. C.	Oct. 11
Oct. 20.	Tank and Towers — Key West, Fla.	Oct. 11
Oct. 22.	Power House and Machine Shop — New London, Conn.	Oct. 11
Oct. 22.	Heating System—Philadelphia, Pa.	Oct. 11
Oct. 22.	Emergency Hospital — Gulfport, Miss.	Oct. 18
Oct. 22.	Bridge — Farmington, N. M.	Oct. 18
Oct. 23.	Post Office — Andalusia, Ala.	Sept. 20
Oct. 24.	Post Office — Bakersfield, Cal. Adv. Sept. 20 and 27.	Sept. 20
Oct. 26.	Post Office — Mt. Carmel, Ill.	Sept. 20
Oct. 28.	Post Office — Waterloo, N. Y.	Sept. 20
Oct. 29.	Buildings—El Cayey, P. R.	Oct. 11
Oct. 29.	Buildings—Grand Isle, La. Adv. Oct. 11.	Oct. 11
Oct. 30.	Metal Work, etc. — Key West, Fla. Adv. Sept. 6 and 13.	Sept. 6
Oct. 30.	Post Office—Farmville, Va.	Sept. 27
Oct. 31.	Power House — Brooklyn, N. Y.	Oct. 4
Oct. 31.	Post Office—Hollidaysburg, Pa. Adv. Oct. 4.	Oct. 4
Oct. 31.	Levee Work — St. Louis, Mo.	Oct. 18
Nov. 1.	Lookout — Omaha, Neb. Adv. Oct. 11.	Oct. 11
Nov. 1.	Post Office—Keokuk, Ia.	Sept. 27
Nov. 1.	Construction Materials — Detroit, Mich. Adv. Oct. 4.	Oct. 4
Nov. 2.	Maneuver Boats — Charleston, S. C. Adv. Oct. 4 to 18.	Oct. 4
Nov. 2.	Post Office — Valparaiso, Ind.	Oct. 4
Nov. 5.	Post Office — Burlington, N. C.	Oct. 4
Nov. 6.	Bridge—Towanda, Penn.	Oct. 18
Nov. 7.	Buildings — Ellendale, N. D.	Oct. 18
Nov. 8.	Levee Work — Vicksburg, Miss. Adv. Oct. 18.	Oct. 18
Nov. 8.	Piers, etc.—Detroit, Mich. Adv. Oct. 11.	Oct. 11
Nov. 9.	Post Office—Forsyth, Ga.	Oct. 11
Nov. 13.	Post Office—Harrisonville, Mo.	Oct. 11
Nov. 14.	Post Office—Austin, Tex.	Oct. 11
Nov. 15.	Canals—El Paso, Tex. Adv. Oct. 18.	Oct. 18
Nov. 16.	Maneuver Boats — Wheeling, W. Va. Adv. Oct. 18.	Oct. 13
Nov. 19.	Fitting out Cranes—Washington, D. C.	Oct. 18
Nov. 20.	Post Office—Caribou, Me.	Oct. 18
Nov. 28.	Post Office — Bellefourche, S. D.	Oct. 11

MISCELLANEOUS

Oct. 23.	Pier—New York, N. Y. Adv. Sept. 27 to Oct. 18.	Sept. 27
Oct. 30.	Elevated Railway—Philadelphia, Pa. Adv. Oct. 18.	Oct. 18
Oct. 30.	Fire Escapes — Dover, N. J. Adv. Oct. 18.	Oct. 18
Nov. 15.	Flood Control—Dayton, O. Adv. Sept. 13 to Oct. 18.	Sept. 13

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official.

WATER-WORKS

Proposed Work

N. Y., Herkimer—City plans to build [illegible] water-works system. L. Wood, city engr.

N. Y., Mt. Kisco—Village will [illegible] bonds for water-works system. G. E. Janum, supt.

N. Y., Olean—[illegible] building filtration plant [illegible] capacity per day. About [illegible] July 5.

N. Y., Rochester—City plans [illegible] L. Elwood, city engr. Noted Sept. 27.

N. Y., Westfield—[illegible] about Oct. 21 [illegible] from [illegible] pipe. About [illegible] engr. Noted Sept. 27.

Pa., Halifax—[illegible] plant.

Ga., Atlanta—[illegible] bonds. L. [illegible]

Water-Works (Continued)

Ga., Chamblee—City having plans prepared by J. B. McCrary & Co., engrs., 3rd Natl. Bank Bldg., Atlanta, for water-works and sewerage systems. J. W. Walker, mayor.

Ga., Dublin—City plans to issue $60,000 bonds to improve water-works system. M. J. Guyton, supt.

Ga., Savannah—(Official)—City defeated election for $500,000 bonds to rehabilitate water-works system. Noted Sept. 20.

Tenn., Lebanon — (Official) — City soon lets contract improvements to water-works system, including concrete stack, 5½ x 150-ft., air compressors, water pumps, shaker grates, etc. About $10,000. D. R. Moore, city engr.

O., Springfield—City Comn. passed ordinance appropriating $11,600 to repair Todd pump at water-works pumping station. M. J. Bahin, city engr.

Ind., South Bend—Council passed ordinance to issue $40,000 bonds to build water-works system. F. J. Anderson, city engr.

Mich., Holly—Village voted $20,000 bonds for water-works system. W. M. Smith, village pres. Noted Sept. 13.

Ill., Antioch—City lets contract about Oct. 21, for purification plant. H. L. Emerson, 133 West Washington St., Chicago, engr.

Ia., Riverside—City plans to build water-works system. About $40,000. J. M. Lewis, supt. parks and pub. property.

Minn., Brainerd—City having plans prepared by L. P. Wolff, engr., 1000 Germania Life Bldg., St. Paul, water-works improvements, including drilling new wells and about 8 mi. 4- and 6-in. c.-i. pipe.

Kan., Eureka—City receiving bids about Nov. 1 for water-works improvements. Cost $30,000. Black & Veatch, 507 Inter-State Bldg., Kansas City, Mo., engrs. Noted Aug. 16.

Kan., Galena — City having plans prepared by Burns & McDonnell, engr., 402 Inter-State Bldg., Kansas City, Mo., for filtration plant; $100,000 bond issue recently voted for work. Noted Sept. 27.

Tex., Quanah—City plans to build water-works system, including pumping plant. Amount $150,000.

Okla., Bristow—City having plans prepared by Benham Eng. Co., engrs., Colcord Bldg., Oklahoma, for extensions to water-works and sewerage systems; $20,000 bonds voted for work. Noted Aug. 2.

Okla., Indianapolis—City voted $15,000 bonds to build water-works system.

Okla., Tulsa—City lets contract about Nov. 1 to extend water-works system, including 40,000 tons 6-in. to 24-in. pipe, 1 [illegible] and 1 [illegible]-gal pump and 4,000,000-gal. filtration plant. About $675,-[illegible]. M. Stevens, 708 Ridge Arcade, Kansas City, Mo., engr. Noted June 21.

Okla., Wapanucka—(Official)—City lets contract about Nov. 1 for water-works system. Cost, $14,000. W. J. Terry, chn. bd. city comrs. Noted Oct. 11.

Okla., Waurika—City having plans prepared by McIntosh-Walton Co. engrs., 1023 State Natl. Bank Bldg., Oklahoma, for water-works system; $20,000 bond issue voted for work. Noted Sept. 13.

Idaho, Du Bois—City having plans prepared by Cotton & Wilson, engrs., for installing water-works system. About $25,000.

Cal., San Fernando—City election soon to vote on $130,000 bond issue for water-[illegible] including [illegible]-gal. reservoir, new distributing system, 8 12-in. riveted steel pipe, 6-in. c.-i. pipe and 10-in. [illegible] pipe. A. L. Sondregger, Central Bldg., Los Angeles, engr.

BIDS DESIRED

N. Y., Tonawanda—(Official)—Until Nov. 7, by [illegible] W. Smith, city clk., for laying intake pipe in Niagara River. About $111,-[illegible]. R. Hilbert, city engr. Noted Oct. 4.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Johnstown**—(Official)—City let contract storage reservoir, earthen dam, spillway and appurtenances on Center Creek, to Hyltin & Lewis, 615 Flower Bldg., Annex, Watertown, $[illegible]. Noted Sept. 13.

Pa., Polk—(Official)—Bd. Trustees of State Institution for Feebleminded of Western Pennsylvania, received low bid for rapid sand filter plant and centrifugal pumps in connection with water supply, from Pittsburgh Filter Mfg. Co., Farmer's Bank Bldg., Pittsburgh. Noted Sept. 20.

★**O., Dayton**—(Official)—City let contract rein.-con. reservoir in southeastern part of city to Davies-Hunt, 1st and Webb Sts., $133,842. Noted Sept. 27.

★**Wis., Oshkosh**—Diamond Match Co. let contract for pumping station at plant to W. Oeflein, 86 Michigan St., Milwaukee, $250,000.

Minn., St. Cloud—City received low bids for 271 tons 8- 12-in. pipe for water-works system from Amer. Cast Iron Pipe Co., 385 Dearborn St., Chicago, $54.95 per ton; lead to be used in laying pipe from U. S. Cast Iron Pipe and Fdry. Co., 122 South Michigan Ave., Chicago; hydrants from Fairbanks Co.

★**N. D., Minot**—City let contract building water mains on several streets to G. W. Krinfer, Minot, $10,000.

★**Tex., El Paso**—City let contract furnishing, erecting and connecting complete triplex or centrifugal pump driven by fuel oil or electric motor, to furnish 600-gal. water per minute, to R. E. Huthsteiner, 923 Mills St., $14,087. Noted Oct. 4.

★**Okla., Red Rock**—(Official)—Bd. Trustees let contract water-works system to N. S. Sherman Machine & Iron Wks., 18-32 East Main St., Oklahoma, $22,000. Noted Aug. 2.

★**Okla., Shamrock** — City let contract water-works system to N. S. Sherman Machine & Iron Wks., 18-32 East Main St., Oklahoma, $37,800. Noted Sept. 13.

★**Okla., Wilburton** — City let contract water-works system to McEachin Bros., McAlester, $24,000. Noted Aug. 16.

★**Cal., Santa Barbara**—City let contract building Mission Ridge Reservoir to A. L. Pendola, 1332 Garden St., $51,112. Noted Oct. 11.

SEWERS

Proposed Work

Me., Portland—City plans sewers in Forest Ave. and East Deering St. About $440,-000. E. M. Hunt, city engr.

Conn., Greenwich—(Official)—Boro. rescinded election to vote on $350,000 bond issue for sewerage system and sewage disposal plant in Sound Beach Sect. Work has been postponed indefinitely. Noted Sept. 13.

Conn., Stratford—City rejected bids for 11 mi. 8- to 30-in. pipe sewers, sewage disposal plant, etc. Noted Sept. 20.

N. Y., Olean—City having plans prepared for sewer in Higgins Ave., including 500 ft. 8- 10-in. pipe. About $14,000. E. E. Allen, city engr.

N. J., Edgewater—Boro. to sell $270,000 bonds Oct. 23 to build sewers. P. F. O'Brien, clk.

Pa., Johnstown—City election Nov. 6th to vote on $500,000 bond issue to build sanitary sewers. J. R. Crissey, city engr.

Pa., Milton—Boro. had plans prepared by A. Potter, engr., 50 Church St., New York City, for sewage disposal plant.

Pa., South Bethlehem—Boro. election soon to vote on $55,000 bond issue to build sewers and improve streets. M. Brady, boro. engr.

Md., Annapolis — Anne Arundel Co. Comrs. soon lets contract sewerage system in Linthicum Heights and Glen Burnie. A. Hayman, co. engr.

Ga., Chamblee—See "Water-works."

O., Dayton—City plans to build sanitary sewers in Districts. Nos. 8 and 10; also sidewalks on portions Valley St. F. O. Eichelberger, city engr.

O., Lebanon—City rejected bids for auxiliary sanitary sewerage system. Election Nov. 5 to vote on bonds for sewage disposal plant. R. E. Klein, Callahan Blk., Dayton, engr. Noted Aug. 23.

O., Massilon—City plans sewers in portions Walnut, Kent, and Green Sts. H. McYost, city engr.

O., Toledo—Comrs. Lucas Co. plan to build sanitary sewers Nos. 45, 47 and 1330, in Ohio main sewer districts Nos. 4 and 6. G. Cooper, aud.

O., Uhrichsville—Uhrichsville and Dennison Villages had plans prepared for sewage disposal plant and sanitary sewerage system. G. Arnold, 114 South Bway., New Philadelphia, engr. About $50,000.

Ind., La Fayette—City having plans prepared for storm sewers. About $250,000. H. B. Overesch, city engr.

Ill., Bradley—Village to issue $22,700 bonds to build sewerage system.

Ill., Moline—City had plans prepared 6-ft. storm drain system on 1st St. to be in conjunction with Rock Island system. About $25,000. L. Payton, city engr.

Ill., Quincy—City having plans prepared for sewerage system, about 4 mi. long. E. R. Chatten, city engr.

Ia., Riverside—City plans sewerage system; main sewer to be 2 mi. long. About $15,000.

Minn., Waseca—City having plans prepared by L. P. Wolff, engr., Germania Life Bldg., St. Paul, sewage treatment plant, including 7000 ft. 15-in. pipe. About $25,-000. Noted July 12.

Kan., Hutchison—City soon lets contract sewerage system. About $70,000. E. Metz, city clk. Noted July 12.

Tex., Austin—City defeated $225,000 bond issue to install Imhoff tank-trickling filter plant and $50,000 for storm sewers and paving. Noted Sept. 27.

Okla., Hobart—(Official)—City has retained Benham Eng. Co., engrs., Colcord Bldg., Oklahoma, to prepare plans for water-works system. About $100,000.

Okla., Sand Springs—(Official)—City had plans prepared by Benham Eng. Co., Colcord Bldg., Oklahoma, for extending sanitary and storm sewerage systems. Election soon to vote on $40,000 bond issue for project.

Okla., Wynnewood—(Official)—City having plans prepared by McIntosh-Walton Co., engrs., 1023 State Natl. Bank Bldg., Oklahoma, for sanitary sewerage system. About $16,000. Noted Oct. 4.

Ariz., Flagstaff—City received no bids for building sewerage system. New bids in spring. Noted May 3.

Wash., Seattle—Streets and Sewers Com. having plans prepared by A. H. Dimock, city engr., improving 22nd Ave. et al with sewers. About $56,933.

Cal., Los Angeles—Council passed ordinances to build sanitary sewers in portions 63rd and 65th Sts. and Bonsello Ave. A. C. Hansen, city engr.

Ont., Colchester South—Council passed bylaw to build storm drains. About $10,-000. J. H. Madill, city clk.

Ont., London—Bd. Control plans to authorize the appropriation of $100,000 for storm sewerage system extensions during 1918. H. A. Brazier, city engr.

BIDS DESIRED

Pa., Scranton—(Official)—Until Oct. 22, by W. G. Robertson, dir. dept. pub. wks., for storm sewers on West Market, Winona, and Leggett Sts.; also grading portions Wheeler Ave. W. Shunk, city engr.

O., Lorain—(Official)—Until Oct. 26, by Dir. Pub. Serv., for sewers in portions Allison and Park Aves., Lake View Blvd., including 4335 ft. 6- 15-in. pipe, 22 manholes, etc. C. M. Osborn, city engr. Noted Sept. 13.

Minn., St. Cloud—(Official)—Until Oct. 23, by City for 4200 lin.ft. 72-in. segment block and 4000 lin.ft. 36-in. segment block or vitr. pipe sewer. About $85,000. R. E. Borrowman, city engr. Noted Sept. 27.

Minn., St. Paul—(Official)—Until Oct. 22, by H. W. Austin, purch. agt., storm-water sewer in portions Fairview Ave. and Lawrence St. O. Claussen, city engr. Noted Oct. 11.

Ariz., Glendale—Until Oct. 29, by H. G. White, town clk., for sewerage system. F. N. Holmquist, Phoenix, engr. Noted Oct. 4.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Brooklyn**—L. H. Pounds, boro. pres., let contract sewage pumping station, superstructures for sewers, and appurtenances to Frymer & Hanna Co., 25 West 45th St., New York City, $45,837. Noted Sept. 27.

★**S. C., Columbia**—City let contract 23,-000 ft. vitr. pipe sewer to Chattanooga Sewer Pipe Wks., foot of Gillespie St., $10,-637. Noted Oct. 4.

★**O., Cleveland**—City let contract installing sewer in Scarsdale Ave., to W. P. Gibbons Constr. Co., 340 Leader-News Bldg., $13,393; in East 171st St., to Gould & Maybach, 823 East 150th St., $7698. Noted Sept. 20.

Sewe. (Continued)

O., Cuyahoga Falls — (Official) — Village received low bids for Gotel Ave. lateral sewerage system, including 7500 cu.yd. earth excav., 300 cu.yd. rock trench excav., 22 manholes and 2 mi. 6- 12-in. sewer pipe, from C. L. Wright, Mt. Vernon, $16,846; Gessner Co., Toledo, $17,063; F. R. George Co., Pittsburgh, Pa., $18,441. Noted Sept. 27.

Mich., Detroit—City received low bid for Linwood Ave. sewer in Lawton, Longfellow and Linwood Aves., about 15,617 ft. long, from Jeynes & Affeld, 1208 Ford Bldg., $644,687.

Mich., Grand Rapids—City received bids constructing southwest sewerage system as follows: Sects. Nos. 1 and 4, Vander Weele Bros., No. 2, McDermott & Cooper; No. 3, Ver Hey & Kloet; for entire system, A. H. Prange, Grand Rapids, and Moreno-Burkham Constr. Co., Syndicate Trust Bldg., St. Louis, Mo. These 2 contractors offered proposition to build sewer for cost plus percentage basis. Estimated cost, $180,546. Noted Oct. 4.

★**Ill., Antioch**—City let contract for sewage disposal plants and sewers to C. M. Porter & Co., 111 West Washington St., Chicago, $19,229.

Wash., Spokane—City received low bid building 4th Ward trunk sewer in Dist. No. 5, from Heikia, Miller & Paulson, Spokane, $11,400. Noted Sept. 20.

Cal., San Diego—City received low bids rein.-con. double compartment storm drain, 16th and Logan Sts., from Holland Constr. Co., 732 Granger Bldg., $22,888, and T. C. Brenenstein, Pasadena, $23,921.

★**Cal., San Francisco**—City let contract for Lake St. outlet sewer to H. Lotzin, $22,500.

Cal., Upland—City received low bids for interior sewerage system, including 32,800 ft. 8- 10-in. vitr. sewer pipe, from E. L. Fleming & Sons, Pomona, $26,675, outfall sewer including 21,280 ft. 12- 14-in. vitr. pipe, from J. Chutuck, 532 South Matthews St., Los Angeles, $24,118. Noted May 10.

BRIDGES

Proposed Work

Ia., Algona—(Official)—Kossuth Co. rejected bids building bridge over Des Moines River. Noted Sept. 27.

Mo., Independence — (Official) — Kansas City Southern Ry. soon lets contract for rein.-con. viaduct over North River Blvd. J. M. Weir, Kansas City, Mo., ch. engr. Waddell & Son, 934 Wyandotte St., Kansas City, Mo., engrs., prepared plans.

Tex., Ft. Worth—City Comn. plans to build rein.-con. viaduct over railroad yards, Jennings Ave. F. J. Von Zuben, city engr.

Okla., Holdenville—Hughes Co. sold $25,000 bonds for bridge improvements in Newburg Twp. A. J. Johnson, co. clk. Noted Sept. 27.

Okla., Waurika — See "Streets and Roads."

BIDS DESIRED

Conn., Hartford — See "Streets and Roads."

Va., Richmond—(Official)—Until Nov. 2, by City, building rein.-con. viaduct over Bacon Quarter Branch and Seaboard Air Line Co.'s property. C. E. Bolling, city engr.; advertised in this issue.

Minn., Little Falls—Until Nov. 6, by Morrison Co., building Royal Mississippi River Bridge, 2 130-ft. and 1 140-ft. truss spans. B. Y. McNairy, co. aud.

Kan., Oswego—(Official)—Until Nov. 6, by Labette Co. Comrs., building 7 rein.-con. bridges. W. J. King, co. engr.; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Albany**—(Official)—W. W. Wotherspoon, supt. pub. wks., Capitol, let contract building bascule bridge below Lock No. 1, Culvert St., Phoenix, Oswego Canal, Sect. 1, Barge Canal Contract No. 167, to W. S. Rae, Oliver Bldg., Pittsburgh, $29,689. Noted Sept. 6.

★**Pa., Pottstown**—(Official) — Montgomery Co., Norristown, and Chester Co., West Chester, let contract repairing Hanover St. bridge over Schuylkill River, to Pittsburgh Constr. Co., Diamond Bank Bldg., Pittsburgh, $32,000. Noted Oct. 11.

★**Ark., Texarkana**—(Official)—Bd. Comrs. Red River Bridge Dist. let contract building bridge over Red River, near Index, to Midland Bridge Co., Kansas City, Mo. About $275,000.

★**Cal., Los Angeles** — See "Streets and Roads."

STRUCTURAL STEEL WORK

Bids Desired

Conn., Hartford—See "Bridges."

REINFORCED CONCRETE

Proposed Work

N. J., Newark—See "Industrial Works."
O., Cleveland—See "Miscellaneous."
Tex., Ft. Worth—See "Bridges."

BIDS DESIRED

Conn., Hartford—See "Bridges."
Va., Richmond—See "Bridges."
Kan., Oswego—See "Bridges."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—See "Industrial Works."
★**N. Y., Hudson**—See "Miscellaneous."
★**O., Dayton**—See "Water-Works."
Cal., San Diego—See "Sewers."

STREETS AND ROADS

Proposed Work

Me., Alfred—York Co. plans building bituminous macadam road from here to Old Orchard.

N. Y., Buffalo—Bd. Pub. Wks. plans to pave portion Main St., asphalt. G. H. Norton, city engr.

New Jersey—State Highway Comn., Trenton, plans to improve road leading to Camp Merritt, Tenafly, 2½ mi. R. A. Meeker, state highway engr.

N. J., Cape May—Cape May Co. to sell $22,000 bonds Nov. 8 to improve roads. F. W. Fowkes, Sea Isle City, clk.

N. J., Freehold — Monmouth Co. plans hard surfacing 13 mi. road from here to Keyport; also improving Norwood Ave., Long Branch. G. D. Cooper, Red Bank, co. engr.

N. J., Jersey City—City plans improving portion Gates Ave., from Old Bergen Rd. to New Jersey Central R.R. bridge. C. A. Van Kuren, city engr.

N. J., North Bergen—(Weehawken P. O.) Town plans to pave Traphagen St.. About $10,000. F. J. Harmon, engr.

N. J., Paterson—Passaic Co. plans to improve Main St. About $200,000. G. Ferguson, co. engr.

N. J., Trenton—City and Pennsylvania R.R. plans to extend Passaic St., over Delaware and Raritan Canal. About $40,000. A. Swan, city engr. A. C. Shand, Broad St. Sta., Phila., ch. engr. ry.

Pa., Bellevue—City plans paving, grading and curbing portions Florence and South Jackson Aves.

Pa., Pittsburgh — City plans widening and extending portion Howard, Alger and Eshelman Sts. R. Swan, city engr.

Del., Milford—City Council plans resurfacing 2½ mi. streets, tarvia. G. M. Townsend, clk.

Md., Baltimore—City plans to pave 25 to 30 mi.; sheet asphalt, including 85 streets and 30 alleys. About $1,000,000. C. Rowland, chn. paving comn.

N. C., Kinston—Lenoir Co. Comrs. plan 2-mi. concrete pavement on Central Highway from Lenoir to Caswell Training School. About $30,000. Natl. Highway Comn. to appropriate $10,000 toward cost.

S. C., Charleston—Charleston Co. voted $275,000 bonds to improve roads. Noted Sept. 13.

Ga., Darien—McIntosh Co. Comrs. plan to issue $55,000 bonds; part of proceeds will be used for road work.

Fla., Lake City—Columbia Co. voted $500,000 bonds to hardsurface roads. Noted Sept. 20.

Fla., Perry—City voted $[illegible] bond issue to pave streets.

Fla., Quincy—(Official)—City voted $18,000 bonds to pave streets. Noted Oct. 4.

Fla., Zolfo—City plans laying 1 mi. brick pavement, 34 ft. wide. R. C. Peterson, engr.

Ala., Gadsden—City plans to pave portions 6th and 12th Sts. asphalt or concrete. About $40,000 and $11,000, respectively. R. M. Wilbanks, clk.

Ala., Geneva—Geneva Co. election set to vote on $100,000 bond issue to improve, repair and extend 100 mi. roads.

O., Bowling Green—(Official)—J. E. Shatzel, secy. bd. trustees, Bowling Green State Normal College, rejected bids for 3500 sq.yd. paving and 10,000 sq.yd. concrete walks and grading. New bids in spring. Noted Sept. 13.

O., Cincinnati—City Council rejected bids to resurface and widen Freeman and Seegar Aves. New bids. F. Krug, city engr. Noted Sept. 20.

O., Dayton—See "Sewers."

O., Lima—City plans to pave portion Atlantic Ave. C. Bryson, city engr.

O., Van Wert — Van Wert Co. having plans prepared by T. K. Priddy, engr., 89.8 mi. macadam roads. About $102,900. W. Klein, aud.

O., Youngstown—City plans paving portions Worthington and Thurman Sts. F. M. Lillie, city engr.

Indiana—State Highway Comn., Indianapolis, plans to build 5 main market highways through state making total of about 800 mi. The routes selected are as follows: Rd. No. 1, beginning at Illinois and Indiana state line, westerly through Dyer, Valparaiso, Laporte, South Bend, Goshen and Ft. Wayne via Lincoln Highway; No. 2, beginning at Illinois and Indiana State line, easterly through Terre Haute, Brazil, Putnamville, Plainfield, Indianapolis, Greenfield, Knightstown, Cambridge City and Richmond to Ohio and Indiana State line; No. 3, beginning at Indiana and Michigan State line, southerly through South Bend, Plymouth, Rochester, Peru, Kokomo, Westfield, Carmel, Indianapolis, Franklin, Columbus, Seymour, Scottsburg, Sellersburg, New Albany and Jeffersonville; No. 4 crossing southern part of state beginning at Evansville, easterly through Boonville, Huntington, Jasper, Dillsboro, Aurora and Lawrenceburg to Ohio and Indiana State line; No. 5, road connecting Vincennes and Mitchell, via Wheatland, Washington, Loogootee and Shoals. W. S. Moore, state highway engr.

Ind., Brazil—Comrs. Clay Co. plan to pave National Rd. from western limits of city to Vigo Co. line. Cost about $20,000 per mi. State Highway Comn. will appropriate $25,000 toward work.

Ind., Danville—Hendricks Co. sold $12,600 bonds to build highways.

Ind., Indianapolis—City plans to improve and pave portions Yandes, Capitol, Eastern, Bway., McCarty, Noble, Pleasant and Julian Sts. B. T. Jeup, city engr.

Mich., Grand Rapids—City had plans prepared paving portions Butterworth St. asphaltic concrete. About $32,300. J. C. Shinkman, clk.

Mich., Marshall—Calhoun Co. Rd. Comrs. plan road to Camp Custer, brick, asphalt or asphaltic concrete. Cost between $25,000 and $50,000 per mile.

Ill., Bloomington—McLean Co. plans to issue $2,000,000 bonds to improve roads. W. Schmidt, chn.

Ill., Freeport—(Official)—Stephenson Co. lets contract about Jan. 1, State aid highway, 10-ft. brick and 3-ft. macadam shoulder. About $23,442. P. G. Hiveley, Springfield, co. supt. highways. Noted Oct. 11.

Ill., Peoria—City Council plans paving Washington St. macadam; brick and cement walks on Franklin St. About $21,000. L. D. Jeffries, city engr.

Ill., Sullivan—Moultrie Co. plans election Oct. 31 to vote on $145,000 bond issue for improving road from Rockford city limits via Cherry Valley to Boone Co. line.

Wisconsin—State Highway Comn., Madison plans Wisconsin River highway from Grand Rapids to Nekoosa via Port Edwards across Nekoosa River to New Rome.

Ia., Ottumwa—(Official)—River Front Comm., Ottumwa Trust Bldg., plans to build 60-ft. boulevard; first section will be about 1,740 ft. long. C. A. Wellman, clk.

Kan., Atchison—City plans paving portion 4th and U sts. and Lancaster Ave. F. S. Adams, city engr.

Kan., Wichita—City plans to pave portion Hillside Ave., Lewis and Bluff sts. A. Dunlavey, city engr.

Neb., Omaha—City plans to improve 32nd and 24th sts. and 30th Ave., also grade portions Cuming st. and St. Marys Ave. J. A. Brum, city engr.

North Dakota — State Highway Comm. Hillsboro having plans prepared by F. W. Cozens and state highway engr. for 19 mi. Federal Aid road.

Streets and Roads (Continued)

Mont., Butte—City created Impvt. Dist No. 2 and plans to build sidewalks and grade streets. About $40,215. J. J. Armstrong, city engr.

Mo., Kansas City—City plans to pave portion Jackson and Lawn Aves. and 34th St.; artificial stone sidewalks on east side of Delaware St.; also curbing portion Jackson Ave. and 59th St. C. Hill, city engr.

Mo., St. Louis—City plans to widen Washington Ave. between Jefferson and Grand Aves. About $15,000. E. R. Kinsey, pres. bd pub serv.

Ark., Clarksville — Johnson Co. Comrs. plan to build macadamized road from Pope Co. to Franklin Co. line. About $140,000.

Ark., De Witt—Arkansas Co. Comrs. had plans prepared by State Highway Comn., Little Rock, building road from Stuttgart to Goldman, 6 mi., tarvia penetration. About $64,000.

Ark., Jonesboro — (Official) — Craighead Co. Comrs. let contract about November building brick and asphaltic concrete highway in Jonesboro-Nettleton Rd. Impvt. Dist. Klyce & Kackley, Life and Casualty Bldg., Nashville, Tenn., engrs. Noted Aug. 16.

Ark., Lewisville — Lafayette Co. Comrs. plan to build 22 mi. gravel road from Columbia Co. line through Buckner, Stamps and Lewisville, to Red River. About $100,000.

Ark., Morrillton—Conway Co. had plans prepared by State Highway Dept., Little Rock, for road from Mero to Van Buren Co. line, 33 mi., to be part of highway from Hot Springs to Mammoth Springs. About $[illegible].

Ark., Mt. Ida—Arkansas Natl. Forest appropriated $5,334,200 to improve Caddo Valley Rd.

Ark., Van Buren—Crawford Co. Comrs. plan to build road from here to Ft. Smith thence to Boston Mt. at Winslow.

Texas—State Highway Comn. had plans prepared Dallas-El Paso Highway, 701 mi. long. About $1,025,241. G. A. Duren, state highway engr.

Tex., Colorado—Mitchell Co. election Nov. 1 to vote on $70,000 bonds to build roads.

Tex., Dallas — Dallas Co. Comrs. rejected bids resurfacing portion Richardson Rd. from Vickery to Richardson, Maple Ave. Rd. from city limits to railroad crossing and California Crossing Rd. J. F. Witt, co. engr. Noted Sept. 13.

Tex., El Paso—City election Oct. 31 to vote on $100,000 bond issue to pave street and alley intersections. G. Espy, city engr.

Tex., Ft. Worth—City Comrs. and Tarrant Co. Comrs. plan to resurface Arlington Heights Blvd. from 7th St. viaduct to center of Camp Bowie.

Tex., Linden—State Atty. General's Dept., Austin, approved issue of $75,000 bonds in Cass Co. for good roads in Dist. No. 3, and $30,000 for roads in Dist. No. 2.

Tex., Palestine—Anderson Co. election [illegible] to vote on $40,000 bond issue to build good roads in Texas Colony and Cayuga Communities.

Tex., Sweetwater—Nolan Co. election Nov. 10 to vote on $100,000 bond issue to build roads.

Okla., Ada — (Official) — City plans to pave residential districts. About $100,000. Benham Eng. Co., 300 Colcord Bldg., Oklahoma engrs.

Okla., Bristow—City having plans prepared by Benham Eng. Co., engrs., Colcord Bldg., Oklahoma, for paving streets. About $75,000.

Okla., Holdenville—Hughes Co. sold $13,-[illegible] bonds for road improvements. A. J. Johnson, co. clk. Noted Sept. 27.

Okla., Waurika—Jefferson Co. election [illegible] to vote on $25,000 bond issue to build roads and bridges in Wear Twp.

Idaho, Albion—Cassia Co. voted $100,000 bond issue for road work in Burley.

Idaho, Burley — (Official) — City election Oct. 2 to vote on $[illegible] bond issue for paving and other improvements deferred indefinitely. E. C. Davis, clk. Noted Sept. 27.

Oregon — State Highway Comn., Salem, plans building Columbia River Highway from here to The Dalles and through the gorge, 16.6 mi. About $320,000.

Ore., Gold Beach—(Official)—Curry Co. lets contract about May for road from Coos Co. to California state line. Noted Oct. 11.

Ore., Toledo—Lincoln Co. at recent election defeated $200,000 bonds for road work. Noted Sept. 27.

Wash., Seattle—City rejected bids paving Beacon Ave. A. H. Dimock, city engr. Noted Oct. 11.

Wash., Seattle—City having plans prepared paving alleys in Pettit and Brown addition. About $24,064. A. H. Dimock, city engr.

Cal., El Segundo—City voted $540,000 bonds to improve streets and build city hall.

Cal., Fresno—City plans to improve portion Franklin Ave. B. E. Cronkite, city engr.

Cal., Los Angeles—City plans to improve 10th, 66th and Andrews Sts. A. C. Hanson, city engr.

Ont., Chatham—City plans to pave portions 7th St., and remove sidewalk on Sheldon Ave. J. W. Adams, city engr.

BIDS DESIRED

Rhode Island—(Official)—Until Oct. 26, by State Bd. Pub. Rds., Providence, building section state highway in South Kingstown; advertised in this issue.

Connecticut—(Official)—Until Oct. 23, by C. J. Bennett, state highway comr., Capitol, Hartford, building roads and rein.-con. and steel bridges in various twps.; advertised in this issue.

N. J., Highland Park—(New Brunswick P. O.)—Until Oct. 29, by Boro., concrete sidewalks throughout boro. R. B. Craig, clk.

N. J., Newark—(Official)—Until Oct. 25, by Bd. Street and Water Comrs., flagging 4200 ft. cement walks, 5 in. thick on Ave. A, 3500 ft. Ave. B, 12,200 ft. Miller St., 5400 ft. Wright St. M. R. Sherrard, city engr.

N. J., West New York — (Weehawken P. O.)—Until Oct. 23, by Town, repaving 9th and Jefferson Sts. About $20,000.

N. J., West Orange—(Official)—Until Nov. 6, by City, paving portion Valley Rd., including 10,175 sq.yd. grouted granite on 6-in. concrete base. About $40,000. C. Winston, city engr. Noted Oct. 11.

Pennsylvania—(Official)—Until Nov. 8, by State Highway Comn., Harrisburg, for road work in Allegheny, Venango, and Somerset Cos.; advertised in this issue.

Pa., Scranton—See "Sewers."

W. Va., Fayetteville—Until Nov. 5, by Fayette Co., grading road in Kanawha Dist., 3 mi. R. J. Stegall, clk. P. Konrad, Kanawha Falls, engr.

Miss., Coffeeville—(Official)—Until Nov. 5, by Bd. Superv., Yalobusha Co., 15 mi. paving; L. T. Whisdom, chancery clk.; advertised in this issue.

Tenn., Morristown—Until Oct. 26, by D. C. Morris, recdr., improving several streets including 5000 cu.yd. excava.; 7000 sq.ft. 16-ft. water-bound macadam paving, 7800 lin.ft. curb and gutter; 34,530 sq.ft. 4½-ft. sidewalk; 2230 sq.ft. concrete crossings; 40 lin.ft. 24-in. pipe; 30 lin.ft. 19-in. pipe; 1699 lin.ft. 15-in. pipe; 1200 lin.ft. 12-in. pipe; 200 lin.ft. 10-in. pipe; 14 catch basins and 7 manholes.

Ohio—(Official)—Until Oct. 23, by C. Cowen, state highway comr., Columbus, improving highway in Franklin Co., Sects. M. and O, Columbus-Sandusky Rd., brick on concrete base. About $12,429.

O., Cleveland—Until Oct. 24, by City, paving, grading, draining and curbing portion East 130th St. R. Hoffman, city engr.

Michigan—Until Oct. 24, by State Highway Comn., Lansing, building 7008 mi. water-bound macadamized road in Allegan Co., Ganges Twp.

Minn., St. Paul—(Official)—Until Oct. 22, by H. W. Austin, purch. agt., grading portions Lake Como, Phalen, Cleveland, Maplewood and Hamline Aves., and certain alleys; also curbing portion Edmund St. O. Claussen, city engr.

Kan., Kansas City — (Official) — Until Nov. 5, by Wyandotte Co. Comrs. repaving Parallel Rd., 2¾ mi.; Kaw Valley Rd., 5½ mi. macadam. About $30,000. O. K. Williamson, co. engr. Noted Oct. 4.

Tex., Dallas — (Official) — Until Oct. 22, by C. E. Gross, aud., Dallas Co., grading and graveling portions Rowlette Rd.; also resurfacing portion Seagoville Rd.

Cal., Santa Cruz—Until Oct. 23, by H. H. Miller, clk. Santa Cruz Co., improving 6-mi. highway between Santa Cruz and Felton.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Boston—City received low bid grading and playground surfacing at Smith's Pond playground, from T. H. Connolly, 2 Harland St., Roxbury, $19,500.

★Conn., Hartford—City let contract, cement concrete pavement to W. T. Ryan, 129 Barker St., $15,000. City will furnish all materials.

N. Y., Brooklyn—(Official)—L. H. Pounds, boro. pres., received low bids regulating and paving Hopkinson Ave., permanent asphalt pavement on 6-in. concrete base, from Sicilian Asphalt Paving Co., 41 Park Row, New York City, $21,793; Borough Asphalt Co., 1301 Metropolitan Ave., $22,461; Cranford Co., 52 9th St., $22,-739. Noted Oct. 4.

N. Y., Long Island City—M. M. Connolly, boro. pres., received low bids paving (a) portions Hughes St., sheet asphalt, 6-in. concrete foundation, (b) Hancock St., from Sicilian Asphalt Paving Co., 41 Park Row, New York City, (a) $10,475; (b) $11,681; Borough Asphalt Co., 1301 Metropolitan Ave., Brooklyn, (a) $10,655; (b) $11,882; Uvalde Asphalt Paving Co., 1 B'way., New York City, (a) $10,836; (b) $12,083. Noted Sept. 27.

N. Y., Mineola—Nassau Co. received low bids improving Shore Rd., Port Washington, from Smull & Dusinberry, Port Washington, $14,821; Andrews Bros., $15,045.

N. Y., New York—D. Matthewson, boro. pres., received low bids paving portions roadway of Bronx and Pelham Pkway., sheet asphalt, concrete foundation, from Union Paving Co., 120 Bway., $58,900; Uvalde Asphalt Paving Co., 1 Bway., $61,-146; Davney Asphalt Co., 52 Vanderbilt Ave., $64,299.

★N. Y., Norwich—City let contract bitulithic pavement to Warren Bros. Co., 142 Berkeley St., Boston, $20,000.

Pennsylvania — State Highway Dept., Harrisburg, received low bids for road work, (a) Cambria Co., East Taylor Twp., Route 52, Sect. 4-0, 9878 ft. vitr. block pavement 16 ft. wide, (b) Cambria Co., Jackson and East Taylor Twps., Route 52, Sect. 4-B, 11,070 ft. vitr. block pavement, 16 ft. wide, (c) Lackawanna Co., Moosie and Old Forge Boroughs, State-aid applications Nos. 487-442; 6562 ft. rein.-con. pavement, 16 ft. wide, (d) Washington Co., Cecil and North Strabane Twps., Route 108, Sect. 1, 19,318 ft. vitr. block and rein.-con. pavement, 16 ft. wide, (e) Allegheny Co., South Fayette Twp., Route 108, Sect. 1, 16,852 ft. vitr. block and rein.-con. pavement, 16 ft. wide, (f) Lehigh Co., Hanover Twp., Route 159, Sect. 1, 11,857 ft. rein.-con. pavement, 16 ft. wide to 20½ ft., (g) Butler Co., Clinton Twp., State-aid Application No. 417, 5800 ft. vitr. block pavement, 16 ft. wide, (h) Westmoreland Co., East Huntingdon Twp., State-aid Application No. 324, 2540 ft. vitr. block pavement 16 ft. wide, (i) Montgomery Co., Upper Moreland, Abington and Upper Dublin Twps., State-aid Application No. 648, 6537 ft. rein.-con. pavement, 16 ft. wide, (j) Venango Co., Cornplanter Twp., State-aid Application No. 681, 7857 ft. vitr. block pavement, 16 ft. wide; (k) Washington Co., East Bethlehem Twp., Route 268, State-aid Application No. 738, 5900 ft. vitr. block and rein.-con. pavement 16 ft. wide; from E. H. Brua, Hollidaysburg, Pa., (a) $78,855, (b) $96,520; J. L. Elder, Center St., Ebensburg, Pa., (a) $79,624, (b) $95,882; R. Hopkins, Troy, N. Y., (a) $80,752, (f) $76,838; Mainwaring & Cumins, Inc., Phila., (b) $109,-890, (i) $50,652; Gibbons & Buckley, Phila., (c) $25,499; Matthias & Stipp & Son, Scranton, (c) $27,642; O'Brien Bros., Division St., Avoca, Pa., (c) $32,309; P. F. Connelly, Reality Bldg., Elmira, N. Y., (d) $165,140; R. Swan, Jenkins Arcade, Pittsburgh, (e) $210,721, (g) $64,105; G. B. Hardner, Lentz Bldg., Allentown, Pa., (f) $69,375; J. C. Bentley, Elizabeth, N. J., (f) $72,858; N. J. Boyer, Butler, Pa., (g) $30,-256; Kennedy Contr. Co., Utica, N. Y., (g) $34,730; R. Gallardi, Connellsville, Pa., (h) $20,955; Ambler, Davis Co., Harrison Bldg., Phila., (i) $44,350; Juniata Co., Empire Bldg., Phila., (i) $45,511; E. M. Love & Son, Corry, Pa., $56,663; Crossan Constr. Co., High St., Brownsville, Pa., (k) $75,322.

★Pa., Bradford—City let contract paving Sherman and Washington Sts., brick, to J. B. Sheenan, $18,000.

Streets and Roads (Continued)

★**Pa., Ellwood City**—City let contract paving portion 9th St. and Border Ave. to A. Dahl, Ellwood City. About $12,380.

★**Pa., Pittsburgh**—Allegheny Co. let contract road work to Booth & Linn, Ltd., 3785 Bway., New York City, East Carson St. extension in St. Clair Boro., Baldwin Twp. and Hays Boro., 13,050 ft., $351,630; Irwin Run Sect. connecting Hays Boro., and Mifflin Twp., 9100 ft., $161,275; Rhinehart Bros., Puckey Rd., Plum Twp., 10,300 ft., $15,883; T. Cronin Co., South 17th and Muriel Sts., Hope Hollow Rd., Scott Twp., 4330 ft., $56.225; Steuben St. extension, Chartiers Twp., 1650 ft., $29,962; Dravosburg Sect. of Irwin Run and West Run connecting road, Mifflin Twp. and Dravosburg Boro., 8900 ft., $143,665; Noblestown Rd., Greentree Boro. and Chartiers Twp., 5900 ft., $86 701; Noblestown Rd. (Dinsmore Sect.), Westwood Boro. and Chartiers Twp., 6150 ft., $44,845; Frankstown Ave., Penn Twp., 3150 ft., $40.650; Spring Garden Rd., Reserve Twp., 6525 ft., $94.175; D. W. Challis & Sons, 420 Centennial Bldg., Bakerstown and Warrendale Rd., Pine Twp., 7600 ft., $83,468; M. W. Ott Co., 414 Warrington Ave., Idlewild Rd., Chartiers Twp., 2700 ft., $38.056; Mattern Ave., Mt. Lebanon Twp., 1900 ft., $27.303; D. McNeil Co., Jenkins Arcade, Butler Pike, Shaler Twp., 17.300 ft., $115,990; Freeport Rd., Sect. No. 2, Harmar and O'Hara Twps., 8050 ft., $99,144.

★**W. Va., Charleston**—City let contract paving several streets and alleys to Central Eng. Co., Charleston. About $58,688. Noted Oct. 11.

★**Louisiana**—(Official)—State Highway Dept., New Orleans, let contract following highway work: Baton Rouge-New Orleans Rd., Ascension Parish, 27.48 mi.; Lafayette-New Iberia, Lafayette-Crowley Rds., Lafayette Parish, 12 2 mi., to S. A. Davis, Jackson, Miss., $86,875. Noted Oct. 4.

★**La., Minden**—City let contract 8 blocks brick paving to Kennedy, Olson Constr. Co., 601 Ridge Arcade Bldg., Kansas City, Mo.

Ohio—State Highway Comn. Columbus received low bids improving highways as follows: Ashland Co., Sect. "A," Columbus-Wooster Rd., monolithic brick, 1:54 mi., Wilson Constr. Co., Newark, $43.718; A. C. Solomon Constr. Co., Lima, $44.012. Clermont Co., Sect. "N-1" Milford-Hillsboro Rd., water-bound macadam, 0.98 mi., John Reubel Constr. Co., Cincinnati, $11.317; H. C. Lamb, Amelia, $11,378. Darke Co., Sect. "A-1," Dayton-Greenville Rd., concrete, 2:63 mi.; York & Studebaker, Greenville, $59.495; Straw & Huber, Pauling, $62,342. Huron Co., Sect. "L," Bellevue-Norwalk Rd., monolithic brick, 2.40 mi., Chris Stoltz, Bellevue, $40,744; R. L. Greenslade, Bellevue, $42 015. Knox Co., Sect. "K," Columbus-Wooster Rd., rein.-con., 1.61 mi., Latshaw & Stinchcomb, Fostoria, $47,431; H. W. Curry & Co., Eaton, $47 986. Lucas Co., Sect. "J" Toledo-Napoleon Rd., waterbound macadam, 4.48 mi.; Gray Bros., Bowling, $72.003. Mahoning Co., Sect. "B," Youngstown-Lowellville Rd., brick, 1.5 mi.; Smith Constr. Co., $53,791. Seneca Co., Sect. "A," Tiffin-Fostoria Rd., bituminous concrete, 1.55 mi.; Modern Constr. Co., Fremont, $40.448. Summit Co., Sect. "R," Akron-Canton Rd., brick, 2.08 mi.; J. L. McCormick, Canton, $64 501. Summit Co., Sect. "N-1," Cleveland-Massillon Rd., brick, 1.80 mi.; W. E. Burke & Sons, Akron, $57 853. Wayne Co., Sect. "Q," Wooster-Canal Dover Rd., monolitic brick on concrete foundation, 1.17 mi., Holmes Constr. Co., Millersburg, $23,479; McGary & Stowe, Akron, $23.823. Wayne Co., Sect. "A," Wooster-Millersburg Rd., monolithic brick on concrete foundation, 0 88 mi.; McGary & Stowe, Akron, $16,074; Holmes Constr. Co., Millersburg, $16,074; Sect. "A," Orrville-Southern Rd., monolithic brick on concrete base, 2.35 mi.; Holmes Constr. Co., Millersburg, $53.131; bituminous macadam, Baum & Ankeny Sycamore, $48.284; Seiple & Wolfe Youngstown, $48,465. Williams Co., Sect. "L," Bryan-Pioneer Rd., waterbound macadam, 3.81 mi., Doan & Langenderfer Toledo, $54 992; H. M. Kelly, Bryan, $57.756; bituminous macadam, Doan & Langenderfer Toledo, $67.120; H. M. Kelly, Bryan, $69,260. Jefferson Co., Sect. "N-2," Steubenville-Cambridge Rd., resurfacing with brick on concrete foundation, 1 83 mi Andrew McDonald, Steubenville, $71,918; resurfacing with brick on rolled base, $65,830. Noted Oct. 4.

★**O., Akron**—City let contract paving and stone curbing on various streets to McAlonan Bros., $19,971. Noted Oct. 4.

★**O., Elyria**—City let contract paving five streets to Elyria Constr. Co., Elyria. About $38,655. Noted Sept. 27.

★**Ill., Champaign**—City let contract paving portion Chandler St., to H. K. Rhoades & Co., Lincoln, Neb., $28,000.

★**Ill., Decatur**—(Official)—City let contract improving North Jasper St. to File & Alexander, 315 Milliken Bldg., $25,253.

★**Ill., Mendota**—(Official)—City let contract brick pavement, 5-in. concrete foundation and cement grout filler, to H. Zalper & Sons, Mendota, $33,470. Noted Sept. 27.

★**Ia., Des Moines**—City let contract paving 34th and Forest Sts., bitulithic, to J. Horrabin & Co., 2d and New York Aves., $2.84 per sq.yd.

★**Ia., Oskaloosa**—Hahaska Co. let contract grading North Market St., also streets and avenues in Penn addition to J. Herbert & Sons, Marshalltown. About $10,000.

★**Kan., Augusta**—City let contract, paving various streets to A. Jaicks Co., Amer. Bank Bldg., Kansas City, Mo., $28,000.

★**Mo., Charleston**—(Official)—City let contract paving, curbing and guttering to A. R. Young & Co., Lawrence, Kan. About $80,000. Noted Sept. 27.

★**Mo., Springfield**—(Official)—Green Co. received no bids to improve 15-mi. road in Galloway Special Rd. Dist. Work will be done by day labor. Noted Oct. 4.

★**Tex., Dallas**—City let contract paving to Texas Bitulithic Co., 1106 Praetorian Bldg., Grand St., $19,768; Washington Ave., $35,474; Kinney Ave., $24,687; Gaston Ave., $16,630.

Tex., Galveston—City received low bids filling in crest in boulevard between 34th and 39th Sts., mudshell, from Hanson & Son, Galveston, $0.95 per cu.yd.; W. D. Hadden, 1814 Amer. Natl. Insurance Bldg., $1.27; Freund & Freund, 211 23rd St., $1.45 per cu.yd. Noted Oct. 4.

★**Tex., Plainview**—City let contract 100,000 yd. brick pavement to J. N. Jordan, Plainview, $200,000.

★**Okla., Okmulgee**—City let contract paving streets to Ok-Park-Moran Co., Okmulgee, $22,965.

★**Idaho, Moscow**—City let contract 38,000 sq.yd. bituminous pavement to Asphalt Paving Co., 517 Lincoln St., .054c. sq.yd., furnishing Torpedo sand, 30c. cu.yd. of 2500 lb. f.o.b. at pit in Spokane.

★**Utah, Provo**—Utah Co. Comrs. let contract paving road between America Fork and Pleasant Grove, 2 mi., cement and rein.-con., 18 ft. wide, 4 ft. rolled shoulder on each side, to Strange & McGuire, Utah Savings and Trust Bldg., Salt Lake City, $39,000. Noted Sept. 13.

★**Utah, Salt Lake City**—(Official)—City let contract Paving Extension No. 138 to Strange-Maguire Pav. Co., Utah Savings & Trust Bldg., $10,961. Noted Sept. 13.

★**Nev., Elko**—Elko Co. let contract 6 mi. highway in Jarbidge Canyon to W. Harkins, $18,500.

★**Washington**—State Highway Comn. let contracts paving Pacific Highway, in Clarke Co., 3½ mi., to A. Rydstrom, Tacoma, $44,989; in Skagit Co. to J. R. Wood, Seattle, $36,838; Olympia Highway, between Olympia and Kalmilchie, 3½ mi., to Alfred & James, Centralia, $43 385; Navy Yard Highway, from Charleston to Clinton, D. Govan, Port Angeles, $78,007; Sunset Highway, from Wilbur west 4 mi. and from Govan west 8 mi., to G. L. Stickler, Uniontown, $14,394 and $20,955 respectively. State Rd. No. 22, 6 mi. from Myers Falls south in Stevens Co., to A. L. Mitchell, Spokane, $29,254. Noted Sept. 20.

★**Wash., Walla Walla**—Walla Walla Co. let contract building Inland Empire Highway from Dayton, north, to C. N. Pentecost, Walla Walla. About $32,978.

★**Cal., Hanford**—Bd. Supervs. Kings Co. let contract River Road unit of highway system, involving 6000 cu.yd. excav., 515,500 sq. ft. asphaltic concrete Topeka surface, to Blanchard-Brown Co. About $46,600. Noted Sept. 13.

★**Cal., Los Angeles**—City let contract paving Reseda Ave. to G. H. Gerald & T. Johnson Bldg. $139,695. Noted Oct. 11.

★**Cal., Los Angeles**—City let contract regrading and oiling Sherman Way and building rein.-con. bridge over Pacific Electric tracks, to W. M. Ledbetter, Pacific Electric Bldg. $24,845. Noted Oct. 11.

Cal., San Diego—City received low bid furnishing 13,500 bbl. cement for building highway from city limits to Camp Kearney, from Golden State Portland Cement Co., Marsh-Strong Bldg., Los Angeles, $1.53 per bbl., net, f.o.b. San Diego.

★**Cal., Taft**—City let contract paving, curbing and building sidewalks to Federal Constr. Co., Sharon Bldg., San Francisco. About $58,849. Noted Sept. 13.

Cal., Visalia—Tulare Co. received low bids for county highway system from Highway Constr. Co., Exeter-Merryman Rd., $72,603; Brady & Flinn, Humboldt Bank Bldg., San Francisco, Porterville-Woodville Rd., $124,971; Isbell Constr. Co., Dinuba-Kingsburg Rd. $84,127; J. E. Lee, Tulare-Paige Rd. $60,801. Noted Sept. 27.

RAILWAYS—STEAM & ELECTRIC

Proposed Work

Kansas—Joplin & Pittsburg Ry., 1st Natl. Bank Bldg., Pittsburg, made preliminary surveys for 2 mi. line from Waco into mineral fields between Waco and Lawton. W. A. Satterlee, genl. mgr.

Washington—Seattle Municipal Ry., 517 County and Citizens Bldg., Seattle, plans to extend city car lines by connecting Lake Burien and Division A lines. Project includes elevated railway on Washington and Spokane Sts., Railroad and Whatcom Aves., extending from 1st Ave. S., to the West Waterway. About $350,000. A. L. Valentine, supt.

California—Municipal Ry. of San Francisco, 2600 Geary St., received franchise from Bd. Supervs. for building new line from west portal of Twin Peaks Tunnel to 20th and Taraval Sts. Bd. Supervs. appropriated $90,000 toward cost. T. A. Cashin, supt.

British Columbia—Canada Copper Corp., Princeton, will spend about $1,000,000; greater part of sum for building railroad from Copper Mountain to Princeton, to serve mines of company.

EXCAVATION AND DREDGING

Proposed Work

N. Y., Albany—(Official)—Ditch—W. W. Wotherspoon, supt. pub. wks., received no bids for improving Erie, Oswego and Champlain Canals. Barge Canal Contract No. 163. Noted Sept. 13.

Ind., Winslow—Dredging—J. S. Spiker, engr., Vincennes, submitted report to Circuit Court Pike Co., Petersburg, estimating cost straightening Patoka River at or near Winslow, west to just above Townsend rock quarry. Work involves cutting 43 mi. wanderings by little river down to 17 mi., thus taking out many kinks; at one point a meandering of 14 mi will be replaced by 4-mi. straight dredge. About $400,000.

Ill., Lawrenceville—(Official)—Ditch—Lawrence Co. Comrs. received no bids, rebuilding 6 mi. old ditch, involving 50,000 cu.yd. excav., also 2 mi. new ditch, involving 72,000 cu.yd. excav. as contractors claimed estimate was too low. G. C. Harvey, Mt. Carmel, engr. Noted Oct. 4.

Minn., Minneapolis—Ditch—Hennepin Co. had plans prepared for open ditch, involving 3-mi. main ditch, 10-ft. bottom, 3 open laterals, 50,000 cu.yd. excav. Address W. H. Nicol, secy., 303 South 3rd St. W. R. Hoag, 624 14th Ave. S. E., engr.

Neb., Hastings—Drainage—Bd. Supervs. Adams Co. plans to reclaim Kenesaw Lagoon. Work involves relocating of 4½ mi. and drainage project to cost about $14,000. Counts to appropriate ½ of cost, property owners, ½.

Utah, Widtsoe—Irrigation—Emery Valley and Emeryville Co. plans to enlarge company's dam on east fork Seeley River to irrigate 10,000 acres. About $[illegible].

Ore., Gold Hill—(Official)—Ditch—Gold Hill Irrigation District receiving bids about Jan. 1 building irrigation ditch. Bonds for $[illegible] voted for same. G. B. Aiken, engr.

Cal., Alameda—Dredging—Southern Pacific Co. plans to dredge channel along its seawall. About $170,000.

BIDS DESIRED

Ill., Crete—Drainage—Until Oct. 27 by County Clerk, Joliet, for Sec. 8, furnishing, loading, digging ditch, laying tile, filling [illegible] ft. 8- to 18-in. tile, 1 single tube S. Pipe [illegible] at Crete.

Minn., Duluth—Ditch—Until [illegible] by St. Louis Co. Drainage Co., Duluth, for Canosia system, involving 41,110 cu.yd. excav., 13 culvert, [illegible] etc. About $[illegible]. Noted Sept. 15.

Excavation and Dredging (Continued)

Minn., Mankato — Ditch — Until Oct. 23, by Blue Earth Co., building Co. Ditch No. 53, involving 25,230 ft. 10- to 24-in. tile. About $14,180. R. H. Allison, co. engr.

Neb., Papillion—Drainage—Until Nov. 1, by Western Sarpy D.D., building 7¼ mi. open ditches, 2¼ mi. levee, tile and brush jetties in river. About $33,463. J. H. Langdon, Gretna, secy. dist. H. D. Patterson, Papillion, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., Albany—Canal—W. W. Wotherspoon, state supt. pub. wks., received low bids for Contract No. 83, completing canal at Tunnel and removing guard lock and culverts near Sulphur Springs, from Mohawk Dredge & Dock Co., Inc., Herkimer, $216,915; Contract No. 164, completing and building canal at certain locations between Lyons and Newark also for retaining dam at Macedon, from Lathrop, Shea & Henwood Co., Ellicott Sq., Buffalo, $159,848; Mohawk Dredge & Dock Co., Herkimer, $228,947. Noted Sept. 13.

N. Y., Albany—(Official)—Canal—W. W. Wotherspoon, supt. pub. wks., received low bids, electrical equipment and operating machinery for Utica Terminal Lock, Barge Canal Contract No. 15-M, from Lupfer & Hemick, Ellicott Sq., Buffalo, $38,967; Lord Constr. Co., 105 West 40th St., New York City, $49,100. Noted Sept. 13.

★**Minn., Mankato**—(Ditch)—Blue Earth Co. let contract building Judicial Ditch No. 22 to Riese & Hall, Eagle Lake, $13,000.

INDUSTRIAL WORKS

Proposed Work

Mass., Fitchburg—Manning, Maxwell & Moore, 100 Bway., New York City, plans steel rolling mill here. About $500,000.

Mass., New Bedford—Union St. Ry., 814 Purchase St., soon lets contract for 80 x 115-ft. power station, brick, concrete, and steel, on Middle St. About $665,000. H. M. Hopes, 185 Devonshire St., Boston, archt.

N. Y., Brooklyn—Midwood Building Co., 44 Court St., having plans prepared by Cantor & Dorfman, archts., 373 Fulton St., 2-story, 80x100-ft., brick and steel garage. About $50,000.

N. Y., Buffalo—Standard Mirror Co., 1168 Seneca St., plans 2-story, 200 x 400-ft. brick and steel factory, 141 Milton St. W. La Hodney, pres.

N. Y., Gloversville—D. Hays Co., 185 West Fulton St., having plans prepared by Cornelius & Van Dresser, archts., 19 West Fulton St., 3-story, 40x180-ft. brick factory. About $80,000.

N. Y., Hague — Foxon Graphite Co., Hague plans new plant. About $300,000.

N. Y., New York—T. J. McCahill, 45 East 42d St., had plans prepared by C. W. Culver, archt., 15 Broad St., for 6-story, 75 x 98-ft. garage at 144-48 East 41st St. About $130,000.

N. Y., New York—E. Mayforth, 17 East 37th St., had plans prepared for 6-story, 100-ft. brick garage, 151 East 42nd St. About $100,000.

N. J., Newark—J. Cockerill, 185 Edgelow St., plans 2-story, 45 x 75-ft. rein.-con. service station, Plane and Haskell Sts. About $55,000.

Pa., East Pittsburgh—Westinghouse Electric & Mfg. Co., having plans prepared by Frank & Berger, archts., 503 Keystone Bldg., Pittsburgh, 165 x 241-ft. foundry. About $10,000.

Pa., Middletown—Lanzius Aircraft Co., 149 Bway., New York City, plant factory here. About $250,000. E. W. Hemmingway, chn. bd. dirs.

Pa., Phila.—Pa. Metals Reclaiming Co., Widener bldg., plans to incorporate with $10,000,000 capital stock and build plant on Delaware River. A. Montalvo, Montalvo, N. J., pres.

Pa., Phila.—White Motor Tire Co., 541 East Erie Ave., Cleveland, had plans prepared by J. W. Watson & Co., 1500 Walnut St., Philadelphia, for 3-story, 100x170-ft. service building, 1501-21 and 1500-20 Vine St. About $125,000. W. T. Wolfe, pres.

Pa., Pittsburgh—Atlantic & Pacific Tea Co., 420 East 149th St., New York City, had plans prepared by Dollinger & Dorsey, archts., 17th and Arch Sts., Phila., for garage and warehouse. About $300,000. A. Brooks, 32 Terminal Way, mgr.

N. C., Kinston—A. J. Chesson Mfg. Co. plans plant for manufacture of farm implements. About $50,000. A. J. Chesson, pres.

Miss., Meridian—City election Nov. 2 to vote on $150,000 bond issue to build ice plant. J. C. Watts, city engr.

La., New Orleans—Wilson & Co., Constance and St. Joseph Sts., secured site on river front and plans to build new packing plant. About $2,000,000. W. D. Cooper, mgr.

Tenn., Jackson—Illinois Central Ry. plans to build store and oil house; some of buildings to be 1-story, 37 x 175 ft. and others 2-story, 37 x 72 ft. About $50,000. A. S. Baldwin, Chicago, ch. engr.

O., Cleveland — National Lamp Works plans warehouse and factory, 1131 East 152nd St. About $160,000. G. H. Johnson, archt.

O., Massillon—A. M. McCarty, of Canton, and associates, plan iron and steel plant on North Summit St., here. About $1,000,000.

O., Westerville—Culver Superior Glass Co., recently organized, plans to build bent glass factory. About $100,000. W. D. Shaw, pres.

O., Youngstown — Automatic Sprinkler Co., Brittain St., has purchased 1-acre site and had plans prepared for addition to plant. About $50,000.

O., Zanesville—City sold $100,000 bonds to build market house. Noted Aug. 23.

Ill., Chicago—Ehman Tire & Rubber Co., 144 West 27th St., had plans prepared by Dibelka, Flake & Minchin, archts., 130 North 5th Ave., for 3-story addition to its factory. About $50,000. A. C. Ehman, pres.

Ill., Chicago—Shank & Co., 30 North La Salle St., plans 5-story brick warehouse, 3950-58 Federal St. About $200,000. Wheelock & Shont, 64 W. Randolph St., Arch.

Ill., Cicero—Chicago, Burlington & Quincy R.R., Chicago, plans 1-story, 41x121-ft. machine shop at Clyde Sta. About $60,000. G. B. Harris, Chicago, ch. engr.

Ill., Madison—Tri-City Steel Co., 2021 Railway Bldg., St. Louis, Mo., recently incorporated with $1,000,000 capital stock, plans to purchase 8½-acre site and build rolling mill. About $100,000. J. A. Hyle, gen. supt.

Ia., Atlantic—Waterloo Creamery Co., 1617 Howard St., Omaha, Neb., plans 2-story, 50x100-ft. brick creamery. About $50,000. R. Corliss, pres.

Minn., Duluth—Marshall Wells Hardware Co., Lake Ave., plans to build factory. About $70,000.

Colo., Pueblo — Norcross Chemical Co. has purchased site of 120 acres and plans to build factory.

Idaho, Nampa—Nampa Milk Co., Nampa, plans 2-story, 88x200-ft. condensary. About $100,000.

Wash., Tacoma—Alber Bros., 821 Dock St., plans improvements and additions to plant, situated on city waterway. About $80,000.

Ont., Sarnia — Romeo Fdry. Co., Port Huron, Mich., plans foundry at Christina and Exmouth Sts., for manufacture of automobile castings. About $200,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—Boston Wharf Co. let contract 8-story, rein.-con. warehouse, 369 Congress St., to W. F. Kearns Co., 240 Albany St., Cambridge.

★**Pa., Allenport**—Pittsburgh Steel Products Co., Frick Annex Court, Pittsburgh, let contract 1-story tube mill to Wilson Constr. Co., Fulton Bldg., $75,000.

★**Pa., Phila.** — Philadelphia Electric Co., 10th and Chestnut Sts., let contract power plant, Beach and Palmer St., to Stone & Webster Co., 147 Milk St., Boston, $2,000,000.

★**Pa., Phila.** — (Tacony) — Tacony Ordnance Co., Commercial Trust Bldg., let contract new plant, including 1-story open-hearth shop, 1-story machine shop, 1-story forge shop and 1-story treating plant to F. W. Marks Constr. Co., Finance Bldg., $450,000.

★**Pa., Phila.**—Unit Constr. Co. let contract building 1- and 3-story gun manufacturing plant, Gray's Ferry Ave. and 57th St., to J. N. Gill & Co., 1215 Filbert St., $80,000.

★**Pa., Pittsburgh**—Point Motor Sales Co., 56 Water St., let contract 3-story, 45 x 229-ft. garage, to D. T. Riffle, Keenan Bldg., $50,000.

★**Ga., Brunswick**—American Shipbuilding Co., 11 Bway., New York City, let contract 2-story mill and 2-story stock building to J. G. Conzelman, Brunswick. Noted Sept. 27.

★**Tenn., Nashville**—E. M. Bond Fireproof Storage Co., 211 3rd Ave., let contract 4-story storage warehouse to Poster & Creighton, $70,000.

★**O., Akron**—N. Loeser, 1533 East Blvd., Cleveland, let contract brick warehouse, 152 Hill St., to Clemmer & Johnson, High and Church St. About $140,000.

★**O., Cleveland**—Natl. Lamp Co., Nela Park, East Cleveland, subsidiary of General Electric Co., let contract 3-story factory, East 52nd St., to be known as Pitney Glass Works, to Heller Bros., Osborn Bldg., $400,000. Noted Sept. 20.

★**O., Cleveland**—J. A. Wigmore & Co., 1330 Williamson Bldg., let contract 2-story, 108x220-ft. sales, service station and garage to Masters & Mullen Constr. Co., 601 Electric Bldg., $125,000.

★**Ill., Chicago** — Ames Steel Co., 2716 Farrell St., let contract 4-story, brick factory to J. Rodatz, 209 South La Salle St., $60,000

★**Ill., Chicago**—Brennan Packing Co., 3916 Normal Ave., let contract 4-story, 65x150-ft. cold-storage building, 49th St. and Union Ave., to E. W. Sproul Co., 1120 West 35th St., $100,000.

★**Colo., Denver**—Linde Air Products Co., 217 West 29th St., New York City, let contract 1-story, 130x155-ft. factory to C. S. Lambie Co., 321 Tramway Bldg., $50,000. Noted May 17.

★**Que., Montreal** — Montreal Locomotive Wks. let contract factory to Structural Steel Co., 10 Cathcart St., $50,000.

★**Ont., Hamilton**—Canada Screw Co., 334 Wellington St., let contract addition to plant to W. H. Yates, 24 Leeming St. About $100,000. Noted Aug. 2.

BUILDINGS

Proposed Work

Mass., New Bedford—School—Bd. Educ. having plans prepared by F. C. Brown, archt., 667 Pleasant St., 2-story, brick, Emma and Freeman Sts. About $150,000.

Mass., Pittsfield—Hospital—House of Mercy, North St., plans, 2-story, 40x125-ft. About $50,000. J. McArthur Vance, 24 North St., archt.

N. Y., Albany—Club House—Young Men's Hebrew Assn. plans. About $80,000. H. Cohen, chn. bldg. com.

N. Y., Chenango—Hospital—Broome Co. Comrs. (Binghamton) had plans prepared by W. H. Whitlock, archt., Security Mutual Bldg., Binghamton, 2-story tuberculosis hospital. About $60,000. H. C. Williams, co. clk.

N. Y., New York—Store and Loft—R. H. Macy & Co., 6th Ave. 34th and 35th Sts., soon receives bids, 4-story, 25x75-ft. J. H. Scheier, 25 West 42nd St., archt. Noted Sept. 13.

N. Y., New York—Office—New Jersey Zinc Co., 55 Wall St., having plans prepared by H. J. Hardenburgh, archt., 47 West 34th St., 7-story, brick and stone.

N. Y., New York—Hospital—Volunteer Hospital having revised plans prepared by A. Mertin, archt., 34 West 28th St., 4-story, 75x80-ft. addition, Beekman and Water Sts. About $75,000. Gen. Ballington Booth, pres. Noted July 12.

N. Y., Rochester—Club—Knights of Columbus, c/o. Meng & Shefer, Powers Blk., having plans prepared by Gordon & Madden, archts., Sibley Bldg., 3-story, 90x200-ft. About $150,000.

N. J., Atlantic City—Home—Order of King's Daughters and Sons plans Home for Aged. About $75,000.

N. J., Glassboro—Normal School—State Bd. Educ. plans State Normal School here. About $300,000. J. P. Murray, Jersey City, pres.

Buildings (Continued)

N. J., Bayonne—Y. M. C. A., c/o. C. A. Towson, 124 East 28th St., New York City, having plans prepared by Shattuck & Hussey, archts., 19 South La Salle St., Chicago, brick. About $250,000.

N. J., Manville—Hotel—H. W. Johns-Manville Co., c/o. R. Newsome, Madison Ave. and 41st St., New York City, plans, 3-story, 150x150-ft. About $100,000.

N. J., Newark—Hospital—Bd. Dir. of the Mecca of Chopractic Hospital and Clinics of Drugless Physicians, plans, 4-story, 50 x 60-ft. Warren St. About $95,000.

N. J., Plainfield—Y. M. C. A. plans 4-story, 100x150-ft. building on Sycamore St. L. E. Jallade, 37 Liberty St., New York City, archt.

N. J., South Amboy—School—Bd. Educ. plans. About $85,000. J. E. Coogan, secy.

N. J., Trenton—Detention—State Hospital for Insane had plans prepared by F. H. Bent, state archt., State House, for 2-story addition. About $110,000.

Pa., Pittsburgh—Home—Curtis Home, Breckenridge Ave., plans addition. About $50,000.

Pa., Pittsburgh—Nurses' Home—St. Margaret's Memorial Hospital had plans prepared by T. E. Billquist, archt., Vandergrift Bldg., 4-story, 35x115-ft. E. J. Edsall, 265 46th St., supt.

O., Canton—Research—State plans Juvenile Research building on State Hospital grounds, West Broad St. About $100,000 available for work.

W. Va., Charleston—Home—A. E. Humphreys, 215 Coronado Bldg., Denver, Colo., plans Home for Aged. About $2,000,000.

La., Monroe—Court House and Jail—Ouachita Parish Police Jury having plans prepared. About $250,000.

O., Toledo—High School—Bd. Educ. to sell $200,000 bonds Nov. 1 to build South High School. L. I. Donat, clk.

Ind., Wishawaka—Hospital—St. Mary's Mercy Hospital soon lets contract, 3-story, 46x100-ft. About $120,000. H. Gaul, 111 West Washington St., Chicago, archt.

Mich., Benton Harbor — Church — St. Mathews Congregation had plans prepared by A. Dohman, archt., 1st Natl. Bank Bldg., Milwaukee, Wis., 1-story. About $50,000.

Mich., Detroit—Church—Beulah Baptist Congregation plans, Kercheval and McClellan St. About $50,000.

Mich., Detroit—School—Bd. Educ. had plans prepared by Malcomson & Higginbotham, archts., 404 Moffat Bldg., for addition to school. About $50,000.

Wis., Milwaukee—School—Bd. Industrial Educ. plans, 7th and Prairie Sts. About $200,000.

Ia., Davenport—Hospital—St. Anthony Hospital having plans prepared by A. Dohman, archt., 1st Natl. Bank Bldg., Milwaukee, Wis., 5-story. About $250,000.

Ia., Manchester—Church—Congregational Church plans. About $78,000.

Ia., Menio—School—Bd. Educ. having plans prepared by Proudfoot, Bird & Rawson, archts., 810 Hubbell Bldg., 2-story. About $70,000. J. W. Wilson, pres.

Ia., Sioux City—Office—Home Securities Co., Sioux City, plans, 12-story. About $80,000. P. H. Pilchard, pres.

Minn., Coleraine — High School — Bd. Educ. plans addition. About $75,000. W. T. Bray, Fidelity Bldg., Duluth, archt.

Minn., Dodge Center—Home—Dodge Co. plans, 2-story, 40x100-ft., brick, Home for Poor. About $50,000. Alden & Harris, 1011 Nat'l. Ex. Bank Bldg., St. Paul, archts.

Minn., Minneapolis—Y. M. C. A. plans building at University of Minnesota. About $160,000. E. C. Gale, 800 Security Bldg., chn. bldg. com.

Minn., Rochester—Hospital—Sisters of St. Francis plan addition to St. Mary's Hospital. About $500,000.

Minn., Rochester—Store and Hotel—Knowlton Realty Co. plans, 6-story, 110x140-ft., cut stone. About $275,000. F. H. Ellerbee, 381 Jackson St., St. Paul, archts.

Minn., St. Paul—Club—St. Paul Athletic Club, plans, 11-story, 100x112-ft., Redford cut stone and red brick. About $700,000. A. H. Stem, Oppenheim Bldg., archt.

Minn., St. Paul—Hospital—Cyrus T. Miller Memorial Hospital receives bids about November 240x300-ft., Summit Ave. A. H. Ancker, 337 Wabasha St., chn. bldg. comn. C. H. Johnston, 715 Capital Bank Bldg., archt.

Neb., Allen—School—City voted $50,000 bond issue for schools.

Neb., Norfolk—Hotel—American Hotel Co. plans, 8-story, 75 x 80-ft., and 2-story, 4th St. and Norfolk Ave. About $300,000.

Neb., St. Paul—Community—City had plans prepared by G. A. Berlinghoff, archt., 911 Security Mutual Life Bldg., Lincoln, 3-story, 50x110-ft. About $50,000. F. A. Taylor, secy.

Mo., St. Louis—Clinic—Bd. Pub. Serv. soon receives bids, 4-story. About $190,000. A. R. Kensey, pres.

Tex., Houston — (Houston Heights) — School—Bd. Educ. plans to build 2 schools. About $100,000.

Tex., Orange—School—City plans election to vote on $75,000 bond issue to build addition to Anderson School. G. W. Curtis, secy. school bd.

Okla., Miami—Jail—County plans election Nov. 20 to vote on $50,000 bond issue for jail. W. P. McCullough, Ottawa, co. clk.

Okla., Pauls Valley—Court House and Jail—Garvin Co. plans election to vote on $150,000 bonds to build court house and jail.

Okla., Tulsa—Bank and Office—S. G. Kennedy, 205 Gallias Bldg., plans 10-story, 100 x 140-ft. addition to Kennedy Bldg., 4th St. and Boston Ave. About $500,000. A. W. Black & Son, Security Bldg., St. Louis, archts.

Wash., Olympia—High School—Bd. Educ. receiving bids about Dec. 1, 3-story, 140 x 150-ft. brick. About $100,000. Heath & Gove, archts., Natl. Realty Bldg., Tacoma, preparing plans.

Wash., Seattle—Loft—J. W. Goodwin, Pike Pl. Market, plans, 4-story, on 1st Ave. About $60,000.

Wash., Spokane—Infirmary—Spokane Co. Comrs. appropriated $80,000 for addition to Tuberculosis Hospital at Edgecliff. Noted Oct. 11.

Cal., El Segundo—City Hall—See "Streets and Roads."

Cal., Los Angeles — Hotel — D. A. and M. A. Hamburger and W. H. Clune, 528 South Bway., had plans prepared, 12-story, 160x248-ft., steel, brick and rein.-con., Bway. and 9th St. About $1,500,000.

Cal., Los Angeles—Office—H. J. Goudge, 622 Investment Bldg., plans, 9-story, 70x155-ft., rein.-con. and brick, on Spring St. Train & Williams, 226 Ex. Bldg., archts.

Cal., Los Angeles—Sanitarium—Western Episcopal Society, incorporated with $100,000 capital stock, plans to build here. About $500,000.

Cal., Vallejo—Schools—City election Nov. 16 to vote on $60,000 bond issue to build schools.

BIDS DESIRED

N. Y., Brooklyn—Armory—Until Oct. 24, by City, additions and alterations to armory buildings on 8th Ave. and 15th St. and Marcy Ave. and Hayward St. About $260,000. Pilcher & Tachau, 109 Lexington Ave., New York City, archts.

N. J., Jersey City—Hospital—Until Oct. 22, by City Comrs., for additions to City Hospital. F. A. Dolan, city clk. Noted July 5.

N. J., Trenton—Dormitory—Until Oct. 29 by F. H. Bent, state archt., State House, at School for Deaf.

S. C., Columbia—Jail—Until Oct. 26 by Newberry Co. J. M. Davis, chn. bldg. com.

Ia., Davenport—Schools—Until Oct. 21 by Bd. Educ. for 6 intermediate schools. J. D. McCollister, secy. Temple & Burrows, 63 Davenport Savings Bank Bldg., archts.

Minn., Lakefield—High School and Manual Training—Until Nov. 5 by Bd. Educ. Library, 54x79 ft., also 2-story, 45x48-ft. rein.-con. book and play. K. T. Snyder, 483 Plymouth Bldg., Minneapolis, archt. Noted Aug. 16.

Kan., Lawrence—Campus—Until Nov. 1 by C. H. Chandler, state archt., State House, Topeka, 2-story, 64x120-ft. and 100x140-ft. About $[illegible]. J. A. Kimball, Topeka, mgr. bd. administration.

Okla., Sapulpa—High School—Until Oct. 25, by Bd. Educ., 3-story, brick, stone and rein.-con. Cost between $175,000 and $200,000. J. W. Young, clk. C. A. Popkin, Berryhill Bldg., archt.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Conn., Greenwich**—Nurses' Home—Greenwich Hospital let contract, 2-story, 67x85-ft., Williams St., to C. T. Willis, Inc., 286 5th Ave., New York City, $60,000.

★**Conn., New Haven**—College—Yale University let contract 10 buildings to M. Eidlitz & Son, 30 East 42nd St., New York City, $2,500,000.

Conn., Shelton—Infirmary—Tuberculosis Sanitorium received low bids, from A. Miller, 21 Church St., Meriden, $62,823; T. J. Pardy Constr. Co., 15 Fairfield Ave., Bridgeport, $66,474.

★**N. J., Bayonne**—Bd. Educ. let contract addition to School No. 11 to G. W. Cranwell & Son, Union St., West Hoboken, $59,000.

★**N. J., Newark**—Fire House—City let contract, 2-story, brick, to W. H. Connolly Co., Inc., 495 12th Ave. About $50,000. Noted Oct. 11.

★**Pa., Bloomsburg**—(Official)—Bank and Office—Columbia County Trust Co. let contract, 4-story, 24x120-ft., to E. H. Sheets, Ritter Bldg., Huntington, W. Va. Noted Oct. 4.

★**Wash., D. C.**—Bank—Dist. Nat. Bank let contract, 28 x 113 ft., granite and marble, G St., near 14th St., N. W., to W. P. Lipscomb & Co., 1405 F St., $150,000.

★**O., Akron**—School—Bd. Educ. let contract, Girard St., to Carmichael Constr. Co., 524 Hamilton Bldg., Akron, $250,000.

★**O., Cleveland**—Home—Montefiore Home for Aged and Infirm Israelites let contract, 170x216-ft., on Mayfield Rd., to R. Hansen, 1413 East 95th St. About $200,000. Noted July 12.

★**Ill., Chicago**—Theater and Store—T. F. Brett, 15 North Ashland Ave., let contract, 3-story, to Harris & Kusel, 707-110 South Dearborn St., $220,000.

★**Wis., Hudson**—High School—Bd. Educ. let contract to W. Baumeister Co., St. Paul, Minn., $75,000.

★**Minn., Kasson**—High School—Bd. Educ. let contract, School Dist. No. 30, to Madsen & Peterson, Plymouth Bldg., Minneapolis. About $101,000. Noted Sept. 13.

★**Neb., Clay Center**—Court House—Clay County let contract to Olson & Johnson, 1236 1st Natl. Bank Bldg., Omaha. About $120,000. Noted Sept. 27.

★**Mo., Kansas City**—Nurses' Home—Christian Hospital, 27th and Paseo Sts., let contract 3-story, brick and rein.-con., to Swinson Constr. Co., Shubert Theater Bldg. About $75,000. Noted Oct. 11.

★**Tex., Mineral Wells** — Hotel — Crazy Hotel Co., Crazy Well Bldg., let contract addition to Van Horn & Martel, $10,000.

★**Cal., Los Angeles**—Mausoleum—California Mausoleum Co., Chamber of Commerce Bldg., Pasadena, let contract 37x143-ft., rein.-con., brick, granite, tile, marble, in Hollywood Cemetery, to W. C. Crowell, 440 Chamber of Commerce Bldg., Pasadena, $100,000.

★**Ont., London** — Hospital — Salvation Army let contract, brick and rein.-con., to R. G. Wilson, 188 College St. About $50,000.

FEDERAL GOVERNMENT WORK

Proposed Work

R. I., Newport — Extension to General Storehouse, Torpedo Yards and Docks, Navy Dept., Wash., also roadway bids for extension to general storehouse, Naval Torpedo Sta. About $100,000.

N. Y., New York—Depot—Brooklyn Yards and Docks, Navy Dept., Wash., asks reinforced bids building Medical Supply depot. About $200,000.

Pa., Phila.—Heating System—Brooklyn Yards and Docks, Navy Dept., Wash., preparing plans for heating system for hospital. About $80,000.

Pa., Phila.—Marine Barracks, etc.—Brooklyn Yards and Docks, Navy Dept., Wash., preparing plans for engine foundations and mechanical equipment for testing experimental engines at Quartermaster Dept. About $50,000.

Pa., Phila.—Tank and Tower—Brooklyn Yards and Docks, Navy Dept., Wash., asks reinforced bids for elevated steel tank and tower. About $70,000.

Federal Government Work (Continued)

Wash., D. C.—Aviation Camps—War Dept., Signal Corps, Wash., soon lets contract building 10 aviation camps; will probably be located in South Carolina, Florida, Oklahoma, and Illinois. Cost about $750,000 per unit.

Wash., D. C.—Retaining Wall—Bureau Yards and Docks, Navy Dept., soon receives bids building at Naval Hospital. Cost about $44,000.

Va., Norfolk—Tower—Bureau Yards and Docks, Navy Dept., Wash., soon receives bids for 200-ft. steel tower. About $12,000.

La., New Orleans — Radio Buildings — Bureau Yards and Docks, Navy Dept., Wash., preparing plans. About $15,400.

P. R., El Cayey—Radio Towers—Bureau Yards and Docks, Navy Dept., Wash., cancelled advertisement for the building of 3 radio towers. Bids to have been opened Oct. 15. Noted Oct. 11.

BIDS DESIRED

Me., Caribou—Post Office—Until Nov. 20, by J. A. Wetmore, superv. archt., treas. dept., Wash.

Wash., D. C.—Fitting-Out-Cranes—Until Nov. 19, by Bureau Yards and Docks, Navy Dept., Wash., for 3 electrically-operated fitting-out cranes of 350 gross ton capacity at Navy Yards, Norfolk, Va., New York and Philadelphia.

W. Va., Wheeling — Maneuver Boats — Until Nov. 16, by U. S. Engr. Office, Wheeling, furnishing and delivering 7 maneuver boats for Ohio River dams; advertised in this issue.

Miss., Gulfport—Emergency Hospital — Until Oct. 22, by Bureau Yards and Docks, Navy Dept., Wash., at Gulfport.

Miss., Vicksburg— Levee Work — Until Nov. 8, by 3rd Mississippi River Dist., P. O. Box 404, building about 1,000,000 cu.yd. levee work; advertised in this issue.

N. D., Elbowoods—Building—Until Nov. 7, by C. Sells, comr. Indian Affairs, Wash., D. C., building 1 office building, No. 14 at Ft. Berthold Indian Agency.

Mo., St. Louis—Levee Work—Until Oct. 31, by Secy. Mississippi River Comn., 1311 International Life Bldg., St. Louis, building 80,000 cu.yd. earthwork, Henderson Co. D.D. No. 1, Ill.

Tex., El Paso—(Official)—Canals—Until Nov. 15, by U. S. Rec. Serv., El Paso, building canals on Rio Grande Project. A. P. Davis, ch. engr., advertised in this issue.

Colo., Towaoc—Bridge—Until Nov. 6, by C. Sells comr. Indian Affairs, Wash., D. C., building highway bridge, Ute Mountain Indian Reservation.

N. M., Farmington—Bridge—Until Oct. 22, by Dept. of Interior Office of Indian Affairs, Wash., D. C., building steel highway bridge at Farmington.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Chelsea—Hospital—Bureau Yards and Docks, Navy Dept., Wash., received low bids for emergency hospital buildings at Naval Hospital Reservation, steel contract from Howard Bros., $12 Lorchester Ave., South Boston, $288,000; W. Grace, Cambridge, Mass., $289,000; Murphy Comply Co., Lorchester, $319,000. Noted Oct. 11.

★R. I., Melville—Officers' Quarters—Bureau Yards and Docks, Navy Dept., Wash., let contract building 3 sets double officers' quarters U. S. Naval Coal Depot to Gilman Bros., 45 Berkley Ave., Newport, $17,947.

Conn., New London — Piers and Quay Walls—Bureau Yards and Docks, Navy Dept., Wash., received low bids building, at Naval Sta., (1) timber piles, (2) sheet piling, (3) timber, (4) steel and iron, (5) sheets and mooring rods, (6) concrete, from H. P. Converse & Co., 30 Broad St., Boston, (1) 3c., (2) $114, (3) 14c., (4) 5c., (5) $14, Indiana Steel Co., 50 Church St., New York City, (1) 3c., (2) $77.50, (3) 14c., (4) 4c., (5) $14.50, T. A. Gillespie Co., 261 Pearl St., (1) 3.7c., (2) 4.5c., (3) 13.5c., (4) 4.5c., (5) $14.50, Bethlehem Steel Co., (1) 3.5c., (2) $120, (3) 13.5c., (4) 4.5c., (5) $14.50, Pittsburgh Steel Co., (1) 3.5c., (2) $120, (3) 13.5c., (4) 4.5c., (5) $14.50, Lackawanna Steel Co., (1) 3.5c., (2) $120, (3) 13.5c., (4) 4.5c., (5) $14.50, Carnegie Steel Co., (1) 3.5c., (2) $120, (3) 13.5c., (4) 4.5c., (5) $14.50, Lukens Iron & Steel Co., (1) 3.5c., (2) $120, (3) 13.5c., (4) 4.5c., (5) $14.50, Jones & Laughlin Steel Co., (1) 3.5c., (2) $120, (3) 13.5c., (4) 4.5c., (5) $14.50, Inland Steel Co., (1) 3.5c., (2) $120, (3) 13.5c., (4) 4.5c., (5) $14.50, Illinois Steel Co., (1) 3.5c., (2) $120, (3) 13.5c., (4) 4.5c., (5) $14.50, Cambria Steel Co., (1) 3.5c., (2) $120, (3) 13.5c., (4) 4.5c., (5) $14.50, Wheeling Steel Co., (1) 3.5c., (2) $120, (3) 13.5c., (4) 4.5c., (5) $14.50, Youngstown Sheet & Tube Co., (1) 3.5c., (2) $120, (3) 13.5c., (4) 4.5c., (5) $14.50, Republic Iron & Steel Co., (1) 3.5c., (2) $120, (3) 13.5c., (4) 4.5c., (5) $14.50, Sharon Steel Hoop Co., (1) 3.5c., (2) $120, (3) 13.5c., (4) 4.5c., (5) $14.50, Trumbull Steel Co., (1) 3.5c., (2) $120, (3) 13.5c., (4) 4.5c., (5) $14.50, Tennessee Coal, Iron & R. R. Co., (1) 3.5c., (2) $120, (3) 13.5c., (4) 4.5c., (5) $14.50, Virginia Bridge & Iron Co., (1) 3.5c., (2) $120, (3) 13.5c., (4) 4.5c., (5) $14.50, Roebling's Sons Co., (1) 3.5c., (2) $120, (3) 13.5c., (4) 4.5c., (5) $14.50, Pacific Coast

Miscellaneous (Continued)

Elimination of Grade Crossings—Cleveland, O.—City, R. Hoffman, city engr., and New York, Chicago & St. Louis Ry., E. E. Hart, Cleveland, ch. engr., plans to build 12 rein.-con. grade crossings on west side at West 38th, 41st, 44th, 45th, 53rd, 58th, 65th, 74th, 77th and 85th Sts., Lorain and Madison Aves. About $2,500,000. City to appropriate 35% of cost, railroad 65%.

Subway— Moline, Ill.—City Council approved plans to build subway at 14th St. crossing. L. Payton, city engr.

Transmission Line — Dubuque, Ia. — Bd. Supervs. Dubuque Co. granted 20-year franchise to Eastern Iowa Electric Co., 302 Security Bldg., to build electric transmission line over county roads to furnish electrical service in towns of New Wine, Luxemburg and Holy Cross.

Wharf Extension, Etc.—Beaumont, Tex.—City plans to improve wharf and terminal system. F. Keith, chn. wharf and dock com.

Dam—Widtsoe, Utah — See "Excavation and Dredging."

BIDS DESIRED

Fire Escapes—Dover, N. J.—(Official)—Until Oct. 30, by Bd. Educ. at Northside School, for new fire escapes and alterations to South Side School. C. H. Benedict, secy.; advertised in this issue.

Elevated Railway—Phila., Pa.—(Official)—Until Oct. 30, by W. S. Twining, dir. dept. of City Transit, 754 Bourse Bldg., for work appurtenant to Frankford Elevated Railway; advertised in this issue.

PRICES AND CONTRACTS AWARDED

★Coal Trestle—Hudson, N. Y.—(Official) Knickerbocker Portland Cement Co. let contract building rein.con. coal trestle, 300 ft. long, 20 ft. high, together with retaining walls and floor to Turner Constr. Co., 244 Madison Ave., New York City.

BUILDING OPERATIONS FOR OCTOBER

Following is a list of contracts awarded, published by the F. W. Dodge Co. for New England, New York, New Jersey, Pennsylvania, Maryland, Delaware, District of Columbia, Virginia, Ohio, West Virginia, Illinois, Indiana, Iowa, Wisconsin, Michigan, Minnesota, North and South Dakota, and portions of Missouri and eastern Kansas from Jan. 1 to Oct. 1:

January 1 to October 1, 1917	$1,278,640,426
January 1 to October 1, 1916	970,251,397
January 1 to October 1, 1915	680,615,100
January 1 to October 1, 1914	579,042,100
January 1 to October 1, 1913	682,425,500
January 1 to October 1, 1912	627,477,000
January 1 to October 1, 1911	607,638,813
January 1 to October 1, 1910	632,002,305

NEW YORK AND NORTHERN NEW JERSEY

January 1 to October 1, 1917	$247,355,000
January 1 to October 1, 1916	180,803,500
January 1 to October 1, 1915	120,400,500
January 1 to October 1, 1914	100,266,000
January 1 to October 1, 1913	214,106,500
January 1 to October 1, 1912	186,517,000
January 1 to October 1, 1911	183,429,000
January 1 to October 1, 1910	186,084,000

The September total for contracts awarded in the larger territory amount to $122,464,271, as against $165,574,155 for August and $159,200,000 for July. For the smaller territory the September figures are $35,027,000, against $25,498,000 for August and $31,549,000 for July. Building operations generally show a decline.

MEXICO TO BUILD MODERN HIGHWAY

According to reports, the Mexican government has committed itself to the policy of constructing at the earliest possible time a system of modern highways that shall connect all the principal cities and ports of the country. This movement was inaugurated several weeks ago by the Department of Communications and Public Works, following the outlining of the tentative plan for construction and improvement of the highways of the country.

A meeting of good roads enthusiasts from different parts of the country was held in the City of Mexico and the organization of the National Highway Association of Mexico resulted.

It is also proposed to build a modern highway to run from the City of Mexico to Vera Cruz, following the ancient highway that was built by Cortez about 400 years ago. There are still remnants of other ancient highways which were built during the days of Conquistadores and wherever it is possible these old camino reals, or main highways, will be rehabilitated and put to modern use.

ROAD WORK, WASHINGTON

State Rd. No. 21

Bids were received by State Highway Comn., Olympia, Oct. 1, for constructing State Rd. No. 21 from Charleston to Clifton, Kitsap and Mason Counties, from (A) David Govan, Port Angeles (awarded contract); (B) Hans Pederson Constr. Co., Alaska Bldg., Seattle; (C) W. O. Bulette, Bremerton; (D) George A. Bandaret, Bryn Mawr, $102,376; (E) Sloane Bros., Seattle, $113,767. The unit bids of the 3 lowest bidders were as follows:

	A	B	C
118,400 cu.yd. overhaul on above material per each 100 ft	$0 02	$0 35	$0 39
43.1 acres clearing	175 00	01½	02
29.1 acres grubbing	150 00	150 00	160 00
Cu.yd. rip rap hand placed	2 50	150 00	225 00
Cu yd. slope wall	7 00	6 00	7 00
Lin.ft. guard rail in place, including spikes and bolts	40	6 00	6 00
52.16 M.b.m. timber and plank in place, including spikes and bolts	35 00	50	45
Lin.ft. piling (fir) above	10	40 00	35 00
1,360 lin.ft. piling (fir) below	40	20	35
Lin.ft. piling (cedar) above	10	.40	45
Lin.ft. piling (cedar) below	.45	.20	35
Lin.ft. logs for cribbing	18	40	45
5,060 lin.ft. logs for culverts	18	.25	30
890 lin.ft. plain concrete pipe in place, 12-in. diameter	1 00	25	35
1,274 lin.ft. reinforced concrete pipe in place, 18-in. diameter	3 00	1 10	1 00
238 lin.ft. reinforced concrete pipe in place, 24-in. diameter	5 00	2 25	1 75
78 lin.ft. reinforced concrete pipe in place, 30-in. diameter	6 50	3 50	3 00
13,560 cu.yd. surfacing	1 25	5 50	4 00
Lin.ft. porus tile drains, 6-in. diam	30	2 00	1 50
Lin.ft. porus tils drains, 8-in. diameter	40	50	60
Extended totals	$78,007	$92,003	$92,725

PACIFIC HIGHWAY

Bids were received by State Highway Comn., Olympia, Oct. 1, for constructing Pacific Highway from Blanchard to Burlington, Skagit Co., from (A) J. R. Wood, Seattle (awarded contract); (B) Skagit Constr. Co., Mt. Vernon; (C) Chas. G. Huber, Central Bldg., Seattle. The unit bids were as follows:

	A	B	C
6,020 cu.yd. common excavation, including haul of 400 ft	$0 40	$0 70	$0 45
Cu.yd. loose rock excavation, including haul of 400 ft	1 00	1 50	80
3,350 cu.yd. solid rock excavation, including haul of 400 ft	2 00	2 50	2 25
Cu.yd. overhaul on any of above materials per 100 ft	02	03	03
0.63 acres clearing	100 00	100 00	150 00
0.13 acres grubbing	100 00	150 00	150 00
Cu.yd. rip rap, hand placed	5 00	4 00	4 50
316 M b m timber and plank in place, including spikes and bolts	43 50	34 00	43 00
Lin.ft. piling cedar above	20	10	20
12,000 lin.ft. piling cedar below	61	45	65
60 lin.ft. plain concrete pipe in place, 12-in. diameter	1 50	3 00	1 49
59-ft. span, undergrade crossing (lump sum)	2,500 00	4,000 00	2,687 00
1,880 cu.yd. surfacing	2 10	2 70	2 25
Extended totals	$36,838	$38,071	$38,754

PACIFIC HIGHWAY

Bids were received by State Highway Comn., Olympia, Oct. 1, for constructing Pacific Highway from Sta. No. 650 to Sta. No. 842. Clarke Co .from (A) Arvid Rydstrom, 3102 Pacific St., Tacoma (awarded contract); (B) Sloane Bros., Seattle; (C) Rajotte, Fobert & Winters, Ziegler Bldg., Spokane; (D) Nettleton, Bruce & Eschbach Co., Amer. Bank Bldg., Seattle, $76,277. The unit bids of the 3 lowest bidders were as follows:

	A	B	C
100,000 cu.yd. excavation, including haul of 400 ft	$0 32	$0 35	$0 50
53,500 cu.yd. overhaul on above material per each 100 ft	02	03	02
11.83 acres clearing	200 00	175 00	260 00
1.96 acres grubbing	250 00	300 00	325 00
Cu yd rip rap, hand placed	5 00	4 00	6 00
254.7 cu.yd. concrete, 1st class	16 00	22 00	18 00
23,970 lb. steel reinforcing bars in place	10	11	08
716 lin ft. tile drain, 6-in. diameter	25	30	25
96 lin ft tile drain, 8-in. diameter	50	60	35
690 lin ft plain concrete pipe in place, 12-in. diameter	1 25	1 50	1 00
428 lin ft reinforced concrete pipe in place, 18-in. diameter	2 25	2 50	2 60
68 lin.ft. reinforced concrete pipe in place, 24-in. diameter	3 00	3 50	3 75
60 cu.yd. rock for tile	3 50	4 00	3 00
Extended totals	$44,598	$50,221	$54,993

OLYMPIC HIGHWAY

Bids were received by State Highway Comn., Olympia, Oct. 1, for constructing Olympic Highway from Thurston Co. line to Kennedyville, Mason Co., from (A) Alfred & James, Centralia (awarded contract); (B) Sloane Bros., Seattle. The unit bids were as follows:

	A	B
36,540 cu.yd. excavation, including haul of 400 ft	$0 40	$0 40
23,080 cu.yd. overhaul on above material per each 100 ft	02	03
12.1 acres clearing	200 00	100 00
4.3 acres grubbing	240 00	200 00
Cu yd rip rap, hand placed	5 00	4 00
685 cu yd concrete, 1st class	20 00	20 00
6,085 lb. steel reinforcing bars in place	11	08
50 lin ft plain concrete pipe in place, 12-in. diameter	1 50	1 00
284 lin ft. reinforced concrete pipe in place, 18-in. diameter	3 00	2 00
174 lin ft. reinforced concrete pipe in place, 24-in. diameter	4 00	3 00
64 lin ft reinforced concrete pipe in place, 30-in. diameter	5 00	4 00
2.50 ft. span, concrete arch bridge (lump sum)	13 000 00	11,500 00
6,150 cu yd. surfacing	2 50	2 00
2,240 lin ft piling (fir)	50	60
Lin ft. piling (cedar)	60	60
Cu yd extra concrete, below elevation shown on plans	20 00	20 50
Extended totals	$40,000	$45,169

SEARCHLIGHT SECTION

Contracts To Be Let

PROPOSALS

Bids received until October 23, 1917.

Barge Canal Terminals

STATE OF NEW YORK, SUPERINTENDENT OF PUBLIC WORKS

Albany, September 24th, 1917.

Sealed proposals will be received by the undersigned at his office in the Capitol at Albany, N. Y., until twelve o'clock noon of Tuesday, October 23rd, 1917, at which place and hour they will be publicly opened and read, for the construction of Barge Canal terminals pursuant to the provisions of Chapter 746 of the Laws of 1911, and of the acts amendatory thereof, as follows:

Terminal Contract No. 38.

For constructing a pier at the foot of West 53rd street, North River, Manhattan.

Contract plans sheets 1 to 12.

Plans may be seen and detailed specifications, engineer's estimate of quantities, proposal blanks, form of contract and bonds required and other information for proposers may be had at the office of the Superintendent of Public Works at Albany, N. Y., at the office of the Assistant Superintendent of Public Works for the Middle Division at Syracuse, N. Y., at the office of the Assistant Superintendent of Public Works for the Western Division at Rochester, N. Y., and at the canal office, Spaulding's Exchange, Buffalo, N. Y.

Copies of detailed plans or drawings may be obtained from the State Engineer and Surveyor at Albany, N. Y., upon payment to him of the cost of producing them.

Monthly estimates will be paid of ninety per centum (90 per cent.) of the work done at the contract price. Every proposal for said work must be accompanied by a money deposit in the form of a draft or certified check upon some good banking institution in the city of Albany or New York, issued by a national or state bank or trust company in good credit within the state and payable at sight to the Superintendent of Public Works for five per centum (5 per cent.) of the amount of the proposal.

The person whose proposal shall be accepted will be required to execute a contract and furnish bonds within ten days from the date of notice of award delivered to him or them in person or mailed to the address given in the proposal.

Upon execution of the contract and approval of bonds, the certified check or draft will be returned to the proposer unless the same shall have been presented for collection prior to such time, in which case the amount of the deposit will be refunded by the Superintendent of Public Works.

The deposits of bidders other than the one to whom the award of contract shall be made will be returned immediately after the award has been made.

The bond required for the faithful performance of each contract shall be in such sum as shall be fixed by the Superintendent of Public Works which sum shall not be less than twenty per centum (20 per cent.) of the estimated cost of the work according to the contract price, and an additional bond, known as the labor bond, in the sum of ten per centum (10 per cent.) of the amount of the estimated cost of the work according to the contract price, will be required as security that the contractor will pay in full at least once a month all laborers employed by him upon the work specified to be done in the contract.

Official Proposals

Price, $3.60 an inch—Copy can be received until Wednesday, 10 a.m., for issue mailed the next day.

PROPOSALS

In the event that more than one surety company is offered as surety on said bonds, co-insurance only will be accepted.

Each proposal must be addressed to the Superintendent of Public Works, Albany, N. Y., and must be endorsed on the envelope with the name of the construction for which the proposal is made.

Award, if made, will be made to the person or persons whose proposal shall be lowest in cost to the State for doing the work, and which shall comply with all provisions required to render it formal. Before any award shall be made the lowest bidder will be required to satisfy the Superintendent of Public Works of his ability to provide suitable equipment and materials for the proper performance of the work.

The right is reserved to reject all proposals and readvertise and award the contract in the regular manner if, in the judgment of the undersigned, the interests of the state will be enhanced thereby.

W. W. WOTHERSPOON,
Superintendent of Public Works.

Bids received until November 8, 1917.

Pavement

Harrisburg, Pa.

Pennsylvania State Highway Department, Harrisburg, Pa.—Sealed proposals will be received at said office until 10 A. M., November 8, 1917, when bids will be publicly opened and scheduled and contract awarded as soon thereafter as possible for the reconstruction of 21,426 linear feet of either reinforced concrete or bituminous concrete pavement, 16 feet wide, in Allegheny County; 7857 linear feet of vitrified block pavement, 16 feet wide, in Venango County, and 39,340 linear feet of either reinforced concrete or bituminous concrete and hillside block pavement 16 feet wide, in Somerset County. Plans and specifications may be seen at office of State Highway Department, Harrisburg, Pa., 1001 Chestnut Street, Philadelphia, Pa., 904 Hartje Building, Pittsburgh, Pa. Full particulars and information on application to J. D. O'Neil, State Highway Commissioner.

OFFICE OF THE COMMISSIONERS, D. C., October 10, 1917.—Sealed proposals will be received at this office, Room 509, District Building, until 2 o'clock P.M., on October 18, 1917, for the construction of approximately 3,000 linear feet of 15 in. and 12 in. diameter pipe sewer. Forms of proposals, specifications and necessary information may be obtained from the Chief Clerk, Engineer Department, Room 427 District Building, Washington, D. C. LOUIS BROWNLOW, JOHN G. D. KNIGHT, W. GWYNN GARDINER, Commissioners, D. C.

PROPOSALS FOR LEVEE WORK.—Office of Third Mississippi River Dist., P. O. Box 404, Vicksburg, Miss.—Sealed proposals will be received here until 11 o'clock a.m., Nov. 8, 1917, and then publicly opened, for constructing about 1,000,000 cubic yards of levee work. Information on application.

PROPOSALS

Bids received until October 23, 1917.

Road and Bridge Construction

Hartford, Conn.

Sealed proposals will be received at the office of the State Highway Commissioner, State Capitol, fourth floor, west end, until 2 P.M., Tuesday, October 23rd, 1917, for the following road and bridge construction:

Town of CROMWELL. About 3900 linear feet of Bituminous Macadam construction over four (4) inch stone base on the Pond Road. Plans and specifications at office of W. H. Sharp, Division Engineer, 151 Main Street, Middletown, Conn.

Town of MIDDLETOWN: Reinforced Concrete Arch Bridge construction over the Arrawanna River on Berlin Street. Plans and specifications at office of W. H. Sharp, 151 Main Street, Middletown, Conn.

City of HARTFORD: About 1800 linear feet of concrete construction on New Britain Avenue. Specifications at office of R. W. Stevens, Division Engineer, 408 Main Street, Hartford, Conn.

Town of WINCHESTER: About 10,980 linear feet of Native Stone Macadam construction on the Colebrook Road. Plans and specifications at office of R. S. Hulbert, Division Engineer, Winsted, Conn.

Towns of NORTH CANAAN and SALISBURY: A Two (2) Span Reinforced Concrete Arch Bridge over the Housatonic River on the Canaan-Salisbury Road. Plans and specifications at office of R. S. Hulbert, Division Engineer, Winsted, Conn.

Towns of WATERFORD and EAST LYME. Substructure and approaches for 245 foot Steel Truss Swing Draw Bridge over the Niantic River on the Niantic-New London Road. Plans and specifications at the office of the New London County Commissioners, Norwich, Conn.

All bids must be accompanied by a surety company bond or a certified check not less than one-third of the cost of the work. The State Highway Commissioner reserves the right to reject any and all bids.

Dated at Hartford, Connecticut, October 12, 1917.

C. J. BENNETT,
State Highway Commissioner.

Bids received until November 2, 1917.

Reinforced Concrete Viaduct

Richmond, Va.

Sealed proposals will be received at this office until 12 o'clock noon, November 2, 1917, for the construction of a reinforced concrete viaduct over Bacon Quarter Branch and Seaboard Air Line Co.'s property on the Chamberlayne Avenue extension as per plans and specifications prepared by Carneal & Johnston, Architects. Parties proposing to bid will apply to the undersigned for plans and specifications. Forms of proposals can be obtained on application.

A certified check for $1000.00 must accompany each bid as a guaranty of execution of contract. The Administrative Board reserves the right to reject any and all bids.

CHAS. E. BOLLING, City Engineer.

MANEUVER BOATS—U. S. Engineer Office, Wheeling, W. Va.—Sealed proposals will be received here until 11 a.m. (Eastern time), November 16, 1917, and then opened, for furnishing and delivering seven maneuver boats for Ohio River dams in Wheeling district. Information on application.

Water-Works (Continued)

Kan., Arma—City having plans prepared by A. C. Moore, engr., Frisco Bldg., Joplin, Mo., for water-works system. About $25,000. Bond election soon.

Kan., Caldwell—(Official)—City rejected bids for water-works and electric-light improvements, including brick power station and concrete reservoir. Noted Oct. 4.

Kan., Ogden — City having plans prepared by G. P. Taylor, engr., Stockton, for improving water-works and sewerage systems. About $18,000.

S. D., Mitchell—City election Oct. 30 to vote on $125,000 bond issue to improve water-works. T. Eastcott, clk.

Ark., Little Rock—Arkansas Water Co., 112 East 4th St., plans to improve water-works system, including remodeling pump to 5,000,000-gal. capacity, replacing water mains, etc. About $100,000.

Tex., Waco—City soon lets contract 5,000,000-gal. reservoir on Trice Hill. About $275,000. N. Werinskiold, 409 Hughes Bldg., Dallas, engr. Noted Aug. 2.

Okla., Guthrie—See "Sewers."

Okla., Miami—City voted $45,000 bonds to extend water mains. A. L. Sailors, supt. Noted Oct. 4.

Okla., Okmulgee—See "Sewers."

Wash., Peshastin—City election Oct. 27 to vote on $125,000 bond issue to extend water-works system.

Ore., Richland—City soon lets contract building water-works system. P. H. Dater, Chamber Commerce Bldg., Portland, engr. Noted May 3.

Cal., Tropico—(Official)—City at recent election defeated $50,000 bonds to build water-works system. A. Campbell, supt. Noted Oct. 4.

BIDS DESIRED

Mich., Lakeview—(Official)—Until Nov. 15, by village for water-works system, including steel tank and tower, motor and pump. About $11,500. F. L. Stebbins, village pres. Noted Oct. 11.

Neb., Hoskins—Until Oct. 31, by City, for water-works system. About $10,000. H. T. Tracy, 11 Norfolk Natl. Bank Bldg., Norfolk, engr.

N. D., Langdon—Until Oct. 29, by City, installing water-works and sewerage systems. J. Sheehan, clk. Noted June 28.

Tex., Galveston—Until Nov. 1, by City, for repairs to Alta Loma Pumping Sta. J. D. Kelley, secy. Stowe & Stowe, 311½ 22nd St., archts.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Wis., Reedsburg—City let contract installing water and sewer mains in portions North and South Water and Vine Sts., to Sweeney Bros., Reedsburg, $27,627.

★Tex., Lockney—(Official)—City let contract water-works system, including 9200 ft. 6-8in. c. i. pipe, 2½ tons specials, 75,000 gal. tank and tower, etc. to J. N. Jordan & Co., Plainview. Noted Oct. 11.

Ont., Hamilton—City received low bids installing machinery in Beach Pumping Sta., from Turbine Equipment Co., Ltd., C. P. R. Bldg., steam turbine pumps and centrifugal pumps, $52,517 and $22,420 respectively; Babcock & Wilcox, Ltd., Traders Bank Bldg., boilers and insulation, $16,950 and $605; Canadian Westinghouse Co., Ltd., Traders Bank Bldg., motors, $16,620; Canadian General Electric Co., Ltd., King and Simcoe Sts., transformers, switchboard and apparatus, $14,010 and $4990; Allan General Supplies, 205 Yonge St.; Venturi meters, $3715, all contractors of Toronto. Noted Aug. 16.

SEWERS

Proposed Work

N. J., Glen Ridge—Town plans to build sewage disposal plant.

N. J., Westfield—Town plans to improve trunk line sewerage system for Rahway Valley watershed. About $50,000. A. W. Vois, engr.

Pa., Franklin—Council passed ordinances to build storm sewers in portions Alcorn and Siverly Aves. and Wayne St.; also sanitary sewers in portions Alcorn, Siverly, Keith, Perce, Carson, and Kramer Aves., 5th, Wayne and Martin Sts., also in all of 10th Ward. J. Snow, city engr.

Pa., Pittsburgh — Council passed ordinances to build sewers in portion Comet Way, Connor, and Haverhill Sts. R. Swan, city engr.

Va., Danville—See "Industrial Works."

S. C., Fountain Inn—City voted $75,000 bonds to build sewerage and water-works systems. F. W. Wellborn, clk.

Ky., Norwood—Council passed ordinance to issue $16,000 bonds to build sanitary sewers in Franklin Ave. and Sheridan Dr.

O., Ashtabula—City plans sanitary sewer in portions Samuel St. L. A. Amsden, city engr.

O., Lorain—City lets contract about Oct. 30 for sanitary sewers in portions various streets. C. M. Osborne, city engr. Noted Sept. 13.

O., Youngstown — Youngstown Sheet & Tube Co., Stambaugh Bldg., plans to build 100 residence sewers and streets improvements here. About $500,000. United Constr. Co., Title Guaranty Bldg., St. Louis, Mo., engrs.

Ind., Anderson—City plans to build sewers in portions 3rd and Sycamore Sts. W. I. Shearer, city engr.

Ind., Laporte—(Official)—City does not plan to install southside trunk sewerage system, as stated in our issue of Oct. 4.

Ia., Davenport—City sold $142,000 bonds to build storm and sanitary sewers. R. E. Sowistowsky, city engr.

Ia., Sioux City—City soon lets contract building sanitary sewers in Lowell Ave., Chambers, 23rd, and 5th Sts. T. H. Johnson, city engr.

Kan., Newton—City having plans prepared by Black & Veatch, engrs., 507 Inter-State Bldg., Kansas City, Mo., for sewage disposal plant.

Kan., Ogden—See "Water-Works."

Neb., Omaha—City plans to build sewers in portions Mormon, South Omaha, 25th, Pacific, Pierce, 26th, and H Sts. About $172,000. Will also issue $400,000 additional bonds in January for sewers. J. A. Bruce, city engr. Noted Sept. 27.

Tex., Waco—City had plans prepared by P. Trevino, engr., San Antonio, for sewage disposal plant. About $182,000. Noted May 17.

Okla., Guthrie—City voted $32,000 bonds to extend sewerage and water-works systems. H. P. Cook, comr. pub. utilities.

Okla., Miami—City voted $80,000 bonds to build storm water sewers and $20,000 to extend sanitary sewers. Noted Oct. 4.

Okla., Okmulgee—City election Oct. 30 to vote on $535,000 bond issue to extend sewerage and water-works systems. Noted Aug. 30.

BIDS DESIRED

N. Y., Altamont—(Official)—Until Nov. 3, by Bd. Village Trustees, for sewerage system and sewage disposal plant. C. Martin, clk. Noted Aug. 16. Advertised in this issue.

N. Y., New York—Until Nov. 1, by D. Mathewson, boro. pres. (Bronx Boro.), constructing sewers and appurtenances in portions Rhinelander, Muliner, Matthews, Ldyig, Wallace, Bronxdale, Neill Hunt and Cruger Aves. and Sagamore St. Baisley Ave. and Ft. Schuyler Rd.

N. J., Newark—(Official)—Until Nov. 1, by Bd. Street and Water Comrs., sewer in Sandford Ave. involving 500 ft. 30 in. concrete pipe sewer, 240 ft. vitr. salt glazed pipe sewer, 12 catch basins and 5 manholes. M. R. Sherrard, city engr. Noted Oct. 11.

Wis., Appleton—(Official)—Until Nov. 6, by Ed. Pub. Wks. building sewers in various streets. A. C. Remley, city engr. Noted Sept. 20.

Ia., Grand Mound—(Official)—Until Nov. 1, by Town, for 2½ mi. sanitary sewers and sewage disposal plant. R. C. Quinn, town clk. C. P. Chase, Clinton, engr. Noted Apr. 26.

N. D., Langdon—See "Water-Works."

Wyo., Cheyenne—Until Nov. 5, by J. J. Shoemaker, city clk., extending sewers from O'Neil to Lydon St. E. W. Gilchrist, city engr. Noted Aug. 9.

Tex., Seguin—(Official)—Until Oct. 31, by C. Brink, mayor, constructing sewerage system and sewage disposal plant. Bartlett & Rees, Inc., San Antonio, engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. J., North Bergen—Town received low bids laying sewer in Tonnele Ave., from R. Mazzone, North Bergen; R. Reilly, Plainfield; W. Whiston, West New York; Nolan & Horning, 309 Kerrigan Ave., Union. Cost estimated at $20,000. Noted Oct. 4.

★Pa., Pennhurst—Eastern Pennsylvania State Institution for Feeble-Minded and Epileptic, Spring City, let contract storm sewers, to W. M. Anderson, 600 Schuylkill Ave., Phila.; about $10,000.

★Md., Hagerstown—City let contract installing main and lateral sewers in various streets and alleys, to H. C. Brooke Co., Inc., Martinsburg, W. Va. Noted Sept. 13.

O., Cuyahoga Falls—(Official)—City received low bids for sanitary sewers from C. L. Wright, Mt. Vernon, $16,846; Gessner Co., Toledo, $17,003; F. R. George Co., Pittsburgh, Pa., $18,441.

★Wis., Reedsburg—City let contract for sewer to Sweeney Bros., $27,627.

★Ia., Ames—(Official)—City let contract storm sewers, involving 7300 ft. 10-15 in. pipe, 13 manholes, and 47 catch basins to A. Coniglia & Co., Omaha, $10,340. Noted Oct. 11.

★Minn., Winona—City let contract laying 1700 ft. storm sewers to W. Danforth, 707 Germania Life Bldg., St. Paul, $35,000. Noted May 12.

★Mo., Kansas City — City let contract sewer in Div. No. 5, Dist. No. 356, to Kinlin Constr. Co., 3426 Michigan St., $11,684. Noted Sept. 13.

★Okla., Ada—City let contract lateral sewer in Dist. No. 6, involving 16,865 8-10 in. sewer pipe, to Koehler Constr. Co., Kansas City, Mo., $25,550; also complete sewage disposal plant, including Imhoff tank, contact beds, etc., to Talbert Constr. Co., Muskogee, $24,673. Noted Sept. 27.

★Wash., Spokane — (Official) — City let contract 4th Ward trunk sewer in Dist. No. 5, to Heikkila, Miller & Paulson, 1609 Water Ave., $11,400. Noted Oct. 18.

★N. S., New Glasgow—City let contract building sewer on Brookside Ave. and Chisholm St., to Gammon & Weir, Archimedes St.

BRIDGES

Proposed Work

Ky., Whitesburg — See "Streets and Roads."

Mo., Kansas City—Bd. Pub. Affairs approved plans of Kansas City Terminal Ry., 1500 Grand Ave., for building rein.-con. viaduct over its tracks on Holmes St. About $200,000. J. E. Gibson, genl. engr.

Mo., Linn—See "Streets and Roads."

Tex., Ballinger—Runnells Co. plans to issue $100,000 bonds to build rein.-con. bridges and culverts.

Tex., Barstow—(Official)—Ward Co. at recent election voted $45,000 bond issue for culverts. F. L. Dyer, engr.

Okla., Ada—See "Streets and Roads."

Colo., Salida—Chaffee Co. Board, Vista and State Highway Comrs. District meeting let contract for rein.-con. bridge over Arkansas River. About $14,000.

Idaho — (Official) — See "Streets and Roads."

BIDS DESIRED

O., Columbus—See "Miscellaneous."

Minn., Minneapolis—Until Nov. 12, by Hennepin Co. Comrs., building ... bridge over Minnesota River on Lyndale Ave. West. Includes ... trestles in Hennepin Co. and ... Bids to be made on a lump-sum basis. Plans ... Hennepin Bldg., Minneapolis. Certified check ... Noted Sept. 27.

Minnesota—See "Streets and Roads."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mo., Rumford—... contract [illegible] bridge at ... Rumford to J. H. Kaw-Hendrix, [illegible] and Oxford Co., to approximate ... award was

Bridges (Continued)

★**Mass., Millbury** — Town let contract building 2 steel and cement bridges over Blackstone River, to E. D. Ward Co., 82 Foster St., Worcester, $17,[illegible]

★**R. I., Woonsocket**—City let contract building bridge and wall over Peters River to Eastern Constr. Co., 660 Winter St.

★**Ga., Oglethorpe**—Macon Co. Comrs. let contract building 2 rein.-con. bridges to H. B. Hoppendietzel Co., 757 Walnut St., Macon, Ga., $18,[illegible]

★**Ind., Goshen**—Elkhart Co. and Indiana & Michigan Electric Co. let contract bridge over St. Joseph River on Elkhart Ave., to Elkhart Bridge & Iron Co., Elkhart, $61,-[illegible] Noted Aug. 2

★**Ill., Joliet** — (Official) — Atchison, Topeka & Santa Fe Ry. let contract building 2 bridges involving 5000 yd. rein.-con., to Standish & Allan, 820 Consumers Bldg., Chicago.

★**Wis., Wauwatosa**—Town let contract building bridge and temporary bridge to Stein Constr. Co., Medford, Wis., $21,300.

★**Minn., Montevideo**—Chippewa Co. let contract building bridges No. 2776, 2777 and 2780 to T. M. Thomson, 3326 Garfield Ave., Minneapolis, $10,400.

★**Tex., Dallas**—(Official)—City let contract building bridge over Turtle Creek Crossing, on Lemmon Ave., to McCall-Moore Eng. Co., 308 Amicable Bldg., Waco, $16,[illegible]

★**Okla., Ardmore**—Carter Co. let contract building 150-ft. rein.-con. bridge over Caddo Creek to Kansas City Bridge Co., 510 Orear-Leslie Bldg., Kansas City, Mo., $14,500.

★**Idaho, Weiser**—Washington Co. let contract building steel highway bridge over Weiser River and dismantling old bridge, to Omaha Structural Steel Works, 48th and Leavenworth Sts., Omaha, Neb., $27,800.

★**Ont., Dundas**—Dundas Co. let contract building 6 bridges to F. M. Egleson, Winchester, $12,000; 6 to H. J. Walker, Cornwall, $12,000; 2 to Ontario Bridge Co., Ltd., Toronto, $10,000

STRUCTURAL STEEL WORK

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Idaho, Weiser**—See "Bridges."

REINFORCED CONCRETE

Proposed Work

Mo., Kansas City—See "Bridges."
Mo., St. Louis—See "Buildings."
Tex., Ballinger—See "Bridges."
Colo., Salida—See "Bridges."
Colo., Windsor—See "Miscellaneous."
Wash., Seattle—See "Industrial Works."

BIDS DESIRED

★**Minnesota**—See "Streets and Roads."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., S. I., Clifton**—See "Industrials."
★**N. Y., Rochester**—See "Industrial Works."
★**Ga., Oglethorpe**—See "Bridges."
★**Tenn., Nashville**—See "Buildings."
★**O., Cleveland**—See "Miscellaneous."
★**Ill., Joliet**—See "Bridges."
★**Okla., Ardmore**—See "Bridges."

STREETS AND ROADS

Proposed Work

N. J., Cliffside—Bd. Educ. plans to pave and grade [illegible] streets. About $[illegible]

Pennsylvania—(Official)—State Highway Comn., Harrisburg, rejected bids building [illegible] road in Somerset Twp., Somerset Co., [illegible] ft. wide. Noted Sept. 27.

Pennsylvania—(Official)—State Highway Comn., Harrisburg, received bids improving [illegible] ft. state highway, Route [illegible] from Waynesburg to Rices Landing, Morgan and Franklin Twps., Greene Co. Noted Sept. 27.

Pennsylvania—(Official)—State Highway Comn., Harrisburg, received bids improving portion State Highway Route [illegible] through Hanover Twp., Lehigh Co., [illegible] ft. concrete, 16-[illegible] ft. wide. Noted Oct. 11.

Pa., Bloomsburg—Columbia Co. plans to improve State Rd. No. 4, through here. State Highway Dept., Harrisburg, to pay half of cost.

Pa., Carnegie—Boro. Council passed ordinance to grade, pave, and curb Chestnut St. O. B. Highley, boro. engr.

Pa., Erie—City soon lets contract paving, grading, curbing and draining portion West 29th and Holland Sts. About $24,-034 and $18,310, respectively. F. G. Lynch, city engr.

Pa., Hawley—City plans to pave Church and Keystone Sts., Penn and Main Aves. E. J. Richardson, clk.

Pa., Johnstown—City election Nov. 6 to vote on $200,000 bond issue to pave streets. J. R. Crissey, city engr.

Pa., Pittsburgh — Council passed ordinance to pave and curb portions Royal and McKee Sts., Flotilla, Fletcher and Tulip Ways; also grade portion Formosa Way. R. Swan, city engr.

Pa., Williamsport—City plans to pave 2-mi. new streets. J. B. Otto, city engr.

Va., Danville—See "Industrial Works."

N. C., Louisburg — Franklin Co. voted $20,000 bonds to build roads in Gold Mine Twp. J. D. Alston, chn. Noted Sept. 20.

S. C., McCormick—McCormick Co. will let contract in spring, building 18-mi. Federal-Aid road. M. E. Worrell, co. engr.

Fla., Bartow — Polk Co. sold $142,600 bonds to build hardsurface road from Auburndale to Lake Co. line. A. T. Mann, chn. comrs. Noted May 17.

Fla., Daytona — City plans to improve several miles of streets, concrete or Warrenite. L. Smith, chn. street com.

Tenn., Camden—Benton Co. having plans prepared for paving Bristol-Memphis highway.

Tenn., Dyersburg—Dyer Co. plans election to vote on $150,000 bonds to build section Jefferson Davis Highway, to be 16 ft. wide, concrete, rock or bitumen. Federal Government to appropriate $25,000 toward cost, State $25,000. Noted Oct. 11.

Ky., Cattlesburg — Boyd Co. plans road between Ashland and Cannonsburg, 8.13-mi. Cost between $135,187 and $215,000, according to material used. Federal Government and State to pay half of cost. Noted Apr. 26.

Ky., Whitesburg—Letcher Co. soon lets contract building roads and bridges. About $30,000.

O., Chillicothe—City plans to issue $6,-000,000 bonds to improve various streets. E. M. Redd, city engr.

O., Cincinnati—Butler Co. having plans prepared improving Cunningham Rd., Symmes Twp. About $20,000. A. Boeh, co. surv.

O., Columbus—City to sell $71,871 bonds Nov. 12 to improve Cory, Putnam and other streets. U. K. Stringfellow, city engr.

O., Sandusky—City plans to pave portion Hancock St. About $22,000. Erie Co. to contribute $800 toward cost. A. F. Johnston, city engr.

O., Youngstown—See "Sewers."

Wisconsin—State Highway Dept., Madison, had plans prepared building concrete road, between Fond Du Lac and Oshkosh, about 9 mi. W. Conway, Green Bay, div. engr. state highway dept.

Ia., Burlington—City had plans prepared paving portions 8th St. About $12,117. C. E. Waterhaus, city engr.

Minn., Bemidji—City election Oct. 29 to vote on $25,000 bond issue to build bridge and sidewalks, paving, curbing. G. Stein, city clk.

Minn., Brainerd—Crow Wing Co. plans to spend $100,000 to improve roads in 1918. C. L. Mott, co. engr.

Kan., Baxter Springs—City plans to pave streets in business district. About 40 blocks.

Kan., Lawrence—Douglas Co. Comrs. will apply to State Highway Comn. for approval to build hard surfaced road from Ft. Leavenworth to Ft. Riley, 18 ft. wide.

Kan., Parsons—City passed resolution to pave portion North Central Ave., vitr. fiber brick or brick block, also to resurface and oil portion 18th, Belmont, Stevens, Corning, Crawford and 22nd Aves. F. W. Frye, clk.

Kan., Wichita—Sedgwick Co. plans road from Wichita to eastern line of county, rock asphalt pavement, 18 ft. wide, 3 ft. crushed rock shoulder. About $12,500.

Neb., Falls City—City plans to issue $10,-000 bonds to pave streets.

Mont., Superior—Mineral Co. plans road near Alberton, 4½ mi., eliminating Nigger Hill. About $120,000. J. D. Dwyer, clk.

Mont., White Sulphur Springs—(Official) U. S. Office Pub. Rds. will receive bids about next spring for 30 mi. mountain road, 14 ft. wide with ditch 4 ft. wide, making practically 16 ft. road, in Little Belt Mts. About $120,000. Scott Leavitt, pres. Noted Oct. 11.

Mo., Greenfield—Dade Co. plans election to vote on $23,000 bond issue to improve roads between Ash Grove, Everton, and Greenfield.

Mo., Jefferson City—Cole Co. plans to improve road from Moreau Blvd. to Tanner Bridge by way of Hough Park, 2 mi., macadam.

Mo., Linn—(Official)—Osage Co. defeated at recent election $200,000 bonds to build roads and bridges. Noted Sept. 27.

Mo., Marble Hill—Bolinger Co. plans to build road between Lowndes and Marble Hill, 4 mi., connecting Greenville and Cape Girardeau.

Mo., St. Louis—City plans to pave portions King's Highway. E. R. Kinsey, pres. bd. pub. wks.

Arkansas — State Highway Dept., Little Rock, had plans prepared for Mountain Home Rd., Baxter Co., to Missouri State line, 36 mi.; road in Phillips Co., connecting Helena and West Helena, 4½ mi. asphaltic concrete on macadam base, 20 ft. wide. About $140,000.

Ark., Clarendon — Monroe Co. Comrs. postponed indefinitely letting of contract for road building. Parkes Eng. Co., Citizens Bank Bldg., Pine Bluff, engrs. Noted Oct. 4.

Tex., Anson—Jones Co. Dist. No. 2, plans election soon to vote on $200,000 bond issue to build roads.

Tex., Barstow—(Official)—Ward Co. at recent election voted $80,000 bond issue for 45 mi. hard surface road. F. I. Dyer, comr. Noted Sept. 27.

Tex., Beaumont — Jefferson Co. election Nov. 17 to vote on $500,000 bond issue to improve highways.

Tex., Brownsville—Cameron Co. Comrs. plan highway from here north to Harlingen and west to Hidalgo Co. line, to be link in Diamond Loop Highway connecting, San Antonio, Leredo, Corpus Christi, and this city, 32 mi. tarvia. About $200,000.

Tex., Corsicana — Powell Good Roads Dist., Navarro Co., election Nov. 10 to vote on $60,000 bonds to build roads.

Tex., Decatur—Wise Co. Comrs. will vote on $80,000 bond issue to build Meridian Highway.

Tex., Galveston—(Official)—Bd. Comrs. soon lets contracts placing 60,000 cu.yd. filling on beach crest between 25th and 39th Sts. and surfacing with 6 in. mainland soil. About $55,000. G. H. Willits, city engr. Noted Oct. 4

Tex., Gilmer — (Official) — Upshur Co. plans election Nov. 10 to vote on $25,000 bond issue for building roads. Noted Oct. 11.

Tex., Groesbeck — (Official) — Limestone Co., Rd. Dist. No. 9, having plans prepared by Hess & Skinner, engrs., South Western Life Bldg., Dallas, for road improvements. About $100,000. Noted May 24.

Tex., Haskell—Haskell Co., Dist. No. 3, plans election to vote on $75,000 bond issue to improve roads.

Tex., Orange—Orange Co. Rd. Dist. No. 3, voted $30,000 bond issue to build shell and gravel roads. Noted Sept. 20.

Tex., Paris—City voted $20,000 bonds to improve Public Sq. and pave portion 23d St. R. G. Tyler, city engr. Noted Sept. 20.

Tex., Robert Lee—Coke Co. Comrs. plan to build highway through here. About $60,000.

Tex., Snyder—(Official)—Scurry Co. defeated $100,000 bond issue to build roads. Noted Sept. 20.

Tex., Sulphur Springs—Hopkins Co. received $50,000 Federal Aid to be applied to build State Highway No. 1, Texarkana-El Paso Rd.

Okla., Ada—City election Nov. 16 to vote on $570,000 bond issue to build good roads and bridges.

Okla., Bartlesville — Washington Co. Comrs. plan to improve 50 mi. road. About $67,000 available.

Streets and Roads (Continued)

Okla., Durant—(Official)—City Council having plans prepared by L. Varner Stinson, city engr., paving Elm St., 13,000 sq. yd. asphalt on 4 in. concrete base.

Okla., Okmulgee—City soon receives bids paving portion Cherokee St. and Oklahoma Ave., tarvia. M. N. Coles, city engr.

Idaho—(Official)—State Highway Comn., Boise, receives bids about December, grading highway between New Meadows and Grangeville, placing culverts and erecting bridges, $150,000. Noted July 5.

Idaho, Coeur d'Alene — Kootenai Co., Fourth of July Canyon, voted $25,000 bonds for newly created highway improvement district. Federal Government to appropriate $50,000 toward cost, State $50,000 and Shoshone Co., $50,000. Noted Oct. 4.

Idaho, Sand Point—Bonner Co. Comrs. election Nov. 3, to vote on $200,000 bond issue to build roads.

Idaho, Twin Falls—Twin Falls Co. plans election soon to vote on $1,000,000 bond issue to pave highway from Buhl to Hansen; also build portion East and West highway, crushed rock and gravel. O. E. Carlson, chn. Noted Sept. 6.

Ariz., Cooper Hill — Gila Co. soon lets contract building El Capitan Highway; about $85,000. Also completing Miami-Gibson Rd., and Little Walnut Rd. in Pleasant Valley.

Wash., Cheney—City voted $20,000 bonds to improve 36 blocks of pavement. Noted Oct. 4.

Wash., Davenport — Lincoln Co. Comrs. had plans prepared building 5-mi. road north of Davenport on North Star Route, including grading 26 ft. wide, and surfacing 10 ft. wide. About $25,000. Noted Oct. 11.

Wash., Kelso—Cowlitz Co. soon lets contract building Martin-Bluff-Woodland section of Pacific highway. State and Federal Government to appropriate $50,000 each toward cost of work. R. M. Gillis, engr.

Wash., Raymond — City had plans prepared for building road on north side, including grading and planking. About $18,850. A. Hendricks, city engr.

Wash., Seattle—City plans to pave portion 6th Ave. About $37,966. A. H. Dimock, city engr.

Oregon — State Highway Comn., Salem, soon lets contract grading road between Wolf Creek and Roberts Mountain and between Mitchell and Pineville, Wheeler Co. About $12,500. County to pay $7500 of cost. H. Nunn, highway engr.

Cal., Colusa—Colusa Co. plans to issue $400,000 bonds to build road connecting Meridian with State Highway, 1½ mi.; Princeton Rd. to Maxwell; Grimes Rd. to connect with State Highway; College City to Arbuckle; Williams to Venando. J. W. Kaerth, co. surv.

Cal., El Cajon—(Official)—City election Oct. 30 to vote on $11,500 bond issue to build 20-ft. paved highway through city. L. T. Machum, clk. Noted Oct. 11.

Cal., Madera—City plans to improve F St. About $66,000. E. M. Saunders, acting city clk.

Cal., Santa Ana—City plans to pave portions Bristol St., connecting city with county road. About $17,000. Property owners to pay half of cost. C. C. Bonebrake, city engr.

Ont., Dutton—Town Council will receive bids about Nov. 1, building cement walks and curbs on Main and Shackleton Sts. J. D. Blue, city clk.

BIDS DESIRED

N. Y., Brooklyn—Until Oct. 29, by L. H. Pounds, boro pres. regulating, curbing, and paving Bway., Ave. M and West 36th St., asphalt (3 contracts).

N. Y., New York—Until Nov. 1 by D. Mathewson, boro pres. (Bronx Boro.), paving portions Victor St. and Van Nest Ave., bituminous concrete on cement foundation.

N. Y., New York—Until Nov. 1, by C. D. Van Name, boro. pres. (Richmond Boro.), concrete sidewalks on University Pl. and Lockman Ave.

N. J., Bloomfield—Until Nov. 5, by City, paving portion Grant St. and Weaver Ave., improving Broad, Thomas, Lawrence and 2nd Sts., including [illegible] pavement, 30,000 lin.ft. curbing and sidewalks E. Baechlin, city engr.

N. J., Jersey City — Until Oct. 30, by City Comrs., repaving Hopkins Ave., brick. C. A. Van Kuren, city engr. Noted Sept. 13.

N. J., Newark—(Official)—Until Nov. 1 by Bd. Street and Water Comrs., paving 8000 ft. Renner Ave., bitulithic pavement, 6-in. concrete base, 1700 ft. new 16 x 5 in. four-cut bluestone, etc. M. R. Sherrard, city engr. Noted Sept. 13.

Pa., Norristown—(Official)—Until Nov. 8, by W. D. Heeber, controller, Montgomery Co., paving portion Germantown Pike; advertised in this issue.

S. C., Spartanburg — Until Oct. 29, by Spartanburg Co. Highway Comn., building 12.9 mi. 20 ft. top soil on Buncombs Rd. between Woodruff and Crossanchor. R. Tull, co. highway engr. Noted July 19.

Fla., Ft. Pierce—Until Nov. 6, by St. Lucie Co. Comrs., grading and hardsurfacing 3 mi. North Bridge Rd. and 2¾ mi. South Canal Rd. P. C. Eldred, clk. M. Hallowes, Ft. Pierce, engr. Noted July 12.

Fla., Tallahassee—(Official)—Until Nov. 6, by Leon Co. Comrs., building Woodville Rd., 6 mi. Former bids rejected. B. E. Reed, co. engr. Noted Oct. 4.

Miss., Raymond—Until Nov. 1, by W. W. Downing, clk. bd. supervs., Hinds Co., grading and graveling Clinton and Raymond Rds.

Ky., Hindman—Until Nov. 22, by City, for improving various streets. About $20,000.

Ky., Prestonsburg—Until Nov. 13, by Floyd Co., for building roads. About $40,000.

O., Bryan—Until Oct. 29, by J. A. Neil, city clk., improving and paving 2 sections of Union St.

O., Lisbon—(Official)—Until Oct. 29, by Columbiana Co. Comrs., improving portion Lisbon-Bayard-Canton Pub. Rd., Hanover Twp. About $82,095. C. E. Hamilton, clk.

O., Steubenville—Until Nov. 1, by F. M. Ranck, clk. Jefferson Co., improving Shull Rd. in Mifflin Twp. and Mann Rd. in Jefferson Twp.

Ind., Kendallville—Until Nov. 23, by City, paving portions Main and Williams Sts.; also certain alleys.

Minnesota—Until Nov. 4, by State Highway Comn., 300 Shubert Bldg., St. Paul, for Minnesota Federal Aid Project No. 3, Millelacs Co., involving 35 acres clearing, 17 acres grubbing, 155,338 cu.yd. grading and side ditching, 14,662 cu.yd. off-take ditching, 21,179 cu.yd. guard rail, 4840 lin.ft. drap, 33,459 cu.yd. gravel surfacing, rein.-con. and corrugated metal culverts, etc. V. C. Doane, co. aud.

Minn., Minneapolis—See "Bridges."

Minn., St. Paul—Until Oct. 29, by H. W. Austin, purch. agt., improving portions Mount Curve Blvd., Roblyn Park, alley in Block 3, Carbon St., Folsom and Como Aves. O. Claussen, city engr.

Mo., Jefferson City — (Official) — Until Nov. 7, by Cole Co. Court, building change in Jefferson City and Osage Bend Rd., Sect. 29, Twp. 43, Range 11, in Gum Springs. E. F. C. Harding, co. highway engr. Noted Sept. 27.

Arkansas—Until Oct. 29, by State Highway Comn., Little Rock, building 9-mi. road in Road Impvt. Dist. No. 1, Faulkner Co., involving 37,600 cu.yd. grading, 600 lin.ft. pipe culverts, 350 cu.yd. concrete, 100 lin.ft. steel trestle.

Wash., Goldendale — Until Nov. 6, by Klickitat Co. Comrs., grading and macadamizing 16 mi. Permanent Highway No. 4, known as White Salmon-Snowden Rd.

Wash., Waterville—(Official)—Until Nov. 6, by Douglas Co. Comrs., grading, draining and surfacing with crushed rock 1½ mi. highway at Mansfield. About $10,154. Noted Oct. 11.

California—Until Nov. 5, by State Highway Comn., Sacramento, building [illegible] in Los Angeles Co. between San Fernando and Tellman, 13-mi. concrete resurfacing road in Fresno Co. between Malaga and Fresno, 2.5-mi. present grading made to Humboldt Co. between Garberville and Miranda, 15.6 mi.

Cal., San Diego—Until Nov. 6, by Bd. Supervs. San Diego Co., building 19.61 ft. [illegible] concrete pavement, 20 ft. wide, from city limits to Camp Kearney.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Massachusetts**—(Official)—State Highway Comn., Boston, let contract building section of highway in Kingston, Pembroke, Marshfield, Cohasset Co. Marshfield, $11,181.

Mass., Boston—City received lowest bid grading Grove St., West Roxbury, from Central Constr. Co., 228 Southampton St., Roxbury, $33,250.

Mass., Boston—(Official)—City received low bids building bituminous macadam road and retaining walls in Pontiac St., Roxbury, from J. C. Coleman & Sons Co., 1620 Tremont St., Roxbury, $19,626; A. Baruffaldi, Parker Pl., Somerville, $19,900.

N. Y., Lawrence—(Official)—City received low bids paving Meadow Lane, 6-in. concrete pavement, 18 ft. wide, from Ganford Co., 581 Jackson Ave., Long Island City, $13,245; Both & Weston, Lawrence, $15,225; Wright & Kowalski, 667 Grove St., Jersey City, N. J., $15,783; Hastings Pav. Co., 25 Broad St., New York City, $17,837.

★**N. Y., Mineola**—Nassau Co. let contract improving Shore Rd., from Reid Ave. to Bayles Corner, Port Washington, to Andrew Bros., Mineola. About $15,045. Noted Oct. 18.

N. Y., New York—M. M. Marks, boro. pres., received low bids widening, regulating and laying concrete foundation in portion 38th, 43rd, 44th, 45th and 46th Sts., from A. Ferris, 672 Degraw St., Brooklyn, $38,318; Cramer & Leedecke, 114 East 52nd St., $43,036; Burnside Contg. Co., 270 Burnside Ave., $51,353; widening, regulating and repaving with wood block on concrete foundation 59th St., from 3rd to 5th Ave., (2 jobs), from W. J. Fitzgerald, 547 West 45th St., $29,762 and $20,348 respectively.

N. Y., New York—D. Matthewson, boro pres. (Bronx Boro.) received low bids repaving Park Ave. west from East 162nd at East 165th Sts., asphalt on concrete foundation from Asphalt Constr. Co., Madison Ave. and 137th St., $10,960; Uvalde Asphalt Paving Co., 1 Bway., $11,367; Davney Asphalt Co., 52 Vanderbilt Ave., $11,622.

N. Y., Yonkers—City received low bids regulating, grading, and improving portions School St., from F. Gross, Yonkers, $19,969; J. Cianfaglione, 41 Western Ave., $20,000; Yonkers Contg. Co., $20,433.

★**New Jersey** — State Highway Comn., Trenton, will improve highway between Trenton and Camp Dix, Wrightstown, by day labor. About $70,000. Noted Sept. 20.

★**N. J., Belvidere** — (Official) — Warren Co. let contract dirt roads in Blairstown Twp., to Arbogast Eng. and Constr. Co., Rockdale, N. Y.; about $30,000.

★**N. J., Newark**—Bd. Freeholders Essex Co. let contract road improvements in Wantage and Sussex, to Franklin Contr. Co., 52 Vanderbilt Ave., New York City.

★**N. J., Newton**—Bd. Freeholders, Sussex Co., let contract grading Ross' Corner Sussex Rd. to Franklin Contr. Co., 52 Vanderbilt Ave., New York City, $11,537. Noted Sept. 20.

★**N. J., North Bergen**—Town let contract repaving Tonnelle St. to W. [illegible] Co., Said St. to 5th St., Hoboken. About $17,885. Noted Oct. 18.

Pennsylvania — (Official) — State Highway Dept., Harrisburg, received low bids building 14,507 ft. tar brick road in Mahon Twp., Armstrong Co., from [illegible] 15th St., East Lemoyne, C. $111,188; also 9 cor. block pavement, Steelsville Boro., Center Co. H. H. Tope, [illegible] $18,150; [illegible] & Sons, [illegible] $17,897.

★**Pennsylvania** — (Official) — State Highway Comm., Harrisburg, let contract building State Aid road from Reynolds to Greenville, Westmoreland Co., 11 ft. to 11 ft. 6 in. Grayash Construction Co., [illegible] cost, $[illegible].

★**Pa., Mt. Penn**—Boro. council let contract paving Penn Ave. [illegible] cement to A. F. Reader, 1417 Spring Rd., Reading. About $15,000.

★**Pa., Phila.**—Until Feb. Wm. [illegible] let contract to Barber Asphalt Co., Land Title Bldg., for paving portion Delaware Ave. [illegible] Ave., [illegible] 9th St., [illegible] 1st Ave., $[illegible].

★**N. C., Winston-Salem**—City let contract paving Liberty St. to Atlantic Refining Co., Virginia St. to Power House, Asphaltum Co.

Streets and Roads (Continued)

★**Ala., Athens**—City let contract paving several streets, brick, to Alabama Paving Co., Amer. Trust Bldg., macadam, to J. L. Mullarky, both of Birmingham. About $117,000 available for work. Noted Aug. 13.

★**Miss., Mendenhall** — Simpson Co. let contract gravel road from Gatesville to Harrisville and Braxton, to T. S. Taylor.

★**Ky., Frankfort**—City let contract improving Bridge, St. Clair and Main Sts., Texico asphalt, to Asphalt Maintenance Co., Chicago, $13,350.

★**Ohio**—State Highway Dept., Columbus, let contracts road work as follows: Clermont Co., Section "N-1," Milford-Hillsboro Rd., paving with waterbound macadam, 0.98 mi., to John Reulbel Constr. Co., Cincinnati, $11,317; Darke Co., Sect. "A-1," Dayton-Greenville Rd., concrete, York & Studebaker, Greenville, $59,495; Knox Co., Sect. "K," Columbus-Wooster Rd., rein.-con., 1.61 mi., to Latshaw & Stinchcomb, Fostoria, $47,431; Mahoning Co., Sect. "J," Toledo Napoleon Rd., water-bound macadam, 4.48 mi., to Smith Constr. Co., Youngstown, $53,791; Summit Co., Sect. "N-1," Cleveland-Massillon Rd., brick, 1.8 mi., to W. E. Burke & Sons, Akron, $57,853. Noted Oct. 18.

★**O., Cleveland**—City let contract improving, paving, and repaving portion Woodhill Rd., to A. M. Pejsa Paving Co., 2359 East 93rd St., $62,770, and Baldwin Bros., 560 Ross Bldg., $60,450; paving Ivanhoe Rd., grade elimination, Riley Bros., 348 Arcade, $24,252. Noted Oct. 11.

★**O., Marysville**—Union Co. let contract rebuilding Bygalia and Arbela Rd. in Washington Twp., 3.56 mi., crushed stone, to Marion Stone Co., Marion, $10,779.

★**O., Norwalk**—Huron Co. Comrs. let contract paving roads, involving 11,000 sq.yd. concrete and 9900 sq.yd. brick, to A. J. Baltes, Norwalk. About $25,159.

★**O., Upper Sandusky** — Wyandot Co. Comrs. let contract improving Parker Rd. to Baum & Ankney, Upper Sandusky. About $11,463.

★**Ind., Indianapolis** — City let contract paving portions California St., asphalt, to Marion Co. Constr. Co., 317 Amer. Central Life Bldg., $4.50 per ft.; portion Dearborn St., asphalt and stratified curb, to Amer. Constr. Co., 1201 East Georgia St., $6.78 per ft. Noted Sept. 6.

Mich., Allegan—Allegan Co. received low bid paving road in Laketown Twp., waterbound macadam, from Boyes & Blanford, $59,507.

★**Ill., Cairo**—City let contract improving Paving Dist. No. 8, to E. Prosser, $26,128.

★**Ill., Elgin** — City let contract paving River St., 7450 sq.yd. brick, to Illinois Hydraulic Stone & Constr. Co., $23,161. Noted Sept. 27.

★**Ill., Granite City** — Morris Realty Co. let contract grading subdivision, 65,000 yd. to L. Rich Constr. Co., East St. Louis. About $12,000. Noted Sept. 27.

★**Ill., Ranoul**—Village let contract paving portions Chandler St., to H. K. Rhoades & Co., Lincoln, Ill. About $28,000.

★**Kan., Columbus** — (Official) — Cherokee Co. Comrs. let contract 19 mi. roads to D. S. Dorsey, Web City, $38,227. Noted Oct. 4.

★**Mont., Billings** — (Official) — City let contract 16,000 sq.yd. paving in Improvt. Dist. No. 29, to Warren Constr. Co., Billings, $37,493. Noted Oct. 4.

★**Ark., Forest City**—St. Francis Co. let contract made in Dist. No. 3 Part Memphis-Little Rock Highway, to Healey Constr. Co., Meridian, Miss., $121,000. Noted Aug. 23.

★**Ark., Little Rock**—(Official) — City let contract paving several streets, asphalt or concrete, to E. F. Wilcox, Kansas City, Mo. About $75,000. Noted Oct. 4.

★**Tex., Dallas**—City let contract paving various Belts, Tyler, 12th, 8th, Beckley, and Victor Sts., to Standard Eng. Co., 118 Martin St.

Tex., Ft. Worth—City received bids for 3rd paving Texas Ave. from General Constr. Co., 706 F. & M. Bank Bldg., $2.95 per sq.yd.

★**Okla., Ada**—City let contract paving various East Main St., to Western Paving Co., 318 Terminal Bldg., Oklahoma, $1.35 per sq.yd. Noted Oct. 4.

★**Okla., Chickasha** — City let contract laying portions Main St., asphaltic concrete, to Western Paving Co., 318 Terminal Bldg., Oklahoma, $1.95 per sq.yd.

★**Idaho, Nez Perce**—(Official)—Lewis Co. let contract building 8500 ft. 16-ft. highway known as Nezperce-Green Creek highway to C. M. Payne & Co., East 724 Mission St., Spokane, Wash.; unit basis. Noted Oct. 4.

★**Ore., Portland**—City let contract paving portions Larabee and Goldsmith Sts., bitulithic, on crushed rock base, to Warren Constr. Co., Journal Bldg. About $19,490. Noted Sept. 20.

California — (Official) — State Highway Comn., Sacramento, received only bid building 12.4 mi. highway in Sonoma Co., and 7.7 mi. in Butte Co., from Municipal Impvt. Co., 803 MacDonald St., $133,111 and $56,240 respectively; low bids for 16-mi. highway in Marin Co., E. J. Tracy, Sheldon Bldg., $173,347; F. Rolandi, 550 Montgomery St., $177,347; Palmer & McBryde, Hooker & Lent Bldg., $186,625, all of San Francisco. Noted Sept. 20.

★**Cal., Los Angeles** — City let contract furnishing asphaltic cement for 1 year to Standard Oil Co., 1727 San Fernando St., $14.40 per ton packed in barrels and $12.40 per ton delivered in tank carloads. Noted Aug. 16.

★**Cal., Los Angeles** — City let contract paving portions West 1st St., bitulithic, to G. Oswald, O. T. Johnson Bldg., $213,991. Noted Oct. 11.

★**Cal., Modesto**—Bd. Supervs. Stanislaus Co. received no bids building 16.67 mi. highway. Work will be done by day labor under the direction of E. H. Annear, co. surv. Noted Sept. 27.

★**Cal., Richmond**—City let contract paving 10th St. to L. L. Page, 8th and Bissell Sts., $25,299.

★**Cal., Visalia**—Tulare Co. let contracts for county highway system as follows: Exeter-Merryman Rd., to Highway Constr. Co., Highland, $72,603; Tulare-Paige Rd., J. E. Lee, Tulare, $60,801; Dinuba-Kingsburg Rd., Isbell Constr. Co., San Diego, $84,127; Porterville-Woodville Rd., Brady & Flynn, Humboldt Bank Bldg., San Francisco, $124,971. Noted Oct. 18.

RAILWAYS—STEAM & ELECTRIC

Proposed Work

New Jersey—New Jersey & Pennsylvania Traction Co., Hanover and Warren St., Trenton, granted permission by Bd. Pub. Utility Comrs. to issue $50,000 bonds to grade road from Gladstone to Pitney. G. Ettinger, ch. engr.

Kentucky—Baltimore & Ohio R.R. having surveys made for 10-mi. branch line from Esco into headquarters of Beefhide Creek, to reach coal lands. H. A. Lane, Baltimore, ch. engr.

Kentucky — Louisville & Nashville R.R. plans to double-track line from Winchester to Sinks, about 59 mi. W. H. Courtney, Louisville, ch. engr.

Kentucky—Shelbyville & Frankfort Realty Co. had plans prepared by Phillips & Beach, engrs., Real Estate Trust Bldg., Phila., for 19½ mi. interurban railway from Shelbyville to Frankfort, to be known as Frankfort-Shelbyville Interurban Line. R. Cox, Shelbyville, ch. engr.

Illinois—Chicago City Ry., Borland Bldg., Chicago, plans to issue $2,172,000 bonds to build and extend its lines. H. B. Fleming, ch. engr.

Missouri—St. Louis & East St. Louis Interurban Ry., D. F. Parsons, 7 Collinsville Ave., East St. Louis, Ill., genl. mgr., and St. Louis & Illinois Ry. applied to Pub. Serv. Comn. for permission to build downtown interurban loop to connect with free bridge at St. Louis.

Oklahoma Oklahoma, Kansas & Missouri Ry. plans to extend line from Picher to Columbus, Kan. H. C. Flower, Kansas City, Mo., pres.

New Mexico—New Mexico Central R.R., 120 mi. long, has been purchased by Federal Export Corp., 115 Bway., New York City, who plans to electrify same or use internal combustion locomotives.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Indiana** — (Official) — Pennsylvania Lines west of Pittsburgh let contract grade revision on Michigan Division at Camden to P. T. Clifford & Son, Valparaiso.

EXCAVATION AND DREDGING

Proposed Work

O., Lorain—Dredging—See "Miscellaneous."

S. D., Sioux Falls—(Official)—Drainage—Minnehaha Co. rejected bids cleaning and deepening 10 mi. channel, D. D. Nos. 1 and 2, also cutting 2 mi. ditches, 20-ft. bottom, and straightening Big Sioux River, north of Sioux Falls; part of D. D. Nos. 1 and 2. E. H. Shonkle, co. aud. H. M. Derr, Pierre, state engr. Noted Oct. 11.

Wyo., Lovell—Ditches—See "Miscellaneous."

Mont., Billings—Irrigation—J. Pope and T. Arthur, 311 Electric Bldg., plans to spend $45,000 for building private irrigation system, Mission Valley.

Mo., Palmyra — Drainage — South River D. D. plans to spend $70,000 to improve system. B. F. Smiley, Hannibal, Mo., engr.

Cal., San Diego—Irrigation—E. Fletcher granted permission by State Water Comn. for diverting 8 second ft. direct and 12,011 acre ft. per annum storage of Escondiddo Creek in San Diego Co. for irrigation purposes. Work involves main canal, 2 mi. long, and diversion and rein.-con. storage reservoir dam, 140 ft. high, 400 ft. long on top and 200 ft. long at bottom, to irrigate 3600 acres in Rancho San Dieguito. About $250,000.

BIDS DESIRED

O., Cloumbus — Dredging — See "Miscellaneous."

Ind., Winamac—(Official)—Ditch—Until Nov. 3, by Pulaski Co., building Mary S. Eckman, et al. ditch, main ditch, 18,035 ft. long, involving 35,502 cu.yd. excav.; Branch No. 1, 1854 ft., 2356 cu.yd. excav.; Branch No. 2, 3736 ft., 4101 cu.yd. excav. R. E. Nutt, constr. comr.

Ia., Algona—Drainage—Until Nov. 2, by Bd. Supervs. Kossuth Co., building D.D. No. 152, involving 46,245 ft. 6-24 in. tile; D.D. No. 153, 38,461 ft. 6-22 in. tile; Sub. D.D. No. 6, 17,650 ft. 6-22 in. tile. E. H. Beardsley, aud.

Minnesota — Ditch — See "Streets and Roads."

Minn., Redwood Falls—Ditch—Until Nov. 2, by Redwood Co., building Branch No. 25 of Co. Ditch No. 24, involving 16,000 ft. open ditch, 122,524 cu.yd. excav. About $12,252. L. P. Larson, aud.

Neb., Lincoln—(Official)—Excavation—Until Nov. 7, by Peterson & Devoe, attys., Sanitary Dist. No. 1, excavating new channel Salt Creek. W. S. Scott, 310 Little Bldg., engr.

Mo., Harrisonvile—Drainage—Until Nov. 8, by D. K. Hall, secy., Grand River D. D. of Cass and Bates Cos., building 24 mi. open ditch, involving 2,800,000 cu.yd. excav.; 10 lateral ditches involving 272,000 cu.yd. excav. G. Bird, Harrisonville, engr.

PRICES AND CONTRACTS AWARDED

N. Y., New York—Dredging—Dept. Docks and Ferries received low bid dredging at foot West 46th St., North River, from Morris & Cumings Dredging Co., 17 State St., $146,300.

★**Ga., Marietta** — Dredging — Cobb Co. Drainage Comrs. let contract dredging Big Altoona Creek to Thompson & Mosley, Inc., Atlanta, $32,500.

★**Tenn., Huntingdon**—Drainage—Carroll Co. let contract reclamation system, Rutherford Fork D. D., involving 10 mi. canals and ditches, etc., to Canal Constr. Co., Ex. Bldg., Memphis, $60,000.

★**Ky., Owensboro**—Drainage — Drainage Comrs. Daviess Co., let contract straightening Panther Creek, to McWilliams Dredge Co., 332 South Michigan Ave., Chicago, $428,902. Noted June 14.

★**Ia., Boone**—Drain—Boone Co. let contracts building Drain No. 168, involving 20,270 ft. 6-24 in. tile to Carver & Hambly, Col., Ia., Iowa Pipe & Tile Co., 4th and Hayes St., Des Moines and McHose Sand & Tile Co., Boone. Noted Oct. 4.

★**Minn., Marshall**—Ditch — Lyon Co. let contract building Co. Ditch No. 37, to F. E. Smith, Clarion, Ia., $23,500; No. 38, to A. Henrickson, Askov, Minn., $14,174. Noted Sept. 27.

INDUSTRIAL WORKS

Proposed Work

Mass., New Bedford—Union Street Ry. Co., 814 Purchase St., plans 6- 7-story, 80 x 115-ft. brick and rein.-con. power house on Middle St. About $665,000. H. M. Hope, 185 Devonshire St., Boston, engr.

Industrial Work (Continued)

N. Y., Buffalo—Hornspeed Propelling Co., 302 Main St., recently incorporated with $1,000,000 capital stock, plans to build factory. J. A. Horne, pres.

N. Y., Buffalo—Lehigh Valley R.R. plans brick boiler house, South Ogden and Dingens Sts.; also brick boiler house, machine shop and storehouse, Ft. Tifft St. About $26,000 and $50,400 respectively. G. F. Hand, 143 Liberty St., New York City, ch. engr.

N. Y., Ithaca—Hires Condensed Milk Co., 913 Arch St., Phila., having plans prepared by W. Morrell, archt., 913 Arch St., Phila., 2-story addition to condensary here. About $50,000.

N. Y., Long Island City — Continental Varnish Co. had plans prepared by L. A. Abramson, archt., 220 5th Ave., New York City, for group of factory buildings. Varick and Johnson Aves., and Ingraham St. About $60,000.

N. Y., New York—Willoughby Garage Corp., 25 Court St., Brooklyn, having plans prepared by Cantor & Dorfman, archts., 371 Fulton St., Brooklyn, for 2-story, 92 x 154 ft. rein.-con. garage, 238-255 West 19th St. About $100,000.

N. J., Paterson—H. H. Kurkjian, 18 Bridge St., secured site on Camden St., and plans to build silk mill containing 150,000 sq.ft. floor space.

Pa., Phila.—Ft. Mifflin Shipbuilding Co. recently incorporated with $10,000,000 capital stock, plans shipbuilding plant on Delaware River, near League Island. A. Masters, pres.

Md., Cumberland—Kelly-Springfield Tire, Cook St., Akron, O., had plans prepared by S. Dieschler & Sons, engrs., Farmers Bank Bldg., Pittsburgh, Pa., for 700 x 900-ft. factory, 100 x 150-ft. machine shop, and 150 x 150-ft. power house. About $5,000,000.

Va., Danville—Dan River & Riverside Cotton Mills plan general improvements to its mills; also to mill village, including women's dormitory, sewerage and waterworks system, concrete sidewalks, fencing railway, under passes, etc. About $300,000.

Va., Roanoke—City plans election to vote on $150,000 bond issue to build 80 x 170-ft. market house. C. M. Brown, mayor.

W. Va., Huntington—United Casket Co., Huntington, recently incorporated with $150,000 capital stock, plans to build factory.

N. C., Wilmington—Chapin Sacks Mfg. Co., 1st and M Sts., plans to build ice-cream factory. About $50,000.

La., New Orleans—Marine Paint Co., 411 South Peters St., has increased its capital stock from $50,000 to $500,000, and plans factory.

La., New Orleans—Union Seed & Fertilizer Co., Hennen Bldg., plans addition to sulphuric plant. About $125,000.

La., New Orleans—Wilson & Co., Union Stock Yards, Chicago, and 816 1st Ave., New York City, plans to expend $2,000,000 to build killing and packing plant here

O., Akron—R. B. Biscuit Co. plans to build large warehouse. Gehres & Ritchie, engrs., 335 Akron Savings & Loan Bldg., surveying site.

O., Akron—Ohio Wire Goods Mfg. Co., 1071 Bank St., increased its capital stock from $100,000 to $500,000 and plans new factory, Bank St. and North Case Ave.

O., Cleveland — City Ice Delivery Co., 1935 Euclid Ave., soon lets contract for bottling factory and office building, Madison Ave., and West 117th St. About $200,000. C. C. Conely, c/o owners, engr.

O., Cleveland—Gates Elevator Co., 3330 Bway., plans factory on Pearl St. About $100,000.

O., Cleveland — J. Heller, 2326 Lorain Ave., having plans prepared by W. Markowitz, archt., 403 United Bank Bldg., for 3-story, 30 x 135-ft. factory and store building on East 5th St. About $55,000.

O., Cleveland—Service Auto Storage Co. lets contract about Nov. 1, for 2-story 115 x 240 ft. public garage. About $100,000. A. M. Gordon, 838 Schofield Bldg., engr. A. F. Janowitz, Permanent Bldg., archt.

Ind., Hammond — Swift & Co., Union Stock Yards, Chicago, having plans prepared by C. H. Kane, engr., for fertilizing plant to comprise group factory buildings. About $500,000

Ind., Indiana Harbor—Standard Forgings Co. plans to build addition to its plant here, including machine shop. About $200,000.

Mich., Ludington—Haskall Mfg. Co., North Rowe St., plans to build new additions to plant; also install machinery. About $1,000,000.

Mich., Port Huron—Romeo Foundry Co. plans 90 x 200-ft. addition to its factory here. About $200,000. L. A. Holme, pres.

Ill., Chicago — A. Nelson Mfg. Co., 564 West Randolph St. had plans prepared for 1-story, 234 x 239 ft. auto accessories building at 2702-22 Southport Ave. About $110,000. S. N. Crowen, 30 North La Salle St., archt.

Ill., Chicago—White Eagle Brewing Co., 3755 South Racine Ave., had plans prepared by A. Rocha, archt., 1225 North Ashland Ave., 2-story bottling plant at Wall and 38th Sts. About $75,000.

Ill., Harvey—Buda Mfg. Co. plans 4-story, 80 x 260-ft. addition to its plant. J. Viles, 80 East Jackson Blvd., Chicago, pres.

Wis., Milwaukee — Milwaukee Tank Works, 851 Kinnickinnic Ave., increased its capital stock from $25,000 to $100,000; proceeds to be used for enlarging and improving plant. E. A. Bienenstock, secy.

Wis., West Allis—Economy Paper Products Co., 315 Wright St., plans to build 3-story brick factory. About $50,000.

Wis., West Bend—West Bend Aluminum Co. having plans prepared by Federal Eng. Co., archts., Stephans Bldg., Milwaukee, 3 and 1-story, 72 x 190-ft. and 50 x 60-ft. factory and warehouse. About $75,000. B. C. Zielger, secy.

Ia., Sioux City—Metz Baking Co., 410 Pearl St., receiving bids about Dec. 1, building 4-story, 60 x 132-ft. bakery. About $60,000. N. T. Vorse, 911 S & L Bldg., Des Moines, archt.

Mo., Kansas City—Riverside Storage Co., recently incorporated, plans 3 warehouses, 8 stories each. About $2,000,000. G. J. Miller, W. Volker and E. F. McElroy, incorporators.

Colo., Denver—International Rubber Co., 1569 Bway., soon lets contract, 4-story, 125 x 145-ft. factory and warehouse. About $100,000. W. L. Rice, 1608 Bway., archt

Wash., Seattle—F. D. Black, of Black Mfg. Co., Colman Bldg., plans 4-story, 80 x 256-ft., rein.-con. factory on Rainier Ave. About $80,000.

Wash., Seattle—Sound Paper Co., of Seattle, plans to purchase a site at Everett and Lake Washington Sts., and build paper mill. About $6,000,000.

Ore., Portland—Amer. Powdered Coal Co. purchased 2½ acre site and plans to build plant. About $100,000.

Ore., Portland—Sunset Motor Co. soon lets contract for 3-story, 81 x 112-ft. brick and concrete garage, 12th Ave. and Pike St. About $60,000. I. B. Johnson, 3838 Evanston Ave., archt

Cal., Fresno—California Raisin Growers' Assn., Rowell Bldg., plans to build warehouses and factory buildings. About $1,500,000 McDonnell & Kahn, San Francisco, engrs.

Cal., Stanislaus—Sierra & San Francisco Power Co., 58 Sutter St., San Francisco, plans to build addition to local plant. About $1,000,000.

Ont., Toronto—T. Emery, Elliott House, plans to build warehouse. About $50,000

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mass., Boston — Cummington Real Estate Trust let contract 3-story, 63 x 241-ft. brick and rein.-con. auto sales and service building to McDonald & Kivell, 10 High St.

★N. Y., S. I., Clifton—Peach Terminal Co., 17 State St., New York City, let contract 7-story, rein.-con. warehouse to include piers and bulkheads, to be built between Clifton and Stapleton to Fairbanks Bldg. Corp., 11 Park Row, New York City.

★N. Y., Rochester—Barnett & Lamb Coal Co., 1633 St. Paul St., let contract 4-story, 120 x 160 ft. rein.-con. factory, St. Paul, Lowell and Martin Sts., to Turner Constr. Co., 244 Madison Ave., New York City. Noted Oct. 4.

★Pa., Chester—Phila. Electric Co. let contract 100 x 100-ft. power plant, Ridge and Palmer Sts., to Stone & Webster Engr. Corp., 147 Milk St., Boston.

★Va., Newport News — Newport News Shipbuilding & Drydock Co. let contract factory to J. Stewart & Co., 30 Church St., New York City. About $600,000.

★Ill., Moline—Deere & Co., 1325 3rd Ave., let contract 1-story, 134 x 204-ft. dry kiln to P. H. Lorenz, 413 Peoples Bank Bldg., $75,000.

★Neb., Omaha—Hoagland Lumber Co., Keeline Bldg., and T. R. Kimball, 936 World-Herald Bldg., let contract 4-story warehouse and store building to J. C. Mardis Constr. Co., 750 Brandeis Theater Bldg., $200,000.

★Mo., Kansas City—Monarch Transfer & Storage Co., 31st and Highland Sts., let contract 5-story, 30 x 55-ft., brick and rein.-con. storage building and garage on 31st and Michigan Sts., to L. Breitag & Son, 3701 West Prospect Pl. About $50,000

Ark., Little Rock—C. A. Sawyer let contract 2-story, 100 x 150-ft. brick warehouse to J. D. Johnson, 420 Johnson St. About $50,000.

★Ore., Astoria—Port Comn. let contract 8-story warehouse to W. Wells, Seattle Wash., $56,913.

BUILDINGS

Proposed Work

Mass., Brockton—School—Bd. Educ. receives bids about Nov. 15 for 2-story school and assembly hall on Kenelworth Ave. About $80,000. R. P. Jackson, 145 West Elm St., archt.

N. Y. New York—Armory—City appropriated $280,000 to enlarge armory of Squadron "A," 94th and 95th Sts. and Park Ave. Pilcher & Tachau, archts., 109 Lexington Ave., prepared plans.

N. Y., New York—Hospital, etc.—Knickerbocker Hospital having plans prepared by Helmle & Corbett, archts., 190 Montague St., Brooklyn, for hospital, main building, 216 x 108 x 109 ft., garage, isolation building and nurses' home. Convent Ave from 130th to 131st St. M. G. Foster, pres.

N. Y., Port Dickinson—High School—Port Dickinson & Ogden School Dists., having plans prepared by Jewel & Umbrect, archts., Press Bldg., Binghamton, 2-story E. Beckwith, Fenton, trustee.

N. Y., Yonkers — Home — C. Neustatter Estate, c/o W. R. Rose, atty., 128 Bway., New York City, plans 2-story convalescents' home. About $250,000. York & Sawyer, 30 East 41st., New York City, archts

Pa., Chester — High School — Bd. Educ. soon lets contract on revised plans for 4-story, addition. About $200,000. C. S. Adams, 2509 Arch St., Phila., archt. Noted Sept. 6

Pa., New Castle—Hospital—New Castle Hospital plans 5-story, 44 x 146-ft. brick addition. About $125,000

Pa., Phila.—Temple—Ancient Arabic Order Nobles of the Mystic Shrine plans to build La La temple. About $1,000,000. W. Freeland Kendrick, grand potentate.

Pa., Vandling—High and Grade School—Bd. Educ. soon lets contract, 2-story. About $50,000. G. W. Esterbrook, Connell Bldg., Scranton, archt.

Va., Danville—Laundry—See "Industrial Works."

Va., Martinsville—Store and Hotel—Hotel Henry Corp. soon lets contract, Franklin Church and Broad Sts. About $50,000. A. Markwood, E. & C. Bldg., Richfield, W. Va., archt.

S. C., Spartanburg—Hospital—Spartanburg City voted $250,000 bond issue to build hospital. W. H. Timms, engr.

Ala., Birmingham—Hospital—City voted $400,000. H. H. Whitlock, 1741 Steiner Bldg., archt.

O., Canton—Hotel—Custom Real Estate Co., c/o E. C. Cassel, archt., 930 Bldg., plan. About $450,000.

O., Cleveland—Library—City Library Bd., 325 Superior Ave., will receive bids about Nov. 1, brick, Superior Ave. and [illegible] St. About $[illegible], C. Cudnow, 1031 Hoyt Bldg., archt.

O., Cleveland — Store — See "Industrial Works."

O., Franklin—School—Bd. Educ. has plans prepared by E. A. Mumaugh, Union Bank Bldg., Cincinnati, heat and ventilation. About $[illegible]

Buildings (Continued)

O., Warren—City Hall—City plans to issue $250,000 bonds to build.

O., Warren — Hotel — G. Baker, Monroe St., plans, 8-story, on High and Haron Sts. About $[illegible]

Ind., Laporte—Sanitarium—Island Assn., c/o S. Von Gunten, archt., 30 North Dearborn St., Chicago, having plans prepared, 3-story, 11 x 360 ft., brick, island in Pine Lake, near here. About $300,000.

Mich., Detroit—School—Bd. Educ. plans addition to Hely School. About $50,000. C. A. Gadd, bus. mgr. Malcomson & Higginbotham, 404 Moffat Bldg., archts.

Mich., Detroit—Y. M. C. A. plans 10-story, 75 x 100-ft. building. About $300,000. C. W. Cowls, Washington and Clifford Sts., pres. A. Kahn and E. Wilby, 58-60 Lafayette St., soon receive bids.

Ill., Chicago. — Library — City plans library to be known as Henry Edward Legler Regional Library, Crawford Ave. and Monroe St. About $75,000

Ill., Evanston—Hotel, Store and Apartment—F. M. Anderson, L. M. Nelson, and J. Lindquist, having plans prepared by R. S. De Goyler, archt., 122 South Michigan Ave., Chicago, 6 story, 170 x 264 ft. About $700,000.

Wis., Madison — Theater — Cosmodami Amusement Co., 753 Johnson St., soon lets contract 100 x 130 ft. About $125,000. Rapp & Rapp, 69 West Washington St., Chicago, archts.

Wis., Superior—School—Bd. Educ. having plans prepared by F. E. Johnson, archt., Trust Bldg. About $150,000

Ia., Sioux City—Temple—Masonic Bldg. Co. having preliminary plans prepared by Boettler & Arnold, archts., 609 Security Bldg., 4-story, 50 x 150-ft. About $150,000. D. M. Brownlee, chn.

Ia., Story City—School—City plans $50,000 bond issue for school.

Ia., Washington — School — Bd. Educ. plans. About $200,000. Eckland, Fugard & Knapp Mecha Bl archts

Minn., St. Paul—School—Bd. Educ. plans, 3-story, on 14th St. About $200,000. A. Hausler, Pioneer Press Bldg., archt.

Kan., Eldorado—Hotel and Office—C. R. Sowers, 875 Spaulding Ave., Wichita, and associates, plan, 8-story. U. G. Charles & Co., Schwirter Bldg., Wichita, archts.

Kan., Pittsburg—Hospital—Sisters of St. Joseph plan, 3-story, 50 x 138-ft., brick and [illegible] About $150,000. G. W. Van Murdock Bldg., Wichita, archt.

Kan., Wichita — Church — University Friends congregation having plans prepared by S. S. Voight, arch., 4th Natl. Bank Bldg., brick and stone. About $50,000

Neb., Omaha — Schools — City election Nov. 20 on [illegible] bond issue to build schools. W. T. Bourke, 505 City Hall, engr.

Mo., Kansas City — School — Presbyterian Parishes had plans prepared by White & Nash, archts., 311 Rochambeau Bldg., 2-story, [illegible] About $[illegible]

Mo., St. Louis—Office—Finance & Mortgage Co. plans fireproof, reinforced, 8th and Olive Sts. About $1,400,000

Tex., Palestine—Hospital—International & Great Northern Ry. plans. About $[illegible] C. H. Cristendon, Houston, chf. engr.

Okla., Tulsa—Gymnasium—Kendall College, c/o F. D. Harwell, 1611 South Baltimore St. plans [illegible] 110-ft. brick and reinforced. About $[illegible] C. K. Birdsall, 1002 Commerce Bldg., Kansas City, Mo., archt.

Ariz., Phoenix—Hospital—Sisters Hospital having plans prepared for new hospital to replace one recently destroyed by fire. About $150,000

Wash., Olympia—Office—State having plans prepared. About $[illegible] J. Zittle, Lumbermen Bldg., Spokane, archt., state capitol comm.

Wash., Seattle—Hotel—Rhein Hotel Co., Jackson St. and 9th Ave., soon lets contract 3-story addition. About $[illegible] J. L. McCarthy, New York Bldg., archt.

Ore., Portland—School—Bd. Educ. soon lets contract Hawthorne-Buckman school. About $190,000.

Cal., Sacramento—Capitol—State plans to build. About $[illegible]

Ont., Orillia—Hospital—Town plans. About $75,000. C. E. Grant, clk.

BIDS DESIRED

Mass., Northampton — Infirmary — Until Nov. 15, by Trustees of Smith College, 2-story, 96 x 100 ft. brick. About $80,000. Putnam & Taylor, Bement Bldg., archts.

N. J., Trenton — (Official) — Hospital — Until Oct. 29, by F. H. Bent, state archt., State House, for extension to criminal insane building at State Hospital. Noted Oct. 18.

W. Va., Charleston—(Offici. l)—Church—Until Nov. 1, by W. E. Moore, chn. bldg. com., First Christian congregation, 1112 Virginia St., 1-story, 81 x 115-ft., stone, terra cotta brick, hollow tile, rein.-con., structural steel. About $65,000. W. H. St. Clair, Capitol and Quarrier Sts., archt. Noted Oct. 11.

O., Cleveland Heights—(Warrensville P. O.)—School—Until Nov. 1, by Bd. Educ., 2-story. About $180,000. D. E. Carpenter, 34 Leader-News Bldg., Cleveland, pres. F. Warner, 718 Hippodrome Bldg., Cleveland, archt. Noted July 19.

Mich., Detroit—(Official)—Schools—Until Nov. 1, by Bd. Educ., (C. A. Gadd, business mgr., 50 Bway.), building Nellie Leland School, Russell and Catherine Sts.; also addition to Greusel School, Medbury and Moran Sts.

Mo., St. Louis—Clinic—Until Oct. 30, by E. R. Kinsley, pres. bd. pub. wks., 208 New City Hall, 4-story. About $190,000. Noted Oct. 18.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., Binghamton—Schools—Bd. Educ. received lowest bid for Bevier St. school, from Schaeffer Constr. Co., Peoples Constr. Bldg. About $56,970.

★N. Y., New York—Clubhouse—Knights of Pythias let contract, 2½-story, 70 x 200-ft. brick, on East 149th St., to Jardin Co., 507 5th Ave.

★N. Y., New York—Store—Ford Motor Co., 1723 Bway., let contract 6-story, 30 x 55 ft. at Bway. and 54th St. About $300,000.

★N. J., Morristown—Hospital—All Souls Hospital, Mt. Kemble St., let contract, 3 story, 41 x 170 ft. brick, to J. McKeefrey, 1416 Bway., New York City. About $100,000.

★N. J., Newark—Church—St. Casimir's congregation, c/o Rev. F. P. Knappek, 164 Nichols St., let contract 2-story, 75 x 158-ft., to Gunn-Va Dale Co., 31 Clinton St., $100,000.

W. Va., Wheeling—Fire House—City received low bid, at Dam No. 24, Ohio River, from Pitt Constr. Co., Fulton Bldg., Pittsburgh, $56,000.

★La., New Orleans — School — Turo-Shakespeare Almhouse let contract, 2-story, 60 x 180-ft., brick, to J. Geary, Perrin Bldg. About $56,000.

★Tenn., Nashville — Library — Peabody College let contract, 3-story, to Foster-Creighton Co., 4th and 1st Bl. About $180,000. Noted Apr. 5.

★Tenn., Nashville—Sunday-School—First Presbyterian congregation let contract 3-story, 80 x 80-ft. rein.-con. addition, to F. Proctor Co., Nashville. About $70,000.

★O., Cleveland Heights — (Warrensville P. O.)—Home—Montefiore Home for Aged and Infirm Israelites let contract, 2 and 3 story, 160 x 122 ft., to A. H. Hansen, 2413 East 93rd St. About $150,000. Noted Aug. 30.

★Ind., South Bend—Hospital—St. Joseph's Hospital let contract, 3-story, 41 x 100 ft., to Larson & Danielson, Laporte. About $100,000.

★Mich., Flint—Hotel—Citizens Hotel Co. let contract, 6-story, 150 x 195 ft., to W. E. Wood, Ford Bldg. About $700,000.

★S. D., Brookings—Administration—Agricultural College c/o Regents of Educ., let contract addition to A. H. Wold Constr. Co., Brookings. $100,000.

Mont., Havre — Mercantile — Ryan Mercantile Bldg. Co. received lowest bid from Leake & Richards, Great Falls. About $67,725.

★Cal., Los Angeles—Bank and Office—J. Benton Van Nuys let contract, 3-story, 60 x 155 ft. rein.-con. and brick, Spring St. to Leonard & Peck, H. W. Hellman Bldg., $50,000. Noted Sept. 20.

★Que., Montreal — Office — Canadian Northern Express Co., 411 Dorchester St., W., let contract to R. Rigby, Montreal. About $58,000.

★Man., Winnipeg—Nurses' Home—Winnipeg General Hospital, Bannatyne Ave., let contract addition to Carter-Halls-Aldinger Co., 1010 Union Bank Bldg., $90,000.

FEDERAL GOVERNMENT WORK

Proposed Work

Mass., Boston—Timber Bulkhead — Bureau Yards and Docks, Navy Dept., Wash., preparing plans.

Conn., New London — Torpedo Storage Building—Bureau Yards and Docks, Navy Dept., Wash., preparing plans building at Submarine Base. About $30,000.

N. Y., New York—Extension of Pneumatic System—Bureau Yards and Docks, Navy Dept., Wash., preparing plans. About $25,000.

Pa., Phila. — Reservoir — Bureau Yards and Docks, Navy Dept., Wash., preparing plans for 2,000,000-gal. rein.-con. reservoir. About $30,000.

Pa., Phila.—Shop—Bureau of Yards and Docks, Navy Dept., Wash., soon lets contract temporary boat building shop.

Wash., D. C.—Coast Artillery Quarters—War Dept. (I. W. Littell, brig. genl.), will soon select sites and prepare plans for certain coast artillery quarters. About $28,000.

S. C., Charleston—Incinerator and Can Sterilizers—Bureau Yards and Docks, Navy Dept., Wash., preparing plans.

S. C., Charleston—Power Plant Improvements—Bureau Yards and Docks, Navy Dept., Wash., preparing plans. About $100,000.

Fla., Key West—Filling—Bureau Yards and Docks, Navy Dept., Wash., preparing plans. About $25,000.

Fla., Miami—Dredging and Filling—Bureau of Yards and Docks, Navy Dept., Wash., soon lets contract. About $20,000.

Ala., Sheffield — Nitrate Plant — War Dept., Wash., D. C. (N. D. Baker, secy.), plans, on Tennessee River near Muscle Shoals.

Cal., Mare Island—(Vallejo P. O.)—Medical Supply Depot — Bureau Yards and Docks, Navy Dept., Wash., preparing plans. About $130,000.

Cal., Mare Island — (Vallejo, P. O.) — Structures—Bureau Yards and Docks, Navy Dept., Wash., soon lets contract building structures for Submarine Base. About $110,000.

BIDS DESIRED

N. Y., Brooklyn — Shipbuilding Ways—Until Nov. 19, by Bureau Yards and Docks, Navy Dept., Wash., concrete and timber shipbuilding ways, pile foundations, at Navy Yard.

N. J., Woodbury—Post Office—Until Nov. 23, by J. A. Wetmore, superv. archt., treas. dept., Wash.

Pa., Phila.—Tank and Tower—Until Nov. 5, by Bureau Yards and Docks, Navy Dept., Wash., building 150,000 gal. steel water tank and tower, concrete foundation, at Navy Yard. Noted Oct. 18.

Wash., D. C.—Dry Dock Crane—Until Nov. 26, by Bureau of Yards and Docks, Navy Dept., furnishing at Navy Yards, Norfolk, Va., cost, $125,000; Phila., Pa., $125,000; New York, N. Y., $100,000.

Va., Norfolk—Steel Tower—Until Nov. 5, by Bureau Yards and Docks, Navy Dept., Wash., building 200 ft. steel tower; also taking down, strengthening and rebuilding existing 200 ft. steel tower at Navy Yard. Noted Oct. 18.

W. Va., Charleston—Distributing System—Until Oct. 29, by Bureau Yards and Docks, Navy Dept., Wash., electric power distributing system. About $35,000.

W. Va., Charleston—Sewerage System—Until Oct. 29, by Bureau Yards and Docks, Navy Dept., Wash., installing at Naval Sta.

N. C., Chapel Hill — Post Office — Until Nov. 27, by J. A. Wetmore, superv. archt., treas. dept., Wash.

S. C., Charleston — Steel Tower—Until Nov. 5, by Bureau Yards and Docks, Navy Dept., Wash., building 300 ft. steel tower and reinforcing 2 existing steel towers at Navy Yard.

Federal Government Work (Continued)

Wyo., Basin—Post Office—Until Nov. 22, by J. A. Wetmore, superv. archt., treas. dept., Wash.

Cal., San Diego—Dredging—Until Nov. 3, by U. S. Engr. Office, 725 Central Bldg., Los Angeles, dredging San Diego Harbor; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Chelsea** — Hospital — Bureau Yards and Docks, Navy Dept., Wash., let contract building emergency hospital at Naval Hospital Reservation, to W. Crane, Hayward St., Cambridge, $269,900. Noted Oct. 18.

Mass., Hingham—Wall—Bureau of Yards and Docks, Navy Dept., Wash., received bids improvements to wall of slips at Naval Ammunition Depot; (a) net price, installation and removal of plant and apparatus, (b) unit price per man per day, (c) unit price per sq.ft., (d) unit price per pound for anchor bolts delivered, (e) unit price per cu.ft. Gunite in place, from Dewey Cement Gun Constr. Co., 836 Hamilton St., Allentown, Pa., (a) $1000, (b) $8, (c) 5c., (d) 32c., (e) $1.06; H. P. Converse & Co., 88 Broad St., Boston, Mass., cost plus %; H. P. Brown, 120 Liberty St., New York City, (a) $980, (b) $6 and $4, (c) 5½c., (d) $2.45.

★**Conn., New London**—Ordnance Buildings, etc.—Bureau Yards and Docks, Navy Dept., Wash., let contract 3 ordnance store buildings and 1 machine shop at Submarine Base, to R. H. Arnold Co., 629 Woodward Bldg., Wash., D. C., $64,174. Noted Sept. 27.

★**Conn., New London**—Piers and Quay Wall—Bureau Yards and Docks, Navy Dept., Wash., let contract building at Naval Sta., to Robbins-Ripley Co., 50 Church St., New York City, $159,644. Noted Oct. 18.

Conn., New London—Power House and Machine Shop—Bureau of Yards and Docks, Navy Dept., Wash., received bids Oct. 22, power house and machine shop at Naval Sta., (work complete), from Bigelow & Nichols, 45 East 42nd St., New York City, $150,430; Durolithic Co., 460 Ellicott Sq., Buffalo, N. Y., $182,000; Casper Ranger Constr. Co., 20 Pine St., Holyoke, Mass., $193,680; T. J. Pardy Constr. Co., 15 Fairfield Ave., Bridgeport, Conn., $198,685. Noted Oct. 11.

★**N. Y., New York**—Bureau Yards and Docks, Navy Dept., Wash., let contract temporary storehouse for ordnance dock to J. Thatcher & Son, 60 Park Ave., Brooklyn, $101,483.

★**N. J., Newark** — Terminal Facilities—Bureau Yards and Docks, Navy Dept., Wash., let contract, including barracks, storehouses, etc., at Port Newark, to McArthur Bros., 120 Bway., New York City, at cost plus percentage basis, approximately, $15,000,000.

Pa., Phila.—Dispensary—Bureau Yards and Docks, Navy Dept., Wash., received low bids building at Navy Yard, (a) work complete, (b) alternate, from McCloskey & Bahl, 16 Thomson St., (a) $31,247, (b) $31,097; Evans Constr. Co., 9 South 18th St., (a) $33,500, (b) $33,500; Lam Building Co., 1001 Wood St., (a) $33,600, (b) $33,250. Noted Sept. 20.

Pa., Phila. — Heating System — Bureau Yards and Docks, Navy Dept., Wash., received low bids installing in foundry (work complete), from Enterprise Steam Heating Co., 600 North Howard St., Baltimore, Md., $68,680; Mathis Bros. Co., Archer Ave., and Canal St., Chicago, $74,435; C. J. Doyle, 2056 Pine St., $75,800. Noted Oct. 18.

★**Md., Annapolis**—Radio Tower—Bureau Yards and Docks, Navy Dept., Wash., let contract additional tower, to Austin Co., 1026 Bulletin Bldg., Phila., cost plus percentage, (supplemental agreement).

★**Md., Indian Head** — Laboratory—Bureau Yards and Docks, Navy Dept., Wash., let contract to Richardson & Burgess, Inc., 616 Colorado Bldg., Wash., D. C., $4500. Noted Oct. 18.

★**Wash., D. C.**—Condensers and Pumping Equipment—Bureau Yards and Docks, Navy Dept., Wash., let contract, furnishing at various navy yards, as follows: Items 3, 4, 5, 6, 9, 10, 12, 13, 16, 17, 18, 26, 27, 28, 29, 48, 49, 53, 54, 55, 56, to Alberger Pump & Condenser Co., 140 Cedar St., New York City, $48,300; Items 37, 38, 42, 43, to Westinghouse Electric & Mfg. Co., Hibbs Bldg., $38,242; Items 7, 15, 20, 22, 24, 25, 31, 32, 33, 35, 52, 57, to E. J. Smith, 30 Church St., New York City, $98,413; Items 19, 30, 36, 50, 51 to D'Oliver Centrifugal Pump & Machine Co., Morris Bldg., Phila., $32,960; Items 1, 8, 11, 46, 47, to A. S. Cameron Steam Pump Wks., 11 Bway., New York City, $23,560. Noted Oct. 4.

★**Wash., D. C.**—Mine Filling Plant—Bureau Yards and Docks, Navy Dept., Wash., let contract building at St. Juliens Creek, Va., to Boyle-Robertson Co., Evans Bldg., $296,981.

Wash., D. C. — Roadway — Bureau of Yards and Docks, Navy Dept., received bids repairs to roadway at Naval Hospital, from R. J. Beall, 612 14th St., $10,997 and R. A. Boiseau, 5909 Blair Rd., $16,400.

★**Wash., D. C. (Anacostia)**—Timber Seaplane Hangar—Bureau Yards and Docks, Navy Dept., let contract to Barney Hocke, Ahlers Constr. Corp., 110 West 40th St., New York City, $28,816.

★**Va., Waynesboro** — Post Office — J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to Olin Gerlach, Frostburg, Md., $33,105. Noted Sept. 13.

★**Fla., Miami**—Seaplane Pier — Bureau Yards and Docks, Navy Dept., Wash., let contract to St. Johns Constr. Co., Miami.

★**Fla., Pensacola** — Concrete Road and Culvert — Bureau Yards and Docks, Navy Dept., Wash., let contract to H. Monk, 125 South Palafox St., $16,800. Noted Oct. 18.

Miss., Gulfport—Emergency Camp—Bureau Yards and Docks, Navy Dept., Wash., received low bids, (a) work complete, (b) omitting pier, road, concrete walks, drains and electrical work, (c) construction of pier, (d) net price for work in (b), (e) electric system, from J. Griffith & Son, Chicago, (a) $349,000, (b) $29[illegible],000, (c) $9500, (d) $30,000, (e) $13,600; Paschen Bros., 111 West Washington St., Chicago, (a) $504,000, (b) $416,110, (c) $13,000, (d) $46,990, (e) $18,000; Doulutt & Williams, 1016 Hibernia Bank Bldg., New Orleans, (c) $15,900.

Miss., Gulfport—Emergency Hospital — Bureau Yards and Docks, Navy Dept., Wash., received low bids, (a) work complete, (b) gas radiation in lieu steam, from J. Griffith & Son, 112 West Adams St., Chicago, (a) $84,000, (b) $75,000; W. T. Hadlow & Co., Baldwin Bldg., Jacksonville, Fla., (a) $99,227; (b) $90,216; Paschen Bros., 111 West Washington St., Chicago, (a) $136,000, (b) $120,000. Noted Oct. 18.

★**Mich., Bad Axe** — Post Office — J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to Northern Constr. Co., 421 Milwaukee St., Milwaukee, Wis., $45,628. Noted Oct. 18.

★**Ill., Flora**—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract, on Main St., to H. F. Pixley, 1st Natl. Bank.

★**Ill., Great Lakes**—Radio Building—Bureau Yards and Docks, Navy Dept., Wash., let contract distant control radio building to O. Sandstrom, 127 Genesee St., Waukegan, $4173.

★**Cal., Mare Island**—(Vallejo P. O.)—Paint Shop—Bureau Yards and Docks, Navy Dept., Wash., let contract to Knowles & Matthewson, Call Bldg., San Francisco, $56,970.

★**Cal., San Francisco**—Wharf—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract rebuilding west wing of wharf at Quarantine Sta., Angel Island to Thomson Bridge Co., 102 Main St., $25,900; time, 5 months. Noted Oct. 11.

★**Cal., Tiburon**—Building—Bureau Yards and Docks, Navy Dept., Wash., let contract building quarters for marine guard, to C. L. Wold & Co., 75 Sutter St., San Francisco, $8498. Noted Oct. 11.

★**H. T., Kuahua**—Mine Storage Building—Bureau Yards and Docks, Navy Dept., Wash., let contract, steel and frame at Naval Ammunition Depot, (work complete), to Walker & Young, 2 Merchant St., Honolulu, $53,000. Noted Oct. 11.

★**P. R., El Cayey**—Radio Towers—Bureau Yards and Docks, Navy Dept., Wash. let contract building 3 600 ft. radio towers to Pittsburg Des Moines Steel Co., Curry Bldg., Pittsburgh, Pa., $233,985. Noted Oct. 11.

MISCELLANEOUS

Proposed Work

Elevated Railway — Brooklyn, N. Y.—Brooklyn Rapid Transit Co. plans to extend company's lines into Long Island City beginning at 2nd Ave. and 39th St., Manhattan, across Queensboro bridge, pass through Dutch Kills industrial basin and by way Greenpoint Ave. bridge reach Manhattan Ave., Brooklyn, extending to Bedford Ave., thence to Brooklyn plaza of Williamsburg bridge. F. S. Williams, 85 Clinton St., pres.

Retaining Wall—Jersey City, N. J.—Bd. Educ. plans, in rear of Dickinson High School. About $20,000.

Pier—Newark, N. J.—Bd. Wks. Comrs. plan to build new 1200-ft. pier at Port Newark Terminal. About $450,000.

Elimination Grade Crossings—Paterson, N. J.—Court of Appeals has sustained order of Pub. Utility Comrs. to compel Erie R.R. to remove Paterson grade crossings. About $6,000,000.

Pier — Phila., Pa. (Official) — Dept. Wharves, Docks & Ferries, 552 Bourse Bldg., rejected bids building pier on Delaware River at Penn Treaty Park. G. S. Webster, dir. Noted Sept. 13.

Fencing Railway — Danville, Va. — See "Industrial Works."

Harbor Extension,, Etc.—Lorain, O.—J. C. Cromwell Steel Co. and National Tube Co. plans to extend Lorain Harbor and dredge Black River.

Dam and Spillway—Traverse City, Mich.—City plans to rebuild Boardman River dam and spillway, recently destroyed under uncertain circumstances. Loss, $50,000.

Transmission Line—Muscatine, Ia.—Iowa Ry. & Light Co. has been granted 25-year franchise by Bd. of State R.R. Comrs. to build and operate electric transmission lines on certain road and highways in Muscatine Co. R. S. Cook, Cedar Rapids, genl. mgr.

Dam, Etc.—Lovell, Wyo.—Lovell Canal Co. authorized $80,000 bond issue to build dam in Shoshone River. Ditches will also be built.

Dam—Windsor, Colo.—B. H. Eaton Ditch Co. plans to build 112-ft. rein.-con. diversion dam on Poudre River, 2 mi. northwest of Windsor.

Dam—Raton, N. M.—Maxwell Ditch & Reservoir Co. voted to spend $130,000 to rebuild Hebron Dam. J. Vail, pres.

Transmission Line — Cataldo, Idaho — Washington Water Power Co., of Spokane, plans to build 45-mi. electric transmission line from Cataldo via Fourth July Canyon to Cœur d'Alene. About $200,000. C. F. Uhden, ch. engr.

Transmission Line—Yuma, Ariz.—Southern Sierras Power Co., 611 Symes Bldg., Denver, Colo., plans to build electric transmission line from Yuma to mines of New Cornelia Copper Co. at Ajo, about 160 mi. C. O. Poole, 1st Natl. Bank Bldg., Riverside, Cal., ch. engr.

BIDS DESIRED

Pumping Machinery—Brockton, Mass.—Until Nov. 15, by Sewerage Comrs., City Hall. A. F. Nordbeck, chn.; advertised in this issue.

Piers—Buffalo, N. Y.—(Official)—Until Oct. 30, by Dept. Pub. Wks., building 4 new piers at Michigan Ave. viaduct, over New York Central R.R. tracks. A. W. Kreinheder, comr.

Duct Line—New York, N. Y.—Until Nov. 7, by Pub. Serv. Comn., 120 Bway., duct line for 7th Ave.-Lexington Ave. Rapid Transit R.R., consisting of 32 ducts extending under Westchester Ave. and Bronx

River Channel Improvements—Columbus, O.—Until Nov. 14, by G. A. Bardon, dir. pub. serv., widening Scioto River, also building levees, bridges, etc., advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Retaining Walls — Boston, Mass.—(Official)—See "Streets and Roads."

★**Sea Wall — Quincy, Mass.** — Com. on Waterways and Pub. Lands let contract on Houghs Neck Manet Ave. to D. F. Crowley, 648 Adams St., $70,000. Noted Aug. 30.

★**Piers and Bulkheads — Clifton, S. I., N. Y.**—See "Industrial Works."

★**Garbage Incinerator — Waukegan, Ill.**—(Official)—City let contract to J. W. Stokes Co., $10,[illegible]. Noted Oct. 4.

★**Foundations—Cleveland, O.**—Bd. Control let contract building rein.-con. foundations for extension to lighting plant to Drummond & Miller Co., Electric Bldg., $67,000.

★**Dam—Las Animas, Colo.**—Pyatt Co. let contract building [illegible] earth and Mud Creek, 2400 ft. long, 50 ft. high, to Sligo Mine Constr. Co., Idaho Bldg., Boise, Idaho.

★**Tunnel, Etc.—Los Angeles, Cal.**—City let contract concrete-lined tunnel and reinforcement and brick power house to L. Calafatas, 2324 Michigan Ave., $48,775.

PAVED ROADS FOR KANSAS

With the new Kansas Road Law six months old, practically every county has organized or is preparing plans for 365-day roads. The five-year campaign for hard surfaced highway, in a state that has lagged for years, is making good headway, according to J. Frank Smith, president of the Kansas Good Roads Association to take advantage of the liberal provisions of the new state law. Most of the permanent roads contemplated—not ones that are made on paper or with a paint brush circle on telegraph poles—will receive Federal aid, which pays 15 per cent. of the cost of the road. If the present activities can be kept going it is believed that before the end of the five-year campaign fully five thousand miles of paved roads will be financed, which will include six permanent highways across the state.

These activities for hard roads are reported from these counties:

Cloud—A petition for a brick road across the county on the White way and a concrete road across the county on the Midland Trail.

Shawnee—Two petitions, one for a brick road from Topeka to Douglas County line, another concrete road between same points over another route. A paved road from Topeka to Dover, twenty miles. A petition has also been started to pave the Capital City Highway across the county.

Jackson—Circulating petition to pave Capital City Highway across the county.

Saline—Pave the Golden Belt and Meridian Road across the county. The program is to pave twenty miles a year until the campaign is finished.

Reno—Petition circulating to ask county commissioners to call an election for bonds to build 154 miles of brick road.

Allen—Promoting campaign to vote county bonds for 150 miles of paved roads. Election will probably be held before spring.

Butler—Brick road from Eldorado to Augusta.

Douglas—Petition been signed to concrete the Midland Trail.

Mitchell—Concrete road from Beloit to Simpson and brick road west from Beloit to county line.

Brown—Pave Ocean-to-Ocean Highway and King of Trails.

Bourbon—Have built 25 miles of rock road under new law.

Barton—Except one township; petition signed to brick old Santa Fe Trail.

Clay—Brick road north from Clay Center to county line.

Washington—Plans a complete county system.

Montgomery—Plans 150 miles of gravel road.

Labette—Will build 30 miles of gravel road a year until entire county system is finished.

Sedgwick—Brick road from Wichita east to county line.

Leavenworth—Brick Midland Trail.

FINISHING THE PAVING JOB AT CORPUS CHRISTI

About 12 miles, or 200 city blocks, have been paved, additional curbing has been built and storm sewers constructed on all the paved streets and practically all the street railway tracks have been relaid during the last four years in Corpus Christi, Texas, at a cost of approximately $1,250,000, in addition to this work the city is now completing what is known as the "improvements" which involved building concrete balustrades, retaining walls and grading certain property.

Working under the plan of the city paying one-fourth of the cost and the abutting property owners three-fourths, the city in 1913 voted $150,000 for its share of the work. In 1914 it voted $75,000. In 1916, $100,000, making a total of $325,000 for street paving.

INDIANA HIGHWAY WORK

Highway building will be accentuated by the war rather than stopped, state officials announce. Plans have been completed for the building of many hundred miles of paved roads next year, at an estimated expenditure of nearly $1,500,000. One road will extend from the Great Lakes to the Ohio river and three roads will traverse the state from the Ohio to the Illinois lines. The Lincoln highway and the Dixie highway will be improved.

STATE HIGHWAY, CALIFORNIA

Bids were received by State Highway Comn., 505 Forum Bldg., Sacramento, for constructing state highway in Marin Co., from (A) Edmund Tracy, Sheldon Bldg.; (B) F. Rolandi, 550 Montgomery St.; (C) Palmer & McBryde, Hooker & Lent Bldg., all of San Francisco; (D) A. J. Fairbanks, Willits, $228,296. The unit bids of the 3 lowest bidders were as follows:

	A	B	C
97,000 cu.yd. excavation without classification	$1.00	$0.85	$0.95
738 lin.ft. 12-in. corrugated metal pipe	.75	.60	.80
746 lin.ft. 15-in. corrugated metal pipe	1.00	.70	.90
338 lin.ft. 18-in. corrugated metal pipe	1.50	.80	1.00
368 lin.ft. 24-in. corrugated metal pipe	2.00	1.00	1.10
78 lin.ft. 30-in. corrugated metal pipe	2.50	1.00	1.50
795 cu.yd. portland cement concrete, Class "A" (culverts and monorails)	6.00	15.00	15.00
15,700 cu.yd. portland cement concrete for pavement, Class "A"	4.00	4.80	4.90
195,000 sq.ft. reinforcement for pavement per 100 sq.ft.	.50	1.50	.30
5,225 lin.ft. guard rail	.70	.50	.50
201 each monuments	7.00	1.00	1.50
Extended totals	$173,347	$177,155	$186,626

BARGE CANAL WORK, ALBANY, N. Y.

Contract No. 164

Bids were received by W. W. Wotherspoon, supt. pub. wks., Capitol, Oct. 9, for completing construction of canal at certain locations between Lyons and Newark, also building retaining dam at Macedon, from (a) Lathrop, Shea & Henwood, Ellicott Sq., Buffalo; (b) Mohawk Dredge and Dock Co., Inc., Herkimer. The unit bids were as follows:

	A	B
130,780 cu.yd. excavation	$0.80	$1.29
2M.f.b.m. sheeting and bracing	60.00	75.00
54,600 cu.yd. forming embankment, 1st class	.18	.20
4,200 cu.yd. forming embankment, 2nd class	.14	.15
2,120 cu.yd. lining	2.40	2.00
2,550 lin.ft. foundation piles	.80	.45
4,080 sq.ft. furnishing ¼-in. steel sheet piling	1.15	1.20
2,550 sq.ft. furnishing ⅜-in. steel sheet piling	1.70	1.69
13,030 sq.ft. driving steel sheet piling	.25	.20
6,400 sq.ft. pulling steel sheet piling	.25	.25
1,010 cu.yd. second-class concrete	10.00	11.00
4,700 cu.yd. wash wall	2.70	3.50
37 cu.yd. relaying wash wall	1.25	1.50
310 cu.yd. fourth-class rip-rap	4.50	3.75
1,610 lin.ft. wooden fence	.45	.35
Concrete culvert (lump sum)	300.00	200.00
Cofferdams, pumping, bailing and draining (lump sum)	800.00	2,000.00
2 removing bridge superstructures	10.00	100.00
Extended totals	$159,848	$228,947

CALIFORNIA HIGHWAY WORK

At a recent meeting of the representatives from fourteen counties with the California Highway Commission at Sacramento, Cal., it was agreed to accept the plan of the commission for the expenditure of $3,000,000 appropriated by the State for the construction of seven roads. The conference decided to proceed with the work as far as the funds would permit, each county bearing its share of the expense, as far as it could be done.

The seven proposed roads have a length of 680 mi. and the estimated cost is $8,900,000. With the State's appropriation of $3,000,000 and a like amount to be provided by the counties, there is still a deficit to be cared for later. For the present the construction of the roads will proceed on the plan of dividing the expense equally between the counties and the State, using the $6,000,000 as a basis.

The following are the figures tentatively decided upon by the Commission, which the counties will be asked to approve:

Trinity lateral 102 mi., estimated cost, $1,775,000; State's portion, $393,240; county's share, $781,760.

Pacheco Pass 83.45 mi., estimated cost, $1,618,413; State's portion, $541,650, county's share, $1,076,764.

El Portal 32.45 mi., estimated cost, $533,554; State's portion, $178,560, county's share, $354,997.

Coalinga 98.25 mi., estimated cost, $1,502,538; State's portion, $448,320, county's share, $999,678.

Cholame 91.22 mi., estimated cost, $1,339,596; State's portion, $448,320, county's share, $891,275.

San Bernardino to Barstow, 76.33 mi., estimated cost, $534,112; State's portion, $178,779, county's share, $355,342.

San Bernardino to Yuma 195.86 mi., estimated cost, $2,260,462; State's portion, $756,510, county's share, $1,503,949.

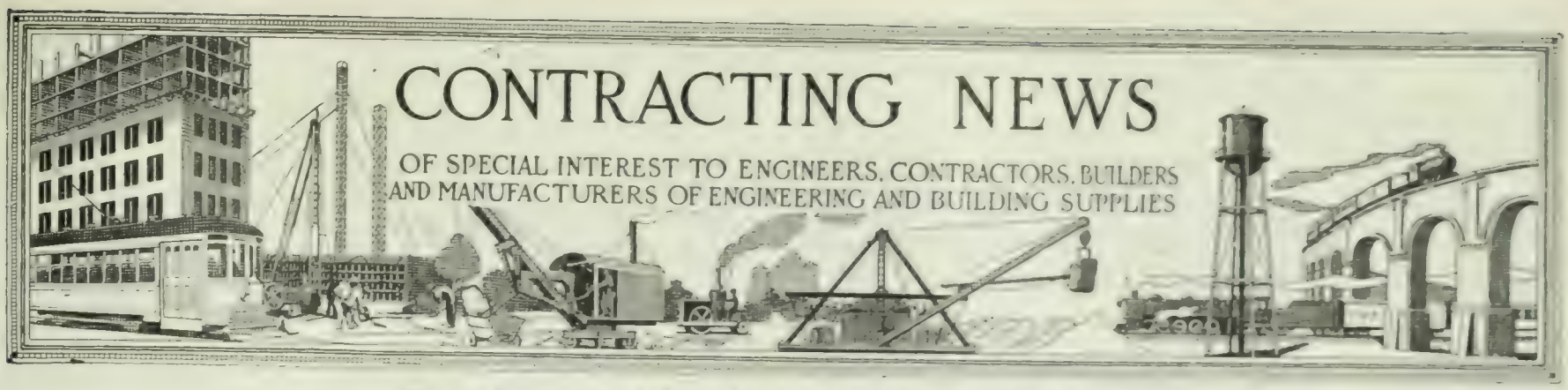
The Records of the **Bridge Builders and Structural Society,** as collected by its secretary, show that during the month of September, 1917, twenty-nine (29) per cent. of the entire capacity of the bridge and structural shops of the country was contracted for.

MISSOURI PUTS CONVICTS ON ROADS

The use of convict labor for road work was begun recently in Missouri by the State Highway Department, and the first camp has been established at Mineola. The Mineola special road district had voted bonds to pay half the cost of constructing the eight-mile link of the National Old Trails road within the district. Finding it impossible to secure local labor, the district induced the county court to make application for 30 men from the state prison. Of these, 25 are employed on the road and five for cooking, laundry and camp work. The road district pays the State Prison Board $1.25 per day for each man actually engaged in road work, and the State Highway Department will reimburse the district for half this expense as the work progresses. The $1.25 covers the cost of housing, boarding and transporting the entire camp, and also includes the salary of a foreman supplied by the prison board, and the services of the cooks and other men required to maintain the camp. Only "honor men" are employed. They work without guards and do not wear prison uniform. To obtain this labor, application must be made through the county court to the State Highway Department and the State Prison Board.

DETROIT BELT DRIVEWAY COMPLETED

Opening of the outer-belt drive of the Wayne County concrete highway system was celebrated at Detroit, Oct. 11. This marked the completion of a continuous line of about 94 miles of hard road, skirting the boundaries of the county and intersecting ten radial highways which center at Detroit.



Price advances are indicated by **heavy type**; declines by *italics*.

PIG IRON

Below are the present quotations with a comparison of a month and a year ago.

CINCINNATI	Nov. 1, 1917	One Month Ago	One Year Ago
No. 2 Southern foundry	$33.00	....	$18.90
No. 2 Northern foundry	33.00	....	21.76
NEW YORK			
No. 2X Northern foundry	34.25	....	21.50 to 22.50
No. 2 plain Northern foundry	33.75	....	21.00 to 21.50
No. 2 Southern foundry†	37.25	....	21.50 to 22.00
BIRMINGHAM			
No. 2 Southern foundry	33.00	....	16.00
CHICAGO			
No. 2 Northern foundry	33.00	....	22.00 to 22.50
No. 2 Southern foundry	37.00	....	....
PITTSBURGH			
Bessemer iron*	36.30	$36.30	24.95
Basic iron*	33.00	33.00	20.95

*These prices include the freight charge from the valley to the Pittsburgh district. †Delivered Tidewater, New York.

RAILWAY SUPPLIES

STEEL RAILS—The following quotations are per 100 lb. f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra.

	Pittsburgh		Chicago	
	Nov. 1, 1917	One Year Ago	Nov. 1 1917	One Year Ago
Standard bessemer rails	$38.00	$33.00	$38.00	$33.00
Standard openhearth rails	40.00	35.00	40.00	35.00
Light rails, 8 to 10 lb.	83.00	50.00	83.00	43.00
Light rails, 12 to 14 lb.	82.00	49.00	82.00	42.00
Light rails, 25 to 45 lb.	75.00	47.00	75.00	40.00

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh				San Fran-
	Nov. 1 1917	One Year Ago	Chicago	St. Louis	cisco
Standard railroad spikes, ¾-in. and larger	*$5.00* to 7.00	$2.65	$5.00	$6.45	$7.25*
Track bolts	7.00 to 8.00	3.25	6.25	Premium	8.80*
Standard section angle bars	*3.50*	2.00	4.50	Premium	4.65*

*Per 100 lb.

RAILWAY TIES—For fair-sized orders, the following prices per tie hold:

	Material	7 In. x 9 in. by 8 Ft. 6 In.	6 In. x 8 in. by 8 Ft.
New York	Yellow Pine	$1.30	$1.06 to 1.11
St. Louis	Plain No. 1 White Oak	1.00	.75
Chicago	White Oak	.97	.82
Chicago	Plain Creosoted	1.30	1.15
San Francisco	Green	1.08	.77
San Francisco	Creosoted	1.97	1.49

PIPE

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh, basing card in effect July 2, 1917, for iron and May 1 for steel:

BUTT WELD

Steel			Iron		
Inches	Black	Galvanized	Inches	Black	Galvanized
¾ to 3	49%	35½%	¼ to 1½	33%	12%

LAP WELD

2	42%	29½%	....	26%	12%
2½ to 6	45%	32½%	2½ to 4	28%	14%
7 to 12	42%	28½%	4½ to 6	28%	14%
13 and 14	32½%	....	7 to 12	28%	12%
15	30%	....	....	....	....

BUTT WELD, EXTRA STRONG, PLAIN ENDS

¾ to 1½	47%	34½%	¼ to 1½	43%	18%
2 to 3	48%	35½%	....	....	....

LAP WELD, EXTRA STRONG, PLAIN ENDS

2	40%	28%	....	27%	14%
2½ to 4	43%	31%	2½ to 4	33%	17%
4½ to 6	42%	30½%	4½ to 6	28%	16%
7 to 8	38%	24%	7 to 8	20%	8%
9 to 12	33%	19%	9 to 12	14%	3%

From warehouses at the places named the following discounts hold for steel pipe:

Black	New York	Chicago	St. Louis
¾ to 3 in. butt welded	38%	42%	44%
3½ to 6 in. lap welded	18%	38%	41%
7 to 12 in. lap welded	10%	35%	21-27½%

Galvanized	New York	Chicago	St. Louis
¾ to 3 in. butt welded	27½%	27½%	19-27½%
3½ to 6 in. lap welded	List	18%	13-27½%
7 to 12 in. lap welded	List to 20%	20%	9-27½%

Malleable fittings Class B and C from New York stock sell at 5 and 5% from list prices. Cast iron standard sizes 34 and 35%.

CAST-IRON PIPE—The following are prices per net ton for carload lots:

	New York						
	Nov. 1, 1917	1 Month Ago	One Year Ago	Chicago	St. Louis	San Francisco	Dallas
4 in.	*$59.50*	*$68.50*	$34.50	*$68.50*	$62.00	*$61.00*	*$57.00*
6 in. and over	*56.50*	65.50	31.50	*65.50*	49.00	*58.00*	*54.00*

Gas pipe and 16 ft. lengths are $1 per ton extra.

CLAY DRAIN TILE—The following prices are per 1000 lin.ft.

	New York						
Size, In.	Nov. 1 1917	One Year Ago	St. Louis	Chicago	San Francisco	Dallas
3	$35.00	$23.00	$18.40	$15.00	$26.25	$21.55
4	42.00	27.45	20.70	18.00	34.75	30.00
5	65.00	42.00	28.75	33.00	48.75	....
6	90.00	56.55	40.25	37.00	67.50	50.02
8	130.00	98.50	74.75	55.00	....	90.09

SEWER PIPE—The following prices are in cents per foot for carload lots:

	New York					
Size, In.	Nov. 1 1917	One Year Ago	St. Louis	Chicago	San Francisco	Dallas
3	$0.093	$0.075	....	$0.09	$0.75	$0.1035
4	.093	.075	....	.10	.10	.1032
5	1.395	12	....	14	14	1.38
6	1.395	12	$0.11	15	.15	.1548
8	.17	150	165	.21	.225	.215
10	.3255	24	.18	.315	.30	.301
12	.4185	30	.33	.405	....	.387
15	.558	.405	.50	.54	.40	.516
18	.775	.57	.55	.75	.75	.731
20	.93	.675	.60	.9	.96	.89
24	1.674	90	1.13	1.20	....	1.118
27	1.395	.975	1.38	1.35	1.375	1.29
27	2.08	1.575	1.52	....	....	1.935
30	2.304	1.725	1.50	....	....	1.935
33	3.06	1.875	1.75	....	....	3.05
36	3.485	2.04	1.80	....	....	3.44

	Boston	St. Paul	Kansas City	Denver	Los Angeles	Seattle
3	$0.090	$0.084	$0.10	$0.09	$0.09	$0.075
5	1.485	1.26	.135	18	10	1.38
8	231	.175	18	25	.18	1.725
12	4455	315	.36	40	32	1.725
24	1.485	1.35	1.35	1.35	1.125	....
36	3.69	2.85	3.25	3.00	....	....

ROAD AND PAVING MATERIALS

ROAD OILS—Following are prices in tank cars 8000 gal. minimum f.o.b. places named:

	Nov. 1 1917 Quoted	Month Ago Quoted
St. Louis, 40-50% asphalt	6½c.	6c.
Chicago, 15-20% asphalt	8½c.	8½c.
Chicago, 40-50% asphalt	8½c.	8½c.
Chicago, Texas	6½c.	6½c.
Dallas, 40-50%	8c.	8c.
Dallas, 75-80%	9c.	9c.
Dallas, 75-80% asphalt	9c.	9c.
San Francisco, 75-80% asphalt	$1.92½ to $2.07½ per bbl.	$1.92½ to $2.07½ per bbl.

ASPHALTUM—Prices per ton in carload lots, bulk or barrels, lots:

	Road	Package	Bulk
New York	Texas	$50.00	
New York	Mexican	38.00	$30.00
Chicago	Mexican	35.00	17.50
St. Louis	Texas or Mexican	42.00	19.50
St. Louis	Selenite	42.00	17.50
San Francisco	Coalinga	40.00	18.50
Dallas	Trinidad and Mexican	42.00	17.00
Seattle	Mexican	45.00	
Denver	Trinidad	44.00	
Kansas City	Texas	40.00	
St. Paul	Trinidad	44.00	

PAVING STONE—

		Nov. 1 1917
New York	Manhattan	$0.50
New York	Other boroughs	0.40
Chicago	Asphalt, Kentucky	0.40
St. Paul	Asphalt, Kentucky	0.40
San Francisco	Asphalt, Kentucky	0.40
Kansas City	Asphalt, Kentucky	0.40
Boston	Asphalt, Kentucky	0.40

FLAGGING—

		Nov. 1 1917
New York	Bluestone	$0.17 sq.ft.
	Flagstone	.18 sq.ft.
	Granite 2-ft. strips	.19 sq.ft.
	5x20-in. cross-walk	.30 sq.ft.
Chicago	18-in. strip	.75 sq.ft.

WOOD BLOCK PAVING—

	Size of Block	Treatment	Per Sq Yd
New York	3½	16	$2.00
New York	4	16	2.25
[illegible]	4	16	1.85
[illegible]	City specifications		1.70
Chicago	3½	16	1.80
St. Louis	4	16	2.03
St. Louis	4	16	2.35
Seattle	4	20	*
Boston	4	20	*
Kansas City	4	16	2.50
St. Paul	3½	16	2.00
San Francisco	3	16	2.15
San Francisco	3½	16	2.26
San Francisco	4	16	2.57

*Market [illegible] of lumber situation

CURBING—Prices per linear foot are as follows:

New York	6 x 10	$0.45
	5 x 20	.50
Chicago	6 x 18	.60
St. Louis	5x18 square edge	.72
San Francisco	5 x 10	.75
	5 x 20	.85

CONSTRUCTION MATERIALS

SAND AND GRAVEL—Price for cargo or carload lots is as follows, per cu.yd.

	Gravel 1½ In.		Gravel ¾ In.		Sand	
	Nov. 1, 1917	One Yr. Ago	Nov. 1, 1917	One Yr Ago	Nov. 1 1917	One Yr Ago
New York	$1.10	$1.00	$1.50	$1.10	$0.50	$0.50
St. Louis	1.11	.70	1.11	.70	1.11	.60
Chicago	1.40	1.00	1.40	1.00	1.40	.75
Dallas	1.50		1.50	....	1.35	....
San Francisco	1.00	1.00	1.00	1.00	1.00	1.00
Los Angeles	.85		.85		.35	....
Denver	1.40		1.40		.95	....
Seattle	.80		.80		.80	....
Boston	1.50		1.60		.80	....
Kansas City	2.15		2.60		.60	....
St. Paul	1.10		1.40		.50	....

CRUSHED STONE—Price for cargo or carload lots is as follows, per cu.yd.:

	1½ In. Nov. 1 1917	1½ In. One Year Ago	¾ In. Nov. 1 1917	¾ In. One Year Ago
New York	*$1.15 to 1.35	$0.90	*$1.25 to 1.35	$1.00
Chicago	1.40	.85	1.40	.95
St. Louis	1.35	1.00	1.35	1.00
Dallas	1.41		1.49	....
San Francisco	1.00	1.00	1.00	1.00
Los Angeles	.95		1.00	....
Denver	1.40		1.40	....
Seattle	1.10		1.10	....
Kansas City	1.60		1.70	....
Boston	1.40		1.40	....
St. Paul	1.00		1.10	....

LIME—Warehouse prices:

	Hydrated per Ton Finishal	Hydrated per Ton Common	Lump per 300 Lb Barrel Finished	Lump per 300 Lb Barrel Common
New York	$10.50		$1.10	
Chicago	11.00	12.00	1.90	1.20
St. Louis	13.00	....	....	1.30
Dallas	20.00	15.00	....	....
San Francisco	16.50	....	....	1.65

Note—Refund of 10c. per bag amounting to $2 per ton.

ROSENDALE NATURAL CEMENT—Price to dealers for 500 lb. or over f.o.b. building bags:

New York	$1.15

Ten cents for bags

PORTLAND CEMENT—Prices are for barrels in carload lots, including bags:

	Nov. 1 1917	One Month Ago	One Year Ago
New York	$1.[illegible]	$[illegible]	$1.77
[illegible]	1.[illegible]9	2.16	1.60
[illegible]	1.[illegible]7	2.77	1.92
[illegible]	1.[illegible]1	2.21	1.86
[illegible]	1.[illegible]1	2.31	1.81
[illegible]	1.[illegible]3	2.34	1.94
[illegible]	1.[illegible]0	[illegible]40	1.95
[illegible]	[illegible]	[illegible]	1.99
[illegible]	[illegible]	[illegible]45	1.99
[illegible]	[illegible]3	2.33	1.98
[illegible]	[illegible]	[illegible]5	2.13
[illegible]	[illegible]	[illegible]0	[illegible]
[illegible]	[illegible]3	2.33	1.98
[illegible]	[illegible]8	[illegible]8	2.09
[illegible]	[illegible]3	[illegible]3	2.04
[illegible]	[illegible]2	[illegible]5	1.85
[illegible]	[illegible]0	[illegible]00	
[illegible]	[illegible]0	2.30	[illegible]30
[illegible]	[illegible]0	2.10	
[illegible]	[illegible]0	[illegible]	
[illegible]	[illegible]4	[illegible]4	
[illegible]	[illegible]5	[illegible]5	
[illegible]	[illegible]	[illegible]5	

TRIANGLE MESH REINFORCEMENT—Price per 100 sq.ft. in carload lots

STYLE [illegible] x 4-IN. MESH

Number	Nominal Area Square Inches per Foot Width	Price	[illegible]	Chicago	St. Louis	Dallas	San Francisco
[illegible]	[illegible]	$[illegible]	$[illegible]	$[illegible]52	$[illegible]94	$1.06	1.27
049	[illegible]039	[illegible]10	[illegible]10	1.[illegible]	1.[illegible]0	1.24	1.[illegible]3
065	[illegible]052	[illegible]14	[illegible]14	1.[illegible]3	1.[illegible]3	1.[illegible]8	2.04
097	[illegible]078	[illegible]20	1.80	1.[illegible]91	1.[illegible]91	2.17	2.62
113	[illegible]091	[illegible]23	[illegible]23	[illegible]44	[illegible]44	2.74	[illegible]26
132	[illegible]106	[illegible]27	[illegible]27	[illegible]01	[illegible]01	3.27	3.32
185	[illegible]148	[illegible]38	[illegible]38	3.31	3.24	3.76	
243	[illegible]195	4.17	4.17	4.[illegible]5	4.41	4.96	5.67
287	[illegible]230	4.93	[illegible]93	[illegible]13	[illegible]12	5.72	6.94
336	[illegible]269	[illegible]56	[illegible]56	[illegible]40	[illegible]52	6.66	

PLAIN 4-IN. x 8-IN. MESH

036P	0.036	.69	.71	.72	.73	.82	....
053P	0.053	.97	1.01	1.02	1.03	1.16	....
072P	0.072	1.26	1.30	1.32	1.33	1.50	....
097P	0.097	1.62	1.68	1.70	1.71	1.93	....
049R	0.049	.97	1.01	1.02	1.03	1.15	1.97
067R	0.067	1.26	1.30	1.32	1.33	1.50	....
089R	0.089	1.62	1.68	1.70	1.71	1.93	....

Made in 16-, 20-, 24-, 28-, 32-, 36-, 40-, 44-, 48-, 52- and 56-in. width in rolls 150-, 200- and 300-ft. lengths.
Galvanized runs about 10% higher than plain.

EXPANDED METAL LATH—Prices per 100 yd. for painted are as follows:

		Carload New York Nov. 1, 1917	Carload New York One Year Ago	Chicago	St. Louis	San Francisco	Dallas
Gage	Weight						
27	233	$31.00	$18.00	$31.00	$34.00	$29.00	$32.00
26	250	32.05	19.00	32.00	35.00	30.25	....
25	300	33.15	20.00	33.00	....	.... *	35.00
24	340	34.25	21.00	34.00	37.00	33.00	36.00
22	450	36.45	24.00	36.00	....	.... *	....

*Not carried.
About 10% additional for smaller quantities.

BARS, CONCRETE REINFORCING—The following quotations are per 100 lb.:

ROLLED FROM BILLETS

	Warehouse New York Nov. 1, 1917	Warehouse New York One Year Ago	Warehouse St. Louis	Warehouse Chicago	Warehouse San Francisco	Warehouse Dallas
In. Mill Shipment						
¾ and larger. ...*	$5.10	$3.35	$2.90†	$4.50	$6.50	$4.75
⅝ ...*	5.15	3.45	2.95†	4.55	6.55	4.80
½ ...*	5.20	3.50	3.00†	4.60	6.60	4.85
⅜ ...*	5.35	3.75	3.15†	4.75	6.75	5.00
¼ ...*	5.60	4.10	3.40†	5.00	7.00	6.00

*Mill quotations on actual specifications.
†St. Louis: Nominal Government price.

ROLLED FROM RAILS

	Dallas		Dallas
¾ in. and larger	$4.75	⅜	$5.00
⅝	4.80	¼	6.00
½	4.85		

BRICK—To contractors the price per 1000 in cargo or carload lots is as follows:

	Common Nov. 1, 1917	Common One Month Ago	Common One Year Ago	Paving Brick	Paving Block
New York	$8.25	$8.25	$7.75	$32.00	$38.00
Boston	13.25	13.25	....	....	25.00
Chicago	8.00	8.00	6.00	....	....
St. Louis, salmon	8.00	8.00	7.00	....	....
St. Louis, selected	10.00	10.00	10.00	....	....
Denver	8.00	8.00	....	....	....
Los Angeles	7.50	6.50	....	....	28.00
San Francisco	10.00	10.00	10.00	....	....
Dallas	8.60	8.60	....	22.00	22.50
Kansas City	11.00	11.00	....	....	23.00
St Paul	8.70	8.70	....	....	....
Seattle	9.00	9.00	....	....	28.75

HOLLOW TILE—Hollow building tile price per block in cents:

	New York Nov. 1, 1917	New York One Year Ago	Chicago	St. Louis	San Francisco	Dallas
4x12x12	$0.0925	$0.075	$0.079	$0.054	$0.0825	$0.075
8x12x12	.1295	.104	.120	.066	.11	.10
8x12x12	.15725	.1266	.135	.09	.1275	.14
10x12x12	.185	.149	.1607	.15	.20	.16
12x12x12	.23125	.1875	.19285	.18	.22	.21

	4x12x12	8x12x12	12x12x12
Boston	$0.0957	$0.171	$0.2266
Kansas City	.058	.112	.1575
Denver	.11	.20	.30
Los Angeles	.055	.10	.165
Seattle	.06	.10	.16
St Paul	.055	.138	.153

STRUCTURAL MATERIAL—The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Pittsburgh	New York Nov. 1, 1917	New York 1 Yr. Ago	St. Louis	Chicago	San Francisco	Dallas
Beams, 3 to 15 in.	$3.00	$5.25	$3.85	$5.05	$5.00	$7.75	$6.00
Channels, 3 to 15 in.	3.00	5.25	3.25	5.05	5.00	7.75	6.00
Angles, 3 to 6 in., ¼ in. thick	3.00	5.25	3.25	5.05	5.00	7.75	6.00
Tees, 3 in. and larger	3.00	5.30	3.40	5.05	5.05	7.75	6.00
Plates	3.25	10.00	4.00	7.05	7.00	10.50	9.00

RIVETS—The following quotations are per 100 lb.:

STRUCTURAL

	Mill Pittsburgh	Warehouse New York Nov. 1, 1917	Warehouse New York One Year Ago	Warehouse Chicago	Warehouse St. Louis	Warehouse San Francisco	Warehouse Dallas
⅞ in. and larger.	$5.25	$7.00	$5.25	$5.50	$5.55	$7.15	$8.40

CONE HEAD BOILER

⅞ in. and larger	5.35	7.10	5.35	5.60	5.65	7.25	8.50
¾ and ⅞	5.50	7.25	5.50	5.75	5.80	7.40	8.65
⅝ and ¾	5.85	7.60	5.85	6.10	6.15	7.75	9.00

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York, St. Louis, Chicago and San Francisco:

	1-Ply c.l.	1-Ply l.c.l.	2-Ply c.l.	2-Ply l.c.l.	3-Ply c.l.	3-Ply l.c.l.
No. 1 grade	$1.15	$1.40	$1.45	$1.60	$1.75	$1.90
No. 2 grade	1.10	1.25	1.25	1.40	1.50	1.65

[illegible] asphalt saturated felt (14 lb. per square) costs $6.50 per 100 lb.

[illegible]-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $1.85 per roll in carload lots and $2.10 for smaller quantities.

Shingles, red and green slate finish, cost $4.75 per square in carloads, $5 in smaller quantities, in Philadelphia.

ROOFING MATERIALS—Prices per ton f.o.b. New York or Chicago:

	Carload Lots	Less Than Carload Lots
Tar felt (14 lb. per square of 100 sq.ft.)	$61.00	$62.00
Tar pitch (in 400-lb. bbl.)	15.00	16.50
Asphalt pitch (in barrels)	29.00	30.50
Asphalt felt	60.00	62.00

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill:

Blue Annealed	Large Lots, Pittsburgh	St. Louis	Chicago	*San Francisco	—New York— Nov. 1, 1917	One Yr. Ago
No. 10	6.00	8.05	8.00	11.00	10.00	4.25
No. 12	6.05	8.10	8.05	11.05	10.05	4.30
No. 14	6.10	8.15	8.10	11.10	10.10	4.35
Black						
Nos. 18 and 20	5.80	9.35	8.30	10.30	9.30	3.80
Nos. 22 and 24	5.85	9.40	8.35	10.85	9.35	3.85
No. 26	5.90	9.45	8.40	10.90	9.40	3.90
No. 27	5.95	9.50	8.45	10.95	9.45	3.95
No. 28	6.00	9.55	8.50	11.00	9.50	4.00
Galvanized						
No. 10	6.50	8.35	8.70	....	10.80	....
No. 12	6.60	8.50	8.70	11.40	10.90	4.50
No. 14	6.60	8.65	8.70	11.40	10.90	4.50
Nos. 18 and 20	6.90	8.95	9.00	11.70	11.25	4.90
Nos. 22 and 24	7.05	9.10	9.15	11.85	10.55	5.30
No. 26	7.20	9.25	9.20	12.00	10.70	5.45
No. 28	7.50	9.55	9.50	12.30	11.00	5.75

LINSEED OIL—These prices are per gallon:

	—New York— Nov. 1, 1917	One Year Ago	— Cleveland — Nov. 1, 1917	One Year Ago	— Chicago — Nov. 1, 1917	One Year Ago
Raw in barrels	$1.16	$0.88	$1.15	$0.97	$1.17	$0.92
5-gal. cans	1.26	.98	1.25	1.07	1.27	1.02

WHITE AND RED LEAD in 500-lb. lots sell as follows in cents per pound:

	—Red— Nov. 1, 1917 Dry	In Oil	1 Year Ago Dry	In Oil	—White— Nov. 1, 1917 Dry and In Oil	1 Yr. Ago Dry and In Oil
100-lb. keg	12.25	12.50	10.50	11.00	12.00	10.50
25- and 50-lb. kegs	12.50	12.75	10.75	11.25	12.25	10.75
12½-lb. keg	12.75	13.00	11.00	11.50	12.50	11.00
1- to 5-lb. cans	14.25	14.50	12.50	12.50	14.50	12.50

LUMBER*—Price per M in carload lots:

Rough Douglas Fir. No. 1 Common—More than carload lots in San Francisco:

Size in Inches	15 Ft. and Under	16 to 24 Ft.	25 to 32 Ft.
3 and 4x4	$24.00	$25.50	....
3 and 4x6 and 8	24.00	24.50	$25.50
6x6 and 8x8	24.50	25.50	25.50
3 and 4x10	24.00	25.50	26.50
6 and 8x10	25.00	26.00	27.00
3 and 4x12	24.00	25.50	26.50
6 and 8x12	25.50	26.50	26.50
10 and 12x12	25.00	25.00	27.00
3 and 4x14	25.00	27.00	28.00
6 and 8x14	26.50	27.50	27.50
7 and 9x14	27.50	28.50	28.50
10 and 12x14	26.00	26.00	28.00

Square Edge and Sound Green

	—Southern Pine— New York — 20 Ft and Under	22-24 Ft	—Chicago— 20 Ft and Under	22-24 Ft	Yellow Pine —St. Louis— 20 Ft and Under	22-24 Ft
3x 4 to 8x 8	$33.75	$35.75	$31.75	$33.75	$28.75	$30.75
3x10 to 10x10	34.75	38.75	32.75	34.75	29.75	31.75
3x12 to 12x12	40.75	42.75	38.75	40.75	35.75	37.75
3x14 to 14x14	42.75	44.75	40.75	42.75	37.75	39.75
3x16 to 16x16	45.75	47.75	43.75	45.75	40.75	42.75
3x18 to 18x18	48.75	50.75	46.75	48.75	43.75	46.75
4x20 to 20x20	51.75	53.75	49.75	51.75	46.75	48.75

Over 24 ft.—Add $1 for each additional 2 ft. in length up to 40 ft. for sizes 12 x 12 and under; for sizes over 12 x 12 add $2. For merchantable add $2 to sizes 10 x 10 and under. For prime add $2 to the price of merchantable for all sizes.

Prices from Lumberman's Bureau.

	—8 x 8 In. x 20 Ft. and Under— Y P	Fir	Hemlock	Spruce	12 x 12 In. 20 Ft. and Under Y P	Fir
Kansas City	$11.00	$21.00	$23.00	....	$17.00	$23.00
Seattle	21.00	21.00	21.00	$21.00	21.00	21.00
Denver	....	30.00	....	27.50	....	27.00
San Francisco	....	24.00	24.00	....	....	24.00
St. Paul	....	28.00	31.50	....	....	43.00

Note—Boston lumber market demoralized.

	1 In. Rough 10 In. x 16 Ft. and Under Y P	Fir	Hemlock	2 In. T. and G. 10 In. x 16 Ft. Y P	Fir
Kansas City	$17.00	$21.00	$17.00	$17.00	....
Seattle	21.00	21.00	21.00	21.00	$21.00
Los Angeles	....	30.00	30.00	....	....
Denver	....	30.00	24.00	....	30.00
San Francisco	....	24.00	24.00	....	24.00
St. Paul	....	51.00	34.00	59.00	37.50

NAILS—The following quotations are per keg from warehouse:

	Pittsburgh	St. Louis	Denver	Chicago	San Francisco	Dallas
Wire	$2.20	$4.00	$4.00	$4.45	$4.60	$4.50
Cut	2.70	5.00	5.00	4.60	6.15	....

MISCELLANEOUS

FREIGHT RATES—On finished steel products in the Pittsburgh district, including plates, structural shapes, merchant steel bars, pipe fittings, plain and galvanized wire nails, rivets, spikes, bolts, flat sheets (except planished), chains, etc., the following freight rates are effective in cents per 100 lb.:

Boston	21.5	New Orleans	30.7
Buffalo	11.6	New York	10.5
Chicago	18.9	Pacific Coast (all rail)	75.0
Cincinnati	15.8	Philadelphia	18.1
Cleveland	10.5	St. Louis	23.6
Denver	68.6	St. Paul	35.9
Kansas City	43.6		

WATER TREATMENT CHEMICALS—Prices per pound are as follows:

	New York	Chicago
Sulphate of alumina (iron free) in 400 lb. barrel	$0.045	....
Hypochlorite of lime (bleaching powder), in 700-lb. drums	.03	$0.04
Soda ash in 400 lb. bbl.	.05	.04
Liquid chlorine in 100 lb. cylinders	.175	16 to 18

Lime is quoted separately.

CONTRACTORS' MISCELLANEOUS SUPPLIES

STEEL SHEET PILING—The following price is base per 100 lb. f.o.b. Pittsburgh, with a comparison of a month and a year ago:

Nov. 1 1917	One Month Ago	One Year Ago
$4.00 to $5.00	$4.50 to $5.00	$2.60 to $2.70

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York	St. Louis	Chicago	San Francisco
Galvanized	10—2½%	10—2½%	10—2½%	List
Bright	20—2½%	20—2½%	20—2½%	15%

MANILA ROPE—For rope smaller than ½-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ½-in., 8 ft.; ⅝-in., 6; ¾-in., 4½; 1-in., 3½; 1¼-in., 2 ft. 10 in.; 1½-in., 2 ft. 4 in. Following is price per pound for ½-in. and larger, in 1200-ft. coils:

Boston	$0.35½	Kansas City	$0.33½
New York	.34	Los Angeles	.33½
Chicago	.32½	Seattle	.33½
Denver	.35½	San Francisco	.31

EXPLOSIVES—Price per pound in small lots at cities named:

	Low Freezing 20%	40%	60%	80%	Black Powder
New York	....	$0.27½	$0.44½	....	$.50*
Boston	....	....	.38¾	$0.44¾	....
Kansas City	$0.20	.26	.34¼	.43¼	....
Los Angeles	.20	.27	.35	....	....
Seattle	.18½	.24¾	.31¾	.41¾	....
Chicago	.19¾	.23¾	.33	.43	.44*
St. Paul	.20	.26¾	.34¼	....	....
St. Louis	.16½	.20½	.29½	.39½	.44*
Denver	.19	.25	.33¼	.42¾	....
Dallas	.25	.29	.39	.49	....

*25-lb. bags

POLES—Prices on Western red cedar poles:

	—New York— Nov. 1 1917	One Year Ago	Chicago	St. Louis	Denver
6 in. by 30 ft.	$5.59	$4.77	$4.24	$4.04	$4.80
7 in. by 30 ft.	7.40	5.90	6.60	6.40	7.80
7 in. by 35 ft.	10.70	....	9.60	9.40	8.55
8 in. by 30 ft.	11.50	9.75	10.60	10.40	9.80
7 in. by 40 ft.	14.35	9.65	11.60	11.40	9.75
8 in. by 40 ft.	13.75	....	12.15	11.45	10.95
*8 in. by 45 ft.	18.20	14.45	14.05	14.30	14.50
*8 in. by 50 ft.	21.85	16.85	16.45	16.45	17.45

*10c. higher (trade) rates on account of double loads.

OLD MATERIAL—The prices following are per gross ton paid to dealers and producers in New York, in Chicago and St. Louis the quotations are net cut top and some deliveries at the mill's works, including freight transfer charges.

	New York Nov. 1 1917	One Month Ago	One Year Ago
Heavy melting steel scrap	$ 0.00 to $ 0.00	$ 0.00 to $ 0.00	$ 0.00 to $ 0.00
No. 1 railroad wrought	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00
Steel axles	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00
No. 1 machinery cast	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00
Machine shop turnings	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00
Cast borings	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00
Railroad malleable	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00

	Chicago Nov. 1 1917	One Month Ago	One Year Ago
No. 1 railroad wrought	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00
Steel axles	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00
No. 1 machinery cast	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00
Machine shop turnings	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00
Cast borings	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00
Railroad malleable	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00

	St. Louis Nov. 1 1917	One Month Ago	One Year Ago
No. 1 railroad wrought	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00
Steel axles	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00
No. 1 machinery cast	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00
Machine shop turnings	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00
Cast borings	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00
Railroad malleable	0.00 to 0.00	0.00 to 0.00	0.00 to 0.00

Proposals

For Proposals Advertised See Pages 82 to 84 Inclusive

WATER-WORKS

Bids Close		See Eng. News-Record
Nov. 5	Moberly, Mo.	Nov. 1
Nov. 7	Tonawanda, N. Y.	Oct. 18
Nov. 8.	Peqiuer, Neb.	Nov. 1
Nov. 10.	Winnipeg, Man. Adv. Nov. 1.	Nov. 1
Nov. 15.	Chapleau, Ont.	Nov. 1

SEWERS

Bids Close		See Eng. News-Record
Nov. 3.	Altamont, N. Y. Adv. Oct. 25.	Oct. 25
Nov. 5.	Cheyenne, Wyo.	Oct. 25
Nov. 5.	St. Paul, Minn.	Nov. 1
Nov. 6	Eagle Lake, Tex.	Nov. 1
Nov. 6.	Kansas City, Mo.	Nov. 1
Nov. 7.	Canton, O.	Nov. 1
Nov. 8.	Jersey City, N. J.	Nov. 1
Nov. 9.	Brooklyn, N. Y.	Nov. 1
Nov. 12.	Pleasantville, N. J. Adv. Nov. 1.	Nov. 1
Nov. 14.	Niles, O.	Nov. 1
Nov. 19.	Brainerd, Minn.	Nov. 1
Nov. 26.	Oil City, Pa.	Nov. 1

BRIDGES

Bids Close		See Eng. News-Record
Nov. 5.	Utica, Ill.	Nov. 1
Nov. 6.	Watonga, Okla.	Nov. 1
Nov. 6.	Oswego, Kan. Adv. Oct. 18 and 25.	Oct. 18
Nov. 6.	Dallas, Tex. Adv. Oct. 11 and 18.	Oct. 11
Nov. 6.	Little Falls, Minn.	Oct. 18
Nov. 8.	Stillwater, Okla.	Nov. 1
Nov. 12.	Minneapolis, Minn.	Oct. 25
Nov. 17.	Charleston, S. C.	Nov. 1

STREETS AND ROADS

Bids Close		See Eng. News-Record
Nov. 2.	Brooklyn, N. Y.	Nov. 1
Nov. 5.	Bloomfield, N. J.	Oct. 25
Nov. 5.	Coffeeville, Miss.	Oct. 18
Nov. 5.	Des Moines, Ia.	Nov. 1
Nov. 5.	Oakland, Cal.	Nov. 1
Nov. 6.	Indiana	Oct. 11
Nov. 8.	Pennsylvania Adv. Oct. 25 and Nov. 1.	Oct. 18
Nov. 10	Gibson, Ga.	Nov. 1
Nov. 12.	California	Nov. 1
Nov. 15.	Clarksville, Tenn.	Nov. 1
Nov. 16.	Cincinnati, O.	Nov. 1
Nov. 19.	Seattle, Wash.	Nov. 1
Nov. 19.	Brewton, Ala.	Nov. 1
Nov. 20.	Holdredge, Neb.	Nov. 1
Nov. 22.	Hindman, Ky.	Oct. 25
Nov. 23.	Kendallville, Ind.	Oct. 25

EXCAVATION AND DREDGING

Bids Close		See Eng. News-Record
Nov. 2.	Armour, S. D.	Nov. 1
Nov. 7.	Lincoln, Neb.	Oct. 25
Nov. 7.	Mason City, Ia.	Nov. 1
Nov. 8.	Harrisonville, Mo.	Oct. 25
Nov. 8.	Ft. Dodge, Ia.	Nov. 1
Nov. 9.	St. Cloud, Minn.	Sept. 27
Nov. 12.	Havana, Ill.	Nov. 1
Nov. 13.	Granite Falls, Minn.	Nov. 1
Nov. 15.	Garden Prairie, Ill.	Nov. 1
Nov. 16.	Madison, Wis.	Nov. 1

BUILDINGS

Bids Close		See Eng. News-Record
Nov. 7.	Bellefontaine, O.	Nov. 1
Nov. 12.	Eldorado, Tex.	Nov. 1
Nov. 12.	Cleveland, O.	Nov. 1
Nov. 12.	Tallahassee, Fla.	Nov. 1
Nov. 13.	Palo Alta, Cal.	Nov. 1
Nov. 15.	Northampton, Mass.	Oct. 25
Nov. 25.	Middletown, Mass.	Oct. 4
Dec. 1.	Norfolk, Va.	S 13

MISCELLANEOUS

Bids Close		See Eng. News-Record
Nov. 5.	Incinerator — Okmulgee, Okla.	Nov. 1
Nov. 7.	Duct Line, New York, N. Y.	Oct. 25
Nov. 13.	Channel Improvements — Columbus, O. Adv. Oct. 25.	Oct. 25
Nov. 15.	Pumping Machinery — Brockton, Mass. Adv. Oct. 25 and Nov. 1.	Oct. 25
Nov. 15.	Flood Control—Dayton, O. Adv. Sept. 13 to Oct. 18.	Sept. 13

FEDERAL GOVERNMENT WORK

Bids Close		See Eng. News-Record
Nov. 5.	Post Office — Burlington, N. C.	Oct. 4
Nov. 5.	Tank and Tower—Philadelphia, Pa.	Oct. 25
Nov. 5	Steel Tower — Charleston, S. C.	Oct. 25
Nov. 5	Steel Tower—Norfolk, Va.	Oct. 25
Nov. 5	Extension General Storehouse—Newport, R. I.	Nov. 1
Nov. 5	Machine Shop — Washington, D. C.	Nov. 1
Nov. 5	Distributing System — Charleston, W. Va.	Nov. 1
Nov. 6	Bridge—Towaoc, Colo.	Oct. 18
Nov. 7	Buildings — Elbowoods, N. D.	Oct. 18
Nov. 8.	Levee Work — Vicksburg, Miss. Adv. Oct. 18 to Nov. 1.	Oct. 18
Nov. 8.	Piers, etc.—Detroit, Mich. Adv. Oct. 11 to Nov. 1.	Oct. 11
Nov. 9.	Post Office—Forsyth, Ga.	Oct. 11
Nov. 12.	Emergency Hospital—Brooklyn, N. Y.	Nov. 1
Nov. 13.	Piles, Walling and Lumber —New Orleans, La. Adv. Nov. 1.	Nov. 1
Nov. 13	Post Office—Harrisonville, Mo.	Oct. 11
Nov. 14.	Post Office—Austin, Tex.	Oct. 11
Nov. 15.	Canals—El Paso, Tex. Adv. Oct. 18.	Oct. 18
Nov. 16.	Maneuver Boats — Wheeling, W. Va. Adv. Oct. 18.	Oct. 18
Nov. 19.	Fitting out Cranes—Washington, D. C.	Oct 18
Nov. 19.	Shipbuilding Ways — Brooklyn, N. Y.	Oct. 25
Nov. 19.	Electric Elevator—Norfolk, Va.	Nov. 1
Nov. 19.	Refrigerating Plant and Brine Circulating System—Washington, D. C.	Nov. 1
Nov. 19.	Timber Bulkheads, Boston, Mass.	Nov. 1
Nov. 20.	Bridge—Washington, D. C.	Nov. 1
Nov. 20.	Post Office—Caribou, Me.	Oct. 18
Nov. 22.	Post Office—Basin, Wyo.	Oct. 25
Nov. 23.	Post Office — Woodbury, N. J.	Oct. 25
Nov. 26.	Dry Dock Crane, Wash., D. C.	Oct. 25
Nov. 26.	Steel Towers—Washington, D. C.	Nov. 1
Nov. 27.	Post Office—Chapel Hill, N. C.	Oct. 25
Nov. 27.	Stone—New Orleans, La. Adv. Nov. 1.	Nov. 1
Nov. 28.	Post Office — Bellefourche, S. D.	Oct. 11
Nov. 30.	Post Office—Buffalo, Wyo. Adv. Nov. 1.	Nov. 1
Nov. 30.	Machinery, etc. — Cincinnati, O.	Nov. 1
Dec. 5.	Post Office—Decatur, Ala.	Nov. 1
Dec. 18.	Laterals — Torrington, Wyo.	Nov. 1

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official.

WATER-WORKS

Proposed Work

Mass., Agawam — Town sold $25,000 bonds to build water-works system. E. A. Kellog, chn. comrs.

N. Y., Olean—(Official)—City having peliminary plans prepared building filtration plant; including 6 motor driven centrifugal pumps, concrete mixing, chambers, coagulating basins, filters, clearwell and brick operating building. E. H. Atwood, c/o Vacuum Oil Co., Olean, engr. Noted Oct. 18.

N. Y., Rochester—City plans election soon to vote on $75,000 bond issue to improve water-works system. E. T. Elwood, city engr.

N. C., Benson—City having plans prepared by G. C. White, engr., Durham, to build water-works and sewerage systems.

Miss., Pascagoula—International Shipbuilding Co. plans to build water-works system for shipyards and residential district.

O., Plymouth—Village election in November to vote on $18,000 bond issue to build filtration plant. E. L. Buckart, supt.

O., West Park — Town to sell $35,000 bonds Nov. 26, to extend and improve water-works system. F. Fouchter, clk.

Ind., Bristol—Town plans to build water-works system.

Mich., Jackson — (Official)—City had plans prepared by S. G. Pollard, engr., 3422 Burch Ave., Cincinnati, O., for water-works improvements, including artesian wells, electrically operated pumping station and 6200 ft. 20-24-in. wood or cement pipe. About $70,000. Noted Oct. 4.

Ia., Red Oak—See "Sewers."

Kan., Eldorado—City plans to install filtration plant. About $20,000. W. H. Betz, supt.

Tex., Beaumont—City election Nov. 17 to vote on $300,000 bond issue to build water-works system. C. L. Scherer, city engr.

Okla., Indiahoma — City voted $15,000 bonds to build water-works system. A. Finigan, pres. Noted Sept. 13.

Okla., Madill — City plans election to vote on bond issue to improve water-works system.

Wash., Othello—City election Nov. 19 to vote on $14,000 bond issue to improve water-works system. Noted Apr. 12.

Water-Works (Continued)

Wash., Seattle—City having plans prepared extending Cedar River water-works system. About $3,700,000. A. H. Dimock, city engr.

Ore., Monmouth—A. J. Pepin, Chitwood, plans to build water-works system for Monmouth and Independence, including 12-in. pipe line from Teals Creek, 15 mi. long. About $100,000. F. Moreland, supt.

Cal., Redding—City having plans prepared for water-works system.

Que., Three Rivers—City soon lets contract for pumping station and concrete reservoir. A Beliveau, clk. Asselin & Denoncourt, Three Rivers, archts. Noted May 3.

Ont., Stratford—City plans to build new storage basin at water-works. About $15,000. A. B. Manson, city engr.

BIDS DESIRED

Neb., Pender—Until Nov. 8, by City, building water-works and electric light systems. Hennington Eng. Co., Omaha, engrs. Noted Oct. 4.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Kan., Winfield—City let contract for water-works improvements, involving 20,000 ft. 14-18-in. c.i. pipe, to Amer. Cast Iron Pipe Co., 716 Scarritt Bldg., Kansas City, Mo., $59,856. Noted Nov. 1.

★N. D., Dickinson—See "Sewers."

★Ark., Dardanelle — (Official) — Comrs. Sewer Dist. No. 1 let contract installing 36,000 ft. 6 21-in. water mains, to McEachin & McEachin, McAlester, Okla., $36,000. Noted Aug. 23.

Wash., Seattle—Bd. Pub. Wks. received low bids for water mains in 10th Ave., N. E. (a) wood pipe, (b) iron pipe, from Scalzo & Co., 1708 22nd Ave., (a) $30,598; (b) $47,327; Fiorito Bros., Seattle, (a) $31,095, (b) $48,798; V. Ramaglia, 4830 37th St., (a) $31,298, (b) $48,798.

SEWERS

Proposed Work

N. J., Passaic—City plans to build sewer in Monroe St. About $27,500. C. R. Wise, city engr.

N. J., Prospect Park—(Paterson P. O.)—Council passed ordinance to build sewerage system and pumping plant. H. J. Harden, boro. engr.

O., Akron—City plans to build main trunk sewer, outlet and branches in Dist. No. 3. E. A. Zeisloft, city engr.

O., Painesville—City plans to build sewer in Sanford St. About $29,000. J. Crabbs, city engr.

O., West Park — City to sell $30,000 bonds Nov. 26 to build sewers. F. Feuchter, clk.

Ind., Indianapolis—City had plans prepared by G. W. Fuller, engr., 170 Bway., New York City, building sewage disposal plant. Cost estimated at $3,090,050. Noted Apr. 17.

Ind., Indianapolis — (Official) — City lets contract about Nov. 15 building sewer in East 30th St., 7325 ft. long, brick or segmental block. About $90,000. C. A. Brown, asst. city engr.

Mich., St. Joseph—(Official)—City rejected bids for sewage disposal plant. Temporary system will be installed for present. Noted Oct. 4.

Ill., Maywood—Sanitary Dist., Chicago, purchased site in Provo Twp. on Des Plaines River, near here, on which it plans to build sewage treatment plant. Cost between $75,000 and $100,000. J. McGillen, Karpen Bldg., Chicago, clk.

Ill., Rock Island—City cancelled contract awarded last year to Independent Contr. Co., 304 Lane Bldg., Davenport, Ia., building southwest storm drain. New bids soon. About $60,000. W. Treichler, city engr.

Ia., Marcus—Town having plans prepared for sanitary sewerage system, including septic tank and disposal plant. About $42,000.

Ia., Red Oak—McGregor Subdivision Co., Cedar Rapids State Bank Bldg., Cedar Rapids, plans to lay out 46-acre subdivision, including sewers, gas mains, water works, and sidewalks. H. R. Green and St. and 1st Ave., Cedar Rapids, engr.

Neb., Omaha—City plans to build storm sewers on 25th and Dahlman Blvd.; also sewer and storm-water drain near Carter Lake. About $28,000 and $31,000 respectively. J. A. Bruce, city engr.

Tex., Frost—City sold $10,500 bonds to build sewers. J. S. Persnall, secy.

Tex., Yoakum—San Antonio & Arkansas Pass Ry. plans sanitary sewerage system throughout shop buildings and grounds. About $10,000. J. S. Peter, San Antonio, genl. mgr.

Colo., Arvada—City election soon to vote on bond issue to build sewerage system. J. Lercher, supt.

Idaho, Burley—Council passed ordinance creating Impvt. Dist. No. 18, and will build storm sewers and pavements. About $54,000. E. C. Davis, clk.

Idaho, Montpelier—Council passed ordinance providing for construction of new sewerage system. T. Barrett, clk.

Utah, Moab—Town plans to install sewerage system for business section. About $12,000.

Utah, Ogden—City plans to install sewerage system. About $26,000. J. M. Tracy, city engr.

Cal., Los Angeles—City plans to build sewers in Junipero Ave. and 11th St.; also in 20 other streets. H. G. Waughop, clk.

Ont., London—City having plans prepared for sanitary sewers on Eva, Florence, York and Eleanor Sts. About $18,000. H. Brazier, city engr.

BIDS DESIRED

N. Y., Brooklyn—(Official) — Until Nov. 9, by L. H. Pounds, boro. pres., building sewer in portion 39th St., involving 1052 lin.ft. 30-in. brick sewer and 125 lin.ft. 18-in. pipe sewer. About $12,573.

N. J., Jersey City—(Official)—Until Nov. 8, by City, for 18-in. vitr. pipe sewer in portion Summit Ave. C. A. Van Kuren, city engr. Noted Sept. 13.

N. J., Pleasantville — (Official) — Until Nov. 12, by City, building sanitary sewerage system and sewage treatment plant. N. Andrews, clk. Noted Sept. 27. Advertised in this issue.

Pa., Oil City—(Official)—Until Nov. 26, by R. Mackenzie, controller, building storm sewers in portions Alcorn and Siverly Aves. and Wayne St.; also sanitary sewers in portions Alcorn, Siverly, Keith, Pierce, and Kramer Aves., Wayne and Martin Sts., involving 13,000 ft., 6-18 in. terra cotta pipe, 390 ft. 18-24 ft. rein.-con. pipe. About $21,000. B. B. Weber, city engr. Noted Oct. 25 under Franklin, Pa.

O., Canton—(Official)—Until Nov. 7, by Dir. Pub. Serv., building storm water sewers in portions various streets. W. E. Sarver, city engr. Noted Sept. 13.

O., Niles—(Official)—Until Nov. 14, by B. L. Hogan, dir. pub. serv., building sanitary sewer in Hartzell Ave. W. J. Breeze, city engr.

Minn., Brainerd—Until Nov. 19, by A. Mahlum, city clk., building lateral sewers in Dist. No. 3, including about 4129 ft. 8-10 in. tile. C. D. Peacock, city engr.

Minn., St. Paul—(Official)—Until Nov. 5, by H. W. Austin, purch. agt., building Otto-Niles sewerage system. O. Claussen, city engr.

Mo., Kansas City—Until Nov. 6, by Bd. Pub. Wks., building sewers, curbing and sidewalks in Dist. No. 5. C. Hill, city engr.

Tex., Eagle Lake—Until Nov. 6, by City, for sanitary sewerage system, including 11,500 ft. 6- 8-in. pipe. Norris Eng. Co., Wharton, engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates contracts awarded)

N. Y., Brooklyn—(Official)—L. H. Pounds, boro. pres., received low bids Oct. 17, building sewers and sewage pumping station in Fairfield Ave. from Ralph Ave. to Fieldcrest Ave., N. Thorpe-Mullaney Co., principal; also laterals Flatland Ave. and Fieldcrest Blvd., from J. F. Cavan Co., Woolworth Bldg., New York City, $44,944; Crawford Co., 30 4th St., $47,776; Norman & Carey Subway Constr. Co., 1128 Nostrand Ave., $48,800. Noted Oct.

N. Y., New York—Boro. received lowest bid, Oct. 23rd, improving sewers in portions of East 114th and 121st Sts. and West 163rd St., from Melrose Contg. Co., 147 East 125th St., about $12,894.

Pa., Phila.—See "Streets and Roads"

W. Va., Wellsburg—City received low bids building lateral sewers in 3rd and 4th Wards, from Ward Heating Supply Co., 521 Main St., $29,213, and B. Cresap, $24,021. Noted Oct. 11.

★Ky., Falmouth—City let contract for sanitary sewerage system, to W. L. Nowland & Co., Covington. About $10,000.

★O., Cuyahoga Falls—City let contract for Hotel Ave. sanitary sewerage system, involving 7500 cu.yd. earth excav., 300 cu.yd. rock trench excav., 2 mi. 6-12-in. sewer pipe, 22 manholes, etc., to C. L. Wright, Mt. Vernon, $16,846. Noted Oct. 18.

★Mich., Detroit—City let contract installing sewers in block bounded by Center Line, Van Dyke, Kebbe and Kerkle Sts.; also sewer in Lawrence St., and in block bounded by 12th, Hamilton, Lawrence and Burlington Sts., to M. Q. Kurjian, 188 Jefferson Ave., $16,296 and $13,811, respectively.

Minn., St. Paul—City received low bids, Oct. 22, for storm water sewer in portions Fairview Ave., Lawrence St., and Macalster Ave., from Thornton Bros., Scandinavian Bank Bldg., $77,687; O'Neill & Preston, 60 East 6th St., $87,400; E. T. Webster, 437 Beacon St., $91,287. Noted Oct. 18.

★Kan., Baxter Springs—City let contract for sewerage system, involving 82,618 ft. 8-15-in. sewer pipe, 302 8- 16-in. c.-i. pipe, together with manholes, etc., to Plummer-Adams Co., Springfield, Mo., $151,237. Noted Oct. 11.

Neb., Omaha—City received lowest bid building sewer in Dist. No. 355, involving 1196 ft. 3-7 in. pipe, from Omaha Contg. Co., 3805 Manderson St., $22,433.

★N. D., Dickinson—City let contract extending sewerage and water-works systems, to C. W. Schruit, Minneapolis, Minn. About $30,000. Noted July 12.

★Mont., Hardin—City let contract building lateral drainage sewerage system and paving 28 blocks to Hanlan & Oakes, 338 Lumber Ex. Bldg., Minneapolis, Minn. About $125,000.

★Mont., Saco—City let contract for sewerage system, to G. W. Kemper, Minot, N. D. About $38,000.

★Idaho, Pocatello—(Official)—City let contract 10,000 ft. 9-in. sewers in Dist. No. 12, to R. M. Bardsen & Co., Pocatello, $24,527. Noted Oct. 11.

Cal., Santa Barbara—City received lowest bid building intercepting sewerage system, from Malgenwith & Gillespie, 319 Bloom St., Los Angeles, $36,355; sewage disposal plant and outfall sewer from W. Ledbetter, Pacific Electric Bldg., Los Angeles, $33,431 and $37,942 respectively. Noted Oct. 4.

★Cal., Upland—City let contract building outfall sewer using cement pipe, to J. Chutuk, 532 South Matthews St., Los Angeles, $18,119. Noted Oct. 18.

BRIDGES

Proposed Work

N. J., Red Bank—[illegible] Freeholders Monmouth Co., Freehold, had plans prepared for reinforced bridges, 100 ft. long, 24 ft. wide over Shrewsbury River, to be known as Hubbards Bridge. About $40,000. C. D. Cooper, 60 Broad St., Red Bank, engr.

Mich., Monroe — Monroe Co. and State Highway Comr., Lansing, plan to build bridge over River Raisin at county farm. About $80,000.

Tex., San Antonio—Comrs. Washington and Medina Cos. plan to build bridge over Sabinas River. About $40,000.

Okla., Sallisaw—[illegible] Harris and Sands, Muskogee, Okla., have been awarded contract for building reinforced concrete bridge over Illinois River, also paving 18 blocks (between 4th and 5th Sts.), about $125,000. Noted Sept. 20.

Wash., Olympia—Thurston Co. received bids building reinforced bridge over Deschutes River, also paving 18 blocks (between 4th and 5th Sts.), about $125,000. Noted Sept. 20.

BIDS DESIRED

S. C., Charleston—(Official)—Until Nov. 5, by Sanitary and Drainage Board, Charleston, for building steel truss bridge over Cooper River, about 1,000 ft. long; also 2,000 ft. approach; plans on file with J. W. Hurrie, engr., and deposit of $50 required.

Bridges (Continued)

Ill., Utica—(Official)—Until Nov. 5, by Cours La Salle Co., Ottawa, building new steel superstructure on 2 north spans of Utica bridge over Illinois River. G. L. Farnsworth, Ottawa, co. supt. highways.

Okla., Stillwater—Until Nov. 8, by Payne Co., building 428 ft. bridge over Cimarron River. H. E. Overholt, ch. bd.

Okla., Watonga—Until Nov. 6, by Blaine Co., building several bridges.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Rome**—W. W. Wotherspoon, supt. pub. wks., Capitol, Albany, let contract building new plate girder bridge over Black River Canal, on Whitesboro St., to W. S. Rae, 439 Oliver Bldg., Pittsburgh, $11,683.

★**Pa., Butler**—(Official)—Pennsylvania Pub. Ser. Comn., Harrisburg, let contract building steel bridge on Main St. to W. S. Rae, 439 Oliver Bldg., Pittsburgh, $184. Noted Oct. 4.

★**Pa., Phila.**—Dept. Pub. Wks. let contract improving Penrose Ferry bridge to E. C. Fish, $15,000.

★**Ala., Carrollton**—See "Streets and Roads."

★**Ia., Ft. Dodge**—(Official)—City let contract building rein.-con. viaduct on North 3rd St., to Jensen Constr. Co., Ft. Dodge, Ia., $118,400. Noted Sept. 27.

★**Kan., Topeka**—Shawnee Co. let contract building 140 ft. Rainbow arch bridge over Soldier Creek on Kansas Ave., to Leavenworth Bridge Co., $25,800. Noted Aug. 30.

★**Tex., Gainesville**—Gainesville Red River Bridge Co. let contract building bridge over Red River at Sacra's Ferry, 7 mi. north of Gainesville, to Midland Bridge Co., 504 Midland Bldg., Kansas City, Mo., $60,000.

STRUCTURAL STEEL WORK

BIDS DESIRED

S. C., Charleston—See "Bridges."

Ill., Havana—See "Excavation and Dredging."

Ill., Utica—See "Bridges."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Pa., Butler**—See "Bridges."

REINFORCED CONCRETE

Proposed Work

N. J., Red Bank—See "Bridges."

Minn., Duluth—See "Industrials."

Wash., Olympia—See "Bridges."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., New York**—See "Industrial Works."

★**N. J., Bayonne**—See "Industrial Works."

★**Ia., Ft. Dodge**—See "Bridges."

★**Cal., Manhattan Beach**—See "Miscellaneous."

★**Cal., San Diego**—See "Miscellaneous."

★**B. C., Vancouver**—See "Industrial Works."

STREETS AND ROADS

Proposed Work

Mass., Revere—City issued $70,000 bonds to build roads on main thoroughfares in different sections of city. C. G. Hammond, engr.

N. Y., Buffalo—City plans to bituminous-surface portion Main, Hertel and Niagara Sts., also parts Delaware, Elmwood and Bailey Aves., with asphalt on concrete foundation. O. H. Amsden, city engr.

N. J., Jersey City—Bd. Freeholders Hudson Co. will receive bids Nov. 5 paving Railroad and Bergenline Aves.

Pa., Erie—City election on Nov. 5 to vote on $1,750,000 bond issue to build roads. C. H. Lynch, city engr.

Pa., Shinglehouse—Boro. plans to pave Academy St., 1½ mi., with State aid.

Va., Staunton—City hiring plans prepared recently and asking estimates on various streets. About $40,000. H. H. Wyatt, engr.

N. C., Ayden—City voted $15,000 bonds to improve roads.

N. C., Fremont — Town plans to issue $20,000 bonds to improve streets, sidewalks and install electric-light plant.

N. C., Hickory — City voted $150,000 bonds to pave various streets.

Ga., St. Mary's—Camden Co. plans election to vote on $100,000 bond issue to build roads.

Fla., Key West—Monroe Co., Cape Sable Dist., voted $60,000 bonds to build 22 mi. road to connect with Ingraham Highway in Dade Co.

La., Baton Rouge—East Baton Rouge Co. plans to sell $50,000 bonds Nov. 13 to complete and maintain cross roads in Dist. No. 2.

O., Bellefontaine—Logan Co. sold $24,000 bonds to improve roads.

O., Cincinnati—City lets contract about Dec. 8, paving, curbing, and building walks on portions Seager Ave. F. Krug, city engr. Noted Sept. 20.

O., Defiance—City plans to pave portions Thurston and Summit Sts., also 5th and Holgate Aves. About $65,000. V. D. Weinsenberger, clk.

O., East Youngstown—City plans to issue $12,000 bonds to pave portions Robinson Rd., and $15,000 bonds to pave 12th St.

O., Germantown—(Official)—Village received no bids Oct. 10 paving West Market St., tarvia bound macadam and combined curb and gutter. New bids in spring. C. A. Eby, clk. Noted Oct. 4.

O., Sidney—City election Nov. 6 to vote on $40,000 bond issue to open and extend Poplar St. T. Blake, city engr.

O., Toledo — Lucas Co. sold $182,316 bonds to improve roads.

O., Toledo—City passed resolution to improve and pave portion Baker, Brown, 13th, Berkley and Raymer Sts. H. McKechnie, engr.

O., Youngstown—City plans to pave portions Ravenwood, Japan, and Belden Aves.; also build sidewalks on portions Dupont St. F. M. Lillie, city engr.

Michigan — (Official) — State Highway Comn., Lansing, rejected bids opened Oct. 24, building water-bound macadam roads in Allegan Co., Ganges Twp. Work will be readvertised. Noted Oct. 18.

Michigan — (Official) — State Highway Dept., Lansing, plans to grade, drain and clear roads in Barage Co. About $200,000. J. H. Bateman, state highway engr.

Mich., Petoskey — Emmet Co. plans to spend $70,000 for road work during year. Main trunk line highways across county from north to south and Dixie and Michigan Highways will be improved.

Mich., Pontiac—Oakland Co. voted $250,000 bonds to build roads.

Ill., Waukegan—Lake Co. plans election soon to vote on $500,000 bond issue to build roads, including east and west road and road from Belvidere to Volo, 15 mi., concrete, to cost $310,000.

Wis., Grand Rapids—City having plans prepared improving paving following streets, rein.-con.: Oak St., 8101 sq.yd. paving, 4704 lin.ft. curb, 4130 yd. grading; 8th St., 5170 sq.yd. paving, 3000 lin.ft. curb, 2750 yd. grading; Lincoln and 5th Sts., 5218 sq.yd. paving, 3030 ft. curb, 2777 yd. grading; also paving portions Grand Ave. brick 6044 sq.yd. About $38,000. J. Wheir, pres. bd. pub. wks.

Ia., Red Oak—See "Sewers."

Ia., Rockwell City—Calhoun Co. plans to gravel 18 mi. road. About $44,595 available. State and Federal Government to appropriate toward cost.

Minn., Fergus Falls—Ottertail Co. voted to accept $30,000 Federal Aid and to appropriate same amount to improve road from Ashby to this city. W. Lincoln, aud.

Minn., St. Cloud—Stearns Co. will receive $50,000 from Federal Government to build roads during 1918. N. Thomey, co. aud.

Minn., St. Paul—City plans to pave portions Raymond Ave. About $114,438. O. Claussen, city engr.

Kan., Cottonwood Falls—Chase Co., Cottonwood Falls and Strong City plan to build 2 mi. rock road to connect Cottonwood Falls and Strong City.

Kan., Council Grove—City to sell $36,000 bonds to pave, curb, and grade certain streets. H. W. Craven, clk.

Mont., Billings—Council plans to pave portion 1st Ave. About $15,000. E. M. Schneckenberger, city engr.

Mo., Kansas City—Council passed ordinance to pave portions 38 streets. C. Hill, city engr.

Arkansas—Arkansas-Louisiana Highway Impvt. Dist. plans to determine road construction detail within 30 days; will issue $2,500,000 bonds and probably $1,000,000 later to build 177 mi. highways in Chicot, Desha, Ashley, Lincoln, and Drew Cos. E. P. Toney, Lake Village, chn. com.

Ark., Berryville—Carroll Co. plans to build 70 mi. road. Noted Aug. 2.

Ark., Magnolia — Columbia Co. Comrs. had plans prepared by State Highway Dept., Little Rock, building road from Magnolia to Ouachita Co. line, 13 mi. About $68,987.

Tex., Belton—Bell Co. plans election to vote on $300,000 bonds to build roads.

Tex., Brady — McCulloch Co. plans to build Puget Sound to Gulf Highway with State aid. About $20,000.

Tex., Crockett — Houston Co. election Nov. 17 to vote on $50,000 bond issue to build streets. A. E. Owen, co. clk. Noted Aug. 16.

Tex., Jasper—Jasper Co. voted $250,000 bonds to build roads. A. L. Hancock, co. clk. Noted Sept. 27.

Tex., Kountze—Hardin Co. plans to issue $200,000 bonds to improve roads.

Tex., San Angelo—Tom Green Co. defeated $200,000 bond issue to improve roads. Noted Sept. 27.

Tex., San Augustine—San Augustine Co. voted $52,000 bonds; $48,000 of this amount to be expended on East Texas Highway, 36 mi., remaining $4000 to improve feeder roads to highway.

Tex., Waco—McLennan Co. plans to build China Springs Rd., gravel with asphalt top; also Marlin Rd., 11½ mi. About $12,500 respectively. State Highway Dept. appropriated $30,000 of Federal Government fund for road work in this county. R. J. Windrow, co. engr.

Okla., Sallisaw—(Official)—Sequoyah Co. voted $18,000 bonds to build roads and bridges in Paw Paw Twp. Noted Oct. 4.

Okla., Tulsa—Tulsa Co. election Nov. 20 to vote on $1,750,000 bonds to build roads.

Idaho, Burley—See "Sewers."

Ariz., Prescott—Bd. Superv. Yavapai Co. voted to build road between Prescott and Jerome. About $78,000 available from State road fund and $47,000 from Federal road fund.

Ariz., Tombstone — Cochise Co. election Dec. 4 to vote on $1,000,000 bonds to build road from Pearce to highway running through Sulphur Springs Valley, also paving roads between Bisbee and Douglas and Wilcox and Pearce.

Washington—State Highway Comn., Olympia, soon receives bids improving Pacific Highway between Vancouver and La Center. About 3½ mi.

Washington—(Official) — State Highway Comn., Olympia, rejected bids opened Oct. 22, grading and draining 12 mi. Sunset Highway. Noted Oct. 11.

Wash., Auburn—City plans to pave East 1st St., et al. About $10,000.

Wash., Castlerock—Town passed resolution creating Local Impvt. Dist. No. 6, providing for construction concrete sidewalks, cross walks, curbs, etc. About $14,000.

Wash., Davenport—Lincoln Co. plans to build North Central Highway to commence at Mohler. About $28,000. Noted Oct. 11.

Wash., Olympia—See "Bridges."

Wash., Seattle—City plans paving, building curbs, sidewalks, and grading portions 10th, 11th and 12th and Northlake Aves., Wall, Bay and Broad Sts.; also had plans prepared paving portions Colorado Ave., brick block, and 8th Ave., N. E. About $11,000 and $106,456 respectively. A. H. Dimock, city engr.

Oregon—State Highway Comn., Salem, approved Post Rd. project on John Day Highway, between Fossill and Sarvice Creek, Wheeler Co., about 9.47 mi. long. Cost, $36,733.

Oregon — State Highway Comn., Salem, soon lets contract building 1½ mi. road between Mitchell and Prineville, Wheeler Co. About $12,500.

Streets and Roads (Continued)

Ore., Eugene—Council passed ordinance to macadamize Potter St. and 28th Ave., et al. About $12,000. A. Forneri, city engr.

Ore., La Grande—Union Co. having plans prepared for building road to Baker Co. line.

Ore., Warrenton — City voted $45,000 bonds to build road from Warrenton direct to ocean beach. Noted Sept. 13.

Cal., Los Angeles—City soon lets contract grading and paving portion Azusa Ave., Rd. Dist. No. 135, 5 in concrete pavement, 20 ft. wide. A. C. Hansen, city engr.

Cal., Porterville—City having plans prepared for paving streets to connect with county highway system.

Cal., San Diego—City plans to pave A, Ash, Beech, Cedar, 7th, and 8th Sts. About $51,810. G. Cromwell, city engr.

Cal., San Luis Obispo—Valmount Country Club plans to build 4½-mi. macadamized road near Moro Beach.

Cal., Willows—Glenn Co. election Nov. 10 to vote on bond issue to improve highway from Hamliton City to Orland, 14½ mi.

Ont., Port Colborne—Council plans to build cement sidewalks on various streets. About $15,000.

Ont., Toronto—City plans to extend Chaw and Crawford Sts. and fill in Sully Crescent. About $30,000.

BIDS DESIRED

N. Y., Brooklyn—Until Nov. 2, by L. H. Pounds, boro. pres., regulating and recurbing easterly side 12th Ave., from 52nd to 53rd St.; grading sidewalk space and laying sidewalks west side 18th Ave. between 61st and 62nd Sts.; laying sidewalks at 3 other locations; furnishing and delivering 40,000 wood paving blocks, 4 in depth; 2000 bbl. portlant cement; 3000 cu.yd. paving sand; 3000 cu.yd. 1½-in. broken stone for concrete; 1500 cu.yd. broken trap rock and 1000 cu.yd. trap-rock screenings.

N. Y., Brooklyn—Until Nov. 9, by L. H. Pounds, boro. pres., regulating, paving and repaving portion 54th St., asphalt on 6-in. concrete base.

N. J., Elizabeth—Until Nov. 8, by Bd. Wks., repaving Cross Ave., sheet asphalt on concrete foundation, involving 6155 sq.yd. asphalt, 4710 lin.ft. 4 x 16-in. bluestone curb, etc. J. F. Kenah, clk. T. E. Collins, city engr.

N. J., Jersey City — (Official) — Until Nov. 8, by City, improving portion Gates Ave., involving 4420 sq.yd. asphalt paving on concrete base, 550 sq.yd. Belgian block paving on concrete base, together with curbing, grading, etc. C. A. Van Kuren, city engr. Noted Oct. 18.

Ga., Gibson—(Official)—Until Nov. 10, by H. G. Sammons, comr. roads and revenues, Glascock Co., furnishing and delivering at depot, 200,000 brick, to grade equal to brick manufactured at Milledgeville; also 200 sacks cement, 200 bbl. lime.

Ala., Brewton—Until Nov. 19, by Escambia Co., building 9 mi. Forest Highway between Brewton and Andalusia; work involves 30 acres clearing and grubbing, 44,182 cu.yd. borrow, 1050 ft. pipe, etc.

Tenn., Clarksville—(Official)—Until Nov. 15, by City, paving portions 3 streets, 15,000 sq.yd. asphalt concrete on concrete base. S. R. Alexander, city engr. Noted July 26; advertised in this issue.

O., Cincinnati—(Official)—Until Nov. 9, by Hamilton Co. Comrs., resurfacing Harrison and Brookville Turnpike, bituminous macadam. A. Reinhardt, clk.

O., Cincinnati—(Official)—Until Nov. 16, by Hamilton Co. Comrs., improving portion Camargo Pike No. 292. A. E. Mittendorf, pres.

O., Montgomery—Until Nov. 7, by Town, improving and paving portion West St. C. W. Harnell, clk.

Ia., Des Moines—Until Nov. 5, by F. Jeffries, city clk., curbing and paving Douglas and Beaver Aves., including 26,900 yd. paving, 15,840 ft. curbing. K. Kastberg, city engr. Noted Aug. 16.

Neb., Holdrege—Until Nov. 20, by W. Lindstrom, city clk., improving streets in Dist. No. 1, including 39,100 sq.yd. pavement, 4442 ft. curb, 10,053 lin.ft. curb and gutter.

Mont., Butte—(Official)—Until Nov. 5, by Silverbow Co. Comrs., for paving, building sidewalks, parkings and curbs in Dist. No. 3. S. L. Anderson, clk. Noted Oct. 18.

Mo., Kansas City—See "Sewers."

Ariz. Globe—(Official)—Until Nov. 7, by Bd. Superv. Gila Co., building Sects. 1, 2, and 3 El Capitan Highway. About $75,000. Noted July 26.

Wash., Seattle—Until Nov. 19, by N. M. Wardall, clk., King Co., building Morris Change Rd.

Oregon—Until Nov. 6, by State Highway Comn., Salem, building Columbia River Highway between Hood River and Mosier, 5 mi. About $352,000. H. Nunn, state highway engr. Noted Sept. 27.

California — Until Nov. 12, by State Highway Comn, Sacramento, paving 3 mi. road in Monterey Co., concrete, grading 9 mi. in Nevada Co.; paving 12 mi. road in San Luis Obispo Co,. concrete.

Cal., Oakland—Until Nov. 5, by E. Gross, clk., Alameda Co., building highway connecting East 14th St. with Dublin Blvd. About $80,000.

Cal., Santa Ana—Until Nov. 7, by N. T. Edwards, clk., Orange Co. building 48,000 sq.ft. concrete pavement on San Juan Hot Springs Rd.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass. Boston**—City let contract grading and playground surfacing to J. C. Coleman & Sons, 1620 Tremont St., Roxbury, $20,000. Noted Oct. 18.

★**Connecticut** — State Highway Dept., Hartford, let contract building state road in Woodbury Twp., to J. De Michiel & Bro., 58 High St., Torrington, $29,500. Noted Oct. 4.

N. Y., Brooklyn—L. H. Pounds, boro. pres., received low bids regulating, curbing and paving portion (a) Ave. M, (b) Snyder Ave., (c) West 36th St., from Cranford Co., 52 9th Ave., (a) $15,095, (b) $11,610, (c) $11,985; Uvalde Asphalt Paving Co., 1 Bway., New York City, (a) $16,025, (b) $11,947, (c) $12,499; Borough Asphalt Co., 1301 Metropolitan Ave., (a) $18,514, (b) $10,912, (c) $12,277. Noted Oct. 25.

★**N. Y., Buffalo**—City let contract paving portions Washington St., block sandstone on concrete foundation to Erie Contg. Co., Morgan Bldg., $29,500.

N. Y., Buffalo—City received lowest bid paving portions Stewart Ave., asphalt on concrete foundation, from German Rock Asphalt Co., Inc., Morgan Bldg., $13,450.

N. Y., New York—(Official)—M. M. Marks, boro. pres., received low bids, Oct. 24, repaving portions various streets, wood block, from W. J. Fitzgerald, 547 West 45th St.; 4th Ave., $10,272; B'way., $37,324; same street (water-gas-tar specifications), $42,658; Madison Ave., $31,341.

N. Y., Utica—W. W. Wotherspoon, state supt. pub. wks., Albany, received low bids building approaches, grading, and paving south side of Erie Canal to bridge over canal in Yorkville, from L. J. Sieling, 171 Madison Ave., New York City, $14,382; C. Kiehm, Gardner Bldg., $15,998.

N. J., Jersey City—(Official)—City received low bids Oct. 23, repaving portion Tonnele Ave., wood block, from P. O'Reilly, 86 Neptune Ave., 128%; J. J. Conlin, 1123 Bway., New York City, 140%. Estimated cost, $22,875. Noted Oct. 11.

N. J., Jersey City—City received lowest bid improving Dwight St. and De Kalb Ave., asphalt paving on concrete base, Van Cleef St. and Germania Ave., bituminous concrete on concrete base, from W. S. S. Critchfield, 2 Green St., about $33,357. Noted Oct. 11.

★**N. J., Paterson**—City let contract paving portions Prince St., to L. Cramer, 99 Ward St., $12,128.

★**Pa., Milton**—Boro. let contract about 2500 sq.yd. vitr. brick paving, to W. H. Lyons, Sunbury, $12,000.

Pa., Phila.—City received only bids Oct. 19th paving and sewers in Delaware Ave. from Mifflin St. to Snyder Ave., from H. H. Vare, Lincoln Bldg., $98,865.

★**Pa., Pittsburgh**—Allegheny Co. let contract improving Bruno Hill Rd. in Forward Twp., 12,500 ft. long, to R. A. Ingersoll, $34,324. Noted Sept. 6.

★**W. Va., Charleston**—Kanawha Co., Loudon Dist., let contract building 3.2 mi. brick on concrete road, also 5 mi. slag road, to Central Eng. Co. About $90,000. Noted Sept. 27.

★**N. C., Pittsboro**—Chatam Co. let contract grading roads and surfacing with top soil or gravel, to C. C. Jordan, Wadesboro, $30,000. Noted May 10.

★**Alabama**—State Highway Dept., Birmingham, let contract building 5.3 mi. road in Blount Co., between Blountsville and Guntersville, to Sharp Bros., Guntersville.

★**Ala., Carrolton**—Pickens Co. let contract building 50 mi. of roads, involving 165,000 cu.yd. grading, 40,750 cu.yd. gravel, also bridges, to Stanley-Signer Constr. Co., Lafayette, about $60,000. Noted Sept. 6.

★**La., Crowley**—City let contract building gravel pavement, also curb and gutter, to Healy Constr. Co., Crowley. About $30,000.

★**Ohio**—(Official)—State Highway Comn., Columbus, let contracts road work to C. Stoltz, Bellevue, Sect. "L," Bellevue-Norwalk Rd., Huron Co., 1.68 mi., monolithic brick, $40,745; J. L. McCormick, Canton, Sect. "R," Akron-Canton Rd., Summit Co., 2.08 mi., brick, $64,501; A. McDonald, Steubenville, Sect. "N2," Steubenville-Cambridge Rd., Jefferson Co., 1.83 mi., brick on rolled base, $65,830; M. Snoffer, 144 East 13th Ave., Columbus, Sects. "M" and "O," Columbus-Sandusky Rd., Franklin Co., brick on concrete base, $12,425. Noted Oct. 18.

★**O., Dayton**—City let contract paving portions River St., to J. Kernan & Co. About $15,000.

★**Mont., Great Falls** — Cascade Co. let contract building Riceville Rd., to F. Elliot, $12,000.

★**Mont., Hardin**—See "Sewers."

★**Mo., St. Joseph**—City let contract paving portions 27th St., vertical fiber brick, to Land Constr. Co., Ballingen Bldg., $2.44 per sq.yd.

★**Mo., Springfield**—City let contract paving to Jarret-Richardson Paving Co., $1.65 per sq.yd.; curbing to M. H. Southworth Constr. Co., 49c. per lin.ft.

★**Tex., Dallas**—(Official)—Dallas Co. Comrs. will resurface by day labor Richardson Rd. from Vickery to Richardson; Maple Ave. Rd. from city limits to railroad crossing; also California Crossing Rd. About $20,000. J. F. Witt, co. engr. Noted Oct 18.

★**Tex., Dallas**—City let contract paving portions Peak St., to Bramley-Lanham Paving Co., Kingsley St., Birmingham, Ala., $23,004.

★**Tex., Eagle Pass**—City let contract paving Main and Commercial Sts., 50,000 sq.yd., to Uvalde Asphalt Co., Sweringen McCraw Bldg., San Antonio.

★**Tex., Ft. Worth**—City let contract paving 11,500 sq.yd. Travis Ave., to General Constr. Co., F and M Bank Bldg., Ft. Worth, $2.05 per sq.yd. Noted Oct. 25.

★**Idaho**—State Highway Comn., Boise, let contract building 17 mi. North and South Highway between Fruitvale and Price Valley, Adams Co., to Nettleton, Bruce & Eschbach, Amer. Bank Bldg., Seattle, Wash., $75,000. 38 mi. Idaho and Pacific Highway through Burley Highway Dist., to H. E. Cornell, Dietrich, $80,000.

★**Idaho, Albion**—Cassia Co. let contract loading, hauling and spreading gravel on 3 sections Idaho-Pacific Highway in Burley Highway Dist., about 57.5 mi., to H. E. Cornell, Dietrich, $80,000. Noted Oct. 18.

★**Idaho, Council**—Adams Co. let contract building 17 mi. North and South highway between Fruitvale and Price Valley, to Nettleton, Bruce & Eschbach, 503 Amer. Bank Bldg., Seattle, Wash., $74,[illegible].

★**Utah**—State Rd. Comm., Salt Lake City, let contract building road leading out of Parowan, Iron Co., to Bruce & Maguire, Savings & Trust Bldg., Salt Lake City.

★**Ore., Portland**—City let contract paving Woodstock Ave., gravel, Lillalbia, to Warren County Co., Journal Bldg., $24,[illegible].

★**California**—(Official)—State Highway Comn., Sacramento, let contract to Mountain Improvement Co., 803 Mackenzie Bldg., Richmond, building 13.8 mi. road in Riverside Co., and 7.7 mi. in Imperial Co., $488,111 and $33,240 respectively. C. C. Young, Southern Pacific Bldg., San Francisco, let 38 mi. highway in Yolo Co., $313,[illegible]. Noted Oct. 25.

Streets and Roads (Continued)

Cal., San Diego — City received lowest bid building 413,491 sq.ft. 4-in. concrete pavement, 3050 ft. cement curbs, culverts, concrete wall, etc., in Prospect St., La Jolla Blvd. and other streets, from T. C. Breitenstein, 465 Van Wyck St., Pasadena. $54,496.

Cal., San Francisco—City let contracts improving streets, (a) excav., (b) granite curbs, (c) concrete curbs, (d) concrete sidewalks, (e) asphalt pavement, (f) basalt-block pavement, gravel filler on concrete base, as follows: C. B. Eaton, 407 11th St.; Clement St., (a) $0.50 per cu.yd., (b) $1.25 per ft., (d) $0.13 per sq.ft., (e) $0.22 per sq.ft. State Impvt. Co., Crocker Bldg.; 18th Ave., (c) $0.83, (d) $0.16, (e) $0.25. J. F. Dowling, San Francisco; Francisco St., (b) $1.75, (d) $0.17, (f) $0.48 per sq.ft., basalt block gutters, $0.48 per sq.ft. Hoffman Ave., (c) $0.95, (e) $0.55. Flinn & Tracey, 1st Natl. Bank Bldg., (b) $0.80, (d) $0.14, (e) $0.24, 10-in. vitr. culvert, $1.50 per ft. T. A. Clark, San Francisco; (a) $1.10, (c) $0.80, (d) $0.15, (e) $0.2275, brick manholes, $85 each, brick catch basins, $100 each. Blanchard-Brown Co., Call Bldg., (b) $1.25 [illegible] $1.25, Fay Impvt. Co., Phelan Bldg.: Balboa St., (b) $1.25 per ft., (d) $0.14, (e) $0.25.

Cal., Stockton—San Joachim Co. received lowest bid, Oct. 10th, building 5½-mi crushed rock or gravel macadam road, from Moring Bros., Stockton. About $37,612 and $30,366 respectively. Noted Sept. 13.

Ont., Cornwall—County received 23 bids for building 60 mi. water-bound macadam roads in Stormont, Dundas and Glegarry Cos. Contract will be let Jan. 24th. J. G. Cameron, co. rd. supt. Noted Oct. 11.

RAILWAYS—STEAM & ELECTRIC

Proposed Work

Kentucky—Middle Fork & South Fork Ry., recently incorporated, plans 29-mi. line from Krypton to mouth of Buffalo Creek. W. H. Porter, 222 Clay Ave., W. E. Williams, 1308 Fayette Natl. Bank Bldg., A. R. Stephens, 17 Mentelle Park, and others, all of Lexington, incorporators.

Texas—Eastern Traction Co., recently organized, plans to build interurban electric railway from Houston, Tex., to Lake Charles, La., via Beaumont, about 160 mi. E. Kennedy, 509 Foster Bldg., Houston, and others interested.

Washington—H. C. and J. Erickson of Kruse, Wash., plan to build railroad from Peterson to Winthrop in Methow Valley, 45 mi.

Ontario—Brandon Municipal Ry. plans to build line to Lake Pierce. About $55,000. T. Boden, City Hall, Brandon, supt.

RAILWAYS—STEAM AND ELECTRIC

(★Indicates contracts awarded.)

★**Ontario**—Essex Terminal Ry., Walker Rd., Walkerville, let contract extending electric railway in Ojibway to Chick Contg. Co., McDougall St., Windsor, $60,000.

EXCAVATION AND DREDGING

Proposed Work

Wash., North Yakima—Canal—Selah Valley Canal Co. plans to spend $50,000 to connect canal and build 7½-ft. tunnel. Ultimate expenditure on project, $300,000.

BIDS DESIRED

Ill., Garden Prairie—Drainage—Until Nov. 15, by Coon Creek Drainage Comrs., for 4 mi. 6-24-in. tile drain; also cement shale or tile pipe. A. Mather, engr., A. L. Webster, Wheaton, engr.

Ill., Havana—Ditches—Until Nov. 12, by Bd. Comrs. Garden Special D. D. Mason Co., building main ditch and laterals, involving 194,342 cu.yd. excav., removing and replacing 6 steel highway bridges, etc. J. F. Krelling, comr.

Wis., Madison—(Official)—Drainage—Until Nov. 15, by Orchard Farm Garden Sub-District, Dane Co., at office of Buell & Lucas, 9 South Pinckney St., Madison, building tile drainage system, involving 156,367 ft. 4-14 in. tile. A. K. Ratcliffe, engr.

Ia., Ft. Dodge—Drain—Until Nov. 8, by Webster Co., building Drain No. 258, involving 15,300 ft. 16-30 in. tile. About $21,190. J. L. Hanrahan, aud.

Ia., Mason City—Drainage—Until Nov. 7, by Cerro Gordo Co., building D. D. No. 49; Sect. 1 involves 8200 ft. 9- to 28-in. tile, Sect. 2, 17,950 ft. 8-18-in. tile. G. E. Frost, aud.

Minn., Granite Falls—Ditch—Until Nov. 13, by Yellow Medicine Co., building Judicial Ditch No. 7, involving 23,321 ft. 5-24 in. tile. About $20,616. G. H. Wilson, aud.

S. D., Armour—Drain—Until Nov. 2, by Douglas Co., building Drain No. 4; work involves open ditch 5 mi. long, 30,000 cu.yd. excav. and 750 ft. 20-in. tile. Dakota Eng. Co., Mitchell, engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Ind., Rockport** — (Official) — Ditches—Spencer Co. let contract building ditches, to J. A. Rahests, Ashland, O., $37,755. Noted Oct. 4.

★**Minn., Henderson**—Ditch—Sibley Co. let contract building Judicial Ditch No. 8, to Arlington Cement Stone Wks., $11,474.

★**Mont., Lewiston** — Canal, etc. — Fergus Co. Land & Irrigation Co. let contract for chief distributing canal and laterals, Flatwillow Project, to C. E. Weir, Lewiston, $411,720.

★**Idaho, Fruitland** — Irrigation — Little Willow Valley Irrigation Dist. let contract installing irrigation system, to Maney Bros., Shaw Bldg., Boise, $175,000.

INDUSTRIAL WORKS

Proposed Work

N. Y., Brooklyn—Rubel Bros., Glenmore Ave., had plans prepared by E. M. Adelsohn, archt, 1776 Pitkin Ave., for 2 story, 100 x 200 ft. ice manufacturing plant, Blake and Van Sinderen Aves. About $75,000.

N. Y., New York—P. Schalita had plans prepared by S. Brooks, archt., 110 West 40th St., for 2 story, 100 x 100 ft. garage, Washington Ave. and 182nd St. (Bronx boro.). About $50,000.

N. J., Newark—Lackawanna Bridge Co., 2 Rector St., New York City, plans two 1-story, 60 x 630 ft. brick and steel shops; also two 2-story, 60 x 60 ft. shops, head house, train shed, and employees' hospital at Port Newark Terminal. About $252,000 and $28,000 respectively.

Pa., Phila.—Atlantic Refining Co., 3144 Passyunk Ave., plans 82x84-ft. power house on Passyunk Ave. and 28th St. About $50,000.

Del., Wilmington—Pusey & Jones, foot Poplar St., plans to build foundry and pattern store room. About $70,000 and $50,000, respectively.

Va., Norfolk—Norfolk Tire Fabric Co., recently incorporated, having plans prepared by R. E. Mitchell, archt., Paul-Gale Greenwood Bldg., for factory to consist of 10 units; 1st unit 262x625 ft. About $750,000. B. C. Brownell, interested.

La., Monroe—A. Brown, 1st Natl. Bank Bldg., Pittsburgh, Pa., and others, plan to build carbon plant here. About $200,000.

La., New Orleans—Swift & Co., Harvey Lane, plans to build acid factory here. About $250,000.

O., Cleveland—Acorn Refining Co., 8205 Franklin Ave., having plans prepared by A. F. Janowitz, archt., Permanent Bldg., for 2-story factory, 8204 Franklin Ave., N. W. Cost between $45,000 and $50,000.

Ind., Anderson—Superior Tire Co., recently organized with $750,000 capital stock, purchased 10-acre site and plans to build factory. W. I. O'Bryan, 1331 Fry Ave., Cleveland, Ohio, vice-pres.

Ind, Indianapolis—Standard Paper Co., 440-50 South Illinois St., having plans prepared by Vonnegut & Bohn, archts., 610 Indianapolis Trust Bldg., 3 story, 100 x 200 ft., 326 East Market St. About $80,000. A. M. Rosenthal, pres.

Mich., Port Huron—Mueller Mfg. Co., 512 Cerro Gordo St., Decatur, Ill., and Sarnia, Ont., soon lets contract 1-story, 80 x 140 ft. factory and power plant, foot of Lapeer Ave. About $200,000. J. Londoun & Hertzberg, Ltd., 37 Toronto Bldg., Toronto, Ont., engrs. Noted Oct. 11.

Minn., Duluth—L. Teweles Seed Co. having plans prepared by Fraser Co., engrs., 667 East Water St., for 7-story, 150 x 180-ft. rein.-con. warehouse, Clybourn St. About $200,000.

Kan., Wichita—McCormick Armstrong Co., 122-24 South Markes St., plans factory 3 story, 100 x 140 ft., steel and concrete, 2nd and Emporia Sts. About $50,000.

Ariz., Golconda—Union Basin Mining Co. plans to rebuild ore-reduction and metal-extraction plants recently destroyed by fire with loss of $250,000. J. D. Wanvig, mgr.

Wash., Seattle—Rodgers-Brown Co. soon lets contract for warehouse and dock on Harbor Island. About $200,000.

Wash., Spokane—Sperry Flour Co., 662 Mallon St., soon lets contract flour mill on East Sprague St. About $300,000. Noted Oct. 11.

Cal., Santa Barbara—E. W. Alexander having plans prepared by R. F. Sauter, archt., for 117x205-ft. garage on Victoria St. About $60,000.

Cal., Stockton—Nat'l Paper Products Co. having plans prepared for factory in Western part of city. About $1,000,000. J. B. Zellerbach, San Francisco, pres.

Que., Cap De Madeleine—Canada Steamship Lines, 9 Victoria Sq., Montreal, plans to build shipyards here. About $100,000.

Que., Montreal—Independent Silk Co., 52 Nazareth St., soon lets contract for factory. About $60,000. G. A. Nonette, 83 Craig St., archt.

Que, Montreal—T. M. Kirkwood of Three Rivers Shipyards, Ltd., Three Rivers, plans shipbuilding plant. About $500,000.

B. C., Vancouver—Pacific White Lead Co. plans to build plant on Industrial Island. About $50,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**R. I. ,Bristol**—National India Rubber Co. let contract 3-story, 60 x 202 ft. brick factory, to W. H. Hamlyn & Son, 35 Greenwich St., Providence.

★**N. Y., Buffalo**—American Radiator Co., 1807 Elmwood Ave., let contract 1 story foundry, to Austin Co., 14230 Euclid Ave., Cleveland, O. About $150,000. Noted June 28.

★**N. Y., New York**—Pouch Terminal Co., Clifton, S. I., let contract 7 story, 120 x 160 ft. rein.-con. warehouse, to Fairbault Bldg. Co., 52 Vanderbilt Ave. Noted Sept. 20.

★**N. J., Bayonne**—Nucoa Butter Co., 5th St., let contract 3 story, 60 x 100 ft. rein.-con. factory on 4th St., to Amer. Concrete Steel Co., 31 Clinton St., Newark.

★**N. J., Jersey City**—Davis-Bournonville Co., Van Wangen Ave., let contract 4 story, 59 x 100 ft. brick and concrete factory, to J. N. Gill & Co., 1215 Filbert St., Phila.

★**Pa., Pittsburgh**—Pennsylvania Chocolate Co., 5850 Center St., let contract 7 story factory at 5850 Center Ave., S., to Turner Constr. Co., 242 Madison Ave., New York City. Noted Oct. 4.

★**W. Va., Fairmont**—Mononga Glass Co., 12th St., let contract 4-story addition to factory to Ferro Concrete Constr. Co., West 8th St., $250,000.

★**O., Akron**—Wellman Seaver Morgan Co., 3000 Central Ave., Cleveland, let contract 1 story, brick and steel factory, to G. A. Fuller Co., 404 Swetland Bldg., Cleveland. About $1,000,000.

★**O., Akron**—Williams Foundry & Machine Co., 60 South Cherry St., let contract foundry to Clemmer & Johnson, High and Church Sts., $75,000. Noted Sept. 20.

★**O., Cleveland**—National Acme Co., 7500 Stanton Ave., S. E., let contract 2-story factory, East 131st St. near Coit Rd., to Master & Mullen Constr. Co., 601 Electric Bldg., $80,000.

★**Wis., Milwaukee**—Cutler-Hammer Mfg. Co., 12th St. and St. Paul Ave., let contract 7-story, 50x200-ft., to H. Schmitt & Sons, 864 Jackson St. Noted Sept. 27.

★**Que., Cedars**—Cedar Rapids Power Co., 83 Craig St., Montreal, let contract addition to power plant to Steel Co. of Canada, 1272 Notre Dame St., Montreal. About $450,000. Noted Sept. 6.

★**B. C., Vancouver**—Canadian Northern Ry. let contract building concrete platforms and train sheds at Canadian Northern Depot, to Northern Constr. Co., Vancouver Block, and C. H. Aldinger Co., Winnipeg, Man. About $150,000.

BUILDINGS

Proposed Work

N. Y., Buffalo — Hospital — **Mt. Mercy** Academy, 1475 Abbott Rd., having plans prepared by H. Spann, archt., 38 Ardmore Pl., brick, stone and steel. About $200,000.

N. Y., Lake Placid—School—Bd. Educ. having plans prepared by Pember & Campaigne, archts., Ilium Bldg., Troy, 3 story, brick and rein.-con. addition on Main St. About $125,000. M. D. Weaver, pres. Noted Aug. 16.

N. Y., New York—Synagogue—Bnai Israel Congregation had plans prepared by E. Roth, archt., 119 West 40th St. About $100,000 J. Adler, 19 West 26th St., pres.

N. Y., Syracuse—Temple—Labor Temple Assn. having plans prepared by E. E. Battey, archt., 161 West Brighton Ave., 3 story, 50 x 100 ft. brick, at 507-9 East Fayette St. About $50,000.

N. Y., Troy—Armory—City having plans prepared by L. F. Pilcher, state archt., Capitol, Albany, new armory, Beman Park and 15th St., to replace one destroyed by fire. About $300,000.

N. Y., Yonkers—School—Bd. Educ. having plans prepared by H. Chamberlain, archt., 18 Bway., 2-story, 75 x 98 ft. addition to School No. 14. About $50,000.

N. J., Seabright — Hotel — Stockholders Peninsula Hotel, Ocean Ave., plan addition. About $60,000.

Pa., Chester—Hotel—G. Shober, 305 Market St., Phila., soon lets contract, 4-story, 70x80-ft., brick, terra cotta and concrete. E. A. Wilson, 1208 Chestnut St., Phila., archt. Noted May 24.

Pa., Johnstown—Schools—Bd. Educ. approved $400,000 bond issue to build schools.

W. Va., Huntington—Bank and Office—Union Savings Bank Co., 4th Ave. and 9th St., soon lets contract, 10-story, 40 x 90 ft. About $150,000. Bankers Eng. Co., 112 W. 19th St., New York City, archts.

Fla., Miami—Hotel and Store—C. J. Martin receiving bids about Dec. 1, 7-story, 50 x 135-ft. About $137,000. F. V. Newell, 6 North Michigan Ave., Chicago, archt.

Ga., Milledgeville — Sanitarium — State having plans prepared by T. H. De Saussure, archt. About $200,000.

O., Akron—Club — Akron Eagle Lodge soon lets contract, 3-story, 66 x 165 ft., Market and Summit Sts. About $125,000. Forest Eng. Co., 512 Hippodrome Bldg., archts. Noted Aug. 23.

O., Cleveland—Church—Fourth Church of Christ Scientist had plans prepared by Briggs & Nelson, archts., Rose Bldg., to be built at 1935 East 105th St.

O., East Cleveland—(Cleveland P. O.)—Junior High School—Bd. Educ. had plans prepared by C. S. Schneider, archt., 2248 Euclid Ave., Cleveland, 3-story, brick and concrete. About $100,000.

O., Kenmore — High School — Bd. Educ. soon lets contract, 2-story, 75 x 130 ft. addition. About $125,000. N. P. Ruer, Peoples Savings & Trust Bldg., archt.

Ind., Claypool—High and Grade School—Clay Twp. having plans prepared by H. G. Bowstead, archt., 512 Glass Bldg., Marion, 2-story. About $50,000.

Ind., New Palestine—School—High and Grade School—Bd. Educ. soon lets contract, 2-story, 88 x 110 ft. About $50,000. W. H. Garns, 817 Fletcher Trust Bldg., Indianapolis, archt. Noted July 19.

Ill., Champaign—Hotel—C. F. Hamilton, mgr., Hotel Hamilton, soon lets contract, 12-story, 43 x 193-ft. About $300,000. H. H. Richards, 327 South La Salle St., Chicago, archt.

Kan., Kansas City—Hospital—Providence Hospital having plans prepared by Wight & Wight, archts., 401 1st Natl. Bank Bldg., Kansas City, Mo., 3-story, 18th and Tauronee Sts. About $250,000.

Kan., Sterling—Auditorium and Conservatory — Trustees Cooper College having plans prepared by T. W. Williamson, archt., Central Natl. Bldg., Topeka, 2-story, 100 x 120 ft., brick, stone trimmings, concrete and steel. About $50,000.

Kan., Wichita—Office—C. W. Bitting, 401 Bitting Bldg., plans 8-story addition. About $250,000.

Neb., Columbus—Court House—Platte Co. Comrs. plan. About $100,000 available.

Mont., Missoula — High School — City plans to sell $75,000 bonds to build addition to high school.

Mo., St. Louis—Hotel and Store—Francis Constr. and Realty Co., 400 Debaliviere Ave., having plans prepared by H. J. Harker, archt., Sawyer Bldg., 6-story, brick, stone, terra cotta and rein.-con. About $200,000.

Mo., St. Louis—Telephone—J. R. Timlin, archt., Boatman's Bank Bldg., c/o Southwestern Bell Telephone Co., lets contract about Jan. 1, 3-story, brick, stone and rein.-con. addition. About $50,000.

Ariz., Phoenix — Hospital — Deaconess Hospital of Arizona, Wesleyan University having plans prepared by Marsh & Howard, archts., 619 Bway. Central Bldg., Los Angeles, Cal., rein.-con., brick and hollow tile. About $100,000.

Wash., Tacoma—Theater—D. Gross having plans prepared by R. E. Borhek, archt., Natl. Realty Bldg., 3-story, 90 x 120-ft., 9th and Market Sts. About $50,000.

Cal., Arcata — High School — Bd. Educ. voted $60,000 bonds to build high school.

Cal., Los Angeles—Church—Methodist Bd. Spanish Missions, 225 East 5th St., having plans prepared by Train & Williams, archts., Ex. Bldg., 8-story, 100x100-ft., rein.-con. and brick.

Cal., Sacramento—Exhibit—State having plans prepared for rebuilding exhibit building recently destroyed by fire. About $300,000. G. B. McDougal, state archt.

BIDS DESIRED

Mass., Northampton — Infirmary — Until Nov. 15, by Bd. Trustees Smith College, 2-story, 96 x 100 ft. About $80,000. Putnam & Taylor, Bement Bldg., archts. Noted Sept. 12.

Fla., Tallahassee—Dormitory and Educational—Until Nov. 12, by Florida State College for Women. About $92,000. E. Conradi, pres. Edwards & Sayward, 633 Candler Bldg., Atlanta, Ga., archts. Noted Sept. 6.

O., Bellefontaine — (Official)—Hospital—Until Nov. 7, by Trustees Mary Rutan Hospital, Lawrence Bldg., P. O. Batch, clk. F. L. Packard, Hayden Bldg., Columbus, archt.

O., Cleveland — (Official)—School—Until Nov. 12, by Bd. Educ., Rockwell Ave., and East 6th St., 3-story, 75x175-ft., to be known as Gladstone School. About $100,000. F. G. Hogen, dir. W. R .McCormick, Rockwell Ave. and East 6th St., archt. Noted July 26.

Tex., Eldorado—Court House—Until Nov. 12, by Schleicher Co. Comrs. Bonds for $60,000 voted for work. H. B. Thompson, 1203 Southwestern Life Bldg., Dallas, archt. Noted Apr. 12.

PRICES AND CONTRACTS AWARDED

(★Indicates contract awarded)

★**Mass., Lowell** School — Lowell Training School let contract 3-story addition, Wonalancet St., to W. Penn, 263 London St., $100,000. Noted July 12.

Conn., Bridgeport—School—St. Michael's Polish congregation, 310 Sterling Pl., received low bids, from J. H. Johnston, Boston, $108,000; J. G. Roy & Sons, 21 Silver St., Springfield, Mass., $119,580; Casey & Hurley, 201 Devonshire St., Boston, $123,710.

★**N. Y., New York**—Office etc.—Herman Motor Truck Corp., 607 West 57th St., let contract 2 story office and 1 story service station, 57th St. near 11th Ave., to Gabler Constr. Co., 402 Hudson St. $60,000.

★**N. Y., Thiells**—Cottages—F. A. Vanderlip, pres. bd. mgrs., Letchworth Village, let contract 8 cottages, to P. Kreier Bldg. Co., 425 Orange St., Albany, $50,000. Noted Sept. 13.

★**Va., Norfolk**—Store—Flat Iron Development Corp. let contract 79x123-ft., to W. T. Gregory, Law Bldg., $50,000.

★**W. Va., West Liberty**—Normal—State Bd. Control let contract addition, to C. C. Heins, Baltimore, Md. About $75,000.

★**Mich., Muskegon**—Armory—Chamber of Commerce and State let contract, to Strom-Johnson Co. About $55,000. Noted June 28.

★**Ia., Iowa City**—School—Bd. Educ. let contract building 3 schools to Read-Macdonald-Brewster, Plymouth Bldg., Minneapolis, Minn., $181,982.

★**Ia, Sioux City**—Theater—J. E. Martin c/o T. S. Martin Estate, 515 4th Ave., let contract, 5th and Nebraska St., to Riesche & Sanborn, 502 United Bank Bldg., $100,000.

Minn., Minneapolis — School — Bd. Educ. received lowest bid building 2-story, 28 x 70-ft. addition to McKinley Grade School, from Laurence Constr. Co., 624 Plymouth Bldg.

★**Mo., St. Louis**—Opera House and Apartment—F. L. Cornwell, and associates, La Salle Bldg., let contact, on Olive St. between Grand and Spring Sts., to Francis Constr. & Realty Co., 400 Debaliviere Ave., $800,000.

★**Wash., Spokane**—Hotel—J. Hetterman, Atty. Realty Bldg., Louisville, Ky., let contract on Main and Monroe Sts., to A. D. Jones Co., 125 Lincoln St., N. Cost between $500,000 and $600,000.

★**Ont., Chatam**—Bank—Bank of Commece let contract, rein.-con. and brick, to E. Bolton, 168 Park St. About $50,000.

MISCELLANEOUS

Proposed Work

Amusement Park—Jersey City, N. J.—Boulevard Park, Inc., 15 Exchange Pl., plans to build amusement park. About $800,000. J. Milton, corp. counsel.

Elimination of Grade Crossings—Dallas, Tex.—Missouri, Kansas & Texas R.R., (L. F. Lonbladh, ch. engr.), will let contract about Dec. 1 for elevation of tracks over Fairmount, Bowen and Hall Sts., Cedar Springs Rd. and Lemmon Ave.; street grade on all but Bowen and Hall Sts. will be lowered, some of them as much as 10 ft. About $750,000. Noted Apr. 12.

Wharf—Point Isabella, Tex.—Rio Grande Ry., Brownsville, plans to build 1500-ft. wharf. D. A. O'Brien, genl. mgr.

Tunnel — North Yakima, Wash. — See "Excavation and Dredging."

Dock—Seattle, Wash.—See "Industrial Works."

Wharf—Seattle, Wash.—City election in December to vote on $1[illegible],000 bonds to build addition to Bell St. wharf. A. H. Dimock, city engr.

Transmission Lines—San Diego, Cal.—Bd. Supervs. San Diego Co. granted [illegible]-year franchise to San Diego Consolidated Gas & Electric Co. to extend electric transmission lines throughout county. H. H. Jones, San Diego, pres. and mgr.

BIDS DESIRED

Incinerator—Okmulgee, Okla.—Until Nov. 5, by R. H. Jenness, comr. finance, building garbage disposal plant. About $1[illegible],000. Noted July 26.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Pier—New York, N. Y.**—W. W. Wotherspoon, supt. pub. wks., Capitol, Albany, let contract building pier foot West 43rd St. Terminal Const. No. 38, to I. J. Standley & Co., Inc., 118 East 28th St., $266,065. Noted Sept. 27.

★**Subway—Parsons, Kan.** — City and Missouri, Kansas & Texas R.R. let contract building subways under tracks on Main St. to Kramer Valved Conduit Co. Contractors Bldg. St. Louis, Mo. $[illegible]. Noted Oct. 4.

★**Oil Reservoir — El Segundo, Cal.** — Standard Oil Co. let contract building 1-[illegible],000 gal. concrete lined oil reservoir, [illegible] ft. deep covering 8 acres, to Bent Bros., Central Bldg., Los Angeles.

★**Pier—Manhattan Beach, Cal.** — (Official)—City let contract building [illegible] to G. W. Harding, Manhattan Beach, $[illegible]. Noted Oct. 4.

★**Dam—San Diego, Cal.**—City let contract [illegible] dam, Lower Otay site, to J. Kennedy, Washington Bldg., Los Angeles, $[illegible]; Warren County, Ga. refused to accept contract calling for [illegible] in compiling bid.

★**Platforms—Vancouver, B. C.**—See "Industrial Works."

FEDERAL GOVERNMENT WORK

Proposed Work

N. H., Portsmouth—Track Scales—Bureau Yards and Docks, Navy Dept., Wash., plans to install two 3-rail road-track scales at Navy Yard.

R. I., Melville—Dredging—Bureau Yards and Docks, Navy Dept., Wash., preparing plans. About $26,500.

N. Y., New York—Steel Towers—Bureau Yards and Docks, Navy Dept., Wash., soon receives bids furnishing 24 steel towers, 200 and 300 ft. high, for Cuban Government, delivery f.o.b. Navy Yard, New York.

Wash., D. C.—Addition to Forge Shop—Bureau Yards and Docks, Navy Dept., Wash., preparing plans. About $155,000.

Wash., D. C.—Building—Bureau Yards and Docks, Navy Dept., Wash., preparing plans for reconstructing Building No. 105, Optical Shop. About $184,000.

Wash., D. C.—Structural Steel—Bureau Yards and Docks, Navy Dept., Wash., plans to purchase structural steel for seaplane hangar, Hampton Roads, Va.

W. Va., Charleston—Electric Duct System—Bureau Yards and Docks, Navy Dept., Wash., plans.

W. Va., Charleston—Track Scale—Bureau Yards and Docks, Navy Dept., Wash., plans to install one 3-rail road-track scale at Navy Yard.

W. Va., Wheeling—Power House—U. S. Engr. Office, Wheeling, rejected only bid received Oct. 2, building at dam No. 24, Ohio River. Noted Sept. 13.

Ill., Peoria—Barracks—War Dept., Brig. Gen. I. W. Littell, soon lets contract for mobile ordnance school-barracks buildings. About $10,000.

Wis., Clintonville—Barracks—War Dept., Brig. Gen. I. W. Littell, soon lets contract for mobile ordnance school-barracks buildings. About $10,000.

Wis., Kenosha—Barracks—War Dept., Brig. Gen. I. W. Littell, soon lets contract for mobile ordnance school-barracks buildings. About $10,000.

N. M., Farmington—Bridge—Dept. of Interior, Office of Indian Affairs, Wash., D. C., rejected bids opened Oct. 22, building steel highway bridge at Farmington. Noted Oct. 18.

BIDS DESIRED

Mass., Boston—Timber Bulkhead—Until Nov. 19, by Bureau Yards and Docks, Navy Dept., Wash., building at Navy Yard. Noted Oct. 25.

R. I., Newport—Storehouse—Until Nov. 5, by Bureau Yards and Docks, Navy Dept., Wash., extension to general storehouse, Naval Torpedo Sta. About $100,000. Noted Oct. 18.

N. Y., Brooklyn—Emergency Hospital—Until Nov. 12, by Bureau Yards and Docks, Navy Dept., Wash., building at Navy Yard.

Wash., D. C.—Bridge—Until Nov. 20, by Commissioners, District Bldg., building 7-span steel plate girder highway bridge, approaches, piers and approaches over tracks Pennsylvania, Baltimore & Washington R.R. and Washington R.R. Bending Rd.

Wash., D. C.—Machine Shop—Until Nov. 1, by Bureau Yards and Docks, Navy Dept., Wash., building at Navy Yard. About $1,-000,000.

Wash., D. C.—Refrigerating Plant and Brine Circulating System—Until Nov. 19, by Bureau Yards and Docks, Navy Dept., Wash.

Wash., D. C.—Steel Towers—Until Nov. 16, by Bureau Yards and Docks, Navy Dept., Wash., building 100-ft. steel towers at St. Thomas, Virgin Isles, West Indies.

Va., Norfolk—Electric Elevator—Until Nov. 15, by Bureau Yards and Docks, Navy Dept., Wash., furnishing and installing electric elevator No. 19, Navy Yard.

W. Va., Charleston—Distributing System—Until Nov. 5, classes of daily, by Bureau Yards and Docks, Navy Dept., Wash., building electric power distributing system at Naval Ammunition plant. Noted Oct. 11.

Ala., Decatur—Post Office—Until Dec. 5, by J. A. Wetmore, superv. archt., treas. dept., Wash.

La., New Orleans—Piles, Waling and Lumber—Until Nov. 13, by U. S. Engr. Office, Customhouse, New Orleans, furnishing and delivering piles, waling and lumber on bank or wharves; advertised in this issue.

La., New Orleans—Stone—Until Nov. 27, by U. S. Engr. Office, Customhouse, New Orleans, furnishing and placing on jetties at Southwest Pass, Mississippi River; advertised in this issue.

O., Cincinnati—Machinery, Etc.—Until Nov. 30, by U. S. Engr. Office, Cincinnati, furnishing and installing operating machinery, etc., at Dams Nos. 31 and 35, Ohio River; advertised in this issue.

Wyo., Buffalo—Post Office—Until Nov. 30, by J. A. Wetmore, superv. archt., treas. dept., Wash.; advertised in this issue.

Wyo., Torrington—Laterals—Until Dec. 18, by U. S. Rec. Serv., Torrington, building 15.7 mi. main laterals, Ft. Laramie Unit, North Platte Project, Nebraska-Wyoming, involving 236,700 cu.yd. excava., near Bridgeport-Guernsey line of Chicago, Burlington & Quincy Ry.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★R. I., Ft. Greble—Wharf Extension—Bureau Yards and Docks, Navy Dept., Wash., let contract concrete pile and timber extension to wharf, to Booth & Chase Co., 554 Davol St., Fall River, Mass., $10,268.

★Conn., New London—Power House and Machine Shop—Bureau Yards and Docks, Navy Dept., Wash., let contract, to Biglow & Nichols, 45 East 42nd St., New York City, $150,430. Noted Oct. 25.

★N. Y., Brooklyn—Paving—Bureau Yards and Docks, Navy Dept., Wash., let contract hard macadam roadway to F. J. Gallagher, 490 Park Pl., New York, $2232. Noted Aug. 16.

N. Y., Waterloo—Post Office—J. A. Wetmore, superv. arch., treas, dept., Wash., received low bids, (a) limestone, (b) sandstone, from Hagen Lumber Co., Hickory and Mattes St., Scranton, Pa., (a) $52,841, (b) $53,300; G. Baur, 2746 Bedford Ave., Brooklyn, (a) $54,500, (b) $55,200; W. H. Fissell & Co., 1328 Bway., New York City, (a) $59,900, (b) $62,900. Noted Sept. 20.

★Pa., Ft. Mifflin—Mine Storage Building—Bureau Yards and Docks, Navy Dept., Wash., let contract, to W. Tinker Co., 831 Cherry St., Phila., $23,700. Noted Oct. 18.

★Pa., Phila.—Dispensary—Bureau Yards and Docks, Navy Dept., Wash., let contract, at Navy Yard, to McCloskey & Bahl, 16 Thompson St., $31,137. Noted Oct. 25.

Pa., Phila.—Electric System—Bureau of Yards and Docks, Navy Dept., Wash., received bids, Oct. 15, electric system in foundry and machine shop at Navy Yard, (a) work complete, (b and c), alternate bids, from Commercial Eng. Co., 1526 Sansom St., (a) $26,919, (b) $8241, (c) $18,678; United Electric Co., 1727 Sansom St., (a) $27,500, (b) $8800, (c) $18,700; Jandous Electric Equipment Co., 109 West 31st St., New York City, (a) $30,773, (b) $9448 (c) $21,725. Noted Sept. 27.

★Pa., Phila.—Heating System—Bureau Yards and Docks, Navy Dept., Wash., let contract, furnishing and installing in structural shop, to Enterprise Steam & Hot Water Heating Co., 600 North Howard St., Baltimore, Md., $68,030. Noted Oct. 11.

Wash., D. C.—Experimental Sheet Rolling Mill—Bureau Standards, Wash., received only bid Oct. 20, from Phila. Rolling Machine Co., Phila., $16,500. Noted Oct. 11.

★Wash., D. C.—Fuel Administration Building—Engr's Office War Dept., Wash., let contract to G. A. Fuller Constr. Co., Munsey Bldg. About $300,000.

★Va., Cherrystone—Office Quarters—Bureau Yards and Docks, Navy Dept., Wash., let contract to King Lumber Co., Charlottesville, Va., $18,881.

Va., Norfolk—Building—Bureau of Yards and Docks, Navy Dept., Wash., received bids remodeling quarters No. 8 at Navy Yard (work complete), from Nichols & Lindemann, 522 Seaboard Bank Bldg., $23,-990; W. W. Keenan, Charlottesville, $26,-440; Nash & Jones, 727 Law Bldg., $27,781.

W. Va., Charleston—Sewerage System—Bureau of Yards and Docks, Navy Dept., Wash., received low bids, Oct. 29, installing at Naval Sta., from Warren Moore, 13th and Market Sts., Philadelphia, $13,387; Reed & Lapsley, South Charleston, W. Va., $14,496; Brown & Floyd, Charleston, W. Va., $17,263. Noted Oct. 25.

S. C., Port Royal—Hospital—Bureau of Yards and Docks, Navy Dept., Wash., received bids emergency hospital building at Naval Hospital Reservation (work complete), from W. D. Hadlow, Jacksonville, Fla., $53,690, and J. L. Crouse, Greensboro, N. C., $60,090.

★Fla., Pensacola—Repairs to Quarters—Bureau Yards and Docks, Navy Dept., Wash., let contract repairing Quarters G and I, to S. F. Fulghum Co., 207 South Palafox St., $3972.

★Fla., Pensacola—Roof Repairs—Bureau Yards and Docks, Navy Dept., Wash., let contract repairing roof building No. 40, to Monk & Eley, 125 South Palafox St., $6000.

Ala., Andalusia—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., received low bids, (a) limestone, (b) sandstone, from G. W. Stiles Constr. Co., La Salle St., Chicago, (a) $42,365, (b) $43,-365; A. Blair, Hill Bldg., Montgomery, (a) $43,752; E. H. Brown, Dothan, (a) $46,-200. Noted Sept. 20.

★Miss., Gulfport—Emergency Camp—Bureau Yards and Docks, Navy Dept., Wash., let contract (work complete), to J. Griffith & Son, 112 West Adams St., Chicago, $349,000. Noted Oct. 25.

★Miss., Gulfport—Emergency Hospital—Bureau Yards and Docks, Navy Dept., Wash., let contract (work complete), to J. Griffith & Son, 112 West Adams St., Chicago, $84,000. Noted Oct. 25.

La., Grande Isle—Buildings—E. P. Bertholf, capt. commandant, U. S. Coast Guard, Wash., D. C., received low bids for new buildings and accessories for Coast Guard Station No. 214 (work complete), from J. Riess, 503 Hibernia St., New Orleans, $39,360; J. Thatcher, 60 Park Ave., Brooklyn, N. Y., $41,600; Hanna & Mitchell, Custom House, New Orleans, $43,900. Noted Oct. 11.

★La., New Orleans—Electric Traveling Crane—Bureau Yards and Docks, Navy Dept., Wash., let contract furnishing in machine shop, to Niles-Bement Pond Co., 111 Bway., New York City, $8800. Noted Oct. 18.

★Ky., Louisville—Lock Gates—U. S. Engr. Office, let contract furnishing and building gates for lock No. 43, Ohio River, to Independent Bridge Co., Beaver and Rebecca Sts., Pittsburgh, Pa., $64,700. Noted Sept. 13.

Ill., Mt. Carmel—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., received low bids, (a) limestone, (b) sandstone, from W. D. Lovell, 1415 South East 8th Ave., Minneapolis, Minn., (a) $52,100; G. W. Stiles Constr. Co., 209 South La Salle St., Chicago, (a) $54,130, (b) $55,630; E. A. Steininger Constr. Co., Victoria Bldg., St. Louis, Mo., (a) $55,935. Noted Sept. 20.

★Ariz., Leupp—Bridges—Comr. Indian Affairs, Wash., D. C., let contract building 2 highway bridges, to Monarch Eng. Co., Kansas City, Mo.

Cal., Bakersfield—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., received low bids (a) limestone, (b) sandstone, from C. Wright and A. Hohn, San Francisco, (a) $124,988; H. S. Williams, San Francisco, (a) $129,968; F. O. Engstrum Constr. Co., 2042 East 15th St., Los Angeles, (a) $133,897, (b) $135,197. Noted Sept. 20.

P. R., El Cayey—Building—Bureau of Yards and Docks, Navy Dept., Wash., received low bids, Sept. 30, radio buildings at high power radio station, (a) work complete, (b) net price operator's quarters, power house and receiving building complete (c) net price chief petty officers' quarters, from Hamilton & Chambers, 29 Broadway, New York City, (a) $79,780, (b) $64,780, (c) $17,000; Pittsburgh Des Moines Steel Co., Pittsburgh, Pa., (a) $85,200, (b) $75,-000, (c) $11,200; Jesus Demitz, El Cayey, P. R., telegram—bid in mail—not yet received by department. Noted Aug. 30.

Water-Works (Continued)

Tex., Goose Creek—N. L. Nelson, Sour Lake, plans to build water-works system and electric-light plant here.

Okla., Ardmore—City plans to improve water-works system. About $250,000. J. H. Curlock, city engr.

Okla., Henryetta—City defeated $128,000 bonds to build water-works. Noted Oct. 11.

Okla., Okmulgee — City voted $385,000 bonds to improve water-works, including new reservoir, pumping station, etc. Noted Oct. 25.

Colo., Windsor—City having plans prepared for water-works. E. B. House, engr.

Utah, Brigham—City voted $80,000 bonds to rebuild water-works system including new reservoir. F. Y. Jensen, supt. Noted Oct. 4.

Utah, Moab—Town plans to issue $45,500 bonds to build water-works.

Ont., Sault St. Marie—City plans to improve water-works. About $25,000. Van Every, mgr.

Ont., Strathroy—Town soon lets contract pump house and turbine pump for reservoir. About $10,000. Kerry & Chase, Confederation Bldg., Toronto, engrs.

BIDS DESIRED

Miss., Charleston—Until Nov. 20, by J. M. O'Neal, comr. water and light, improving water-works and electric-light systems; including oil engines, pumps, deep well, reservoir, elevated tank, and oil storage facilities. X. A. Kramer, Magnolia, engr. Noted Oct. 11.

O., Euclid—(Official)—Until Nov. 26, by H. S. Dunlop, village clk., building 6 in. water mains in Independence Ave. from St. Clair Ave. to Babbitt Rd.; Chelsea Ave. from St. Clair Ave. to Babbitt Rd.; Naumann Ave. from Gardner to Cut Rd.; Ivan Ave. from Bliss Rd. to Ivan Ave., Nicholas Ave. from Bliss Rd. to Nicholas Ave. F. A. Pease, Marshall Bldg., Cleveland, village engr.

O., Wooster—(Official)—Until Nov. 19, by R. Bruno, city clk. for improving water-works. O. A. Gierow, city engr. Noted Sept. 27.

Ia., Sioux City—(Official)—Until Nov. 10, by City, building North Riverside sewerage system, including pumping station and outfall beds. C. Kloster, clk. T. H. Johnson, city engr.

Man., Winnipeg — (Official) — Until Nov. 10, by Greater Winnipeg Water Dist., supplying portland cement for year 1918. R. D. Wauch, chn. Advertised in this issue.

Man., Winnipeg—By Greater Winnipeg Water Dist. improving water-works as follows:

Nov. 16, gate house and intake at Shoal Lake.

Nov. 26, c.i. gate valves and sluice gates

Dec. 3, material to be used in pipe line from Red River to McPhillips St. reservoir; also for building pipe line. W. G Chace, ch. engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Pa., Phila.—City received lowest bid laying water pipes in Parkway between 22nd and 25th Sts., from E. C. Fish Co., Real Estate Trust Bldg., $36,385.

★**Pa., Phila.**—(Official)—Springfield Consolidated Water Co. let contract 4,000,000-gal. cross-compound Corliss pumping engine at Pickering Creek Sta., to Allis-Chalmers Mfg. Co., Pennsylvania Bldg.

O., Akron—(Official)—City received low bids Contr. No. 89, laying c.-i. water pipe, from E. & W. McShaffrey, 173 South Forge St., $15,388; T. E. McSchaffrey, 130 South College St., $18,165; Peters-Carpenter Handy Co., Akron, $18,273. Noted Oct. 4.

★**Ill., Berwyn**—City let contract for water-works improvements in Lawndale Manor to J. W. Harker, 531 North 5th Ave.; Clinton, Harvey and Wenonah Aves., to F. Trinner, 1333 Kenilworth Ave.; Oak Park; Curtis Subdivision and Lombard Aves., to T. H. Inglehart, 209 South La Salle St., Chicago. Noted Oct. 11.

★**Kan., Kansas City**—City let contract water mains and valves for reservoir, to Arkansas Bridge Co., 1503 Waldheim Bldg., Kansas City, Mo. About $30,000. Noted Aug. 16.

★**Kan., Towanda**—City let contract for water-works to B. F. Evans, Newton. About $25,000. Noted Sept. 20.

★**N. D., Dickinson**—City let contract extending water-works and sewerage systems, to C. W. Schruit, Minneapolis, Minn. About $30,000.

★**N. D., Langdon**—(Official)—City let contract for water-works and sewerage systems, to Haggart Constr. Co., Fargo, $73,358. Noted Oct. 25.

★**Tex., Electra**—City let contract building reservoir about 4 mi. from here, $90,000,000 gal. capacity; concrete spillway 300 ft. long, to O'Neil Eng. Co., Praetorian Bldg., Dallas.

★**Wash., Seattle**—City let contract laying c.i. water mains on 10th Ave. and other streets, to Scalzo & Co., 1708 22nd St., $47,327.

★**Que., Three Rivers**—City let contract building pumping station and concrete reservoir to Nubert, Durge & Arsenault, Three Rivers. Noted Nov. 1.

★**Ont., Hamilton**—City let contract installing machinery in Beach Pumping Sta., to Turbine Equipment Co., Ltd., Canadian Pacific Ry. Bldg., steam turbine and centrifugal pumps, $75,000; Canadian Westinghouse Co., Ltd., Traders Bank Bldg., 1650 kv.-a. synchronous motor, $16,620; Canadian General Electric Co., Ltd., King and Simcoe Sts., transformers and switchboards, $19,000; Babcock & Wilcox, Ltd., Traders Bank Bldg., 1400 hp. water tube boiler and insulation, $17,555; Allen General Supplies, 205 Yonge St., Venturi meters, $3715. All contractors of Toronto. Noted Oct. 25.

SEWERS

Proposed Work

N. J., Newark—Council passed ordinance to build sewer in Oraton St. between Grafton and Verona Aves. M. R. Sherrard, city engr.

Pa., Duquesne—Council passed ordinance to build sewer in North 6th St. from West Grant Ave. to Hamilton Ave., 1st Ward. J. A. Conlin, boro. clk.

Ga., Stone Mountain—City election Dec. 5 to vote on $15,000 bond issue to build water-works system.

Fla., Perry—City plans to sell $25,000 bonds to extend sewerage system.

Tenn., Knoxville—City soon lets contract extending 3rd creek sewerage system connecting it with laterals of Dale Ave. system. About $12,000. J. B. McCalla, city engr.

Tenn., Morristown — City sold $15,000 bonds to build sewers in south side of city.

O., Akron—City plans to build sewers in Noah St. from Lawton to Maple St.; Maple St. from Noah to Doran St.; Bacon St. from Maple to Peckham St.; Doran St. from Maple to Peckham St.; Little St. from Noah to West St.; West St. from Lawton to Maple St., Garth St. from West to Grace St.; Grace St. from Diagonal Rd. to Maple St.; Adeline St. from South to Crosier St. E. A. Zeisloft, city engr.

O., Marion—City plans to build sanitary sewer in Fairground St. from State to Greenwood St. H. H. Noyes, city engr.

O., Newark—City plans to build sewer in Columbia St. between 10th and 11th Sts. C. H. Wells, city engr.

Ind., Hammond—City soon lets contract for Atchison Ave. sewer. About $105,417. P. J. Lyons, city engr.

Ind., La Fayette—(Official)—City had plans prepared for trunk line sewerage system in 7th Ward, including 7800 ft. 54-90 in. pipe. About $90,000. H. B. Overesch, city engr. Noted Oct. 18.

Mich., Saginaw—City plans to build sewers in Hiland St. from Jefferson to Macaulay Ave. and from Sheridan to Macaulay Ave., Macaulay Ave. from Weiss to Hiland St. H. H. Eymer, city engr.

O., Akron—See "Streets and Roads."

Minn., Kinney—(Official)—Village defeated $20,000 bonds to build sewers. Noted Oct. 11.

Mo., St. Joseph—City plans to improve sewerage system in Hyde Park Dist.; including 3 service drains in Dist. No. 40, from 3rd St. north to Haeberle Gardens; Dist. No. 141 begining at 9th and Court Sts., west on Court to 8th St., south on 8th to new storage sewer; also sewer west to 7th St. C. P. Hoff, city engr.

Mo., Springfield—City having plans prepared extending sewers and improving septic tank. About $35,000. O. D. Chrisman, city engr.

Tex., Austin—City plans new election to vote on bond issue to build sewage disposal plant. M. C. Welborn, city engr. Noted Oct. 18.

Tex., Wolf City—City plans to improve water-works, including new pumping plant.

Okla., Guthrie—(Official) — City plans election in January to vote on bond issue to build sewerage and water-works systems. H. P. Cook, comr. pub. utilities. Noted Oct. 25.

Okla., Henryetta—City defeated $32,000 bonds to build storm water sewers. Noted Oct. 11.

Okla., Okmulgee — City voted Oct. 30, $150,000 bonds to improve sewerage system. Noted Oct. 25.

Okla., Quinton—City plans to improve sewerage system.

Idaho, Preston—City election, Nov. 19, to vote on $30,000 bond issue to build sewerage system. J. Johnson, clk.

Cal., Stockton—City having plans prepared by Haviland & Tibbitts, Alaska Commercial Bldg., San Francisco, building sewage disposal and sewage pumping plants.

Ont., St. Catherines—City plans building relief and outlet sewer on Carlton St. About $70,000. W. P. Near, city engr.

Alta., Calgary—City plans to install sewage disposal plant.

BIDS DESIRED

N. Y., New York—(Official)—Until Nov. 16, by M. H. Connolly, boro. pres. (Queens Boro) building sewers in portions Penn, Maspeth, Hayes, Roosevelt, McCormick and Oxford Aves., Dunsing and North Villa Sts., and Sycamore Pl.

N. Y., New York—(Official)—Until Nov. 14, by M. M. Marks, boro. pres., alterations to basins and building inlets in Madison Ave. from 43rd to 46th St.; also building sewer in Cedar St. from Bway. to Trinity Pl.

Pa., Pittsburgh — See "Streets and Roads."

O., Lorain—(Official)—Until Nov. 13, by Dir. Pub. Serv., building sanitary sewers in West 28th St. from Leyington to Oakdale Ave.; Oakdale Ave. from West 27th to West 28th St.; East 34th St. from Elyria to Apple Ave.; Clifton Ave. from East 35th to East 36th St. L. B. Johnston, clk. C. M. Osborn, city engr.

Mich., Highland Park—(Official)—Until Nov. 12, by H. A. Stone, village clk., building sewers in Chatham Ave. between Connecticut Ave. and northerly village limits; in Alley between Cardoni and Russell Sts.; in Connecticut Ave. from Oakland to Russell Sts. and Russell St. from Connecticut Ave. to alley south of Greenwood Ave.

Wis., Appleton—Until Nov. 17, by C. L. Williams, city clk., building sewer in Adams St. A. C. Bentley, city engr.

Mo., Independence—Until May 14, by City, laying pipes in various streets, including 1181 ft. 8-in. sewer pipe. About $10,000. J. Craig, clk. H. H. Funkhouser, city engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., New York—H. Matthews, [illegible] received [illegible] building sewers in 181st Street, Aqueduct Ave. between Hoyt and Brooklyn Ave., Matthews Ave. between Lydig and Hunt Aves., Lydig Ave. between Matthews and Matthews Aves., Matthews Ave. between Lydig Ave. and Bronx River. (2) Building sewer in Ave. between Bronx River and Pennsylvania Rd. (3) [illegible]

Sewers (Continued)

side, between Eastern Blvd. and Puritan Ave., from Anita Constr. Co., 2975 Marion Ave., (a) $171,783; Union Paving Co., 120 Bway., (a) $226,054; A. McBride (b) $23,706; (c) $23,706; E. J. McLaughlin, 337 East 134th St., (b) $25,091; Black & Co., (b) $25,833, (c) $23,361; M. Dimena, 2336 Cambrelling Ave., (c) $37,886. Noted Oct. 25.

★**N. J., Jersey City**—City let contract building sewer in 3rd Ward, to Culligan & Machansky, $20,830.

Pa., Scranton — City received low bids [illegible] on West Market St., from Gibbons & Buckley, $12,101 and J. J. Manley, 325 Adams Ave., $14,094. Noted Oct. 18.

★**O., Cleveland**—Bd. Control let contract installing sewers in East 125th and East 128th Sts., to P. Ciraci; East 127th and East 128th Sts., to Courey Bros. & Co.; East 124th St., to N. Iafornaro. About $20,000.

★**O., Lorain**—(Official)—City let contract sewers in portions Allison and Park Aves., and Lake View Blvd., to T. Trifelli, 319 13th St. About $11,000. Noted Oct. 18.

★**O., Maumee**—See "Streets and Roads."

★**Ia., Grand Mound**—(Official)—Town let contract 2½ mi. sanitary sewers and sewage disposal plant, to R. C. De La Hunt, Cedar Rapids, $17,804. Noted Oct. 25.

★**Ia., Sioux City**—(Official)—City let contract building 2 sanitary sewers to W. B. Carter, Sioux City, 74c. and 75c. per ft. for 8-in. pipe.

Minn., St. Cloud—City received low bids for sewerage system, including 4200 lin.ft. 72-in. segment block and 4000 lin.ft. 36-in. segment block or vitr. pipe, from Paskurete & Co., 511 Lyceum Bldg., $133,217; Comstock & Hansen, Cedar Rapids, Ia., $148,011; Thill, Manning & Wheeling, La Crosse, Wis., $157,872. Noted Oct. 18.

★**Minn., St. Paul**—City let contract furnishing and delivering vitr. clay pipe sewer and specials for high service reservoir, involving 1650 lin.ft. 24-in. double strength vitr. clay sewer pipe and four 24-in. 45 degree double strength vitr. clay bends for material and building sewer on 6th St., to Streator Clay Mfg. Co., Streator, Ill., $1.85 per ft.

★**N. D., Dickinson**—See "Water-Works."

★**N. D., Langdon**—See "Water-Works."

★**Cal., Santa Barbara**—City let contract building intercepting sewerage system, to Magee-Hansen & Gillespie, 110 Bloom St., Los Angeles, $56,125. Noted Nov. 1.

BRIDGES

Proposed Work

W. Va., Wheeling—City (C. B. Cooke) engr. and West Virginia Traction & Electric Co. (R. D. Jennison, genl. mgr.), Wheeling, plan to build 2 rein.-con. bridges over Wheeling Creek. About $70,000.

Ill., Highland Park—City had plans prepared by C. Russell, engr. Court House, Waukegan, for reinforcement girder bridge 5 spans, asphalt macadam surfacing, on [illegible] Sheridan Rd. About $15,000. E. A. Warren, city engr.

Minn., Grand Rapids—See "Streets and Roads."

Minn., St. Paul—See "Streets and Roads."

Mo., Kansas City—City (C. Hill, engr.), Kansas City Ry. (J. E. Gibson, genl. mgr.), 1555 Grand Ave., and other railroads at 21st St. plan to build new reinforcement viaduct to connect with viaduct built to State line by the Kansas side. Harrington, Howard & Ash, Orear-Leslie Bldg., Kansas City, consultg. engr.

Okla., Sapulpa—See "Streets and Roads."

Okla., Woodward—See "Streets and Roads."

Wash., Spokane—Spokane Co. Comrs. plans to build two reinforcement bridges over Spokane River next year. About $14,000.

Que., Montreal—Bd. Control plans to spend $40,000 to repair Lachapelle bridge. P. E. Mercier, city engr.

BIDS DESIRED

Pa., Phila.—See "Streets and Roads."

S. C., Charleston—(Official)—Until Nov. 19 (change of date), by Sanitary & Drainage Comn., Charleston Co., building steel drawbridge and timber approach over Dawboo River. J. W. Marvin, engr.; advertised in this issue. Noted Nov. 1.

Fla., West Palm Beach—(Official)—Until Dec. 4, by Palm Beach Co. Comrs., building 2 steel drawbridges over East Coast Canal. R. F. Goodman, co. engr.; advertised in this issue.

Mo., Bowling Green—Until Nov. 17, by Pike Co., furnishing steel for 9 bridges. About $12,000. C. H. Harris, co. engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**O., Troy**—Miami Co. let contract building bridge over Stillwater River, to Rochester Bridge Co., Rochester, Ind., $15,600.

★**Ia., Sioux City**—Sioux City Terminal Ry. let contract building superstructure bridge to Frankman Bros. Bridge & Constr. Co., 911 Metropolitan Life Bldg., Minneapolis, Minn.; substructure to E. A. Whitney, Sioux City. About $27,642.

Minn., Minneapolis—(Official)—City received lowest bid building Waddell direct lift bridge, from Hanlon & Okes, 338 Lumber Ex. Bldg., $122,130.

★**Ark., Little Rock**—See "Streets and Roads."

★**Tex., Dallas**—City let contract building Forest Ave. trestle, to Austin Bros., 18 Coombs St., $12,178. Noted July 5.

★**Colo., Salida**—(Official)—Comrs. Chaffee Co., Buena Vista, and State Highway Comn., Denver, let contract building rein.-con. bridge over Arkansas River, to R. P. McDonald Constr. Co., Denver, $14,700. Noted Oct. 25.

STRUCTURAL STEEL WORK

BIDS DESIRED

S. C., Charleston—See "Bridges."

Fla., West Palm Beach—See "Bridges."

Mo., Bowling Green—See "Bridges."

REINFORCED CONCRETE

Proposed Work

N. Y., Brooklyn—See "Industrial Works."

N. J., Newark—See "Industrial Works."

W. Va., Wheeling—See "Bridges."

Ill., Highland Park—See "Bridges."

Mo., Kansas City—See "Bridges."

Wash., Spokane—See "Bridges."

Cal., Sacramento—See "Industrial Works."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**O., Cincinnati**—See "Industrial Works."

★**Ia., Spirit Lake**—See "Buildings."

★**Colo., Salida**—See Bridges."

★**Wash., Seattle**—See "Industrial Works."

STREETS AND ROADS

Proposed Work

Mass., Boston—City plans to build new roadway from Boylston St. and Commonwealth Ave. through the Fens; also concrete sidewalks on the Common. About $45,000. E. F. Murphy, comr. pub. wks.

N. Y., Buffalo—City Council plans to pave Wyoming Ave., Troy and Glendhu Pl., and 4th, Glenn and Georgetown Sts., asphalt on concrete foundation. G. H. Norton, city engr.

N. J., Camden—City Council plans to pave Liberty St. from 9th to 10th St., 9th St. from Kaighn to Atlantic Ave., Bradley Ave. from Kenwood to Greenwood Ave., sheet asphalt on concrete foundation. I. E. Farnham, city engr.

N. J., Haledon—Boro. Council plans to widen and improve Haledon Ave.

N. J., Jersey City—(Official)—City received no bids repaving Hopkins Ave., brick. Noted Sept. 13.

Pa., Greensburg—Westmoreland Co. plans to build concrete road from New Kensington to Leechburg with State aid. About $300,000.

N. C., Asheville—City plans to pave Cherokee and Victoria Rds., also College and West Haywood Sts. B. M. Lee, city engr.

Georgia—State Highway Comn., Atlanta, plans to improve with Federal aid Bacon and Brooks Cos.: Walton-Oconee Co. Highway; Hull-Lumpkin Highway. About $270,000.

Ga., Nashville—City election Dec. 11 to vote on $18,000 bond issue to pave streets.

Fla., Perry—City receives bids about Dec. 1 improving streets, asphalt on macadam base. About 75,000. Noted July 12.

Fla., Tallahassee—Leon Co. Comrs. rejected bids building 6 mi. Woodville Rd. New bids. B. E. Reed, co. engr. Noted Oct. 25.

Ala., Union Springs—Bullock Co. plans to build road from Union Springs to Montgomery Co. line, 8 mi. Cost, $23,733. County to pay ¼, State ¼ and Federal Government, ½ of cost.

Miss., Monticello—Lawrence Co. soon lets contract improving and graveling highways.

La., Thibodaux—Lafourche Parish, Rd., Dist. No. 3, at recent election, voted $50,000 bond issue for road improvements. Noted Sept. 27.

Ky., Louisville—Jefferson Co. plans to build Edwardsville-Georgetown Highway, 8586 ft. long. About $10,975.

Ky., Owenboro—Fiscal Court Davies Co. rescinded contracts awarded Sept. 18, building Hardinsburg, Ware, Livermore, Henderson, Grave Lane, Boonsville, Curdsville, and Pleasant Valley Rds., as prices were too high. About $117,789. Work will be readvertised. Noted Oct. 4.

O., Akron—Council passed ordinance to grade, pave, build sidewalks, curbs, and sewers in Bowery St. from Thornton to South St.; East Ave., from Wooster Ave. to Maple St.; West North St. from Howard St. to Northern Ohio R.R. E. A. Zeisloft, city engr.

O., Cincinnati—Hamilton Co. had plans prepared improving Montauk Rd. Cost as follows: concrete, $84,072, asphaltic concrete, $94,101, warrenite, $98,173.

O., Columbus—City plans to issue $100,000 bonds to build streets and alleys in outlying sections of city. H. Maetzel, city engr.

O., Elyria—City sold $18,000 bonds for road work. C. M. Theobold, city engr.

O., Sidney—City sold $214,700 bonds for paving streets. T. Blake, city engr.

O., Springfield—City Council passed resolution to improve and pave portions Chestnut and Columbia Sts. M. J. Bahin, city engr.

Mich., Bessemer—Gogebic Co. plans to spend $78,000 to improve roads in 1918.

Mich., Wyandotte—City having plans prepared by M. L. Brown & Son, engrs., 819 Chamber Commerce Bldg., Detroit, building rein.-con. and cement pavements. About $150,000. C. Block, city clk.

Ill., Rockford—(Official)—Winnebago Co. voted $145,000 bond issue to build 6½ mi. permanent road from Rockford to Cherry Valley. Bids for work will be received in March. Noted Oct. 11

Wis., Lancaster—Grand Co. plans to build and improve state trunk line and county roads. About $54,000 available.

Ia., Ida Grove—City Council passed resolution to pave 30 blocks. K. C. Gaynor, Sioux City, engr.

Ia., Winterset—Madison Co. plans election, Nov. 20, to vote on $500,000 bond issue for road work.

Minn., Anoka—Anoka Co. plans to build road from city limits of Minneapolis o Elk River, about 23 mi., with State aid. About $90,000.

Minn., Grand Rapids—Itasca Co. plans to spend $88,000 for road and bridge work.

Minn., Minneapolis—City plans to improve Drew Ave. from 40th to 44th St.; 51st St. from 34th to 42nd St.; 38th Ave. from 50th to 54th St.; 39th St. from 50th to 54th St.; 40th Ave. from 49th to 54th St.; 41st Ave. from 49th to 54th St.; 42nd Ave. from 49th to 54th St.; widening and opening 47th St. from Chicago to Nicollet

Streets and Roads (Continued)

Ave.; also from 28th to 46th Aves.; 34th St. from 28th to 34th St.; 31st from 25th to 31st St.; 38th Ave. from 31st to 32nd St.; 41st Ave. from Dorman Ave. to 32nd St.; 47th St. from Beard to France Ave.; 32nd Ave. S. from Hiawatha to 47th St.; 47th St. from 34th to Minnehaha Creek; Vincent Ave. from 52nd to 53rd Sts. Total cost about $40,650. F. W. Cappelin, city engr.

Minn., St. Paul—Ramsey Co. receives bids about January to grade, gravel and surface roads and build culverts. About $80.000. G. J. Ries, co. aud.

Minn., St. Paul—(Official)—City received no bids improving portions Mount Curve Blvd., Roblyn Park, alley in Block 3, Carbon St., Folsom and Como Aves. Noted Oct. 25.

Kan., Beloit—City passed resolution to pave Hersey and Lincoln Aves. and Chestnut, 3rd and Court Sts. C. R. Herrick, city clk.

Kan., Minneapolis—Ottawa Co. Comrs. plan election Dec. 4 to vote on $400,000 bond issue for road improvements and new jail.

Kan., Topeka—Shawnee Co. having plans prepared paving West 10th St. 2 mi. west from city limits, asphaltic concrete. About $32,000. Kenneth Raub, clk.

Mo., Greenfield—Dade Co. voted $28,000 bonds issue for roads in Everton Special Rd. Dist. Noted Oct. 25.

Mo., Independence—City plans paving and grading various streets; about $15,000. also grading, fencing, building walks and driveways in cemetery addition, 20,000 yd. H. H. Pendleton, city engr.

Mo., Springfield—City plans to improve Grand Ave. from Jefferson St. to Holland Ave. O. D. Christman, city engr.

Arkansas—State Highway Comn., Little Rock, had plans prepared paving road from Van Buren to Fayetteville, 58 mi., in Prairie Co.; Hazen to Watsons Bridge, 7 mi., $48,000, in Hempstead Co., 13 mi., gravel, $76,000.

Texas — Guadalupe, Gonzales, Fayette, Colorado, Austin, and Fort Bend Cos. plan election Dec. 18 to vote on $8,000,000 bond issue to build road between San Antonio and Houston, 16 ft. wide, bituminous, 230 mi. Address Co. Clk., Belleville.

Tex., Burnet—(Official)—Burnet Co. defeated $100,000 bonds to build roads in Precinct No. 4. Noted Oct. 4.

Tex., Canyon—Randell Co. Comrs. plan election, Nov. 24, to vote on $50,000 bond issue for road work.

Tex., Center—Shelby Co. voted $600,000 bond issue for road work. R. H. McCaully, clk. Noted Aug. 2.

Tex., Dallas—(Official)—Dallas Co. received no bids grading and graveling portion Rowlette Rd.; also resurfacing portion Seagoville Rd. C. E. Gross, co. aud. Noted Oct. 18.

Tex., Dallas—City rescinded contract let Sept. 14 to Bramley-Lanham Paving Co., Dallas, paving Knight St.; also rejected bids for paving Woodlawn St. from Fitzhugh to Bank St., Washington St. from Main to Worth St., and Beckley St. from 10th St. to city limits. Noted Sept. 27.

Tex., El Paso—(Official)—City voted on $100,000 bond issue to pave street intersections. B. M. Williams, city engr. Noted Oct. 18.

Tex., Madisonville—Madison Co., Precinct No. 1, plans election Nov. 19 to vote on $100.000 bonds issue to build 2 state and national highways.

Tex., Tahoka—Lynn Co. Comrs. plan election, Nov. 20, to vote on $60,000 bond issue for road work.

Tex., Texarkana—City plans paving Olive St. from 4th to 19th St. C. E. Hayden, city engr.

Tex., Vernon — Wilbarger Co. election Nov. 15 to vote on $115,000 bond issue to build roads in Dist. No. 1.

Okla., Hugo—Choctaw Co. defeated $50,000 bonds to build roads in Wilson Twp. Noted Oct. 4.

Okla., Sapulpa—Creek Co. voted $80,000 bonds to build roads and bridges. Noted Oct. 4.

Okla., Woodward—Woodward Co. election Nov. 17 to vote on $675,000 bond issue to build roads and bridges.

Idaho, Bonners Ferry—(Official)—Boundary Co. received no bids for grading and building small bridges. Work postponed until next spring. J. V. Stanley, co. clk. Noted Oct. 11.

Wash., Clarkston—City plans to pave several streets and lay sidewalks.

Wash., Seattle—City had plans prepared grading and paving Delaware Dr., and Maple Pl., cost, $25,000; 9th Ave., S., $100,000; Gilman Ave. and West 71st St., $15,000. A. H. Dimock, city engr.

Oregon—State Highway Comn., Salem, had plans prepared improving Ococho and Canyon Creek Rd., Crook Co., from proposed dam of Ococho Irrigation Dist. to Wheeler Co. line; about $40,000. Also road from Baker to Cornucopia, 70 mi.

Cal., Monrovia—City plans to pave White Oak Ave. from west city limits to Mayflower Ave.

Cal., Richmond—City having plans prepared paving streets in Canal Subdivision, concrete. H. D. Chapman, city engr.

Cal., Susanville — Lassen Co. voted to form boulevard district out of Supervisorial Dists. Nos. 1, 2 and 3, to build road to connect with Reno, Nevada. About $120,000. State to appropriate $60,000 toward cost. Noted Sept. 20.

Ont., St. Catherines—City Council plans to improve and widen Great Western St. from St. Paul St., W., to Grand Trunk Sta. About $12,500. J. A. Pay, city clk.

Man., Oakland—Council plans to build 60 mi. highway. W. T. Johnson, Wawanesa, clk.

Man., Sifton—Council plans to build 40 mi. highways. R. H. Hockin, Oak Lake, clk.

Man., Westbourne—City plans election to vote on bond issue to build 310 mi. gravel highway. P. McGregor, Gladstone, clk.

Bids Desired

N. Y., Wingdale—(Official)—Until Nov. 15, by Comn. on New Prisons, Hall of Records Bldg., Centre and Chambers Sts., New York City, grading at Wingdale Prison; advertised in this issue.

N. J., New Brunswick—Until Nov. 19, by Bd. Freeholders, Middlesex Co., paving of Sect. 1, River Rd., in Piscataway and Highland Park, 39,342 sq.yd., warrenite on macadam foundation. A. B. Fox, co. engr.

Pa., Phila.—(Official)—Until Nov. 14, by G. E. Datesman, dir. pub. serv., grading Weikal St. from Ann to Monmouth St., Janney St. from Ann to Cambria St., Monmouth St. from Tulip to Janney St., Front St. from Nicetown Lane to Wingohocking St.; also building portion of Pkway. from 17th to Race St.; dredging creek in 40th Ward, and repairing bridges. About $100,000. C. E. Albright, city engr. Noted Apr. 19.

Pa., Pittsburgh—(Official)—Until Nov. 12, by City, grading, paving and curbing Albert St. from Ruth to Westwood St.; Cresson St. from Bailey Ave. to Eureka St.; Eureka St. from Beltzhoover Ave. to Estella St.; Lafferty Ave. from Montooth to Gearing St.; Westwood St. from Albert to Walden St.; Warrington Ave. from Montooth St. to West Liberty Ave.; also Addis, Benitz, Osric, Vose and Culloden Ways; 15 in. T C pipe sewers on Murray Ave. and 8 in. pipe sewer on property of Pittsburgh Ry. Co. and Mango Way. R. Swan, city engr.

W. Va., Charleston—Until Nov. 24, by Kanawha Co. Court, improving section of Fayette and Kanawha Turnpike, including 43,747 cu.yd. unclassified material, 1738 cu.yd. concrete, 16,400 lb. reinforcement, 774 ft. 12 in. and 162 ft. 18 in. culvert pipe, brick, concrete, asphaltic concrete or penetration macadam. L. C. Mason, co. clk.

Ala., Enterprise—Until Nov. 15, by W. B. Glenn, mayor, paving several streets, with brick, cement-concrete, bituminous-concrete, macadam or wood block, including 12,000 sq.yd. paving and sidewalks. A. Lyng, Forsyth Bldg., Atlanta, Ga., engr. Noted May 24.

Ala., Tuscumbia—Until Dec. 4, by Colbert Co., improving 7.07 mi. Jackson Highway, including 16,112 cu.yd. earth excav., 9650 cu.yd. gravel, 2850 cu.yd. concr., 11,215 sq.yd. bituminous treatment, 44 cu.yd. concrete, 84 lin.ft. D.S. vit. pipe.

Ky., Lebanon—Until Nov. 12, by Marion Co., building 5½ mi. inter-county road from here to Bardstown, beginning at Smocks Chapel and extending to Nelson Co. line. S. J. Spalding, co. clk.

Indiana—By Co. Comrs. building roads as follows:

Nov. 15: Madison Co., Anderson; building 16,006 ft. gravel, stone or macadam road on line between Madison and Delaware Cos. E. T. Flahavin, aud.

Nov. 17: Floyd Co., New Albany; building 8568 ft. road, Georgetown Twp. E. Dupaquier, aud.

Minn., St. Paul—(Official)—Until Nov. 12 by H. W. Austin, purch. agt., grading East and West Alley in Howard Park addition, Lake Como and Phalen Aves. from Rice St. to Western Ave., Marion St. from Lake Como to Phalen Ave.; Cleveland Ave. from Commonwealth Ave. to Scudder St.; Scudder St. from Cleveland to Raymond Ave.; Lake Como and Phalen Ave. between Arcade and Forest Sts.; alley in Williams Rearrangement of Block 3; Hamline Ave. from Nebraska to Hoyt Aves.; May Ave. from West 7th to Alaska Sts.; also surfacing with asphalt; Wabash St. from 4th to 5th Sts. O. Claussen, city engr. Noted Oct. 18.

Arkansas—(Official)—Until Nov. 15, by State Highway Comrs., Little Rock, building 42 mi. gravel, concrete and asphalt macadam roads. Petersen & Marshall, Texarkana, engrs. Advertised in this issue.

Colorado—Until Nov. 10, by State Highway Comn., Denver, building Sec. 1 and 2 Fall River Rd. between Fall River and Hilner Pass. Larimer Co.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—City let contract building artificial stone sidewalks upon the Strandway from Head House at Marino Park to point opposite Mosquito Fleet Yacht Club, South Boston, to J. L. Pierce, Boston, $13,668.

★**Mass., Boston** — (Roxbury)—(Official)—City let contract building bituminous macadam roads and retaining walls in Pontiac St. from Tremont to Hillside St., to J. C. Coleman & Sons Co., 1620 Tremont St., Roxbury, $19,647. Noted Oct. 25.

Rhode Island—State Bd. Pub. Rds., Providence, received low bids, Oct. 30, building section state highway in South Kingstown from Perryville & Catamount [illegible] $62,660, J. Bristol, Narragansett Pier, $71,377. T. Murphy, Keene, N. H., $72,537. Noted Oct. 18.

★**Connecticut** — State Highway Comn., Hartford, let contract building portion Pond Rd., Cromwell Twp., 1600 ft. 2 in. bituminous macadam, to F. Arrigoni & Bro., 605 Main St., Middletown. About $15,000. Noted Oct. 18.

★**N. Y., Buffalo**—Bd. Pub. Wks. let contract paving Northampton St. from Main St. to Humboldt Pkwy., 28 ft. wide, asphalt on concrete base, to Cranson Bros. Asphalt Co., Morgan Bldg. About $67,000.

★**N. Y., Phoenix**—Village let contract 1060 ft. brick paving to A. J. Colino, Oswego, $10,[illegible].

★**Pennsylvania**—(Official)—State Highway Comn., Harrisburg, let contracts building 4878 ft. vit. block road, 16 ft. wide, Hughes Hollow, Bucks Co., Charles H. Hunt, Doylestown, $13,[illegible]; 12,375 ft. vit. block road, Gilmore Hollow, Bucks Co., to Hunt Construction Co., Doylestown, $[illegible]; 4[illegible] ft. tarvia road, Cambria Co., to J. L. Eller, Carrolltown, $[illegible]; 2 mi

Streets And Roads (Continued)

★**N. C., Newbern**—City let contract paving Bridgeton St. brick, connecting Neuse River County bridge with improved highway through town to Vanceboro to Georgia Eng. Co., Augusta. About $12,000.

★**S. C., Darlington**—City let contract paving busines section, to Simons & Mayrant Co., 18 Broad St., Charleston. About $54,-895. Noted May 19.

★**S. C., Spartanburg**—(Official) — Spartanburg Co. let contract building 12.9 mi. 24-ft. top soil on Buncombe Rd. between Woodruff and Crossanchor, to Thompson & Chandler, Burlington, N. C., $33,000. Noted Oct. 25.

★**Ala., Gadsden**—City let contract paving 6th St., asphaltic concrete on concrete base, to J. F. Morgan & Co., Gadsden. About $11,000. Noted Oct. 18.

★**Ala., Russellville**—(Official) — City let contract grade work, gravel paving and culvert work, to Mitchell Bros., Oneonta, Ala., $35,067. Noted Sept. 20.

★**O., Cleveland**—Bd. Control let contract paving portion Edgewater Cliff Dr., to Cleveland Trinidad Paving Co., The Arcade. About $13,480. Noted Oct. 4.

★**O., Lakewood**—City let contract grading and building sidewalks, to E. Cosa, 2454 Baldwin Rd., $33,000; Ohio Concrete Co., 14,716 Detroit Ave., $6060; Randall & Cooper c/o Sewer Constrs. Assn., 343 The Arcade, Cleveland, $67,000.

★**O., Lisbon**—(Official)—Columbiana Co. Comrs. let contract improving portion Lisbon-Bayard-Canton Pub. Rd., to Seiple & Wolf, Youngstown, $82,254. Noted Oct. 25.

★**O., Maumee**—Village let contract building pavements and sewers in various streets, concrete, to Warner-McKetchnie Co., Nasby Bldg., Toledo, $17,000.

★**Ind., East Chicago**—City let contract 6385 sq.yd. paving, to Campbell Constr. Co., Hammond, $18,123.

★**Mich., Grosse Pointe**—City let contract improving Waxburn Ave., to T. E. Currie, 20 McGraw Bldg., Detroit; $1.65 per sq.yd. for excavating and concrete base; $0.55 per lin.ft. concrete curb, 6 x 24 in.; $1.80 per sq.yd. brick paving.

★**Ill., Berwyn**—City let contract paving Harvey, Wesmuth and Wisconsin Aves., asphaltic concrete to H. Goeliz, 810 North Blvd., Oak Park. Noted Oct. 11.

★**Ill., La Salle**—City let contract paving Hennepin St. from 1st to 4th St., brick, also concrete curbing, to T. W. Keys, La Salle. $17,800.

Ia., Des Moines—City received lowest bid paving Grand View Ave. from East 14th to North Union St. from Lambert Paving Co., 405 Utica St., $2.81 per sq.yd.

Ia., Sioux City—City received low bids paving 21st St., from Jackson to Jones Sts., from S. J. Krage, Sioux City, paving $1.63 yd., curbing, 39c., extra concrete, $9; J. Freeman & Co., $1.54, 41c and $10.

★**Minn., St. Paul**—City rejected bids paving 9th St. between Smith and Summit Aves.; College Ave. between 6th and Summit Aves. Work will be done by force account. Noted Aug. 16.

★**Ark., Conway**—Faulkner Co. Comrs. let contract gravel road from here to Saltillo, to Bell Constr. Co., Dallas, Tex. About $48,000. Noted Oct. 11.

★**Ark., Little Rock**—Pulaski Co. Comrs. let contract building roadbed, bridges and culverts on 7 mi. road in Perkins Twp., to J. A. Gregory, Little Rock. About $15,-000.

★**Tex., Galveston**—(Official) — City let contract furnishing sandfill for filling on beach front between 24th and 36th Sts. and surfacing with 6-in. caliche mill to Harris Sand, etc. per cu.yd. About $57,-000. Noted Oct. 25.

★**Tex., Paris**—City let contract paving Central Plaza and 23rd Sts., to Texas Bitulithic Co., Praetorian Bldg., Dallas. About $25,000. Noted Oct. 25.

★**Okla., Ardmore**—Carter Co. let contract building 8.5 mi. road to Larkin Constr. Co., Dallas, Tex. About $99,491.

★**Okla., Bristow**—City let contract paving Main, 8th and 7th Sts., vertical fiber combination 6-in. concrete curb, to Parks-Myers Co., Muskogee. About $19,000. Noted June 7.

★**Idaho, Twin Falls**—City Council let contract paving alleys in Local Improv. Dist. No. 28, to C. H. Holmes. About $12,782. Noted Oct. 11.

★**Cal., San Diego**—City let contract paving several streets to T. C. Braithwaite, 447 Van Ness Av., Pasadena. About $14,491. Noted Nov. 1.

Cal., Santa Barbara—(Official)—City received lowest bid improving Salsipuedes and Carpenteria Sts., from Fairchild-Gilmore-Wilton, Pacific Electric Bldg., Los Angeles, $73,482. Noted Oct. 4.

★**Cal., Santa Cruz** — (Official)—Santa Cruz Co. received no bids, Oct. 23, improving 6 mi. highway between Santa Cruz and Felton. Work will be done by day labor. Noted Oct. 18.

★**Cal., Santa Monica**—City let contract paving Central Ave. to F. Ockert. About $30,739.

★**Man., St. Francois Xavier** — City let contract building highway to A. A. Balvin, $165,000.

RAILWAYS—STEAM & ELECTRIC

Proposed Work

Kentucky—Louisville & Nashville R.R. plans to build extension from Blackley up Rockhouse Creek, to develop coal mines, about 18 mi. W. H. Courtney, Louisville, ch. engr.

Texas—Kansas City, Mexico & Orient R.R. soon lets contract building extension from Alpine to Chihuahua, Mexico, about 135 mi. N. J. O'Brien, San Angelo, Tex., genl. mgr.

British Columbia—Kettle Valley Ry. plans to build branch line from Pendicton to Copper Mountain, about 14 mi. Cost, $1,000,000. A. McCulloch, Penticton, ch. engr.

EXCAVATION AND DREDGING

Proposed Work

Cal., Redding—Irrigation—E. G. Hopson, Portland, Ore., granted permit by State Water Comn., San Francisco, to divert water Cow Creek in Shasta Co. for irrigation purposes. Work involves canal 10 mi. long, ditch, 34,750 ft. long. About $100,000.

BIDS DESIRED

Pa., Phila.—Dredging—See "Streets and Roads."

O., Marion—Ditch—Until Dec. 6, by C. Ash, co. surv., building drainage ditch, known as Tymochtee Creek Impvt.; advertised in this issue. Noted June 21.

Wis., Somers—Drainage—Until Nov. 10, by Bd. Town Supervs., building Pike Creek D.D.; work involves 19,000 lin.ft. open ditch, 84,763 cu.yd. excav., 26,823 ft. 6-30 in. tile. J. J. Barrows, comr.

Ia., Clarion—Drainage—Until Nov. 12, by F. E. Osier, aud. Wright Co., building Franklin-Wright Joint Drain Nos. 8-159, involving 46,756 ft. 6-28 tile; Franklin-Wright Joint Drain Nos. 6-141, involving 53,985 ft. 6-30 in. tile.

Minn., Glenwood—Ditch—Until Nov. 22, by O. Irgens, aud., Pope Co., building Co. Ditch No. 15, involving 129,705 cu.yd. excav. About $14,269. Noted Sept. 13.

Mo., Memphis—Ditch—Until Nov. 22, by Wyaconda River D.D. No. 2, Scotland Co., at office of C. J. Weegner, engr., building 3.43 mi. drainage ditch, involving 156,000 cu.yd. excav.; also cleaning out ¾ mi. old ditch.

Ont., Dover Twp.—Drainage—Until Nov. 15, by W. G. McGeorge, engr., 153 Queen St., Chatham, building drainage system for township council. About $20,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Albany**—Barge Canal Improvements—W. W. Wotherspoon, supt. pub. wks., Capitol, let Contract No. 179, completing canal prism excav. and incidental work at New York Central R.R. crossing near Pittsford, to I. M. Ludington Sons, Inc., Powers Bldg., Rochester, $79,712. Noted Oct. 11.

N. Y., Albany—Barge Canal Improvements—W. W. Wotherspoon, supt. pub. wks., Capitol, received low bids improving New York State canals, Contract No. 152, from P. L. Cohen, 49 Niagara St., Buffalo, $113,-334; Lupfer & Remick, 592 Ellicott Sq., Buffalo, $142,278; Contract 165, Mohawk Dredge and Dock Co., Inc., Herkimer, $176,-215; Contract 170, Cleveland & Sons Co., Brockport, $64,588; Woolsey Constr. Co., Davenport, Ia., $67,217; Mohawk Dredge and Dock Co., Inc., Herkimer, $74,595. Noted Oct. 11.

N. Y., New York—Drainage—Dept. of Health received low bids, Oct. 30, ditching, draining, filling and improving certain areas in salt marshlands and meadows, in Bronx and Queens Boro, from U. S. Drainage & Irrigation Co., 17 Battery Pl., (a) $85,900, (b) $3515, (c) $3515; Eaton, Prouty & Simpson Inc., 90 West St., (a) $92,050, (b) $4495, (c) $3895; Peace Bros., 20 Main St., Flushing, N. Y., (b) $5500.

★**Fla., Elkton**—Drainage—Elkton D.D. No. 2 let contract building 4½ mi. canal to drain 2200 acres to M. L. Grimes, Elkton.

★**Minn., Mankato** — (Official) — Ditch—Blue Earth Co. let contracts building Co. Ditch No. 50, to P. Paulson, Carroll, Ia., tile, $81,000; Rood Constr. Co., Grand Rapids, Wis., open work, $0.1465 per yd. Noted Oct. 4.

★**Minn., Mankato** — (Official) — Ditch — Blue Earth Co. let contract building Co. Ditch No. 53, to Judson Concrete Co., Judson, Minn., $14,950. Noted Oct. 18.

★**Minn., Marshall**—Ditch—Lyon Co. let contract tile on Judicial Ditch No. 16, to Marshall Tile and Cement Co., Marshall, $45,995.

★**Ont., Toronto**—Drainage—Bd. Control let contract completing Moore Park drainage system, to Godson Contr. Co., Ltd., Manning Chambers, $60,000.

INDUSTRIAL WORKS

Proposed Work

Mass., Provincetown — See "Miscellaneous."

N. Y., Brooklyn—Bemis Bros. Bag Co., 61 Bway., New York City, having plans prepared by G. W. Wadleigh, archt., 61 Bway., for 3-story, 85 x 700-ft. factory, rein.-con., on 52nd St. About $300,000.

N. Y., Brooklyn—H. Davidson, 28 Devine St., had plans prepared by M. Zipkes, archt., 405 Lexington Ave., New York City, 2-story, brick garage on Marion St. About $35,000.

N. Y., Brooklyn—North American Brewing Co., Hamburg and Greene Aves., had plans prepared by T. Engelhart, archt., 905 Bway., for 2- and 6-story, 90 x 100- and 50 x 130-ft. additions to its brewery. About $140,000.

N. Y., Brooklyn—Willoughby Garage Corp., 26 Court St., had plans prepared by Cantor & Dorfman, archts., 371 Fulton St., for 2 story, 92 x 154 ft. garage. About $100,000. J. Goodsky, pres.

N. Y., Buffalo—Transmission Ball Bearing Co., 1050 Military Rd., purchased 7 acre site here and plans new factory.

N. Y., College Point—L. M. F. Eng. Co. had plans prepared by P. M. Coco, archt., 120 West 32nd St., New York City, 1-story, 100 x 170-ft. brick factory, 4th Ave. and 10th St. About $150,000. A. Flint, genl. mgr.

N. Y., New York—Non-Column Garage Constr. Co., Edgewater, N. J., having plans prepared by M. J. Harrison, archt., World Bldg., for brick and stone garage, 143rd St. near Lenox Ave. About $25,000.

N. Y., New York—J. Ruppert, Inc., 1639 Third Ave., had plans prepared by Maynicke & Franke, archts., 25 Madison Sq., 1-story, 105 x 210-ft. garage, 268-274 East 91st St. About $30,000.

N. Y., New York—M. Waldman plans to build garage at 156-158 East 105th St. About $25,000

N. J., Newark—Wallington Leather Co., 42 Kent St., having plans prepared by F. Grad, archt., 245 Springfield Ave., for new 50 x 150 ft. rein.-con. factory; also 50 x 115 ft. addition, on Frelinghuysen Ave. About $40,000.

N. J., Yardville — Zee Zee Rubber Co., Yardville, had plans prepared by J. O. Hunt, archt., 114 North Montgomery St., Trenton, for plant including 2-story, 50 x 160-ft. brick factory for tubes, 40 x 60-ft. mill room and 2-story, 40 x 125-ft. office. About $350,000.

Pa., Bloomsburg—F. P. Edwards, 150 West Main St., soon lets contract for 2 story garage. About $25,000. W. H. Lee, Dime Trust Bldg., Shamoken, archt.

Pa., Erie—Erie Forge Co., 15th and Cascade Sts., plans plant outside of city limits. About $2,000,000.

Pa., Farrell—Carnegie Steel Co., Carnegie Bldg., Pittsburgh, will build a new bar mill here. About $1,200,000.

Pa., Nazareth—Dexter Cement Co., Nazareth, plans large addition to plant. About $300,000.

Pa., Phila.—Berman Bros., 6019 Market St., plans 112 x 120 ft. garage on Cedar Ave. and 61st St. About $25,000.

Pa., Phila.—M. T. Lucas purchased site on 46th and Chestnut Sts. and plans to build garage. About $26,000.

Md., Baltimore—Corkan & Hill Co., 27 South Howard St., having plans prepared by Gardener & Lindberg, archts., 140 South Dearborn St., Chicago, for 3-story packing and cold-storage plant. About $200,000.

Industrial Work (Continued)

Md., Baltimore—Porcelain Enamel & Mfg. Co., O'Donnell St., soon lets contract for 1 story, 120 x 229 ft. factory, Bayard and Ridgeley Sts. About $100,000.

Md., Westport—Chesapeake Iron Works, soon lets contract 1 story erecting shop at plant here. About $150,000.

W. Va., Mullens—Mullens Ice & Cold Storage Co. had plans prepared by A. F. Wysong, archt., Princeton, W. Va., for bottling and cold-storage plant. About $50,000.

N. C., Morgantown—Garron Knitting Mills recently incorporated with $150,000 capital stock, plans to build several factories here.

Tenn., Paris—Louisville & Nashville R.R. plans roundhouse, shop, etc. About $60,000. W. H. Courtenay, ch. engr.

O. Bucyrus—A. L. Holloway, local agt. for Ford Motor Car Co., purchased site at 243 East Mansfield St., and plans 2 story garage. About $30,000.

O., Cincinnati—Fox-Klein Motor Co., 123 East 7th St., having plans prepared for 3 story, 65 x 100 ft. factory. Gilbert Ave., near 8th St.

O., Cleveland — Manufacturers Oil and Grease Co., 608 Century Bldg., plans factory on Walworth Ave. About $25,000.

O., Cleveland—K. V. Painter, 6203 Euclid Ave., plans to build garage. About $40,000.

O., Cleveland—Pipe Machinery Co., 4907 Mead Ave., plans 1 story brick factory, Mead and Mumford St. About $25,000.

O., Cleveland—Simmons-Chalmers Co., 1900 East 19th St., plans to build garage and service station. About $100,000. R. C. Simmons, genl. mgr.

O., Sandusky—Lake Erie Drydock & Mill Co., recently incorporated with $1,600,000 capital stock, plans shipbuilding plant. C. Bright, 222 East 82nd St., New York City, interested.

O., Toledo—Toledo Plate & Window Glass Co., 1014 West 11th St., plans 113 x 200 ft. factory, St. Clair and Hamilton Aves. About $150,000.

Ind., Great Falls—Montana Power Co., Electric Bldg., Central Ave., plans 90 x 138 ft. substation. About $150,000.

Ind., Whiting—Great Western Smelting & Refining Co., Chicago, purchased 25-acre site at Whiting, and plans to build plant; first unit to be foundry. About $60,000.

Mich., Detroit—Essex Motor Corp., 2901 East Jefferson Ave., soon lets contract for 1-story, 100 x 500-ft. factory. About $100,000. W. J. McAneeny, pres.

Mich., Detroit—Pennsylvania Lines West of Pittsburgh having plans prepared by B. C. Somerville, engr., 802 Penobscot Bldg., for 3 story 400 x 1000 ft. freight house. Estimated cost, $1,000,000. W. Thos. Rodd, Pittsburgh, ch. engr

Mich., Pontiac—C. R. Wilson Foundry & Machine Co had plans prepared for factory on South Saginaw St. About $30,000. C. B. Wilson, pres. Smith, Hinchman & Grylls, 710 Washington Arcade, Detroit, archts.

Ill., Chicago—G. M. Davis Regular Co., 422 Milwaukee Ave., having plans prepared by F. D. Chase, engr., Chicago, for 1 story factory, 25th St. and Washtenaw Ave. About $75,000.

Ill., Chicago—Gutmann & Co., 14 West Austin Ave., soon let contract for 5-story, 60 x 150-ft. addition to tannery, Dominick St. and Webster Ave. E. J. Gutmann, pres. Ottenheimer, Stern & Reichert, 220 South State St., archts.

Ill., Chicago—Illinois Central R.R. purchased site between 157th and 175th Sts., and plans to build new freight house. About $1,250,000. A. S. Baldwin, ch. engr

Ill., Cicero—Chicago, Burlington & Quincy R.R., Chicago, soon lets contract 1 story, 41 x 121-ft. machine shop at Clyde Sta. About $60,000. W. T. Krausse, Chicago, engr. of bldgs. Noted Oct. 18.

Wis., Madison — Steele Turret Machine Co., 2305 Waubesa St., soon lets contract 1 story, 110 x 500-ft. brick, steel and concrete gun factory.

Wis., Milwaukee—Milwaukee Corrugating Co., 36th Ave. and Burnham St., plans factory. About $100,000.

Wis., Milwaukee—Reitman-Straus Co., 412 Ry. Ex. Bldg., soon lets contract 1 story, 70 x 170 ft. garage on Frederick Ave. and Folsom Pl. About $15,000. O. Klenzendorff, 1015 4th St., archt.

Wis., Milwaukee—Standard Steel Co., increased its capital stock from $30,000 to $300,000, and purchased 23 acre site at Lake St. and Hopkins Rd., on which it plans to build factory. E. J. Guenther, pres. and treas.

Wis., Sheboygan—Kiel Woodenware Co. plans addition to generating plant here. About $65,000.

Ia., Sac City—City retained G. L. Long, engr., Webster City, to supervise building of electric-light plant. About $60,000.

Kan., Rosedale—Rushton Baking Co., 914 Southwest Blvd., plans 2 story, 80 x 148 ft. bakery. About $40,000.

Neb., Omaha—Sprague Tire & Rubber Co., 1106 Woodmen of World Bldg., plans 5 story, 66 x 264 ft. factory.

Mo., Kansas City—M. Ross, 500 East Armour Blvd., having plans prepared by White & Dean, archts., 311 Bellefonte Ave., 2 story garage and machine shop, Bway. and Goodrich St. About $25,000.

Mo., St. Louis — Bulis Mfg. Co., 1122 South 12th St., purchased site on Calvary Ave., and plans addition to factory. About $100,000.

Mo., St. Louis—St. Louis Electric Wks., 4060 Forest Park, increased its capital stock from $20,000 to $100,000, and plans to enlarge and improve plant.

Tex., Temple—Gulf, Colorado & Santa Fe R.R. plans to build power house, machine shop, etc. About $150,000. F. Merritt, Galveston, ch. engr.

Okla., Fredrick—O. L. Phipps, soon lets contract 2 story garage. About $25,000. Vahlberg & Riggins, 304 Baum Bldg., Oklahoma, archts.

Cal., Alturas—Modoc County Packing Corp., had plans prepared for 3 story packing plant. About $75,000.

Cal., Los Angeles—Leach Motor Car Co., 1132 South Grand Ave., plans 3 story, 100 x 155 ft. factory, 16th and Figueroa Sts. About $150,000.

Cal., Los Angeles—United Light & Power Co., plans electric power plant on San Gabriel River. About $300,000.

Cal., Sacramento—Libby, McNeil & Libby, 31st and P Sts., had plans prepared by W. Miller, archt., 417 Market St., San Francisco, for rein.-con warehouse. About $140,000

N. S., Dartmouth—Liquid Air Co., 1 Earnest St., Montreal, having plans prepared for acetylene plant here. About $50,000.

N. S. Halifax—Robinsons, Ltd., Queen and Doyle Sts., soon lets contract 2 story garage. About $50,000. S. P. Dumasesq, St. Paul Bldg., archt

Ont., Toronto — Canadian Fairbanks-Morse Co., 26 Front St., W., plans addition to hydraulic plant. About $30,000.

BIDS DESIRED

N. Y., Central Islip—(Official)—Until Nov. 14, by State Hospital Comn., Capitol, Albany, building power house. E. S. Elwood, secy. Advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Me., Biddeford**—Biddeford Motor Mart, 297 Main St., let contract 2-story public garage to T. R. Brennan, 63 South St., $25,000.

★**Mass., Boston**—(South Boston)—P. E. Atteaux, 176 Purchase St., Boston, let contract factory 84 x 170-ft. rein.-con. factory to Turner Constr. Co., 244 Madison Ave., New York City.

★**R. I., East Providence**—Gorham Mfg. Co., East St., Providence, let contract to J. W. Bishop Co., 403 Foster St., Worcester, Mass. $150,000

★**Conn., Stratford**—Burns Engineering Co., let contract 1 story, 224 x 250 ft. factory to Brinkerhoff-Austin Co., 1188 Main St., Bridgeport. About $90,000

★**N. Y., Brooklyn**—National Lead Co., 171 Front St., let contract 4 story, 115 x 135 ft. factory, to Turner Construction Co., 244 Madison Ave., New York City. $80,000

★**N. Y., Buffalo**—Barker Automobile Co., 776 Walden Ave., let contract factory, 75 x 175 ft., also to Turner Construction Co., 244 Main St. About $75,000

★**N. Y., Fulton**—Fulton Steel Corp., c/o H. W. McAlteer, Woolworth Bldg., New York City, let contract for plant to F. W. Woodcock, Fulton, $60,000.

★**N. Y., Yonkers**—H. Schneider Co., 150 Downing St., let contract 2 story, 30 x 152 and 50 x 86 ft. factory buildings, to J. Diehl Constr. Co., Mansion Ave. About $40,000.

★**N. J., Linden**—See "Buildings."

★**N. J., Newark**—Miller, Edgar Co., Blanchard St., let contract 4 story, 70 x 163 ft. and 1 story, 11 x 40 ft. power house and warehouse, to F. Kilgus, Inc., 13 East 6th St.

★**N. J., Newark**—United Color Pigment Co., 763 Broad St., let contract factory, to W. G. Sharwell Co., Cedar Ave., Montclair. $100,000.

★**N. J., Perth Amboy**—National Synthetic Co., let contract 1 story factory building, to Tullis & Blanchard, 326 East 42nd St., New York City, $75,000

★**Pa., Pittsburgh**—South Negley Ave. Garage & Repair Co. let contract 2 story garage, to Lytle Campbell Co., Inc., 1007 Forbes St. About $55,000

★**O., Cincinnati**—Proctor & Gamble Co., Spring Grove St. and Ivorydale Ave., let contract 4-story, 60x350-ft. rein.-con. addition to factory to Ferro Concrete Constr. Co., Richmond and Harriet Sts

★**O., Cincinnati**—O. Schlear Motor Car Co. let contract 2 story, 90 x 110 ft. warehouse, 9th and Sycamore Sts., to L. Eid Constr. Co., 1206 Liberty St. About $60,000. Noted Sept. 6.

★**O., Cleveland**—A. P. Schraner Pattern Works Co., 430 Prospect Ave., N. W., let contract, 3-story, 60 x 107-ft., on Payne Ave., N. E., to H. G. Stalmyer & Son Constr. Co., 203 Lakeside Ave., N. W. Noted Oct. 4.

★**Mich., Detroit**—Lincoln Motor Co., West Warren and Levermois Sts., let contract 4 story, brick and concrete factory and 1 story power plant, to Walbridge-Aldinger Co., Detroit

★**Ill., Chicago**—Lyman Tire & Rubber Co., 144 West 27th St., let contract 2 story addition, to J. L. Carnegie & Son, 189 West Madison St. $[illegible]

★**Ill., Chicago**—Robb Motor Co., 2803-10 Sheffield Ave., let contract 3-story, brick garage to J. A. Wesson Co., 444 West Washington St., Chicago, $76,000.

★**Ill., Decatur**—Classy Automobile Co., Orlando Bldg., let contract 2-story assembling plant, to M. J. Hoffman Constr. Co., Bankers Union Bldg., Evansville, Ind., about $135,000. Noted June 7.

★**Ia., Sioux City**—Sioux City Welding & Machine Wks. let contract welding and machine shop to Blanchard Bldg. Co., Frances Bldg., $30,000

★**Colo., La Salle**—Union Pacific R.R. let contract icing plant, to J. P. McDonald, Denver, $100,000.

★**Wash., Seattle** — Willys-Overland Co., Central Bldg. let contract factory 120 x 180-ft., rein.con. garage, salesroom and repair shop, to Wayland-Cowan Co., Arcade Bldg. About $[illegible]

★**Cal., Oakland**—Moore & Scott Iron Works, 418 Second St., San Francisco, let contract 1 story machine and pattern shop, to P. J. Walker Co., Monadnock Bldg., San Francisco, $[illegible]

BUILDINGS

Proposed Work

Mass., Boston—[illegible] let contract [illegible] 80 x 110 ft. About 114 [illegible] T. J. O'Connor, owner, J. McLaughlin, 88 Tremont St., archt

N. Y., Brooklyn—[illegible] Queens County Jockey Club, [illegible] bids [illegible] to T. Bennett, [illegible] 24 x 115 ft. [illegible] to [illegible] Grand Stand Track. About $[illegible]

N. Y., Elmhurst—[illegible] let contract [illegible] addition to [illegible] Chicago St. About $[illegible] Dorner & Feiss, 37 Cornelia St., New York City, [illegible]

N. Y., Greenport—[illegible] Town of Southold, Millbrook Bldg., New York City, has been prepared by P. J. Mason and J. Quinn, Jr., Town Hall, Ed. Schmidt [illegible] to [illegible] 1 story, 24 x 100 ft. [illegible] Lewis. About $[illegible]

Buildings (Continued)

N. Y., New York—Hotel—A. G. Vanderbilt Estate, Grand Central Terminal, had plans prepared by Warren & Whitmore, archts., 16 East 47th St., for 18 story, 48 x 167 ft. addition to Hotel Vanderbilt, Hillard Hotel Co., 102 4th Ave., lessee. G. L. Rossmain, pres.

N. Y., New York—Inn—Blue Goose Inn Operating Co., 30 West St., had plans prepared by W. G. Massarene, archt., 15 East 40th St., for 1 story addition. About $50,000. R. Joseph, pres.

N. J., Trenton—Conservatory—State Bd. Architects rejected bids, Century at School for Deaf. Figures were in excess of appropriation. Noted Oct. 18.

Pa., Harrisburg—High School—Bd. Educ., 113 Chestnut St., soon lets contract, 2 and 4 story, 147 x 184 ft. About $1,000,000. A. C. Stamm, pres. C. H. Lloyd, Telegraph Bldg., archt. Noted June 7.

Pa., Phila.—High School—Bd. Educ., c/o W. Gaynor, 21 Edgemont Ave., soon lets contract, 4 story, 115 x 245 ft. About $200,000. C. S. Adams, 1509 Arch St., archt.

Pa., South Bethlehem—Lodge—W. L. Ester, 855 Delaware Ave., for Kappa Alpha Fraternity, soon lets contract, 3-story, 28 x 100 and 14 x 44 ft. V. Van Pelt, 281 4th Ave., New York City, archt.

Md., Baltimore—Theater—Homewood Amusement Co., c/o C. A. Finch, 1127 Munsey Bldg., soon lets contract, 1 story, 73 x 125 ft. About $150,000. Blake & Zink, Equitable Bldg., archts. Noted Sept. 13.

W. Va., Huntington—Bank and Office—Union Bank and Trust Co., 4th Ave. and 4th St., soon lets contract, 16-story, 40 x 90 ft. About $1,000,000. Hanscom Eng. Co., 112 West 19th St., New York City, archt. Noted Sept. 20.

Ga., Claxton—Court House—Evans Co. election soon to vote on $50,000 bond issue for court house.

O., Columbus—Prison—State Prison Comm. having plans prepared by Richards, McCarty & Bulford, archts., Hartman Bldg. Cost between $2,000,000 and $4,000,000.

Ind., Gary—Bank, Store and Office—Gary Trust & Savings Bank had plans prepared by A. H. Andrews, archt., 1100 West 42nd St., 2 and 3 story, 75 x 125 ft. About $1[illegible]. D. F. Van Liew, cashier.

Mich., Detroit—Church, Rectory and School—St. Hyacinth's congregation, McDougall and Frederick Aves., had preliminary plans prepared by E. Priedmer & Sons Co., archts., 41 University Bldg., Milwaukee, and 19 South La Salle St., Chicago. 1 story. About $[illegible]. I. S. Matkiewicz, pastor.

Mich., Mt. Pleasant—School—Ed. Educational [illegible] to build school.

Ill., Chicago—Church—Grace Episcopal [illegible] lets contract for [illegible] ft., to replace one destroyed by fire [illegible] years ago. About $200,000. H. G. Hamilton, 2 West 45th St., New York City, archt. Noted June 14.

Ill., Chicago—Tenant—Glenny & Horn, 228 South Wells St., soon lets contract for 1-story, 125 x 132 ft. About $[illegible]. F. Cronson, also long term, H. M. Hyde, 134 South La Salle St., archt.

Wis., Marathon—Apartment—[illegible] Pathman plan, 2 story, 105 x 170 ft. About $[illegible]. H. T. Lueker, Wausau, archt.

Wis., West Allis—High School—Bd. Educ. soon lets contract. About $[illegible]. H. A. Messmer & Bros., Mitchell Bldg., archts. Noted June 21.

Kan., Minneapolis—Bus Terminals and Hotels.

Kan., Pittsburg—Business College—F. W. Parker having plans prepared by Maxwell & Maxwell, archts., Log Angeles Bldg., Kansas City, brick. About $40,000.

Kan., Topeka—Church—H. Smith, Cedar Ave., Los Angeles, Cal., c/o D. E. Hyde, Syndicate plans to [illegible]. About $[illegible].

Kan., Wichita—Bank—Kansas City Nat'l. Bank having plans prepared, 11 story, 120 x 132 ft., Main and Douglas Sts. About $1,[illegible]. C. W. Smith, this [illegible].

Neb., Gering—Court House—Scotts Bluff Co. plans election soon to vote on $[illegible] bond issue to build courthouse.

Okla., Bartlesville—Lodge and Office—Masonic Bodies c/o H. Weber, M. D., having plans prepared by A. L. McGregor & W. Everman, archts., 8 story, 100 x 140 ft. About $275,000. Noted May 17.

Okla., Bryan—High School—Pawnee Co. voted $99,000 bonds to build high school here. L. B. Smith, Pawnee, co. school supt.

Okla., Norman—Dormitory and Cafeteria—University Building Co. plans. About $[illegible]. E. De Barr, pres.

Okla., Oklahoma—Office—Western Natl. Bank having plans prepared by Hawk & Parr, archts., 501 Security Bldg., 12 story, brick and rein.-con. About $200,000.

BIDS DESIRED

Me., Lewiston—Social—Until Nov. 14, by Bates College, 2 story, 162 x 210 ft., brick. About $100,000. Coolidge & Carlson, 89 State St., Boston, archts.

N. J., Red Bank—School—Until Nov. 13, by Bd. Educ., 2-story, on Park Pl. About $125,000. Noted Oct. 4.

W. Va., Glenville—Court House, Jail, etc.—Until Dec. 1, by Gilmer Co., 2 story, 75 x 100 ft. About $55,000. A. F. Wysong, Princeton, archt.

Ia., Pleasant Plain—Grade and High School—Until Nov. 20, by Consolidated School Dist. Reimer & Herlin, Marshalltown, archts.

Kan., Eldorado—Court House—Until Nov. 12, by Schleicher Co. Comrs. H. B. Thompson, 1203 Southwestern Life Bldg., Dallas, Tex., archt.

Okla., Sapulpa—High School—Until Nov. 12, by Bd. Educ., 3 story, brick, stone, and rein.-con. About $200,000. J. W. Young, clk. C. A. Popkin, Berryhill Bldg., archt. Noted Oct. 18.

Cal., Palo Alta—High School—Until Nov. 13 (readvertisement) by High School Trustees, to consist of 7 buildings. About $200,000. Allison & Allison, Hibernian Bldg., Los Angeles, archts. Noted July 5.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Conn., Shelton—Sanitarium—State let contract addition to tuberculosis sanitarium, to L. A. Miller, 21 Church St., Meriden, $52,000. Noted Oct. 18.

N. Y., Fredonia—Hospital—Chautauqua Co. received lowest bid for tuberculosis hospital, from Green & Wicks, 110 Franklin St., Buffalo, $153,555.

★N. Y., New York—Office and Transportation—Adams Express Co., 61 B'way., let contract 1-story, 50x150-ft. transportation building, and 2-story, 21x100-ft. office building, 216-230 West 31st St., and 225-237 West 30th St., to J. O'Dell Whitenack, 231 West 18th St., about $70,000.

★N. Y., Syracuse—Theater, Store, and Office—Keith & Albee, 1564 Bway., New York City, let contract 1 story, 72 x 120 ft. and 10 story, 118 x 147 ft., to E. K. Fenno, 204 North Beech St. About $500,000. Noted Sept. 20.

★N. J., Linden—Office, etc.—Standard Aero Corp., Elizabeth, let contract 2 story, 60 x 140 ft. office, and 2 story, 50 x 145 ft. factory, brick and steel, to A. E. Austin & Sons, 14230 Euclid Ave., Cleveland, O., $[illegible].

N. J., Trenton—Hospital—State received low bids for Criminal Insane Hospital, from W. H. Fissell & Co., Bway. and 34th St., New York City, $61,258; Matthews Constr. Co., Rosedale Rd., Princeton, $79,000. Noted Nov. 1.

★Pa., Fairview—Wards and Connecting Corridors—State Comm. for treatment for Criminal Insane let contract to Roydhouse, [illegible], 112 North Broad St., Phila., about $[illegible]. Noted Sept. 6.

★Pa., Torentum—Hospital—Allegheny Valley Hospital let contract 2 story, to Wilhelm & Hass Supply Bldg., Pittsburgh, $[illegible].

★Wash., D. C.—Office—A. C. Mather, [illegible] Chicago, let contract, [illegible] to J. South Woodward Bldg., about $[illegible].

Fla., Jacksonville—School—Bd. Educ. received [illegible] for [illegible] and Hubbard Sts. Jones & Chambers, 902 Main St., $[illegible]. Noted June 29.

★Ala., Carbon Hill—School—Bd. Educ. let contract, 3 story, concrete, tile, and brick, to Walker Bros. & Co., Fayette, $210,000.

★Tenn., Chattanooga—Chapel and Science Hall—Chattanooga University let contract, to J. O'Brien, Chattanooga. About $85,000. Noted Oct. 11.

★O., Cleveland—Church—Fourth Church Christ Scientist let contract, brick and steel, East 105th St. and Fairmount Rd., to E. S. Barlow, 25 Hunt Ave., Boston, Mass. About $200,000. Noted Nov. 1.

★O., Cleveland—Store and Office—Oak Investment Co. let contract, 6 story, East 11th St. and Walnut Ave., to Paul Bros., Citizens Bldg.

★Ind., Mishawaka—Hospital—St. Mary's Mercy Hospital let contract, 3-story, to Larsen & Danielson, 1205 Washington St., Laporte, Ind., $120,000. Noted Oct. 18.

★Ia., Mapleton—High and Grade School—Bd. Educ. let contract, 3 story, 79 x 164 ft., to C. W. Ennis, Toledo, Ia.; about $95,000. Noted July 12.

★Ia., Spirit Lake—Hotel and Administration—Knight Templars of Iowa, c/o C. Huttenlocke, pres. bldg. comn., Des Moines, let contract 3 story, 32 x 360 ft., rein.-con., to Guarantee Constr. Co., Cedar Rapids. About $125,000. Noted Sept. 20.

★Minn., Minneapolis—School—Bd. Educ. let contract 2 story addition to Corcoran School to Lawrence Constr. Co., 624 Plymouth Bldg. About $56,000. Noted June 28.

★Minn., Pipestone—High School—Bd. Educ. let contract to L. C. Jorgenson, 1072 Marshall Ave., St. Paul, $350,000. Noted June 21.

★Kan., Pittsburgh—Bank—1st State Bank let contract to Hoggson Bros., 485 5th Ave., New York City. About $100,000.

★Kan., Smith Center—Court House—Smith Co. let contract, 2-story, 82 x 98 ft. stone and rein.-conc. to M. E. Brady, Smith Center. About $85,000. Noted Oct. 4.

★Kan., Winfield—Hotel—Winfield Hotel Co., let contract 4 story, brick, stone, and rein.-con., to H. L. Stevens Co., 900 South Michigan Ave., Chicago, $80,000.

★Neb., Omaha—Store and Hotel—Commi Realty Co., 514 Ware Blk., let contract, 10 story, 66 x 132 ft., to G. A. Thompson, Brandies Theater Bldg., $400,000.

★Colo., Pueblo—Colorado Fuel & Iron Co. let contract 2 story, 120 x 315 ft. Y. M. C. A. building, to Narble Bros., Pueblo, $200,000

★Cal., Healdsburg—High School—Bd. Educ. let contract to Anderson & Ringrose, 320 Market St., San Francisco, $68,493.

FEDERAL GOVERNMENT WORK

Proposed Work

Mass., Boston—Heating—Bureau Yards and Docks, Navy Dept., Wash., preparing plans for heating system at Commonwealth Pier, specification No. 2684.

R. I., Newport—Garage—Bureau Yards and Docks, Navy Dept., Wash., preparing plans building, at Naval Torpedo Sta.; specification No. 2688. About $10,000.

Pa., Phila.—Fitting Out Piers—Bureau Yards and Docks, Navy Dept., Wash., preparing plans 3 fitting out piers; specification No. 2692. About $505,000.

Pa., Phila.,—Heating System for Emergency Barracks—Bureau Yards and Docks, Navy Dept., Wash., preparing plans.

Pa., Phila.—Piping System—Bureau Yards and Docks, Navy Dept., Wash., preparing plans, building at Navy Yard; specification No. 2694. About $240,000.

Md., Indian Head—Dock and Railroad—Bureau Yards and Docks, Navy Dept., Wash., preparing plans; specifications No. 2687. About $92,000.

Wash., D. C.—Extension to Marine Barracks—Bureau Yards and Docks, Navy Dept., preparing plans for extension to marine barracks, at St. Juliens Creek, Va., specification No. 2686.

Wash., D. C.—Pier and Bulkhead Wall—Bureau Yards and Docks, Navy Dept., preparing plans building at Hampton Roads; specification No. 2690. About $1,631,000.

Federal Government Work (Continued)

Wash., D. C.—Temporary Buildings—Bureau Yards and Docks, Navy Dept., Wash., preparing plans 10 temporary buildings at Hingham, Mass., and Lake Denmark, N. J., specification No. 2685.

Va., Hampton—Electrical and General School—Bureau Yards and Docks, Navy Dept., Wash., preparing plans; specification No. 2693. About $360,000.

S. C., Charleston—Automatic Sprinkler System—Bureau Yards and Docks, Navy Dept., Wash., preparing plans, installing in general storehouse.

Cal., Mare Island—(Vallejo P.O.)—Extension of Building—Bureau Yards and Docks, Navy Dept., Wash., preparing plans extending building No. 122; specification No. 2689.

Ala., Andalusia—Post Office—J. A. Wetmore, superv., archt., treas. dept., Wash., rejected bids opened Oct. 23. Noted Nov. 1.

BIDS DESIRED

Mass., Boston—Bulkhead—Until Nov. 19, by Bureau Yards and Docks, Navy Dept., Wash., building timber bulkhead at Navy Yard.

Mass., Chelsea—Heating, Plumbing and Lighting Systems—Until Nov. 12, by Bureau Yards and Docks, Navy Dept., Wash., installing at emergency hospital.

Pa., Phila.—Reservoir—Until Nov. 26, by Bureau Yards and Docks, Navy Dept., Wash., for 2,000,000 gal. rein.-con. reservoir; specification No. 2654. Noted Oct 25.

Wash., D. C.—Addition to Forge Shop—Until Nov. 12, by Bureau Yards and Docks, Navy Dept., building at Navy Yard. About $155,000. Noted Nov. 1

Wash., D. C.—Storehouse, etc.—Until Nov. 12, by Bureau Yards and Docks, Navy Dept., building general storehouse, 1 covered annex and 1 covered extension to crane runway. About $400,000. Noted Oct. 11.

W. Va., Charleston—Electric Duct System—Until Nov. 26, by Bureau Yards and Docks, Navy Dept., Wash.; specification No. 2669. About $5000. Noted Nov. 1.

Fla., Key West—Filling—Until Nov. 19, by Bureau Yards and Docks., Navy Dept., Wash. About $25,000. Noted Oct. 25.

Miss., Gulfport—Emergency Camp—Until Nov. 12, by Bureau Yards and Docks, Navy Dept., Wash.; specification No. 2616 Former contract awarded to J. Griffith & Son, 112 West Adams St., Chicago, rescinded. Noted Nov. 1.

Miss., Gulfport—Emergency Hospital—Until Nov. 12, by Bureau Yards and Docks, Navy Dept., Wash.; specification No. 2615. Former contract awarded to J. Griffith & Son, 112 West Adams St., Chicago, rescinded. Noted Nov. 1.

Miss., Vicksburg—Levee Work—Until Nov. 10, by 3rd Mississippi River Dist., P. O Box 404, Vicksburg, 410,000 cu.yd. levee work.

La., New Orleans—Bulkhead—Until Dec. 5, at U. S. Engr. Office, Custom House, for bulkhead at Southwest Pass Mississippi River; advertised in this issue.

La., New Orleans—Levee Work—Until Nov. 10, by U. S. Engr. Office, 519 Canal St., New Orleans, 1,822,000 cu.yd. earthwork, in Lower Tensas, Barataria and Pontchartrain Levee Dists.

La., New Orleans—Radio Buildings—Until Nov. 26, by Bureau Yards and Docks, Navy Dept., Wash. About $15,400. Noted Oct. 18.

Tex., Denton—Post Office—Until Dec 17, by J. A. Wetmore, superv. archt., treas. dept., Wash.

N. M., Ft. Stanton—Electric Generating Equipment—Until Nov. 26, at office custodian, U. S. Sanitorium, Ft. Stanton, furnishing and delivering f.o.b. cars Capitan, N. M.; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—Seawall—U. S. Engr Office let contract, building at Ft. Warren, to Bay State Dredging & Contg. Co., 31 Atlantic Ave., Boston, $33,000. Noted Oct. 11.

★**Mass., Hingham**—Wall—Bureau Yards and Docks, Navy Dept., Wash., let contract for improvements to wall of slips at Naval Ammunition Depot, to Dewey Cement Constr. Co., 836 Hamilton St., Allentown, Pa., and H. P Brown Co., 120 Liberty St., New York City. Noted Oct. 25.

★**N. J., North Raboy**—Ordnance Storehouses—War Dept. (I. W. Littell, brig. genl.) let contract, to Snare & Triest, Woolworth Bldg., New York City. Cost plus %, about $6,000,000.

Pa., Hollidaysburg—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., received low bids (a) limestone, (b) sandstone, from King Lumber Co., Charlottsville, Va., (a) $62,000, (b) $64,000; W. H. Fissell & Co., 1328 Bway., New York City, (a) $63,000, (b) $65,500. Noted Oct. 4.

★**Pa., Phila.**—Salvage Storage Building—Bureau Yards and Docks, Navy Dept., Wash., let contract, to McCloskey & Bahls, 1620 Thompson St. $4475.

★**Md., Baltimore** — Storehouses — War Dept. (I. W. Littell, brig. genl.) let contract building at Curtis Bay Sta., to Smith, Hauser & McIsaacs, 18 East 41st St., New York City. Cost plus % amounting to about $3,000,000.

★**Wash., D. C.**—Barracks—War Dept. (I W. Littell, brig. genl.) let contracts as follows:

To Sperry Eng. Co., 82 Church St., New Haven, Conn:

Ft. H. G. Wright, N. Y.,	4 units	$87,200
Ft. Terry, New York,	5 units	$109,000

To Turner Constr. Co., 242 Madison Ave., New York City:

Ft. Schuyler, N. Y.	1 unit	$21,800
Ft. Totten, N. Y.	4 units	$87,200
Ft. Hamilton, N. Y.	7 units	$152,600
Ft. Tilden, N. Y.	1 unit	$21,800
Ft. Wadsworth, N. Y.	7 units	$152,600
Ft. Hancock, N. Y.	12 units	$261,600

To H. H. Jackson, Chester, Pa.

Ft. Dupont, Del.	1 unit	$21,800

To Consolidated Eng. Co., 343-59 Culvert Bldg., Baltimore, Md.:

Ft. Howard, Md.	3 units	$65,400

To Hampton Roads Eng. & Constr. Co., Hampton, Va.:

Ft Monroe, Va.	4 units	$87,200
Ft Caswell, N. C.	3 units	$65,400

To W. T. Richardson, Jacksonville, Fla.:

Ft. Taylor, Fla	2 units	$43,600
Ft. Dade, Fla.	2 units	$43,600

To W E Hampton & Co., Los Angeles Trust & Savings Bldg., Los Angeles:

Ft. Rosecrans, Cal.	5 units	$109,000
Ft. McArthur, Cal.	9 units	$196,200

To Dinwiddie Constr. Co., Yeon Bldg., Portland, Ore.:

Ft. Winfield Scott, Cal.	9 units	$196,200
Ft Stevens, Oregon	3 units	$65,400
Ft Columbia, Wash	2 units	$43,600
Ft Canby, Wash	2 units	$43,600

To Sound Constr. & Eng. Co., 72 Union St., Seattle, Wash.:

Ft Worden, Wash	5 units	$109,000
Ft Casey, Wash	5 units	$109,000
Ft Flagler, Wash	5 units	$109,000

Each of these units is estimated to take care of 109 men. Cost of quarters estimated at rate of $200 per man

★**Wash., D. C.**—School—District Comrs. let contract building addition to Petworth School, to Melton Constr. Co., Real Estate Trust Bldg., $158,700

Va., Farmville—Post Office—J. A. Wetmore, superv., archt., treas. dept., Wash., received low bids from R. K. Stewart, South Boston, Va., $46,400; W. J. Brent, 506 Int. Trade Bldg., Norfolk, $49,000; C. G. Heflin, Fredericksburg, $47,600. Noted Sept. 27.

Va., Norfolk — Remodeling Quarters — Bureau Yards and Docks, Navy Dept., Wash., received low bids for remodeling quarters H, Marine Barracks, Navy Yard from Nichols & Landmann, 925 Seaboard Bank Bldg., $23,900, time 120 days; Nash & Jones, Law Bldg., $17,881, no time stated; W. W. Keeler, Charlottesville, $18,440, 30 days.

★**Va., Norfolk**—Warehouse—War Dept. (I. W. Littell, brig. genl.) let contract building at Hoge Depot Sta., to J. Simons & Co., 40 Cortlandt St., New York City. Cost plus % amounting to about $100,000.

★**W. Va., Charleston**—Public Buildings—Bureau Yards and Docks, Navy Dept., Wash., let contract building at U. S. Army depot, to W. A. Scott, 37 Portland St., Boston, Mass., $44,344. Noted Oct. 18.

★**S. C., Charleston**—Alteration to Local Custom Building—Bureau Yards and Docks, Navy Dept., Wash., let contract to Charleston Dock & Canal Co., 58 Broad St., Charleston, cost plus 10%.

★**S. C., Paris Island**—Temporary Hospitals—Bureau Yards and Docks, Navy Dept., Wash., let contract to W. J. Haddon, Jacksonville, Fla. $53,630

Fla., Key West—Tank and Tower—Comr. Fisheries, Dept. of Commerce, Wash., D. C., received bids for building concrete tower and tank at Biological Sta. from Williams-Gerstle Engr. Co., 195 Bway, New York City, $3828, time 120 days. Noted Oct. 11.

★**Fla., Pensacola**—Railroad Piers and Repairs to Hangars—Bureau Yards and Docks, Navy Dept., Wash., let contract, to C. H. Turner & Co., 30 East Garden St., $44,914.

★**La., New Orleans**—Levee Work—U. S. Engr. Office, Queen and Crescent Bldg., New Orleans, let contracts building 4,343,000 cu.yd. earthwork, Lower Tensas, Atchafalaya, Lafourche, Barataria, Pontchartrain and Lake Borgne Dists., to Dameron White Co., Baton Rouge, $12,600; Helgason Bros., $94,775; Grasser Contr. Co., Hennen Bldg., $194,400; D. B. Hearin & Son, and C. O. Ogden, Baton Rouge, $86,719; L. F. Alexander, Audubon Bldg., $58,693. Noted Sept. 27.

O., Kenton—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., received only bid, from Schmidt Bros. Constr. Co., Chicago, $73,860, limestone, $75,860, sandstone. Noted Sept. 27.

★**Ind., Indianapolis**—Aviation Camp—War Dept. let contract, to Bedford Stone & Eng. Co., Indianapolis, cost plus percentage. Cost between $200,000 and $800,000.

Ind., Valparaiso—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., received low bids, from J. H. Wiese, 1301 City Natl. Bank Bldg., Omaha, Neb., $79,785; C. Weitz & Son, 713 Mulberry St., Des Moines, Ia., $73,000; Schmidt Bros. Constr. Co., 105 North Clark St., Chicago, $77,450. Noted Oct. 4.

Cal., Mare Island—(Vallejo P. O.)—Refrigerating Plant—Bureau Yards and Docks, Navy Dept., Wash., received low bids, building at Navy Yard, from Cyclops Iron Wks., 827 Folsom St., San Francisco, $23,269, alternate, $21,589, time for both 90 days; Vulcan Iron Wks., 1849 Kearney St., San Francisco, $23,816 and $21,838, 90 days; York-California Constr. Co., 832 Folsom St., San Francisco, $25,570 and $25,046, 90 days.

MISCELLANEOUS

Proposed Work

Pier, Bulk Head, etc.—**Provincetown, Mass.**—Provincetown Cold Storage Co. having plans prepared by F. E. Hube, archt., for reinforced concrete and steel pier, bulk head and wall, cold storage plant and warehouse. About $150,000.

Elevated Railway—**Phila., Pa.**—(Official)—W. S. Twining, dir. Dept. of City Transit, 704 Bullitt Bldg., received bids on Contract No. 5, steel and frame work and reinforced concrete bents and parapets, side structures, roofs, drain gutters and spouts for 3 station platforms and connecting passageway or foot bridge between station platforms and station buildings at Orthodox, Margaret Sts. and Rising Sun Ave. Work will be readvertised. Noted Oct. 18.

Contract Work—**McKeesport, Penn.**—Butler City Co., McKeesport, wish to contract the removal of sand and clay overburden necessary to be removed in open-pit mining of pottery clays; advertised in this issue.

Wharf—**St. John, N. B.**—Council plans to erect wharf and build shed. About $10,000.

BIDS DESIRED

Bulkheads—**Boston, Mass.**—Until Nov. 9, Park & Recreation Dept., 31 Beacon St., grading and building bulkheads on Tenean Beach, Ward 29. J. H. Dillon, Clk.

Roof Repairs—**Elmira, N. Y.**—(Official)—Until Nov. 10, by H. Melville Dow, Supt. of Supplies, Bureau of Supplies and Accounts, Navy Dept., Washington, D. C., proposals for repairing roofing and sheet metal work on Bldg. 20, Navy Yard, Brooklyn, N. Y.; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Incinerator**—**Long Island City, N. Y.**—M. F. Connell has been awarded contract for building and equipping refuse destructor plant, 2 Hayward-Hutchinson Co. units, at Gallo & Ewen Island, July 15.

Miscellaneous (Continued)

Wall—New York, N. Y.—Dir Bellevue Hospital received bids for excav. removals, alterations and replacement north wall at tunnel, front of laundry and power house, south side East 26th St. from Natl Fence & Foundation Co., 103 Park Ave., $11,000; Del Balso & Balbo, 261 Bway., $12,000; T. Gallagher, Inc., $12,500.

★**Coke Storage Bin—Rochester, N. Y.**—(Official)—Rochester Railway and Light Co., 34 Clinton St., let contract, rein.-con., to Turner Constr. Co., 242 Madison Ave., New York City, $70,000.

★**Crane Run-Way—Phila., Pa.**—Tacony Cordage Corp., Bleigh and Milnor Sts., let contract to F. W. Mark Constr. Co., Finance Bldg., $19,500.

★**Elevated Railway—Phila., Pa.**—(Official)—W. S. Twining, dir. Dept. of City Transit, let Contract No. 533, station buildings at 4604 Frankford and 4679-4681 Frankford Ave.; Contract No. 534, buildings at 4270-4272 Frankford Ave., and 4269-4271 Frankford Ave., to Standard Constr. Co., 1616 and Sycamore St., $46,459. Noted Oct. 18.

★**Dam—Anahuac, Tex.**—(Official)—Trinity River Irrigation Dist. let contract building dam between Turtle Bay and Trinity Bay; also dredging channel from locks, to F. W. Lotz, Anahuac, $35,500. Noted Oct. 11.

HIGHWAY FROM LAKES TO GULF IS PROPOSED

Humboldt and a number of other towns located on the Central West Tennessee National Highway have been notified that they have been designated as a part of one of the great north and south highways, known as the Meridian Highway, and promoted by an Illinois good roads corporation, which will run from Lake Superior to Mobile. This highway has already been designated and marked from Lake Superior as far south as Pana, Ill., and the marking will be continued as rapidly as possible until completed.

Malcolm MacKinnon of Chicago, who is secretary of the Meridian Highway Association, also manager of the Chicago division of the Touring Club of America, has given out the following interview relative to this great highway:

"Completion of the marking of the Meridian Highway from Lake Superior to the gulf has been arranged at a meeting of the association at Decatur, Ill., Thursday, Oct. 25. The logic behind this movement for a direct road connecting the resorts of Wisconsin and Northern Michigan with those of the gulf coast country in Alabama, Mississippi and Louisiana is appealing more and more to the people along the line. The plan provides also a direct road for travel between intermediate points.

"Under the privileges of the new trunk line road law in Wisconsin and the $60,000,000 bond issue bills in Illinois, the completion of a broad, permanent pavement in those states within a few years looms very bright indeed.

"Kentucky and Tennessee parts of the road are to be opened for with federal and municipal as the state and government money has already been ordered placed to the south from Cairo to Corinth, Miss., by way of Fulton, Martin, Sharon, Greenfield, Trenton, Humboldt, Jackson, Henderson and Shiloh Park. The route of a broad pavement across these states plays a prominent part in the development of the Meridian Highway from Meridian to the gulf by way of impassable Forests, Aberdeen, Meridian, Laurel, Hattiesburg and Gulfport as a link in Meridian from Meridian to the gulf by way of Evangeline, Ark., has been designated for its part also.

"This will be the greatest north and south national highway in existence. It will serve the most logical and shortest route to connect the two most important touring regions in the great middle part of the United States. It touches at east and west continental roads such as the Dixie Overland at Meridian, Broadway at Corinth, the Old National Trail at Vandalia, the Ocean to Ocean at Decatur, the Cliff Trail at El Paso, the Illinois Valley West at La Salle, the Cannon Trail and Chicago route at Meridian; the Lincoln Highway at Sterling, the Grand Highway at Lincoln and the National Parks and Lakes to River Highway at Madison and the Yellowstone Trail at Stevens Point.

"Notable trail movements like these named are the livest things in road agitation in all the states and those routes now being laid out and marked will be the great arteries of travel in the future. Many are motoring long distances every week-end to see wagons up today, but those on highways stand out as unmistakable different and as having a much greater attraction."

SEWERS, DETROIT, MICH.

Bids were received by City, Oct. 18, for constructing brick sewer on Linwood Ave., from (A) Jaynes & Affeld, 1208 Ford Bldg.; (B) Julius Porath, 34 McGraw Bldg.; (C) Carpenter Constr. Co., 707 Ford Bldg., all of Detroit. The first totals represent the contractors estimate and the second the contractors' unit bids applied to the correct quantities. The unit bids were as follows:

Size Ft.	Size In.	A Estimated Quantity	A Unit Bid	B Estimated Quantity	B Unit Bid	C Estimated Quantity	C Unit Bid
14	0	1,795½	$87.00	1,796	$94.35	1,795.6	$100.00
11	0	29½	55.00	29	85.00	29.6	60.00
10	0	642½	50.00	642	46.40	642.5	60.00
9	9	2,201	46.00	2,201	46.40	2,201.0	55.00
9	6	626	45.50	626	42.30	626.0	45.00
9	3	1,750	44.40	1,750	41.50	1,750.0	40.00
9	0	1,788	43.36	1,788	41.00	1,788.0	40.00
7	6	2,209	35.40	2,209	36.90	2,209.0	30.00
7	0	1,637	23.00	1,637	29.40	1,637.0	28.00
6	6	83	21.60	83	28.00	83.0	25.00
5	3	887	18.00	760	18.60	887.0	20.00
5	0	1,841	17.28	1,788	18.30	1,807.0*	17.00
3	9	18	15.00	18	16.00	.....*	.....
3	6	80	12.50	56	15.00	56.0*	12.00
2	9	28	10.40	28	15.00	28.0	10.00
5	3	.....	.....	127	25.00	.....	.....
5	0	.....	.....	53	18.00	.....	.....
3	6	.....	.....	24	16.00	.....	.....
Manholes		17	175.00	17	300.00	17.0	500.00
Extended totals,		$644,870		$666,227		$682,723	

* Indicate shortages. 34 ft.–5 ft. 18 ft.–3 ft. 9 in. 24 ft.–3 ft. 6 in.

		A	A	B	B	C	C
14	0	1,795.6	$87.00	.....	$94.35	.....	$100.00
11	0	29.6	55.00	.....	85.00	.....	60.00
10	0	642.5	50.00	.....	46.40	.....	60.00
9	9	2,201.0	46.00	.....	46.40	.....	55.00
9	6	626.0	45.50	.....	42.30	.....	45.00
9	3	1,750.0	44.40	.....	41.50	.....	40.00
9	0	1,788.0	43.36	.....	41.00	.....	40.00
7	6	2,209.0	35.40	.....	36.90	.....	30.00
7	0	1,637.0	23.00	.....	29.40	.....	28.00
6	6	83.0	21.60	.....	28.00	.....	25.00
5	3	887	18.00	760	18.60	.....	20.00
5	0	1,841	17.28	1,788	18.30	.....	17.00
3	9	18	15.00	.....	16.00	.....	.....
3	6	80.0	12.50	56	15.00	.....	12.00
2	9	28.0	10.40	.....	15.00	.....	10.00
5	3	.....	.....	127	25.00	.....	.....
5	0	.....	.....	53	18.00	.....	.....
3	6	.....	.....	24	16.00	.....	.....
Manholes		17	175.00	.....	300.00	.....	500.00
Extended totals,		$644,884		$666,263		$683,589	

PAVING AND SEWERS—LOS ANGELES, CAL.

Bids were received by City for grading and constructing bitulithic pavements, storm drains and sewers on various streets, from (A) G. H. Oswald, O. T. Johnson Bldg., (B) Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., both of Los Angeles. The unit bids were as follows:

	A	B
634,649.23 sq.ft. grading to subgrade	$0.07½	$0.09
8,144.75 sq.ft. grading to subgrade	.01½	.121
24,466.85 sq.ft. grading to finished surface in Lake St.	.08	.04
17,943.28 sq.ft. grading to finished surface in Rockwood St.	.10	.07
26,729.89 sq.ft. grading to finished surface in all other streets to be improved	.01½	.02
1,997.90 sq.ft. grading to finished surface first alley W. of Witmer St.	.08	.077
634,649.23 sq.ft. bitulithic paving	.16	.16
849.00 sq.ft. asphalt paving, including grading-x sec. 101	.17	.20
2,126.09 sq.ft. asphalt paving, including grading—special x sec.	.17	.20
8,144.75 sq.ft. concrete paving	.15	.15
69,140.92 sq.ft. sealcoating, tarvia and oil	.03½	.03
24,139.42 lin.ft. cement curb "A" steel angles at returns	.40	.37
118,937.87 sq.ft. cement sidewalk	.12½	.12½
18,988.60 sq.ft. vitrified brick gutter	.40	.35
8,348.23 sq.ft. concrete gutter	.17	.20
Storm sewer and appurtenances in 1st St. from Witmer St. to Lake Shore Ave.	1,132.49	1,065.00
Storm sewer and appurtenances in Belmont Ave., 1st St. and Catalina Ave. from Rockwood St. to 2nd St.	2,394.75	2,593.00
Storm sewer and appurtenances in 2nd St. from Union Ave. to Catalina Ave.	638.48	887.00
Storm sewer and appurtenances in 1st St. from Westlake Ave. to Alvarado	1,828.39	1,721.00
Storm sewer and appurtenances in 1st St. from Reno St. to Occidental Blvd.	723.09	754.00
Storm sewer and appurtenances in 1st St. from Vendome to Dillon Sts.	709.10	695.00
Storm sewer and appurtenances in 1st St. from Commonwealth Ave. to 464.32 ft. W. of Vogel	1,314.80	1,772.00
Storm drain and appurtenances in Loma Dr. from 328.5 ft. to 235.5 ft. south of 1st St.	190.90	177.00
Storm drain and appurtenances in Lake St. from 12.6 ft. N. to 26.5 ft. S. of Dorcas St.	181.75	202.00
26 catch basins, 2 junction chambers and 2 manholes and connection drains in 1st and inter streets	1,608.00	2,224.00
Sanitary sewer, house connections and appurtenances in 1st St. between Loma Dr. and Colina Ave.	298.88	497.00
Sanitary sewer and structures in 1st St. between Witmer St. and Loma Dr. and between Colina Ave. and Union Ave.; also in Loma Dr., Belmont Ave. and Rockwood St., including sludge and tank and reconstruction of a manhole (House connection sewers not included)	6,397.00	6,397.00
Extended totals	$213,992	$222,622

ROAD IMPROVEMENT THROUGHOUT COUNTRY IN 1917

The millions that the Government, the states and other agencies have spent this year in good roads have not been spent in vain. Crews of fleets testing tires for the B. F. Goodrich Rubber Co. of Akron, returning from every part of the country after nine months of steady touring in which they made aproximately 5,000,000 mi.—the equivalent of girdling the globe 200 times—report that there isn't a nook or cranny today that is not accessible to the motorist, owing to the volume of road improvement. Even the desert no longer holds terrors for the automobilist with nomadic tendencies. In fact, the glistening trails across the Great American and Mojave deserts testify to greater tourist travel, perhaps, than any other two roads in the country.

Condensed, these are the principal observations of the tire testing fleets:

The Pacific Coast has the finest roads in the country, and in consequence the motorists there get more tire mileage and use less gasoline per mile than in any other region of the country.

Eastern highways are groaning under the weight of motor trucks engaged in haulage—an industry sprung into being since railroad freight congestion made the use of other conveyances imperative. Particularly is this noted between Boston and New York.

Prosperity in the farming states of the West has never been greater. There are not many farmers in the six big farming states who do not possess automobiles. All the field work is done by tractors—the horses are used in the making of new roads for the automobilist.

The 2200-mi. run from Chicago to Los Angeles is the finest pleasure run in the country. Gasoline can be had every 50 mi., and there is only one tough spot in the entire route—a 40-mi. stretch near Askfork, Ariz.

Maine is the most backward in road betterment. Along the seacost the roads are good, but in the interior one is apt to encounter much trouble.

The best single stretch of road is on the new ridge highway, built by the great oil interests for travel between Los Angeles and Bakersfield, Calif. Millions were expended in constructing this great thoroughfare.

Transcontinental travel has been greater than in any previous year, the war notwithstanding.

Stones are the worst enemies of the motorist. They bruise the fabric and deteriorate starts at once, although a "blowout" may not occur for 500 mi. afterwards.

The shallow streams crossing the Dixie highway should be bridged. The sharp pebbly bottoms cut the tread and make possible punctures. Aside from these disadvantages, found more in Georgia than in any of the other states, the highway is much improved.

The Lincoln highway between Philadelphia and New York is showing the effects of heavy traffic, it being necessary now to negotiate 7 mi. of this short run in low gear.

"On the whole there are few bad roads in the country today," said one of these bronze visaged pilots. The war has not, contrary to expectations, lessened the volume of road building and improvement. States have been aroused to the necessity of keeping up their roads, because the better roads the greater the volume of business. There are at least 3,655,000 automobiles in this country today and every owner spends money. He will follow good roads. The more attractive the roads, the more picturesque the surroundings the greater the community's prosperity, hence the general alertness on the part of local governments.

"It doesn't take much to make a good road. Of course, asphalt, concrete, macadam and brick make the best roads but any road is a good road that does not have loose stones in the autoist's path. Stones, we have found, do more damage to the motorist's car than any other obstacle he will encounter. They bruise tires, destroy wheel alignment and break springs."

The West is striving to maintain its supremacy in good roads, the test tire men find, by a big campaign in 1918. North and South Dakota are getting busy and Georgia is making plans that should please the Southern tourist.

PIER, NEW YORK, N. Y.

Bids were received by W. W. Wotherspoon, supt. pub. wks., Capitol, Albany, Oct. 23, for constructing pier at foot of West 53rd St., North River, Barge Canal Contr. No. 58, from (A) I. J. Stander & Co., 118 East 28th St. (awarded contract), (B) G. P. Spratlin, 90 West St.; (C) Lupfer & Remick, Ellicott Sq., Buffalo, (D) G. W. Rogers Co., 29 Bway., $299,882. The unit bids of the 3 lowest bidders were as follows:

	A	B	C
Removing old material (lump sum)	$475 00	$400 00	$480 00
60,000 lin ft. foundation and bracing piles	46	475	54
1,400 lagged piles	78 00	74 47	80 00
170 fender piles	24 76	30 20	30 00
710 M. ft.b.m sawed lumber	79 20	83 16	86 00
180 M. ft b.m sawed lumber, treated	86 90	95 05	98 00
80,000 sq ft. surface treatment of lumber	01¼	015	015
524 cu yd. 1st class reinforced concrete	14 50	14 55	11 00
1,120 cu yd. 2nd class reinforced concrete	8 28	10 00	7 50
5,000 lb. rigid metal conduit	215	203	20
37,000 lb. iron castings	.07	081	08
53,000 lb. metal reinforcement	.06	079	06
284,000 lb. structural steel	.085	107	088
14 spools	275 00	275 00	200 00
Extended totals	$266,065	$276 906	$278,976

PAVING—LOS ANGELES, CAL.

Bids were received by City for paving Reseda Ave. from Devonhsire St. to Ventura Blvd., from (A) Geo. H. Oswald, O. T. Johnson Bldg., (awarded contract); (B) Fred Hoffman; (C) Geo. R. Curtis, 2440 East 26th St.; (D) Johnston & Grabs, $169,504; (E) Johnson-Shea Co., Central Bank Bldg., Oakland, $169,615; (F) Rogers Bros. Co., Hibernian Bank Bldg., $201,061; (G) Tryon & Bain, 1648 West 36th, $210,949. The unit bids of the 3 lowest bidders were as follows:

	A	B	C
740,230 sq.ft. grading to sub-grade	$0 01¼	$0 0095	$0 01
560,480 sq.ft. cultivating, tamping and rolling	.026	02	02
740,230 sq.ft. concrete paving with bituminous protecting coat	.17	16	15¾
560,480 sq.ft. grading to sub-grade	.02	0085	01
Steel and concrete culverts (lump sum)	3,750 87	2,100 00	2,000 00
Extended totals	$139,662	$143,543	$143,913

OREGON AT WORK ON 38 PROJECTS

There are 38 projects now receiving the attention of the state highway commission. These projects are in 20 different counties in Oregon. They represent $2,263,115.21 and total about 190 miles of work and 10 bridges. This work has been started since June 5. The greatest activity is in Columbia, Clatsop, Douglas and Hood River.

A survey discloses the fact that the commission is working on four trunk lines, three of which cross the state. The Columbia River Highway, an east and west cross-state road; the Pacific Highway, a north and south cross-state road, and The Dalles-California highway, a cross-state road running north and south through Central Oregon are being opened, graded and macadamized. The fourth trunk line is the Tillamook Highway.

Following are the projects as listed at the office of the commission on October 1:

Clackamas County — Pacific Highway, grading near New Era, 2½ miles, $30,873.20.

Clackamas County — Pacific Highway, paving, Oregon City to Canby, eight miles, $145,721.40.

Clatsop County—Columbia River Highway, macadamizing, Svenson to Westport, approximately 15.5 miles, $111,295.

Clatsop County—Columbia River Highway, paving, Astoria to Svenson, approximately nine miles, standard bitulithic, $199,235.33.

Columbia County—Columbia River Highway, 10 bridges, $86,9[illegible].

Columbia County—Columbia River Highway, grading, Goble section, 1.8 miles, $43,300.20.

Columbia County—Columbia River Highway, grading, Rainier hill section, 1.3 miles, $11,888.10.

Columbia County—Columbia River Highway, macadamizing [illegible] miles east of Deming school house to Goble, [illegible] miles, $[illegible].

Columbia County—Columbia River Highway, macadamizing Clatskanie to [illegible] miles east of Deming school house, $49,130.30.

Columbia County—Columbia River Highway, grading and macadamizing from Clatsop county line to Clatskanie, [illegible] miles, $36,474.

Columbia County—Columbia River Highway, paving from Scappoose to Multnomah county line, 2.5 miles, bituminous, $[illegible].

Columbia County—Columbia River Highway, macadamizing, Cable section, 1.1 miles, $11,888.

Coos County — Engineering on county work, $15,000.

Deschutes County—The Dalles-California Highway, widening Bend [illegible] $17,000.

Douglas County—Myrtle road to Tillard, grading 10.8 miles, $17[illegible] Bids not advertised yet.

Douglas County—Canyon Creek Pass to Johns Place, grading, approximately 2.8 miles, $23,680.60. Bids not advertised yet.

Douglas County—Pacific Highway, Yoncalla to Oakland, grading, 10.4 miles, $94,905.74.

Douglas County—Pacific Highway, Comstock to Leona; grading and macadam, 4.6 miles, $57,946.02.

Douglas County—Pacific Highway, Lane-Douglas county line to Comstock, grading and macadam, 2.4 miles, $26,787.

Gilliam County—John Day Highway, macadamizing south of Condon to Trout[illegible] mile creek, 6.7 miles, $20,[illegible].

Hood River County — Columbia River Highway, Cascade Locks section, grading 8.2 miles, $105,930.

Hood River County — Columbia River Highway, Viento section, grading, 3.6 miles, $71,033.

Hood River County — Columbia River Highway, Ruthton hill section, grading, 2.4 miles, $39,988.75.

Jackson County—Pacific Highway, grading Ashland fill crossing, $[illegible].

Josephine County — Pacific Highway, grading Wolf creek fill, 4.2 miles, $[illegible]. Half of this amount to be federal aid. The project must be carried through even though the government does not help.

Josephine County — Pacific Highway, Lone Mile section, grading [illegible] miles, $[illegible].

Klamath County — Dixie to Klamath Falls, grading and macadamizing [illegible] miles, $36,000.

Lake County — The Dalles-California Highway, macadamizing between Silver and Paisley, three miles, $18,000.

Lane County—Pacific Highway, macadamizing south across the Siuslaw river, Lane County, $[illegible].

Lincoln County—Pioneer mountain road, Corvallis to Newport, grading [illegible] mile, $2000.

Multnomah County — Tyndall-Portland paving, starting at [illegible] paving [illegible] south five miles, bituminous, $[illegible].

Umatilla County—Columbia River Highway, paving from Pendleton 11 miles, bitulithic, $[illegible].

Wasco County — Columbia River Highway, [illegible] from The Dalles 12 miles, $10,[illegible].

Washington and Yamhill Counties, Pacific Highway, paving Cedar Hill-Portland county line to Tualatin, 10.3 miles, bitulithic, $[illegible].

Wheeler County — John Day Highway, grading Clarno hill [illegible] miles, $[illegible].

Yamhill County—Pacific highway, paving from Whiteson to Sheridan, [illegible] miles, $[illegible].

SEARCHLIGHT SECTION

Contracts To Be Let

PROPOSALS

Bids received until Nov. 15, 1917.

Asphalt Concrete Pavement

Clarksville, Tenn., Oct. 18th, 1917.

Sealed Proposals will be received by the Board of Mayor and Aldermen of the City of Clarksville, Tennessee, at the office of W. B. Young, City Recorder, until Nov. 15th, 1917, at noon, for paving parts of three streets with Asphalt Concrete laid on a Concrete base. Approximately 15,000 sq. yds.

All bids must be made on forms of proposals furnished by the City Engineer.

All proposals submitted for the construction of this improvement shall be accompanied by a certified check or a suitable bond, with at least two good and solvent sureties, who are citizens or residents of the City of Clarksville, Tennessee; or in lieu of personal sureties, the bond of some surety company authorized to do business in the state of Tennessee may be given in a penal sum of at least ten per cent. of the entire cost of the work to be done, computed on the basis of the proposal submitted, and conditioned that the contractors named therein shall in case said work is awarded to them, enter into a contract with said city in the time required and for the price named in their respective bids, and in accordance with the plans and specifications of the City and provisions of the ordinance providing for the improvement.

The successful bidder shall execute a bond to said City in an amount equal to fifty per cent. of the entire contract price of said improvement.

The checks of the unsuccessful bidders shall be returned as soon as the contract is awarded, but the successful bidder or bidders will be retained until a bond for fifty per cent. of the amount of the contract has been executed and filed.

Plans and Specifications can be seen at the office of S. R. Alexander, City Engineer.

The right is reserved by the Board of Mayor and Aldermen to reject any or all bids

T. H. MARABLE, Jr. (?), Mayor
[illegible]
Special Committee.

Bids received until November 19, 1917.

Steel Draw Bridge

Charleston, S. C., Oct. 11 1917.

Sealed proposals will be received at the office until noon November 19, 1917, for constructing steel draw bridge and timber approach across Goose Creek, near Goose Creek, S. C. for information or application

SANITARY AND DRAINAGE COMMISSION FOR CHARLESTON COUNTY,
JAMES W. MARTIN,
Engineer

PROPOSALS FOR LETTER WORK—Office of Thos. E. Murray, Hyde Park, N. Y. Box 156, Vanderbilt, Minn. Sealed proposals will be received here until 12 noon E. S. Dec. 4, 1917, and then publicly opened for constructing about $1,000 feet of cable yards of letter work. Information on application.

Official Proposals

Price, $3.60 an inch—Copy can be received until Wednesday, 10 a.m., for issue mailed the next day.

PROPOSALS

Bids received until November 10, 1917.

Tenders for Supply of Cement for the Year 1918

GREATER WINNIPEG WATER DISTRICT
Winnipeg, Man., Can.

Tenders upon the form adopted and supplied by the district will be received by the Corporation of the Greater Winnipeg Water District up to 12.00 o'clock noon on Saturday, the 10th day of November, A. D. 1917, for the supply of Portland Cement to the District during the year 1918 in accordance with the terms of the Information for Bidders, Form of Tender and Form of Contract, adopted by the District; all of which can be obtained on application at the offices of the District No. 501, Tribune Building, Winnipeg, Manitoba, Canada.

R. D. WAUGH,
Chairman of Commissioners.

October 23rd, 1917.
Winnipeg, Man., Canada.

Bids received until December 6, 1917.

Drainage Ditches

OFFICE OF THE COUNTY SURVEYOR
Marion, Ohio,
Nov. 1, 1917.

Sealed proposals will be received at the office of the County Surveyor at Marion, Ohio, until 12 o'clock noon, December 6, 1917, for the construction of drainage ditches known as the Tymochtee Creek Improvement.

Length—26.96 miles.

Estimated Yardage—500,779.

Estimated cost of construction — $77,-741.42.

The contractor must submit a proposal and contract bond for an amount equal to 100% of the estimated cost or a certified check on any bank in the city of Marion, Ohio, for 10% of estimated cost of each section bid on.

Plans and specifications are on file at the office of the County Surveyor and can be had by writing for same.

The County Surveyor reserves the right to reject any and all bids.

LORING K. WARNER,
County Surveyor.
By CHARLES ASH,
Acting County Surveyor.

Contract Work Wanted

McKenzie, Tenn.

We wish to contract the removal of sand and clay overburden necessary to be removed in open pit mining of Pottery Clays. Overburden from 15 to 40 feet thick. Will contract for continuous movement of 1000 yards per day, or a lump contract of 300,-000 yards. Address The Johnson-Porter Clay Co., McKenzie, Tenn.

PROPOSALS

Bids received until November 10, 1917.

Roof Repairs

Elmira, N. Y.

Sealed proposals for repairs to roof of Superintendent's residence, construction work, at Elmira Reformatory, Elmira, N. Y., will be received by Mr. Henry Melville, President of the Board of Managers of Reformatories at the Eastern New York Reformatory, Napanoch, N. Y., until 12 o'clock noon, Saturday, November 10th, 1917, when they will be publicly opened and read. Proposals shall be enclosed in an envelope furnished by the State Architect, sealed and addressed, and shall be accompanied by a certified check in the sum of five per cent. (5%) of the amount of proposal. The contractor to whom the award is made will be required to furnish surety company bond in the sum of fifty per cent. (50%) of the amount of contract within thirty (30) days after official notice of award of contract and in accordance with the terms of Specification No. 2891. The right is reserved to reject any or all bids. Specifications may be consulted at the Elmira Reformatory, Elmira, N. Y., at the New York Office of the Department of Architecture, Room 1224, Woolworth Building, and at the Department of Architecture, Capitol, Albany, N. Y. Specifications and blank forms of proposal may be obtained at the Department of Architecture, Capitol, Albany, N. Y. Upon reasonable notice to and in the discretion of the State Architect, LEWIS F. PILCHER, Capitol, Albany, N. Y.

Dated, October 29, 1917.

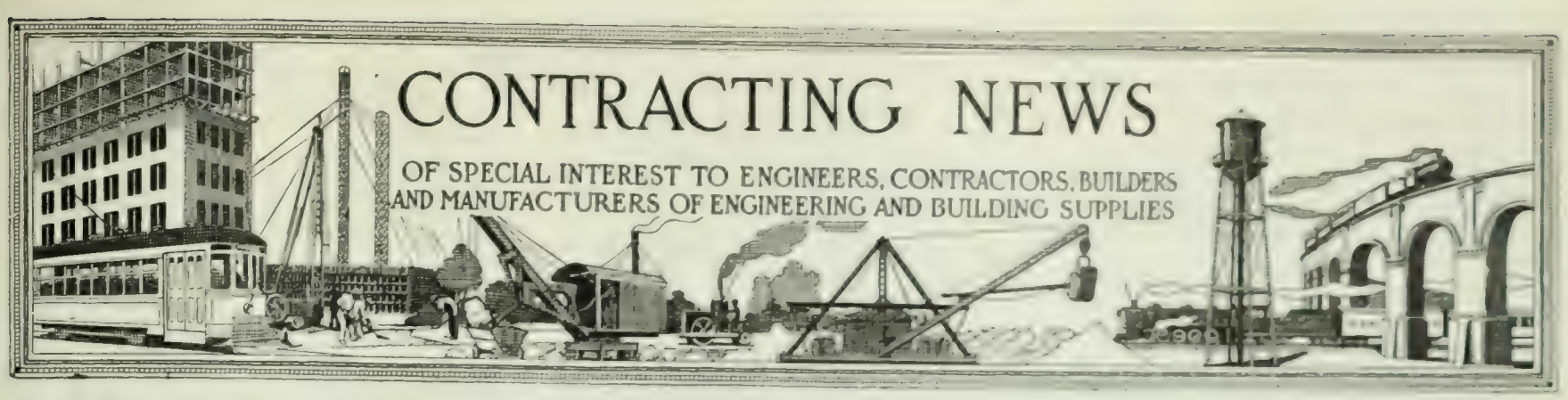
Bids received until November 15, 1917.

Construction Work

Wingdale, N. Y.

Sealed proposals for construction work—grading, at Wingdale Prison, Wingdale, N. Y., will be received by the Commission on New Prisons, Room No. 615, Hall of Records Building, Centre and Chambers Sts., New York City, until 2:30 o'clock P.M. on Thursday, November 15th, 1917, when they will be publicly opened and read. Proposals shall be enclosed in an envelope furnished by the State Architect, sealed and addressed, and shall be accompanied by a certified check in the sum of five per cent. (5%) of the amount of proposal. The contractor to whom the award is made will be required to furnish surety company bond in the sum of fifty per cent. (50%) of the amount of contract within thirty (30) days after official notice of award of contract and in accordance with the terms of Specification No. 2816. The right is reserved to reject any or all bids. Drawings and specifications may be consulted at the office of the Commission on New Prisons, Room No. 615, Hall of Records, New York City, at the New York Office of the Department of Architecture, Room 1224, Woolworth Building, and at the Department of Architecture, Capitol, Albany, N. Y. Drawings and specifications and blank forms of proposals may be obtained at the Department of Architecture, Capitol, Albany, N. Y. upon reasonable notice to and in the discretion of the State Architect, LEWIS F. PILCHER, Capitol, Albany, N. Y.

Dated, November 2, 1917.



Proposals

For Proposals Advertised See Pages 51 to 53 Inclusive

WATER-WORKS

Bids Close		See Eng. News-Record
Nov. 16.	Winnipeg, Man.	Nov. 8
Nov. 19.	Tulsa, Okla.	Nov. 15
Nov. 19.	Wooster, O.	Nov. 8
Nov. 20.	Charleston, Miss.	Nov. 8
Nov. 26.	Euclid, O.	Nov. 8
Nov. 26.	Winnipeg, Man.	Nov. 8
Nov. 26.	Winnipeg, Man.	Nov. 15
Nov. 26.	York Twp., Ont.	Nov. 15
Nov. 27.	Akron, Ohio	Nov. 15
Dec. 3.	Winnipeg, Man.	Nov. 8

SEWERS

Nov. 16.	New York, N. Y.	Nov. 8
Nov. 17.	Appleton, Wis.	Nov. 8
Nov. 19.	Brainerd, Minn.	Nov. 1
Nov. 19.	Lincoln, Neb.	Nov. 15
Nov. 23.	Independence, Mo.	Nov. 8
Nov. 26.	Oil City, Pa.	Nov. 1

BRIDGES

Nov. 17.	Charleston, S. C.	Nov. 1
Nov. 17.	Bowling Green, Mo.	Nov. 8
Nov. 19.	Bartlesville, Okla.	Nov. 15
Nov. 19.	Charleston, S. C. Adv. Nov. 8.	Nov. 8
Nov. 27.	Milford, Del.	Nov. 15
Dec. 1.	Dayton, Ohio	Nov. 15
Dec. 4.	West Palm Beach, Fla.	Nov. 8
Dec. 10.	St. Augustine, Fla.	Nov. 15

STREETS AND ROADS

Nov. 17.	Indiana	Nov. 8
Nov. 17.	Knoxville, Tenn.	Nov. 15
Nov. 19.	Seattle, Wash.	Nov. 1
Nov. 19.	Brewton, Ala.	Nov. 1
Nov. 19.	St. Paul, Minn.	Nov. 15
Nov. 20.	Holdredge, Neb.	Nov. 1
Nov. 22.	Hindman, Ky.	Oct. 25
Nov. 23.	Kendallville, Ind.	Oct. 25
Nov. 24.	Charleston, W. Va.	Nov. 8
Nov. 27.	Rogersville, Tenn.	Nov. 15
Nov. 27.	Bayonne, N. J.	Nov. 15
Dec. 1.	Columbus, Ohio	Nov. 15
Dec. 3.	Scottsboro, Ala.	Nov. 15
Dec. 4.	Tuscumbia, Ala.	Nov. 8
Dec. 4.	Columbus, Neb.	Nov. 15
Dec. 5.	Red Wing, Minn.	Nov. 15

EXCAVATION AND DREDGING

Nov. 20.	Chatham Twp., Ont.	Nov. 15
Nov. 21.	Pipestone, Minn.	Nov. 15
Nov. 21.	Anoka, Minn.	Nov. 15
Nov. 22.	Glenwood, Minn.	Nov. 8
Nov. 22.	Memphis, Mo.	Nov. 8
Nov. 24.	Buffalo, Minn.	Nov. 15
Nov. 26.	Havana, Ill.	Nov. 15
Nov. 27.	Mankato, Minn.	Nov. 15
Dec. 1.	Barstow, Tex.	Nov. 15
Dec. 4.	Salina, Kan.	Nov. 15
Dec. 6.	Marion, O. Adv. Nov. 8.	Nov. 8

Bids Close		See Eng. News-Record

BUILDINGS

Nov. 18.	Storrs (Eagleville P. O.) Conn.	Nov. 15
Nov. 19.	Johnstown, Pa.	Nov. 15
Nov. 19.	Cleveland, Ohio	Nov. 15
Nov. 19.	Hartford, Conn.	Nov. 15
Nov. 20.	Barrie, Ont.	Nov. 15
Nov. 20.	Pleasant Plain, Ia.	Nov. 8
Nov. 22.	Owensboro, Ky.	Nov. 15
Nov. 25.	Middletown, Mass.	Oct. 4
Nov. 27.	Harrisburg, Pa.	Nov. 15
Nov. 30.	Strahan, Ia.	Nov. 15
Dec. 1.	Norfolk, Va.	Sept. 13
Dec. 1.	Glenville, W. Va.	Nov. 8
Dec. 3.	Olympia, Wash.	Nov. 15

FEDERAL GOVERNMENT WORK

Nov. 19.	Fitting out Cranes—Washington, D. C.	Oct. 18
Nov. 19.	Shipbuilding Ways — Brooklyn, N. Y.	Oct. 25
Nov. 19.	Electric Elevator—Norfolk, Va.	Nov. 1
Nov. 19.	Refrigerating Plant and Brine Circulating System—Washington, D. C.	Nov. 1
Nov. 19.	Timber Bulkheads, Boston, Mass.	Nov. 1
Nov. 19.	Filling—Key West, Fla.	Nov. 8
Nov. 19.	Dredging—San Francisco, Cal.	Nov. 15
Nov. 20.	Bridge—Washington, D. C.	Nov. 1
Nov. 20.	Post Office—Caribou, Me.	Oct. 18
Nov. 22.	Post Office—Basin, Wyo.	Oct. 25
Nov. 22.	Steel Pipe—San Francisco, Cal.	Nov. 15
Nov. 23.	Changes to Custom House —Boston, Mass.	Nov. 15
Nov. 23.	Post Office — Woodbury, N. J.	Oct. 25
Nov. 26.	Dry Dock Crane, Wash., D. C.	Oct. 25
Nov. 26.	Steel Towers—Washington, D. C.	Nov. 1
Nov. 26.	Electric Duct System — Charleston, W. Va.	Nov. 8
Nov. 26.	Radio Building—New Orleans, La.	Nov. 8
Nov. 26.	Reservoir — Philadelphia, Pa.	Nov. 8
Nov. 26.	Electric Generating System, Ft. Stanton, N. M. Adv. Nov. 8.	Nov. 8
Nov. 26.	Power Plant Improvements —Charleston, S. C.	Nov. 15
Nov. 26.	Addition to Boiler Shop—Mare Island (Vallejo P. O.) Cal.	Nov. 15
Nov. 27.	Post Office—Chapel Hill, N. C.	Oct. 25
Nov. 27.	Stone—New Orleans, La. Adv. Nov. 1 and 8	Nov. 1
Nov. 28.	Post Office — Bellefourche, S. D.	Oct. 11
Nov. 29.	Post Office—McLeansboro, Ill.	Nov. 15
Nov. 30.	Post Office—Buffalo, Wyo. Adv. Nov. 1.	Nov. 1
Nov. 30.	Machinery, etc. — Cincinnati, O. Adv. Nov. 1 and 8.	Nov. 1
Dec. 3	Incinerator — Mare Island (Vallejo P. O.) Cal.	Nov. 15
Dec. 5.	Post Office—Decatur, Ala.	Nov. 1
Dec. 5	Bulkhead — New Orleans, La.	Nov. 8
Dec. 14	Foam Fire Protection — Guantanamo, Cuba	Nov. 8
Dec. 19	Heating System — Phila., Pa.	Nov. 15
Dec. 17	Post Office—Denton, Tex.	Nov. 8
Dec. 18	Laterals — Torrington, Wyo.	Nov. 1

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official.

WATER-WORKS

Proposed Work

N. J., Wharton — Boro voted $110,000 bonds to build water-works. Noted Oct. 11.

Pa., Phila.—City plans to install Hartwell Ave. water-pipe line feeding Mt. Airy and section Chestnut Hill. About $100,000. C. E. Davis, city engr.

N. C., Leaksville—City plans to build water-works and sewerage systems. J. N. Ambler, Durham, engr.

S. C., Columbia—City plans to install one 2,000,000 gal. and two 5,000,000 gal. electrically-driven pumps with necessary equipment at water-works. About $30,000. F. C. Wyse, city engr.

La., Bossier City—City having plans prepared by Honaker & Swope, engrs., Shreveport, for water system, including 4- and 8-in. pipe, 1 centrifugal and 1 oil engine-driven pump, 1 500,000-gal. reservoir and 1 well. About $30,000. Noted May 10.

Ky., Irvine—Estill Water & Gas Co. plans to build water-works. About $25,000. H. L. Leete, engr. and supt.

Ky., Lawrenceburg — [illegible] — City voted $15,000 bonds to build filtration plant. Noted Oct. 4.

O., Hamilton—City had plans prepared by State Bd. Health, Columbus, drilling 8 rock tubular wells 150 ft. each and installing new piping at pump house. About $16,000. F. E. Weaver, city engr.

Ind., South Bend—City plans to install 225,000-gal. reservoir. F. J. Anderson, city engr.

Ill., Cicero—Town plans to build water-works. About $31,850. J. Monkreig, town engr.

Ill., Quincy—City plans to improve water-works, including new standpipe. About $250,000. E. R. Chatten, city engr.

Wis., Milwaukee — City plans to build water purification plant. About $10,000,000. G. Stark, city engr.

Wis., New Richmond—City plans to improve water-works. Address J. E. Hughes.

Ia., Keokuk—City plans to install one pumping unit in water-works. About $18,000.

Kan., Junction City—City plans to issue $18,000 bonds to improve water-works. T. W. Dean, clk.

Kan., La Crosse—City voted $47,000 bonds to build water-works. Noted Sept. 27.

Kan., McCracken—City voted $12,000 bonds to build water-works. L. L. Dean, city clk. Noted Oct. 11.

S. D., Aberdeen—City voted $125,000 bonds to improve water-works. P. Lang, city engr.

N. D., Belfield—City plans to build water-works. About $40,000.

Mont., Geraldine—City voted $35,000 bonds to build water-works. Noted Sept. 20.

Tex., El Paso—City voted $1,000,000 bonds to improve water-works. J. W. Gaddis, city engr.

Okla., Hunter—[illegible]—City, defeated $40,000 bonds to build water-works. Noted Dec. 4.

Okla., Ponca City—City voted $75,000 bonds to improve water-works. H. O'Neill, supt. Noted Oct. 11.

Water-Works (Continued)

Colo., Sterling—City having plans prepared by A. A. Weiland, engr., Pueblo, improving water-works. Noted June 14.

Ore., Albany—City plans election in December to vote on $400,000 bond issue to improve water-works.

Ore., Richland—(Official) — City postponed indefinitely building water-works, owing to advance in price of materials. Noted Oct. 25.

Cal., Delano—City voted $45,000 bonds to build water-works.

Cal., El Centro — City voted $50,000 bonds to build filtration and purifying plant. Noted Sept. 27.

B. C., Delta—City plans to install electric pump and pump-house in East Delta. About $12,000. N. A. McDiarmid, city engr.

BIDS DESIRED

Okla., Tulsa—Until Nov. 19, by F. Newbark, city audr., for 7,200 ft. 24-in. c.-i. pipe. E. M. Stevens, 708 Ridge Bldg., Kansas City, Mo., engr. Noted Oct. 18.

Ont., York Township—(Official)—Until Nov. 26, by F. Barber, twp. engr., 40 Jarvis St., Toronto, trenching and laying water mains in Lauder and Glenholme Aves.

Man., Winnipeg—Until Nov. 26, by Greater Winnipeg Water Dist., for Contr. No. 56, building tunnel, shafts and well, at Red River crossing; Contr. No. 35, building gate house and intake at Waugh. W. G. Chace, ch. engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Lynn**—General Electric Co., 920 Western Ave., let contract building reservoir to Simpson Bros. Co., 166 Devonshire St., Boston.

N. Y., New York—(Official)—Bd. Water Supply, Municipal Bldg., let contract Shandaken tunnel, to Degnon Contg. Co., 68 Hunter's Point Ave., Long Island City, $12,138,738. Noted Oct. 4.

O., Akron—(Official)—City received low bids, Contr. No. 91, laying water pipe in Cuyahoga Falls Ave., Berwin, Camden, and Hanford Sts., from T. E. McShaffrey, 130 South College St.; P. Agrios, Akron, and F. Manalla, Kenmore.

★**O., Akron**—(Official)—City let contract building elevated steel water tank, to Chicago Bridge & Iron Wks., 37 West Van-Buren St., Chicago, $30,500. Noted Oct. 4.

★**O., Willoughby** — Village let contract building water-works, to Freshwater & Haffey, Willoughby, $44,946.

★**Kan., Winfield**—City let contract for 10,000 ft. 14-18 in. c.i. pipe, to Amer. Cast Iron Pipe Co., 716 Scarritt Bldg., Kansas City, Mo., $59,868.

★**S. D., Ardmore**—City let contract building water-works to A. C. Evans, Sheridan, Wyo., about $400,000.

★**Cal., Bay Point**—Bay Point Light & Water Co. let contract building reservoir to Lindgren & Co., Monadnock Bldg., San Francisco.

SEWERS

Proposed Work

Conn., Torrington—Town having plans prepared by C. A. Patterson, engr., c/o C. H. Ellwell, town clk., building outfall sewers. About $25,000.

Pa., Ellwood City—City having plans prepared by H. W. Pratt, engr., 708 Hippodrome Bldg., Cleveland, installing trunk sewers and sewage disposal plant. About $110,000.

Pa., Parnassus—Boro. had plans prepared by State Health Dept., Harrisburg, building sanitary sewerage system, intercepting sewers, sewage pumping station and sewage-treatment plant.

Pa., Reading—City had plans prepared by State Health Dept., Harrisburg, building sanitary sewers in Dist. No. 14, area for each sewer. W. H. Dechant, city engr.

W. Va., Martinsburg—City having plans prepared by T. Sparrow, engr., c/o P. W. Leggett, mayor, building storm sewers. About $25,000. Noted May 16.

N. C., Leaksville—See "Water-Works."

Fla., St. Petersburg—City to sell $30,000 bonds Nov. 26 to extend sewerage system. W. J. Chapman, dir. pub. wks.

Tenn., Winchester—City voted $10,000 bonds to improve sewerage system.

O., Cincinnati—(Official) — City defeated $500,000 bond issue to build sewers. Noted Oct. 4.

O., Cleveland—(Official)—City voted $3,000,000 bonds to build sewers. R. Hoffman, city engr. Noted Nov. 1.

O., Columbus—See "Streets and Roads."

O., Elyria—City plans to build sewers in Dist. No. 3, Dilworth St. from Gulf to Harwood Sts., and on Harwood St. from Caroline St. to north line of Dilworth Allotment. C. M. Theobald, city engr. Noted Sept. 27.

O., Lima—City voted $155,000 bonds to build relief sewers. C. Bryson, city engr. Noted Oct. 4.

O., Marion—City plans to build sanitary sewer on Edwards St. from Silver St. to south end. H. H. Noyes, city engr.

O., Rocky River—Village lets contract about Nov. 30, building sewerage system and sewage disposal plant. About $90,000. R. W. Pratt, Hippodrome Bldg., Cleveland, engr. Noted Oct. 11.

Mich., Royal Oak—Village plans sewers on 7th, Knowles, 6th, East Harrison, and Hudson Sts.

Ill., Bradley—Village soon lets contract building sewerage system. About $175,000. Marr-Green Co., 17 South La Salle St., Chicago, engrs. Noted Oct. 18.

Ill., Granite City—City having plans prepared by E. Hall, engr., for lateral sewers. About $120,000.

Ill., Rock Island—Council passed ordinance to build 10-in. sewer drain in 9th St., from 34th to 45th Aves. About $13,797. W. Treichler, city engr.

Wis., Appleton—(Official)—City rejected bids opened Nov. 2 building sewers in various streets. Noted Oct. 25.

Wis., Wingra—City having plans prepared building sewers in Wingra Sewerage Dist. O. S. Norsman, clk.

Kan., Pittsburg—City defeated $75,000 bonds to build sewers. Noted Sept. 6.

Neb., Valparaiso—City plans to build sewerage system.

Mo., Macon — (Official) — City having plans prepared by F. L. Wilcox, engr., Syndicate Trust Bldg., St. Louis, for sewage disposal plant.

Mo., Kansas City—City having plans prepared for Blue River sanitary sewer. About $750,000. A. G. Ludlow, c/o Bd. Pub. Wks., engr.

Okla., Oklahoma — City plans storm sewers in 5 districts and sanitary sewers in 1 district, concrete or vitr. pipe. About $50,000. B. M. Hart, city engr.

Okla., Okmulgee—See "Water-Works."

Okla., Tulsa—City soon lets contract for 60 x 115-ft. intake. E. M. Stevens, 701 Ridge Bldg., Kansas City, Mo., engr. Noted July 26.

Colo., Arvada—City election soon to vote on bond issue to build sewerage system. J. Lercher, supt.

Wash., Bremerton—City plans to build sanitary sewers in Warren St. About $12,000.

N. S., New Glasgow—Town plans to build sewers on Water, Church and Front Sts. About $60,000. E. S. Frase, engr.

BIDS DESIRED

Neb., Lincoln—Until Nov. 19, by H. Berg, city clk., building 24-in. sanitary sewer from 26th and Vine Sts. to Salt Creek along west bank of Antelope Creek. About $13,900. A. Dobson, city engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Altamont**—(Official)—City let contract building sewerage system and sewage disposal plant, to E. B. Edgar, 729 Brandywine Ave., Schenectady, $41,000. Noted Oct. 25.

N. Y., Brooklyn—L. H. Pounds, boro. pres., received low bids Nov. 9th, building sewers in portions 39th St., from P. J. Donlon Contg. Co., 84 B'way., 121%; Kenmore Contg. Co., 6102 18th Ave., 121⅞%; D. Donegan Co., 5904 14th Ave., 124%. Noted Nov. 1.

★**Pa., Pittsburgh**—See "Streets and Roads."

★**N. C., Mooresville** — See "Streets and Roads."

O., Hamilton—City received low bids for sewers in East Hamilton, Dist. No. 3, from L. A. Dillon and J. L. Walker Co., 231 Court St. Cost estimated at $11,068. Noted Oct. 4.

★**O., Willoughby** — Village let contract sewerage system, to Freshwater & Haffey, Willoughby, $30,225.

★**Mich., Grand Rapids**—(Official)—City let contracts building southwest sewerage system as follows: Sects. Nos. 1 and 4, Vander-Weele Bros., $76,453; No. 2, McDermott & Cooper, $56,296; No. 3, Ver Hey & Kloet, $46,194. Noted Oct. 18.

★**Ill., Rock Island**—Cities of Rock Island and Moline let contract installing first half 46th St. storm drain to Frazer-Davis Constr. Co., St. Louis, Mo., $27,863. Noted May 24.

★**Minn., St. Paul**—(Official)—City let contract building Otto-Niles sewerage system, to O'Neil & Preston, 60 East 6th St., $90,000. Noted Nov. 1.

★**Kan., Towanda**—City let contract building sewers, to C. C. Jamison, Eldorado. About $13,000.

★**Wyo., Cheyenne** — (Official) — City let contract extending sewers from O'Neil to Dillon St., to W. J. Wilseck, 2013 Pebrican St. Noted Oct. 25.

★**Ariz., Glendale**—City let contract building sanitary sewerage system, involving 35,369 ft. 8-15 in. pipe, 52 manholes, 2 flush tanks, etc., to C. Fisher & Co., 845 North 6th St., Phoenix, $46,797. Noted Oct. 18.

★**Ariz., Phoenix**—See "Streets and Roads."

★**Ont., London**—City let contract building sewers in Florence St., W. McCracken, 481 Central Ave.; Eleanor St., Mitchell & Mohan, c/o. H. A. Brazier, city engr.; York St., J. McMurphy, 224 Queens Ave. About $18,000. Noted Nov. 1.

BRIDGES

Proposed Work

N. Y., Cohoes—City had plans prepared by W. Marden, engr., 24 James St., Albany, for bridge between Cohoes and Lansingburg. About $57,000.

Fla., Bradentown — See "Streets and Roads."

Fla., Miami—See "Streets and Roads."

Fla., West Palm Beach—See "Streets and Roads."

Mich., Detroit—(Official)—City defeated $3,000,000 bond issue to build Belle Island bridge, rein.-con. Noted Oct. 4.

Neb., Falls City—Richardson Co. election Nov. 27 to vote on $100,000 bonds to build bridges and culverts. F. J. Relf, co. engr.

BIDS DESIRED

Del., Milford—(Official)—Until Nov. 27, by Sussex Co., Georgetown, building twin 30-ft. rein.-con. bridge over Mispillion River. W. E. Hawkins, co. engr.

Fla., St. Augustine—(Official)—Until Dec. 10, by St. Johns Co. Comrs., building 2400 ft. rein.-con. bridge, with movable span in channel over Matangas River; also building 66 mi. hard surface roads, 15 ft. wide, including rein.-con. bridges and culverts. Bond election for project will probably be held in January or February.

O., Dayton—(Official)—Until Dec. 1, by Montgomery Co. Comrs., building approches to Shoup's Bridge over Stillwater River, Harrison Twp., involving 2100 cu.yd. earth embankment, 135 cu.yd. rock excav., 320 cu.yd. gravel in roadway, 542 lin.ft. guard rail. W. H. Aszling, clk.

Okla., Bartlesville—Until Nov. 19, by Washington Co., building 7 steel bridges. About $50,000. J. C. Mitchell, clk.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Va., Richmond—City received low bid building rein.-con. viaduct over Bacon Quarter Branch and Seaboard Air Line Co.'s property, from W. P. Funsten & Co., Richmond, $74,000. Noted Oct. 18.

★**W. Va., Big Chimney**—Kanawha Co., Charleston, let contract building steel highway bridge over Elk River, near Big Chimney to Virginia Bridge & Constr. Co., $31,000. Noted Oct. 11.

Bridges (Continued)

★**Ia., Oskaloosa**—Mahaska Co. let contract building superstructures, 3 high truss bridges, to Clinton Bridge Wks., Clinton, $24,024; piers and floors, Ottumwa Supply & Constr. Co., Ottumwa, $17,700.

★**Minn., Little Falls**—(Official) — Morrison Co. let contract building Royal Mississippi River Bridge, to Minneapolis Bridge Co., 728 Metropolitan Bldg., Minneapolis, $35,890. Noted Oct. 18.

★**Kan., Oswego**—(Official)—Labette Co. let contract building 7 rein.-con. bridges, to M. E. Gillioz, Monett, Mo., $25,489. Noted Oct. 18.

★**Idaho, Challis**—Custer Co. let contract building 3 steel bridges and 41 rein.-con. culverts on Lost River Highway, between Challis and Mackay, to Missouri Valley Bridge & Iron Co., Leavenworth, Kan., $35,000.

★**Wash., Blanchard**—Skagit Co. let contract building viaduct over Great Northern R.R. tracks between Blanchard and Burlington; also ½ mi. approaches, to J. R. Wood, Seattle, $36,838.

★**Cal., Santa Barbara**—Associated Oil Co. let contract building suspension bridge over Santa Ynez River, to Mercer Fraser Co., Eureka, $25,000.

★**Que., St. Alexis**—City let contract building rein.-con. bridge, to Laberge & Dufour, St. Alexis, $14,800.

★**Ont., Galt**—Canadian Pacific Ry., let contract building rein.-con. bridge, to Sherwood Constr. Co., Ltd., Mail Bldg., Toronto, $20,000. Noted Aug. 16.

STRUCTURAL STEEL WORK

BIDS DESIRED

Okla., Bartlesville—See "Bridges."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**O., Akron**—See "Water-Works."
★**Idaho, Challis**—See "Bridges."

REINFORCED CONCRETE

Proposed Work

Mich., Detroit—See "Bridges."
Ia., Burlington—See "Industrial Works."
Colo., Grand Junction—See "Miscellaneous."

BIDS DESIRED

Del., Milford—See "Bridges."
Fla., St. Augustine—See "Bridges."
Tex., Barstow—See "Excavation and Dredging."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Va., Richmond—See "Bridges."
★**W. Va., Big Chimney**—See "Bridges."
★**Kan., Oswego**—See "Bridges."
★**Mont., Boseman**—See "Miscellaneous."
★**Idaho, Challis**—See "Bridges."
Cal., Long Beach—See "Miscellaneous."
★**Que., St. Alexis**—See "Bridges."
★**Ont., Galt**—See "Bridges."

STREETS AND ROADS

Proposed Work

New York—(Official) — State Highway Comn., 55 Lancaster St., Albany, rejected bids building 1.13 mi. Rd. No. 5217-A, Chautauqua Co., and .61 mi. Rd. No. 5590, Niagara Co. Noted Sept. 27.

N. Y., Center Moriches—Town of Brookhaven plans to improve road leading to Camp Upton from South Country Rd. at Center Moriches, crushed stone and oil-treated pavement. About $15,000. R. P. Howell, superv.

N. Y., Lowville—Lewis Co. sold $10,800 bonds to build highways. H. A. Williams, co. treas.

N. Y., Mayville—Chautauqua Co. voted $16,000 bonds to improve roads.

N. J., Camden—City plans paving River Ave. and 27th St., hard-surfaced material. L. E. Farnham, city engr.

N. J., Mount Holly—Bd. Freeholders Burlington Co. plan to pave 4 mi. highway between Wrightstown and Georgetown, bituminous macadam.

Pa., Pittsburgh—(Official)—City Council passed ordinance to pave, grade and curb Salisbury St. from Sterling to Eleanor St.; Sutherland St., from Chartiers Ave., to Jean St.; North Homewood Ave., from Mount Vernon to Colored St.; 30th St., from Paulowna St. to Brereton Ave.; Universal St. from Chartiers Ave. to Lundy St.; Pioneer Ave. from Kenilworth Ave. to Jillson St.; Hancock St. from Dobson to 33rd St.; 38th St. from Liberty Ave. to Howley St.; Oberlin St. from Sprague St. to Lemington Ave.; Stayton St., from Woodland Ave. to Hodgkiss St.; Moyer St. from Allendale to Francisco St.; Smith Way from Boggs Ave. to Westwood St.; Tweed St. from Allendorf to Francisco St.; Edgerton Ave. from East End to Braddock Ave.; Hoffers Way from Roberts to Overhill St.; Jean St. from Fairdale to Sutherland St.; Jupiter Way from Hybia to Bainton St.; Juniata Pl. from Linden to Hastings St.; Lakewood Ave. from Lorenz Ave. to city limits; May Way from Glenn Way to Maripoe St.; Austin Way from South Rebecca to South Graham St.; Downing St. from west angle of Hancock St. to Hancock St.; Albion St. from Hamilton Ave. to Finance St.; Agnes Way from Hoffers Way to Linton St.; R. Swan, city engr.

Pa., Scranton — J. G. Hayes, dir. pub. wks., soon lets contract paving Boulevard Ave.; from Electric to East Market St. W. A. Schunk, city engr.

N. C., Mocksville—Bd. Comrs. plan to issue $12,000 bonds to build sidewalks on portions Depot, South Main, Cherry, Salisbury, Furniture Factory, Pine and North Main Sts. and Sanford Ave., brick, block, sheet asphalt, bitulithic or bituminous concrete.

Ga., Folkston—Charlton Co. Comrs. plan $100,000 bond issue to build roads.

Fla., Bradentown—Manatee Co. plans to issue $200,000 bonds to build roads and bridges in Palmetto-Ellenton-Terra Cela-Gillete Dist. Noted Sept. 6.

Fla., Miami—Dade Co. to sell $140,000 bonds Nov. 20, to build roads and bridges. H. Crabtree, engr. Noted Sept. 6.

Fla., West Palm Beach—Palm Beach Co. voted $30,000 bonds to build roads and bridges, Lake Worth Special Rd. and Bridge Dist.

Ala., Birmingham—Bankhead Highway Assn. plans road between Birmingham and Georgia state line through Cleburne, Calhoun, Talladega, and St. Clair Cos. T. S. Flowman, Birminghom, pres.

Miss., Pascagoula—City plans to pave 3 mi. of streets. G. H. Hague, clk.

Tenn., Shelbyville—Bedford Co. plans to build about 20 mi. of Dixie Highway through county.

O., Ashland—City plans to improve and pave portions Walnut, Claremont, Miller, Pleasant and East 4th Sts., and Lincoln Way. R. R. Conn, city engr.

O., Cleveland—Cuyahoga Co. receives bids Dec. 8 for purchase of $64,995 bonds, to be used for improving So. Center Rd. No. 6.

O., Cleveland—City plans to grade, curb, and pave Independence Rd., S. E., from Fleet Ave., S. E., to city limits, brick on concrete foundation; West 7th Pl. from Railway Ave., S. W., to Novak Ave., S. E., brick on concrete base; Novak Ave., S. W. from 7th St. to West 5th St., brick on concrete base. R. Hoffman, city engr.

O., Columbus—(Official)—City plans to improve, by grading, asphalt paving, draining, curbing and building sewers, Neill Ave., from Goodale St. to 5th Ave., also 2nd alley north of Long St., from 20th to 22nd Sts. H. Maetzel, city engr.

O., Jefferson—Ashtabula Co. plans to build brick road, 14 mi., between Ashtabula and Conneaut.

O., Lima—City voted $75,000 bonds to be used toward paving 30 streets. Total cost, $50,000. C. Bryson, city engr.

O., Middletown—City plans to improve roadway of Curtis Ave., from Yankee Rd. to Kunz Ave., rein.-con., also cut lead water connections to water mains, from abutting property not already supplied with such connections. W. C. Morrison, city engr.

O., Salem—Council passed ordinance to pave and grade Garfield Ave., from south end to city limits, brick. A. Fresch, city engr.

Ind., Columbus—Bartholomew Co. will receive new bids about December [illegible] 11,874 ft. road in Flatrock Twp., and 11,[illegible] ft. in German Twp., gravel. W. H. Scott, aud. Noted Oct. 4.

Ind., Ft. Wayne—State Highway Comn. appropriated $74,[illegible] to improve Lincoln Highway in Allen Co. pending county appropriate like amount. Noted Oct. 11.

Ind., Goshen—Goshen Co. sold $14,000 bonds to build road in Concord Twp.

Michigan—State Bd., Lansing, voted $35,000 to be spent on completion of military road between Detroit, Mich., and Toledo, O. Co. will appropriate $15,000 toward same.

Mich., Cadillac—(Official)—City at election Nov. 6 voted favorably on $35,000 bond issue, which together with $25,000 from assessments, etc., will be used for paving streets, brick or wood block. T. V. Stephens, city mgr.

Mich., Gladwin—Gladwin Co. plans to improve road between here and Beaverton. About $24,000 available for same.

Mich., Grand Rapids—Kent Co. Comrs. plans election to vote on $100,000 bonds to build roads.

Ill., Carroll—Carroll Co. voted $13,000 bonds to build 15 ft. concrete slab roadway. S. C. Campbell, supt.

Ill., Chicago—Cooke Co. voted favorably on $1,000,000 bond issue to improve roads. Noted Oct. 11.

Ill., Havana—Mason Co. voted $55,000 bonds to build roads.

Ill., Springfield — Sangamon Co. voted $500,000 bonds to build state and federal aid roads. Noted Sept. 27.

Wis., Ft. Atkinson—City Council plans to issue $20,000 bonds to improve streets.

Wis., Racine—City plans to pave Baline Ave. from McKinzie to Osborne St., De Koven Ave., from Main to Mead St. About $49,658. P. H. Connolly, city engr.

Ia., Marshalltown—Marshall Co. plans to surface roads with gravel. About $200,000. J. M. Brown, Albion, co. engr.

Minn., Grand Rapids—Itasca Co. plans election to vote on $1,200,000 bond issue to build roads. F. Sherman, aud.

Minn., Minneapolis—City sold $242,085 bonds to widen 9th St. from Hennepin to Nicollet Ave. F. W. Cappelin, city engr. Noted Oct. 4.

Kan., Lindsborg—City [illegible] lets contract paving 25,176 sq.ft. A. Monson, clk.

Mont., Hamilton—Ravalli Co., Hamilton, and Granite Co., Philisburg, will cooperate with U. S. Forest Service and build 25 mi. of roads. N. W. Blindhouse, Hamilton, engr.

Mo., Centerville—Reynolds Co. voted $100,000 bonds to build and improve roads. Noted Oct. 11.

Mo., Fulton—Callaway Co. plans election Nov. 24 to vote on $25,000 bond issue for road work.

Arkansas—State Highway Dept., Little Rock, prepared plans building 17 mi. road in Poinsett Co., Harrisburg. About $37,250.

Ark., Ft. Smith—City voted $[illegible] bonds to extend roads and approaches to new bridge. Hedrick & Hedrick, Inter-State Bldg., Kansas City, Mo., engrs.

Ark., Hot Springs—City plans to pave 40,000 sq.yd. G. C. Smith, city engr.

Ark., Wynne—State Highway Dept. appropriated $12,516 for road work in Dist. No. 1, Cross Co. F. O. Cogbill, secy. co. comrs.

Tex., Columbus—Colorado Co. plans election to vote on $75,000 bonds issue to build roads.

Tex., Commerce—City voted bonds to pave all business streets.

Tex., Dickens—Comm. Court of [illegible] Co. passed election Nov. 27 to vote on $[illegible] bond issue for road work.

Tex., Haskell—Haskell Co., Dist. No. 3, defeated $[illegible] bonds to build roads. Noted Oct. 25.

Tex., Port Lavaca—Calhoun Co. Ind. Sch. Dist. No. 2, voted Tuesday, Oct. 23, on $[illegible] bond issue to build and improve roads. Noted Sept. 13.

Okla., Oklahoma—City plans [illegible] of asphaltic concrete, paving [illegible] streets. About $[illegible].

Okla., Sapulpa—Creek Co. voted $[illegible] bonds to build roads in Shamrock Twp.

Wash., Kelso—Cowlitz Co. paving plans prepared building highway from Cow[illegible] 15 m. to Toutle River. P. C. Ireland, co. engr.

Wash., Mount Vernon—Skagit Co. having plans prepared for[illegible] Marsh and Riverside Rd., 3 bond issues, [illegible] ft. wide. About $[illegible].

Wash., Ritzville—Adams Co. Comrs. reported bids receiving contract [illegible] to Grant Co. line, 14 mi. Noted Oct. 4.

Streets and Roads (Continued)

Wash., Seattle—Puget Mill Co., Walker Bldg., soon lets contract grading, building sidewalks and paving streets in Westlake Addition, on Fauntleroy and 35th Aves. About $100,000.

Cal., Calexico—City soon lets contract paving main streets with bitulithic on 5 in. concrete base and 2 in. top, and other streets with warrix on 4 in. concrete base and 1½ in. top. Following are streets to be paved:

2nd St., full width to Blair Ave., and strip 20 ft. wide in center of street from Blair to east city limits.

Imperial Ave., full width to 7th St., and strip 20 ft. wide in center of street from 7th St. to north city limits.

Heber Ave., full width from 2nd to Sherman St., to north end of high school grounds.

3rd St., widened to 56 ft. and paved full width to Mary St.

7th St., full width from Emerson to Heber St.

4th, 5th and 6th Sts. from Emerson to Imperial St.

7th St. from Imperial to Heber St., 3rd St. from Heber to Mary St.

Emerson St. full width from 3rd to 7th St.

Cal., San Diego—San Diego Co. plans to build 80 mi. scenic boulevard. W. S. Dorland, interested.

Cal., Santa Maria—City plans to pave Main St. About $30,000.

N. S., New Glasgow—City voted $11,000 bonds to extend Archimedes St.

Ont., Sandwich West Twp.—City plans to pave Front Rd., from Turkey Creek to Chappus Corners. About $27,000. C. E. Bondy, Loiselville, clk.

Ont., Winona—See "Industrial Works."

BIDS DESIRED

N. J., Bayonne—(Official) — Until Nov. 27 by city, laying concrete sidewalks on East 22nd St., from Prospect Ave. to Ave. I, excavating 40,000 sq.ft. excav. W. P. Lee, city clk. W. L. Carlson, city engr.

Fla., St. Augustine—See "Bridges."

Ala., Scottsboro—Until Dec. 3, by Jackson Co. Comrs., macadamizing part State Trunk Rd., No. 4 between Woodville and Limrock, involving 9360 cu.yd. crushed stone. About $18,000. W. S. Keller, state highway engr. Noted Aug. 16.

Tenn., Knoxville—Until Nov. 17, by city, macadamizing, grading and repaving Fremont Ave., Hiway, Middlebrook Pike and Hiwassee Road. J. B. McAfee, city engr. Noted June 12.

Tenn., Rogersville—Until Nov. 27, by Hawkins Co. Comrs., building 8 mi. highway from Stiney Point to Stanley Valley. H. L. Williams, engr.

Ky., Owensboro—Until Nov. 25 by Fiscal Court, Daviess Co., building Grayes Lane, Wells Lane, Livermore, Beaverville, Curdsville and Lewisport-Hawesville Rd. About 45 mi. Former contract rescinded. Noted Nov. 4.

O., Columbus—Until Dec. 1, by Franklin Co. Comrs., grading and macadamizing roads in Jefferson and Mifflin Twps. J. Dunn, co. engr.

Minn., Red Wing—Until Dec. 5, by Goodhue Co. building Minnesota Federal Aid Project No. 44, involving 3 acres clearing, 1.5 acres grading, 53,887 cu.yd. side slopping, 1,211 cu.yd. guard rail, etc. C. H. Mead, co. engr.

Minn., St. Paul—Until Nov. 13, by Ramsey Co. Comrs., macadamizing Bald Eagle Lake Ave. from Hoffman St. to Myrtle Ave., grading, clearing and grubbing Robinson Lake Rd. from New Brighton Rd. east to Hamline Ave. G. H. Hess, co. and

Minn., St. Paul—Until Nov. 13, by H. W. Austin, parks and playgrounds supt., grading alley in block 13, Hyde Addition; also between Dale St. and Arundel St. between Iglehart and Cedar Aves.; James St. between Cyprus and Cleveland Aves.; also in block 8, Dunning Park and block 7, Oakdale Park, Underwood Ave. between Randolph and Hartford Aves.; Dunn St. between Underwood Ave. and Edgcumbe College Park Addition; Ellis St. near Underwood Ave.; Warren St. near Underwood Ave.; Hartford Ave. near Fairview Ave. O. Gaasland, city engr.

Neb., Columbus—Until Dec. 4, by City, for 29,528 sq.yd. paving. L. Gottschalk, special engr.

California—Until Nov. 26, by State Highway Dept., Sacramento, grading 8 mi. in Mendocino Co. between Willits and Gould; paving in Butte Co., between Briggs and Nelson, and in Monterey Co., between San Ardo and Lucas, 8 mi., concrete.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Rhode Island** — (Official) — State Bd. Pub. Rds., Providence, let contract building section state highway in South Kingstown, to Perrin & Cadario, Boston, Mass., $62,660. Noted Nov. 8.

★**New York**—(Official)—State Highway Comr., 55 Lancaster St., Albany, let contract building .12 mi. Rd. No. 5217-A, Chautauqua Co. to S. B. Van Wagenen, Inc., Rondout, $2767; 8 mi. Rd. No. 1315, Niagara Co., E. J. Latus, Albany, $62,560; .70 mi. Rd. No. 5547, Oneida Co., W. P. McDonald Constr. Co., Lakeland, Fla., $20,733; Rd. No. 5044, Mexico-Union Sq., Part 1, Oswego Co., F. H. Wells, Savannah, N. Y., $10,359. Noted Oct. 4.

N. Y., Brooklyn—L. H. Pounds, boro. pres., received only bid, Nov. 9, regulating, paving and repaving roadway of 54th St., from 9th Ave. to Ft. Hamilton Pkway., from Cranford Co., 52 Ninth St., $10,327. Noted Nov. 1.

★**N. Y., Buffalo**—City let contract paving Stewart and Wohlers Aves., asphalt on concrete foundation, to H. P. Burgard Co., 196 Filmore Ave., Exchange Pl., to Erie Contg. Co., Morgan Bldg. Noted Nov. 1.

★**N. Y., Buffalo**—City let contract paving Breckenridge St., sandstone on concrete base, to Erie Contg. Co., Morgan Bldg. Noted Oct. 11.

★**N. Y., Yonkers**—City let contract for curbing and building sidewalks on McLean Ave. between Central Ave. and Lawton St., grading and improving 242nd St. from McLean Ave. to south city line, regulating, grading and improving Martha Ave. from McLean Ave. to city line, to W. Hopper, Yonkers. About $15,087.

N. Y., Yonkers—Bd. Contract and Supply received low bids resurfacing Central Ave. from south to north city limits, from J. E. Pawson Co., 58 Wells Ave., $16,050; J. J. Hart, 280 Nepperhan Ave., $16,991; Yonkers Contg. Co., $21,210.

N. J., Elizabeth—(Official)—Bd. Wks. received low bid repaving Cross Ave. sheet asphalt on concrete base, from Standard Bitulithic Co., Essex Bldg., Newark, $23,201; Uvalde Asphalt Paving Co., 1 Bway., New York City, $23,791; Northern Constr. Co., 665 Broad St., Newark, $23,826. Noted Nov. 1.

★**N. J., Jersey City**—City let contract paving 4420 sq.yd. on Gates Ave., asphalt on concrete base, also 550 sq.yd. Belgian blocks, on concrete base, together with curbing, grading, etc., to W. T. Crichfield, 2 Green St. Noted Nov. 1.

★**N. J., Newark**—(Official)—City let contract paving North 6th, Geneva and North Canal Sts., to Newark Paving Co., 133 1st St., $33,831, $10,382 and $15,235 respectively. Noted Oct. 4.

★**N. J. Newark**—Bd. Pub. Wks. let contract paving Renner Ave., bitulithic, to Standard Bitulithic Co., 31 Clinton St. About $26,861. Noted Oct. 25.

★**N. J., West Orange**—(Official)—City let contract paving portion Valley Rd., to T. G. Schriver, 28 Boyden St., East Orange, $10,523. Noted Oct. 18.

Pennsylvania — (Official) — State Highway Comn., Harrisburg, received low bids for 7857 ft. vitr. block pavement, Cornplanter Twp., Venango Co., from J. E. Bibby & W. Cramer and J. McSnow, Franklin, $52,888. Keystone Constr. Co., Meadville, $58,178. C. E. Wood Inc., Albany, N. Y., $82,853; 21,426 ft. State Highway Route 248, Allegheny Co., from R. Sean Co., Jenkins Arcade, Pittsburgh, $221,206; Donald McNeil Co., Jenkins Arcade, Pittsburgh, $161,977; 39,340 ft. State Highway Route 166, Lincoln and Jenner Twps. and Jennerstown Boro., from D. E. Keller, Somerset, $244,857. Donald McNeil Co., Jenkins Arcade, Pittsburgh, $345,564. Noted Oct. 18.

★**Pa., Pittsburgh**—City let contract grading, paving, curbing and building sewers in various streets to Nevigan & Daly, 214 Fitzsimmons Bldg., $10,197; T. Cronin, South 17th and Muriel Sts., $10,317; C. Donatelli, 1313 Collier St., $15,863.

★**Md., Towson**—Baltimore Co. let contract improving Viaduct Rd., to W. H. Thompson, Relay, Md.

★**N. C., Mooresville** — City let contract improving several streets, involving 11,000 sq.yd. paving, 2 mi. sidewalks, grading, curbing, and building storm sewers, to R. M. Hudson Co., Concord, as follows: Excav., 49c. per cu.yd., 4 in. concrete foundation, 85c. per sq.yd., sheet asphalt wearing surface, 1½ in. binder, 1½ in. top, using oil asphalt, 5 year guaranteed, $1.19 per sq.yd.

★**S. C., Charleston**—(Official)—City let contract paving 8500 sq.yd. concrete, to General Road & Drainage Constr. Co., 4 Broad St., $1.815 per sq.yd. Noted Oct. 4.

★**Fla., Tampa**—Hillsborough Co. Comrs. let contract building roads through Pasco, Polk, Manatee and Pinellas Cos., including 35.32 mi. brick road, 9 ft. wide; 20.36 mi. asphalt block road, 15 ft. wide; also several bridges, to Davis & Webb, Tampa. About $860,616. Noted Oct. 4.

★**Ky., Owensboro**—Davies Co. let contract paving several roads, to M. G. Moore, $24,708.

★**O., Napoleon**—Henry Co. let contract paving 8½ mi. macadam-bound road, to K. A. Westrick, Holgate. About $83,000.

★**Indiana**—(Official)—Bd. Co. Comrs. let contract building roads as follows:

Marion Co., Indianapolis, building and improving Southeastern Ave., Warren Twp., to E. W. Gant & Co., Greenfield, $78,400.

Marshall Co., Plymouth, building 5 gravel roads as follows: O'Connor Rd. to H. L. Short, Lakeville, $9650; Thomas Rd., to H. M. Lee, Logansport, $9810. Sickmiller, Milner and Urschel Rds. to Becker Enyart Co., Fulton, $13,860, $13,350 and $32,290 respectively.

Jasper Co., Rensselaer; 2 stone roads, Marion and Barkley Twps., to A. S. Keene, Wheatfield, $11,800, and A. McCoy, Lowell, $13,885.

Harrison Co., Corydon, building 11,471 ft. road between Posey and Webster Twps. to C. J. Treece, Elizabeth, $9000. Noted Oct. 11.

★**Mich., Detroit**—City let contract grading, asphaltic concrete paving, and curbing, to Detroit Asphalt Paving Co., McGraw Bldg.; Shoemaker Ave., $25,084, Coplin Ave., $11,856; also paving various alleys to R. J. Powelson, Detroit. About $41,000.

★**Minn., Minneapolis**—Hennepin Co. let contract building Rd. No. 29, Cedar Ave., to S. K. Grocs & Son, Kansote Bldg. About $30,000.

★**Kan., Kansas City**—(Official)—Wyandotte Co. let contract repaving Kaw Valley Rd., 5½ mi., to Readscker & Bouseman, Rosedale, Kan., $23,500. Noted Oct. 18.

★**Mo., Kansas City**—Bd. Educ. let contract paving school yard, Pacific and Tracy Sts., to Kansas City Constr. Co., Spring and Grand Aves. About $23,573.

★**Tex., Dallas**—City let contract 60,000 sq.yd. 2-in. rock asphalt paving on 5-in. concrete base, to Standard Eng. Contg. Co., 308 Interurban Bldg., $150,000.

★**Ariz., Phoenix** — City let contract to Southwestern Constr. Co. for improving 3rd St., involving 9060 sq.yd. bitulithic pavement, $1.80 per sq.yd., 4327 lin.ft. combined concrete curb and gutter, $1.15 per lin.ft.; 340 lin.ft. curb, 70c.; 145 lin.ft. curb, 70c.; 522 lin.ft. valley gutter, $1.10; 269 lin.ft. 12-in. concrete pipe, $1.35; 51 lin.ft. 16-in. concrete pipe, $1.75; 273 lin.ft. corrugated iron pipe, $3.50; 2 gutter inlets, $65 each, storm water manhole, $275, 8 standpipes, $20 each, 16 sheet metal gates, $5.50 each.

★**Wash., Colville**—Stevens Co. let contract clearing, grubbing, grading and ditching, Addy-Gifford Permanent Highway No. 1, 4½ mi., to Acorn & Son, Colville, $15,955.

★**Wash., Ephrata**—(Official)—Grant Co. Comrs. let contract surfacing 3 mi. Permanent Highway No. 10; also 2 mi. Permanent Highway No. 8A, to F. J. Cole, Warden, $10,885 and $5871 respectively. Noted Oct. 11.

★**Wash., Wapato**—City let contract paving Wapato Ave., to Washington Paving Co., L. C. Smith Bldg., Seattle, $28,588.

California — (Official) — State Highway Comn., Sacramento, received low bids building Div. 7, Route 9, Sect. "A," state highway in Los Angeles Co., from A. L. McCray, 234 West 28th St., Los Angeles, $111,251; F. Hoffman, 111 East 12th St., Long Beach, $117,275; G. R. Curtis, 2440 East 26th St., Los Angeles, $141,135; Div. 6, Route 4, Sect. "B," Fresno Co., (a) 1A asphalt wear-

Streets and Roads (Continued)

ing surface, (b) 2A asphalt wearing surface, Blanchard-Brown Co., Call Bldg., San Francisco, (a) $22,824; Worswick Street Paving Co., Union Natl. Bank Bldg., Fresno, (a) $23,775, (b) $25,677; Federal Constr. Co., Sharon Bldg., San Francisco, (a) $39,625, (b) $41,210; Div. 1, Route 1, Sect. "B," Humboldt Co., Palmer & McBryde, Hooker and Lent Bldg., San Francisco, $223,555; A. J. Fairbanks, Willits, $241,341; Bates & Borland, Oakland Bank Savings Bldg., Oakland, $283,818. Noted Oct. 25.

Cal., Long Beach—See "Miscellaneous."

★**Cal., Los Angeles**—Bd. Pub. Wks. let contract building 92,467 sq.ft. concrete pavement with warrenite surface, cement sidewalks, granite block gutters, vitr. pipe house drains, etc., in Hoover St. from 3rd to 5th St., to Bryant & Austin, 1656 Compton Ave. About $18,587.

Cal., Oakland—Alameda Co. Supervs. received low bid building Castro Valley Rd., from T. B. Russell. About $82,861. Noted Nov. 1.

★**Cal., Pasadena**—City let contract paving Holly St., including 54,800 sq.ft. concrete pavement with bitulithic surface, 14,000 sq.ft. cement sidewalks, 5700 sq.ft. concrete gutter, 2190 lin.ft. cement curbs, etc., to Bryant & Austin, Inc., 1656 Compton Ave., Los Angeles, $15,967.

Cal., San Diego—City received lowest bid Nov. 6, building 30,074 ft., 6½ and 4 in. concrete pavement, 20 ft. wide, on road from city limits to Camp Kearney, from Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., Los Angeles, $108,236. Noted Oct. 25.

RAILWAYS—STEAM & ELECTRIC

Proposed Work

New York—Empire State R.R., recently incorporated with $3,750,000 capital stock, plans to build railroad. W. Nottingham, Walnut Ave., H. S. Holden, 107 University Blk., H. S. Tenney, 820 James St., all of Syracuse, are incorporators.

Virginia — Virginia & Southwestern Ry. making surveys for line from Clinchport to Kingsport, Tenn., about 15 mi. Address W. H. Wells, ch. engr. Southern Ry., 1300 Pennsylvania Ave., Wash., D. C.

Florida — Pensacola Electric Co., West Garden St., Pensacola plans to spend $75,000 to improve its railway system. T. J. Hauton, mgr.

Ohio — Steubenville, East Liverpool & Beaver Valley Traction Co., Junction Park, Beaver Valley, Pa., recently incorporated with $4,000,000 capital stock, plans to build traction line connecting Steubenville with Pennsylvania cities. J. H. Maxwell and G. H. Faulk, Park Blvd., East Liverpool, O., and others are incorporators.

Texas—Houston & Texas Central R.R., subsidiary of Southern Pacific Texas Lines, plans to build belt line and new freight terminals in Dallas. About $1,000,000. E. B. Cushing, Houston, asst. genl. mgr.

Washington—Nitrogen Products Co., Securities Bldg., Seattle, plans to build railroad from Darrington to The Dalles, Ore., about 18 mi.

Washington—Spokane & British Columbia Ry. making surveys for railroad from Spokane to Republic, about 80 mi. F. M. Holland, Toronto, Ont., genl. mgr.

Oregon—Comn. Pub. Docks plans to extend spur line from Oregon, Washington R.R. & Navigation Co. to municipal dock at St. Johns, Portland. About $25,500. G. B. Hegardt, port engr. will prepare plans.

California — San Diego South Eastern Ry. plans to build electric railway into Mountain Empire, from Lakeside to Santa Ysabel, about 27 mi. E. J. Burns, San Diego, mgr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Illinois**—(Official)—Bryant Northwestern Ry., recently incorporated, let contract building line from Bryant to Clver, about 4½ mi., to J. Marsch, Inc., Borland Bldg., Chicago.

EXCAVATION AND DREDGING

Proposed Work

Minn., Fairmont — Ditch—Martin Co. plans to establish Judicial Ditch No. 15. About $13,500. H. J. Welte, aud.

Minn., St. Cloud—(Official) — Ditches — Stearn Co. received no bids Nov. 9, building Co. Ditches No. 42 and 43. N. Thomey, co. aud. Noted Sept. 27.

Kan., Arrington — (Kingman P. O.) — Drainage—D. D. No. 1, Kingman Co., having plans prepared by J. E. Marcellus, state drainage engr., Manhattan, for system to protect 5200 acres from overflow of Delaware River.

Mo., Carrollton — Drainage — Sugarton D.D. plans to redredge 16 mi. canal during 1918, to drain 6000 acres farming land. S. P. Sorrenson, Brunswick, engr.

BIDS DESIRED

N. J., Bayonne—See "Streets and Roads."

Ga., Athens—(Official)—Drainage—Until Nov. 16, by Beaver Dam D.D. No. 1, building 13 mi. ditch along Beaver Dam Creek to reclaim 1600 acres. About $35,732. H. H. Hampton, comr. C. M. Straham, Athens, engr.

Ill., Havana—Drainage—Until Nov. 26, by Comrs. Chautauqua Drainage & Levee Dist., Mason Co., building drainage system; Sec. 1, Illinois River Levee, involving 1,461,000 cu.yd. embankment, 138,000 cu.yd. exploration trench; Sec. 3, planting willows for levee protection on 9 mi. graded bature-berm. H. Hahn, comr.

Minn., Anoka — (Official) — Ditch — Until Nov. 21, by Anoka Co., building Co. Ditch No. 59, main ditch involves 61,495 cu.yd. excav., Branch No. 4, 33,204 cu.yd.; Branches No. 5 and 6, 25,131 cu.yd., other branches and laterals, 62,956 cu.yd., etc. About $29,709. Noted Oct. 11.

Minn., Buffalo—Ditch—Until Nov. 24, by Wright Co., building Co. Ditch No. 34, involving 13,000 ft. 8-10 in. tile. About $14,312. J. A. Berg, co. aud.

Minn., Mankato—Ditches—Until Nov. 27, by Blue Earth Co., building Judicial Ditch No. 21, involving 38,655 ft. 8-32 in. tile, cost, $29,835; Judicial Ditch No. 25, 21,850 ft. 6-24 in. tile, $11,995; Judicial Ditch No. 28, 17,625 ft. 8-24 in. tile, $12,711; Judicial Ditch No. 20, 53,780 ft. 8-34 in. tile, $32,337; Judicial Ditch No. 30, 14,500 ft. 8-20 in. tile, $7081; Judicial Ditch No. 23, 19,075 ft. 8-26 in. tile, $7262. C. L. Kennedy, co. aud.

Minn., Pipestone—Ditch—Until Nov. 21, by T. A. Bailey, aud., Pipestone Co., building Judicial Ditch No. 1, involving 475,925 cu.yd. excav., 337,350 ft. 6-32 in tile, and 50 bulkheads. About $170,608.

Minn., Red Wing — See "Streets and Roads."

Kan., Salina—Drainage—Until Dec. 4, by Bd. Supervs. D.D. No. 1, Saline Co., building system involving 87,250 cu.yd. excav., etc. P. A. Tobin, 109 North Santa Fe Ave., secy.

Tex., Barstow — (Official) — Irrigation — Until Dec. 1, by Ward Co. Irrigation Dist. No. 1, building irrigation canal with structures therein and rein.-con. dam, involving 90,000 cu.yd. excav., etc. A. H. Dunlap, engr.

Ont., Chatham—Drainage—Until Nov. 20, by Township Council, building drainage system. About $20,000. W. G. McGeorge, 153 Queen St., Chatham, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Ga., Athens**—Drainage—Clarke Co. let contract building Shoal Creek D. D. No. 2 to drain 430 acres, involving 6½ mi. ditch floating dipper dredge, to Moseley & Thompson, Atlanta. Noted Sept. 27.

★**Minn., Redwood Falls** — (Official) — Ditch—Redwood Co. let contract building Branch No. 25 of Co. Ditch No. 24, involving 16,000 ft. open ditch and 123,524 cu.yd. excav., to H. D. Barr, Herman, Minn., 12c. per cu.yd. Noted Oct. 25.

★**Neb., Lincoln** — (Official) — Excavating — Paterson & Dorse, Alvo Sanitary Dist. No. 1, let contract excavating low channel Salt Creek, to Martin Constr. Co., Lincoln, $0.184 per cu.yd. Noted Oct. 18.

★**Neb., Papillion** — (Official) — Drainage — Western Sarpy Dist. let contract grading work on 7½ mi. open ditches, 18 mi. levees in river to Boyd County Co., Grand Island, Wis. Noted Oct. 18.

★**Mont., Bozeman** — Irrigation — Miscellaneous.

★**Tex., Donna** — Canal — Donna Canal Co. let contract building extension to irrigating canal system to Water Inn. Development, $150,000.

★**Cal., Sacramento** — Miscellaneous.

INDUSTRIAL WORKS

Proposed Work

Conn., New Britain — Laundry — Frary & Clark, 47 Center St., soon lets contract 1-story, 50 x 117 ft. addition to laundry, Elm and Commercial Sts. About $25,000. Unkelbach & Perry, 16 Main St., archts.

N. Y., Brooklyn — L. Beer Estate, 148 Remsen St., had plans prepared by W. Debus, archt., 89 Cedar St., New York City, 1-story, 110 x 210 ft. garage. About $80,000.

N. Y., Brooklyn—Foster Impvt. Co., 2027 Douglas St., had plans prepared by S. Millman & Son, archts., 1780 Pitkin Ave., 1-story, 90 x 195 ft. garage. About $25,000. S. Berenstein, pres.

N. Y., Brooklyn—A. King, 59 West St., New York City, having plans prepared by C. P. Cannella, archt., 1163 Herkimer St., 1-story, 121 x 132-ft. garage, Flushing and Waverly Aves. About $30,000.

N. Y., Buffalo — Amsterdam Radiator Co. had plans prepared by Austin Co., 14230 Euclid Ave., Cleveland, O., 1-story, 120 x 200-ft. foundry. About $50,000. H. E. Kles, 1807 Elmwood Ave., genl. mgr.

N. Y., Buffalo—Niagara Macaroni Co. had plans prepared for 2-story, 75 x 145-ft. brick factory, Niagara and Carolina Sts. About $40,000. P. Cimini, 47 Niagara St., archt.

N. Y., Hudson — Gifford-Wood Co. had plans prepared 2-story, 75 x 150-ft. addition to factory. About $30,000. M. Gifford, Second Hill, pres.

N. Y., New York—Motor Starter Corp., recently incorporated with $2,000,000 capital stock, plans to build plant. Address S. McRoberts, 32 East 64th St.

N. Y., Niagara Falls—Elderfield Hartsthorn Hardware Co., 40 Falls St., had plans prepared by Wright & Kremers, archts., 407 Gluck Bldg., 1- and 2-story, 50 x 100-ft. warehouse and tin shop. About $25,000.

N. Y., Warsaw — Warsaw-Wilkinson Co. increased capital stock from $100,000 to $200,000, and plans addition to plant here.

N. J., Irvington — Pulsometer Steam Pump Co., 485 South 21st St., had plans prepared for 1-story addition to plant. About $60,000. W. J. Berow, secy.

N. J., Red Bank—Roberts Safety Water Tube Boiler Co., Oakland St., Red Bank, having plans prepared by H. D. Best, archt., 52 Vanderbilt Ave., New York City, 1- and 2-story, 80 x 140-ft. addition to factory and 80 x 140-ft. addition to office.

Pa., Phila.—W. S. Barnes & Co., 1414 Cherry St., plans to build power house in Frankford Sect. About $75,000.

Pa., Phila.—J. D. Scott, 46th and Ludlow Sts., plans to build garage. About $29,000.

Pa., Phila.—S. Shippen & Son, 711 South 2nd St., receives contract to build 72 x 45-ft. addition to storage warehouse. F. E. Hahn, 112 Chestnut St., archt.

Pa., Phila.—Westmoreland Chemical & Color Co., c/o M. Hupfel, 918 Chestnut St., having plans prepared for 40 x 71-ft. and 45 x 48-ft. addition to factory, 22nd and Allegheny Sts. About $15,000.

Pa., Williamsport—F. P. Dunham, having plans prepared by Bartpence & Fisher, archts., Westinghouse Bldg., Pittsburgh, 3-story, 75 x 115-ft. factory. About $40,000.

Pa., Williamsport—Smith Printing Co., 228 Pine St., has plans prepared for 2-story, 70 x 90-ft. printing plant, West 3rd and Laurel Sts. H. Budd, archt.

Pa., Williamsport—United States Rubber Co. having plans prepared for factory addition to factory here.

Va., Berkley—Hamilton Motor Co., c/o H. C. Brownell, Norfolk, plans 1-story, 125 x 150-ft. auto factory. About $75,000. H. H. Mitchell, Real Estate Trust Bldg., Norfolk, archt.

Va., Newport News — W. L. Wise, 111 Diamond, Industrial Warehouse Co., 111 Diamond, 1100 ft. bulkhead, large pier, concrete, 1-story, 100 x 1000-ft. storage warehouse. About $500,000.

N. C., Elizabeth City — Elizabeth City Co. issues $100,000 bonds for factory and [illegible] Noted Sept. 27. About $75,000.

Industrial Work (Continued)

O., Akron—Ohio Ware Goods Mfg. Co., has increased its capital stock from $100,000 to $500,000, and plans to build an addition to plant.

O., Bedford—Cross Tire & Rubber Co., 1360 Euclid Bldg., Cleveland, soon receives bids for 1- and 2-story factory and power house. About $125,000.

O., Cleveland—Wiltsee Constr. Co., 709 Marshall Bldg., having plans prepared for 150 x 150-ft. garage, St. Clair and Ontario Sts. About $250,000.

O., Cleveland—Willard Storage Battery Co., 131st St. and St. Clair Ave., had plans prepared by E. D. Kreeln, engr. for lumber and storage building. About $150,000.

O., Cleveland—Youngstown Pressed Steel Co., recently organized with $1,000,000 capital stock, purchased plant of Sharon Steel Hoop Co. and its subsidiary, Youngstown Iron & Steel Co., and plans to build additions. C. F. Hamilton, pres.

O., Cincinnati — (Oakley) — Cincinnati Bickford Tool Co., South St., plans addition to factory here. About $40,000.

O., Columbus—Blue Valley Creamery Co., 700 South Clinton St., Chicago, plans to build factory here. About $50,000.

O., Youngstown—Youngstown Pressed Steel Co., recently organized with $1,000,000 capital stock, has taken over fabricating department of Youngstown Iron & Steel Co., Wilson Ave. and Sharon Steel Hook Co. The new company will erect new plant along more extended lines. W. W. Galbreath of General Fireproofing Co., pres.

nd., East Chicago—George Lember Co., 154th St. and Todd Ave., will build 2-story, 5 x 143-ft. pattern shop and storage building. About $15,000. W. F. Braetisky, 64 West Randolph St., Chicago, archt.

Ind., Ft. Wayne—Supreme Motor Corp., 218 Union Bldg., Cleveland, plans 1-story, 100 x 400-ft. factory here. A. M. Allen Co., Leader Bldg., Cleveland, O., archts.

Ind., Greencastle—Indiana Portland Cement Co., recently organized with $1,000,000 capital stock having plans prepared by F. L. Smith engr., 45 Church St., New York City, for cement factory near Greene-Castle Putnamville Highway.

Ind., Hammond—Keith Ry. Equipment Co., 1353 Peoples Gas Bldg., Chicago, purchased 35-acre site here and plans to build.

Mich., Battle Creek—Armour Grain Co., 208 South La Salle St., Chicago, soon lets contract for 40 x 150-ft. packing house. About $200,000. M. J. Murphey, 345 So. Dearborn St., Chicago, archt.

Mich., Detroit—Detroit, Toledo & Ironton R.R. (T. Groner, Springfield, O., ch. engr.) and Grand Trunk R.R. (H. F. Safford, Montreal, Que., ch. engr.) purchased 76-acre site in down river section and plans to build freight terminals. About $1,000,000.

Mich., Detroit—C. R. Wilson Body Co. had plans prepared by Marcus & Binford, archts., 200 New Telegraph Bldg., for 1-story plant, involving 2 units. About $150,000.

Ill., Blue Island—American Wire Fabrics Co., 231 South La Salle St., Chicago, having plans prepared by F. D. Chase, archt., 111 South Michigan Ave., Chicago, for factory. About $250,000. C. K. Anderson, engr.

Ill., Chicago—L. Rosenberg, 1337 North Ogden Ave., soon lets contract factory, 75 x 125-ft. garage. About $40,000. A. L. Himelblau, 175 West Washington St., archt.

Ill., Chicago—Central Waxed Paper Co., 2744 Pierce Ave., plans addition to plant. About $15,000.

Ill., Chicago—Chicago & Northwestern R.R. plans viaduct over C. M. & St. P. Ry. and Austin Ave. About $25,000. W. H. Finley, Chicago, engr.

Ill., Chicago—H. M. Davis Regulator Co., purchased site on 24th St. and Washtenaw Ave. and plans factory. About $75,000. P. F. Pease, Chicago, engr.

Ill., Chicago—International Harvester Co., 606 South Michigan Ave., plans factory, 1000 West 31st St. About $175,000.

Ill., Chicago—H. K. Ingram Mfg. Co., purchased site of land adjoining present works and plans addition. About $175,000. A. S. Arpadie, 10 South La Salle St., archt.

Ill., East St. Louis—Terminal Automatic Train Door Conveyor Co., Peoples Bldg., plans 2-story factory, 100 x 200-ft., between 20th and 21st Sts. About $100,000.

Ill., East St. Louis—East St. Louis Chemical Co. having plans prepared by Westinghouse, Church & Kerr, archts., 37 Wall St., New York City, 2-story, 500 x 700-ft. mill and warehouse.

Wis., Appleton—Northern Boiler and Structural Wks., Appleton, soon lets contract 1-story, 100 x 150-ft. addition to machine shop. Cost between $30,000 and $40,000.

Wis., Eau Claire—United States Switch Co., Eau Claire, recently organized with $1,750,000 capital stock, soon lets contract 60 x 130-ft. forge-shop addition. T. C. Hadley, genl. mgr.

Wis., Milwaukee—Milwaukee Forge and Machine Co., 224 Lake St., purchased 5-acre site at Oklahoma Ave., Manitoba St. and Chicago Northwestern R.R., and plans 75 x 150-ft. forge shop and 65 x 100-ft. machine shop. About $100,000. G. P. Pillar, pres.

Wis., Watertown—O. Biefeld Co. soon lets contract for foundry and machine-shop addition here. About $40,000. M. Liefeld, secy.

Wis., Waupun—Libby, McNeil & Libby, Union Stock Yards, Chicago, plans 1-story, 150 x 250-ft. box factory. About $100,000.

Ia., Burlington—Murray Iron Wks. Co. plans 2-story, 77 x 105-ft. steel and rein.-con. addition to plant here.

Minn., Duluth—Zenith Furnace Co., 58th Ave., West Duluth, plans to build machine shop and storage building. About $50,000.

Neb., Omaha—Myers & Laier, 424 Omaha Natl. Bank Bldg., having plans prepared by Latenser & Sons, archts., 632 Bee Bldg., 7-story, 132 x 132 ft. warehouse. About $250,000.

Neb., Omaha—Nebraska Buick Auto Co., 1912-16 Farnam St., plans 4 story addition to factory. L. Huff, mgr.

Mont., Moore—Montana Power Co., Butte, plans to build large hydro-electric power plant at foot Mystic Falls. F. M. Kear, Butte, genl. supt.

Mo., Kansas City—Atlas Cereal Co., 8th and Santa Fe Sts., plans new mill here. About $150,000.

Mo., Kansas City—Oxygen Gas Co., Traders Bldg., soon lets contract 1-story, 44 x 102-ft. factory. About $60,000. Keene & Simpson, 400 Reliance Bldg., archts.

Tex., Dallas—Perkins Dry Goods Co., 71014 Commerce St., plans 8 story factory, Commerce, Austin, Young and Market Sts. L. H. Lewis, genl. mgr.

Tex., Donna—La Blanca Sugar Co., recently incorporated with $500,000 capital stock, plans sugar mill near here. J. C. McDowell, Oil & Gas Farmers' Bank Bldg., Pittsburgh, Pa., pres.

Okla., Miami—Delta Mining Co., Kennedy Bldg., recently organized, plans concentrating plant and mill. About $75,000. W. E. Templeman, 816 Kennedy Bldg., pres.

Utah, Marysvale—Mineral Products Co. plans to rebuild potash plant, recently destroyed by fire. About $150,000. Howard S. Chappell, pres.

Wash., Seattle—Boering Aëroplane Co., Hoge Bldg., plans 2-story, 84 x 88-ft. machine shop and office building.

Wash., Seattle—Puget Sound Machinery Depot, 318 1st Ave., plans new factory here. About $1,000,000.

Wash., Seattle—Skinner & Eddy Shipbuilding Co., 1559 Railroad Ave., S., having plans prepared for 60 x 150-ft. foundry, shipways, power house and punch shops. About $1,000,000.

Wash., Tacoma—St. Paul & Tacoma Lumber Co., Tide Flats, plans to build sawmill. About $80,000.

Cal., Oakland—American Can Co., Mills Bldg., secured site of land and plans several additions to plant. About $1,000,000.

N. S., Bridgewater—Gray Marine Motor Co. plans to build plant here. About $50,000.

N. S., Comeauville—Comeau Shipbuilding Co., Ltd., plans shipbuilding plant. About $150,000. E. L. Comeau, proj. engr.

N. S., Dartmouth—Canadian Carbonate Co., 132 Hollis St., Halifax, plans factory here. About $10,000.

N. S., New Glasgow—Nova Scotia Steel & Coal Co., Ltd., plans to build additions to factory. About $1,000,000. F. H. Crockard, genl. mgr.

N. S., Saulnierville—Acadian Shipbuilding Co. plans shipbuilding plant here. About $75,000. D. D'Entremont, Meteghan River, secy.-treas.

Que., St. Romauld—Dussault Co., Levis, had plans prepared for machine shop here. About $50,000. M. J. St. Dussault, Wolfe St., Levis, pres.

Ont., Brantford—Dominion Steel Products Co. secured site of land and plans large addition to plant here. About $100,000.

Ont., Fergus—J. Wilson & Sons, St. Andrews St., plans sawmill. About $50,000.

Ont., Hamilton—Frost Wire Fence Co. plans to build addition to plant here. About $25,000.

Ont., Strathroy—Dominion Canners having plans prepared rebuilding 2 story factory recently destroyed by fire. About $100,000.

Ont., Temiskaming—Riordan Pulp & Paper Co., 355 Beaver Hall Sq., Montreal, plans large sulphite mill and paper plant here.

Ont., Toronto—Cluff Bros. Ammunition Co., 28 Atlantic Ave., plans to rebuild its plant recently destroyed by fire. About $200,000.

Ont., Whitby—United Rubber Mfg. Co. plans to build factory here. About $50,000.

Man., St. Boniface—Armour & Co., Union Stock Yards, Chicago, Ill., plans to build new meat-packing plant here. About $4,000,000.

B. C., Prince Rupert—S. E. Landry, Vancouver, plans large shipbuilding plant here. About $250,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., New York**—Adams Express Co., 61 Bway., let contract 1-story, 50 x 150-ft., and 21 x 100 ft. transportation building, to J. O'Dell Whitenack, 231 West 18th St., $70,000.

★**N. Y., New York**—New Jersey Zinc Co., 55 Wall St., let contract for laboratory, to H. M. Krumbhaar, 68 William St., $200,000.

★**N. Y., Rochester**—Bridgeford Machine Tool Co., Winton Rd., let contract building addition to factory, to Crowell, Lundoff & Little, Museum Bldg., Cleveland, O., about $50,000.

★**N. J., Fords**—National Synthetic Co., Fords, let contract 1- and 2-story, 38 x 260-ft., 54 x 84-ft., and 50 x 76-ft. additions, to Tullis & Blanchard, 326 East 42nd St., New York City, $75,000.

★**N. J., Newark**—Art Metal Wks., 7 Mulberry St., let contract addition to factory to W. Nairn, 207 Maple Ave., Kearney, $25,000.

★**N. J., Newark**—Ferry Hat Mfg. Co., 329 North 5th St., let contract 3-story, 37 x 120-ft. addition to plant, to Miller & Sons Co., 441 East Orange St. About $33,000.

★**Pa., Eddystone**—Baldwin Locomotive Works, 500 North Broad St., Phila., let contract 1-story, brick, steel and concrete erecting shop at local plant, to F. W. Mark Constr. Co., Finance Bldg., Phila. About $500,000.

★**Pa., Erie**—Erie Forge & Mfg. Co., 15th and Cascade Sts., let contract factory outside of city limits, to J. R. Gloyd, Hippodrome Bldg., Cleveland. About $2,000,000. Noted Nov. 8.

★**Pa., Phila.**—White Motor Car Co., 842 East 79th St., Cleveland, let contract 1- and 2-story, 210 x 270-ft. auto service building, 20th and Erie Ave., to F. Shoemaker, Juniper and Walnut Sts. About $300,000. Noted Oct. 18.

★**Pa., Phila.**—W. T. White, 20th and Erie Aves., let contract 1-story, 215 x 253-ft. machine shop to Watson Eng. Co., 216 North Broad St., $130,000.

★**Md., Baltimore**—Bartlett-Hayward Co., Scott and McHenry Sts., let contract 1-story, 160 x 380-ft. factory, Gunpowder and Hamburg Sts., to Morrow Bros., 1201 Fidelity Bldg., $79,500.

★**Md., Baltimore**—Chesapeake Iron Wks., Westport, let contract, 1-story, 40 x 210 ft. erecting shop, to B. F. Bennett Bldg. Co., 123 South Howard St., about $150,000. Noted Nov. 8.

★**Md., Baltimore**—Poole Eng. Co., West of N. C. Ry. and north of Padonia Sta., let contract 150 x 500 ft. gun factory, to H. D. Watts Co., Garrett Bldg. About $2,000,000. Noted Oct. 11.

★**Va., Newport News**—Newport News & Hampton Ry. let contract 1-story, 40 x 100-ft. freight house, to Harwood & Moss, Sibley Bldg., $74,000.

Industrial Work (Continued)

★**Va., Richmond**—Kingan & Co. let contract 3-story packing plant to J. T. Wilson & Co., 22nd and Cary St. About $70,000. Noted Aug. 30.

★**O., Cleveland**—Parish & Bingham Co., West 106th St. and Madison Ave., let contract machine shop, dye and storage building, to W. I. Thompson & Son Co., 6110 Euclid Ave., $100,000.

★**O., Cleveland** — Pipe Machinery Co., 4907 Mead Ave., let contract 1-story, 60 x 100-ft. brick factory, Mead and Mumford Sts., to W. Dunbar Co., 8201 Cedar Ave., $30,000. Noted Nov. 8.

★**O., Niles** — Engel Niles Aircraft Co., Niles, let contract factory, to Hunkin Conkey Constr. Co., Cuyahoga Bldg., Cleveland, $30,000.

★**Mich., Detroit** — Wells Fargo Express Co., 612 Ford Bldg., let contract 2-story, 116 x 130 ft.-warehouse, to I. Misch Constr. Co., 701 East Grand Blvd.

★**Ill., Champaign**—Illinois Central R.R., 135 East 11th St., Chicago, let contract 1- and 2-story, 30 x 47 ft. and 40 x 253 ft. freight depot and boiler room, to A. W. Stoolman, 212 East Armory St., $50,000.

★**Ill., Chicago** — D. C. Cook, 15 East Washington St., let contract 5-story factory and warehouse, Michigan and South Water Sts., to E. L. Archibald Co., 11 West Washington St., $100,000.

★**Wis., Madison**—Four Lakes Ordnance Co., organized by interests owning Steinle Turret Machine Co., 2305 Waubesa St., let contract 1-story, 150 x 500-ft. steel, brick and rein.-con. factory, to Austin Co., 14230 Euclid Ave., Cleveland, O. Noted Nov. 8.

★**Mo., Kansas City** — Belfast Co., Inc., c/o W. S. Dickey, New York Life Bldg., let contract 1-story, 96 x 912 ft. warehouse, to Smith & Wodling, 302 Reliance Bldg., $40,000.

★**Colo., Rocky Ford**—American Beet Sugar Co. let contract for factory to C. A. Dalgren, La Junta, $60,000.

★**Que., Cap de Madeleine**—Canada Steamship Lines, 9 Victoria Sq., Montreal, let contract building 2 shipyards to England Constr. Co., $100,000. Noted Nov. 1.

★**Que., Montreal**—A. R. Whittall Can Co., Ltd., 740 Mullins St., let contract addition to factory. E. Carrigan, 318 Ballantyne Ave., N. About $25,000.

★**Ont., Hamilton**—Frost Wire Fence Co., Sherman Ave., let contract addition to G. Frid Constr. Co., Bank of Hamilton Bldg., $25,000. Noted Nov. 15.

★**Sask., Saskatoon**—J. H. Early, 1st and 23rd Sts., let contract cold-storage plant, to A. W. Cassidy & Co., 332 1st St., N., $150,000.

BUILDINGS

Proposed Work

Mass., Boston—(Roxbury)—Hospital—B. P. O. E. plan, on Parker Hill. About $250,000.

Mass., Worcester—School—St. Peters' Church plans, 135 x 135-ft., brick, Main and Ripley Sts. About $125,000. J. W. Donahue, 476 Main St., Springfield, archt.

Conn., Hartford—Fire Headquarters — City having plans prepared by B. S. Clark, archt., 747 Main St., 3-story, 50 x 90 ft. About $100,000. H. B. Clark, pres. fire comrs.

Conn., Hartford — Jail — Hartford Co. plans, brick and steel. About $700,000.

Conn., Waterbury—Y. M. C. A. plans to build new on Old Baptist Church property. About $110,520.

N. Y., Brooklyn—School—Bd. Educ. plans new brick and stone addition, on Howard Ave. About $275,000.

N. Y., Hobart—High School—Bd. Educ. plans, 2-story. About $65,000.

N. Y., Kingston—Theater—S. Berenstein, 173 Pearl St. and A. Cohen, 225 Hurley Ave., representing syndicate having plans prepared by G. W. Betz, archt., 61 John St., for 2-story, 80 x 120-ft. brick and rein.-con., on Wall St. About $125,000.

N. Y., New York—Home—A. Frees Foundation Home for Aged Men and Women, having preliminary plans prepared by J. H. Freedlander, archt., 681 Fifth Ave., and H. A. Jacobs, associate archt., 170 Fifth Ave., to be built at Grand Blvd. and Concourse, 166th to 167th Sts. About $350,000. S. Untermeyer, pres.

N. Y., New York—Hospital—Beth Israel Hospital, 70 Jefferson St., having plans prepared altering 7-story apartment house, Livingston Pl. and East 17th St., to be used for hospital purposes in connection with new 16-story building, which will represent an expenditure of about $1,000,000. Present project to cost about $85,000. L. A. Abramson, 220 5th Ave., archt.

N. Y., New Rochelle — Theater — E. F. Rush, 127 West 48th St., New York City, having plans prepared by De Rose & Pereira, archts., 150 Nassau St., New York City, 2-story, terra cotta. About $150,000.

N. J., Newark—School—Bd. Educ. had plans prepared by L. Sonntag, archt., City Hall, 3-story, brick, Hawkins St. About $250,000. F. H. Somner, secy.

N. J., Orange—Hospital—New Jersey Orthopaedic Hospital, Lincoln Ave. and Frankfort St. plans. About $90,000.

N. J., Red Bank—Office—See "Industrial Works."

N. J., West New York — School — Bd. Educ. having plans prepared by W. Mayer, Jr., and E. Manahan, 711 Bergenline Ave., archts., 3-story, 115 x 190-ft. brick and terra cotta, Madison to Polk Sts. About $225,000. H. G. Auf der Heide, pres.

Pa., Altoona—Y. W. C. A. having plans prepared by J. F. Schollar, archt., Altoona Trust Bldg., 3 story, 36 x 50 ft. addition to building. About $50,000. C. T. Witherow, 1540 12th Ave., secy.

Va., Richmond—School—Union Theological Seminary, Brock and Westwood Aves., Genter Park, plans 1-story. About $50,000. Nolan & Baskerville, Travelers Insurance Bldg., archts.

Ga., Atlanta — Hospital — Scottish Rite Hospital for Crippled Children plans. About $67,500. Hentz, Reid & Adler, Atlanta, archts.

O., Akron—Hotel—Park Hotel Co., Ohio Bldg., soon lets contract, 8-story, 95 x 115 ft. About $300,000. Mills & Millspaugh Co., 2nd Natl. Bank Bldg., archts. Noted Sept. 27.

O., East Akron—High School—Bd. Educ. soon lets contract. About $250,000. T. Ralph, Ridley Cottage Pl., Akron, archt.

Wash., Seattle—Office—See "Industrial Works."

BIDS DESIRED

Conn., Hartford—School—Until Nov. 19, by Bd. Educ., 48 x 79 ft. and 34 x 84 ft. additions. About $75,000. Chilton & McMahon, 36 Pearl St., archts. Noted Sept. 13.

Conn., Storrs—(Eagleville P. O.)—Infirmary, Dining Hall, Etc.—Until Nov. 18, by State Agricultural College, 1-story, 98 x 115-ft. dining hall, 1-story, 28 x 48-ft. infirmary, and 2-story cottages. About $100,000. Unkelbach & Perry, 16 Main St., New Britain, archts. Noted Nov. 8.

Pa., Johnstown—School—Until Nov. 19, by Bd. Educ. About $1,000,000. H. F. Hornbostle, 63 William St., New York City, archt.

O., Cleveland—School — (Official) — Until Nov. 19, Bd. Educ., Rockwell Ave. and East 6th St., for addition Rice School. F. G. Hogan, dir. of schools.

Ia., Strahan—School—Until Nov. 10, by Bd. Educ., 2 story, 82 x 86 ft., cut stone, rein.-con. and terra cotta. About $50,000. H. H. Kayton, secy. W. F. Gernandt, 307 Keeline Bldg., archt.

Wash., Olympia—Temple—Until Dec. 1, by State Capitol Comn., Olympia. About $350,000. Wilder & White, 50 Church St., New York City, archts. Noted Oct. 11.

Ont., Barrie—Institute—Until Nov. 20, by F. Marr, secy. treas. bd. educ., for collegiate institute. Eiits & Ellis, Manning Chambers, archts.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract.)

Mass., Boston—(East Boston)—School—Bd. Educ. received low bids from Hunter Const. Co., Water St., $143,000, alternate, $122,000; J. Rowen Co., 184 Dudley St., Roxbury, $125,000, alternate, $122,000; F. O. Conners, 93 Washington St., $124,500, alternate, $120,000.

★**Mass., Cambridge**—High and Latin School—Bd. Educ. let contract addition to J. B. Bryce, Inc., 167 Sydney St., Cambridge, $54,747. Noted Sept. 20.

★**N. Y., Scarsdale**—School—Bd. Educ. let contract, 2-story, to Sherman & Converse, 31 West 34th St., New York City. About $85,000. Noted Oct. 11.

★**N. Y., Yonkers**—School—Bd. Educ. let contract, 2-story, 75 x 78-ft., addition to school No. 14, to T. & C. Miller Const. Co., Riverdale Ave., $70,000. Noted Nov. 1.

★**Pa., Ashland**—School—Bd. Educ. let contract, 1-story, to A. L. Fretz & Son, [illegible] Charleston St., Phila., $115,000.

★**Pa., Bloomsburg**—Bank and Office—Columbia Co. Trust Co. let contract, 4-story, [illegible], 10 E. H. Sheets Ritter Bldg., Huntington, W. Va.

★**O., Cleveland**—Hotel—D. M. Mayer, Peoria, Ill., let contract, 7-story, concrete, on East 9th St. to W. F. Hyde Constr. Co., 1008 Scoville Ave. About $100,000.

O., Cleveland Heights—(Warrensville P. O.)—School—Bd. Educ. received low bid from H. R. Evans & Co., 1005 Commerce Savings & Trust Bldg., Columbus; about $175,805. Noted Sept. 13.

★**Ill., Chicago** — Hospital — Comr. Pub. Wks. let contract addition, to J. Griffiths & Sons, 112 West Adams St. About $374,900.

★**Minn., Riverton**—School—Bd. Educ. let contract, 2-story, 85 x 160 ft., to J. C. Nelson & Son, 17 South 6th St., Minneapolis, $115,000. Noted June 7.

★**Kan., Abilene**—High School—Bd. Educ. let contract, 3-story, brick and rein.-con., to Otto Peterson, Salina. About $90,000. Noted Oct. 4.

★**Mo., Excelsior Springs**—Hotel—Manitoba Investment Co. let contract, 5-story, brick, terra cotta, concrete and hollow tile, to Rayburn-Laird Constr. Co., 609 Waldheim Bldg., Kansas City. $150,000.

★**P. E. I., Charlottetown**—Home—Dominion Government Hospital Comn. let contract Soldiers' Convalescent Home, to E. E. Parkman & Son, 13 Euston St., $130,000.

★**Que., Ste Anne de Bedeyue**—Hospital—Military Hospitals Comn., Drummond Bldg., Montreal, let contract to E. G. M. Cape & Co., Ltd., 10 Cathcart St., Montreal, $200,000. Noted Oct. 11.

★**B. C., Vancouver** — Depot — Canadian Northern Ry. let contract, to Northern Constr. Co., Ltd., 606 Union Bank Bldg., Winnipeg, Man. About $1,000,000.

FEDERAL GOVERNMENT WORK

Proposed Work

N. J., Little Silver — Buildings — War Dept., Signal Corps, Wash., D. C., soon lets contract for buildings in connection with additional supply depot, Camp Dix, Wrightstown. About $250,000.

Pa., Ft. Mifflin—Buildings—Bureau Yards and Docks, Navy Dept., Wash., plans to build addition to Building No. 62, also new steel building. Specification No. 3193. About $15,000.

Colo., Towaoc—Bridge—C. [illegible], Indian Affairs, Wash., D. C., rejected bids opened Nov. 6, building highway bridge, Ute Mountain Indian Reservation. Noted Oct. 18.

Cal., San Diego—Buildings—War Dept., Signal Corps, Wash., D. C., soon lets contract for buildings at Rockwell Aviation Field.

BIDS DESIRED

Pa., Phila.—Heating System—Until Dec. 10, by Bureau Yards and Docks, Navy Dept., Wash., installing heating system in laundry. About $60,000.

S. C., Charleston—Water Front Improvements—Until Nov. 20, by Bureau Yards and Docks, Navy Dept., Wash., for piers and accessories, coal handling, structural steel foundations, timber draft tests and miscellaneous work in connection with installation of new equipment on power plant at Navy Yard. Noted Oct. 11.

Ill., McLeansboro—Post Office—Until Nov. 23, by [illegible], supervising architect, treas. dept., Wash.

Cal., San Francisco—Dredging—Until Nov. 19, by U. S. Engr. Office, 342 Custom House, Francisco, dredging in Oakland Estuary.

Cal., San Francisco—[illegible]

Mare Island—(Vallejo P. O.)—[illegible]

Cal., Mare Island—(Vallejo P. O.)—[illegible]

Cuba, Guantanamo—Piers, Wet Docks, Etc.—Until [illegible], by Bureau Yards and Docks, Navy Dept., Wash., about $4,000,000.

Federal Government Work (Continued)

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

R. I., Newport — Extension to General Storehouse, Bureau Yards and Docks, Navy Dept., Wash., received low bids (equip. complete), from Harting Slade Constr. Co., Contractors Bridge, Newport, $88,181; J. Herndon, Worcester, Mass., $89,-997; Wiggins Co., 101 Park Ave., New York City, $[illegible]

★**R. I., Newport**—Power Plant and Torpedo Station—Bureau Yards and Docks, Navy Dept., Wash., let contract to Westinghouse Church Kerr Co., 37 Wall St., New York City, $[illegible]

★**R. I., Newport** — Wharf, etc — Bureau Yards and Docks, Navy Dept., Wash., let contract building at Block Island, to T. A. Scott Co., Inc., 292 Pequot Ave., New London, Conn., $[illegible]

Conn., New London—Power House and Machine Shop—Bureau Yards and Docks, Navy Dept., Wash., received low bids, building at Naval Station (work complete), from R. H. Arnold, Wash., D. C., $186,915; Casper Ranger Constr. Co., Holyoke, Mass., $[illegible]; W. H. Fissell, 132 Bway., New York City, $[illegible]

★**Conn., New London**—Torpedo Shop and Storage—Bureau Yards and Docks, Navy Dept., Wash., let contract building at submarine base to M. F. Kelley, 51 East 42nd St., New York City, $35,000. Noted Oct. 25.

N. Y., New York — Changes to Custom House—J. A. Wetmore, superv. archt., treas. dept., Wash., received low bids, from Dunn & Sheridan, 188 East 42nd St., $68,100; J. M. Krupp, 544 West 43rd St., $71,554; N. B. Smythe, New York, $74,998.

★**Pa., Phila.**—Electric System — Bureau Yards and Docks, Navy Dept., Wash., let contract electric system in foundry and machine shop, to Commercial Eng. Co., 1526 Sansom St., Phila., $26,919. Noted Nov. 1.

Pa., Phila.—Marine Barracks — Bureau Yards and Docks, Navy Dept., Wash., received low bids, (a) lot price (b) if building is increased in size in accordance with alternative drawings No. 323-28 to 323-30, inclusive, from Price Constr. Co., 210 Maryland Trust Bldg., Baltimore (a) $237,600, (b) $239,960; W. W. Agstine Co., Phila., (a) $237,814, (b) $245,187; W. R. Dougherty, 1608 Sansom St., (a) $238,441, (b) $246,329. Noted Oct. 18.

Pa., Phila.—Tank and Tower—Bureau Yards and Docks, Navy Dept., Wash., received low bid building steel water tank and tower (work complete), from Pittsburgh-Des Moines Steel Co., Curry Bldg., Pittsburgh, $24,650. Noted Oct. 25.

★**Wash., D. C.**—Cold Storage and Ice Manufacturing Plant—Bureau Yards and Docks, Navy Dept., Wash., let contract building at Hampton Roads, Va., to Cramp & Co., 329-35 South Broad St., Phila. Cost plus per cent.

★**Wash., D. C.**—Heating System—Bureau Yards and Docks, Navy Dept., Wash., let contract heating system for gun shop, to Mathis Bros. Co., Chicago, $48,100.

★**Wash., D. C.**—Machine Shop—Bureau Yards and Docks, Navy Dept., Wash., let contract building at Navy Yard, to Industrial Eng. Co., 35 Church St., New York City, $[illegible]. Noted Nov. 1.

★**Wash., D. C.**—Retaining Wall—Bureau Yards and Docks, Navy Dept., Wash., let contract building at Naval Hospital to J. W. Earley, 2131 G St., $[illegible]. Noted Oct. 18.

Wash., D. C.—Storage Plants for Fuel Oil—Bureau Yards and Docks, Navy Dept., received low bids building at various Navy Yards, Specification No. 1543, as follows:

San Diego, Cal.—General Heating & Ventilating Co., 198 Milwaukee St., Milwaukee, Wis., (6) $[illegible], (7) $[illegible], (8) $[illegible]; J. W. Ingalls Co., 70 Ellicott Sq., Buffalo, N. Y., (6) $[illegible], (7) $[illegible], (8) $6000; Cumberland Iron Co., Inc., 64 West 44th St., New York City, (6) $[illegible], (7) $[illegible], (8) blank.

Pearl Harbor, T. H.—J. W. Ingalls Co., 70 Ellicott Sq., Buffalo, N. Y., (6) $[illegible], (7) $[illegible], (8) $[illegible]; Cumberland Iron Co., Inc., 64 West 44th St., New York City, (6) $[illegible], (7) $[illegible], (8) $[illegible].

Puget Sound, Wash.—Cumberland Iron Co., 64 West 44th St., New York City, (6) $[illegible], (7) $[illegible], (8) $[illegible]; General Heating & Ventilating Co., 198 Milwaukee St., Milwaukee, Wis., (6) $76,450, (7) $[illegible], (8) [illegible]; J. W. Ingalls Co., 70 Ellicott Sq., Buffalo, N. Y., (6) $[illegible], (7) $[illegible], (8) [illegible].

Mare Island, Cal.—Cumberland Iron Co., Inc., 64 West 44th St., New York City, (6)

$120,000, (7) $137,000, (8) $7000; General Heating & Ventilating Co., 198 Milwaukee St., Milwaukee, Wis., (6) $87,800, (7) $118,-600, (8) $9950.

Wash., D. C.—Structural Steel—Bureau Yards and Docks, Navy Dept., Wash., received low bids structural steel for seaplane hangar, Hampton Roads, Va., Specification No. 1998, from Pittsburgh-Des Moines Steel Co., Curry Bldg., Pittsburgh, Pa., (a) $16,139, (b) $31,750, (c) $12,510, (d) $24,462; Richmond Structural Steel Co., 17th and Dock Sts., Richmond, Va., (a) $20,981, (b) $29,348, (c) $17,158, (d) $23,-184; Klein Iron Wks. Co., Bellevue, O., (a) $24,697, (b) $48,500, (c) $19,297, (d) $37,-850. Noted Nov. 1.

Va., Norfolk—Capstans — Bureau Yards and Docks, Navy Dept., Wash., received low bid (a) work complete, (b) alternate, from American Eng. Co., Aramango Ave. and East Cumberland St., (a) $21,000, (b) $21,800.

Va., Norfolk—Steel Tower—Bureau Yards and Docks, Navy Dept., Wash., received low bids building 200-ft. steel tower and taking down and strengthening and rebuilding existing 200-ft. steel tower at Navy Yard, from Pittsburgh-Des Moines Steel Co., Curry Bldg., Pittsburgh, $21,350; J. E. Ogden, 147 Cedar St., New York, $23,051. Noted Oct. 25.

★**Va., Port Royal**—Repairs to Wharf—Bureau Yards and Docks, Navy Dept., Wash., let contract, to P. D. Hay, 29 Bee St., Charleston, S. C., $7500.

★**W. Va., Charleston** — Electric Power Distributing System — Bureau Yards and Docks, Navy Dept., Wash., let contract to G. E. Eng. Co., Inc., 417 Canal St., New York City, $26,711.

★**W. Va., Charleston**—Sewerage System —Bureau Yards and Docks, Navy Dept., Wash., let contract installing at Naval Sta., to Warren-Moore & Co., Columbia Trust Bldg., Phila., $13,887. Noted Nov. 1.

N. C., Burlington—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., received low bids Nov. 5, from W. H. Stillwell, Savannah, Ga., $55,208; A. Blair, Hill Bldg., Montgomery, Ala., $55,426; J. N. Boston, Marion, Ky., $55,722. Noted Oct. 4.

★**S. C., Charleston** — Steel Towers—Bureau Yards and Docks, Navy Dept., Wash., let contract building 300 ft. steel tower and reinforcing 3 existing steel towers at Navy Yard, to Aetna Steel Products Co., 30 Church St., New York City, $22,450. Noted Oct. 25.

★**Fla., Miami**—Dredging and Filling—Bureau Yards and Docks, Navy Dept., Wash., let contract to Bowers Southern Dredging Co., Miami. About $50,000. Noted Oct. 25.

N. D., Elbowoods—Building — C. Sells, comr. Indian Affairs, Wash., D. C., received low bid from Johnston Constr. Co., Fargo, N. D., $14,086. Noted Oct. 18.

★**Wash., Puget Sound**—(Bremerton P. O.) —Air Cooled Refuse Burner—Bureau Yards and Docks, Navy Dept., Wash., let contract, to Seattle Boiler Works, 1132 West 45th St., Seattle, $8990.

★**Cal., Mare Island**—(Vallejo, P. O.)— Ice Making and Refrigerating Plant—Bureau Yards and Docks, Navy Dept., Wash., let contract to Vulcan Iron Wks., 1849 Kearny St., San Francisco, $23,850.

Cal., Mare Island—(Vallejo P. O.)—Bureau Yards and Docks, Navy Dept., Wash., received low bids building structures for submarine base, Specification No. 2660, from Clinton Constr. Co., 140 Townsend St., San Francisco, (a) $86,250, 90 days, (b) $10,900, 5 days, (c) $26,500, (d) $5250; H. J. & C. Christensen, 565 16th St., Oakland, (a) $89,000, 100 days, (b) $500, (c) $34,200, 10 days, (d) $4840; Tibbetts Pacific Co., 16 California St., San Francisco, (a) $93,900, 90 days, (b) $15,600, 10 days, (c) $22,500, (d) $4900. Noted Oct. 25.

★**P. R., El Cayey** — Building — Bureau Yards and Docks, Navy Dept., Wash., let contract (work complete) to Hamilton & Chambers, 29 Bway., New York City, $79,-780. Noted Nov. 1.

MISCELLANEOUS

Proposed Work

Fire Escapes—Dover, N. J.—(Official)—Bid [illegible] at Northside School rejected bids opened Oct. 30 for fire escapes and alterations to South Side School. C. H. [illegible], engr. Noted Oct. 31.

Park Improvements—Passaic, N. J.—City [illegible] to spend $[illegible] to improve public parks. Calvin R. Wise, city engr.

Shipping Terminal—South Amboy, N. J.—State Bd. Commerce and Navigation plans to build shipping terminals on Raritan River, near South Amboy. J. S. Smith, state house, pres.

Pier—Chester, Pa.—Federal Steel Foundry Co., Delaware and Reaney Sts., applied to Bd. Comrs. of Navigation for permission to build new pier on Delaware River, near Reaney St.

Amusement Park — Taylorsville, Pa. — City plans to build on Delaware River. About $25,000.

Subway—Wesleyville, Pa.—Pub Serv. Comn. issued order for abolition of grade crossings, by building subway. New York Central R.R, (G. W. Kittredge, ch. engr.), New York, will apropriate $111,707 toward cost; New York, Chicago, & St. Louis R.R. (E. E. Hart, ch. engr.) Cleveland, $25,162; East Erie Commercial R.R., $73,542; Erie Co., $15,000; Mill Creek Twp., $10,000, and Wesleyville, $2500.

Dry Dock—Tampa, Fla.—Tampa Dock Co., Tampa, plans to build new sectional floating dry dock, 4000-ton capacity. About $600,000.

Subway—Ashtabula, O.—(Official)—City voted $140,000 bonds to build subway at Center St. Cost, $401,700. New York Central R.R., (G. W. Kittredge, ch. engr.), Grand Central Terminal, New York City and Pennsylvania Lines West of Pittsburgh, (T. Rodd, ch. engr., Pittsburgh), will appropriate 65% of cost. L. A. Amsden, city engr. Noted Oct. 4.

Levees—Modale, Ia.—Utman Farm Co. plans to spend $40,000 to build levees on Crow Island, southwest of Modale, to protect 1500 acres farm and pasture lands from backwaters of Missouri and Soldier Rivers.

Dam—Grand Junction, Colo.—Dirs. Redlands Power & Irrigation Co., 60 Wall St., New York City, plan to build rein.-con. dam to replace present wooden structure at Redlands, near Grand Junction. F. L. Lucas, pres.

Subway—Portland, Ore.—City plans to build, at intersection of 11th St. P. H. Dater, city engr.

BIDS DESIRED

Dam—Barstow, Tex. — See "Excavation and Dredging."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Duct Line—New York, N. Y.—Pub. Serv. Comn. received low bids duct line for 7th Ave-Lexington Ave. Rapid Transit R.R., consisting of 32 ducts extending under Westchester Ave. and Bronx River (Bronx Boro.), from Underpinning & Foundation Co., 290 Bway., $47,113; 198 Bway. Constr. Co., 4925 Bway., $50,250; H. E. Fox Constr. Co., 81 East 125 St., $54,570. Noted Oct. 25.

Playground—New York, N. Y.—Dept. Parks received low bids improving playground on west side of 1st Ave., from 67th to 68th St., from T. Crimmins Contg. Co., 444 East 69th St., $19,999; F. Del Balso, 1481 Hoe Ave., Bronx, $20,116; Natl. Excav. & Foundation Co., 103 Park Ave., $21,998. Noted June 14.

★**Coal Bunkers — Rochester N. Y.** — Rochester Ry. & Light Co., 34 Clinton St., let contract to Turner Constr. Co., 242 Madison Ave., New York City, $75,000.

★**Piers—Baltimore, Md.**—Baltimore & Ohio R.R. let contract rebuilding Piers Nos. 8 and 9, 150 x 950 ft., to McLean Contg. Co., foot East Fort Ave., and Empire Eng. Co., 723 Munsey Bldg.

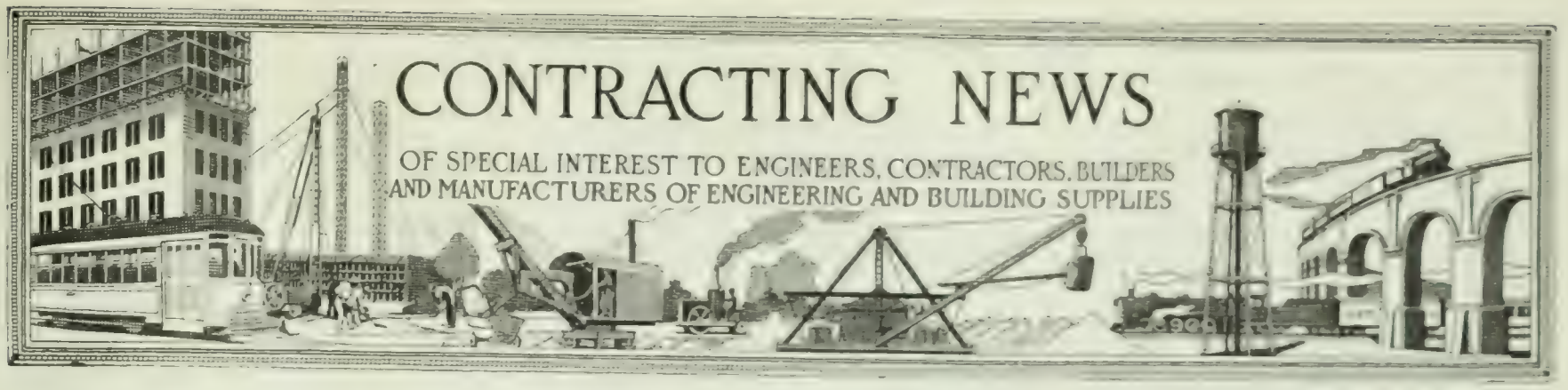
★**Flume—Bozeman, Mont.**—Gallatin Co. let contract building rein.-con. flume on high line canal to D. Anderson, Bozeman, $24,750.

★**Incinerating Plant—Kansas City, Mo.** —(Official)—City let contract Grand Ave. and Missouri River Front, to Decarie Incinerator Co., c/o Kansas City Eng. Co., Scarritt Bldg., $129,957.

★**Gas Tank—Fresno, Cal.**—Pacific Gas & Electric Co. let contract to Duncanson-Harrelson Co., Chronicle Bldg., San Francisco, $34,980.

Seawall, etc.—Long Beach, Cal.—City Council received only bid building combined rein.-con. sea wall, sidewalk, center wall, end walls, staps, lighting standards, sheridized conduits and vitr. pipe sewers on Seaside Blvd., from Mercereau Bridge & Constr. Co., Pacific Electric Bldg., Los Angeles, $76,400. Noted Sept. 20.

★**Toe Wall, etc.—Sacramento, Cal.**—San Joaquin D.D. let contract building timber toe wall, also for material except cement, to build 4-in. plain concrete revetment, to Duncanson-Harrelson Co., Chronicle Bldg., San Francisco, $20,451.



Proposals

For Proposals Advertised See Pages 47 to 50 Inclusive

WATER-WORKS

Bids Close		See Eng. News-Record
Nov. 26.	Euclid, O.	Nov. 8
Nov. 26.	Winnipeg, Man.	Nov. 8
Nov. 26.	Winnipeg, Man.	Nov. 15
Nov. 26.	York Twp., Ont.	Nov. 15
Nov. 27.	Akron, Ohio	Nov. 15
Nov. 27.	Tonawanda, N. Y.	Nov. 22
Nov. 27.	Manasquan, N. J.	Nov. 22
Nov. 27.	New York, N. Y.	Nov. 22
Nov. 30.	Keithsburg, Ill.	Nov. 22
Dec. 3.	Winnipeg, Man.	Nov. 8
Dec. 5.	Red Bank, N. J. Adv. Nov. 22.	Nov. 22

SEWERS

Nov. 23.	Independence, Mo.	Nov. 8
Nov. 26.	Oil City, Pa.	Nov. 1
Nov. 26.	Estherville, Ia.	Nov. 22
Nov. 27.	Jersey City, N. J.	Nov. 22
Nov. 27.	Trenton, N. J.	Nov. 22
Nov. 28.	Jersey City, N. J.	Nov. 22
Dec. 1.	Ozark, Ala.	Nov. 22
Dec. 10.	Lake Andes, S. D.	Nov. 22

BRIDGES

Nov. 27.	Milford, Del.	Nov. 15
Dec. 1.	Dayton, Ohio	Nov. 15
Dec. 3.	Akron, O.	Nov. 22
Dec. 3.	Laurel, Miss.	Nov. 22
Dec. 4.	West Palm Beach, Fla.	Nov. 8
Dec. 10.	St. Augustine, Fla.	Nov. 15
Dec. 12.	New York, N. Y.	Nov. 22

STREETS AND ROADS

Nov. 26.	Texarkana, Tex.	Nov. 22
Nov. 24.	Charleston, W. Va.	Nov. 8
Nov. 27.	Rogersville, Tenn.	Nov. 15
Nov. 27.	Bayonne, N. J.	Nov. 15
Nov. 27.	Oregon	Nov. 22
Nov. 27.	New Ulm, Minn.	Nov. 22
Dec. 1.	Columbus, Ohio	Nov. 15
Dec. 3.	Scottsboro, Ala.	Nov. 15
Dec. 3.	Washington	Nov. 15
Dec. 3.	Stanberry, Mo.	Nov. 22
Dec. 4.	Tuscumbia, Ala.	Nov. 8
Dec 4.	Columbus, Neb	Nov. 15
Dec 5.	Red Wing, Minn	Nov. 15
Dec. 5.	Santa Ana, Cal	Nov. 15
Dec. 11.	St. James, Minn.	Nov. 22
Dec. 11.	Granite Falls, Minn.	Nov. 22

EXCAVATION AND DREDGING

Nov. 24.	Buffalo, Minn.	Nov. 15
Nov. 26.	Havana, Ill.	Nov. 15
Nov. 27.	Mankato, Minn.	Nov. 15
Nov. 27.	Rockwell City, Ia.	Nov. 22
Dec. 1.	Barstow, Tex.	Nov. 15
Dec 1	Montevideo, Minn.	Nov. 15
Dec. 1.	Greenfield, Ind.	Nov. 15
Dec 4.	Salina, Kan.	Nov. 15
Dec. 6.	Marion, O. Adv. Nov. 8.	Nov. 8

BUILDINGS

Nov. 25.	Middletown, Md.	Oct. 4
Nov. 26.	Philadelphia, Pa.	Nov. 22
Nov. 26.	Corinth, Ia.	Nov. 15
Nov. 27.	Lafayette, Ind.	Nov. 22
Nov. 27	Harrisburg, Pa.	Nov. 15
Nov. 30.	Strahan, Ia.	Nov. 15
Dec. 1.	Grand Mound, Wash.	Nov. 22
Dec. 1.	Norfolk, Va.	Sept. 13
Dec. 1.	Glenville, W. Va.	Nov. 8
Dec. 3.	Olympia, Wash.	Nov. 15
Dec. 8.	Suffern, N. Y.	Nov. 22
Dec. 10.	East Cleveland (Cleveland P. O.) O.	Nov. 8
Jan. 1.	Wichita, Kan.	Nov. 22

INDUSTRIAL WORKS

Nov. 26.	Linden, N. J.	Nov. 8

FEDERAL GOVERNMENT WORK

Nov. 24.	Power for Horses—Indian Head, Md.	Nov. 22
Nov. 25.	Addition to Filtration Plant—Rock Island, Ill.	Nov. 22
Nov. 26.	Locomotive Dry Dock Cranes—Wash., D. C.	Nov. 22
Nov. 26.	Warhead Storage — Newport, R. I.	Nov. 22
Nov. 26.	Dry Dock Crane, Wash., D. C.	Oct. 25
Nov. 26.	Steel Towers—Washington, D. C.	Nov. 1
Nov. 26.	Electric Duct System — Charleston, W. Va.	Nov. 8
Nov. 26.	Radio Building—New Orleans, La.	Nov. 8
Nov. 26.	Reservoir — Philadelphia, Pa.	Nov. 8
Nov. 26.	Electric Generating System, Ft. Stanton, N. M. Adv. Nov. 8.	Nov. 8
Nov. 26.	Power Plant Improvements—Charleston, S. C.	Nov. 15
Nov. 26.	Addition to Boiler Shop—Mare Island (Vallejo P. O.) Cal.	Nov. 15
Nov. 26	Fencing—Lake Denmark, N. J.	Nov. 22
Nov. 27.	Post Office—Chapel Hill, N. C.	Oct. 25
Nov. 27	Stone—New Orleans, La. Adv. Nov. 1 and 8	Nov. 1
Nov. 28.	Post Office — Bellefourche, S. D.	Oct. 11
Nov. 29	Post Office—McLeansboro, Ill.	Nov. 15
Nov. 30	Post office—Buffalo, Wyo. Adv. Nov. 1	Nov. 1
Nov. 30	Machinery, etc. — Cincinnati, O. Adv. Nov. 1 and 8	Nov. 1
Nov. 30	Power House and Machine Shop — New London, Conn.	Nov. 15
Dec. 2	Incinerator — Mare Island (Vallejo P. O.) Cal.	Nov. 15
Dec. 3	Dredging—Memphis, Ft. Pillow, Tenn.	Nov. 15
Dec. 3	Pattern Shop — Washington, D. C.	Nov. 22
Dec. 3	Post office—Jasper, Ala.	Nov. 1
Dec. 5	Bulkhead — New Orleans, La.	Nov. 8
Dec. 10	Fence, Fire Protection — Quantico, Va.	Nov. 8
Dec. 10	Heating System — Phila., Pa.	Nov. 15
Dec. 10	Refrigerating Apparatus, etc.—Washington, D. C. Adv. Nov. 15.	Nov. 15
Dec. 10	Heating System—Philadelphia, Pa.	Nov. 15
Dec. 17	Post office—Dripping Tex.	Nov. 8
Dec. 18	Laterals — Torrington, Wyo.	Nov. 1
Dec. 27.	Post Office — Alexandria, La.	Nov. 15

MISCELLANEOUS

Nov. 28.	Portland Cement—Minnesota, Minn.	Nov. 15
Dec. 1	Steam Pipe and Fittings—San Jose, Cal.	Nov. 15

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official.

WATER-WORKS

Proposed Work

N. Y., Coxsackie—Village [illegible] to vote on $30,000 bond issue to build storage reservoir.

Ga., Dublin—City election Jan. 8 to vote on $15,000 bond issue to install water and sewer mains. M. J. Sullivan, Engr. Noted Oct. 18.

O., Canton—City plans to drill 12 new wells. About $[illegible]. L. R. Metzger, engr. Noted July 5.

O., Woodville (Official)—City defeated $75,000 bonds to install water works. Noted Sept. 22.

Mich., Highland Park—City voted $147,686 bonds to [illegible] water works.

Mich., Lakeview (Unofficial)—City reported bids opened Nov. 15 for water works, including steel tank and tower, motor and pump. Noted Oct. 25.

Wis., Tomahawk (Official)—City contemplates improving water-works system [illegible] spring owing to high cost of material and labor. Noted Nov. 8.

Kan., Ogden—City election Dec. 3 to vote on $[illegible] bonds to build water works. Noted Oct. 15.

Kan., Winfield — City plans election to vote on $[illegible] bond issue to build water works. J. M. Bradley, city engr.

Mont., Billings Yellowstone Co. Comrs. plans to build water system. About $11,320

Mo., Kansas City—City plans to issue $[illegible] bonds to build additional [illegible] station. C. H. Hill, city engr.

Tex., San Angelo—San Angelo Water, Light and Power Co. plans to build reservoir dam to secure water from spring of South Concho River and Dove and Sulphur Creeks, across each Concho River, 75 ft. long, 15 ft. high, width at base 10 ft., and at top 4 ft. About $[illegible].

Okla., Altus—City election Dec. 4 to vote on $[illegible] bond issue to improve water works. S. B. Hitchcock, mayor. Noted May 31.

Okla., Odfon—City plans to build new water system.

Okla., Okmulgee—City voted $[illegible] bonds to build water-works and sewer system.

Okla., Sulphur — City plans election to vote on $[illegible] bond issue to build water works.

N. M., Albuquerque—City plans to issue $[illegible] bonds to purchase and improve water system.

Ariz., Bisbee—City plans election to vote on $[illegible] bond issue to build water works and electric light plant. J. C. Shepherd, city engr.

Wash., Pasco — Municipal Irrigation League plans election to vote on $[illegible] bond issue to build new water-works. Noted Sept. 15.

Wash., Seattle—City has plans prepared [illegible] water system [illegible] West Seattle. W. West Hubbard, engr. About $[illegible]. A. H. Dimock, city engr.

Ore., Richland—City voted $[illegible] bonds to build water-works.

Cal., Fresno — City Survey plans prepared by Dinsmore & Cleveland, engrs. Bids [illegible] Engineering Dept. for supplying [illegible] pressure water mains. Noted Aug. 18.

Water-Works (Continued)

Cal., Inglewood—City having plans prepared by Olmsted & Gillelen, engrs., 111 Hollingsworth Bldg., Los Angeles, for water-works.

Cal., Redding—City having plans prepared for water system. E. B. House, city engr.

Cal., Stockton—Holt Mfg. Co. plans to build water-tower, also install piping system and other fire-fighting equipment at its plant here. About $[illegible].

Ont., Winona—See "Buildings."

BIDS DESIRED

N. Y., Tonawanda—(Official)—Until Nov. 17 (readvertisement), by U. W. Sunson, city clk., laying intake pipe in Niagara River. About $11,000. B. Hinkey, city engr. Noted Oct. 18.

Ill., Keithsburg—(Official)—Until Nov. [illegible] by City, rebuilding water system. W. L. Mellinger, city clk. C. F. Sturtevant, Holdrege, Neb., engr.

Ariz., Bisbee—See "Industrial Works."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Neb., Pender—(Official)—City let contract building water-works and electric-light plant, to Wright Electric Constr. Co., Freemont, $19,989. Noted Nov. 1.

★Mo., Kansas City—City let contract, about 600 tons c.i. water pipe, to Cast Iron Pipe & Foundry Co., 122 South Michigan Ave., Chicago, $52 per ton.

★Mo., Moberly—City let contract for water-works and additional wells, to Layne & Bowler, 400 Inter-State Bldg., Kansas City, Mo., $30,000. Noted Nov. 1.

★Tex., Galveston—(Official)—City let contract repairing Alta Loma pumping station to J. W. Zeagler, Galveston. Percentage basis. Noted Oct. 25.

SEWERS

Proposed Work

Mass., Boston—City plans to improve main trunk line sewers in eastern section, including Neponset sewerage system, to cost $[illegible], and Franklin Park sewer, $[illegible]. E. F. Murphy, comr. pub. wks.

Mass., Fitchburg—City plans to build sewers in several streets. About $23,000. G. Chase, city engr.

N. Y., Port Jefferson—Village had plans prepared for sewage disposal plant.

N. J., South Orange—Township plans to join with other municipalities and build sanitary trunk sewer and sewage disposal plant. E. H. Arrowsmith, Jr.

Pa., Johnstown—(Official)—City voted $[illegible] bonds to build sanitary sewerage system. J. R. Crissey, city engr. Noted Oct. 18.

Pa., New Castle—City plans to build sewage disposal plant. C. H. Milliken, city engr.

Pa., Vandergrift—City had plans prepared for new sewage disposal plant. About $[illegible]. Rudy-Wenlen Co., engrs.

S. C., Columbia—City plans to build sanitary sewers along Bultman Branch and Columbia Canal. Cost between $[illegible] and $[illegible]. T. E. Legare, city engr. Noted Oct. 4.

Ga., Dublin—See "Water-Works."

Tenn., Morristown—(Official)—City having plans prepared collecting sewers in south side. About $[illegible]. E. C. Brown, city engr. Noted Nov. 8.

Ky., Shelbyville—City voted $[illegible] bonds to extend sewerage system. Noted Aug. 21.

O., Columbus—City plans sewer in Walhalla Rd. between High St. and Indianola Ave. About $[illegible]. H. Maetzel, city engr.

O., Toledo—(Official)—City voted $[illegible] bonds for sewer and pumping plant; contracts for $[illegible] worth of work will be let about Feb. 15. H. F. MacNaire, city engr. Noted Sept. 13.

O., West Park—(Official)—City has contract in January, building sewers. About $[illegible]. F. Fischer Co. Noted Nov. 1.

Ind., Frankfort—City plans to build storm sewer in West Washington St. H. H. Boynton, city engr.

Ill., Maywood—(Official)—Sanitary Dist. of Chicago having plans prepared for sewage plant with appurtenances for population of 35,000 people including small sewage pumping station. About $[illegible]. J. McGilley, Karpen Bldg., Chicago, engr. Noted Nov. 1.

Ia., Eagle Grove—City having plans prepared by C. H. Currie, engr., Webster City, building sewerage system.

Ia., Red Oak—(Official)—McGregor Subdivision Co., Cedar Rapids State Bank Bldg., Cedar Rapids, lets contract about Feb. 1, laying out 46-acre subdivision, including sewers, water-works, gas mains, paving, and building sidewalks. H. R. Greene, 2nd St. and 1st Ave., Cedar Rapids, engr. Noted Nov. 1.

Minn., St. Paul—City plans sewers in Fenton St. near Kentucky St., Baldwin St., between Walpole and St. Clair Sts.; Cretin Ave. near Randolph St.; Winter St. near Capitol Blvd. H. W. Austin, purch. agt. O. Claussen, city engr.

Tex., Princeton—City plans election to vote on $50,000 bond issue to build sewerage system.

Colo., Colorado Springs—City plans to build West End sewer extension. About $25,000. F. F. Mallon, city engr.

Ariz., Tucson—City plans to build storm sewers along 6th Ave. and 8th St. C. F. Von Petersdorff, city engr.

Ore., Portland—(Official)—City rejected bids for sewer in Klickitat St., also East 65th St. sewerage system. Noted Sept. 27.

Ont., London—City having plans prepared for sewage pumping system for West London. About $150,000. H. A. Brazier, city engr.

Ont., Winona—See "Buildings."

BIDS DESIRED

N. J., Jersey—(Official)—Until Nov. 27, by City, building sewer in Division St., from 8th to 9th St.; in Magnolia Ave. from a point about 430 ft. south of Tonnele Ave.; in Tonnele Ave. to Pavonia Ave. F. A. Dolan, clk. C. A. Van Kuren, city engr.

N. J., Manasquan—(Official)—Until Nov. 27, by R. D. Bush, boro. clk., building additions to sewerage system, consisting of pipe sewers, manholes, Y branches, etc. G. R. Moore, engr.

Ia., Estherville—Until Nov. 26, by M. G. Egbert, city clk., building sanitary sewers involving about 5690 ft. 8-10-in. pipe, together with manholes and flush tanks.

S. D., Lake Andes—Until Dec. 10, by City building sewerage system and sewage disposal plant, involving 4200 ft. 12-in. main sewer, septic tank, sludge bed, and sand filter bed. A. A. Loft, 1st Natl. Bank Bldg., Yankton, engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★N. Y., Brooklyn—L. H. Pounds, boro. pres., let contract building sewers and sewage pumping station in Flatlands Ave., to J. F. Cogan Co., Woolworth Bldg., New York City, $421,673. Noted Nov. 1.

N. Y., New York—M. E. Connolly, boro. pres. (Queens Boro.), received low bids building sewers in Maspeth Ave. from Rust St. to Clermont Ave. and in Clermont Ave. from Maspeth Ave. to Grand St., from J. J. B. La Marsh, Inc., 26 Court St., Brooklyn, $20,906; R. Carvel, 401 West 59th St., New York City, $20,143; J. Broderick, $21,154.

Roosevelt Ave. from Alburtis Ave. to 51st St.; Gunther St., from Alburtis Ave. to 51st St., and Havermeyer St. from Alburtis Ave. to 51st St., from Green Contg. Co., 734 Verona Ave., Astoria, $10,699; J. J. Johnson, 1045 Forest Ave., Brooklyn, $11,870; E. W. Fitzpatrick, 128 3rd Ave., Brooklyn, $12,507.

Matthew Pl. from Forbes to Dunsing St., Dunsing St. from Matthew Pl. to Marston Ave., from Kenmore Contg. Co., 6102 18th Ave., Brooklyn, $47,068; Peace Bros., 20 Main St., Flushing, $52,323; Stanhope Contg. Co., 404 Stanhope St., Brooklyn, $[illegible].

North Villa St. from Ridgewood to Jamaica Ave., South Conahan Ave. from Ridgewood to Jamaica Ave., North Curtis Ave. from Ridgewood to Jamaica Ave., from J. H. Johnson, 1045 Forest Ave., Brooklyn, $[illegible]; E. W. Fitzpatrick, 128 3rd Ave., Brooklyn, $10,166; C. Petracca, $10,-[illegible]. Noted Nov. 8.

★O., Cleveland—City let contract building 8-ft. 6-in. sanitary sewer from Washington Park to sewage disposal plant in Newburg Heights, to Connelly Constr. Co., [illegible] Arcade, $[illegible].

★O., Lorain—(Official)—City let contract building sanitary sewers in West 34th St., from Lexington to Oakdale Ave., Oakdale Ave. from West 37th to West 39th St., East 37th St. from Clyde to Lorain Ave., Colton Ave. from East 34th to East 37th St., to T. Trifiletti, Lorain. Noted Nov. 8.

★Wis., Madison—City let contract building about 3 mi. of 6-12 in. sewers, to J. R. Cullinane, 618 West Dayton St., $39,177.

★Wis., Whitefish—City let contract laying 12,050-ft. storm sewer to Wisconsin Drainage Co.

★Ia., Sioux City—(Official)—City let contract building North Riverside sewerage system, including pumping station and outfall beds, to Ward & Weighton, 516 Davidson Bldg., about $34,000. Noted Nov. 8.

Cal., Long Beach—City received lowest bid building sewers in State, Locust and other streets, vitr. clay pipe with brick flush tanks and manholes, rein.-con. pumping station, centrifugal pumps, motors, iron frames and covers, automatic flushing siphons, etc., from J. Kennedy, Washington Bldg., Los Angeles, $56,250.

BRIDGES

Proposed Work

Minn., Minneapolis—Hennepin Co. Comrs. rejected bids building 800-ft. bridge over Minnesota River on Lyndale Ave. Noted Oct. 25.

Kan., Wichita—See "Streets and Roads."

Okla., Tecumseh—See "Streets and Roads."

Ariz., Tucson—Pima Co. having plans prepared by T. Haddock, state engr., Phoenix, for building bridges over Santa Cruz and Sahuarita Rivers.

BIDS DESIRED

N. Y., New York—Until Dec. 12, by D. Mathewson, boro. pres. (Bronx Boro.), building bridges and approaches, regulating, reregulating, paving and repaving Gun Hill Rd. between Webster Ave. and White Plains Rd., granite block, sand foundation.

N. J., Red Bank—(Official)—Until Dec. 5, by Bd. Freeholders, Monmouth Co., Freehold, building Hubbards Bridge. C. M. Wyckof, dir. Advertised in this issue. Noted Nov. 1.

Miss., Laurel—Until Dec. 3, by Jones Co., building 120-ft. steel bridge, 14.8-ft. roadway. H. B. Graves, clk.

O., Akron—(Official)—Until Dec. 3, by Bd. Comrs. Summit Co., building superstructure of Waterloo Bridge over Canal, Tract 11, Coventry Twp. L. Kauffman, clk.

Oregon—See "Streets and Roads."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Conn., Canaan—(North Canaan)—(Official)—State Highway Comr., Hartford, let contract building rein.-con. arch bridge over Housatanoic River, between North Canaan and Salisbury Twps., to L. J. Sieling, 171 Madison Ave., New York City, $35,000.

★Minn., Carver—City let contract steel work for new bridge over Minnesota River to Franklin Bros. Bridge & Constr. Co., 911 Metropolitan Life Bldg., Minneapolis, $15,-000.

★Tex., Dallas—Dallas Southwestern Traction Co. let contract building steel bridge over Trinity River, to Missouri Valley Bridge & Iron Co., Leavenworth, Kan., $63,300. Noted Oct. 11.

★Okla., Tulsa—Tulsa Co. Comrs. let contract building 13 bridges and culverts to Froebe-Gray Constr. Co., Muskogee, $11,694

STRUCTURAL STEEL WORK

Proposed Work

N. J., Camden—See "Industrial Works."
Ida., Caldwell—See "Buildings."

BIDS DESIRED

Miss., Laurel—See "Bridges."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★N. J., Camden—See "Industrial Works."
★Minn., Carver—See "Bridges."
★Tex., Dallas—See "Bridges."

REINFORCED CONCRETE

Proposed Work

N. Y., New York—See "Industrial Works."
O., Cleveland—See "Miscellaneous."
Minn., Alexandria—See "Buildings."
Tex., San Angelo—See "Water-Works."
Ariz., Jerome—See "Buildings."
Cal., Long Beach—See "Miscellaneous."

Reinforced Concrete (Continued)

BIDS DESIRED

Oregon—See "Streets and Roads."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Conn., Canaan**—(North Canaan)—See "Bridges."

★**Kan., Lawrence**—See "Buildings."

★**Pa., Phila.**—See "Miscellaneous."

Cal., Long Beach—See "Sewers."

STREETS AND ROADS

Mass., Boston—(Official)—Bd Street Comrs. plan to widen Crescent Ave., Dorchester. J. J. O'Callaghan, secy.

N. Y., Buffalo—City Council plans to pave Zenner St. from Ferry St. to Scajaquada Creek. G. H. Norton, city engr.

N. Y., Huntington—Town plans to improve roads in Huntington Village and station with concrete, cost $27,000; improving highways with cinders, $7000; improving macadam road between Northport and Cold Springs Harbor, $20,000.

N. J., Newark—Bd Freeholders Essex Co. plans to pave following roads with granite block on concrete base: Bloomfield Ave. from Montclair-Verona line through Verona, Caldwell, North Caldwell and West Caldwell to Dutch lane, cost, $390,000; Avondale Rd., Nutley, from Washington Ave. to Avondale bridge, $21,200; Tuger St., Belleville, from Washington Ave. to Belleville bridge, $20,300, with bituminous concrete, Stuyvesant Ave., Irvington, from Newark line to Union Co. line, $95,200; Gregory Ave., West Orange, from Ludlington Rd. to Mt. Pleasant Ave., $75,800; Watchung Ave., Montclair and Bloomfield, from Upper Montclair Ave., Montclair, to East Passaic Ave., Bloomfield, $77,600.

N. J., Newark—(Official)—Bd Street & Water Comrs. soon lets contract paving Vail St. from Marion to Abbottsford Ave.; High St., from Warren St. to Boyden Pl.; South St. from Pacific to Dawson St.; North Munn Ave. from South Orange Ave. to East Orange line; Central Ave. from Plane to Burnet St.; Abbottsford Ave. from Sanford Ave. to East Orange line; Sunset Ave. from South Orange Ave. to Abinger Pl.; Mulberry St. from Center to Market St.; Meeker Ave. from Elizabeth to Freylinghuysen Ave.; Comes Alley from Market to Bank St.; Salem St. from South Orange Ave. to Rockland Terrace; Wheeler Point Rd.; Chadwick Ave. from Jeffrey Pl. to Custer Ave.; Mapes Pl. from Mapes to Shephard Ave.; Stengel Ave. from Elizabeth Ave. to Hunterdon St. M. R. Sherrard, city engr.

N. J., New Brunswick—Bd. Freeholders Middlesex Co. plans to pave Parlin Rd. from Millers Corners, Sayreville, to South Amboy.

N. J., Ocean City—City plans to extend 55th St. across tracks of West Jersey & Seashore Ry. to form portion of ocean boulevard from New York to Cape May, section of which is now being constructed between Ocean City and Sea Isle City.

N. J., Pompton Lakes—Boro. Council passed ordinance to improve Adrian St. and Lenox and Passaic Aves.

Pa., Greensburg—Westmoreland Co. soon receives bids for building 4-mi. road north and south of Irwin. County and township will each pay one-half of cost.

Pa., Johnstown—(Official)—City voted $200,000 bonds to pave streets. J. R. Crissey, city engr. Noted Oct. 18.

Pa., McKeesport—City plans to open, widen and extend Bowman Ave. from Elm St. to 5th Ave., and Maple Alley from Stewart to Brom St. J. M. Smith, city engr.

Pa., New Brighton—(Official)—Boro passed ordinance to pave, grade and curb 13th St. between 6th Ave. and Penn Ave. and 6th St. between 3rd Ave. and 6th Ave., vitr. block. H. T. Barber, boro. engr.

Pa., Wampum—(Official)—Boro plans to grade, curb and pave Main St. from north to south of borough line, monolithic reinforced. C. L. Repman, secy.

Va., Norfolk—City plans to widen and improve Cove St. W. H. Taylor, Jr., city engr.

Va., Richmond—City plans paving 1st Ave. from Meadow Bridge Rd. to Front St., granolithic pavement. C. E. Bolling, city engr.

N. C., Atkinson—City voted $20,000 bond issue to build roads. Address the mayor.

N. C., Fayetteville—See "Miscellaneous."

Ga., Dublin—City election Jan. 4, to vote on $35,000 bond issue to pave streets. Noted Oct. 18.

Ga., West Point—City and Troupe Co. (Lagrange Co. seat), plan to build concrete road 20 ft. wide, from city limits to Mt. Hope cemetery.

Fla., Quincy—City soon receives bids grading Jefferson, Washington, Adams and Madison Sts. About $54,000. J. B. McCrary Co., Atlanta, engrs. Noted June 14.

Miss., Corinth—Alcorn Co. sold $60,000 bonds to build Gulf Highway.

La., Alexandria—Rapids Parish plans to sell $75,000 bonds, Jan. 2, to build roads in Dist. No. 14.

O., Canton—Federal Government ordered Stark Co. Comrs. to improve Lincoln Highway from Osnaburg east to Columbiana Co. line, passing through Canton and Massillon.

O., Cincinnati—City plans to sell $70,500 bonds to improve Central Ave., and to issue $13,000 bonds to open and extend Millbrae Ave. from Oakley to Minot Aves. F. Krug, city engr.

O., London—(Official)—City at recent election defeated $30,000 bond issue for paving various streets. Noted Oct. 4.

O., Warren—City sold $25,000 bonds for resurfacing High St. and soon lets contract for same. H. S. McKibben, city engr.

O., Xenia—(Official)—City at election Nov. 13 defeated $17,000 bond issue for street improvements. Noted Aug. 30.

Ind., Anderson—Madison Co. Comrs. rescinded contract for paving Meridian Ave. let to Indiana Asphalt Paving Co., 25th St. and Lake Erie Western Ry. Work will be readvertised. Noted Sept. 20.

Ind., Ft. Wayne—Allen Co. sold $76,000 bonds to build 5 stone roads. Noted Sept. 27.

Mich., Hastings—Barry Co. Supervs. plan to complete Grand Rapids-Battle Creek Highway leading to Camp Custer, 8 mi. 16-ft. road. Noted Apr. 19.

Mich., Holland—City Council plans to pave Lincoln Ave. from 7th to 16th St. C. T. Bowen, city engr.

Ill., Petersburg—Menard Co. voted $55,000 bonds to build hard-surfaced roads. Federal Government will contribute toward cost.

Ill., Waukegan—Lake Co. voted $500,000 bond issue to improve Sheridan Rd. from Chicago to Wisconsin State line. This amount, together with $325,000 appropriated by State and Federal Government, will make $825,000 available for road work in county. Noted Sept. 27.

Wisconsin—State Highway Comn., Madison, plans to build 12th St. Rd. as trunk line between Racine and western end of county to connect village of Rochester with trunk highway between Burlington and Waterford. A. H. Hirst, state highway comr. Noted July 5.

Wis., Green Bay—Brown Co. Supervs. plan to improve following roads during 1918: Green Bay, New Franken & Kewaunee Rd.; Green Bay, Denmark & Manitowoc Rd.; East De Pere & Dixon Rd.; Glenmore, Larkin & Wrightstown Rd.; De Pere-Greenleaf Rd.; Suamico & Oconto Rd.; Green Bay & Seaward Rd.; Pittsfield & Pulaski Rd.; Green Bay, Hobart & Seymour Rd.; West De Pere & Oneida Rd.; Town of Eaton Rd.; Bellevue Sta., East, Green Bay, Menominee Rd.; Sturgeon Bay Rd.; Town of Scott Greenleaf & Wrightstown Rd.; Green Bay, Ashwaubenon & West De Pere Rd.; Hansbohr & Kewaunee Rd.; Greenleaf, Allouez & Brillion Rd.; De Pere, Lawrence and Appleton Rd. About $175,000 will be expended. Noted Oct. 4.

Wis., Marinette—Marinette Co. plans to build 5-mi. highway from Pulcy's Corners south of Peshtigo to Oconto Co. line, about $14,000. Federal Government to appropriate $8000 toward cost, state $8000 and county $8000. State and county will also build truck road from Menabee Hall to Pound. Cost $8450.

Wis., Washburn—Bayfield Co. plans $300,000 bond issue for road work.

Wis., West Allis—City plans $50,000 bond issue for street improvements.

Ia., Red Oak—See "Sewers."

Kan., Chanute—City plans to pave West Second St. from North Santa Fe to Forest Ave., vertical fiber brick. Chas. Frank, city engr.

Kan., Wichita—Sedgwick Co. plans election to vote on $2,000,000 bond issue to build roads and bridges.

Kan., Winfield—Cowley Co. had plans prepared building interurban road between Winfield, Augusta, El Dorado and Wichita.

Neb., Columbus—City will sell $15,000 bonds to pave streets in Dist. No. 2.

Neb., Rushville—Sheridan Co. Comrs. in cooperation with Alliance Commercial Club, Alliance, plan to build road to Gordon. About $35,000.

Mont., Butte—(Official)—Silverbow Co. Comrs. rejected bids for paving, building sidewalks, parkings and curbs in Dist. No. 3. New bids. S. L. Anderson, co. clk. Noted Nov. 1.

Missouri—State Highway Comn., Jefferson City, had plans prepared building Joplin-Miami Rd., 7 mi. concrete. About $300,000. A. W. Graham, state highway engr.

Mo., Clinton—Henry Co. had plans prepared for state road from Windsor to Johnson Co. line. About 7 mi.

Mo., Doniphan—Ripley Co. plans election Dec. 11 to vote on $150,000 bond issue to build roads. Noted Oct. 11.

Mo., Fulton—Calloway Co. Comrs. plan to build 16 mi. Old Trails Highway, east of Fulton to Montgomery Co. line. About $75,000.

Mo., Greenfield—(Official)—Dade Co. plans election Nov. 24 to vote on $28,000 bond issue for roads in Everton Special Rd. Dist. Former election illegal. J. C. Webb, co. clk. Noted Nov. 8.

Arkansas—State Highway Dept., Little Rock, has plans prepared road through Ozark National Forest, part Harrison-Russellville section of Jefferson Highway. Federal Government and State appropriated $40,000 and $10,000 respectively for work. Noted Oct. 4.

Ark., Little Rock—City plans to pave Pike Ave. from 14th to 17th St., concrete. H. Linvison, city engr.

Ark., Perryville—Perry Co. had plans prepared by State Highway Dept., Little Rock, building road from Bigelow to Cross-roads, 6 mi. About $11,000.

Ark., Piggott—Clay Co. plans to build $2-mi. road from St. Francis to Greene Co. line with Federal aid.

Tex., Center—(Official)—Shelby Co. at recent election defeated $600,000 bond issue for road work. R. H. McCauley, clk. Noted Nov. 8.

Tex., Dallas—City soon lets contract grading Forest Ave. and building concrete culvert to be used in connection with Forest Ave. extension idea; also paving Lemmon and Washington Aves. and Howell St. Estimates. H. Moseley, city engr.

Tex., Greenville—Hunt Co. White Rock Dist. voted $40,000 bonds to build 6 mi. highway connecting Wolfe City roads with Greenville RR. at Klondy.

Tex., Junction—Comrs. Court of Kimble Co. plans election soon to vote on $150,000 bond issue to build roads.

Tex., Lockhart—Comrs. Court of Caldwell Co. plans election soon to vote on $100,000 bond issue for road work.

Tex., Palestine—Anderson Co. voted $40,000 to Frankston Precinct and $40,000 to Cayuga Rd. Dist. for road work. Noted Oct. 18.

Okla., Ada—City plans to pave East 9th and East 10th Sts. and Hope Ave. from Main St. north to 9th St.

Okla., Miami—Ottawa Co. plans election Dec. 4 to vote on $400,000 bond issue to build roads and rail. Noted Oct. 11.

Okla., Tecumseh—Pottawatomie Co. plans election to vote on $400,000 to build roads and Canadian Bridge.

Okla., Waurika—Jefferson Co. voted $85,000 bond issue to build roads and bridges in Wiley Twp. Noted Oct. 11.

Idaho, Grangeville—Idaho Co. plans election soon to furnish Treasury Dist. to vote on $40,000,000 bonds for road building to Clearwater.

Idaho, Sand Point—Bonner Co. voted $400,000 bonds to build roads. Noted Oct. 25.

Utah, Payson—City Council plans paving 4 blocks, portland cement.

Ariz., Florence—Bd. Examiners and Pinaleno.

Wash., Seattle—City plans to pave Yesler-Lake Ave. from Fremont to Eastlake Ave.; Dexter Ave., Wallingford, Fuhrer, Aurora, Woodland and Park Ave., Green Lake; Southlake Pl. to Fairview Pl., and Southlake Pl. from Wallingford Ave. to Fremont Pl.

Streets and Roads (Continued)

Wash., Seattle—City election May 6 to vote on $[illegible] bonds to improve Smilecole Ave. and other streets in Ballard Mill Dist. A. H. Dimock, city engr.

Oregon—State Highway Comm., Salem, has plans prepared for Baker-Communipta Post Rd. E. Kingsley, state highway comr.

Ore., Astoria—Clatsop Co. plans to improve roads in Rd. Dist. No. 2 and Seaside Rd. Dist. About $11,500 and $17,500 respectively.

Ore., Roseburg—Douglas Co. plans to build portion Roseburg-Myrtle Point Rd. extending into Coos Bay. About $80,000 to be expended. Noted June 7.

Ore., The Dalles—Council passed resolutions to improve Union St. from present pavement at 5th St. to south line of 10th; 5th St. from Union St. to 9th St. bridge; 10th St. from Union to Washington St.; Washington St. from 10th to Clay St.; Clay St. from Washington to Kelly St.; Court St. from 4th to 8th St.; Washington St. from 4th to Fulton St.; Fulton St. from Washington to F St.; Kelly Ave. from Fulton to Alvord St.; Federal St. from Alvord to Clay St., and from Alvord to Fulton St.; Laughlin St. from Alvord to Fulton St., and F St. from Alvord to Fulton St.

Cal., Riverside—Riverside Co. soon receives bids building about 14 mi. highway between Thermal and Mecca.

Cal., Santa Barbara—Santa Barbara Co. plans election Nov. 28 in Mesa Improv. Dist. to vote on $[illegible] bond issue for road improvements. About $28,000 will be expended. Noted July 20.

Ont., London—City receives bids about Dec. 11 for concrete, asphalt and stone required to build new pavements to cost about $150,000. H. Brazier, city engr.

Ont., Port Rowan—Council plans to improve Main St. About $20,000. W. A. Mabee, clk.

Ont., Windsor—City having plans prepared by A. Brian, city engr., for asphaltic concrete pavement. About $75,000.

BIDS DESIRED

N. Y., New York—See "Bridges."

N. Y., New York—Until Nov. 27, by M. E. Connolly, boro. pres. (Queens Boro.), regulating, grading, curbing, paving and laying sidewalks on portions Gilmore Studwell, Stephen, Beach 117th, Decatur and Hill Sts., Forest and Jamaica Aves. and Toole Pl.

N. Y., New York—Until Nov. 27 by C. D. Van Name, boro. pres. (Richmond Boro.), regulating and grading Great Kills Rd. from Amboy Rd. to Seaside Blvd.

N. J., Jersey City—(Official)—Until Nov. 26, by Bd. Freeholders, for temporary improvement of 2 county highways from approaches end of bridge over Hackensack River to Sanford Ave. W. O'Mara, clk. Noted July 13.

N. J., Trenton—(Official)—Until Nov. 27, by Bd. Freeholders, Mercer Co., paving approaches to Upper Basin Bridge on Brunswick Pike [illegible] bituminous concrete surface, macadam foundation.

Ala., Ozark—Until Dec. 1, by Dale Co., improving Ozark and Enal Rds. being portion State Trunk Rd. No. 7, between Ozark and Troy, [illegible] mi. work involves 19 acres clearing and grubbing, 19,611 cu.yd. earth, 17,[illegible] cu.yd. sand-clay surfacing, [illegible] lin.ft. D. B. culverts, 56 cu.yd. concrete.

Ky., Lebanon—(Official)—Until Dec. 4, by Marion Co., building 14-mi. inter-county road from here to Raywick, including [illegible] Simpkins Chapel and extending to Nelson Co. line. No bids opened Nov. 17. S. J. Spalding, clk.

Mo., Stanberry—Until Dec. 3, by C. J. Greenlee, city clk., paving curbing and guttering Main St. from Park St. to Wilson St., 5th St. from Jackson to Hyde St. and alley in block 41 from Lincoln to Park St.

Tex., Texarkana—(Official)—Until Nov. 26, by City Comr., Spring St. from 11th to 16th St., including [illegible] cement and 4700 sq.yd. gutter. Alton D. Cain. Noted Nov. 8.

Washington—(Official)—Until Dec. 1, by State Highway Comm., Olympia, improving Sumner and Enumclaw-Wilkeson Highways, involving clearing, grading, draining and surfacing 10 [illegible] mi. in Franklin Co.

Oregon—(Official)—Until Nov. 27, by State Highway [illegible] for 1½ mi. [illegible]

Ochoco Forest Rd., 4 mi. from Mitchell; also building 90-ft. wood-span bridge (separate bid for bridge). 13 mi. grading in Douglas Co., on Pacific Highway, known as Myrtle Creek-Dillard Sect., involving 140,000 cu.yd. excav.; one 90-ft. rein.-con. viaduct across Goble Creek, in Columbia Co. on Columbia River Highway. Noted Oct. 25.

Cal., Santa Ana—Until Dec. 5, by Orange Co. Comrs., building Santa Ana canyon road from Peralta to Riverside Co. line; also paving Buena Park, Topeka mixture.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Brooklyn**—L. H. Pounds, boro. pres., let contract regulating and paving Hopkinson Ave., to Sicilian Asphalt Pav. Co., 41 Park Row, New York City, $21,793. Noted Oct. 18.

★**N. Y., Brooklyn**—L. H. Pounds, boro. pres., let contract improving Ave. M and West 36th St., to Cranford Co., 52 9th Ave., $15,095 and $11,610, respectively. Noted Nov. 1.

★**N. Y., Long Island City**—M. M. Connolly, boro. pres., let contract paving portion Hughes and Hancock Sts., to Sicilian Asphalt Paving Co., 41 Park Row, New York City, $10,475 and $11,681, respectively. Noted Oct. 18.

★**N. Y., New York**—D. Mathewson, boro. pres., let contract paving roadway of Bronx and Pelhahm P'kway., between Southern Blvd. and Butler St., and Butler St. and Boston Rd., to Union Paving Co., 120 Bway., $58,900. Noted Oct. 18.

★**N. Y., New York**—M. M. Marks, boro. pres., let contract improving roadway 59th St. to W. J. Fitzgerald, 547 West 47th St., $29,762. Noted Oct. 18.

★**N. Y., New York**—M. M. Marks, boro. pres., let contract improving portion 38th, 43rd, 44th, 45th and 46th Sts., to A. Ferris, 672 Degraw St., Brooklyn, $38,318; repaving portion Park Ave. to Asphalt Constr. Co., Madison Ave. and 137th St., $11,367. Noted Oct. 25.

N. Y., New York—M. M. Connolly, boro. pres. (Queens boro.), let contract improving portion Jamaica Ave., to Uvalde Asphalt Paving Co., 1 Bway., New York City, $93,783. Noted Oct. 4.

★**N. Y., Yonkers**—Bd. Contract & Supply let contract paving Central Ave., from south to north city limits, to J. E. Pawson Co., 58 Wells Ave. About $16,050. Noted Nov. 15.

N. J., Atlantic City—City received low bids building ornamental parkway from city limits to Virginia and Mediterranean Aves., from Hill Dredging Co., Atlantic and Somerset Pl., $153,589; E. L. Bader, Tennessee and Thorp Sts., $172,000, both of Atlantic City.

★**S. C., Darlington**—City rescinded contract let to Simons & Mayrant Co., 18 Broad St., Charleston, and relet same to Noll Constr. Co., Chattanooga, Tenn., $57,019. Noted Nov. 8.

★**Ia., Ida Grove**—City let contract paving 16 blocks, Texaco asphalt, to J. S. McLaughlin & Sons, Red Oak; about $1.89 per sq.yd. Noted Nov. 8.

★**Kan., Lindsborg**—City let contract paving [illegible] sq.yd. Main St., vertical fiber brick, including [illegible] ft. curbing and gutter, also [illegible] sq.yd. to Geiger Constr. Co., Leavenworth. About 62,321. Noted Nov. 15.

★**Tex., Ft. Worth**—Tarrant Co. Comrs. let contract building [illegible] from its mills to [illegible] bridge, to D. H. Purvis, Ft. Worth. About $17,874. Noted Sept. 20.

★**Colorado**—State Highway Comr., Denver, let contract building 4 mi. Littleton-Denver Rd., 24 ft. wide, to C. Conner. About $[illegible]. Noted July 7.

★**Ariz., Globe**—(Official)—Gila Co. let contract paving [illegible] to R. O. Black, Clifton, $70,290. Noted Nov. 1.

★**Wash., Seattle**—City Comptroller let contract building [illegible] Highway, to [illegible] Paving Co., Everett, $31,140.

★**Wash., Seattle**—City let contract paving [illegible] to Macadam Bitulithic Pavement Co., [illegible] Bldg., $[illegible]. Noted Sept. 27.

★**Oregon**—State Highway Comm., Salem, let contract building Wolf Creek-Graves Creek Highway in Josephine Co., to Amer. Exploration & Contg. Co. About $56,947.

★**California**—State Highway Comm., Sacramento, let contract building 15.6 mi. highway between Garberville and Miranda in Humboldt Co., to Palmer & McBryde, Hooker & Lent Bldg., San Francisco, $223,555; laying asphaltic surface on highway between Fresno and Malaga, Fresno Co., to Blanchard-Brown Co., Call Bldg., San Francisco, $22,824; 10 mi. highway between San Fernando and Rancho Tujunga, Los Angeles Co., to A. L. McCray, 234 West 28th St., Los Angeles, $111,251. Noted Nov. 15.

★**Cal., Los Angeles** — City let contract grading and paving Exposition Blvd. from Roseburg Pl. to Menlo Ave., involving 109,315 sq.ft. grading, paving, 421 lin.ft. cement curb, 2059 sq.ft. and concrete gutter, 290 sq.ft. granite block gutter, to G. R. Curtis, 2440 East 26th St. About $16,757.

★**Cal., Oakland**—(Official)—Alameda Co. Supervs. let contract building Castro Valley Rd. to Russell & Fernandez, Hayward, $82,861. Noted Nov. 15.

★**Cal., San Diego**—San Diego Co. let contract paving Lookout Dr. and Palm Ave., La Mesa Dist., to Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., Los Angeles. About $17,000.

★**Cal., San Diego**—Bd. Superv. let contract building 6 mi. 20-ft. concrete road between San Diego and Camp Kearny, to Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., Los Angeles. About $108,325. Noted Nov. 15.

★**Que., Chicoutimi**—Council let contract building macadam roadways to Riverin & Riverin, Chicoutimi. About $135,000.

RAILWAYS—STEAM & ELECTRIC

Proposed Work

Pennsylvania — Pennsylvania R.R. purchased property foot Welch St., Chester, and having plans prepared for extending its trunk line as far as Market St. and Marcus Hook, also building double draw bridge over Chester River on Market St. A. C. Shand, Broad St. Sta., Phila., ch. engr.

Delaware — Pennsylvania R.R. plans to spend $3,000,000 to improve its Edge Moor yards, near Wilmington. A. C. Shand, Broad St. Sta., Phila., ch. engr.

Texas—Southern Pacific R.R. plans to relay its tracks between Houston and El Paso with 90 lb. steel rails, about 297 mi. W. Hood, Flood Bldg., San Francisco, ch. engr.

California—Pacific Electric Ry., Pacific Electric Bldg., Los Angeles, plans to build extension from Santa Ana to San Diego. About 80 mi. J. McMillan, genl. mgr.

EXCAVATION AND DREDGING

Proposed Work

Ariz., Florence — (Official)—Reclamation—Theresa Hall Cotton Co. plans to reclaim and grade 3000 acres of land. R. W. Waterman, Blythe, Cal., engr.

Ariz., Parker—(Official)—Reclamation—Theresa Hall Cotton Co. plans to reclaim 2000 acres of land. R. W. Waterman, Blythe, Cal., engr.

Ariz., Phoenix—Irrigation—Paradise Valley Verde Water Users' Assn. plans to organize irrigation district and issue bonds to build projected Horseshoe dam.

Wash., Prosser—Irrigation—Prosser Irrigation Dist. prepared plans for pumping plant near Prosser to lift water from Sunnyside Canal to water 2000 acres above gravity flow. About $200,000.

BIDS DESIRED

Ind., Greenfield—(Official)—Drain—Until Dec. 1, by C. Boone, engr., Hancock Co., building Henry D. Holt et al. drain, Blue River Twp., involving 5839 ft. 7-20-in. tile; 1 retaining wall, cleaning out old channel, etc.

Ia., Rockwell City—Drainage—Until Nov. 27, by R. B. Dixon, aud., Calhoun Co., improving D. D. No. 67, involving 17,000 ft. 24-40-in. tile, also cleaning out or redigging main open ditch from Sta. 21 to Sta. 265, involving 25,880 excav.

Excavation and Dredging (Continued)

Minn., Granite Falls—(Official)—Ditch—Until Dec. 11, by Yellow Medicine Co., building Judicial Ditch No. 7, involving 23,321 ft. 5-24 tile. About $20,616. Former bids rejected. G. H. Wilson, aud. Noted Nov. 1.

Minn., Montevido—Ditch—Until Dec. 1, by J. J. Stennes, aud., Chippewa Co., building Co. Ditch No. 22, involving 1,225,662 cu.yd. open work and 316,598 ft. 6-20-in. tile. About $202,329.

Minn., New Ulm—Ditch—Until Nov. 27, by Brown Co., building Ditch No. 43, involving 17,181 ft. 6-in. tile. W. P. Backer, aud.

Minn., St. James—Ditch—Until Dec. 11, by Watonwan Co., building Judicial Ditch No. 18, involving 62,986 ft. 6-34-in. tile, Judicial Ditch No. 13, 73,765 ft. 6-34-in. tile. J. C. Jensen, co. aud.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Ia., Ft. Dodge—(Official)—Drain—Webster Co. let contract building Drain No. 258, to Burkland & Littell, Eagle Grove, Ia., $22,699. Noted Nov. 1.

★Ia., Sibley—Drainage—Osceola Co. let contract building D.D. No. 26, involving 57,230 ft. 6-30 in. tile, to Sibley Cement Co., Sibley. Noted Oct. 11.

★Kan., Belvue—Ditches—Bd. Dir. Belvue D. D. let contract building drainage ditches and changing course of channel, Lost and Welch Creek River Dist., to T. L. Campbell, Atchison, Kan., $17,000. Noted Oct. 4.

★S. D., Armour—(Official) — Drain—Douglas Co. let contract building Drain No. 4, involving open ditch 5 mi. long, 30,000 cu.yd. excav. and 750 ft. 20-in. tile, to H. Vander Pol, Corsica, 25c. and 27c. per cu.yd. respectively. Noted Nov. 1.

★Ont., Hullett Twp.—Drainage—Hullett and Grey Twps. let contract drainage work to A. Guhr, Brussels, Ont., $53,000.

INDUSTRIAL WORKS

Proposed Work

Mass., Boston—City having plans prepared by Maher & Winchester, archts., 8 Beacon St., 2-story fireproof market house. About $68,000.

Conn., Bridgeport — D. W. Flint, Allen Ave., Providence, R. I., having plans prepared by W. H. Van Tine, archt., Fisher Arcade Bldg., Detroit, Mich., for 3-story, 140 x 150-ft. factory. About $100,000.

N. Y., Brooklyn—Foster Impvt. Co., 2027 Douglas St., had plans prepared by S. Millman & Sons, archts., 1780 Pitkin Ave., for 1-story, 90 x 105-ft. garage. About $25,000.

N. Y., Brooklyn—M. C. K. Contg. Co., 2168 Dean St., having plans prepared by S. Millman & Son, archts., 1780 Pitkin Ave., 1-story, 100 x 100-ft. brick garage on Fulton St. About $25,000.

N. Y., Brooklyn—National Aniline & Chemical Co., 38 Ross St., plans to build 36 x 87 ft. power house at Ditmas Ave. and 83rd St. About $30,000.

N. Y., Brooklyn—Richnitz Bros., 44 Court St., had plans prepared by S. Millman & Son, archt., 1780 Pitkin Ave., 1-story, 90 x 220-ft. brick garage, Ave. C and Coney Island Ave. About $60,000.

N. Y., Brooklyn—Roberts Numbering Machine Co., 706 Jamaica Ave., having plans prepared by W. C. Winters, archt., 106 Van Sicklen Ave., building 2½-story factory. About $30,000.

N. Y., Buffalo—Beaver Board Co. plans to build 4-story, 40 x 80-ft. rein.-con. addition to its plant on Beaver Rd., Ontario St., and New York Central R.R. W. F. MacGlashan, pres.

N. Y., Buffalo—Fore River Shipbuilding Corp., 97 Howard St., Quincy, Mass., subsidiary of Bethlehem Steel Corp., had plans prepared, 1-story machine shop on Vulcan St., here.

N. Y., College Point—L. M. F. Eng. Co., Inc., had plans prepared by P. M. Coco, archt., 120 West 32nd St., for 1-story, 100 x 170-ft. factory, 4th Ave. and 10th St., here. About $150,000.

N. Y., New York—Chelsea Storage Warehouse, 112 W. 107th St., New York City, having plans prepared by Wortman & Braun, archts., 114 East 28th St., for 7-story addition to warehouse. About $45,000. L. Schramm, 426 West 26th St., pres.

N. Y., New York—Himoff Machine Co., 50 Church St., increased its capital stock from $100,000 to $250,000, and plans to build an addition to its factory.

N. Y., New York—B. Iannucilli, 1772 Mt. Hope Ave., having plans prepared by De Rosa & Pereira, archts., 150 Nassau St., 2-story, 100 x 112-ft. brick and iron garage on Inwood Ave. near McCombs Rd. About $25,000.

N. Y., New York—E. & H. Levy, 4th Ave. and 19th St., plans 3-story, 52 x 203-ft. rein.-con. factory on Purdy St. About $75,000.

N. Y., Niagara Falls—Elderfield Hartshorn Hardware Co., 40 Falls St., had plans prepared by Wright & Kremers, archts., 407 Gluck Bldg., for 1- and 2-story, 50 x 100-ft. tinshop and warehouse. About $25,000.

N. Y., Plattsburg — Plattsburg Alloys Corp. has increased its capital stock from $60,000 to $125,000, and plans to build addition to plant here.

N. Y., Syracuse—New Idea Double Tire Co., 261 West Onondaga St., plans 3-story, 50 x 150-ft. cement block factory. About $25,000.

N. J., Trenton—Empire Tire & Rubber Corp., North Clinton and Mulberry Sts., plans new addition to plant; also installation of new machinery. About $220,000 J. C. Murray, 800 Riverside Ave., treas.

Pa., Phila.—S. Sklaroff & Sons, 712 South 2nd St., had plans prepared 6-story, 22 x 145-ft. addition to storage warehouse. F. E. Hahn, 112 Chestnut St., engr. and archt., soon receives bids.

Wash., D. C.—Potomac Electric Power Co., 14th and C Sts., N. W., plans addition to factory. About $27,000. Milburn & Heister, Union Savings Bank Bldg., archt.

Va., Norfolk—Hampton Roads Shipbuilding & Dry Dock Co., has acquired 150 acres of land here and plans to construct shipbuilding plant. About $800,000. R. B. Wallace, genl. mgr.

La., Monroe—Monroe Hardware Co. had plans prepared 2-story, 110 x 200-ft., brick warehouse. About $50,000. J. W. Smith, Central Savings Bank & Trust Bldg., archt.

Tenn., Nashville—Bransford Realty Co., 219 6th Ave., N., plans brick and concrete warehouse, 125 x 29 ft., 8th Ave. About $60,000.

O., Cleveland—Blair Auto Co., 1717 Euclid Ave., soon lets contract 2- and 3-story, 64 x 86-ft., brick and rein.-con. addition to garage and salesroom. About $40,000. B. Blair, mgr.

O., Cleveland—Toledo Plate & Window Glass Co., 1014 West 11th St., soon lets contract, 120 x 150-ft. factory, St. Clair Ave. and Hamilton St. About $150,000. Walker & Weeks, 1900 Euclid Ave., archts.

O., Cleveland—Wicklow Constr. Co., 700 Marshall Bldg., having plans prepared for 146 x 165-ft. garage, St. Clair and Ontario Sts. About $250,000.

O., Dayton—Buckeye Iron & Brass Wks., 326 East 3rd St., recently increased its capital stock from $75,000 to $[illegible], and plans to build an addition to its factory.

O., Springfield—Springfield Baking Co., 132-36 West Washington St., having plans prepared by Graves & Co., archts., Century Bldg., Pittsburgh, Pa., 2-story, 50 x 80-ft. addition to bakery.

Mich., Detroit—See "Buildings."

Mich., Detroit—Dodge Bros., Campau & Hamranck Aves., having plans prepared for munition factory. About $1,500,000.

Mich., Muskegon—Anderson Packing Co. having plans prepared by H. C. Christensen, archt., 7258 South Union St., Chicago, for 2-story packing plant. About $150,000.

Ill., Chicago—Harrington & King Perforating Co., 812 North Union Ave., having plans prepared for 1 and factory building, Taylor and Campbell Aves. About $150,000.

Ill., Chicago—Kenderdine Campbell Co., 2256-7 Fullerton Ave., soon lets contract, 2-story garage and show room. About $10,000. R. G. Pierce, 18 South La Salle St., archt.

Ill., Chicago — B. Lange & Son, 1461 Newberry St., having plans prepared by A. Anderson, archt., 183 North Clark St., for 1-story, 48 x 100-ft. warehouse. About $50,000.

Ill., Chicago — C. C. Mimmack & Co., archts., 175 South Michigan Ave., soon lets contract, 3-story, 100 x 105 ft. manufacturing, Kinzie and Franklin Sts., for Illinois Specialty Moulding Co., 101 West Kinzie St. Noted Sept. 15.

Ill., Chicago — H. G. Seal Co., 1416 Fullerton Ave., commissioned Rosenberg & Rebolinger, 111 West Washington St., to prepare plans required for W. J. Braulicky, archt., 54 West Randolph St., for 2-story, 100 x 115-ft. factory on Rosemond St. About $100,000.

Ill., East St. Louis—St. Louis Coke & Chemical Co., subsidiary of American Coke & Chemical Co., 608 South Dearborn St., Chicago, plans coke plant here. About $16,000,000. W. G. McGuire, St. Louis, secy.

Wis., Appleton—Eagle Mfg. Co. increased its capital stock from $[illegible] to $[illegible] and plans to build addition to its factory here. F. Salbenack, pres.

Wis., Menasha—Menasha Wire & Mfg. Co. plans to build factory here. About $25,000.

Wis., Monroe—L. E. Geite, c/o Industrial Cooperative Union, soon lets contract, 3-story, 45 x 130-ft. coal storage warehouse. About $60,000. C. F. Ringer & Son, University Bldg., Milwaukee, archts.

Tex., Houston—Sinclair Gulf Refining Co., subsidiary of Sinclair Gulf Corp., 120 Bway., New York City, plans to build refinery, also pipe line here, to consists of 4 units. About $6,000,000.

Okla., Oklahoma—H. E. Bagby soon lets contract, 3-story, 50 x 140-ft. garage. About $25,000. L. H. Bailey, Colcord Bldg., archt.

Okla., Pawhuska — City voted $75,000 bonds to improve gas plant. P. H. McMahon, clk.

Ariz., Bisbee—City Council plans election soon to vote on $375,000 bond issue to build new electric-lighting and gas-manufacturing plants, also water system.

Wash., Seattle—Elliot Shipbuilding Co. plans to construct 280 x 320-ft. shipbuilding shed, cost $35,000; also office building, foundry and machine shop, $135,000.

Ore., Baker—Baker White Pine Lumber Co. plans to build sawmill between Baker and Durkee. About $175,000. W. J. McIntyre, representing Murray Mfg. Co., Wausau, Wis., archt.

Cal., Monterey—B. J. Sandersman plans to build 3 fish canneries here, 60 x 150 ft., 80 x 100 ft., 100 x 125 ft. About $[illegible].

Cal., Sacramento—State Printing Office, 15th and M Sts., plans new shop on 8th St. About $100,000.

Cal., San Diego—Craig Shipbuilding Co., Bway. and Water St., Long Beach, plans shipbuilding plant near municipal pier here. About $500,000.

Cal., San Francisco—Fowler Airplane Corp., 128 12th St., plans to build factory to contain about 50,000 sq.ft. space.

N. S., New Glasgow—Nova Scotia Steel and Coal Co., Ltd., plans additions to plant here. About $4,000,000. F. H. Crockard, genl. mgr.

Que., St. Romauld—Ogeault Co., Levis, had plans prepared for machine shop. About $50,000. M. J. B. Ouimault, Wolfe St., Levis, prop.

B. C., Prince Rupert—S. E. Landry, Vancouver, plans to construct shipbuilding plant. About $[illegible].

BIDS DESIRED

N. J., Linden—(Official)—Until Nov. 28 by C. H. Higgins, chief, 185 Bway., New York City, for 2 new buildings, 1 story, 37 x 51 ft. and 2 story, 18 x 18 ft., cyl. conc. brick and frame fills; also alterations to factory, 45 x 100 ft. building, Elizabeth Ave. and Staple St., for Transcontinental Oil Co., 120 Wall St., New York City.

Pa., Phila.—Until Nov. 16, by Phila. & Reading Ry. for engine house and machine shop, Erie Ave. Yard, 2d and Erie Avs. S. T. Wagner, engr.

Wash., Grand Mound—See "Buildings."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★N. Y., New York—Woodhaven Wire Co., 214th St. and Hudson River, contemplated building factory, recently reported by Jos. to Torres & Bro., 171 Park ave.

★N. J., Camden—(Official)—See Page 1 Shipbuilding Co., Ltd., Penn Bldg., Camden, for addition to machine shop, 1 story, 40 x 60 ft., to boiler shop, 1 story, 40 x 100 ft., and miscellaneous items, including 1 locomotive

Industrial Work (Continued)

[illegible] steel buildings, [illegible] and steel trusses and "T" and "U" buildings. About [illegible] at its plant at Bway and Fallowfield Sts., to MacClintic-Marshall Co., 1911 Bridge Ave., Phila.

★**N. J., Newark**—American Can Co., 129 [illegible] New York City, let contract 3-story, [illegible] x 400-ft. brick [illegible] factory, Wallace St. to Ameri Concrete Steel Co., 17 Clinton St.

★**Pa., Edgewater** — (Oakmont P. O.)—Edgewater Steel Co. let contract building addition to factory here, to Austin Co., 1440 Euclid Ave., Cleveland, O. About $[illegible].

★**Pa., Phila.** — Ballayne Worsted Mills, Wister St. and Pennsylvania R.R. let contract, 61 x 412 ft. factory, 16th St. and Huntington Park Ave., to H. E. Baton, 12 Sansome St., $152,000. Noted Apr. 5.

★**Pa., Phila.**—J. T. Lewis & Bro., Lafayette Bldg., let contract 2-story, brick and [illegible] factory addition to Turner Concrete Steel Co., 1713 Sansom St. About $150,000.

★**W. Va., Mullens** — (Official) — Mullens Ice & Cold Storage Co., let contract cold-storage and bottling plant, to Earley Bros., Mullens, $36,000. Noted Nov. 8.

★**O., Bedford**—Bedford China Co. let contract 1st unit of pottery plant, 1 story, brick and concrete, to W. Dunbar Constr. Co., 6201 Cedar Ave., Cleveland. About $150,000. Total cost, $500,000.

★**O., Cleveland**—Parish & Bingham Co. let contract 2-story, 50 x 220-ft. and 1-story, 50 x 265-ft. machine shop, die and storage buildings, to W. I. Thompson Co., 6110 Euclid Ave., percentage basis.

★**O., Cleveland**—Wellman-Seaver-Morgan Co., [illegible] Central Ave., S. E. let contract for 150 x 400-ft. steel factory in connection with its Akron works, to G. A. Fuller Co., 644 Swetland Bldg.

★**O., Elyria**—Willys Overland Co., Overland Bldg., Toledo, let contract, 1-story, [illegible] x 40-ft. boiler house, to Crowell-Ludoff-Little Co., 1951 East 57th St., Cleveland, $[illegible].

★**Ill., Peoria**—Holt Mfg. Co., West Washington, East Peoria, let contract, 1-story, 140 x 300-ft. foundry, to V. Jobst & Sons, 109 South Jefferson St. Noted July 26.

★**Wis., Cudahy**—Federal Rubber Co. let contract 1-story, 60 x 160-ft. factory here, to Leonard Constr. Co., 332 South Michigan Ave., Chicago, $150,000.

★**Wis., Manitowoc**—Tinsel Mfg. Co. let contract 1-story, 60 x 120-ft. factory, 16th and Hamilton Sts., to W. W. Oerlein, 86 Michigan St., Milwaukee.

★**Wis., Milwaukee** — American Grinder Mfg. Co., 2246 Sycamore St., let contract factory, 85 x 121-ft. addition to shop, to Cunningham Eng. Co., North Milwaukee, $[illegible].

★**Ia., Dubuque**—Adams Co., 295 6th St., let contract 2-story, 74 x 249-ft. factory, to A. Zwick, 1891 Clay St., $40,000.

★**Kan., Arkansas City**—Kansas Gas & Electric Co. let contract large addition to plant to Dinwiddie Constr. Co., 721 Munsey Bldg., Baltimore, Md.

★**Kan., Wichita**—O. A. Boyle, c/o Boyle Const. Co., 143 North Rock Island Ave., let contract factory, 40 x 160-ft. warehouse to O. Seelhoff Const. Co., 301 Finance Bldg., Kansas City, Mo., $[illegible].

★**Neb., Ord**—City let contract electric-light plant to Myrtle-Hefner Machinery Co., 101 Interstate Bldg., Kansas City, Mo., $[illegible].

★**Wyo., Torrington**—J. P. Nolan let contract 2-story, 100 x 145-ft. garage, to Ideal Constr. Co., Bridgeport, Neb., $40,000.

★**Okla., Oklahoma**—Sefore Candy Co., 317 Grand Ave. Bldg., let contract, 4-story, 50 x 150-ft. factory, to Campbell & Pyle, 610 Majestic Bldg., $[illegible]. Noted Aug. 9.

★**Ont., Fergus**—J. Wilson & Sons, St. Andrews St., let contract 2-story, brick and [illegible] addition to G. J. Jeffrey, 71 Victoria St., Toronto. Noted Nov. 18.

★**Ont., Sault St. Marie**—Algoma Steel Corp. let contract 4 blocks buildings to be built by Canadian Ore method, to Hilton Cement Gun Concrete Co., Ltd., Toronto.

BUILDINGS

Proposed Work

Mass., Haverhill—Hospital—City [illegible] lets contract, [illegible] 1-story, 37 x 94 ft. H. W. Cobb, 45 Cornhill St., Boston, archt.

Mass., Roxbury—Hospital—Grand Lodge of Elks plans to build hospital for sailors and soldiers on Parker Hill, to consist of 6 units. About $200,000. Address J. R. Nicholson, 45 Commercial Wharf, Boston.

Conn., New Haven—Hotel—A. Porto had plans prepared by R. Williams, archt., Chamber of Commerce Bldg., 4-story, brick, Columbus Ave., and Water St.

Conn., New Haven—Office—W. P. Curtis, c/o Union & New Haven Trust Co., 57 Church St., representing syndicate, having plans prepared by C. Gilbert, archt., 244 Madison Ave., New York City, 10-story, fireproof, on Church St. About $800,000.

N. Y., Brooklyn—Bank—Peoples Natl. Bank, 1336 Bway., having plans prepared by Koch & Wagner, archts., 26 Court St., 1 story, 44 x 106 ft., Quincy St. and Ralph Ave. About $130,000.

N. Y., Brooklyn—Hospital—Maternity Hospital Society, 1666 Pitkin Ave., soon lets contract. About $75,000. Cohn Bros., 363 Stone Ave., archts.

N. Y., Brooklyn—Restaurant and Theater—Putnam Theatrical Co., c/o M. Loew, 1493 Bway., New York City, had plans prepared by T. W. Lamb, archt., 644 8th Ave., New York City. About $500,000.

N. Y., Freeport—Theatre and Office—F. Tinney, c/o C. E. Kern, archt., 55 East Ave., soon lets contract, 2 story, 117 x 200 ft.

N. Y., New York—Court—City had plans prepared by A. Hopkins, archt., 101 Park Ave., 2-story, 44 x 100-ft. brick and marble, 2nd St. and 2nd Ave. About $150,000. W. McAdoo, 300 Mulberry St., chief city magistrate.

N. Y., Randalls Island—Kitchen—City of New York having plans prepared by D. Barber, archt., 101 Park Ave., New York, City, 1-story. About $65,000. J. A. Kingsbury, Municipal Bldg., New York City, comr. charities.

N. J., Trenton—Administration, Home, Etc.—Bd. Mgrs. State Home for Girls plans colony to include administration building, 3 separate wards, etc. About $300,000. Dr. J. M. Reese, Phillipsburg, pres.

Pa., Harrisburg—Hospital—State plans. About $200,000. Address Lewis S. Sadler, Carlisle.

Pa., Phila.—Club—Drexel Hill Club had plans prepared, 2 story, Garrett Rd. and Beaumont Ave. About $60,000.

Pa., Warren—Hospital—Warren State Hospital for Acute Patients having plans prepared by Kendall, Taylor & Co., 93 Federal St., Boston, Mass., and E. A. Phillips, Warren Trust Bldg., archts., for new buildings. About $250,000.

Pa., Tamaqua—High School—Bd. Educ. plans. Bonds for $125,000 voted for work.

Ga., Atlanta — Store — Davison-Paxon-Stokes Co., 59 Whitehall St., has leased McClure store corner, Whitehall and Hunter Sts., and plans to build new 4-story, 31 x 103-ft. building. W. T. Downing, Grant Bldg., archt.

O., Cleveland—Store—Wolfe-Sill Realty Co., 715 Garfield Bldg., having plans prepared by Steffens & Steffens, archts., 1027 Williamson Bldg., brick and concrete, at East 141st and St. Clair Sts. About $[illegible].

O., Dayton—Bank—General City Bldg. & Loan Assn. had plans prepared by Schenk & Williams, archts., 591 Arcade Bldg., 1 story, 38 x 50 ft. About $100,000. O. J. Bard, mgr.

O., Deshler—School—City election soon to vote on $80,000 bond issue to build school.

O., East Cleveland—(Cleveland P. O.)—Junior High School—Bd. Educ. soon lets contract, 3-story, rein.-con. and brick. About $200,000. C. S. Schneider, 2258 Euclid Ave., Cleveland, archt.

O., East Cleveland—(Cleveland P. O.)—Hospital—Hospital Comrs. soon let contract, 4 story, [illegible] ft., brick, rein. con. and steel. About $200,000. W. Hirsch, 1303 Swetland Bldg., archt. Noted Aug. 23.

O., London—Prison—State plans to build near here. Cost between $3,000,000 and $4,000,000. Richards, McCarty & Bulford, Hartman Bldg., Columbus, archts.

O., Norwood—School — Bd. Educ. had plans prepared, 2-story, 79 x 131 x 138 ft. H. Hake & C. Kuck, Telephone Bldg., Cincinnati, archts., soon receive bids.

O., Ravenna—Hospital—Portage Co. election soon to vote on $50,000 bond issue to build hospital.

O., Shaker Heights (Cleveland P. O.)—School—Bd. Educ. will receive bids about Jan. 1. Cost, $300,000. F. C. Warner, Hippodrome Annex, Cleveland, archt.

O., South Newburg—(Cleveland P. O.)—School—Town plans to build. Bonds for $50,000 voted for work.

O., Steubenville—Hotel—C. Mildner, Imperial Hotel, represents company having plans prepared by Peterson & Clark, archts., Nath Bldg., to construct hotel. About $300,000.

O., Toledo—Hotel—Ohio Athletic Club having plans prepared by Mills, Rhines, Bellman & Nordhoff, archts., 1234 Ohio Bldg., 10 story, 125 x 150 ft., 11th St. and Madison. Ave. About $500,000.

Ind., Farmerville—Court House—Spencer Co. plans. About $125,000.

Ind., Ft. Wayne—Store—D. N. Foster Furniture & Carpet Co., 715-17 Court St., plans, 4 story, 70 x 126 ft., tile, on Main St.

Mich., Alma—Hotel—Alma Development Co. plans. About $150,000. E. R. Dunley, Hammond Bldg., Detroit, archt.

Mich., Detroit—Office—Michigan State Telephone Co. plans, 8 story, 100 x 214 ft., Michigan and State Sts. About $1,250,000. Smith, Hinchman & Grylls, Washington Arcade, archts.

Mich., Jackson—Hotel—J. Cavanaugh, 251 Main St., having plans prepared by E. E. Bailey, archt., Chambers Bldg., Oil City, Pa. About $200,000.

Ill., Chicago—Hotel—A. Pick & Co., 212 West Randolph St., plans, 10 or 12 story, 84 x 90 ft., Madison and Market Sts. About $600,000.

Ill., Chicago — Office — See "Industrial Works."

Ill., Lake Forest—Church—Methodist Congregation plans, on Market Sq. About $100,000. D. W. Brown, pastor.

Ill., Rock Island—Hospital—Sisters of Mercy having plans prepared by A. Dohmen, archt., 1st Natl. Bank Bldg., Milwaukee, Wis. About $200,000.

Ill., Urbana — Hospital — University of Illinois plans, on Armour Ave. About $120,000.

Wis., Kenosha — Theater—A. Meis, c/o Virginia Theater, had plans prepared by White, White & White, archts., 414 Pub. Serv. Bldg., 2-story, 65 x 140 ft. About $90,000.

Wis., Lake Geneva—Hospital—Northwestern Military & Naval Academy, Lake Geneva, having plans prepared by Marshall & Fox, archts., 706 Lincoln Ave., Chicago, building hospital and refectory; also power and lighting plant. About $125,000.

Wis., Milwaukee — High School — Bd. Educ. plans, 4 story, 250 x 250 ft., Lenox and Montana Sts. About $600,000. Van Ryn & De Gelleke, 726 Caswell Blk., archts.

Wis., Milwaukee — Terminal — Chicago North Shore Rd. had plans prepared, Grand Ave. About $250,000. B. J. Fallon, 72 West Adams St., Chicago, ch. engr.

Wis., Washburn—Club House—Du Pont Powder & Munitions Co., Du Pont Bldg., Wilmington, Del., plans to build here for employees. About $80,000.

Ia., Des Moines—Hotel—Witmer Estate, 201 Manhattan Bldg., plans, 4th and Locust Sts. About $1,000,000.

Ia., Dubuque—Hospital — Dubuque Co. having plans prepared by K. F. Saam, archt., 428 Security Bldg., 2-story, 7th Ave. About $75,000. R. Benson, chn. bldg. comn.

Ia., Newton — Church — Congregational Church plans to rebuild church destroyed by fire last winter. About $60.000. G. C. Williams, pastor.

Ia., Pella—Dormitory, Etc.—Central College plans to build women's dormitory, gymnasium and auditorium. About $100,000.

Minn., Alexandria—Court House and Jail—Douglas Co. plans 2-story, 104 x 192-ft. courthouse, rein.-con. and marble, and 2-story, 74 x 100-ft., rein.-con. jail, on Belknap St.

Minn., Austin—Hospital—St. Olaf's Hospital, 908 Lansing St., soon lets contract, 8-story. About $50,000. C. S. Sedgwick, Lumber Ex. Bldg., Minneapolis, archt.

Minn., Minneapolis—Hotel and Stores—C. G. Wentworth, 100 Metropolitan Life Bldg., had plans prepared by J. W. Lindstrom, archt., Andrus Bldg., 3-story, 50 x 165-ft. hotel and 3 stores.

Buildings (Continued)

Tex., Waco—School—Bd. Educ. having plans prepared by L. Schmidt, archt., 121 North Market St., for addition. About $60,000.

Okla., Miami—See "Streets and Roads."

Wash., Seattle—See "Industrial Works."

Ont., Winona—Aerodrome—Royal Flying Corps, 56 Church St., Toronto, plans aerodrome, including hangars, water-works, lighting system, sewerage system and concrete roadways. About $500,000. J. B. Carswell, 56 Church St., Toronto, archt.

BIDS DESIRED

N. Y., Suffern—Hospital—Until Dec. 8, by Rockland Co. Comrs., for tuberculosis hospital. Tooker & Marsh, 101 Park Ave., New York City, archts.

Pa., Harrisburg—Junior High School—Until Nov. 27, by Bd. Educ., 4-story. About $300,000. C. Howard, Lloyd Telegraph Bldg., archt.

O., East Cleveland—(Cleveland P. O.)—(Official)—Junior High School—Until Dec. 10, by Bd. Educ., 3-story, rein.-con. and brick. About $200,000. C. S. Schneider, 2258 Euclid Ave., Cleveland, archt. Noted Nov. 15.

Ind., Lafayette—Office—Until Nov. 27, by Lafayette Life Insurance Co., 10 story, 51 x 121 ft., 3rd and Main Sts. J. A. Alexander & Son, Ball Blk., archts. Noted July 19.

Ia., Corinth—School—Until Nov. 26, by Bd. Educ., 2 story, rein. con. About $70,000. W. C. Oelke, secy.

Kan., Wichita—Hospital—Until Jan. 1, by Wesley Hospital, for 1st unit, 4 story. About $250,000.

Wash., Grand Mound—Cottage—Until Dec. 1, by O. A. Togerson, secy. state bd. control, Olympia, building cottage and power plant at state institution. About $70,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Yonkers**—School—Bd. Educ. let contract addition to School No. 16 to T. & C. Miller Bros., 244 Riverdale Ave. About $70,000.

★**Pa., Ashley**—High School—Bd. Educ let contract, 2 story, 100 x 118 ft., brick and steel, to E. J. Donohue, Ashley. Noted Sept. 6.

★**Wash., D. C.**—Office—Arlington Bldg., Inc., c/o Wyatt & Nolting, archts., Keyser Bldg., Baltimore, Md., let contract on Vermont St. to Underpinning & Foundation Co., 290 Bway., New York City. About $2,500,000.

★**Ala., Birmingham**—Schools—Bd. Educ. let contract 3 schools to J. W. Ager, $58,000. Noted Oct. 11.

★**Mich., Detroit**—Store—R. H. Fyfe & Co., Woodward Ave., let contract 10-story store and garage, to J. T. Mayhew, 317 Grand River St., $300,000.

★**Mich., Port Huron**—Grade and High School—Bd. Educ. let contract junior high and grade school, to A. Schultz, 805 Bancroft Ave., $113,224. Noted July 26.

★**Ia., Templeton**—School—Bd. Educ. let contract consolidated school building to C. W. Ennis, Toledo, Ia., $64,925.

★**Minn., Minneapolis**—Hospital, Etc.—Bd. Charities and Corrections, Court House, let contract 3-story, rein.-con. hospital, and 1-story, 25 x 10-ft., rein.-con. power house to R. J. Cheney & Co., 716 11th Ave. About $86,748. Noted Oct. 4.

★**Kan., Lawrence**—Administration and Liberal Arts—State University let contract, 3-story, rein.-con., to Olson & Johnson, 1st Natl. Bank Bldg., Omaha. About $300,000. Noted Sept. 20.

★**Tex., Beaumont**—Freight Depot—Gulf Coast Line, Amer. Trust Bldg., let contract Neches and Bowie Sts., to H. Weber, Beaumont. About $50,000. Noted Oct. 4.

★**Tex., Denton**—Church—First Baptist Church will be built by day labor. About $50,000. Address J. W. Alexander, Denton.

★**Okla., Okmulgee**—Hospital—City let contract 3-story, 40 x 80-ft. steel, concrete and brick, to L. Crosby & Son Constr. Co., Massachusetts Bldg., Kansas City, Mo., about $50,000. Noted Nov. 15.

★**Colo., Denver**—Museum—City and Denver Co. let contract, 2½-story addition, to A. Olson, 655 Vine St., $75,000.

★**Wash., Tacoma**—(Official)—Theater—J. S. Baker & H. F. Moore let contract 3-story, 90 x 120-ft., rein.-con., steel and brick, 9th and Market Sts., to Dawson & Dahlberg, Tacoma, $60,000. Noted Nov. 1.

FEDERAL GOVERNMENT WORK

Proposed Work

N. Y., Waterloo—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., rejected bids opened Oct. 28. Noted Nov. 1.

Pa., Ft. Mifflin—Ammunition Box Repair House and Central Heating Plant—Bureau Yards and Docks, Navy Dept., Wash., preparing plans; Specification No. 2716.

Pa., Ft. Mifflin—Marine Barracks—Bureau Yards and Docks, Navy Dept., Wash., preparing plans; Specification No. 2717. About $70,000.

Wash., D. C.—Addition to Hospitals—War Dept., I. W. Littell, brig. genl. soon lets contract for additions to present base hospitals at Camp Mills, Garden City, and Camp Upton, Yaphank, L. I.

La., Grande Isle—Buildings—E. P. Bertholf, capt. commandant, U. S. Coast Guard, Wash., D. C., rejected bids opened Oct. 29 for new buildings and accessories for Coast Guard Station No. 214, Baratarvia Bay. Noted Nov. 1.

O., Kenton—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., rejected bids opened Nov. 1. Work will be readvertised. Noted Nov. 8.

BIDS DESIRED

R. I., Melville—Dredging—Until Dec. 3, by Bureau Yards and Docks, Navy Dept., Wash. About $26,500. Noted Nov. 1.

R. I., Newport—Warhead Storage Building—Until Nov. 26, by Bureau Yards and Docks, Navy Dept., Wash., building, on Rose Island. About $15,000.

Conn., New London—Power House and Machine Shop—Until Nov. 30, by Bureau Yards and Docks, Navy Dept., Wash., building at submarine base; Specification No. 2626.

N. J., Lake Denmark—Fencing—Until Nov. 26, by Bureau Yards and Docks, Navy Dept., Wash., fencing U. S. magazine buildings. About $54,000.

Md., Indian Head—Powder Dry Houses—Until Nov. 24, by Bureau Yards and Docks, Navy Dept., Wash. About $230,000.

Wash., D. C.—Locomotive Dry Dock Cranes—Until Nov. 26, by Bureau Yards and Docks, Navy Dept., for furnishing at Norfolk, Va., Phila. and New York Navy Yards.

Wash., D. C.—Pattern Shop—Until Dec. 3, by Bureau Yards and Docks, Navy Dept., Wash., building at Navy Yard. About $475,000.

Wash., D. C.—Refrigerating Apparatus, Electric Freight Elevators, Meat Dregs, etc.—Until Dec. 10, by Major B. Crowell, E. O. R. C., U. S. Army, genl. purch. agt. Panama Canal, Wash., D. C.; advertised in this issue.

La., Alexandria—Post Office—Until Dec. 27, by J. A. Wetmore, superv. archt., treas. dept., Wash. Noted May 3.

Ill., Rock Island—Addition to Filtration Plant—Until Nov. 25, by G. W. Burr, colonel ordnance dept., Rock Island Arsenal, enlarging filtration plant.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—Heating Apparatus—Bureau Yards and Docks, Navy Dept., Wash., let contract installing heating apparatus, Commonwealth Pier, to Walworth-English Flett Co., 100 Pearl St., $6123. Noted Nov. 8.

Mass., Boston—Timber Railroad—Bureau Yards and Docks, Navy Dept., Wash., received low bids building at Navy Yard (work complete), from W. L. Miller Co., Boston, $7,130; C. M. Leach, Boston, $7,874; Randall Stoddard Co., Chelsea, $12,998. Noted Nov. 1.

Mass., Chelsea—Heating, Plumbing and Lighting—Bureau Yards and Docks, Navy Dept., Wash., received low bids contracting in emergency hospital, from Lynch & Woodward, 16 Beach St., Boston, $3,824; Burchel & Co., 14 Union Park St., Boston, $410.48; Lord Electrical Co., 11 Water St., Boston, cost plus percentage. Noted Nov. 8.

★**R. I., Newport**—Battery Shed—Bureau Yards and Docks, Navy Dept., Wash., let contract battery sheds for Submarine Base, to Darling & Slade Constr. Co., 11 Bway., St., $37,000.

★**R. I., Newport**—Extension to General Storehouse—Bureau Yards and Docks, Navy Dept., Wash., let contract, to J. Herndon, 12 Boynton St., Worcester, Mass., $147,833. Noted Nov. 15.

Conn., New London—Torpedo Shop and Storage Building—Bureau Yards and Docks, Navy Dept., Wash., received low bids, building at submarine base, (a) net price, (b) using concrete foundation, from M. F. Kelley, 401 West 126th St., New York City, (a) $35,867, (b) $35,000; Darling Slade Constr. Co., Contractors Bridge, Newport, R. I., (a) $39,488, (b) $35,686; R. H. Arnold & Co., Woodward Bldg., Wash., D. C., (a) $43,950, (b) $41,718. Noted Oct. 25.

★**N. Y., Brooklyn**—Addition to Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract, to B. Knapp, 431 West 41st St., New York City, $15,670.

★**N. Y., Brooklyn**—Emergency Hospital—Bureau Yards and Docks, Navy Dept., Wash., let contract to Frymier, Hanna Co., 25 West 45th St., New York City, $198,512.

N. Y., Brooklyn—Shipbuilding Ways—Bureau of Yards and Docks, Navy Dept., Wash., received bids Nov. 12, (a) excav., (b) filling, (c) dredging, (d) timber work, (e) timber work, (f) removal of quay wall, (g) rein.-con., (h) plain concrete, (i) rein.-steel, (j) expansion joints, (k) miscellaneous metals, (l) rip rap, (m) recovering and resetting granite coping, (n) miscellaneous work, (o) concrete piles (alternate only), Specification 2577, from:

Jarrett-Chambers Co., 30 East 42nd St., New York, (a-1), $1.20; (a-2), $3.60; (a-3), $10; (b) $.28, (c), $.44; (d) $.39; (e-1), $2.18; (e-2), $175; (e-3), $215; (e-4), $208; (e-5), $86; (e-6), $107; (e-7), $30; (f) $12,000; (g-1), $42; (g-2), $40; (h-1), $12; (h-2), $11; (h-3), $39; (i), $.078; (j), $243; (k-1), $.088; (k-2), $.053; (k-3), $.083; (k-4), $.105; (k-5), $.078; (l), $1.64; (m), $2.46; (o), $1.80; time, 240 days.

I. J. Stander & Co., 118 East 28th St., New York, (a-1), $2, alternate, $2.10; (a-2), $4.30; alternate $4.30 (a-3), $6.40; (b), $.25; (c), $2.50; (d), $.60; (e-1) $178; (e-2), $186; (e-3), $156; (e-4), $157; (e-5), $153; (e-6), $116; (e-7), $14; (f), $14,000; (g-1), $15; (g-2), $16; (g-3), $24; (h-1), $12; alternate, $18; (h-2), $18; (h-3), $23.56; (i), $11; (j) $400; (k-1), $.14; (k-2), $.97; (l), $170; (m), $1.50; time, 270 days.

Degnon Contg. Co., 68 Hunterspoint Ave., Long Island City, (a-1), $5; (a-2), $6.50; (a-3), $8; (b), $2; (c), $2; (d), $.65 alternate, $.75; (e-1), $165; (e-2 to 6), $165; (e-7), $75; (f) $10,000; (g-1), $20; (g-2), $21; (g-3) $22; (h-1), $17; (h-2), $18; (h-3), $19; (i), $.08; (j), $125; (k-1), $.15; (k-2) $.16; (k-3) $.10; (k-4) $.12; (k-5), $.12; (l), $5; (m), $3; time, 140 days. Noted Oct. 18.

N. Y., New York—Aircraft Storage and Aircraft Repair for Export—Bureau Yards and Docks, Navy Dept., Wash., received low bids, (a) work complete, (b) structural steel (c) and (d) alternate from Post & McCord, 100 Park Ave., (a) $284,000, (c) deduct $4000, (d) add $450; Austin Co., Bulletin Bldg., Phila., (a) $.65,850, (b) $198,800, (c) $.09,675, (d) $268,160; J. Stewart & Co., 30 Church St., (a) $273,000, (b) $200,000, (c) deduct $3000, (d) add $1000; U. S. Steel Products Co., 30 Church St., (b) $86,288.

N. Y., New York—Pneumatic Tube System—Bureau Yards and Docks, Navy Dept., Wash., received low bids (a) work complete, (b) c and d1 alternate bids from Lampson Co., Boston, Mass., (a) $.6,847, (b) $18,311, (c) $1.77, (d) $.40; Standard Store Service Co., Inc., 381 Madison Ave., (a) $24,850, (b) $20,800, (c) $2, (d) $1.40.

N. J., Cape May—Cottage Quarters—Bureau Yards and Docks, Navy Dept., Wash., received low bids from Morse Dredge Construction Co., 49 Cortlandt St., New York City, $1,000; W. F. Kemp, 8426 Lafayette St., Chicago, $1,111.

Pa., Ft. Mifflin—Buildings—Bureau Yards and Docks, Navy Dept., Wash., received low bids building addition to Building No. 61, also one steel building, (a) 8 x 150 ft., (b) 10 x 80 ft., from Monahan & Lewis, Inc., 1111 Chestnut St., Phila., (a) $11,000, (b) $4,048; George B. Dunn, 1711 North 11th St., Phila., (a) $14,888. Noted Oct. 18.

★**Pa., Hollidaysburg**—Post Office—J. A. Wetmore, supervising archt., treas. dept., Wash., let contract to King Lumber Co., Williamsville, Va., $1,000. Noted Nov. 8.

Pa., Phila.—Filling and Pier at A. Building, Wash.—Bureau Yards and Docks, Navy Dept., received low bids, (a) filling and bulkhead wall at Navy Yard, Specification No. 2577, and (b) [illegible] from [illegible]

Federal Government Work (Continued)

City, Item 1, $.55; 2, $85; 3, $95; 3b, $105; [illegible]; 4c, $15; 4d, $8; 4e, $10; 5, $115; 6a and [illegible]; 7a and e, $.07; 7f, $.10; g and h, $.08; 8a, $.05; b, $.07; c and d, $.10; e, $30; f, $4500; g, $275; 9, $.70; 10a, $.14; 11a, $35; 12, $25; 13, $25; 14, $.50; 16, $300; Degnon Constr. Co., 68 Hunters Point Ave., Long Island City, 1a, $.50; b and c, $.60; Item 2, $160; 3a and d, $110; 4a, $15; Item 5, $160; 6a, $12; 7a, $12; 8a, $.05; 9, $.75; 10a and b, [illegible]; 11a, $80; 12, $20; 13, $20; 14, $50. Maryland Dredging Co., 1515 Fidelity Bldg., Baltimore, Md., 1a, $.95; [illegible]; 3a, $150; 4a, $17; 5, $140; 6a and f, $.15; 7a and g, $.10; 8a, $.05; 9, $1; 10a and b, $.30 each, 11a and c, $50; 12, $25; 13, $5; 14, $42. Noted Nov. 8.

Pa., Phila.—Railroad Turntable—Bureau Yards and Docks, Navy Dept., Wash., received only bid (work complete) from Amer. Bridge Co., 600 Cont. Trust Bldg., Baltimore, $7200.

Pa., Phila.—Sprinklers—Bureau Yards and Docks, Navy Dept., Wash., received only bid furnishing under Specification No. [illegible] from General Fire Extinguisher Co., 275 West Exchange St., Providence, R. I., (1) $20,372, (2) $1807, (3) $4465.

Pa., Phila.—Tank and Tower—Bureau Yards and Docks, Navy Dept., Wash., received low bids building steel water tank and tower, (a) work complete, (b) alternate bids from Memphis Steel Constr. Co., Magee Bldg., Pittsburgh, (a) $16,864, (a1) $16,816, (b) $16,678, (b1) $15,529; Aetna Steel Products Co., 30 Church St., New York City, (a) $21,500; Chicago Bridge & Constr. Co., New York, (a) $22,500, (b) $18,200.

Md., Indian Head—New Dock and Railroad—Bureau Yards and Docks, Navy Dept., Wash., received low bids, unit prices, from McLean Constr. Co., Fidelity Bldg., Baltimore, (a) $300 per acre, (b) $.83, (c) $4.75, (d) $1000, (e) $3, (f) $40, (g) $12, (h) $.70, (i) $15.00; W. J. Torrington, Weightman Bldg., Phila., (a) $2, (b) $86,-250, (c) $44,588, (d) $11,000, (e) $90,600, (f) $2500, (g) $4465, (h) $675,000, (i) $1[illegible]. Noted Nov. 8.

Wash., D. C.—Addition to Forge Shop—Bureau Yards and Docks, Navy Dept., received low bids building at Navy Yard, (a) work complete, (b) per lin.ft. for piles, (c) addition for removal of roof, from Boyle Robertson Constr. Co., Evans Bldg., (a) $117,874, (b) $.45 add., (c) $124,705; A. C. Moses Constr. Co., 916 New York Ave., (a) $119,200, (b) $1531 add.; M. A. Weller Co., 816 14th St., (a) $121,477. Noted Nov. 8.

Wash., D. C.—Fitting out Cranes—Bureau Yards and Docks, Navy Dept., Wash., received low bids for 2 electrically operated fitting out cranes of 350 gross ton capacity at Navy Yards, Norfolk, Va., New York and Phila., as follows: (a) Work complete; (b) modification of Drawing No. 68,192 (under this item bids may be submitted for cranes of two or more operations controlled by single motor by means of suitable clutches; (c) one crane in accordance with drawing No. 68,193; (d) one crane drawing No. 68,193 Navy Yard, Philadelphia; (e) one crane drawing No. 68,193, Navy Yard, Norfolk, Va.; (f) modification of (e); (g) one crane drawing No. 68,193, Navy Yard, New York. Wellman-Seaver-Morgan Co., 7000 Central Ave., S. E., Cleveland, Ohio, (a) $2,414,840, (b) $825,950, (c) $881,000, (d) $888,000, McMyler, Interstate Co., 49 Cedar St., New York City, (a) $2,449,670, (b) $844,822, (c) $843,925, (d) $2,405,875, (e) $827,771, (f) $881,371; Webb & Ryan, New York, N. Y., cost plus [illegible]%, informal, no check with bid. Noted Oct. 18.

★**Wash., D. C.**—Hospitals—War Dept., Brig. Gen. J. W. Lutes let contract building 24 hospitals at Walter Reed Army General Hospital to Bleasby & Harrell, Kellogg Bldg., cost plus percentage.

Wash., D. C.—Pier and Bulkhead—Bureau Yards and Docks, Navy Dept., received low bids building at Hampton Roads; specification No. [illegible], from [illegible] Co., 88 Broad St., Boston, Mass., Item 1, $.98; 2, $119.00; 3, $87.10; 4, $.75; 5a, $.0865; b, $.0865; 6, $.0524; 7a, $.76; 8a, $[illegible]; b, $.[illegible]; c, $.[illegible]; 9, $[illegible]; 10, $.[illegible]; 11, $[illegible]; 12, $.[illegible]; 13, $[illegible]; 14, $[illegible]; 15, $[illegible]; 16, $[illegible]; 17a, $[illegible]; b, $[illegible]; c, $[illegible]; 18, $[illegible]; 19, $[illegible]; 20, $[illegible]; 21, $[illegible]; 22, $[illegible]; 23, $[illegible]; 24a, $.075; 25a, $102.08; 26a, $.264; [illegible]; 27a, $.[illegible]; 28a, $.[illegible]; 29, $.[illegible]; 30, $.[illegible]; 31, $.[illegible]; 32, $.[illegible]; 33, $.[illegible]; 34, $.[illegible]; 35, $.[illegible]; 36, $.[illegible]; 37, $.[illegible]; 38, $.[illegible]; 39, $.[illegible]; 40, $.[illegible]; 41, $.[illegible]; 42, $.[illegible]; 43, $.[illegible]; 44, $.[illegible]; 45, $.[illegible]; 46, $.[illegible]; 47, $.[illegible]; 48, $.[illegible];

Water-Works (Continued)

Wis., Hurley—City voted $360,000 bonds to build water system.

Wis., Manitowoc — See "Streets and Roads."

Wis., Milwaukee—(Official)—City Council defeated project to build water purification plant. Noted Nov. 15.

Wis., Sparta—City soon lets contract drilling 10-16-in. well, 300 ft. deep. W. G. Kirchoffer, Madison, engr.

Kan., Chanute—City plans to improve water system including elevated tower of 250,000 gal. capacity, 7600 ft. 16-in. c.-i. pipes. About $42,000. C. Pratt, city engr.

Kan., Waverly—City plans to issue $11,000 bonds to install new engine and pump at water-works and repair reservoir.

N. D., Belfield — City plans to install water system. About $30,000.

Wyo., Lusk—City plans election Dec. 18 to vote on $12,000 bond issue for water-works system. D. E. Goddard, clk.

Mo., Kansas City—City plans to lay 48 in. water main, 22,000 ft. long, on Nicholson and Monroe Sts. About $500,000. First unit to cost $10,000. R. W. Stalnaker, secy. water & fire bd.

Mo., Kansas City—Water Bd. plans to build water pumping station in East Bottoms to have 20,000,000-gal. capacity. C. Hill, city engr. Noted Nov. 8.

Mo., Maysville—City plans to build reservoir, 1,000,000 gal. capacity. A. D. Hewitt, clk.

Tex., Crosbyton—(Official)—City having plans prepared by H. E. Elrod, engr., Interurban Bldg., Dallas, building water system.

Tex., Quenah — (Official) — City having plans prepared by H. E. Elrod, engr., Interurban Bldg., Dallas, building water system. About $150,000. Noted Oct. 18.

Tex., San Marcos—San Marcos Utilities Co., San Marcos, plans to improve water-works system and electric-light plant. About $20,000.

Okla., Altus—City election Dec. 4 to vote on $80,000 bond issue to extend and improve water-works. E. Morgan, clk.

Okla., Buffalo—City plans to build water system.

Okla., Cyril—City election soon to vote on $20,000 bond issue to build water system. A. W. Funnell, pres.

Okla., Madill—City voted $65,000 bonds to build water system. Noted Nov. 1.

Okla., Sulphur—City voted $10,000 bonds to build water system. Noted Nov. 22.

Utah, Brigham—City rejected bids improving water system. Work will be readvertised. Noted Oct. 4

Ariz., Globe—(Official)—City postponed election until next May to vote on $435,000 bond issue for addition to water system and improvements to sewers. Noted July 26.

Ariz., Williams — Town voted $55,000 bond issue for water-works system at recent election. Noted Oct. 4.

Ariz., Yuma—City election Dec. 11 to vote on $400,000 bond issue to build water, gas, electric-light, heat and power systems.

Cal., Napa—State Bd. Control, Sacramento, plans to build water system here to provide water for State Hospital, Fry and Smith-Brown Ranches, and Veterans' Home. M. De Motte, chn. About $70,000.

Cal., Seal Beach—City voted $15,000 bonds to build water system. Noted Oct. 4.

Cal., Vallejo—City had plans prepared by F. H. Tibbets, engr. Mutual Commercial Bldg., San Francisco, building reservoir, 273,000,000-gal. capacity, to supply water for Green Valley. About $200,000. Noted July 12.

Ont., London—City plans to extend water mains to new soldiers' hospital in county. About $25,000. E. V. Buchanan, City Hall, mgr. utilities comrs.

BIDS DESIRED

N. Y., New York—Until Dec. 3, by W. Williams, comr. water supply, gas and Electricity, Municipal Bldg., heading and laying water mains and appurtenances to cross-connect existing mains in Southern Blvd., from East 163rd St. to East 181st St. (Bronx Boro.)

O., Wooster—(Official)—Until Dec. 20, by Dir. Pub. Serv. improving water system. W. J. Sherman Co., Nasby Bldg., Toledo, engrs.; advertised in this issue.

Mich., Jackson—(Official)—Until Dec. 5 by A. W. D. Hall, city mgr., drilling 4 wells; advertised in this issue.

Mont., Laurel — Until Dec. 4, by city, building intake in Yellowstone River for water system. G. A. Allen, clk. B. C. Lillis, 239 Clark Ave., Billings, engr.

PRICES AND CONTRACTS AWARDED

S. C., Columbia—City received low bids installing one 3,000,000-gal. and two 5,000,000-gal. centrifugal pumps in pumping station, from Earle Gear & Machine Co., Stinton and Wyoming Aves., Phila., $5532; Morris Machine Works, 41 Cortlandt St., New York City, $5550; Matthews Electric Co., $6000. Noted Nov. 15.

★**Neb., Hoskins**—City let contract for engine and pump for water system to Merkle Machinery Co., 1020 Woodmen of World Bldg., Omaha; tower and tank to Steel Structural Wks.; pumphouse, to Farmers' Lumber Co., Hoskins. About $10,000. Noted Oct. 25.

Wash., Bremerton—City received low bids building concrete reservoir for water system, from W. B. Lance, Northern Bank Bldg., Seattle, $39,456; W. O. Pulett, Bremerton, $41,513; Swenson & Co., Arcade Bldg., Seattle, $45,592. Noted June 14.

Cal., Long Beach—See "Sewers."

SEWERS

Proposed Work

Conn., Bristol—City plans to install new septic or Imhoff tanks, new filtration beds, and general improvements to sewage disposal system. About $100,000. Sperry & Buell, Main St., city engrs.

Conn., Stratford—City plans to install sewerage system and sewage disposal plant. About $250,000. C. Potts, 30 Church St., New York City, engr. Noted Oct. 18.

N. Y., Brooklyn—Boro. plans to build sewers in Ave. M, East 3rd, East 4th and 60th Sts., Ocean Pkway. and 23rd Ave. About $44,000. L. H. Pounds, pres.

N. Y., Long Island City—Boro. plans to build sewer in Grand St. from Queens Blvd. to Long Island R.R. About $20,500. M. M. Connolly, pres.

N. J., Jersey City—(Official)—City rejected bids for 18 in. vitr. pipe sewer in portion Summit Ave. About $12,366. Work will be readvertised. C. A. Van Kuren, city engr. Noted Nov. 1.

N. J., Trenton—City plans to install sewerage system in Riverside Park. About $19,732. J. R. Fell, Jr., city engr.

Pa., Johnstown—City having plans prepared by Gannett, Seelye & Fleming, engrs., 204 Locust St., Harrisburg, for sanitary sewerage system; $500,000 bonds voted for work. Noted Nov. 22.

Pa., Lansford—City voted $50,000 bonds to build sewers, parks and street improvements. J. B. Warriner, city engr. Noted Sept. 27.

Del., Laurel—City plans election to vote on $60,000 bond issue to build sewerage system and improve streets.

N. C., Gastonia—City plans to build sewage-disposal plant. L. M. Ross, city engr.

Tenn., Copperhill—See Water-Works.

Ky., Maysville—City defeated $[illegible] bonds to build sewerage system. Noted Sept. 13.

Ky., Paris—(Official)—City voted $20,000 bonds to build sewerage system. J. W. Hayden, city clk.

O., Cincinnati—City plans to issue $[illegible] bonds to improve sewers. F. S. King, city engr.

O., Cuyahoga Falls—Silver Lake Improv. Co., Platt-Iron Bldg., Akron, having plans prepared by Cunston Eng. Co., Leader-News Bldg., Cleveland, building concrete water main conn[illegible]. About $[illegible].

O., Newport—City plans to build trunk sewer in York St. from Ohio River to city limits. About $25,000. J. Bowman, city engr.

Ind., Frankfort—City having plans prepared building storm sewers in West Washington St. C. C. Hedges, city engr.

Ind., Union City—City has let contract building sewers. About $[illegible]. C. E. Hollinger, Greenville, O., engr.

Ill., Springfield—City plans to lay sewers on 17th St. from Laurel to Cook St. Also on St. from 16th to 17th St. Mason Ave.

from 15th to East Grand Ave.; also having plans prepared for sewer to be laid from Walnut and Mason St. to Lincoln Ave. About $150,000. W. D. Seeley, city engr.

Wis., Manitowoc—See "Streets and Roads."

Wis., South Milwaukee—City soon let contract, [illegible] on sanitary sewers in Dist. No. 3, involving 8-in. vitr. pipe, 250 ft., 16-in. c.-i. pipe. About $30,000. Alvord & Burdick, 8 South Dearborn St., Chicago, engr.

Minn., Lamberton—City plans to build sewerage system. A. L. & E. W. Goldenstar, Mankato, engrs.

Minn., Mankato—City having plans prepared by M. M. Cram, engr., Mankato, for sanitary sewerage system. J. H. A. Brahtz, 312 Commercial Bldg., St. Paul, cons. engr.

Minn., Melrose—Village soon let contract building sewerage system, involving about 5200 ft. 12-in. vitr. tile. Chute & Bradley, St. Cloud, engrs.

Minn., Winnebago—Village having plans prepared by C. H. Currie, engr., Webster, Ia., for storm sewerage system. About $60,000.

Mo., Carthage—City Council having preliminary plans prepared by L. E. Seaton, city engr., for lateral sewer in Dist. No. 29, embracing territory between Lyon and Forest Sts. on Wiggins and Macon Sts.

Mo., Kansas City—City having plans prepared building Blue River sanitary sewer. About $750,000. A. G. Ludlow, engr. bd. pub. wks.

Okla., Tulsa — City received no bids building storm sewer on Trenton St. from 3rd to Katy St. New bids H. H. Wyer, city clk.

Colo., Gunnison—City plans to extend sewers in southern part of city.

N. M., East Las Vegas—City plans to install sewerage system. About $29,478. V. K. Jones, city engr.

Ariz., Globe—See "Water-Works."

Wash., Camas—City had plans prepared for uphill sewerage system. H. G. Ausplund, city engr.

Cal., Seal Beach—City voted $15,000 bonds to build sewerage system. Noted Oct. 4.

N. S., Pictou—(Official)—Town plans to build sewers on Water, Church and Front Sts. About $60,000.

BIDS DESIRED

O., Elyria—(Official)—Until Dec. 1, by M. M. Wilcox, dir. pub. serv., building sewers in Ellsworth St. from East to Harwood Ave., Harwood St. from Carolina St. to east line of Dilworth allotment. C. M. Theobald, city engr. Noted Nov. 15.

O., Rocky River—Until Dec. 10, by F. Mitchell, village clk., building sanitary and [illegible]. About $[illegible]. E. S. Irwin, Hippodrome Bldg., Cleveland, engr. Noted Nov. 15.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract.)

★**O., Canton**—City let contract building central southwest storm sewer, rein.-conc. pipe, to F. A. Turner Const. Co., Interstate Bldg., Akron, [illegible]. About $[illegible].

★**Mich., Highland Park**—(Official)—Village [illegible] bids Nov. 19, building sewer in Cadillac Ave. between Connecticut Ave. and southern village limits, in Manhattan Courts and Russell Ave. to connect with sewer from Oakland to Russell St. from Connecticut Ave. to alley south of Connecticut Ave. Work will be done by day labor. Noted Nov. 8.

★**Mich., Port Huron**—City let contract building main sewer [illegible] from 12th to 24th St. to Carpenter-Gregg Co., [illegible] Bond Bldg., Detroit. About $[illegible].

Mich., Saginaw—City received bids for building sewers on Weiss St. from Fisher Ave. to Maynard St., Fisher Ave. from Weiss to Hancock St., Hancock St. from Maynard St. to Weiss St., Maynard St. from Weiss to Hancock St., W. Holly St. from Hancock St. to Fisher Ave., Fisher Ave. from Holly St. to Maynard St. and Maynard St. from Fisher Ave. to Holly St. Noted Nov. 8.

★**Minn., Brainerd**—City let contract building sewers in [illegible] Nov. 1, [illegible] Co., Brainerd. Noted Nov. 1.

[illegible]

★Neb., Lincoln—(Official)—City let contract building [illegible] from [illegible] and [illegible] to Salt Creek along west [illegible] of Antelope Creek, to A. M. Dettenbaugh, Lincoln, $13,335. Noted Nov. 15.

★Neb., Omaha—City let contract [illegible] in Dists. Nos. 353 and 357, to A. [illegible] Kennedy Bldg., Omaha, $25,092 and $17,[illegible], respectively.

★Mo., Kansas City—City let contract [illegible] in Dist. No. [illegible] to Hoover [illegible] 18th and Tracy Sts., $[illegible].

★Wash., Lind—City let contract for sewer [illegible] including [illegible],000 ft. 8-12-in. [illegible] to J. E. Romans, 4414 18th Ave., Seattle, $48,450. Noted Oct. 11.

Cal., Long Beach—City received only bid building [illegible] sewers in State, 20th, 21st and Wilson Sts. and Junior Ave., and [illegible] system along, together with Class "A" [illegible] Class "B" brick manholes, rein.-con. pumping station, centrifugal [illegible] pumping [illegible] iron [illegible] water [illegible] water meters, automatic flushing [illegible] etc., from J. Kennedy, Washington Bldg., Los Angeles, $[illegible].

★Cal., Los Angeles—See "Streets and Roads."

★Cal., San Diego—(Official)—City let contract for rein.-con. double compartment storm drain, 16th and Logan Sts., to Holland Constr. Co., Granger Bldg., $24,469. Noted Oct. 18.

BRIDGES

Proposed Work

Fla., Tampa—See "Streets and Roads."

Wis., Grand Rapids—Wood Co. plans to build steel bridge. About $60,000.

Kan., Topeka—City preparing plans for [illegible] ft. [illegible] bridge over Shunganunga Creek, on 4th St. About $16,000. C. E. [illegible], city engr.

Que., Grand Mere—Laurentide Co., Ltd., plans to build steel bridge over St. Maurice River.

BIDS DESIRED

Pa., Nelson—(Official)—Until Dec. 11, [illegible] superstructure and [illegible] Capitol, Harrisburg, building bridge [illegible] Twp. [illegible].

W. Va., Fairmont—(Official)—Until Dec. [illegible] Bd. Affairs, building reinforcement bridge [illegible] Monongahela River. A. J. Kern, city [illegible]; advertised in this issue.

Ala., Livingston—Until Dec. 12 by Sumter Co. Comrs. building several reinforced slab bridges, culverts and piers, on State [illegible] Nos. 4 and 5, between Livingston and Epes, and concrete and [illegible] and [illegible] work, [illegible] 125 cu. yd. Class "A" [illegible], 250 cu. yd. Class "B" [illegible], 48 cu. yd. Class "C" [illegible], and 1,[illegible] lb. [illegible] steel.

Miss., Woodville—See "Streets and Roads."

Minn., Litchfield—See "Excavation and Dredging."

Neb., St. Paul—Until Dec. 12 by Howard Co., building one 40-, one 45- and one 28-ft. [illegible] bridges, R. D. [illegible], etc.

Mo., Jefferson City—See "Streets and Roads."

Mo., Kansas City—(Official)—Until Dec. [illegible] by Comrs. building Central Ave. viaduct. H. A. Mendenhall, mayor; advertised in this issue.

Mo., Kansas City—(Official)—Until Dec. [illegible] by Bd. Public Buildings, building 23rd St. trafficway viaduct; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Pa., Perla—[illegible] of [illegible] for [illegible] building [illegible] concrete bridges and [illegible] and painting [illegible] over [illegible] signal bridges in connection with signaling [illegible] Delaware River and Baltimore & Ohio Railroad, to Dalmas Iron Works, 22nd and Washington Ave.

★Ind., Logansport—City let contract [illegible] over Eel River at [illegible] Ave. to [illegible] Co., Indianapolis, [illegible]; date [illegible].

STRUCTURAL STEEL WORK

Proposed Work

Que., Grand Mere—See "Bridges."

BIDS DESIRED

Neb., St. Paul—See "Bridges."

REINFORCED CONCRETE

Proposed Work

N. Y., Olean—See "Water-Works."

N. Y., Syracuse—See "Industrial Works."

N. J., Ocean City—See "Miscellaneous."

Pa., Mt. Joy—See "Water-Works."

Wis., Eau Claire—See "Industrial Works."

Ia., Charter Oak—See "Industrial Works."

Kan., Topeka—See "Bridges."

Cal., Sacramento—See "Industrial Works."

BIDS DESIRED

Ala., Livingston—See "Bridges."

Mo., Jefferson City—See "Streets and Roads."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Middletown**—See "Miscellaneous."

★**N. Y., New York**—See "Industrial Works."

★**Pa., Chester**—See "Buildings."

★**O., Cleveland**—See "Miscellaneous."

Cal., Long Beach—See "Sewers."

★**Cal., Sacramento**—See "Industrial Works."

★**Cal., San Diego**—See "Sewers."

Wash., Bremerton—See "Water-Works."

STREETS AND ROADS

Proposed Work

N. Y., White Plains—Comr. Pub. Wks. soon receives bids paving Hamilton and Martine Aves. and Stewart Pl. W. I. Collyer, city engr.

N. J., Atlantic City—City rejected bids building ornamental parkway from city limits to Virginia and Mediterranean Aves. as too far above estimates. Noted Nov. 22.

N. J., Elizabeth—Bd. Freeholders, Union Co., plan to appropriate $451,480 for road work during coming year. Work includes paving Faitoute and Michigan Aves. in Aldene Sect., $25,000; Springfield Rd., Summit, $10,000; also paving portions Hazelwood and Mountain Aves., and Chestnut St., Rahway, to cost $50,000 per mi. J. L. Bauer, co. engr.

N. J., Newark—Bd. Freeholders, Essex Co., plans to pave Rutgers St., Bloomfield, granite block.

N. J., New Brunswick—Middlesex Co. having plans prepared by A. Fox, engr., improving and rebuilding Sayerville-South Amboy Rd., 5 mi. long.

N. J., Newton—Bd. Freeholders, Sussex Co., plans paving Newton-Fredon Rd. W. Hardin, co engr.

Pa., Lansford—See "Sewers."

Pa., Philadelphia—City plans to open and continue 44th St. through property of Pennsylvania Hospital for Insane, from Market St. to Haverford Ave., West Phila. C. E. Albright, city engr.

Pa., Reading—Berks Co. Comrs. plan to build Old Turnpike to Harrisburg. About $[illegible].

Pa., Sunbury—Boro. plans to pave Front St. from Bainbridge St. to intersection of Susquehanna Ave., 1⅛ mi., 16 ft. wide. Est. at $[illegible].

Del., Laurel—See "Sewers."

Md., Annapolis—Anne Arundel Co. soon lets contract concrete road from Annapolis Blvd. to St. Margarets. About $50,000. Federal Government to appropriate toward cost. H. R. Shirlet, c/o F. H. Zouck, chn. state highway rd. comrs., Garrett Bldg., Baltimore, engr.

Fla., Jasper—Hamilton Co. plans election Dec. 11 to vote on $[illegible] bond issue to build roads.

Fla., Tampa—Palmetto-Ellenton Terra Ceia-Gillette Dist., Hillsborough Co., voted $[illegible] bonds to build roads and bridges in district. Part of sum to be used in connecting road to Hillsborough-Manatee line to connect with road which Hillsborough plans to build, giving complete hard surfaced road through Tampa.

Miss., Lexington—Holmes Co. sold $15,000 bonds for road work in Pickens-Richland Rd. Dist. and $25,000 in Special Rd. Dist. No. 1.

Ala., Anniston—Calhoun Co. voted to appropriate $[illegible] to build road between here and Camp McClellan. War Dept. will furnish an equal amount. Noted Sept. 6.

O., Findlay—City passed resolution to issue $[illegible] bonds to pave Lima Ave. to [illegible] Millersdale City Line.

O., Newport—City plans to improve various streets. About $[illegible], J. Herman, [illegible] engr.

O., Rocky River—Village voted $100,000 bonds to pave streets. E. H. Arnold, village engr.

O., Stockport—Village having plans prepared by G. Dunn, engr., McConnellsville, for paving various streets. About $10,500.

O., Tiffin—Seneca Co., in conjunction with Seneca, Hopewell, Big Spring and Scipio Twps., plans to build 1½ mi. Tiffin-Upper Sandusky Rd., 2½ mi. Fostoria Rd. and 2 mi. Fostoria Carey Rd. About $150,000 will be expended.

O., Toledo—City having new plans prepared by H. McKechnie, city engr., for extending Summit St. to Bway. About $580,000. Cost to be borne equally by city and property owners. Noted July 26.

O., Urbana — Champaign Co. Comrs. passed resolution to improve Urbana-North Lewisburg Pike.

O., Youngstown — City Council passed resolution to pave portion South Ave. between Indianola Ave. and end of present pavement. F. M. Lillie, city engr.

Ind., Huntington — City had plans prepared resurfacing 3680 ft. Matilda St., wood block, brick, asphalt, asphaltic concrete or sheet asphalt. About $50,698. P. H. Latchen, city engr.

Mich., Mt. Clemens — Macomb Co. soon lets contract building 42.5 mi. road 9 to 16 ft. wide, slag or gravel top. About $90,000. W. J. Lehner, engr. Noted Apr. 12.

Ill., Marshall—Clark Co. voted $112,000 bonds to build roads. Z. Arbuckle, co. supt. highways.

Ill., Peoria—Peoria Co. appropriated $77,000 for construction of 5 mi. concrete roads. W. E. Emery, co. highway supt.

Wis., Black River—Jackson Co. having plans prepared building concrete pavement between Black River Falls and Melrose, about 3 mi. W. F. Baumgartner, La Crosse, state engr. Noted Apr. 5.

Wis., Manitowoc—City plans to surface and gravel 50 blocks; also to install sewers and water mains. About $65,000. F. V. Alter, city engr.

Wis., Merrill—Lincoln Co. plans to build roads through county. About $30,000. J. Brandt, aud.

Minn., Owatonna—Steele Co. Comrs. plan to spend $37,000 for road work next year.

Kan., Council Grove—Morris Co. plans to hard surface 33 mi. Old Trails Rd. across county. J. M. Lowe, pres. Natl. Old Trails Assn.

Kan., Fredonia — Wilson Co. preparing plans graveling 50 mi. roads. H. S. McFadden, co. engr.

Kan., Wichita—City passed resolution to pave Waco Ave. from 15th to 18th St., vertical fiber brick, and Buffum Ave. from Riverside Ave. to Riverside Dr., sheet asphalt. P. L. Brockway, city engr.

South Dakota—State Highway Comn., Pierre, plans to appropriate $25,000 for county highways. A. Peck, state road engr.

S. D., Sioux Falls—Minnehaha Co. plans to build 21 mi. macadam road from here to Dell Rapids. About $262,500.

Mont., Bozeman—City plans paving streets in Dist. No. 154, standard crushed rock bitulithic or some other hardsurface material. About $24,430. C. C. Widener, city engr.

Mont., Livingston—Park Co. plans to build highway from Gardiner to Meagher Co. line on Park-to-Park Highway. Federal Government to contribute $30,000 toward cost.

Mo., Clayton—St. Louis Co. plans road through Allenton, Eureka, Crescent, Valley Park, Kirkwood, Glendale, Webster Groves and Shrewsbury Twps., and along Watson Rd. into St. Louis. About $300,000.

Mo., Pleasant Hill—City plans improving portion 1st St., including grading, shouldering, surfacing and macadamizing with crushed rock.

Mo., St. Louis—City Plan Comn. plans to improve various streets, including opening of semicircular street as extension of Morgan St.; building twin cut-off on east side of Grand Ave. leading in opposite directions to Pine St. and Lawton Ave.; widening Lindell Ave. and other downtown streets. E. E. Kinsey, pres. bd. pub. serv.

Ark., Osceola—Mississippi Co. plans to build Osceola-Little River Rd.

Ark., Van Buren—Crawford Co. Comrs. soon lets contract building 35 mi. of Van Buren-Winslow Pike to connect Van Buren with modern highway extending down to North Arkansas from Kansas City and St. Louis. Cost to be borne be county, state, federal government and Frisco Lines. Noted Oct. 18

Streets and Roads (Continued)

Tex., Baird—Callahan Co. plans election Dec. 21 to vote on $100,000 bond issue constructing highway through Baird, Clyde and Putnam. Noted Apr. 5.

Tex., Bryan—Brazos Co. plans election to vote on $70,000 bond issue to build roads in Millican Dist.

Tex., Decatur—Wise Co. voted $80,000 bonds to build Meridian Highway through county. Noted Oct. 25.

Tex., Dickens—Comrs. Court of Dickens Co. voted $400,000 bond issue to build roads. Noted Nov. 15.

Tex., Fairfield—Freestone Co. Rd. Dist. No. 2, voted $20,000 bond issue for road work.

Tex., Roby—Fisher Co. Comrs. plan election Dec. 17 to vote on $250,000 bond issue for road work.

Tex., Sweetwater—Nolan Co. voted $100,000 bonds to build roads. Noted Oct. 18.

Tex., Vernon — Wilbarger Co. voted $115,000 bonds to build roads in Dist. No. 1. Noted Nov. 8.

Okla., Bartlesville—City soon lets contract repaving 2nd and 3rd Sts. from Dewey Ave. to railroad tracks, vertical fibre brick. About $14,000. E. D. Kirkpatrick, city engr. Noted Aug. 16.

Okla., Waurika — Jefferson Co. Comrs. plan to appropriate $10,700 for highway improvements, including grading and bridge building on Chisholm trail from Stephens Co. line to Red River.

Okla., Woodward—(Official)—Woodward Co. defeated $675,000 bond issue to build roads and bridges. Noted Nov. 8.

Colo., Conejus—Conejus Co. plans to build road over Cumbres Pass from Antonito to Elk Creek. About $30,000.

Wash., Goldendale—Klickitat Co. rejected bids grading and macadamizing about 16 mi. Permanent Highway No. 6, known as White Salmon-Snowden Rd. Noted Oct. 25.

Wash., North Yakima — Yakima Co. Comrs. plan to build 11.95 mi. McClellan Pass Highway; about $80,587. County to pay $17,625, state, $22,669, and Federal Government, $40,293. Noted Aug. 16.

Wash., Waterville—Dougals Co. rejected bids building Permanent Highway No. 4A, 1½ mi., involving grading, draining and surfacing with crushed rock. About $10,194. Noted Oct. 25.

Oregon—State Highway Comn., Salem, having plans prepared building Pacific Highway between Albany and Jefferson, 9 mi.

Ore., North Bend—City plans about 1 mi. concrete paving, 16 ft. wide. R. L. Cavanaugh, city engr.

California—State Highway Comn., Sacramento, soon lets contract paving highway in Eldorado Co. A. B. Fletcher, Sacramento, state highway engr.

Cal., Alturas—Modoc Co. plans to build road from Alturas to Nevada line, 32 mi., to open up lateral from main valley trunk line to State Highway into Nevada. Federal Government will contribute towards cost.

Cal., Bakersfield — Kern Co., (Bakersfield), and San Luis Obispo Co., (San Luis Obispo), and State Highway Comn., Sacramento, plan to build 91.22 mi. highway from Wasco to Paso Robles through both counties. About $982,893. State will appropriate $460,865 toward cost.

Cal., Hamilton City—Glenn Co. plans to form boulevard district to build 14 mi. concrete highway from Monroeville north to county line and from Glanella Bridge to western boundary of district.

Cal., Los Angeles—Los Angeles Co. plans to organize road improvement district to build 74 mi. road in Antelope Valley. F. H. Joyner, co. road comr., preparing plans.

Cal., Newport Beach—City plans to pave Central Ave., 4-in. concrete, with 2-in. Topeka surface; Bay Ave., 4-in. concrete with 1-in. Topeka surface; also cement sidewalks on various other streets.

Cal., San Francisco—State Bd. Harbor Comrs., Sacramento, soon lets contract paving east side of Embarcadero between piers 7 and 17, including 60,000 sq.ft. bituminous concrete pavement, and relaying 30,000 sq.ft. base-block pavement.

Cal., Santa Ana—City plans improving North Parton St., including curbing, grading and macadamized pavement; 4th St. between Bristol and Artesia St., 4 in. concrete base and 1½ in. asphaltic oil wearing surface. C. Bonebrake, city engr.

Cal., Santa Cruz—City soon receives bids paving various streets. G. Cromwell, city engr.

BIDS DESIRED

Mass., Fitchburg —(Official)—Until Dec. 15 by Dept. Streets & Engr., furnishing paving material. W. J. Gannon, acting comr.; advertised in this issue.

N. J., Elizabeth—Until Dec. 4 by Bd. Freeholders, Union Co., improving Washington and South Aves., and Edgar Rd., stone and tarvia, about 6600 lin.ft. J. L. Bauer, 120 Broad St., co. engr.

N. J., Elizabeth—Until Dec. 27, by city, paving portion Valley St., Vaux Hall Dist., macadam on macadam base. T. E. Collins, city engr.

Pennsylvania—(Official)—Until Dec. 11, by State Highway Comn., Harrisburg, for road work in Erie and Clearfield Cos.; advertised in this issue.

Va., Eastville—Until Dec. 3, by Northampton Co., building road between Persimon Tree and Salt Works in Franktown Dist., 1¾ mi.

Ala., Geneva—Until Dec. 11, by Geneva Co., building portion Samson & Opp Rd., part of State Trunk No. 12. W. S. Keller, Montgomery, state highway engr.

Ala., Jasper—Until Dec. 15, by Walker Co., building portion Jasper & Birmingham Highway, being part of State Trunk Rd. No. 9, between Jasper and Birmingham, 4.5 mi. long, including 10,071 cu.yd. earth excav., 5 acres clearing and grubbing, 415 ft. culvert pipe, 3590 cu.yd. crushed sandstone. W. S. Keller, Montgomery, state highway engr.

Miss., Woodville—Until Dec. 4, by Wilkinson Co., improving several roads, including grading and building small bridges, culverts and abutments and vitr. iron pipe for drains. L. Lewis, clk.

Ind., Anderson—Until Dec. 12, by Madison Co. Comrs. paving Meridian Ave. Former contract rescinded. Noted Nov. 22.

Ia., Jefferson — Until Dec. 4, by Bd. Supervs. Green Co., furnishing, delivering and spreading gravel on Junction-Dana Rd., Panora Rd., Rippley-Dawson Rd., Jefferson-Bagley and Farlin-Churdan Rds.

Neb., Kearney—Until Dec. 3, by C. D. Swan, city clk., for paving Dist. No. 29, about 10,112 sq.yd., alternate bids on sheet asphalt, vertical vibre brick, asphaltic concrete and concrete pavement. H. W. Kibbey, city engr.

Mo., Jefferson City—Until Dec. 6 by Cole Co., for improving, grading, gravelling and building rein.-con. culverts, etc., portions of Henley and Marris Home Rd., Honey Fork Dr., Osage Bend and Williams Ferry Rds., and Russelville-Centertown Rds., Boonville and Decatur Rds., roads in Dist. No. 9. F. C. Harding, co. highway engr.

Tex., Gilmer—(Official)—Until Dec. 10 by Upshur Co. court, grading and surfacing roads. W. H. McClelland, co. judge. Noted Oct. 25.

Washington—Until Dec. 10, by State Highway Comn., Olympia, clearing, grading and draining, 5.21 mi. Pacific Highway between Woodland and Martins Bluff in Cowling Co.; widening embankment and changing tracks of Southern Pacific Ry. System west of Cooks in Skamania Co., involving 30,000 cu.yd. embankment.

Cal., San Diego—Until Dec. 5, by A. H. Wright, city clk., grading Upas St. between Granada Ave. and line 100 ft. west and Albatt St. from Lone Fourth Ave. to Brighton Ave. G. Crummell, city engr.

Cal., Yreka—Until Dec. 4, by W. J. [illegible], clk. Siskiyou Co., building Sanborn Hill Rd.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Mass., Boston—City received [illegible] paving from Essex, from Washington Bldg., 14 Beckley St., bituminous, $47,231; Lord Construction Co., 1697 Commonwealth Ave., Brighton, sheet asphalt, $18,114; asphaltic concrete, $17,[illegible].

★**N. Y., Lawrence**—Village let contract building 4 mi. concrete pavement, in Fl. side, to Chanford Co., 381 Jamaica Ave., Long Island City, $[illegible]; [illegible] Co., $[illegible].

N. Y., New York—M. Marks, [illegible] received low bids for regulating and relaying roadway of Lark St., from point 95 ft. west of Early Ave. to 7th Ave., sheet asphalt on concrete foundation, from Cleveland Trimming Pipe Co., Brooklyn, $13,191; Asphalt Constr. Co., 2197 Madison Ave., $13,457; Ulrich Asphalt Paving Co., [illegible], $[illegible], grading and regulating Laurel Hill Terrace from West 181st to West 184th St. and flagging West 181st St., Laurel Hill Terrace, to Amsterdam Ave., from Burnside Contg. Co., 270 Burnside Ave., $17,[illegible]; [illegible] Paving Co., $18,063; Angelo Costa Co., $18,053.

★**N. Y., New York**—M. M. Marks [illegible] let contract regulating and paving Riverside Dr. Service St. from 162nd St. to 165th St., sheet asphalt, to Asphalt Constr. Co., 2197 Madison Ave. Amount $[illegible].

★**N. J., Freehold**—Bd. Freeholders Monmouth Co. let contract building Freehold-West Freehold Rd., to R. Huffman Co. About $36,0[illegible].

★**N. J., Mount Holly**—(Official)—Bd. Freeholders Burlington Co. received no bids paving 4-mi. highway between Wrightstown and Georgetown. Work will be done by convict labor. Noted Nov. 15.

N. J., New Brunswick—Middlesex Co. received low bids paving and curbing (a) Sect. 1 of River Rd., in Piscataway and Highland Park, warrenite on macadam foundation, (b) Sect. 2, same road, from T. H. Riddle, 102 Church St., (a) $163,490; Meagher & Smith, 251 Market St., Perth Amboy, (a) $164,426; (b) $150,196; Utility Constr. Co., 46 Paterson St., (a) $166,859, (b) $149,922; Liddle & Pfeiffer, 137 New Brunswick Ave., Perth Amboy, (a) $168,-360, (b) $149,208. Noted Nov. 8.

Pa., Norristown — Montgomery Co. received [illegible] bids building 7 mi. Germantown Rd. from DeKalb St. Rd. to Collegeville, from Union Paving Co., 30th and Locust Sts., Phila. About $177,469. Noted Oct. 25.

Pa., Phila.—(Official)—C. E. Bateman, dir. pub. serv., received low bids for 32,121 cu.yd. grading from J. McMenany & Co., 512 Walnut St.; D. Dunlop, 2401 East Lehigh Ave., average price $[illegible] per cu.yd.; constructing portion of Pkway., east of 17th St. to Race St., from J. J. McHugh, 1430 South Penn Sq., $44,437. Noted Nov. 8.

★**N. C., New Bern**—City let contract building about 1 mi. of brick streets connecting Neuse River Co. bridges with improved county highway leading through Vanceboro, to Georgia Eng. Co. About $12,[illegible].

★**Ala., Brewton**—Escambia Co. let contract building 9 mi. sand clay road between Andalusia and Brewton (portion of state highway [illegible] Alabama) to J. N. Grille & Sons, Brewton. Amount $11,[illegible]. Noted Nov. 1.

★**Ala., Troy**—City let contract for 1[illegible] sq.yd. paving and several thousand yd. sidewalks to Southern Clay Mfg. Co., [illegible] Hill, Chattanooga, Tenn. About $[illegible].

★**La., Baton Rouge**—East Baton Rouge Co. let contract building road 5½ S. A. Cain, [illegible] Mile. About $[illegible]. Noted Nov. 1.

★**Tenn., Clarksville**—(Official)—City let contract laying portions 2 alleys, covering [illegible] sq.yd. asphaltic concrete on concrete base, to West Coast Co., 14th and Market Sts., $33,353. Noted Nov. 1.

★**O., Bryan**—(Official)—City let contract [illegible] and paving 2 sections of Union St., to Brooks Contr. Co., 2491 Miley St., Ft. Wayne, Ind., [illegible]. Noted Oct. 25.

★**O., Canton**—State Co. let contract grading, paving and curbing [illegible] Rd., in E. & [illegible] Sts., [illegible], building [illegible] bridges; City let to Arend & Weil Construction Co., West Side, [illegible]—[illegible]. Noted Nov. 15.

★**O., Cleveland**—City let contract paving portion Archwood Ave., at Rocky River, West 150th St. and Clark Ave., [illegible]. Noted Sept. 13.

★**Michigan**—[illegible] let contract [illegible] and [illegible] Co. [illegible] to build [illegible] Rd., [illegible] Co., [illegible] Mich., [illegible] Noted Nov. 15.

Streets and Roads (Continued)

★**Ill., Joliet**—City let contract paving Jackson St. from Chicago to Collins St., to H. F. Conway Co., Chamber of Commerce Bldg., Chicago, $26,779.

★**Minn., Duluth**—St. Louis Co. let contract paving 4 mi. road in Stuntz Twp., to E. W. Coons Co., 230 Center St. About $[illegible] per sq.yd.

Neb., Holdredge—(Official)—City received low bids improving streets in Dist. No. 1, involving 39,100 sq.yd. pavement, 4442 ft. curb, 10,053 lin.ft. curb and gutter, from E. D. Tyner Constr. Co., Kansas City, Mo., Class A brick, $2.54; Class B, $2.39; Roberts Constr. Co., 510 1st Natl. Bank Bldg., Lincoln, Class A, brick, $2.53; Class B, $2.39. Noted Nov. 1.

★**Tex., Houston**—Harris Co. let contract improving Telephone Rd., to Haden & Austin, $[illegible].

★**Colorado**—(Official)—State Highway Comn., Denver, let contract building Sect. 1, Fall River Rd., between Fall River and Milner Pass, Larimer Co., to Jacobson & Severson, Boulder, $20,303. Noted Nov. 8.

★**Ore., Portland**—City plans to repave Terwilliger Blvd. by day labor. About $23,390.

★**California**—(Official)—State Highway Comn., Sacramento, let contracts paving in various counties as follows:

Los Angeles Co., between San Fernando and Rancho Tujunga, Div. 7, Route 9, Sect. A, to A. L. McCrary, 422 Amer. Bank Bldg., Los Angeles.

Humboldt Co., between Garberville and Miranda, Div. 1, Route 1, Sect. B, to Palmer & McBryde, Hooker and Lent Bldg., San Francisco.

Fresno Co., between Malaga and Fresno, Div. 6, Route 4, Sect. B, to Blanchard-Brown Co., New Call Bldg., 74 Montgomery St., San Francisco.

San Luis Obispo Co., between Santa Maria River and Arroyo Grand, Div. 5, Route 2, Sect. F, to W. A. Dontanville, Los Angeles.

Nevada Co., grading 9 mi. between southerly boundary and Rattlesnake Creek, Div. 3, Route 17, Sect. A, to A. J. Fairbanks, Willits, $83,221. Noted Nov. 1.

★**Cal., Los Angeles**—City let contract grading, paving and building storm drain in [illegible] St. between Vermont Ave. and line [illegible] ft. west of Grandview Pl., warrants [illegible] concrete base to Fairchild-Gilmore Wilton Co., Pacific Electric Bldg., $33,800. Noted Oct. 18.

★**Cal., Los Angeles**—Los Angeles Co. let contract improving Lexington and Gallatin Highway, to Redondo Constr. Co., 218 South Redondo Ave., Redondo Beach, $18,500.

Cal., San Diego—City received lowest bid improving Utah St. from Upas St. to University Ave., including 142,630 sq.ft. 4 in. concrete paving, 2896 sq.ft. cement walk, 676 lin.ft. cement curb, ten 4-in. and thirteen 6-in. sewer laterals, 2676 ft. 6 in. Class A water pipe, etc., from C. R. Daley, 111 McKenzie Bldg. About $24,707. Noted Nov. 17.

★**Cal., Ukiah**—Mendocino Co. rejected bids on building Elk Creek-Greenwood Rd. About $15,000. Work will be done by day labor.

★**Que., Contrecoeur**—Town Council let contract building macadam road to Carbonatte & Lachapelle St. corp. About $[illegible].

★**Que., Grand Mere**—City let contract building concrete highway to A. Cartier Ste. Ville de Champlain. About $[illegible].

RAILWAYS—STEAM & ELECTRIC

Proposed Work

New Jersey—[illegible] Pub. Utility Comm. granted permission to Erie R.R. to issue $[illegible] bonds to improve its lines and system. W. S. Parsons, 15 Church St., New York City, ch. engr.

Tennessee—Tenn. & Mississippi Valley R.R. increased its capital stock from $15,000 to $[illegible] and plans to double-track line from Memphis to Vicksburg, Miss., about [illegible] mi. Work to be done at rate of 20 mi. a year. A. H. Egan, Memphis, engr.

Kansas—Dodge City & Cimarron Valley Ry., subsidiary Atchison, Topeka & Santa Fe Ry., plans to build line from Satanta, west to Colorado line, about 37 mi. Work involves moderately heavy grading. C. F. W. Felt, 35 S. Dearborn St., Chicago, ch. engr.

Idaho—American Smelting & Refining Co., 120 Bway., New York City, plans to build 14-mi. railroad from Lewiston up South Fork of Clearwater River to Northern Pacific R.R. at Stites.

California—Clear Lake R.R. granted permission by State R.R. Comn. to issue $1,152,000 bonds to build line from Hopland, Mendocino Co., to Lakeport, Lake Co., about 23 mi. M. S. Sayre, Lakeport, vice-pres.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Wyoming**—Union Pacific R.R. let contract double tracking and grading line between Le Roy and Aspen and Atlamont and Evanston, about 16 mi., to Utah Constr. Co., McIntyre Bldg., Salt Lake City, Utah.

EXCAVATION AND DREDGING

Proposed Work

Ia., Mason City—Drainage—Cerro Gordo Co. rejected bids opened Nov. 7, building D. D. No. 49, Sect. 1, involving 3200 ft. 9-28-in. tile, Sect. 2, 17,850 ft. 8-18-in. tile. G. E. Frost, aud. Noted Nov. 1.

Minn., Bagley—Ditch—Clearwater Co. sold $65,500 bonds to build Judicial Ditch No. 3. H. K. Rude, co. aud.

Utah, Fillmore—Drainage—Millard Co. plans to sell $54,000 bonds, Dec. 8, for drainage improvements. G. W. Cropper, Deseret, pres. of project.

Utah, Kanab—Irrigation—H. A. Parkyn, 1511 Marquette Bldg., Chicago, applied to G. F. McGonagle, state engr., for permission to use 100,000 acre-feet water from Paria River to irrigate land in Kane Co.

Ore., Bend—Irrigation—North Unit Irrigation Dist., Deschutes Co., voted $5,000,000 bonds to build irrigation system to cover 100,000 acres.

Ore., Grants Pass—(Official)—Irrigation—Grant Pass Irrigation Dist. receiving bids about Dec. 1 for district covering 5250 acres, involving 35 mi. main canal, laterals, flumes, tunnels, etc. About $250,000. G. A. Hamilton, Secy. Noted Sept. 20.

Cal., Hanford—Irrigation—Lakeland Canal Co. plans to repair canal, 35 mi. long, to irrigate 30,000 acres. About $25,000. Address E. E. Bush.

BIDS DESIRED

N. Y., Albany—(Official)—Canal—Until Dec. 20, by W. W. Wotherspoon, supt. Pub. Wks., Capitol, repairing and waterproofing existing concrete lining and placing new concrete lining in Canal, Little Falls, Cont. No. 181; advertised in this issue.

N. Y., New York—Excavation—Until Dec. 6, by F. J. H. Kracke, comr. plant and structures, Municipal Bldg., excavating and dredging at site of Eastchester Bridge.

Ind., Anderson—(Official)—Drain—Until Dec. 5, at office of A. C. Call, atty., Phoenix Bldg., Anderson, building Sarah E. and William O. Canady Drain No. 2192, involving 16,776 ft. 6-24-in. tile, 10,979 cu.yd. excav. About $11,738. H. L. Jones, supt. of constr.

Ia., Clarion—Drainage—Until Dec. 10, by F. E. Osier, aud., Wright Co., building Franklin-Wright Joint Drain Nos. 8-159, involving 46,756 ft. 6-28-in. tile; Franklin-Wright Joint Drain Nos. 6-141, involving 53,958 ft. 6-30-in. tile, etc.

Minn., Litchfield—Ditch—Until Dec. 4, by A. O. Palmquist, aud., Meeker Co., building Co. Ditch No. 47, involving 165,451 cu.yd. excav., four 28-ft. I-beam bridges, etc. About $17,345.

Cal., El Centro—Irrigation—Until Dec. 14, by Imperial Irrigation Dist., for raising volcano and Saiz levees. Former job will involve 555,000 cu.yd. excav., by train and steam shovel, and must be completed by Apr. 15; latter job about 240,000 cu.yd. excav., mostly by teams and scrapers and must be completed by Apr. 1. Rock riprap will be constructed later. Cost about $500,000. C. K. Clarke, ch. engr. F. H. McIver, clk. Noted June 7.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Pa., Phila.—(Official)—Dredging—G. E. Bateman, dir. pub. serv., received only bid dredging creeks in 40th Ward, from Chew Bros., **Mantus, N. J.**, $10,380. Noted Nov. 8.

★**Ia., Algona**—Drainage—Bd. Supervs. Kossuth Co. let contract building D. D. No. 152, to Berkland & Littell, Eagle Grove, Ia., $26,594; D. D. No. 153 and Sub. D. D. No. 6, to Welp Cement Products Co., Bancroft, Ia., $20,373 and $19,483 respectively. Noted Oct. 25.

★**Ia., Clarion**—Drainage—Wright Co. let contract labor for building Franklin-Wright Joint Nos. 8-159 to M. Jensen, Clear Lake, Ia., for Franklin-Wright Joint Drain Nos. 6-141 to J. S. Jensen, Rutland, Ia. Bids for material will be readvertised. Noted Nov. 8.

★**Minn., Anoka**—(Official)—Anoka Co. let contract building Co. Ditch No. 59, as follows: W. R. Ewing, Inc., 112 West Adams St., Chicago, floating dredge work, $16,707; S. H. Adams, Long Prairie, Minn., dry works, $17,416. Noted Nov. 15.

INDUSTRIAL WORKS

Proposed Work

Mass., New Bedford—Manomet Mills, Riverside Ave., plans 2-story, 80 x 189-ft. addition to its plant. About $200,000.

Mass., West Springfield—Boston & Albany R.R. plans to build transformer station here. About $35,000. F. B. Freeman, Boston, ch. engr.

N. Y., Brooklyn—Roberts Numbering Machine Co., 706 Jamaica Ave., having plans prepared by W. C. Winters, archt., 106 Van Siclen Ave., for 2½ story addition to its factory, Jamaica Ave. About $30,000.

N. Y., New York—S. Ransom, 401 West St., plans 4-story, 64 x 81-ft. addition to its boiler factory. About $60,000.

N. Y., New York—J. L. Schnurmacher, 402 East 108th St., had plans prepared by O. L. Spannhake, archt., 13 Park Row, 2-story, 100 x 150-ft. public garage, 1190 62nd Ave. About $50,000.

N. Y., Rochester—C. D. Brown Co., 6 Redfield St., rejected bids building 3-story, 48 x 75-ft. tannery. About $25,000. Foote, Headley & Carpenter, 401 Carter Bldg., archts.

N. Y., Syracuse—Church & Dwight Co., 27 Cedar St., New York City, having plans prepared by Starrett & Van Vleck, archts., 8 West 40th St., New York City, 3-story, 93 x 240-ft., rein.-con. warehouse, Willis Ave. About $100,000. E. A. Schroeder, 1416 Willis Ave., local mgr.

N. Y., Watertown—City having plans prepared by S. M. Greene & Co., engrs. and archts., 293 Bridge St., Springfield, Mass., building power plant and fireproof power house about 1½ mi. from city. Cost, $300,000.

N. J., Cartaret—United States Metal Refining Co., Chrome, N. J., secured 120 acres land here and plans to build plant.

N. J., Jersey City—Brandis & Co., Inc., 15 Exchange Pl., recently organized with $100,000 capital stock, plans to build factory here.

N. J., Jersey City—Pennsylvania R.R. had plans prepared by Maintenance of Way Dept., Phila., for addition of 19 stalls at engine terminal here. A. C. Shand, Broad St. Sta., Phila., ch. engr.

N. J., Newark—Bonnell Motor Car Co., 520 Broad St., having plans prepared for 1-story, 110 x 180-ft. machine shop and service station, 39 Sussex Ave. About $35,000.

N. J., Newark—Heller & Merz, Hamburg Pl. Rd., plan to build two 1-story, 70 x 200-ft. factories. About $56,000.

N. J., Newark—E. & H. Levy, 35 Maiden Lane, New York City, had plans prepared by F. A. Phelps, archt., Union Bldg., for factory on Purdy St. About $75,000.

Pa., Erie—Bay City Forge Co. plans 1-story, 67 x 176-ft. brick and steel machine shop. E. C. Parshall, Cranberry and West 18th Sts., genl. mgr. A. F. Schotte, engr., 405 Palace Hardware Bldg., soon receives bids.

Pa., Lancaster—Rowe Motor Mfg. Co., Downington, purchased 5-acre tract and plans to build factory here. S. J. Rowe, pres.

Pa., Pittsburgh—Electric Co., Lexington Ave., having plans prepared by C. D. Cooley & Co., archt., Century Bldg., Pittsburgh, Pa., for 50 x 200-ft. brick factory. About $40,000.

Industrial Works (Continued)

Pa., Pittsburgh — Miller-Owen Electric Co., had plans prepared by C. D. Cooley Co., archts., Century Bldg., for 50 x 200-ft. plant near switch of Penn. R.R. About $40,000.

Pa., Pittsburgh—Ward Mackey Biscuit Co. having plans prepared for factory on North Lexington Ave. About $350,000.

Del., Wilmington—Cahill Bros., 2nd and French St., had plans prepared for automobile repair shop and show room. About $30,000. J. P. Cahill, mgr. J. J. Kennedy, 925 Market St., archt., soon lets contract.

Md., Baltimore—Corkan & Hill Co., Union Stockyards, soon receives bids building 3-story, brick and rein.-con. plant. Noted Nov. 8.

Va., Norfolk—Natl. Concrete Boat Co., recently organized with $1,000,000 capital stock, had plans prepared for shipbuilding plant here.

Va., Pulasky—Natl. Carbide Co. recently increased capital stock from $350,000 to $600,000 and plans additions to its plant here. S. M. Buck, pres.

W. Va., Morgantown — American Sheet Tin Plate Co., plans large factory at Barbarton, suburb of Morgantown.

S. C., Charleston—Southern Shipbuilding Corp., recently organized by Whittelsey & Whittelsey, naval archts., 17 Battery Pl., New York City, will build shipyard here to construct fabricated steel ships for U. S. Government, having obtained large contract from Emergency Fleet Corp. H. Newton Whittelsey, pres.

La., New Orleans—Morris & Co., Union Stock Yards, Chicago, plans 3-story brick addition to packing plant here. About $100,000.

O., Bedford—Owen Tire & Rubber Co., 1900 Euclid Bldg., Cleveland, receives bids about Dec. 10 for 1- and 2-story, 20 x 40-ft. and 60 x 340-ft. factory and power house. About $125,000. W. C. Owen & Co., 1900 Euclid Ave., Cleveland, archts. Noted Nov. 15.

O., Cleveland—G. Malham, 689 East 99th St., had plans prepared for 1-story, 40 x 150-ft. garage. About $25,000. J. Collins, 1025 Illuminating Bldg., archt., soon lets contract.

O., Cleveland—Westinghouse Electric & Mfg. Co., 413 Huron Rd., plans 1- and 2-story, 150 x 150-ft. addition to its foundry, 1228 West 58th St.

O. Toledo—Long Dressed Beef Co., 2351 East 4th St., soon lets contract, 2-story, 57 x 83-ft. packing plant, West 68th St. and Cleveland, Cincinnati, Chicago & St. Louis R.R. About $30,000. E. G. Long, mgr. J. Kalsch, 4500 Euclid Bldg., archt.

O., Toledo—Swiss Magneto Co., Monroe, O., recently organized with $400,000 capital stock, plans factory here between Pinewood and Norwood Aves. A. A. Megget, pres.

O., Youngstown—Amer. Sintering Co., 10 Poland Ave., plans to rebuild its plant recently destroyed by fire. About $75,000.

Mich., Detroit—Chevrolet Motor Co., 1244 Woodward Ave., plans new factory, also addition to its present plant here. About $100,000 and $300,000 respectively.

Mich., Detroit—Detroit Steel Products Co., East Grand Blvd. and Griffin St., had plans prepared by Smith, Hinchman & Grylls, archts., 710 Washington Arcade, for 1-story, 79 x 270-ft. and 90 x 168-ft. sash shop. About $100,000.

Mich., Detroit—Schoen Bros., 322 Decatur St., Atlanta, Ga., plan to build abattoir opposite Detroit stock yards here. About $125,000.

Mich., Detroit—Wayne Co. having plans prepared by F. F. Van Tuyl, engr., 1112 Union Trust Bldg., for light and power plant on Randolph St. About $100,000.

Ill., Chicago—J. Davis, 1400 Milwaukee Ave., plans 4-story, 73 x 125-ft. factory, at Milwaukee Ave. and Lincoln St. About $125,000.

Ill., Chicago — E. S. Gamble, Gladstone Hotel, plans to build garage on 138th St. About $42,500.

Ill., Chicago—Hotpoint Electric Heating Co., Ogden Ave. and 22nd St., plans to build factory here. About $250,000.

Ill., Chicago—Marshall Field & Co., State and Washington Sts., had plans prepared for 2-story garage. About $60,000. Graham, Anderson, Probst & White, 80 East Jackson Blvd., archts., soon let contract.

Ill., Chicago — C. Quinlan, 124 South Green St., plans 4-story factory. About $30,000. A. F. Pashley, 431 South Dearborn St., archt.

Ill., East St. Louis—B. Gratz, c/o Amer. Mfg. Co., 1026 South 11th St., St. Louis, Mo., having plans prepared by Klipstein & Rathman, archts., Chemical Bldg., St. Louis, Mo., for 1-story, 60 x 80-ft. power plant and 1-story, 60 x 70-ft. machine shop. About $40,000 and $30,000 respectively.

Wis., Eau Claire — United States Auto Gear Shift Co., Eau Claire, plans 2-story, 100 x 165-ft. brick, steel and concrete plant. About $90,000. N. J. Whelan, pres.

Wis., Eau Claire—United States Switch Co. receives bids about Dec. 1 for 60 x 130-ft. rein.-con. forge shop. T. C. Hadley, genl. mgr. Noted Nov. 15.

Wis., Kenosha—White, White & White, archts., soon let contract for 1-story, 70 x 125-ft. brick, steel and concrete addition to Arneson Foundry Co., 319 Exchange St. About $50,000.

Wis., Milwaukee—See "Buildings."

Wis., Oshkosh — Oshkosh Storage Co., Oshkosh, plans 5-story, 60 x 90-ft. rein.-con. and steel cold-storage plant. About $75,000.

Wis., Port Washington—Turner Mfg. Co. has increased its capital stock from $150,000 to $250,000, and plans to build addition to its factory here. M. Turner, vice pres.

Wis., Racine—J. I. Case Plow Co., Mead St., plans 4-story, 105 x 123-ft. brick warehouse. About $50,000. A. A. Guilbert, Robinson Bldg., archt.

Ia., Charter Oak—Godbersen Co., Dennison, plans to build 2-story, 100 x 150-ft. factory, concrete. About $50,000.

Minn., Stillwater—Twin City Forge & Fdry. Co., subsidiary of Minneapolis Steel & Machinery Co., 29th St. and Minnehaha Pkway, Minneapolis, plans to build large munitions factory here. G. A. Atwood, Stillwater, pres.

Tex., San Antonio—Missouri, Kansas & Texas R.R. plans to build ice and cold storage plant here. About $100,000. F. Ringler, Dallas, ch. engr.

Tex., Victoria—City had plans prepared for electric-light plant. About $40,000.

Wash., Seattle—Barton & Co., Spokane Ave. and Wyoming St., plans to build packing plant in Duwamish Valley. About $250,000.

Cal., Sacramento—J. H. Herspring & Co., Superior California representatives of State Prune & Apricot Growers' Assn., plans to build 4-story, 30 x 160-ft. rein.-con. packing plant, 12th and B Sts. About $200,000.

Que., Montreal — Canadian Steel Foundries Co., Inc., 120 St. James St., plans to build addition to its plant. About $60,000.

Ont., Essex—Essex Tractor Co., Essex, having plans prepared for factory and foundry. About $50,000.

Ont., Eugenit — Hydroelectric Power Comn. having plans prepared for addition to its power plant. About $75,000.

Ont., Lindsay—Grand Trunk Ry. had plans prepared for roundhouse, machine shops and coal hoist. About $100,000. J. D. McMillan, Belleville, supt. of div. H. R. Safford, Montreal, Que., ch. engr.

Ont., Toronto—Dominion Shipbuilding Co., Ltd. purchased 15 acre site on water front, and plans shipbuilding plant between Spadina Ave. and Queen's Wharf.

Ont., Toronto — W. Williamson plans to build addition to planing mill on Woodbine Ave. About $35,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Me., Oakland**—Amer. Woolen Co., Shawmut Natl. Bank Bldg., Boston, let contract power house to H. W. Pitman Co., Bay State Bldg., Lawrence, Mass., $75,000.

★**Mass., Cambridge**—Worthington Pump & Machinery Co., 115 2nd St., let contract 1-story, 81 x 121-ft. foundry, to Aberthaw Constr. Co., 57 School St., Boston. About $48,000.

★**N. Y., New York**—Baker & Williams, 519 West 29th St., let contract 9-story, 100 x 100-ft., fireproof warehouse at Greenwich and Leroy Sts. to Cauldwell-Wingate Co., 381 4th Ave. About $900,000.

★**N. Y., New York**—Willoughby Garage Corp., 25 Court St., let contract 2-story, 92 x 154-ft. rein.-con. garage, 238-66 West 19th St., to G. & M. Improv. Co., 26 Court St., $100,000. Noted Oct. 25.

★**N. Y., Rochester**—Rochester Light & Power Co. let contract 4-story, 35 x 50-ft. addition to power plant, to Turner Constr. Co., 244 Madison Ave., New York City.

★**N. Y., Utica**—West End Brewing Co., 811 Edward St., let contract 3-story, 72 x 150-ft. bottling plant, to P. Kerner & Son, 538 Canal St.

★**N. J., Elizabeth**—Waclark Wire Co. let contract 2-story, 105 x 177-ft. factory addition to Almon Eng. & Constg. Co., 25 Church St., New York City. About $100,000.

★**N. J., Jersey City**—Amer. Can Co., 120 Bway., New York City let contract 4-story, 172 x 200-ft. addition to storage building. Communipaw Ave., near Woodward St., to W. L. Goeltz, Inc., 50 Broad St., New York City. About $500,000. Noted July 26.

★**N. J., Jersey City**—Central R.R. of New Jersey let contract 1-story power plant to Westinghouse, Church, Kerr & Co., 37 Wall St., New York City. About $150,000.

★**Pa., Phila.**—City let contract building power house at Vintage and University Aves., to Standard Constr. Co., 1713 Sansom St., $238,000.

★**Pa., Phila.**—W. Cramp & Sons, Richmond and South Morris Sts., let contract 1-story, 58 x 100-ft. and 120 x 120-ft. shops, to Joffman Eng. & Constr. Co., Pennsylvania Bldg. About $35,000.

★**Pa., Phila.**—M. Lloyd & Co., 20th and Ridge Ave., let contract building 1-story, 25 x 70-ft. garage to E. E. Hillonback, 1809 Brandywine St., $25,000.

★**Pa., Phila.**—W. T. White let contract 1-story, 215 x 353-ft. brick machine shop, 20th St. and Erie Ave., to Watson Eng. Co., 216 North Broad St. About $150,000.

★**Tenn., Paris**—(Official) Louisville & Nashville R.R. let contract building addition to roundhouse, to G. H. Rommel Co., 639 South Campbell St., Louisville, Ky. About $60,000. Noted Nov. 8.

★**O., Akron**—Northern Ohio Traction & Light Co., Hamilton Bldg., let contract 1-story, 44 x 175-ft. garage to H. P. Moran Co., 425 2nd Natl. Bank Bldg., $80,000.

★**O., Cincinnati**—Setoo Realty Co., 134 East 4th St., let contract 3-story, 40 x 67-ft., store and service station, to Lellenk Const. Bldg. Co., 134 East 4th St., $28,000.

★**O., Cleveland**—Hydraulic Pressed Steel Co., 3152 East 61st St., let contract brick and steel plant to Westinghouse, Church, Kerr & Co., 37 Wall St., New York City. About $1,500,000.

★**O., Columbus**—Pennsylvania Lines West of Pittsburgh (Southwest System), let contract 2-story, 82 x 168-ft. car shop and factory, 95 x 100-ft. tank shop, to D. W. McGrath, 801 New 1st Natl. Bank Bldg. Noted Aug. 16.

★**Mich., Detroit**—Detroit Nut Co., foot of Lycaste Ave., let contract 3-story brick and steel factory addition to Detroit & Canton Campau Bldg.

★**Mich., Detroit**—Dodge Bros., Chicago and Hamtramck Aves., will build 600 x 800-ft. munition factory by day labor. About $1,500,000. Noted Nov. 22.

★**Mich., Detroit**—Packard Piano & Motor Co. let contract 50 x 150-ft. and 60 x 100-ft. additions to plant here, to A. K. Smith Constr. Co., 8-11 Campau Bldg. About $100,000.

★**Mich., Kalamazoo**—Monarch Paper Co. let contract factory, 70 x 150-ft., superintending to H. L. Vanderhart, 404 South Burdick St. About $40,000.

★**Wis., Green Bay**—Green Bay Motor Car Co., 818-20 North Adams St., let contract 1-story, 60 x 100-ft. garage and repair shop to Yahr Constr. Co., Green Bay. About $10,000.

★**Wis., Milwaukee**—Bundle Mfg. Co., 27th and Wash. Aves., let contract 2-story, 50 x 150-ft. brick and reinforced concrete addition to Machle Constr. Co., 345 Grand Ave. About $15,000.

★**Wis., Shawano**—Shawano Hardware & Auto Co. let contract 1- and 2-story garage and repair shop to F. Schmidt, Shawano. About $11,000.

Industrial Works (Continued)

★**Minn., Minneapolis**—[illegible] Bros., [illegible] Palmer Bldg., let contract 2-story, 40 x 123-ft. garage to Albinson Constr. Co., Wilmar Bldg. Noted Nov. 8.

★**Cal., Sacramento**—Libby, McNeil & Libby, [illegible] let contract reinforced warehouse to Lappe & Peterson, Monadnock Bldg., San Francisco. About $[illegible]. Noted Nov. 8.

★**Que., Montreal**—A. R. Whittal Can Co., 740 Wellington St., let contract brick addition to factory to E. Carrigan, 318 Ballantyne Ave., N. About $25,000.

BUILDINGS

Proposed Work

Mass., Fall River—Store—W. J. Doran & Co., [illegible] South Main St., plans 3-story, 50 x 85-ft., brick and terra cotta. M. J. Doran, [illegible].

N. Y., New Rochelle—(Official)—Theater and Store—E. F. Rush, 1482 Bway., New York City, receives bids about Dec. 15., 2-story. Cost, $150,000. De Rose & Pereira, 154 Nassau St., New York City, archts. Noted Nov. 15.

N. Y., New York—Asylum—Bd. Trustees Hebrew Orphan Asylum, Amsterdam Ave. and 138th St., plans to build group institutional buildings in Wakefield Sect. of Bronx.

N. Y., New York—Office—W. R. Grace & Co., 7 Hanover Sq., having plans prepared by J. W. O'Connor, archt., 3 West 29th St., 7-story, 46 x 70-ft. brick and stone addition at [illegible] Water St. About $[illegible].

N. Y., New York—Theater, Store, Etc.—The 181st St. Constr. Co. having plans prepared by De Rosa & Pereira, archts., 150 Nassau St., 5-story, 150 x 200-ft. brick and terra cotta, Bway. and 181st St. About $[illegible]. S. Morse, [illegible] 7th Ave., Pres.

N. J., Fort Lee—High School—Bd. Educ. plans brick and stone. About $125,000. E. G. Kauffer, pres. E. Sibley, archt.

N. J., Jersey City—Nurses' Home and Hospital—City plans $[illegible] bond issue for additions to Jersey City Hospital.

N. J., Ocean City—(Official)—Theater, Store, Etc.—H. E. Wendell, archt., 431 Central Ave., preparing plans for 80 x 250-ft. theater, 2-story, 75 x 125-ft. observation and dance pavilion, 1-story, 75 x 125-ft. stores, 50 x 407-ft. bath house, frame construction and 2-story, 50 x 100-ft. brick swimming pool; also 125 x 400-ft. concrete piling and concrete girder ocean pier.

Pa., Harrisburg—Hotel—F. B. Aldinger, 16 Grace Ave., has purchased Senate Hotel on Market Sq. and plans to replace same with new 10-story structure.

Pa., Phila., City Hall—City plans to improve old city hall, 5th and Chestnut Sts. About $69,000. T. B. Smith, mayor.

Pa., Phila.—School—Cook Lane Country Day School, Cook Lane, Phila., having plans prepared by Stegeziner & Eberhart, archts., 401 Chestnut St., 1-story, 100 x 1550 ft., brick. About $[illegible].

Pa., Williamsport—School—City Council [illegible] $[illegible] bond issue to build 2 new [illegible].

S. C., Lexington—School—City plans election to vote on about $[illegible] bonds to build [illegible].

Ga., Atlanta—Auditorium—Lanier Improvement Assn. plans [illegible] Auditorium to build recreation park adjacent field of 8 acres and swimming pool. C. L. Powell, pres.

O., Cleveland—Flats and Lodge—Lithuanian Christian Home Co. had plans prepared for 3-story, 45 x 115-ft. brick and terra cotta, Superior Ave. and East 61st St. About $[illegible]. G. P. Kopp, [illegible] Euclid Ave., archt. Noted Nov. 8.

O., Cleveland—Hotel—D. M. Mayer, [illegible], had plans prepared by W. J. Stanard, archt., 1836 Penrill Ave., S. E., for [illegible] 4-story, [illegible] ft. brick and concrete [illegible] to [illegible] Noted Nov. 8.

O., Cleveland—Office—Oak Investment Co. had plans prepared by A. [illegible], archt., Park Bldg., 11th St. and Walnut Ave. About $[illegible].

O., Deshler—School—City voted $[illegible] bonds to build school.

O., East Cleveland—(Cleveland P. O.)—Technical High School—Bd. Educ. [illegible] bids about Dec. 1 for 3-story, About $[illegible]. W. H. Vickers, archt. Noted July 17.

Ind., Connersville—Bank—Farmers & Merchants Trust Co. having plans prepared by Hoggson Bros., engrs., 485 5th Ave., New York City, 48 x 82½ ft. About $100,000. E. W. Ansted, pres.

Mich., Ann Arbor—Dormitory—State University plans 3-story, 47 x 139-ft. About $100,000. H. B. Hutchins, pres. A. Kahn and E. Willby, archts., Marquette Bldg., Detroit, soon receive bids.

Mich., Grand Rapids—College—Dominican Sisters plan to build college to consist of 3 buildings, on Fulton Rd. About $100,000.

Mich., Muskegon—Hospital—Sisters of Mercy, Mt. Mercy Home, West Bridge St., Grand Rapids, having plans prepared by Brielmaier & Son, archts., 41 University Bldg., Milwaukee, Wis., 4-story. About $150,000.

Ill., Chicago—Hospital, Etc.—Augustana Hospital Assn. plans 7-story, 50 x 188-ft. ward building, 7-story administration building, 6-story, 40 x 130-ft. nurses' home and 1-story boiler house. About $1,500,000. M. Sturm, 116 South Michigan Ave., archt.

Wis., Milwaukee—Hotel—J. E. Theil & Co., 706 Caswell Blk., having plans prepared for hotel and garage. About $200,000.

Wis., Wausau—School—Bd. Educ. had plans prepared by Swarthout & Speer, archts., Wasau, brick. About $200,000.

Minn., Bloomington—(Minneapolis P. O.)—School—Bd. Educ. having plans prepred by G. L. Lockhart, archt., 391 Endicott Bldg., St. Paul, 1 and 2-story, 59 x 137 ft., and 2 wings, 1-story, 42 x 70-ft. brick, tile and rein.-con. About $70,000. W. McCutchan, R. No. 4, Minneapolis, clk.

Minn., Lakefield—High School and Manual Training Schools—Bd. Educ. rejected bids building 2-story, 60 x 97-ft.; also 2-story, 61 x 96-ft. rein.-con. brick and tile. K. T. Snyder, 933 Plymouth Bldg., Minneapolis, archt. New bids in February. Noted Oct. 18.

Minn., Rochester—Store and Hotel—Knowlton Realty Co. rejected bids 6-story, 110 x 140 ft., cut stone. About $275,000. Noted Oct. 18.

Minn., St. Paul—Exhibition Hall and Barns—State Agricultural Society plans. About $150,000. T. H. Canfield, Como and Snelling Ave., genl. mgr.

Minn., St. Paul—Hospital—Bethesda Hospital plans, on Capitol Blvd., Park and Como Aves., and Viola St. About $500,000. J. A. Krantz, supt.

Minn., St. Paul—Workhouse—City plans election to vote on $475,000 bond issue to build workhouse and garbage-disposal plant. A. Goss, comr.

Minn., St. Paul—St. Luke's Congregation plans, Lexington and Summit Aves. About $350,000. J. T. Comes, Resleau Bldg., Pittsburgh, Pa., archt.

Kan., Eureka—Home—Independent Order Odd Fellows plans to build here. About $100,000.

Kan., Manhattan—School—State plans addition to State Agricultural School. About $50,000. C. H. Chandler, State House, Topeka, archt.

Kan., Peabody—High School—Bd. Educ. having plans prepared by G. W. Van Meter, archt., 604 Caldwell-Murdock Bldg., Wichita, for 2-story, 65 x 100-ft. addition. About $[illegible].

Kan., Pittsburg—Normal—State Bd. Administration, Topeka, had plans prepared by C. H. Chandler, state archt., Topeka, 3 story, 80 x 250 ft., with wing 90 x 106 ft., brick, concrete, terra cotta and stone. About $200,000.

Kan., Topeka—Hotel—Stock Co., c/o J. F. Renker, 301 Leland St., had plans prepared by Smith, Rea & Lovitt, archts., Finance Bldg., Kansas City, Mo., 10-story.

Neb., Aurora—Schools—Bd. Educ. plans. About $55,000.

Neb., Columbus—Court House—Platte Co. Comrs. let contract about Jan. 1, 3 [illegible]. About $[illegible]. C. Werdeman, Columbus, Neb., archt. Noted Nov. 1.

Neb., Lincoln—Hospital—Bd. Comrs. State Institutions having plans prepared 2-story, [illegible] x 200-ft. Hospital for Insane. About $190,000. J. H. Craddock, Farnum Bldg., Omaha, archt.

Neb., Omaha—Schools—Bd. Educ. plans to issue $2,250,000 bonds to build schools.

S. D., Minot—Bank and Office—Brush-McWilliams Co. had plans prepared by Tulgren & Son, archts., 1st Natl. Bank Bldg., Milwaukee, Wis., 6-story, 25 x 140-ft. About $100,000. C. H. Mott, 46 Main St., pres.

N. D., Bismarck—Chemistry—University of North Dakota having plans prepared by F. W. Keith, Bismarck, archt. About $90,000.

N. D., Minot—Hotel—Million Dollar Hotel Co., Inc., soon lets contract, 8-story, 75 x 146 ft. About $450,000. G. J. Hoffman & Co., Rochester, Minn., archts.

N. D., Wahpeton—Hospital—Lutheran Deaconess Hospital having plans prepared by W. F. Kurke, archt., Huntington Bl., Fargo, 3-story, brick. About $50,000.

Mont., Billings—Bank—Merchants Natl. Bank & Merchants Loan Co. to build here, 7-story, fireproof. About $400,000.

Mo., Kansas City—Church—First Christian congregation having plans prepared by Shepard, Farrar & Wiser, archts., 1292 R. A. Long Bldg., 32 x 76 ft. About $100,000. Address F. N. Daniels, 9th St. and Denver Ave.

Mo., Kansas City—Church—Holy Name congregation soon lets contract, 2-story, 101 x 166 ft. About $200,000. J. Fowler, 2201 Benton Bldg., rector. Wight & Wight, 401 1st Natl. Bank Bldg., archts.

Mo., Kansas City—Library and School—Bd. Ed. having plans prepared by C. A. Smith, archt., 602 Finance Bldg. About $150,000.

Mo., Kansas City—Masonic Temple—Ivanho Masonic Lodge plans, 3-story, 90 x 125-ft., stone and rein.-con. About $175,000. Smith, Rea & Lovett, archts., 602 Finance Bldg., receiving bids about Jan. 1. J. O. Christensen, 3131 Campbell St., chn. bldg. com.

Mo., St. Louis—Store—Bear & Fuller, 6th and Washington Sts., having plans prepared by Mauran, Russel & Crowell, archts., Chemical Bldg., for addition. About $300,000.

Mo., St. Louis—Theater and Apartment—F. L. Cornwell, La Salle Bldg., having plans prepared by H. J. Harker, archt., 810 Chestnut St., 9-story, 175 x 326 ft. About $800,000.

Tex., Arlington—Administration—Grubbs Vocational College soon lets contract, 70 x 125 ft., brick and concrete. About $100,000.

Tex., Arlington—Home—Berachah Home plans. About $50,000. J. T. Upchurch, supt.

Tex., Dallas—Station—City plans to build fire station, Augusta St. and Columbia Ave. About $50,000. A. Magee, fire ch.

Tex., Dallas—Store—Overland Automobile Co., 2426 Commerce St., soon lets contract, 2 story, South Ervay and Cadiz Sts. About $150,000. Lang & Witchel, 1613-15 Southwestern Life Bldg., archts.

Tex., Dallas—Synagogue—Shareth Israel Congregation plans. About $75,000. L. Klineman, pres.

Tex., Ft. Worth—Schools—City election soon to vote on $400,000 bond issue to build schools; plans of Bd. Educ. include building high school, $125,000, wing to present high school and school auditorium, $240,000.

Okla., Okmulgee—Hospital—City had plans prepared by Smith, Rea & Lovitt, archts., Terminal Bldg., Kansas City, Mo., 3 story, 40 x 80 ft., steel, concrete, and brick. About $50,000.

Okla., Pauls Valley—Court House and Jail—Garvin Co. at recent election voted $150,000 bond issue to build courthouse and jail. Noted Oct. 18.

Idaho, Caldwell—Office—C. H. Sebree, Caldwell, having plans prepared by R. E. Field, archt., Binz St., Houston, Tex., 5 story, steel, Arthur and Kimball Sts. About $80,000.

Ariz., Jerome—Hotel and Apartment House—United Verde Extension Mining Co. had plans prepared by Lescher & Kibbey, archts., Bank of Arizona Bldg., Phoenix. 3-story, 55 x 200-ft. concrete hotel, and 3-story, 70 x 60-ft. concrete apartment house. About $125,000.

Ariz., Tucson—Schools—City election Dec. 8 to vote on $50,000 bond issue to build schools.

Ore., Baker—Swimming Pool—City plans election Dec. 3 to vote on $54,000 bond issue for swimming pool.

Buildings (Continued)

Cal., Bay Point—School—Bd. Educ. having plans prepared by J. T. Narbett, archt., 9th and McDonald St., Richmond, for additions and alterations. About $50,000.

Cal., Fresno — Cathedral — Scottish Rite Lodge soon lets contract, 3-story, rein.-con. and brick. About $200,000. C. Werner, Phelan Bldg., San Francisco, archt.

Cal., Sacramento—Home—Chamber of Commerce soon lets contract, 2 story, on 7th St. Cost between $60,000 and $75,000. C. Virden, pres. Noted Oct. 11.

Cal., Sacramento—Store—Weinstock Lubin Co., 4th and K Sts., plans, 10 story, 160 x 210 ft., 9th and L Sts. About $1,000,000.

Cal., San Francisco—Store—J. D. and A. B. Spreckles having plans prepared by G. A. Applebarth, archt., Claus Bldg., 5-story, at Harrison and Spear Sts. About $200,000.

Cal., San Francisco — Theater — Colonial Theater Co. having plans prepared by C. Werner, archt., Phelan Bldg., Clement St. and 9th Ave. About $125,000.

Cal., San Pedro—Y. M. C. A. plans 3-story, 100 x 160 ft. building. About $200,000. D. E. Luther, Los Angeles, secy.

Que., Verdune — School — School Comrs. plan, 3-story, brick and stone. Cost $175,000. J. E. A. Benoit, archt., 1290 Wellington St., receives bids about December.

Ont., Toronto—Store—F. Stollery plans, Yonge and Bloor Sts. About $100,000.

Man., Winnipeg — Schools — Bd. Educ. plans to build 4 schools. About $500,000. W. H. Champion, 206 Butland St., secy.

Sask., Saskatoon — High School — High School Bd. plans addition. About $150,000 J. F. Cairns, chn.

BIDS DESIRED

N. H., Nashua—High School—Until Dec. 1, by Bd. Educ., 3-story, 152 x 183-ft. brick and stone school and auditorium. About $200,000. T. M. James, 185 Devonshire St., Boston, archt. Noted Sept. 6.

N. Y., New Platz—(Official)—School—Until Dec. 17, by Dr. T. E. Finegan, deputy comr. educ., Albany, for addition to State Normal School; advertised in this issue.

N. Y., New York — (Official) — Synagogue—Until Jan. 15, by Bnai Israel congregation. J. Adler, 19 West 26th St., pres. E. Roth, 119 West 40th St., archt.

Fla., Miami — School — Until Dec. 4, by Dade Co., Bd. Pub. Instruction, building North Side School, concrete and hollow tile; also for addition to Highland Park and Buena Vista Schools. About $50,000. R. E. Hall, supt. A. E. Lewis, Real Estate Bldg., archt.

O., Kenmore—(Official)—High School—Bd. Educ. to sell $140,000 bonds Dec. 10, to build high school. I. W. Fiscus, clk.

Kan., Pittsburg—Normal—Until Dec. 17, by State Bd. Administration, Topeka, 3-story, 86 x 247 and 96 x 100 ft., brick, stone and rein.-con. About $200,000. C. H. Chandler, Topeka, state archt. Noted Nov. 22.

N. M., Gallup — (Official) — High and Grade School—Until Dec. 15, by Bd. Educ., to be built on tract of land north of Sante Fe R.R. tracks. C. L. Wilson & Co., Amer. Natl. Bank Bldg., Monrovia, Cal., archt.

Cal., Patton—(Official)—Cottage — Until Dec. 4, by W. F. McClure, state engr., Forum Bldg., Sacramento, building Cottage No. 17 at Southern California State Hospital.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Brooklyn** Bank—Peoples Natl Bank, 1336 Bway, let contract 1-story, 48 x 106 ft., brick and marble, Quincy St. and Ralph Ave., to J. Auer & Sons, 648 Lexington Ave. About $100,000. Noted Nov. 22.

★**N. Y., Buffalo** Church—St. Nicholas Ruthenian congregation let contract, 1-story, 80 x 92 ft., Fillmore and Ontilda Aves., to Niedepruem Bldg. Co., 1170 Jefferson St. About $80,000. Noted Aug. 24.

N. Y., Central Islip — (Official) — Addition Patients' Building—State Hospital Comn., Albany, received low bids Nov. 14, building addition to Central Islip State Hospital, from B. J. Raynor, Islip, $89,660; Stewart Willey Co., Inc., 1123 Bway., New York City, $92,000; M. Kantrowitz, 151 Market St., Albany, $94,000. Noted July 13.

★**N. J., Red Bank**—School—Bd. Educ. let contract building on Park Pl. to I. R. Taylor & Co., R. R. Ave., Asbury Park. About $73,330. Noted Nov. 8.

★**Pa., Chester**—High School—Bd. Educ. let contract 4-story, 120 x 245-ft. stone and rein.-con., to J. R. Wiggin, 1215 Filbert St., Phila. About $200,000. Noted Oct. 25.

★**Pa., Pittsburgh**—Store—E. F. Baird, Ferry St., let contract 3-story, brick, to Toupet, Beil & Conley, office 5931 Penn Ave., Pittsburgh, Pa. About $50,000.

★**Md., Baltimore**—Y. M. C. A. let contract 4-story, 60 x 100-ft., brick and rein.-conc. building on Druid Hill Ave. and Delphin St. to G. R. Morris, Title Bldg. About $100,000.

★**Fla., Tallahassee**—Dormitory and Educational—Florida State College for Women let contract to O. C. Parker & Co., Tallahassee, $82,701. Noted Nov. 1.

Ala., Bessemer—Court House and Jail—Jefferson Co. let contract to Evans Bros., 2312 Ave. F., about $95,000. Noted July 19.

★**O., Cleveland**—See "Industrial Works."

★**O., Cleveland Heights** (Warrensville P. O.)—School—Bd. Educ. let contract, 2-story, 82 x 164-ft., to R. H. Evans & Co., Columbus Savings & Trust Bldg., Columbus. About $200,000.

★**Ia., Ventura**—School—Bd. Educ. let contract, 3-story, brick and rein.-con., in Consolidated Dist., to C. Rye, Mason City. About $50,000. Noted Aug. 2.

★**Cal., Livermore** — Hospital — Alameda Co. let contract building tuberculosis hospital to W. G. Thornally, 3027 16th St., Oakland, $52,985. Noted Sept. 6 under Oakland.

★**Ont., London** — Hospital — Hospital Comn., Ottawa, let contract, brick and rein.-conc., to J. Hayman & Sons, 432 Wellington St. About $200,000. Noted June 28.

FEDERAL GOVERNMENT WORK

Proposed Work

N. Y., New York—Electric Traveling Cranes—Bureau Yards and Docks, Navy Dept., Wash., plans to install electric traveling cranes for use in extension to machine shop in Navy Yard; specification No. 2720. About $76,000.

N. Y., New York—Repairs to Structural Steel Work of Terminal Building—Bureau Yards and Docks, Navy Dept., Wash., plans; Specification No. 2724.

Pa., Ft. Mifflin—Office—Bureau Yards and Docks, Navy Dept., Wash., plans; Specification No. 2725. About $14,000.

Md., Indian Head—Extension to Power House—Bureau Yards and Docks, Navy Dept., Wash., plans to build extension to power house; Specification No. 2722. About $29,000.

Wash., D. C.—Aviation Stations—War Dept., Signal Corps soon lets contract for aviation stations in Alabama and Florida, exact location not given, also at Sam Houston, Tex.

Wash., D. C.—Crane Runways—Bureau Yards and Docks, Navy Dept., bids to install in Gun Park; Specification No. 2711. About $140,000.

Wash., D. C. — Motor Generator Sets — Bureau Yards and Docks, Navy Dept., preparing plans installing at Phila., Norfolk, Va., New York and Wash., D. C. navy yards.

Wis., Rhinelander — Post Office — J. A. Wetmore, supervising archt., Treas. dept., Wash., receiving bids in December; 2½ to 3 sty., 70 ft., brick and concrete. Noted Nov. 15.

Mo., Harrisville — Post Office — J. A. Wetmore, supervising archt., Treas. dept., Wash., rejected bids opened May 15. Noted Nov. 22.

Ark., Lonoke — Aviation School — War Dept. soon lets contract for one 400-acre aviation school to be built near Memphis, Tenn., $750,000.

Cal., Bakersfield — Post Office — J. A. Wetmore, supervising archt., Treas. dept., Wash., received bids opened Oct. 31. Noted Nov. 1.

BIDS DESIRED

R. I., Newport — Garage — Until Dec. 10, by Bureau Yards and Docks, Navy Dept., Wash., building at Naval Training Station; specification No. 2707. Noted Nov. 8.

Conn., New London — Cranes — Until Dec. 10, by Bureau Yards and Docks, Navy Dept., Wash., furnishing and installing on runway rails, one 5-ton, 3-motor bridge crane, one 2-ton hand-operated bridge crane in machine shop at Submarine Base; Specification No. 2701.

Conn., New London — Removal of Wall — Until Dec. 3, by Commandant, Submarine Base, New London, removing 300 cu.yd. concrete wall; Specification No. 2712.

N. Y., New York — Dredging — Until Nov. 30, at U. S. Engr. Office, 39 Whitehall St., New York, dredging and rock removal in East River.

Pa., Phila.—Cranes—Until Dec. 10, by Bureau Yards and Docks, Navy Dept., Wash., installing in galvanizing plant; Specification No. 2660. About $20,000.

Pa., Phila.—Dredging—Until Dec. 21, at U. S. Engr. Office, Phila., dredging in Delaware River on Baker and Liston Range ranges.

Pa., Phila.—Piping, Etc.—Until Dec. 10, by Bureau Yards and Docks, Navy Dept., Wash., furnishing and installing piping tunnel, piping, valves, fittings, hydrants and accessories necessary for complete steam, hot water, compressed air, Delaware River water, fresh water and fuel-oil distributing systems at Navy Yard; Specification No. 2694. Noted Nov. 8.

Wash., D. C.—Grading—Until Dec. 3, at office of Comrs. Dist. Columbia, grading 41,300 cu.yd. L. Brownlow, comr.; advertised in this issue.

Wash., D. C.—Surveying Instruments—Until Dec. 3, by Supt. U. S. Coast and Geodetic Survey, 295 New Jersey Ave., S. E., Wash., advertised in this issue.

Fla., Key West—Tank and Tower—Until Dec. 6, by Comr. Fisheries, Dept. Commerce, Wash., D. C., building concrete tank and tower at Biological Sta.

Fla., Santa Rosa—Wharf and Boathouse—Until Dec. 17, by E. P. Bertholf, capt. commandant, U. S. Coast Guard, Wash., D. C., building wharf and boathouse at Sta. No. 212, Santa Rosa; advertised in this issue.

Tex., Galveston—Riprap—Until Dec. 14 by U. S. Engr. Office, Galveston, furnishing and delivering riprap at Port Aransas or Rockport, Tex.; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Me., Caribou—Post Office—J. A. Wetmore, supervising archt., Treas. dept., Wash., received low bids from C. Nelson Co., Bangor, $48,752; E. T. Abbott Constr. Co., 111 Bway., New York City, $51,000; T. W. Cassell, Newark, O., $54,450. Noted Oct. 18.

★**Mass., Boston**—Timber Bulkhead—Bureau Yards and Docks, Navy Dept., Wash., let contract to W. F. Miller Co., 171 Alford St., $7,000. Noted Nov. 22.

★**Mass., Chelsea**—Heating and Piping—Bureau Yards and Docks, Navy Dept., Wash., let contract heating and piping at Naval Hospital Reservation to Howard Bros., 412 Dorchester Ave., Boston, $4,444.

★**Mass., Chelsea**—Heating, Ventilating and Lighting—Bureau Yards and Docks, Navy Dept., Wash., let contract installing in Emergency Hospital Units 1, 2 and 3 to Buerkel & Co., 24 Union Park St., Boston, $138,944. Noted Nov. 15.

★**N. Y., New York**—Aircraft Storage and Aircraft Repair Shops—Bureau Yards and Docks, Navy Dept., Wash., let contract for building to Austin Co., Bulletin Bldg., Penn. Terminal, $80,000; work complete, $120,000; contract to be awarded Nov. 29.

★**N. Y., New York**—Temporary Tent Division—Bureau Yards and Docks, Navy Dept., Wash., let contract (work completed) to Lawson Co., 156 Fulton St., Boston, $75,333. Noted Nov. 15.

★**N. Y., New York**—Commanding Officer's Residence—Bureau Yards and Docks, Navy Dept., Wash., let contract to W. Crawford, 1 East 42d St., $30,000.

★**N. J., Little Silver**—Drainage—Wm. Cook, Signal Corps, let contract for drainage in connection with Hollywood Aviation Field, Camp Alfred Vail, to T. H. Hamilton, Asbury Park, $3,000. Noted Nov. 15.

Federal Government Work (Continued)

N. J., Woodbury—Post Office—J. A. Wetmore, superv. archt. treas. dept., Wash., received low bids from Hagen Lumber Co., Dunbury and Mattes St., Scranton, Pa., $53,698; E. T. Abbott Constr. Co., 1133 Bway., New York City, $54,210; T. W. Cissell, Newark, O., $55,470. Noted Oct. 25.

★Pa., Ft. Mifflin—Buildings—Bureau Yards and Docks, Navy Dept., Wash., let contract building addition to Building No. 61, also new steel building, to George & Horst, 277 South 11th St., Phila., $14,489.

★Pa., Phila.—Fitting out Piers—Bureau Yards and Docks, Navy Dept., Wash., let contract 3 fitting out piers to Snare & Triest, 233 Bway, New York City, $465,000. Noted Nov. 22.

Pa., Phila.—Marine Barracks—Bureau Yards and Docks, Navy Dept., Wash., received low bids (work complete), from McCloskey & Bahl, 1620 West Thompson St., $213,547; Price Constr. Co., 216 Maryland Trust Bldg., Baltimore, $227,000; W. R. Dougherty, 1608 Sansom St., Phila., $230,000. Noted Nov. 15.

★Pa., Phila.—Tank and Tower—Bureau Yards and Docks, Navy Dept., Wash., let contract (work complete), to Memphis Steel Constr. Co., Magee Bldg., Pittsburgh, $16,864. Noted Nov. 22.

★Pa., Phila.—Temporary Building—Bureau Yards and Docks, Navy Dept., Wash., let contract, temporary building for marine corps, to McCloskey & Bahls, 1620 Thompson St., Phila., $29,476.

Md., Indian Head—Artesian Wells—Bureau Yards and Docks, Navy Dept., Wash., received low bids for additional artesian water supply at Naval Proving Ground, (a) work complete, (b) work complete with modification, from E. Christman, 416 McClymonds Bldg., Massillon, O., (a) $93,472, 120 days, (b) $55,685, 120 days; J. L. Sweigard & Co., Lincoln Bldg., Phila., (b) $115,850, 180 days.

Md., Indian Head—Powder Dry Houses—Bureau Yards and Docks, Navy Dept., Wash., received low bids building 23 powder dry houses at Naval Proving Grounds, (a) net price for work complete, using either galvanized iron or asbestos protected metal, (b) net price for work complete, using either galvanized iron or asbestos metal on roof and timber siding on exterior walls, (c) net price for work complete, using asbestos shingles on roof and timber sidings on exterior walls, (d) net price for work complete, using asbestos shingles on roof and sides, (e) net price fofr each additional cubic foot of brick on concrete piers and walls over quantity shown on drawings, from J. H. Nolan Constr. Co., Munsey Bldg., Wash., D. C., (a) $263,677; Austin Co., 1020 Bulletin Bldg., Phila., (a) $322,146, (b) $317,926, (c) $299,189, (d) $305,562, (e) $0.70; Dawson Constr. Co., May Bldg., Pittsburgh, (a) $331,789, (b) $332,456, (c) $317,418, (d) $315,120, (e) $0.40; Snare & Triest, 233 Bway., New York City, (a) $376,400, (b) $372,800, (c) $372,200, (d) $376,000, (e) $0.60. Noted Nov. 22.

★Wash., D. C.—Addition to Forge Shop—Bureau Yards and Docks, Navy Dept., let contract building at Navy Yard, to Boyle Robertson Constr. Co., Evans Bldg., $117,874. Noted Nov. 22.

Wash., D. C.—Alterations to Office Building—J. A. Wetmore, supervising archt. treas. dept., received low bids for alterations to building at 708-710 14th St., N. W., from W. F. Mussey, Bruce Bldg., $51,713; F. L. Wagner, 1413 H St., N. W., $55,400.

Wash., D. C.—Bridge—Comrs. Dist. Columbia, District Bldg., received low bids building 7 span steel girder highway bridge abutments, piers and approaches, over tracks Philadelphia, Baltimore & Washington R. R., Bunting Rd., item 1, approaches, item 2, work complete, design A and B, from Penn Bridge Co., Bond Bldg., item 1, $81,000, 2a, $101,750, 2b, $91,000; F. J. Rose, 701 North Broad St., Phila., item 1, $107,000, 2a, $105,000, 2b, $99,000; C. H. Tompkins, 1882 Bway., N. W., 2a, $99,000, 2b, $91,000. Noted Nov. 1.

Wash., D. C.—Fitting Out Cranes—Bureau Yards and Docks, Navy Dept., Wash., received low bids furnishing 3 electrically operated fitting-out cranes of 250 tons capacity at Navy Yards, Norfolk, Va., New York and Phila., (a) 3 cranes, complete, (b) with modification, (c) 1 crane Phila., (d) same with modification, (e) 1 crane Norfolk, (f) same with modification, (g) 1 crane New York, (h) same with modification, from McMyler Interstate Co., Bedford, O., (b) $2,449,975, (d) $840,325 for 1 crane only and $820,326 each for 3 cranes, (f) $843,925 for 1 crane only and $823,925 each for 3 cranes, (h) $841,125 for 1 crane only and $821,125 each for 3 cranes; alternate A same as above, alternate B, (b) $2,409,975, (d) $827,771 for 1 crane only, $807,701 each for 3 cranes, (f) $831,371 for 1 crane, $811,371 each for 3 cranes, (h) $828,571 for 1 and $808,570 each for 3 cranes, alternate C, same as B; time as specified: Wellman-Seaver-Morgan Co., 7000 Central Ave., Cleveland, (a) $2,414,000, delivery 1 in 540 days, 1 in 720 days and 1 in 900 days; (c),(e), (g), $836,900 each, time 540 days; Webb & Ryan, Grand Central Terminal, New York City, cost plus percentage. Noted Oct. 18.

★Wash., D. C.—Pier and Bulkhead—Bureau Yards and Docks, Navy Dept., Wash., let contract building at Hampton Roads, Va., Proposition "A" to J. Stewart & Co., 30 Church St., New York City; Proposition "B" to H. P. Converse, 88 Broad St., Boston, cost plus percentage. Noted Nov. 22.

★Va., Norfolk—Wood Block Floors—Bureau Yards and Docks, Navy Dept., Wash., let contract (no dredging), to H. P. Converse & Co., 88 Broad St., Boston, Mass., $500,000.

★Va., Norfolk—Wood Block Floors—Bureau Yards and Docks, Navy Dept., Wash., let contract building wood block floors in various shops, to Wyckoff Pipe & Creosoting Co., 30 East 42nd St., New York City, $26,438.

★Ga., Forsyth—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract to H. B. Wilder, Columbus Rd., Macon, $36,697. Noted Nov. 22.

Wyo., Basin—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., received low bids (a) wood girders, (b) steel girders, from W. D. Lovell, 1415 South East 8th St., Minneapolis, (a) $35,700, (b) $36,500; J. H. Wiese, 1301 Citizens National Bank, Omaha, Neb., (a) $38,780, (b) $39,405; C. Weitz Sons, 713 Mulberry St., Des Moines, Ia., (a) $40,500, (b) $41,000. Noted Oct. 25.

★Tex., Austin—Remodeling Court House, Etc.—Bureau Yards and Docks, Navy Dept., Wash., let contract to Walsh & Burney, 528 Littlefield Bldg., $22,806.

MISCELLANEOUS

Proposed Work

Shaft—New York, N. Y.—(Official)—Pub. Ser. Comn., 120 Bway., rescinded contract let to I. J. Stander & Co., Inc., 118 East 28th St. Noted Oct. 4.

Pier—Ocean City, N. J.—(Official)—See "Buildings."

Park Improvements — Trenton, N. J. — City plans to improve Assanpink Park. About $20,000. J. W. Thompson, Broad St. Bank Bldg., archt.

Parks—Lansford, Pa.—See "Sewers."

Wharf—Fayetteville, N. C.—City plans to build wharf, also road leading to same.

Park, etc.—Atlanta, Ga. — See "Buildings."

Wharf — Florence, Ala. — City plans to build wharf.

Terminals — Sheffield, Ala. — City plans election to vote bonds to build rail-to-water terminal facilities.

Subway—Cleveland, O.—H. L. Davis, mayor, appointed C. J. Neal, Fielder Sanders, M. A. Bradley, C. E. Adams and C. A. Otis as commission to make preliminary surveys, adopting plans, which must be given popular approval, after which contracts will be awarded, for subway system. This commission will supervise construction of subway and after terminals are built will have charge of same. Proposed subway will run from high level bridge at West 6th St. and Superior Ave. to Pub. Sq., Euclid and St. Clair Aves. and 9th and Ontario St. Noted Apr. 12.

Park—Lakewood, O. — Council plans to sell $300,000 bonds for public park, Lake Ave. at foot Belle Ave.

River Improvements — Lima, O. — City voted $100,000 bonds for river improvements. C. Bryson, city engr.

Dock—Detour, Mich.—U. S. Steel Corp., 71 Bway., New York City, having plans prepared by Cleveland office for large coaling dock here.

Breakwater — Milwaukee, Wis.—Harbor Comrs. plan to build 600-ft. stone breakwater opposite north end Jones Island. Bond issue of $500,000 planned for project.

Garbage Disposal Plant—St. Paul, Minn. —See "Buildings."

Dam—Stevensville, Mont.—City plans to build 600-ft. dam across Bitter Root River, 10 mi. south of city.

Channel—Beaumont, Tex. — City voted $300,000 bonds to deepen Beaumont ship channel. J. F. Weed, engr. navigation dist. Noted July 12.

Transmission Line—Dallas, Tex.—Texas Power & Light Co. plans to build 7-mi. transmission line to connect at Norwood and Trinity Heights with lines of Dallas Power & Light Co. About $250,000. F. R. Slater, 1332 Commerce St., vice-pres.

Park Improvements—Oklahoma, Okla.—City voted $300,000 for park improvements.

Flood Control—Sacramento, Cal.—State Rec. Bd. ordered construction of entire bypass system in Butte and Sutter Basins as called for by Sacramento River flood-control project, estimated to cost, $14,993,190, including right-of-way, incidental expenses, etc. Flood-control engineer estimated cost of Sutter By-Pass, 31.2 mi., 4000 to 6000 ft. wide, at $7,099,638; Tisdale By-Pass, 4.25 mi., 1000 ft. wide, $799,225; Butte Slough By-Pass, 5.75 mi., 4000 ft. wide, $649,705; Butte By-Pass, 12 mi., 3300 to 4500 ft. wide, $5,264,437. Plans contemplate diversion of 185,000 second-feet of flood water from Sacramento River at Moulton weir, 14 mi. above Colusa and carrying it through Butte and Sutter Basins and discharging it over Fremont weir into Yolo By-Pass.

Transmission Line—Greenwood, B. C.—West Kootenay Power & Light Co. plans to build transmission line from Greenwood to Princeton and Copper Mountain, about 100 mi. L. A. Campbell, Rossland, B. C., genl. mgr.

BIDS DESIRED

Plumbing and Electrical Work — Phila., Pa. — (Official) — Until Dec. 4, by W. S. Twining, dir. dept. city transit, 754 Bourse Bldg., installing plumbing and electrical work in station buildings at Orthodox-Margaret Sts. and Ruan-Church Sts., Contrs. Nos. 539 and 540; Frankford Elevated Ry.; advertised in this issue.

Improving Harbor—Newport, Ore.—Until Jan. 2, by L. Wade, secy. joint ports, furnishing stone and building south jetty at entrance to Yaquina Bay; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

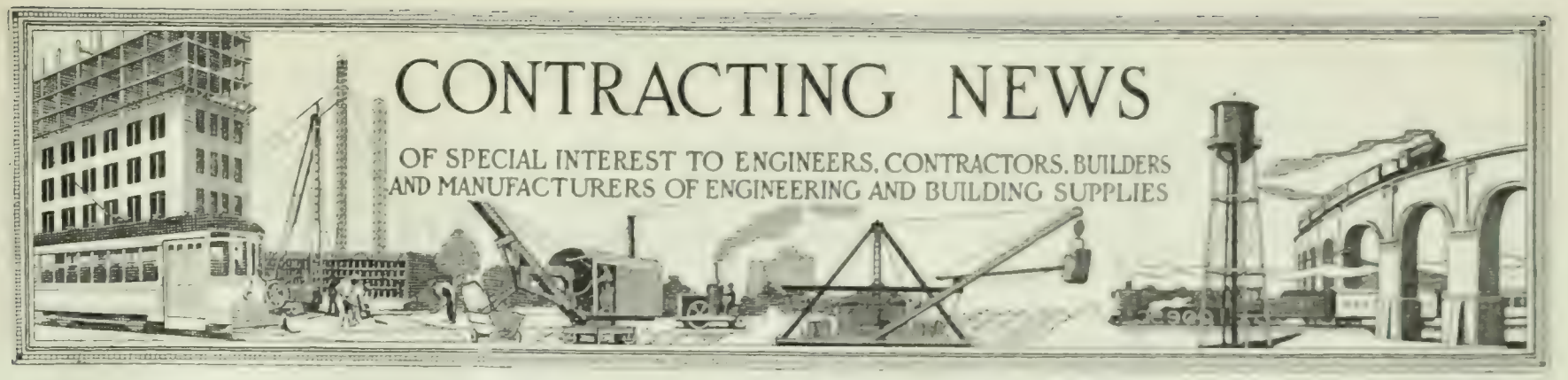
★Bulkhead—Boston, Mass.—Park & Recreation Dept., 33 Beacon St., let contract grading and building bulkhead on Tenean Beach, Ward 20, to A. Baruffaldi, 5 Parker Pl., Somerville, $78,594. Noted Nov. 8.

★Foundation—Middletown, Mass.—Essex Co., Salem, let contract building rein.-con. foundation for Tuberculosis Hospital to F. W. Hammond, 18 Columbus Ave., Beverly, Mass., $25,318.

★Foundation—Cleveland, O.—Bd. Control let contract building rein.-con. foundations for Public Hall, East 6th and Lakeside Sts., to Hunkin-Conkey Constr. Co., 320 Cuyahoga Bldg., $65,288.

★Incinerator—Okmulgee, Okla.—City let contract building garbage-disposal plant to W. McCanse, Durant, $17,150. Noted Nov. 1.

Cement—Winnipeg, Man.—City received only bid furnishing cement for 1918 for Greater Winnipeg aqueduct work, from Canada Cement Co., $3.06 per bbl. gross and $2.61 per bbl. net.



CONTRACTING NEWS

OF SPECIAL INTEREST TO ENGINEERS, CONTRACTORS, BUILDERS AND MANUFACTURERS OF ENGINEERING AND BUILDING SUPPLIES

Price advances are indicated by heavy type; declines by *italics*.

PIG IRON

Below are the present quotations with a comparison of a month and a year ago

	Dec. 1, 1917	One Month Ago	One Year Ago
CINCINNATI			
No. 2 Southern foundry	**$35.90**	$33.00	$24.46
No. 2 Northern basic	34.26	..	28.26
NEW YORK			
No. 2X Northern foundry	34.25	34.25	29.00
No. 2 plain Northern foundry	33.75	33.75	28.50
No. 2 Southern foundry†	**38.75 to 39.25‡**	37.25	28.00
BIRMINGHAM			
No. 2 Southern foundry	33.00	33.00	22.00
CHICAGO			
No. 2 Northern foundry	33.00	33.00	27.00
No. 2 Southern foundry	37.00	37.00	..
PITTSBURGH			
Bessemer iron*	37.25	36.30	34.45
Basic iron*	33.00	33.00	30.00

*These prices include the freight charge from the valley to the Pittsburgh district. †Delivered Tidewater, New York. ‡Rail and water.

RAILWAY SUPPLIES

STEEL RAILS—The following quotations are per 100 lb. f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh		Chicago	
	Dec. 1, 1917	One Year Ago	Dec. 1 1917	One Year Ago
Standard bessemer rails	$38.00	$38.00	$38.00	$38.00
Standard openhearth rails	40.00	40.00	40.00	40.00
Light rails 8 to 10 lb	*43.50*	50.00	*43.50*	47.00
Light rails 12 to 14 lb	*39.00*	49.00	*39.00*	46.00
Light rails 25 to 45 lb	*39.00*	47.00	*39.00*	44.00

Note—Reported that rerolled rails are higher than new rails rolled from billets.

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh				San
	Dec. 1, 1917	One Year Ago	Chicago	St. Louis	Francisco
Standard railroad spikes, ⅝-in. and larger	**$5.00 to 5.50**	$2.65	$5.00	$6.45 base	$7.25
Track bolts square nuts	**7.00 to 8.50**	3.25	6.25	Premium	8.80
Standard section angle bars	*3.50 to 4.00*	2.00	4.50	Premium	4.65

RAILWAY TIES—For fair-sized orders, the following prices per tie hold:

	Material	7 In. x 9 in. by 8 Ft. 6 In.	6 In. x 8 in. by 8 Ft.
New York	Yellow Pine	$1.20	**$1.06 to 1.11**
St. Louis	White Oak	1.00	.75
Chicago	Plain	.97	.82
Chicago	Creosoted	1.30	1.15
San Francisco	Green	**1.13**	**.80**
San Francisco	Creosoted	**2.02**	*1.43*

PIPE

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh, basing car of Nov. 5, by Government, for steel iron still basis of May 1:

BUTT WELD

Inches	Steel Black	Steel Galvanized	Inches	Iron Black	Iron Galvanized
⅜ to 3	*51%*	*32½%*	⅜ to 1¼	*31%*	17%
LAP WELD					
2	*44%*	*31½%*	1¼	18%	3%
2½ to 6	*47%*	*34½%*	1½	24%	11%
7 to 12	*44%*	*30½%*	2	24%	12%
13 and 14	*31½%*		2½ to 6	8%	1%
15	*32%*		7 to 12	7%	13%
BUTT WELD EXTRA STRONG PLAIN ENDS					
¾ to 1½	*49%*	*36½%*	¾ to 1½	*37%*	18%
2 to 3	*50%*	*37½%*			
LAP WELD EXTRA STRONG PLAIN ENDS					
2	*47%*	*36½%*	1¼	19%	4%
2½ to 4	*52%*	*41½%*	1½	29%	11%
4½ to 6	*55%*	*44½%*	2	29%	14%
7 to 8	*50%*	*36½%*	2½ to 4	29%	17%
9 to 12	*35%*	*21½%*	4½ to 6	8%	10%
			7 to 8	20%	8%
			9 to 12	14%	3%

From warehouses at the places named the following discounts hold for steel pipe:

	New York	Chicago	St. Louis
⅜ to 3 in. butt welded	45%	43%	46%
3½ to 6 in. lap welded	18%	16%	20%

	New York	Chicago	St. Louis
⅜ to 3 in. butt welded	22%	20%	23%
3½ to 6 in. lap welded	1 net	0.5%	3%

Malleable fittings Class B and C from New York stock sell at 40 and 5% from list prices. Cast iron screwed extra 50 and 5%.

CAST-IRON PIPE—The following are prices per net ton for carload lots:

	New York						
	Dec. 1, 1917	1 Month Ago	One Year Ago	Chicago	St. Louis	San Francisco	Dallas
4 in.	$59.50	$59.50	$34.50	$58.35	$57.00	$66.40	$62.00
6 in. and over	56.50	56.50	31.50	55.35	54.00	63.40	59.00

Gas pipe and 16-ft. lengths are $1 per ton extra.
Note—Advances due to Government price fixing.

CLAY DRAIN TILE—The following prices are per 1000 lb. f.t.

Size, In.	New York Dec. 1 1917	New York One Year Ago	St. Louis	Chicago	San Francisco	Dallas
3	$35.00	$23.00	$18.40	$15.00	$26.25	$24.00
4	51.00	32.45	20.70	18.00	34.75	36.00
5	65.00	45.00	28.75	23.00	48.75	48.00
6	90.00	56.55	40.25	27.00	67.50	64.00
8	120.00	98.50	74.75	55.00	..	120.00

SEWER PIPE—The following prices are in cents per foot for carload lots:

Size In.	New York Dec. 1 1917	New York One Year Ago	St. Louis	Chicago	San Francisco	Dallas
3	$0.093	$0.0725	..	$0.09	$0.075	$0.1
4	.093	.0725	..	.10	.10	.1032
5	.1395	.12	..	.13	.12	.1
6	.1395	.12	$0.12	.15	.15	.1
8	.217	.165	.165	.21	.225	.2
10	.3255	.24	.23	.315	.30	.31
12	.4185	.30	.33	.405	.40	.387
15	.558	.405	.50	.54	..	.5
18	.775	.57	.75	.75	.75	.731
20	.93	.675	.90	.90	.90	.86
30	1.24	.90	1.13	1.20	..	1.118
24	1.395	.975	1.28	1.35	1.375	1.29
27	2.08	1.65	1.58	..	..	1.935
30	2.304	2.035	1.70	..	..	2.2
33	3.06	2.625	2.25	..	..	3.05
36	3.485	2.94	2.50	..	..	3.44

	Boston	St. Paul	Denver	Los Angeles	Seattle
3	$0.09	$0.09	$0.09	$0.0675	$0.0825
5	.1485	.135	18*	.1125	..
8	.231	.1875	.25	.2025	.2475
12	.4455	.3375	.40	.36	.48
24	1.485	1.44	1.44	1.25	1.75
36	3.60	3.00	3.00*	..	..

*Denver: 6-in. and 30-in.

ROAD AND PAVING MATERIALS

ROAD OILS—Following are prices in tank cars $[illegible] gal. minimum f.o.b. places named:

St. Louis, 45-50% asphalt	$[illegible]
Chicago, 15-20% asphalt	[illegible]
Chicago, 100% asphalt base	08½
Dallas, 40-50% asphalt	07
Denver, 65-70% asphalt	08
Dallas, 75-90% asphalt	[illegible]
San Francisco, 75-95% asphalt	1.90*

*Per barrel of 42 bulk gallons.

ASPHALTUM—Prices per ton in packages and bulk in carload lots:

	Brand	Package	Bulk
New York	Texaco	[illegible]	
New York	Mexican	[illegible]	[illegible]
Chicago	Mexican	[illegible]	[illegible]
St. Louis	Standard	[illegible]	[illegible]
San Francisco	[illegible]	[illegible]	[illegible]
Dallas	[illegible] Mexican	[illegible]	[illegible]
Seattle		15.00	
Denver	[illegible]	[illegible]	
Denver	[illegible]	[illegible]	
St. Paul	[illegible]	16.50	

PAVING STONE

New York	Trinidad	[illegible]	[illegible]
New York	[illegible]	[illegible]	[illegible]
New York	[illegible]	[illegible]	[illegible]
Chicago	Alberene [illegible]	[illegible]	[illegible]
San Francisco	[illegible]	[illegible]	[illegible]
St. Paul	[illegible]	[illegible]	[illegible]

FLAGGING

		Dec. 1 1917	One Year Ago
New York	[illegible]	[illegible]	[illegible]
New York	[illegible]	[illegible]	[illegible]
New York	[illegible]	[illegible]	[illegible]
Chicago	[illegible]	[illegible]	[illegible]
		22c	22c

WOOD BLOCK PAVING—

	Size of Block	Treatment	Per Sq Yd
[illegible]	[illegible]	16	$2.00
New York	4	16	[illegible]
[illegible]	4	16	1.85
[illegible]	[illegible]	16	1.70
Chicago	City specifications		2.10
St. Louis	[illegible]	16	1.81
St. Louis	4	16	2.04
Seattle	4	16	1.53
St. Paul	Minneapolis specifications		2.00
New Orleans	[illegible]	16	2.30
New Orleans	4	16	2.60
San Francisco	3	16	2.15
San Francisco	3½	16	2.26
San Francisco	4	16	2.57

CURBING—Prices per linear foot are as follows:

New York	15 x 16	$0.45
	15 x 20	.50
Chicago	6 x 18	.60
St. Louis	5x16 square edge	.72
San Francisco	16 x 16	.65
	16 x 20	.80

CONSTRUCTION MATERIALS

SAND AND GRAVEL—Price for cargo or carload lots is as follows, per cu.yd.:

	Gravel				Sand	
	1½ In		¾ In			
	Dec. 1. 1917	One Yr. Ago	Dec. 1. 1917	One Yr. Ago	Dec. 1. 1917	One Yr. Ago
New York	$1.40	$1.00	$1.50	$1.10	$0.50	$0.50
Los Angeles	.75*		.75*	....	.55*	....
Chicago	1.40	1.00	1.40	1.00	1.40	1.00
St. Louis	1.11	.70	1.11	.70	1.11	.60
New Orleans	1.95		1.95	....	1.95	....
Dallas	1.50	1.00	1.50	1.00	1.35	.75
Denver	1.45		1.45	....	1.00	....
San Francisco	1.06	1.00	1.00	1.00	1.06	1.00
Seattle	.80		.80	....	.80	....
Boston	1.50		1.60	....	.90	....
St. Paul	1.10		1.40	....	.50	....

*Price per ton.

CRUSHED STONE—Price for cargo or carload lots is as follows, per cu.yd.

	1½ In		¾ In.	
	Dec. 1 1917	One Year Ago	Dec. 1. 1917	One Year Ago
New York	$1.15–1.25	$1.00–1.10	$1.25–1.35	$1.10–1.25
Boston	1.50	....	1.50	....
Chicago	1.40	1.00	1.40	1.00
St. Louis	1.45	1.00	1.45	1.00
Dallas	1.39	....	....	....
San Francisco	1.06	1.00	1.00	1.00
St. Paul	1.00	....	1.10	....
Seattle	1.10	....	1.10	....
Denver	1.45	....	1.45	....
Los Angeles	.95	....	.95	....

LIME—Warehouse prices

	Hydrated per Ton		Lump per 300-Lb. Barrel	
	Finished	Common	Finished	Common
New York	$16.50	....	$2.10	....
Chicago	15.00	12.00	....	....
St. Louis	13.00	....	1.50	....
San Francisco	16.50	....	....	$1.65

ROSENDALE NATURAL CEMENT—Price to dealers for 500 lots or over, f.o.b. including bags:

New York $1.15

30c. allowed for bags.

PORTLAND CEMENT—These prices are for barrels in carload lots, including bags, to contractors:

	Dec. 1, 1917	One Month Ago	One Year Ago
New York	$2.22	$2.22	$1.87
Jersey City	2.16	2.16	1.80
Boston	2.37	2.37	2.02
Chicago	2.21	2.21	1.96
Pittsburgh	2.31	2.31	1.96
Cincinnati	2.44	2.44	2.09
Detroit	2.40	2.40	2.05
Indianapolis	2.38	2.38	2.09
Columbus	2.40	2.40	2.09
Milwaukee	2.33	2.33	2.08
Minneapolis	2.48	2.48	2.23
Duluth	2.51	2.51	2.21
Peoria	2.33	2.33	2.08
Cedar Rapids	2.48	2.48	2.19
Davenport	2.40	2.40	2.14
St. Louis	2.45	2.45	1.95
Denver	3.20	3.20	....
San Francisco	2.30	2.30	2.30
Los Angeles	2.40	2.30	....
Dallas	2.60	2.40	....
Seattle	2.37	2.37	....
New Orleans	3.00	....	....
St. Paul	2.83	2.58	....
Seattle	2.75	2.65	....

TRIANGLE MESH—Price per 100 sq.ft. in carload lots:

PLAIN 4.18 x 4.18 MESH

Style Number	[illegible] per Roll 3 Wide	Pittsburgh	New York	Chicago	St Louis	Dallas	San Francisco
022	[illegible]	$0.96	$0.99	$1.01	$0.96	$1.13	$1.27
049	[illegible]	1.22	1.27	1.28	1.22	1.13	1.63
065	[illegible]	1.52	1.57	1.60	1.52	1.79	2.04
097	[illegible]	1.96	2.03	2.06	1.96	2.11	2.62
126	[illegible]	2.48	2.56	2.60	2.48	2.92	2.96
153	[illegible]	2.96	3.07	3.11	2.96	3.48	3.32
190	[illegible]	3.39	3.50	3.56	3.39	3.99	
243	[illegible]	4.18	4.64	4.70	4.18	5.27	5.65
297	[illegible]	5.18	5.36	5.44	5.18	6.10	6.94
328	[illegible]	6.00	6.21	6.30	6.00	7.06	
355	[illegible]	6.96	7.17	7.30	6.96	8.19	
430	[illegible]	.74	.76	.78	.74	.87	....
443	[illegible]	1.04	1.08	1.09	1.04	1.23	....
072	0.072	1.35	1.39	1.41	1.35	1.59	....
097	0.097	1.74	1.80	1.83	1.74	2.05	....
049	0.049	1.04	1.14	1.09	1.04	1.23	1.97
067	0.067	1.35	1.39	1.42	1.35	1.59	....
089	0.089	1.74	1.80	1.83	1.74	2.05	....

Made in 16-, 20-, 24-, 28-, 32-, 36-, 40-, 44-, 48-, 52- and 56-in. width in rolls 150-, 200- and 300-ft. lengths.

Galvanized is about 10% higher.

EXPANDED METAL LATH—Prices per 100 yd. for painted are as follows:

Carload

Gage	Weight	New York Dec. 1. 1917	New York One Year Ago	Chicago	St. Louis	San Francisco	Dallas
27	233	$31.00	$18.00	$31.00	$34.00	$29.00	$32.00
26	250	32.05	19.00	32.00	35.00	30.25	....
25	300	33.15	20.00	33.00	....	....	35.00
24	340	34.25	21.00	34.00	37.00	33.00	36.00
22	450	36.45	24.00	36.00	....	....	....

About 10% additional for smaller quantities.

BARS, CONCRETE REINFORCING—The folowing quotations are per 100 lb., for plain round or square bars:

ROLLED FROM BILLETS

In.	Mill Shipment	Warehouse: New York Dec. 1. 1917	Warehouse: New York One Year Ago	St. Louis	Chicago	San Francisco	Dallas
¾ and larger	$2.90	$4.09½	$5.10	$4.17	$4.10	$6.00	$4.75
⅝	2.95	4.14½	5.15	4.22	4.15	6.05	4.80
½	3.00	4.19½	5.20	4.27	4.20	6.10	4.85
⅜	3.15	4.34½	5.35	4.42	4.35	6.25	5.00
¼	3.60	4.59½	5.60	4.67	4.60	6.50	6.00

Twisted bars cut to length take extra of 27½c. per 100 lb. Extra on deformed bars, uncut, 7½c.

ROLLED FROM RAILS

	Chicago	Dallas		Chicago	Dallas
¾ in. and larger	$4.10	$4.75	⅜	$4.35	$5.00
⅝	4.15	4.80	¼	4.60	6.00
½	4.20	4.85			

BRICK—To contractors the price per 1000 in cargo or carload lots is as follows:

	Common: Dec. 1. 1917	Common: One Month Ago	Common: One Year Ago	Paving: Brick	Paving: Block
New York	$8.25	$8.25	$9.50	$33.00	$40.00
Chicago	8.00	8.00	6.00	17.00	25.00
St. Louis, selected	10.00	10.00	10.00	18.00	....
St. Louis, salmon	8.00	8.00	7.00	....	....
Denver	8.00	8.00	....	....	....
San Francisco	10.00	10.00	10.00	....	....
Dallas	9.50	8.60	....	22.00	22.50
Boston	13.25	13.25	....	....	25.00
St. Paul	8.70	8.70	....	....	27.00
Seattle	9.00	9.00	....	....	28.75
Los Angeles	8.00	7.50	....	....	....
New Orleans	10.00	....	....	....	10.50

HOLLOW TILE—Hollow building tile price per block in cents:

	New York Dec. 1. 1917	New York One Year Ago	Chicago	St. Louis	San Francisco	Dallas
4x12x12	$0.095	$0.075	$0.079	$0.054	$0.0825	$0.075
6x12x12	.133	.104	.119	.066	.11	.105
8x12x12	.1615	.1266	.137	.09	.1275	.14
10x12x12	.190	.149	.158	.15	.20	.16
12x12x12	.2375	.1875	.205	.18	.22	.21

Above prices are for carload lots o. more.

	4x12x12	8x12x12	12x12x12
Boston	$0.08	$0.15	$0.20
St. Paul	.055	.138	.153
Denver	.11	.20	.30
Los Angeles	.0668	.12	.20
Seattle	.06	.10	.16

STRUCTURAL MATERIAL—The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Pittsburgh	New York Dec. 1, 1917	New York 1 Yr. Ago	St. Louis	Chicago	San Francisco	Dallas
Beams 3 to 15 in.	$3.00	$4.195	$3.85	$4.27	$4.20	$7.75	$6.00
Channels, 3 to 15 in.	3.00	4.195	3.25	4.27	4.20	7.75	6.00
Angles, 3 to 6 in., ¼ in. thick	3.00	4.195	3.25	4.27	4.20	7.75	6.00
Tees, 3 in. and larger	3.00	4.195	3.40	4.27	4.25	7.75	6.00
Plates	3.25	4.445	4.00	4.52	4.45	7.75	9.00

RIVETS—The following quotations are per 100 lb.:

STRUCTURAL

	Mill Pittsburgh	Warehouse: New York Dec. 1 1917	Warehouse: New York One Year Ago	Chicago	St. Louis	San Francisco	Dallas
¾ in. and larger	$5.25	$7.00	$5.25	$5.50	$5.55	$7.15	$8.40

CONE HEAD BOILER

⅞ in. and larger	5.35	7.10	5.35	5.60	5.65	7.25	8.50
¾ and ⅞	5.50	7.25	5.50	5.75	5.80	7.40	8.65
½ and ⅝	5.85	7.60	5.85	6.10	6.15	7.75	9.00

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York, St. Louis, Chicago and San Francisco:

	1-Ply c.l.	1-Ply l.c.l.	2-Ply c.l.	2-Ply l.c.l.	3-Ply c.l.	3-Ply l.c.l.
No. 1 grade	$1.15	$1.40	$1.45	$1.60	$1.75	$1.90
No. 2 grade	1.10	1.25	1.25	1.40	1.50	1.65

Asbestos asphalt-saturated felt (14 lb. per square) costs $6.50 per 100 lb.

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $1.85 per roll in carload lots and $2.10 for smaller quantities.

Shingles, red and green slate finish, cost $4.75 per square in carloads, $5 in smaller quantities, in Philadelphia.

ROOFING MATERIALS—Prices per ton f.o.b. New York or Chicago:

	Carload Lots	Less Than Carload Lots
Tar felt (14 lb. per square of 100 sq.ft.)	$61.00	$62.00
Tar pitch (in 400 lb. bbl.)	15.00	16.50
Asphalt pitch (in barrels)	29.00	30.50
Asphalt felt	60.00	62.00

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill:

Blue Annealed	Large Lots—Pittsburgh	St. Louis	Chicago	San Francisco	New York—Dec. 1, 1917	New York—One Yr. Ago
No. 10	4.25	5.42	5.45	8.25	5.445	4.25
No. 12	4.30	5.47	5.50	8.30	5.495	4.30
No. 14	4.35	5.52	5.55	8.35	5.545	4.35
Black						
Nos. 18 and 20	4.80	6.42	6.25	8.30	6.245	3.80
Nos. 22 and 24	4.85	6.47	6.30	8.35	6.295	3.85
No. 26	4.90	6.42	6.35	8.40	6.435	3.90
No. 28	5.00	6.52	6.45	8.50	6.445	4.00
Galvanized						
No. 10	5.25	6.97	6.80	....	6.695	....
No. 12	5.35	6.97	6.80	8.60	6.795	4.50
No. 14	5.35	6.97	6.80	8.60	6.795	4.50
Nos. 18 and 20	5.65	7.17	7.10	8.90	7.095	4.90
Nos. 22 and 24	5.80	7.32	7.25	9.05	7.245	5.30
No. 26	5.95	7.47	7.40	9.20	7.395	5.45
No. 28	6.25	7.77	7.70	9.50	7.695	5.75

LINSEED OIL—These prices are per gallon:

	New York—Dec. 1 1917	New York—One Year Ago	Cleveland—Dec. 1 1917	Cleveland—One Year Ago	Chicago—Dec. 1. 1917	Chicago—One Year Ago
Raw in barrels	$1.22	$1.01	$1.25	$1.05	$1.22	$0.96
5-gal. cans	1.32	1.11	1.40	1.15	1.32	1.06

WHITE AND RED LEAD in 500-lb. lots sell as follows in cents per pound:

	Red—Dec. 1, 1917 Dry	Red—Dec. 1, 1917 In Oil	Red—1 Year Ago Dry	Red—1 Year Ago In Oil	White—Dec. 1, 1917 Dry and In Oil	White—1 Yr. Ago Dry and In Oil
100-lb. keg	12.25	12.50	10.50	11.00	12.00	10.50
25- and 50-lb. kegs	12.50	12.75	10.75	11.25	12.25	10.75
12½-lb. keg	12.75	13.00	11.00	11.50	12.50	11.00
1- to 5-lb. cans	14.25	14.50	12.50	12.50	14.50	12.50

LUMBER—Price per M in carload lots:

Rough Douglas Fir, No. 1 Common—More than carload lots in San Francisco:

Size in Inches	15 Ft. and Under	16 to 24 Ft.	25 to 32 Ft.
3 and 4x4	$24.00	$25.50	....
3 and 4x6 and 8	24.00	24.50	$25.50
6x6 and 8x8	24.50	25.50	25.50
3 and 4x10	24.00	25.50	26.50
6 and 8x10	25.00	26.00	27.00
3 and 4x12	24.00	25.50	26.50
6 and 8x12	25.50	26.50	26.50
10 and 12x12	25.00	25.00	27.00
3 and 4x14	25.00	27.00	28.00
6 and 8x14	26.50	27.50	27.50
7 and 9x14	27.50	28.50	28.50
10 and 12x14	26.00	26.00	28.00

Square Edge and Sound Green

	Southern Pine—New York—20 Ft. and Under	Southern Pine—New York—22-24 Ft	Southern Pine—Chicago—20 Ft. and Under	Southern Pine—Chicago—22-24 Ft	Yellow Pine—St. Louis—20 Ft and Under	Yellow Pine—St. Louis—22-24 Ft
3 x 4	$33.75	$34.00	$31.75	$32.75	$28.75	$29.75
3 x 10	36.75	37.00	34.75	35.75	31.75	32.75
3 x 12	41.75	42.00	39.75	40.75	36.75	37.75
3 x 14	42.75	43.00	41.75	42.75	38.75	39.75
3 x 16	45.75	47.00	43.75	45.75	40.75	42.75
3 x 18	48.75	51.00	46.75	49.75	43.75	46.75
4 x 20	51.75	54.00	49.75	52.75	46.75	49.75

Over 24 ft.—Add $1 for each additional 2 ft. in length up to 40 ft. for sizes 12 x 12 and under; for sizes over 12 x 12 add $2. For merchantable add $2 to sizes 10 x 10 and under. For prime add $2 to the price of merchantable for all sizes.

Prices from Lumberman's Bureau.

	8 x 8 In. x 20 Ft. and Under—Y.P.	8 x 8 In. x 20 Ft. and Under—Fir	8 x 8 In. x 20 Ft. and Under—Hemlock	8 x 8 In. x 20 Ft. and Under—Spruce	12 x 12 In. 20 Ft. and Under—Y.P.	12 x 12 In. 20 Ft. and Under—Fir
Boston				$40.00		
Seattle	$23.00	$23.00	$23.00	23.00	$23.00	$23.00
Los Angeles		34.00	30.00			
New Orleans	26.00				38.00	
St. Paul		38.00	38.00	38.00		51.00
Denver		32.00		28.50		34.00
San Francisco		24.00	24.00			24.00

	1 In. Rough 10 In. x 16 Ft. and Under—Y.P.	1 In. Rough 10 In. x 16 Ft. and Under—Fir	1 In. Rough 10 In. x 16 Ft. and Under—Hemlock	2 In. T. and G. 10 In. x 16 Ft.—Y.P.	2 In. T. and G. 10 In. x 16 Ft.—Fir
Seattle	$23.00	$23.00	$23.00	$22.00	$23.00
New Orleans	26.00			24.00	
San Francisco		24.00	24.00		24.00
St. Paul		53.00	34.00	61.00	37.00
Denver		30.00	30.00		30.00

Yellow Pine—Dallas. Price per M

2x4 to 2x12—12, 14 and 16	$37.50
2x4 to 2x12—18 and 20	41.00
2x4 to 2x12—22 and 24	41.50
4x4, 4x6, 6x6, 8x8 and 3x8	42.00
8x10, 10x10 and 3x10	42.50
12x12 and 3x12	42.50

NAILS—The following quotations are per keg from warehouse:

	Pittsburgh	St. Louis	Chicago	San Francisco	Dallas
Wire	$3.50	$4.39	$4.40	$4.50	$4.50
Cut		5.25	4.40	6.15	

MISCELLANEOUS

FREIGHT RATES—On finished steel products in the Pittsburgh district, including plates, structural shapes, merchant steel bars, pipe fittings, plain and galvanized wire nails, rivets, spikes, bolts, flat sheets (except planished), chains, etc., the following freight rates are effective in cents per 100 lb.

Boston	21.5	New Orleans	30.7
Buffalo	11.0	New York	19.[illegible]
Chicago	18.9	Pacific Coast (all rail)	75.0
Cincinnati	15.8	Philadelphia	18.[illegible]
Cleveland	10.5	St. Louis	[illegible]
Denver	68.6	St. Paul	32.9
Kansas City	43.6		

Note—Add 3% transportation tax.

WATER TREATMENT CHEMICALS—Prices per pound are as follows:

	New York	Chicago
Sulphate of alumina (iron free), in 400-lb. barrel	$0.045	
Hypochlorite of lime (35% to 37% available chlorine), in 200-lb. drums	.03	
Soda ash, in 400-lb. bbl.	.05	0.[illegible] to [illegible]
Liquid chlorine, in 100-lb. cylinders	.175	16 to 18

Lime is quoted separately.

CONTRACTORS' MISCELLANEOUS SUPPLIES

STEEL SHEET PILING—The following price is base per 100 lb. f.o.b. Pittsburgh, with a comparison of a month and a year ago:

Dec. 1, 1917	One Month Ago	One Year Ago
$4.00 to $5.00	$4.00 to $5.00	$3.00

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York	St. Louis	Chicago	San Francisco
Galvanized	10—2½	10—2½	10—2½	10
Bright	20—2½	20—2½	20—2½	15

Note—Change in price imminent.

MANILA ROPE—For rope smaller than ½-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ⅜-in., 8 ft.; ½-in., 6; ⅝-in., 4½; 1-in., 3½; 1⅛-in., 2 ft. 10 in.; 1¼-in., 2 ft. 4 in. Following is price per pound for ⅜-in. and larger, in 1200-ft. coils:

Boston	$0.[illegible]	New Orleans	$0.[illegible]
New York	.35	Los Angeles	.34
Chicago	.37½	Seattle	.43
St. Paul	.34	Denver	.[illegible]

EXPLOSIVES—Price per pound in small lots at cities named:

	Less Freight	Chicago		San Francisco	
		40%	60%	40%	60%
New York	$0.[illegible]	$0.[illegible]			$2.50*
Boston			$0.[illegible]		
New Orleans					
Los Angeles	$0.21	.30	.39		
Seattle	18½	31½		41½	
Chicago	16¾	31		43	1.[illegible]*
St. Paul	.20	34½			2.55*
St. Louis	16½	30½		39½	2.15*
Denver	.19	32½		41½	
Dallas	.25	36	.39	49	

*Keg.

POLES—Price of Western red cedar poles is as follows:

	New York—Dec. 1 1917	New York—One Year Ago	Chicago	St. Louis	Denver
6 in. by 30 ft.	$5.59	$4.77	$4.94	$4.94	$4.[illegible]
7 in. by 30 ft.	7.40	6.00	6.60	6.60	6.[illegible]
7 in. by 35 ft.	10.50		9.60	9.60	8.55
8 in. by 35 ft.	13.20	9.75	10.60	10.60	9.[illegible]
7 in. by 40 ft.	13.80	9.95	11.60	11.60	9.[illegible]
*8 in. by 45 ft.	18.30	14.45	18.00	16.20	14.[illegible]
*8 in. by 50 ft.	21.85	16.85	19.45	18.65	17.15

*10c. higher freight based on loading of double loads.

For piles per pound delivered New York, the base is as follows:

10-in. butts, 5-in. tops, length 70 to 75 ft.	$[illegible]
12-in. butts, 6-in. tops, length 70 to 75 ft.	[illegible]
12-in. butts, 6-in. tops, length 41 to 61 ft.	[illegible]
14-in. butts, 6-in. tops, length 61 to 71 ft.	[illegible]
14-in. butts, 6-in. tops, length 61 71 ft.	[illegible]

OLD MATERIAL—The prices following are per gross ton paid to dealers and producers in New York. In Chicago and St. Louis the quotations are per net ton and mean delivery at the buyer's works, including freight transfer charges.

	New York—Dec. 1 1917	New York—One Year Ago	Chicago	St. Louis
Heavy melting steel	$[illegible] to [illegible]	[illegible] to [illegible]	[illegible] to [illegible]	[illegible] to [illegible]
No. 1 railroad wrought	[illegible] to [illegible]	[illegible] to [illegible]	[illegible] to [illegible]	[illegible] to [illegible]
Stove plate	[illegible] to [illegible]	[illegible] to [illegible]	[illegible] to [illegible]	[illegible] to [illegible]
No. 1 machinery cast	[illegible] to [illegible]	[illegible] to [illegible]	[illegible] to [illegible]	[illegible] to [illegible]
Machine shop turnings	15.00 to 16.00	[illegible] to [illegible]	[illegible] to [illegible]	[illegible] to [illegible]
Cast borings	14.00 to 15.00	[illegible] to [illegible]	[illegible] to [illegible]	[illegible] to [illegible]
Railroad malleable	[illegible] to [illegible]	[illegible] to [illegible]	[illegible] to [illegible]	[illegible] to [illegible]

	Dec. 1 1917	One Month Ago	One Year Ago
No. 1 railroad wrought	[illegible] to [illegible]	[illegible] to [illegible]	[illegible] to [illegible]
Steel axle	[illegible] to [illegible]	[illegible] to [illegible]	[illegible] to [illegible]
No. 1 machinery cast	[illegible] to [illegible]	[illegible] to [illegible]	[illegible] to [illegible]
Cast borings	19.00	[illegible] to [illegible]	[illegible] to [illegible]
Machine shop turnings	15.00	[illegible] to [illegible]	[illegible] to [illegible]
Railroad malleable	[illegible] to 26.00	[illegible] to [illegible]	[illegible] to [illegible]

	Dec. 1 1917	One Month Ago	One Year Ago
No. 1 railroad wrought	[illegible] to 21.00	[illegible] to [illegible]	[illegible] to [illegible]
Steel axle	[illegible] to [illegible]	[illegible] to [illegible]	[illegible] to [illegible]
No. 1 machinery cast	[illegible] to [illegible]	[illegible] to [illegible]	[illegible] to [illegible]
Machine shop turnings	[illegible] to [illegible]	[illegible] to [illegible]	[illegible] to [illegible]
Cast borings	[illegible] to [illegible]	[illegible] to [illegible]	[illegible] to [illegible]
Railroad malleable	[illegible] to 26.00	[illegible] to [illegible]	[illegible] to [illegible]

Proposals

For Proposals Advertised See Pages 59 to 63 Inclusive

WATER-WORKS

Bids Close		See Eng. News-Record
Dec 14	New York, N. Y.	Dec 6
Dec 14	Lamoille, Ill	Dec 6
Dec 18	New York, N. Y	Dec 6
Dec. 20.	Wooster, Ohio	Nov. 29
	Adv. Nov. 29 and Dec. 6	

SEWERS

Dec 10	Lake Andes, S. D.	Nov 22
	Adv. Dec. 6	
Dec. 11.	Oklahoma, Okla.	Dec 6
Dec. 11.	Columbus, O.	Dec 6
Dec. 11.	Mansfield, O.	Dec 6
Dec. 12.	Glasgow, Neb.	Dec 6
Dec. 12.	New York, N. Y.	Dec 6
Dec. 19.	Baltimore, Md.	Dec. 6
Dec 30	Rocky River, Ohio	Nov. 29

BRIDGES

Dec. 10.	St. Augustine, Fla.	Nov. 15
Dec. 10.	St. Paul, Neb.	Nov. 29
Dec. 10.	Spartanburg, S. C.	Dec. 6
Dec. 11.	Nelson, Pa.	Nov. 29
Dec 11	Harrisburg, Pa.	Dec 6
Dec. 12.	New York, N. Y.	Nov. 22
Dec. 12.	Fairmount, W. Va.	Dec. 6
	Adv. Dec. 6.	
Dec. 18.	Kansas City, Mo.	Nov. 29
	Adv. Nov. 29 and Dec. 6	
Dec 18	Beatrice, Neb	Dec 6
Dec 18	Princeton, Minn	Dec 6
Dec. 21.	Kansas City, Mo.	Nov. 29
	Adv. Nov. 29 and Dec. 6.	
Dec 21	Pocatello, Idaho	Dec 6
Dec 21	Neenah, Wis	Dec 6
Dec. 22.	Livingston, Ala.	Nov. 29

STREETS AND ROADS

Dec. 10.	Washington	Nov. 29
Dec 10	Glenn, Tex	Nov 29
Dec 10	Sacramento, Cal	Dec 6
Dec 11	Fresno, Cal	Dec 6
Dec 11	Akron, O	Dec 6
Dec 10	Pleasant Hill, Mo	Dec 6
Dec. 10.	Spartanburg, S. C.	Dec. 6
Dec. 10.	Sacramento, Cal.	Dec. 6
Dec 10	Seattle, Wash	Dec 6
Dec. 11.	Calexico, Cal.	Dec. 6
Dec 11	East View, O	Dec 6
Dec. 11.	St. James, Minn.	Nov. 22
Dec. 11.	Granite Falls, Minn.	Nov. 22
Dec. 11.	Geneva, Ala.	Nov. 29
Dec. 11.	Pennsylvania	Nov. 29
	Adv. Nov. 29 and Dec. 6	
Dec 12	Anderson, Ind	Nov 29
Dec 12	Knox, Ind	Dec 6
Dec 12	New York, N. Y	Dec 6
Dec 12	Brooklyn, N. Y	Dec 6
Dec 15	Jasper, Ala	Nov 29
Dec 15	Fitchburg, Mass	Nov 29
	Adv. Nov. 29	
Dec 15	Hatley, Que	Dec 6
Dec 17	Los Angeles, Cal	Dec 6
Dec 17	Quincy, Ills	Dec 6
	Adv. Nov. 29 and Dec. 6	
Dec 17	Dorena, Wash	Dec 6
Dec 15	Hartman, O	Dec 6
Dec 17	Elizabeth, N. J	Nov 29
Dec 19	Huntington, Ind	Dec 6
Dec 21	Bay Minette, Ala	Dec 6

EXCAVATION AND DREDGING

Dec 10	Clarke, Ia	Nov. 29
Dec 11	Madison, Miss	Dec 6
Dec 14	El Centro, Cal	Nov 15
Dec 14	Ivanhoe, Minn	Dec 6
Dec 14	Buffalo, Minn	Dec 6
Dec 15	Sheboygan, Wis	Dec 6
Dec 15	Toronto, Ont.	Dec 6
Dec 18	Elbow Lake, Minn.	Dec. 6
Dec. 20.	Albany, N. Y.	Nov. 29
	Adv. Nov. 29 and Dec. 6.	

BUILDINGS

Dec 8.	Gary, Ind.	Dec. 6
Dec. 10.	East Cleveland (Cleveland P. O.) O.	Nov. 22
Dec. 10.	Syracuse, N. Y.	Dec. 6
Dec. 10.	Akron, Ohio	Dec. 6
Dec. 12.	Wellesley, Mass.	Dec. 6
Dec. 12.	New Hampton, N. Y.	Dec. 6
Dec. 15.	Gallup, N. M.	Nov. 29
Dec. 15.	Kokomo, Ind.	Dec. 6
Dec. 17.	Kenmore, Ohio	Nov. 29
Dec. 17.	New Paltz, N. Y.	Nov. 29
	Adv. Nov. 29 and Dec. 6.	
Dec. 17.	Pittsburgh, Kan.	Nov. 29
Dec. 17.	East Cleveland (Cleveland P. O.) O.	Dec. 6
Dec. 17.	Miami, Okla.	Dec. 6
Dec. 18.	Kansas City, Mo.	Nov. 29
	Adv Nov. 29	
Dec. 21.	Shaker Heights (Cleveland P. O.) O.	Dec. 6
Dec. 22.	Oxford, Ohio	Dec. 6
Dec. 24.	Cleveland, Ohio	Dec. 6
Jan. 1.	Wichita, Kan.	Nov. 22
Jan. 15.	New York, N. Y.	Nov. 29

INDUSTRIAL WORKS

Dec. 10.	Syracuse, N. Y.	Dec. 6
Dec. 11.	Albany, N. Y.	Dec. 6
	Adv. Nov. 29 and Dec. 6.	

FEDERAL GOVERNMENT WORK

Dec 10.	Foam Fire Protection — Guantanoma, Cuba	Nov. 8
Dec. 10.	Heating System—Philadelphia, Pa.	Nov. 15
Dec. 10.	Refrigerating Apparatus, etc.—Washington, D. C.	Nov. 22
	Adv. Nov. 22.	
Dec. 10.	Cranes—Philadelphia, Pa.	Nov. 29
Dec. 10.	Piping, etc.—Philadelphia, Pa.	Nov. 29
Dec. 10.	Cranes — New London, Conn.	Nov. 29
Dec. 10.	Garage—Newport, R. I.	Nov. 29
Dec. 10.	Building — Washington, D. C.	Dec. 6
Dec. 11.	Stone—New Orleans, La.	Dec. 6
	Adv. Dec. 6.	
Dec. 12.	Generating Sets — Washington, D. C.	Dec. 6
Dec. 12.	Bridge—Fairmont, W. Va.	Nov. 29
	Adv. Nov. 29	
Dec. 14.	Rip Rap—Galveston, Tex.	Nov. 29
	Adv. Nov. 29 and Dec. 6.	
Dec. 17.	Post Office—Denton, Tex.	Nov. 8
Dec 17	Wharf and Boathouse—Santa Rosa, Fla.	Nov. 29
	Adv. Nov. 29 and Dec. 6.	
Dec 17.	Motor Generator Sets — Washington, D. C.	Dec. 6
Dec 17	Seaman Gunners' Quarters Washington, D. C.	Dec. 6
Dec. 18.	Laterals — Torrington, Wyo.	Nov. 1
Dec 19	Dredging—San Francisco, Cal	Dec. 6
Dec. 21.	Dredging — Philadelphia, Pa.	Nov. 29
Dec. 26.	Sewerage System, Water Supply Intake, Reservoir —Washington, D. C.	Dec. 6
Dec. 27.	Post Office — Alexandria, La.	Nov. 22
	Adv. Nov. 22 and 29.	
Dec. 27.	Steam Heating System—Shawnee, Okla.	Dec. 6
Jan 4	Buildings — Grande Isle, La	Dec. 6
	Adv. Dec. 6.	
Jan 7	Post Office — Eldorado, Kan.	Dec. 6
Jan 7	Post Office — Shawnee, Okla	Dec. 6
Jan. 28.	Post Office—Sunbury, Pa.	Dec. 6

MISCELLANEOUS

Dec. 17.	Docks—Seattle, Wash.	Dec. 6
Jan. 2.	Improving Harbor — Newport, Ore.	Nov. 29
	Adv. Nov. 29 and Dec. 6.	

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official.

WATER-WORKS

Proposed Work

Mass., Worcester — City plans to issue $200,000 bonds to improve water-system on Asabumskit water shed and Pine Hill dam. F. A. McClure, city engr.

Pa., Quarryville — Boro. voted $25,000 bonds to build water system. P. Helm, secy.

Md., Hagerstown—Washington Co. Water Co. having surveys made in Blair's Valley, relative to constructing reservoir to increase water supply in Hagerstown.

Va., Hopewell—City plans to issue $75,000 bonds to build water, sewer and electric-light systems.

N. C., Durham—City plans to issue $100,000 bonds to build water system, including pumping equipment, reservoir, etc. G. W. Woodward, clk.

Fla., Titusville—City voted $40,000 bonds to improve water-works.

O., Logan — Village will issue $15,000 bonds to build water system.

O., Sebring—City voted $125,000 bonds to purchase water system and build filtration plant. Noted Oct. 4.

Ind., South Bend — City plans to build 225,000 gal. reservoir. F. J. Anderson, city engr.

Mich., Grand Rapids—(Official)—City to sell $100,000 bonds to improve water system. G. J. Wagner, city engr.

Ill., Chicago—City plans to install water service pipes, etc., during 1918. About $500,000. J. Ericson, city engr.

Wis., Campbellsport — Village having plans prepared by J. Donna, engr., 720 New York Ave., Sheboygan, for water and sewerage systems. Noted Aug. 16.

Wis., Hartford—City having plans prepared by A. Martin, engr., Hartford, building pump house and reservoir. About $20,000.

Ia., Beloit—Village plans to install water-works.

Minn., St. Cloud—See "Sewers."

Kan., Lawrence — City to sell $18,000 bonds to improve water system, including 10 meters, well, and transmission lines. C. H. Dunmire, city engr.

Mo., Bowling Green—See "Buildings."

Tex., Ft. Worth—(Official)—City having plans prepared by J. H. Gregory, engr., 170 Bway., New York City, improving water filtration plant, including additional rapid filters, new filters, settling basins, mixing chamber, chemical house, and aeration chamber. About $85,000. Noted June 14.

Okla., Anthon—City plans to build water system.

Okla., Jenks—City election son to vote on bonds to build water system.

Okla., Pawhuska—City to issue $20,000 bonds to improve water system.

Okla., Quapaw—City election Jan. 1 to vote on $75,000 bonds to build water and sewerage systems.

Okla., Yale—City plans to improve water systems.

Wash., Spokane — City voted $10,000 bonds to build water system in Empire Heights. A. G. Butler, city engr.

Cal., Mercer—City plans to build water and light systems. C. D. Martin, city engr.

Water-Works (Continued)

Ont., Wallaceburg—Town Council plans to improve water-works. L. G. McNeice, city engr.

BIDS DESIRED

N. Y., New York—(Official)—Until Dec. 10, by W. Williams, comr. water supply, gas and electricity, Municipal Bldg., hauling and laying water mains and appurtenances in East 177th St. (Bronx Boro.)

N. Y., New York—(Official)—Until Dec. 12, by W. Williams, comr. water supply, gas and electricity, Municipal Bldg., for laying water mains and appurtenances in 5th Ave. and Delancy St., to connect with shafts Nos. 18 and 20 of City tunnel, Catskill Aqueduct; also cross-connections existing trunk mains in Bway., Central Park West, Amsterdam, Columbus, 8th and 9th Aves., and in West 42nd St.

N. J., Jersey City—(Official)—Until Dec. 11, by Bd. City Comrs. furnishing and delivering 20 tons special castings, hydrant connections, plugs, caps, sleeves, bends, branches, etc.; also c.i. water pipe, 50 tons water gate boxes and covers, also manhole heads and covers. F. A. Dolan, city clk. C. A. Van Kuren, city engr.

Md., Baltimore—Until Dec. 19, by City, for brass pipes, fittings, brass and bronze castings, lead lined wrought iron pipe and fittings, c.i. pipe and fittings, etc. W. E Lee, water engr.

Ill., La Moille—(Official)—Until Dec. 10, by F. A. Rambo, village clk., improving water system, including water mains, fire hydrants, etc. About $19,000

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

O., Wooster—City received low bids improving water system, (a) stand pipe, (b) furnishing 575 tons, 16-in. pipe, (c) pump house, from L. J. Wrench Co., Chicago, (a) $16,580; Pittsburgh-Des Moines Steel Co., Curry Bldg., Pittsburgh, (a) $17,050; Chicago Bridge & Iron Co., 37 Van Buren St., Chicago, (a) $22,480; Massillon Iron & Steel Co., Massillon, O., (b) $54.85; Hardware & Supply Co., Hower Bldg., Chicago, (b) $55; United States Cast Iron Pipe Co., 122 South Michigan Ave., Chicago, and Amer. Cast Iron Co., 1 Bway., New York City, (b) $55.15; Keystone Drilling Co., Beaver Falls, Pa., (c) $1650. Noted Nov. 8.

★**Neb., Sidney**—City let contract building extension to water and sewer mains, to Gordon Constr. Co., 334 Century Bldg., Denver. Noted June 21.

★**Wash., Bremerton**—City let contract building concrete reservoir for water system to W. B. Lance, Northern Bank Bldg., Seattle, $39,456. Noted Nov. 29.

★**Ont., Stratford**—City let contract building water basin on Romeo St., to A. G. Everitt, Chestnut St. About $15,000. Contractor is in market for 150 bags portland cement. Noted Nov. 1.

SEWERS

Proposed Work

N. J., Boonton—Jersey City Comrs. having plans prepared by C. Potts, engr., 30 Church St., New York City, for sewage disposal plant to be built here.

N. J., Pleasantville — City rejected bids building sewerage system. About $200,000. Noted Nov. 1.

Pa., Erie—City plans to build storm and sanitary sewers in Myrtle and other streets. About $70,000. F. G. Lynch, city engr.

Pa., Lewisburg — City defeated $25,000 bonds to build sewage disposal plant. Noted Sept 13

Va., Hopewell—See "Water-Works."

Tenn., Kingsport — See "Streets and Roads."

O., Ashtabula—City plans to build sanitary sewers in Humphrey Pl., Samuel St., and Perryville Ave. L. A. Amsden, city engr.

O., Cincinnati—(Official)—City to issue $54,500 bonds to build sewers on California Ave., Reading Rd., Bank St. between Idaho and Whiteman Sts., and other streets and avenues. F. S. Krug, city engr.

O., Youngstown—(Official) — City plans to build sewer on Hunter Ave. from Japan St. to City Lot 29314; on Hilton Ave., from Market St. to Southern Blvd.; on Sillman St. from Steel to Oneta St. F. M. Lillie, city engr.

Ind., Anderson—City having plans prepared for rebuilding sewerage system by providing greater drainage for southern part of city, also eliminating Green branch with large sewer. About $450,000. G. L. Clausen, 139 N. Clark St., Chicago, engr.

Mich., Grand Rapids—(Official)—City to sell $55,000 bonds, Dec. 10, to build sewers in Pearl, Sheldon, Fairbanks and Canton Sts., Sinclair Ave.; also Silver Creek sewerage system. G. J. Wagner, city engr.

Ill., Chicago—City plans to build 260 mi. of sewers in 1918. About $1,500,000. J. Ericson, city engr.

Wis., Campbellsport — See "Water-Works."

Wis., Madison—City having plans prepared building sanitary sewer in Orchard St. E. E. Parker, city engr.

Wis., Waukesha—City sold $10,000 bonds to build sewers. T. C. Martin, city clk.

Wis., Wrightstown — City having plans prepared by Orbert & Albert, engrs., Green Bay, building 1 mi. sewers. About $15,000.

Ia., Humboldt—City having plans prepared, buildings sewers and sewage disposal plant.

Ia., Iowa City—City plans to build 12 in. vitr. storm sewers in Lyon's addition between Dodge and Lucas Sts. S. N. Hands, city engr.

Minn., St. Cloud—City rejected bids laying sewers and water mains in 7th and 9th Aves. Work will be readvertised in the spring. C. E. Borrowman, city engr.

Mo., Kansas City—(Official) — City receives bids about Jan. 1, building 1st section Blue River sanitary sewer, from Missouri River to south city limits, about 13½ mi.; sewer will vary in size from 24 in. pipe at south city limits to 10 ft. rein.-con. section at Missouri River. About $2,000,000. A. D. Ludlow, engr. of sewers. Noted Nov. 29.

Okla., Cushing—City having plans prepared building sewer in Dist. No. 24. L. P. Wharton, clk.

Okla., McAlester—City plans to extend sewage disposal plant and outfall sewer About $50,000. A. H. Kindrick, city engr

Okla., Quapaw—See "Water-Works."

Okla., Tulsa—Council passed ordinance creating sewer in Dist. No. 133. H. H. Wyss, city engr.

BIDS DESIRED

N. Y., New York—(Official)—Until Dec. 12, by M. M. Marks, boro. pres., building emergency repairs to outlet sewer in East 42nd St. from East River to 3rd Ave.

O., Columbus—(Official)—Until Dec. 11, by G. A. Borden, dir. pub. serv., building sewers on Markeson Ave., from 17th to 18th St., in alley north of 17th Ave. from alley east of Cleveland Ave., on 16th Ave. from Cleveland Ave. to alley east, thence to alley north; on 15th Ave. from Cleveland Ave. to alley east. H. Mosier, city engr.

Mont., Glasgow—Until Dec. 12, by City, building sanitary and drainage sewer in Dist. No. 38. C. H. Bilbrey, city engr.

O., Mansfield—(Official)—Until Dec. 11, by Secy. Bd. Control, building sewers on Diamond and Ford Sts., from center of Inlet No. 1530 to West line Rd. on south side of South Diamond St., and from point in front of Inlet No. 215 to Diamond St. on south side of Ford St. W. J. Hagstoz, city engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Pa., Oil City**—(Official)—City let contract building storm sewers to perform Alcorn and Siverly Aves. and Wayne St.; also sanitary sewers in portions Alcorn, Siverly, Keith, Pierce and Kramer Aves., Wayne and Margie Sts., measuring 13,000 ft., 6,418 ft., 18-in. terra cotta, 1,800 ft., 18-in. c.i., remainder 6in. to 15-in. c.i., to City, $39,112. Noted Nov. 1.

★**Ind., Indianapolis**—City let contract building sewer on Dist. Improvement No. 91, between Hillside Ave. and Sewell St., to Schlemmer Constr. Co., Indianapolis, $51,881. Noted Nov. 1.

★**Ia., Sioux City**—City let contract building sewer on Meyer Ave., outlet to South Morningside sewerage system, to F. T. Leeder, 73c. per ft. 8-in. pipe, either vitr. or concrete.

★**Kan., Augusta**—City let contract building storm sewer, to McCoy & Taylor, Wichita, $16,000.

★**Neb., Sidney**—See "Water-Works."

★**Mo., Carthage**—City let contract building trunk line sewer in eastern part of city, to McDonald Constr. Co., Moberly, $30,000. Noted Nov. 29.

★**Mo., Kansas City** — City let contract building sewer in Dist. No. 409, Dist. No. 5 to C. H. Crosby, $49,526.

★**Tex., Seguin**—City let contract building sewerage system and sewage disposal plant, to Kirkwood & Wharton, San Antonio, $29,855. Noted Oct. 25.

BRIDGES

Proposed Work

W. Va., Fairmont—(Official)—Until Dec. 12, by City, building rein.-con. bridge over Monongahela River; A. J. Kern, city clk; advertised in this issue.

Ky., Paducah—City plans to build rein.-con. bridge over Island Creek on Bridge St. L. A. Washington, comr. pub. wks. About $17,000.

Ia., Dyersville—Leighton Co. had plans prepared for rein.-con. bridge, two 70-ft. spans, 40 ft. roadway, 6 ft. sidewalks. About $32,000. W. B. Turlay, co. engr.

Minn., Ballclub—Itasca Co., Grand Rapids, soon lets contract building bridge over Mississippi River. About $[illegible].

Minn., Mazeppa—City retained J. H. A. Brahtz, engr., Commercial Bldg., St. Paul, to prepare plans for rein.-con. and steel bridge. About $[illegible].

Ark., Little Rock—Pulaski Co. receives bids about Jan. 15, building rein.-con bridge, 40 ft. wide between curbs with 8 ft. walks. About $800,000. W. Donaghey, Bankers Trust Bldg., chn. comrs. D. C Luten, Indianapolis, Ind., engr.

Okla., Holdenville—See "Streets and Roads."

Wash., Port Orchard—See "Streets and Roads."

Cal., Red Bluff — Bd. Supervs. Tehama Co. had plans prepared by Wurtz & Day, engrs., Phelan Bldg., San Francisco, for following rein.-con. bridges: 12 span over Thomas Creek, cost $[illegible], 8 span over Deer Creek, $60,000; 4 span over Mill Creek, $4[illegible]; 4 span over Red Bank Creek, $4[illegible]; 168-ft. bridge over Thomas Creek, $30,000; 4 span over Dry Creek, $[illegible]; 3 span over Antelope Creek, and subway under Southern Pacific tracks, $20,000.

BIDS DESIRED

Pa., Harrisburg—(Official)—Until Dec. 21 by State Bd. Commrs. Public Grounds & Bldgs., for 180-ft. steel plate girder bridge, with steel floor and other appurtenances, C. A. Porter, 401-403 Commonwealth Trust Bldg., engr.

S. C., Spartanburg—Until Dec. 18 by Spartanburg Co. Highway Comm., building 3 concrete bridges in connection with road work.

Wis., Neenah—(Official)—Until Dec. 31 by Juneau Co. building Westernville bridge over Wisconsin River, between Newville and Strongs Prairie, Adams Co., consisting of four 40-ft. steel plate girder spans and 18-ft. roadway, including 187 lineal ft. of steel concrete pedestrian floor, piers and riprap. M. W. [illegible], engr.

Neb., Beatrice—Until Dec. 18, by E. P. Peterson, city clerk, Gage Co., building one 45-ft. span bridge, 16-ft. roadway and wooden floor; also 2 pony bridges, 16-ft. roadway and wooden floor; also 2 pony bridges, 16-ft. roadway and wooden floor; also 2 pony bridges

bridges (Continued)

★S. C., Charleston—(Official)—Sanitary and Drainage Comm., Charleston Co., let contract building steel span bridge over Cooper River to Allstin Bros., 156 Greenwood Ave., Atlanta, Ga., $28,500. Noted Nov. 8.

Fla., Miami—Lock Co. received only bid building bridge across Snake Creek Canal from Champion Bridge Co., Wilmington, Ohio, $11,000. Noted Nov. 15.

★Neb., North Platte—Lincoln Co. let contract rein.-con. bridge over South Platte River, to E. F. Pettis, Lincoln. About $[illegible]. Noted Sept. 27.

★Mont., Myers—State Highway Comm., Helena, let contract 151-ft. steel span bridge to Security Bridge Co., Billings. About $11,000.

★Okla., Bartlesville—Washington Co. let contract building 8 bridges to Rochester Bridge Co., Bartlesville, $73,284. Noted Nov. 15.

STRUCTURAL STEEL WORK

Proposed Work

Minn., Mazeppa—See "Bridges."

BIDS DESIRED

Pa., Harrisburg—(Official)—See "Bridges."
Neb., Beatrice—See "Bridges."
Mo., Kansas City—See "Streets and Roads."
Idaho, Pocatello—See "Bridges."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mont., Myers—See "Bridges."

REINFORCED CONCRETE

Proposed Work

N. J., Ocean—See "Buildings."
Pa., Johnstown—See "Industrial Works."
Ky., Paducah—See "Bridges."
Ala., Birmingham—See "Industrial Works."
Ill., Chicago—See "Industrial Works."
Ia., Burlington—See "Industrial Works."
Ia., Davenport—See "Industrial Works."
Minn., Mazeppa—See "Bridges."
Neb., Omaha—Office and Service Station—See "Buildings."
Mo., Kansas City—See "Sewers."
Ark., Little Rock—See "Bridges."
Tex., Canyon—See "Streets and Roads."
Ariz., Tucson—See "Industrial Works."
Cal., Red Bluff—See "Bridges."

BIDS DESIRED

N. Y., Syracuse—See "Industrial Works."
S. C., Spartanburg—See "Streets and Roads."
Wis., Necedah—(Official)—See "Bridges."
Minn., Princeton—See "Streets and Roads."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Conn., Bridgeport—Tunnel—See "Miscellaneous."
★N. J., Bloomfield—See "Industrial Works."
★Pa., Oil City—See "Sewers."
★O., Sandusky—See "Buildings."
★Ind., Terre Haute—See "Buildings."
★Ill., Chicago—See "Industrial Works."
★Kan., Wichita—See "Industrial Works."
★Neb., North Platte—See "Bridges."
★Wash., Bremerton—See "Water-Works."

STREETS AND ROADS

Proposed Work

R. I., Warwick—Town plans an appropriation [illegible] building, including Apponaug Ave., Commercial, Clare Rd. from Apponaug to Natick, Warwick Neck Division, Warwick Rte. south and Buttonwoods [illegible]. Carpenter Quinn & Hastings, consult. engrs.

N. Y., Rochester—City plans to pave portion Thurston Rd., asphalt, and Jones St., brick. About $24,000 and $15,000, respectively. F. Elwood, city engr.

N. J., Bayonne—(Official)—City rejected all bids received Nov. 27 for laying concrete sidewalks on East 22nd St. W. L. Clarkson, city engr. Noted Nov. 15.

N. J., Freehold—Bd. Freeholders Monmouth Co., plan to issue $75,000 bonds, to be used towards building 3rd, 4th, 5th, and 7th sections, Pennsgrove-Malaga State Rd. G. D. Cooper, Red Bank, co. engr.

N. J., Salem—Bd. Freeholders Salem Co. plans to issue $75,000 bonds for road work in Pennsgrove Twp.

Pa., Harrisburg — (Official) — Council passed ordinance to pave and curb Bailey St. from 12th St. to property of Messiah Rescue Home. M. B. Cowden, city engr.

Pa., New Brighton—Boro. plans paving, grading and widening sidewalks on 7th Ave. from 14th and 15th St.; 8th Ave. from 9th to 10th St., 14th Ave. from 2nd to 5th St., and 3rd Ave. H. T. Barber, boro. engr.

Pa., Pittsburgh—Allegheny Co. plans to build 50-ft. rein.-con. boulevard from end East Carson St. to McKeesport. About $650,000.

Pa., Pittsburgh—City passed ordinance to grade, pave and repave portion Bigelow Blvd., also pave, grade and curb South Side Ave., from Hespen St. to Sunset Ave. R. Swan, city engr.

Ga., Albany — Dougherty Co. plans to build 10 mi. highway between Albany and Acree.

Ga., Waycross—Ware Co. Comrs. voted to pave 20 mi. Dixie Highway between Waycross and Pierce County line with Beech Island gravel.

Ala., Mobile—Chickasaw Shipbuilding Co., Mobile, plans to build streets and sidewalks for town occupied by employees of plant. J. F. Coleman, genl. supt.

Miss., Iuka—Tishominge Co. sold $30,000 bonds to construct Muscle Shoals Highway. Noted Sept. 13.

La., Monroe — Ouachita Parish Police Jury plans election Feb. 9 to vote on $1,050,000 bond issue for road work, drainage, courthouse and jail.

Tenn., Kingsport — Kingsport Impvt. Corp. plans to grade streets, build sidewalks and macadam driveway and install sewers. About $16,000.

O., Ashtabula—City preparing plans paving Prospect St. from Ann to Division St. L. A. Amsden, city engr.

O., Lima—City plans to pave Main St. from Erie R.R. to O'Connor Ave., wood block. V. Miller, city engr. Noted Nov. 15.

O., Sidney—(Official) — City defeated $40,000 bond issue for opening and extending Poplar St. Noted Nov. 1.

O., Steubenville—City plans to pave and improve McLister and Murdock Aves., concrete. J. A. Leech, city engr.

O., Toledo—City Council passed resolution to pave Mallet Ave., rein.-con., also alley between Oakwood and Norwood Aves., brick. H. A. McClure, city engr.

O., West Union—A. B. C. Good Roads Assn. plans to rebuild 50 mi. State Market Rd. No. 6 through Adams, Brown and Clermont Cos. Address co. clk., West Union.

Ind., Anderson — Madison Co. plans to pave Frankton Rd., gravel and cement. About $[illegible].

Ind., Danville—Hendricks Co. plans to build road through Guilford, Liberty and Franklin Twps. Federal Government and townships to appropriate $90,000 toward cost. Noted Oct. 18.

Ind., Lafayette—Tippecanoe Co. plans to build new Dresser Rd. About $96,330. G. Baxter, co. aud.

Mich., Flint — City plans laying about 125,000 sq.yd. paving and 500,000 sq.ft. of sidewalks. E. Shoecraft, city engr.

Mich., Grand Rapids—(Official)—City to sell $[illegible] bonds Dec. 19 to grade and pave Lamberton, Alpine, Sheldon and Bostwick Aves., Lee and Butterworth Sts. [illegible] J. Wagner, City Engr.

Ill., Beardstown — Town plans to pave Lafayette St. from the river to south end of town. J. Goodel, town engr.

Ill., Ottawa—La Salle Co. plans to improve 6900 ft. road, Deer Park Twp.

Ill., Peoria — City plans to resurface Bradley Ave. from Bourland Ave. to College St., concrete. E. N. Woodruff, city engr.

Ill., Winnetka — Winnetka and Kenniworth had plans prepared by Windes & Marsh, engrs., Winnetka, for paving 62,000 yd. Winnetka Ave., concrete. About $200,000.

Wis., Chippewa Falls — Chippewa Co. plans to build Eau Claire-Chippewa trunk line highway. About $28,000. W. N. Herbert, aud.

Wis., Eau Claire—Eau Claire Co. will expend $51,000 for road work. H. Nygaard, clk.

Wis., Monroe—Green Co. plans to construct Monroe-Monticello Rd. About $25,000. J. W. Stewart, co. clk.

Wis., Portage — Columbia Co. Comrs. voted $36,000 bonds to improve 7 mi. Portage-Columbia Rd. H. R. Tongen, aud. Noted Apr. 26.

Wis., Racine—City plans to pave following streets in 1918: Youth St., cost about $20,000; Asylum Ave., $9598; Milwaukee Ave., $5836; Osborne Blvd., $7279; Blake Ave., $5244; 13th, Howland, 10th, Main, Grange, Prospect, Carlisle, Albert, Geneva, 11th, Pearl Sts., Hilker and Davis Pl., St. Clair and Lake Aves., $80,019. P. H. Connolly, city engr.

Ia., Iowa City—Johnson Co. plans to improve 6½-mi. Kalona Rd. About $32,000. A. F. Fisher, co. engr.

Ia., Iowa City—City plans to pave Coralville Rd. from river to city limits. About $30,000. S. M. Hands, city engr.

Ia., Stuart—City soon lets contract paving 11 blocks.

Kan., Atchison—City soon lets contract paving about 28 blocks. F. S. Altman, city engr.

Kan., Baxter Springs—City having plans prepared by A. C. Moore, engr., Joplin, Mo., paving streets in business district, about 60 blocks. Noted Oct. 25.

Kan., Leavenworth — Golden Belt Rd. Dist., Leavenworth Co., had plans prepared building 19 mi. road. E. McNerney, chn.

Kan., Lindsborg—City plans to pave Main St., brick and concrete. Riddle & Riddle, Abilene, engrs.

Mont., Kalispell — Flathead and Teton Cos. plan to build Belton-Glacier Park Highway, from south side of Glacier Park, 57 mi. long, 12 mi. in Teton Co. and 45 mi. in Flathead Co.

Mo., Fulton—Callaway Co. voted $25,000 bonds to build roads. Noted Nov. 15.

Mo., Greenfield—(Official)—Dade Co. defeated $23,000 bond issue for improving roads between Everton, Ash Grove and Greenfield Twps. Noted Nov. 22.

Arkansas—State Highway Comn., Little Rock, having plans prepared for new road in Van Buren Co., from Formosa to county line via Shirley. About 30 mi. Cost, $64,000.

Ark., Jasper—Newton Co. Comrs. plan building 20 mi. road from Mount Judy to western county line. About $44,000.

Tex., Athens — Henderson Co. Comrs. plan election to vote on $50,000 bonds to build roads.

Tex., Beaumont—Jefferson Co. Rd. Dist. No. 1 voted $500,000 bonds to complete highway between here and Port Arthur and to pave highways between Beaumont and Houston and Beaumont and Silsbee. Noted Oct. 25.

Tex., Canyon—(Official)—Randell Co. receiving bids about Jan. 15, grading roads and building, rein.-con. culverts. About $65,000. Noted Nov. 8.

Tex., Centerville—Leon Co. plans election to vote on $250,000 bonds to build roads.

Tex., Dallas—City rejected bids opened Nov. 21 for paving Knight St., from Brown to Cedar Springs and Washington Ave. from Main to Worth St.

Streets and Roads (Continued)

Tex., Galveston—State Highway Comn., Austin, appropriated $10,000 to build roads in Galveston Co.

Tex., Gonzales—Gonzales Co. plans election to vote on $75,000 bonds to build and improve highways

Tex., Longview—Gregg Co. voted $75,000 bond issue for road work. E. W. Davis co. engr. Noted Oct. 11.

Tex., Madisonville — Madison Co., Precinct No. 1, voted $100,000 bonds to build 2 state and national highways. Noted Nov. 8.

Tex., Meridian—Bosque Co., Rd. Dist. No 7, election Dec. 22 to vote on $40,000 bonds to build roads.

Tex., Montague — Montague Co. plans election to vote on $300,000 bonds to build roads.

Tex., Richmond—Ft. Bend Co. plans election to vote on $400,000 bonds to build roads, Rosenberg Twp.

Okla., Alva — Woods Co. sold $38,500 bonds for road work in Waynoke Twp

Okla., Bartlesville — City rejected bids paving 2nd and 3rd Sts. from Dewey Ave. to railroad tracks. Work will be readvertised. E. D. Kirkpatrick, city engr. Noted Nov. 29.

Okla., Frederick — City Council passed resolution to issue $44,840 bonds for improving streets.

Okla., Holdenville—Hughes Co. voted $53,000 bonds to build roads and bridges in Barrard Twp.

Okla., Tulsa—Tulsa Co. at election Nov. 20 voted $1,750,000 bond issue to construct 108 mi. roads. L. Cline, co. clk. Noted Nov. 1.

Utah—Iron, Garfield, San Juan, Kane and Washington Cos. have joined formation Grand Canyon Highway Assn., Panguitch, Garfield Co., and plan to build roads in southern part of state. Cost to be borne by Federal Government, State and Grand Canyon Highway Assn. Noted June 21

Wash., Everett—City had plans prepared building industrial roadway along water front to Blackman's Point. About $13,311. H. Mumm, city engr.

Wash., North Yakima — City plans to hard surface North 1st Ave. About $100,000. N. A. Gilman, city engr.

Wash., Olympia — Thurston Co. plans election in spring to vote on $600,000 bonds to build and improve highways.

Wash., Port Orchard—(Official)—Kitsap Co. lets contract in spring building permanent Highway No. 1C, about 2 mi., with riprap along beach, culverts, and 1 pile trestle, 195 ft. long. About $15,000. E. E. Boester, deputy co engr. Noted Aug. 2.

Wash., Prosser—City plans to macadamize 3800 cu.yd. of roads from city limits to business section and replace wooden walks with concrete. About $11,727.

Wash., Tacoma—Pierce Co. plans to pave 2 mi. Pioneer Highway, leading through Orting toward South Prairie; also pave 1 mi. road in Buckley

Wash., Tacoma—City soon lets contract building concrete sidewalks in district bounded by North 42nd, 43rd, 44th, and 46th Sts. from Cheyenne to Mullan St. About $20,400. W. C. Raleigh, city engr.

Ore., Bend—Deschutes Co. plans to spend $29,000 to build roads.

Ore., Coquille—Coos Co. plans to surface 11-mi. Bandon Rd. About $30,000.

Ore., Pendleton—City Council plans paving Union St. from 5th to 10th St., 9th from Union to 9th St. bridge, 10th St. from Union to Washington St.; Washington St. from 10th to Clay St.; Clay St. from Washington to Kelly Ave., Court from 5th to 8th St.; Washington St. from 5th to Fulton St.; Kelly St. from Fulton to Alvord St.; Federal St. from Alvord to Fulton St.; Laughlin St. from Alvord to Fulton St. grading Wilson St. from Madison to Bush St.

Cal., El Segundo—City plans to pave 2½ mi. of streets, macadam. About $29,000. A. W. Cory, city engr. Noted Oct. 18.

BIDS DESIRED

N. Y., Brooklyn—(Official)—Until Dec. 12, by L. H. Pounds, boro. pres., regulating, grading, and laying sidewalks on Sedgwick Pl., from 67th St. to Wakefield Pl.; regulating and paving roadway of 36th St. from Church to 15th Ave., and 86th St. from 21st to 22nd Ave., asphalt on 6-in. concrete foundation.

N. Y., New York—(Official)—Until Dec. 12, by M. M. Marks, boro. pres. regulating and repaving 10th St., from Stuyvesant St. to University Pl., asphalt on concrete foundation; 3rd Ave. from 6th to 8th St., wood block on concrete foundation; 3rd Ave. from 6th to 8th Sts., wood block on concrete foundation, water, tar, gas specifications.

N. Y., New York—(Official)—Until Dec. 12, by D. Mathewson, boro. pres. (Bronx Boro.), regulating, grading, curbing, laying sidewalks and crosswalks, building inlets, receiving basins, drains, and culverts, etc. in West 176th St. from Jerome Ave. to Macombs Rd.; also sewer in Barkley Ave. between Clarence Ave. and Long Island Sound.

S. C., Spartanburg — (Official) — Until Dec. 10, by Comrs. Spartanburg Co., building Sect. B of Natl. Highway, 12.06 mi., in Spartanburg, Reidville and Beach Springs Twps., 20 ft. top soil roadway; also to construct Fair Forest Rd., 3½ mi. 20-ft. top soil roadway, Contr. No. 6 and building 5 concrete bridges, Contr. No. 7. Reid Tull, co. highway engr.

Ala., Bay Minette — Until Dec. 31, by Baldwin Co., building 4 mi. Bay Minette and Daphne Rd., between Stapleton and Daphne, involving 12,000 cu.yd. excav., 510 lin.ft. pipe. Noted Oct. 4.

O., Dayton—Until Dec. 22, by Montgomery Co., widening Dayton and Greenville Rd. at Salem. A. Knoop, co. engr.

O., East View—Until Dec. 11, by Town, grading, draining, curbing, paving and building sidewalks, portion Lee Rd. Pease Eng. Co., Marshall Bldg., Cleveland, engrs.

Ind., Huntington—(Official)—Until Dec. 29, by Grant Co., building stone road between Van Buren Twp. and Jefferson Twp. M. McRae, aud.

Ind., Knox—(Official) — Until Dec. 12, by Bd. Trustees, improving Lake St. from Main St. to western end of same; Shields St. from Lake St. to South line of New York St.; Delaware St. from Main to Shields St., asphalt, bitulithic, or wood block. R. Thompson, clk.

Minn., Princeton—Until Dec. 18, by W. C. Doan, Millelacs Co. aud., building Minnesota Federal Aid Project No. 3 involving 33,459 cu.yd. gravel surfacing, building 9 rein.-con. bridges and two 16-ft. one 20 ft., two 30-ft. and one 70-ft. beam span bridges. Noted June 7.

Mo., Pleasant Hill—(Official)—Until Dec 10, by City building about 9000 sq.yd macadam pavement. Noted Nov. 29.

Okla., Miami—(Official)—Until Dec. 17, by Ottawa Co. Comrs., building state and county roads. About $350,000. J. A. Walker, clk. Noted Nov 22

Okla., Okmulgee—(Official)—Until Dec. 17, by Okmulgee Co. Comrs., grading and building culverts and paving about 118 mi. roads. H. Hart, chn.; advertised in this issue.

Wash., Everett—(Official)—Until Dec. 17, by Snohomish Co. Comrs., building Permanent Highway No. 32 M Weatherbee co and Noted Oct 4

Wash., Pasco—Until Dec 15 by Franklin Co. graveling 30 mi. highways and grading and graveling 7 mi. J. W. Ketner, co. engr

Wash., Seattle—(Official)—Until Dec. 10, by Puget Mill Co., Walker Bldg. for grading, curbing, building cement walks and water mains in Westhaven Addition on Fauntleroy and 45th Aves. About $61,000 Address E. Folsom Noted Nov 15

Cal., Calexico—Until Dec 11, by City, paving main streets with bitulithic 5-in concrete base and 2-in top and other streets with warrenite, 4-in concrete base and 1½-in. top. Following are streets to be paved:

2nd St., full width to Blair Ave and strip 20 ft wide in center of street from Blair to east city limits

Imperial Ave., full width to 7th St. and strip 20 ft wide in center of street from 7th St. to north city limits

Heber Ave., full width from 2nd to Sherman Sts., to north end of high school grounds.

3rd St., widened to 56 ft. and paved full width to Mary St.

7th St., full width from Emerson to Heber St.; 4th, 5th, and 6th Sts., from Emerson to Imperial Sts.

7th St., from Imperial to Heber St., and 3rd St., from Heber to Mary St.; Emerson St., full width from 3rd to 7th St. Noted Nov 15

Cal., Fresno—Until Dec. 10, by D. M. Bernwell, Fresno Co., clk., building Shaver-Big Creek Rd. and portion Millwood Rd. near Squaw Valley.

Cal., Los Angeles—Until Dec. 17, by Los Angeles Co. Supervs., building macadam pavement on Inglewood Drive between Wilshire Blvd and Santa Monica Blvd 4th Dist No 3 Work involves 1918 cu.yd excav 3443 lin.ft shaping road bed, 1881 sq.ft. concrete gutter, 4 in. thick, hauling and placing 839 lin.ft. cement curb, 5 x 8 x 12 in. and 382 lin.ft. 5 x 9 x 15 in., hauling and placing 1321 lin.ft. macadam pavement.

Cal., Sacramento—(Official)—Until Dec. 10, by Sacramento Co., building highway on Sacramento River Levee of Grand Island, 13.25 mi. long, involving about 17,278 cu.yd. concrete.

Que., Hatley—(Official)—Until Dec. 15, by H. B. Whitcomb, secy.-treas. building portion Massawippi and Compton Rds.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., New York—M. E. Connolly, boro. pres. (Queens Boro.), received low bids regulating, grading, curbing and paving (a) Glasser St. from Sandol St. to Cypress Hill Rd., (b) Hill St. from Hunterspoint to Thomson Ave., (c) Beach 117th St. from Ocean to Washington Ave., from Boro. Asphalt Co., 1301 Metropolitan Ave., Brooklyn, (a) $11,817, (c) $17,694; Uvalde Asphalt Paving Co., 1 Bway., (a) $12,450, (c) $19,407; E. W. Fitzpatrick, 128 3rd Ave., Astoria, (b) $10,788; Degnon Contg. Co., 30 East 42nd St., (b) $13,805; Peace Bros., 20 Main St., Flushing, (b) $18,240. Noted Nov. 22.

★**N. Y., Rochester**—City let contract grading and building sidewalks and sewers on Grand Ave., to F. V. Brotsch Co., E & B Bldg., $25,335 Noted Oct. 11.

★**N. Y., Wingdale**—Comm. on New Prisons, Hall of Records Bldg., New York City, let contract grading at Wingdale Prison, to Fallkill Constr. Co., 1 Washington St., Poughkeepsie, $40,000. Noted Nov. 8.

★**N. J., Hackensack** — Bd. Freeholders Bergen Co. let contract grading sidewalks on Paterson Plank Rd. in Boros. of East Rutherford and Wallington, to C. M. Brewster County Co., $18,257

★**N. J., Jersey City** — Bd. Freeholders Hudson Co. let contract furnishing crushed stone for Newark Turnpike, to W. J. Geraghty, 661 Newark Ave. $4.15 per ton Noted Nov 22

★**N. J., Trenton**—(Official) — Bd. Freeholders Mercer Co. let contract paving approaches to Hibers Basin Bridge on Brunswick Pike Rt. 1, to C. A. Reid Co., Trenton, $47,456 Noted Nov 22

★**Pa., Phila.**—G. E. Bateman, dir. pub. wks. let contract building portion Parkway east of 17th St. to Race St. to J. J. McHugh, 1429 South Penna Sq., about $47,000. Noted Nov 15

★**S. C., Chester**—Chester Co. let contract building roads in J. T. Blackmon's Greenville S. C. $195,000 Noted Aug. 16

Fla., Miami—Dade Co. received bids building road work in Dist. No. 1, from Seminole County Co., Miami, (a) third, $4,559, (b) to Dade, $47,726, Sects. 2, 3 and 4 to E. Collins, $41,244 Noted Nov 15

★**Ala., Enterprise**—City let contract paving streets with brick, natural concrete, bituminous concrete, macadam concrete to Southern Clay Mfg. Co., James Bldg., Chattanooga, $75,941 Noted Nov. 8

★**Indiana**—Ind. Co. Comrs. let contract building roads in various townships as follows:

Ehart Co., New Albany, [illegible] $568 Grand, Georgetown, Cox, Co. & T. Cheney, H.P. [illegible] New Albany, $4,[illegible]

Streets and Roads (Continued)

Madison Co., Anderson; building 16,006 ft. road on line between Madison and Delaware Cos., to Sullivan & Sullivan, Alexandria, $9165. Noted Nov. 8.

Ind., Kendallville—City received low bids paving South Main and Williams Sts., and certain alleys in downtown district, from Moellering Constr. Co., Murray St., and Brooke Constr. Co., 2104 Nuner St. About $52,547. Noted Oct. 25.

★Minn., Hibbing—St. Louis Co. let contract paving Dupont and Dublin Rds., to Mallet Bros., $[illegible]

★Minn., St. Peter—Nicollet Co. let contract building State Rd. Nos. 5 and 9, to A. W. Webster.

★Mo., Rock Port—City let contract improving about 7 mi. of streets to Western States Constr. Co., 7821 Brandeis Bldg., Omaha, $53,490.

★Ark., Forrest City—St. Francis Co. let contract building 42 mi. gravel, concrete and asphaltic concrete roads, Dists. No. 1 and 2 to Lewelling & Price Williams, Little Rock, $253,000. Noted Aug. 23.

★Tex., Wheeler—Wheeler County let contract building roads, Rd. Dist. No. 2, to Smith Bros., Crockett, $35,000. Noted Apr. 26.

★Okla., Ardmore—City let contract paving 2nd Ave. S.W. from H to L Sts., asphalt, to Ardmore Constr. Co., Ardmore, $16,259.

★Okla., Oklahoma—City let contract paving 13th St. from Lindsay Ave., asphalt, to Western Paving Co., 518 Terminal Bldg. About $12,510. Noted Sept. 13.

Wash., Clarkston—City received low bid gravel surfacing and grading 6 mi. streets from B. Bragg, Lewiston, Idaho, $1.33 per sq.yd. and 45c per yd. respectively. Noted Nov. 8.

★Ore., Pendleton—City let contract paving Lewis St. from Lee to Beauregard St., and Wilson St. from Madison to Main St., to Warren Constr. Co., Journal Bldg., Portland, $10,[illegible]

★Cal., Los Angeles—Los Angeles Co. let contract grading and paving portion Azusa Ave., Rd. Dist. No. 135, involving 32,000 sq.yd. concrete pavement, for which county furnishes cement, gravel and corrugated metal culverts, to Redondo Constr. Co., 218 South Redondo Ave., $18,500. Noted Nov. [illegible]

★Cal., San Pedro—Outer Harbor & Dock Co. let contract paving Miner Fill, to Fair-child-Gilmore-Wilton Co., Pacific Electric Bldg., San Francisco. About $10,[illegible]

RAILWAYS—STEAM & ELECTRIC

Proposed Work

Georgia—State R.R. Comm. granted permission to Atlanta & Anderson Ry. to issue $[illegible] bonds for building interurban line from Atlanta to Anderson, S. C. M. Bedding, Atlanta Nat. Bank Bldg., Atlanta, Ga., Noted May 2.

Ohio—See "Industrial Works," Cincinnati.

Ohio—Wheeling & Lake Erie R.R., Lessee, Illig Coverdale, acquired [illegible] acres of land near Bedford and plans large freight yard. W. L. Bollinger, chf. engr.

California—See "Industrial Works," Los Angeles.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Kentucky—Louisville & Nashville R.R. let contract building Hopkinsville-Fairview line, Princeton to Cadiz, Hiawatha for depot, engine and miscellaneous buildings, to T. F. Thompson, Knoxville, Tenn. Noted Nov. 8.

★California—Western Pacific R.R. let contract [illegible] grade from Niles to San Jose to Utah Construction Co., Phelan Bldg., San Francisco. About $400,000. Noted June 29.

EXCAVATION AND DREDGING

Proposed Work

S. C., Marion—Drainage—C. S. Reaves, Jr., and associates ideas to build drainage system [illegible] including 4 mi. canal, 24 ft. wide.

La., Monroe—Drainage—See "Streets and Roads."

Ill., Muddy—(Official)—Excavation—Central Illinois Pub. Serv. Co. plans to excavate about 5000 yd. in cooling pond. Work is in connection with new addition to power house. D. R. Truax, purch. agt.

Ill., Woodstock—Ditch—Local Crafton Dist. No. 1, McHenry Co., plans to build 20 mi. open ditch and 15 mi. tile ditching. About $225,000. T. Homer, co. clk. G. Nelson, Sherwin Bldg., Elgin, engr.

Minn., Glenwood—Ditch—O. Irgens, aud. Pope Co. received no bids building Co. Ditch No. 15, involving 129,705 cu.yd. excav. About $14,269. Noted Nov. 8.

Kan., Manhattan—Drainage—State Dept. of Drainage and Irrigation, Topeka, soon receives bids building 2 drainage systems, involving 587,250 cu.yd. excav. J. B. Marcellus, state engr.

BIDS DESIRED

Wis., Sheboygan—Ditches—Until Dec. 15, by Sheboygan Valley D.D., Elkhart Lake. Sheboygan Co., building 6 mi. main ditch and 12 mi. laterals, involving 833,000 cu.yd. excav.

Minn., Buffalo—Ditch—Until Dec. 14, by J. A. Berg, aud., Wright Co., building Co. Ditch No. 33, involving 41,900 ft. 6-28 in. tile; 6 concrete walls; 44 intakes, 2000 ft. sheathing and 5700 ft. open ditch. About $19,718.

Minn., Elbow Lake—Ditch—Until Dec. 18, by C. M. Nelson, co. aud., building Co. Ditch No. 30, involving 28,550 ft. 6-24 in. tile. H. Dunaway, engr.

Minn., Ivanhoe—Ditch—Until Dec. 14, by K. A. Hansen, Lincoln co. aud., building Co. Ditch No. 37, involving 234,635 cu.yd. open work, 34,500 lin.ft. tile, 4 concrete drops, 8 bulkheads, 3 manholes and 12 tile inlets, about $65,015; Co. Ditch No. 34, all tile, $6938; Judicial Ditch No. 29,500 ft. open work and tile, $23,503.

Minn., Madison—Ditch—Until Dec. 11, by A. G. Shogren, aud., Lac qui Parle Co., building Co. Ditch No. 27, involving 53,800 ft. 6-14-in. clay or common tile. About $11,061.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Ind., Hartford City—Ditch—Blackford Co. let contract building Roby Ditch in northern part of county and extending into Wells Co., to G. Frommeyer & Co., Dunkirk, $14,057.

★Ill., Garden Prairie—(Official)—Drainage—Coon Creek Drainage Comrs., let contract 6 mi. tile drain, to Streater Drain Tile Co., Streater, $14,314. Noted Nov. 1.

★Ia., Rockwell City—(Official)—Drainage—Calhoun Co. let contract improving D.D. No. 67, to Rude & Kold Pomeroy, labor, $14,677; to Cement Products Co., tile, $19,352. Noted Nov. 22.

★Minn., Buffalo—(Official)—Ditch—Wright Co. let contract building Ditch No. 34 to C. P. Madsen, Hutchinson. About $17,175. Noted Nov. 15.

★Minn., Mankato—(Official)—Blue Earth Co. let contract building Judicial Ditch No. 25, to G. F. Widman, Webster City, Ia., $12,900; No. 21 to Peterson & Malzahn, Good Thunder, Minn., $30,750; No. 23 to New Ulm Brick & Tile Yards, $8500; No. 28 and No. 20 to Paul Paulson, Mankato, Minn., $14,700 and $39,800 respectively, No. 10 to E. Nelson, Wells, Minn., $7400. Noted Nov. 15.

★Minn., Pipestone—Ditch—(Official)—Pipestone Co. let contract, open work, to Northwestern Drainage Co., Thief River Falls, Minn., $0.1285 per cu.yd.; tile, to F. Bisballe, Tyler, $153,200. Noted Nov. 15.

★Mo., Memphis—Ditch—Wyaconda River D.D. No. 2, Scotland Co., let contract ditch, involving 156,000 cu.yd. excav., to L. E. Sternberg, Creston, Ia. Noted Nov. 8.

★Tracy, Cal.—Irrigation—Ed. Dir. West side Irrigation Dist. let contract pumping plant, to Lindgren Co., Monadnock Bldg., San Francisco. About $25,[illegible]

INDUSTRIAL WORKS

Proposed Work

Conn., Waterbury—Mattatuck Mfg. Co., East Main St., had plans prepared by Aberthaw Constr. Co., archts., 27 School St., for 4-story factory. G. E. Judd, secy. and treas.

N. Y., Astoria—Astoria Consumers Ice Co. had plans prepared for 95 x 195 ft. ice manufacturing plant on 17th St. About $60,000.

N. Y., Astoria—Hunoff Machine Wks., 45 Mills St., having plans prepared by M. J. Harrison, archt., World Bldg., New York City, for 1-story machine shop. About $25,000.

N. Y., Brooklyn—P. Abbott Constr. Co., 180 Montague St., had plans prepared by S. Millman & Sons, archts., 780 Pitkin Ave., for 1-story, 131 x 152-ft. brick garage, on Ocean Ave. About $85,000.

N. Y., Brooklyn—E. W. Bliss Co., Adams and Plymouth Sts., had plans prepared by W. Pfaendler, Ordnance Dept., foot 53rd St., for 6-story, brick and steel factory.

N. Y., Brooklyn—C. Hartman Co., 985 Deane St., has increased its capital stock from $10,000 to $80,000 and plans addition to factory.

N. Y., Brooklyn—F. Jiancarlo, 1470 67th St., had plans prepared by F. Savignano, archt., 6005 15th Ave., for 1-story, 72 x 100-ft. concrete garage on 60th St. About $35,000.

N. Y., Buffalo—Kellog Prodocts Co., 98 Delaware Ave., had plans prepared, 2-story, 32 x 64-ft. transformer house, 2-story, 30 x 112-ft. boiler house, 1-story, 50 x 57-ft. addition to boiler house and 3-story, 52 x 73-ft. packing house. About $40,000. R. J. Reidpath, Builders' Ex., archt.

N. Y., Buffalo—O'Neil Iron Wks., Perry St., has increased its capital stock to $500,000 and plans to build addition to plant.

N. Y., Long Island City—Astoria Light, Heat & Power Co., 130 East 15th St., New York City, had plans prepared for 1- and 4-story, 101 x 151-ft. grinding factory on Winthrop Ave. About $25,000. W. H. Bradley, pres.

N. Y., Long Island City—Ice Mfg. Co., 1480 Bway., New York City, had plans prepared by Mortensen & Co., archts., 405 Lexington Ave., New York City, for 1-story, 45 x 141-ft. ice plant and garage, Packard Pl. and Dreyer Ave. About $35,000.

N. Y., New York—American Stove Co., 209 West 43rd St., has increased its capital stock from $7,000,000 to $10,000,000, and plans to build addition to plant.

N. Y., New York — Standard Concrete Machinery Co., 233 Bway., has increased its capital stock from $100,000 to $250,000 and plans to build addition to plant.

N. Y., New York—Toch Screw Machine Products Corp., 8th St., has increased its capital stock from $50,000 to $100,000, and plans to build addition to plant.

N. Y., New York—P. Weinstein & Sons, 1397 Stebbins Ave. having plans prepared by I. Margan, archt., 372 East 149th St., 4-story, 100 x 100-ft. addition to garage, (Bronx Boro.). About $135,000.

N. J., Camden—Columbia Bronze Foundry Co., 529 Columbia Ave., has increased its capital stock from $10,000 to $200,000 and plans addition to plant.

N. J., Trenton—Standard Oil Co. acquired additional land on New York Ave. here, and plans to build several additions to its plant.

N. J., Wharton—Wharton Steel Co. will increase its capital stock from $3,000,000 to $10,000,000 and plans to build additions to its plant here.

Pa., Butler—Spang & Co., Etna St., plans 1- and 2-story, 170 x 250-ft. addition to its plant. About $150,000.

Pa., Groveton—Lewis Foundry & Machine Co. has increased its capital stock from $210,000 to $1,000,000 and plans addition to plant.

Pa., Johnstown — Flood City Mfg. Co., Elder and Messenger Sts., has increased its capital stock from $15,000 to $100,000, and plans 4-story, 100 x 120-ft. concrete and steel addition to factory. J. L. Hershberger, Southmont, genl. mgr.

Pa., Phila.—Main Belting Co., 1219 Carpenter St., had plans prepared for 3-story addition to plant.

Industrial Works (Continued)

Pa., Phila.—A. Schoenut & Co., had plans prepared for 1-story, 58 x 141-ft., 40 x 89-ft., and 21 x 89-ft. lumber yard and kiln building. About $50,000. A. P. Schoenhut, Adams and Cepviva Sts., pres. Ballinger & Perrot, 17th and Arch Sts., archts., soon let contract.

Pa., Phillipsburg—Atlantic Refining Co., 3144 Passyunk Ave., Phila., having plans prepared by C. H. Ehler, archt., c/o Phila. office, for 4-story, 100 x 200-ft. oil storage warehouse. About $200,000. C. Metz, Phillipsburg, supt. constr.

Pa., Stealton—John Hoffer Flour Mill Co. soon lets contract rebuilding 5-story, 50 x 70-ft. brick mill recently destroyed by fire. E. E. Hollenbach, Brandwyne St., Phila., archt.

Md., Baltimore—L. Raast, 2340 Eutaw Pl., plans to build 2 and 3 story, 80 x 45 and 80 x 40 ft. brick and concrete warehouses, at 1540 Ridgely St. Abaut $22,000 and $30,000 respectively. Callis & Callis, 2055 Kennedy Ave., archts.

Va., Lynchburg—Lynchburg Foundry Co. plans to build 1-story foundry. About $60,000. Wiley & Wilson, engrs.

Va., Narrows—Union Tanning Co., Narrow, plans to rebuild plant recently destroyed by fire. Loss, $200,000.

W. Va., Huntington—Jeffrey-Dewitt Co., Butler St. and Grand Trunk R.R., Detroit, Mich., plans to build factory here. About $100,000.

N. C., Lexington—Peacock Furniture Co. plans rebuilding furniture factory recently destroyed by fire with $60,000 loss.

Fla., Tampa—Oscar Daniels Shipbuilding Co., Woolworth Bldg., New York City, has leased shipyards of Tampa Shipbuilding & Eng. Co., and plans to build several large additions to same.

Ala., Birmingham—Indian Refining Co., 1320 Ave. E, plans rebuilding concrete warehouse and plant which was destroyed by fire. About $100,000. F. A. Chapman, mgr.

Ky., Solvay—Kentucky Solvay Co., controlled by Semet-Solvay Co., Milton Ave., Syracuse, plans to increase its capital stock from $2,700,000 to $5,200,000 and plan addition to plant.

O., Cincinnati — Cincinnati Terminal Warehouse Co., soon lets contract 7-story, freight terminal and warehouse in site enclosed by Central Ave., Smith St. and from Front to Augusta St. Plans include laying 4 tracks covering area 175 x 750 ft. and running entire length of terminal. A. M. Allen & Co., Cincinnati, engrs

O., Cleveland—Cleveland Gear Grinding Co., recently incorporated with $350,000 capital stock, plans to build factory in East 152nd St. Dist.

O., Cleveland—Viehek Tool Co., Quincy Ave., plans to build 3-story addition to plant.

O., Cleveland — Woodland-55th St. Co., 630 Cuyahoga Bldg., plans to build brick and concrete garage, 5700 Woodland Ave. About $25,000.

O., Columbus—Blue Valley Creamery Co., 702 South Clinton St., Chicago, had plans prepared for 3-story brick factory on Grove St. About $50,000. Noted Nov. 15.

O., Mansfield—Phoenix Electric Co. plans 1-story, 100 x 500-ft. factory. Althause & Jones, archts., 204 Market Bldg., soon let contract.

Ind., Ft. Wayne—City having plans prepared by Mahurin & Mahurin, archts., 124 West Jefferson St., for addition to lighting plant. About $35,000.

Ind., Hammond—Standard Steel Car Co. plans to build several large additions to its plant here. Company recently received $60,000,000 contract from U. S. Government for gun parts.

Mich., Detroit—Amer Car & Ferry Co. having plans prepared for 1-story paint shop. About $50,000. J. H. Ames, 445 East Ferry St., engr.

Ill., Chicago—Bunte Bros., 730 West Monroe St., have leased 14-acre site at Franklin Blvd. and Ohio St., and plans rein.-con. factory. About $1,500,000.

Ill., Chicago—L. Pfaelzer & Son, 3927 South Halsted St., soon let contract, 2-story, 51 x 109-ft. abbattoir. About $80,000. Packers' Architectural & Eng. Co., 431 South Dearborn St., archts. and engrs.

Ill., Lincoln—Langellier Motor Co., 112 South McLean St., had plans prepared by Deal & Ginzel, archts., 209 Independent Order of Odd Fellows Bldg., for 50 x 138-ft. garage and salesroom. About $30,000. O. L. Langellier, mgr.

Ill., South Chicago—Iroquois Iron Co., having plans prepared by C. D. Rawstorne, archt., 122 South Michigan Ave., for 1-story slag handling plant. About $100,000. E. Raum, 3267 East 95th St., secy.

Wis., Menominee Falls — Standard Oil Co., 16th and Grand Ave., Milwaukee, plans to build 2-story garage here. About $50,000. Leiser & Hoist, 402 Germania Bldg., Milwaukee, archt.

Wis., Osseo—Oatman Condensed Milk Co., 327 North Jefferson St., Chicago, soon receives bids for 2-story, 100 x 225-ft. brick and steel condensory.

Ia., Burlington—G. G. Higbee, Washington and Central Aves., plans to build 77 x 106-ft. concrete corliss shop. About $50,000. W. F. Weibley, Tama Bldg., archt.

Ia., Burlington—Iowa Soap Co., 816 Valley St., plans 5-story, 40 x 42-ft. rein.con factory. About $55,000. F. M. Smith, pres. W. F. Weibley, Tama Bldg., archt.

Ia., Davenport—Armour & Co., 105 Rock Island Ave., purchased site on Front St. and plans to build rein.-con. and steel addition to its plant. About $135,000.

Minn., Rochester—J. C. Thompson plans 2-story, 76 x 140-ft. garage here. About $30,000. F. H. Moose, archt.

Kan., Wichita—Cudahy Packing Co., 14th and Jones Sts., Omaha, Neb., plans to build plant on newly acquired 60-acre tract of land. About $500,000.

Neb., Omaha—C. W. Calkins, City Natl Bank Bldg., soon lets contract, 1-story, 100 x 132-ft. garage. About $30,000. J. T. Allen, Brandeis Theater Bldg., archt.

Wyo., Cheyenne—Union Pacific R.R. plans to build additions to its shops here. About $1,600,000. R. L. Huntley, 15th and Dodge Sts., Omaha, Neb., ch. engr.

Mo., St. Louis—M. A. Burdeau, 16 Hortense Pl., soon lets contract, 1-story, 50 x 135-ft. garage and sales building. About $60,000. P. J. Bradshaw, 512 International Life Bldg., archt.

Tex., Grand Saline—Grand Trunk Saline Salt Co. plans to rebuild its plant, recently destroyed by fire. About $41,500.

N. M., Tucumcari—D. F. Thomas, Tucumcari, and associates plan to build 125-ton oil flotation mill here. About $30,000.

Ariz., Tuscon—Tuscon Warehouse & Transfer Co. having plans prepared by W. Curlett & Son, archts., Merchants Bank Bldg., Los Angeles, for 4-story, 66 x 66-ft. rein.-con. warehouse. About $40,000.

Cal., Fresno—Western Meat Co., 744 P St., having plans prepared for addition to plant. About $90,000.

Cal., Hanford—Cousins Tractor Co., recently incorporated with $100,000 capital stock, plans to build factory on East 7th St. H. R. Cousins, S. McCord Hanford and A. D. Ferguson, Fresno, among incorporators.

Cal., Hanford—Kings County Packing Co. plans to build 80 x 100-ft. addition to cannery. About $45,000.

Cal., Los Angeles—Acme Can Co., 4851 Santa Fe St., plans to build new can factory and warehouse, also lay additional tracks to hold 61 freight cars. About $1,000,000.

Cal., Sacramento—California Prune & Apricot Growers, Inc., plans to build 4-story packing plant. About $160,000.

Cal., Sacramento—Southern Pacific Co. plans building steel manufacturing and switch plant. W. Hood, Floed Bldg., San Francisco, ch. engr. About $400,000.

Cal., San Francisco—California Prune Co. plans to build 4-story fruit packing plant on Folsom St. About $45,000.

Cal., San Francisco—Natl. Paper Prod. Co., 534 Battery St., plans factory, 100 x 800-ft. factory. About $400,000. Mayberald & Kahn, engrs.

Ont., Weston—K. & S. Canadian Tires Ltd., 527 Yonge St., Toronto, plans building 70 x 150-ft. factory here. About $60,000.

BIDS DESIRED

N. Y., Albany—(Official)—Until Dec. 11 by W. W. Wotherspoon, supt. pub. wks., Capitol, building freight sheds and roadhouse on Pier 6 East River Terminal. Contract No. 297; advertised in this issue.

N. Y., Syracuse—Until Dec. 10, by Starrett & Van Vleck, archts., 8 West 40th St., New York City, for 3-story, 93 x 240-ft. rein.-con. warehouse on Willis Ave., here, for Church, Dwight & Co., 27 Cedar St., New York City. About $[illegible]. Noted Nov. 29.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Maynard**—Amabel Mills, Maynard & Shawmut Bank Bldg., let contract, 5-story, 50 x 400-ft. addition to E. W. Pitman Co., Bay State Bldg., Lawrence. Percentage basis.

★**Conn., Hartford**—Pratt & Cady, Inc., 556 Capitol Ave., let contract, 3-story, 35 x 100-ft. addition, to Porteus Walker Co., Inc., 13 Forest St.

★**N. Y., Buffalo** — National Analine & Chemical Co., 351 Abbott Rd., let contract 3-story, 80 x 120-ft. brick factory, at 340 Lee St., to J. W. Cowper Co., 724 Fidelity Bldg., $88,500.

★**N. Y., Morristown**—Hires Condensed Milk Co., 913 Arch St., Phila., let contract 3-story, 60 x 80-ft. factory to Thompson & Binger Co., 280 Madison Ave., New York City. About $85,000.

★**N. Y., New York**—E. Greenbaum & Co., 349 East 103rd St., let contract, 3-story, 50 x 93-ft. addition to packing plant, to Lustbader Constr. Co., 103 Park Ave., $75,000.

★**N. J., Bloomfield**—International Arms Co. let contract 1-story, 240 x 600-ft. rein.-con. and steel munition factory, to Amer Concrete Steel Co., 27 Clinton St., Newark.

★**N. J., Camden**—Dynamo & Leverich, 217 Atlantic St. let contract 1-story, 110 x 240-ft. rein.-con. and steel addition to plant, to G. Kessler Contg. Co., Drexel Bldg., Phila. About $45,000.

★**N. J., Newark**—Hannell Motor Car Co., 520 Broad St., let contract, 1-story, 112 x 200-ft. garage and service station to Becker Constr. Co., 361 Grove St., $50,000. Noted Nov. 29.

★**N. J., Perth Amboy**—Natl. Synthetic Co. let contract building 2 additions to chemical plant here to Tuller & Hammond, 126 East 42nd St., New York City. About $75,000.

★**N. J., Yardville**—Zoo Zoo Rubber Co., Yardville, let contract, 2-story, 50 x 160-ft. factory, to Martin Bros., Yardville, $[illegible].

★**Pa., Erie**—Anne Banks Shoe & Fury Co., 1305 West 12th St., let contract 1- and 2-story, 150 x 150 ft. addition to plant, to Crowell Lumber Co., 1501 East 24th St., Cleveland, O. About $[illegible].

★**Pa., Phila.**—Union Printing Engraving & Design Co., 1831 Chestnut St., let contract 3-story, 50 x 140 ft. brick and concrete machine shop and storage plant on Carpl St., to P. Compton & Bro., 4814 Oakland St., Frankford. About $[illegible].

★**Pa., Phila.**—[illegible] and Jefferson Sts. let contract 1-story, 115 x 140-ft. brick factory, to [illegible] Chestnut St. About $100,000. Noted Oct. 11.

Pa., Phila.—Penn & Jenkins, Inc. received low bid for building engine house and repairing store, Delp and Emerald Sts., Phila. Wm. Steele & Sons Co., 31 South 16th St., Phila. About $[illegible]. Noted Nov. 15.

★**Md., Baltimore**—[illegible] Co., 348-50 East Hamburg St., to enlarge 4 plants, 1 to Isaac Crouch Co., Maryland Trust Bldg. About $[illegible].

★**Va., Lynchburg**—Lynchburg Foundry Co., 7th St., to build 1-story addition to factory, to [illegible] 1-story addition to [illegible] Noted Nov. 15.

★**Ala., Attalla**—[illegible] let contract for work at [illegible] to [illegible] Investment Co. [illegible]

Industrial Works (Continued)

★O., Cleveland—Ideal Tire & Rubber Co. [illegible] contract, 3-story, brick and steel factory, Warner Rd., to Hughes-Conkey Constr. Co., Cuyahoga Bldg.

★O., Cleveland — Manufacturers Brush Co., 1748 West 45th St., let contract for factory, 1554 West 114th St., to Hailsbauer & Krelschrer, 7945 Lorain Ave., $[illegible].

★O., Cleveland—National Lamp Co. let contract building 72 x 186-ft. garage at New Pgh. plant, Noble Rd. to S. W. Emerson Co., 1900 Euclid Ave., $30,000.

★O., Elyria—Elyria Machine Co. let contract 1-story, 60 x 300-ft. foundry and machine shop, to Austin Co., 14220 Euclid Ave., Cleveland. About $35,000.

★O., Ironton—Ironton Portland Cement Co., Masonic Temple, let contract building coal grinding and cinder recovery plants to W. C. Harrison & Co., 50 Pine St., New York City.

★Ind., Miller — International Airship Corp., 327 RWAY Garage, let contract 1-story, [illegible] x 400-ft. airship factory and power house, to N. P. Severin, 105 North Clark St., Chicago, $200,000. Noted Sept. 18.

★Ill., Chicago—A. M. Castle Co., 1300 North Branch St., let contract, 1-story, addition to warehouse, to C. Rasmussen, 154 Randolph St., $[illegible].

★Ill., Chicago—Union Special Machine Co., let contract 3-story, 100 x 100 ft. concrete factory, West Kinzie and Franklin Sts., to C. A. Fuller Co., 140 South Dearborn St. About $125,000. Noted Nov. 22.

★Wis., Jamesville—Chas. Skid Mfg. Co., Jamesville, let contract 1-story, 50 x 150-ft. addition to factory, to A. Summers & Son, Jamesville. About $70,000.

★Ia., Ft. Madison — Perfection Tire & Rubber Co., building 3-story, 60 x 250-ft. tire plant by day labor. About $80,000. F. E. Humphrey, Fostoria Ave., mgr.

★Minn., Minneapolis — William Bros. Boiler & Mfg. Co., let contract, 193 x 298-ft. addition to warehouse, to A. Cederstan Co., Central and 3rd Aves., $40,000.

★Kan., Wichita—Wichita Flour Mill Co., 17th and Santa Fe St., let contract flour mill addition to Lehrack Eng. and Contg. Co., 725 Gloyd Bldg., Kansas City, Mo. About $150,000.

★Utah, Provo — Goddard Packing Co., 29th St. and Lincoln Ave., Ogden, let contract packing plant here, to Valladson Bros., Dooly Bldg., Salt Lake City. About $[illegible].

★Cal., Alameda—Union Iron Works let contract building machine shops, to W. E. Lunsel & Co., Sharon Bldg., San Francisco, $[illegible]. Noted Apr. 20.

BUILDINGS

Proposed Work

Mass., Brookline—(Official)—Church—Christian Science Extension now having plans prepared by J. F. McLaughlin, archt., 131 Newbury St., Boston, building group of buildings on corner tract of Single Tree Hill, F. H. Anderson, 120 Huntington Ave., Boston, will supervise construction.

Conn., Bridgeport—Church—St. Stephen's Congregation having plans prepared by J. A. Jackson, archt., 111 Wall St., New York City, for [illegible]-ft. church, about $[illegible]. C. Cramlitzer, rector.

N. Y., Brooklyn—Institute—Brooklyn Institute of Arts and Sciences, now having plans prepared for buildings F and G. About $[illegible]. A. W. Tilly, Academy of Music Bldg., now in charge. Magee, Mead & White, [illegible] Park Ave., New York City, archt.

N. Y., New York—Hotel—Hampton Hotel Corp., c/o F. Klinger, 56 Church St., had plans prepared by Schwartz & Gross, archts., 347 4th Ave., for [illegible]-story, 150 x [illegible]-ft. hotel, about $[illegible].

N. Y., New York—Church—Christ Pub. Church, Methodist, now having plans prepared by D. Hunter, archt., 101 Park Ave., for [illegible]-story, 54 x [illegible]-ft. addition, seating 700. About $[illegible]. J. J. Dougherty, contr., 65 [illegible].

N. Y., Rochester—Church—Salem Evangelical congregation, 435 Mt. Hope Ave., plans addition to church. About $148,000.

N. J., Ocean City—(Official) Theater—Stores, etc.—H. E. Wendell, archt., 431 Central Ave., lets contract about Jan. 1, for 80 x 150-ft. theater, 2-story, 75 x 125-ft. observation and dance pavilion, 2-story, 75 x 125-ft. stores, 50 x 407-ft. bath house, frame concrete construction, and 2-story, 50 x 100-ft. brick swimming pool; also 135 x 400-ft. concrete piling and concrete girders, ocean pier; owners, Park Amusement Co., Inc. About $225,000. Noted Nov. 29.

Pa., Lititz—Bank—Lititz National Bank, 40 East Main St., having plans prepared by C. E. Urban, archt., Woolworth Bldg., Lancaster, 1-story, 65 x 75 ft. About $90,000. E. H. Snyder, cashier.

Pa., Phila.—Art Gallery—City having plans prepared. About $2,000,000. T. Booth Smith, Mayor.

Pa., Pittsburgh—Bank—Union Trust Co., 437 4th Ave., having plans prepared by E. P. Mellon and Trowbridge & Livingston, archts., Phila., 4-story. About $1,000,000.

Md., Baltimore—Hospital—G. W. DeHoff, M. D., 2020 North Charles St., c/o Baltimore Homeopathic Hospital plans. About $150,000. W. Gieske, 65 Gunther Bldg., archt.

Md., Baltimore—Theater—H. W. Webb, Fidelity Bldg., c/o Parkway Amusement Co., had plans prepared for 2-story, 83 x 125-ft.. About $150,000. O. D. Wight, archt., Munsey Bldg., soon lets contract.

Va., Petersburg—Hotel—Petersburg Investment Corp., plans 5-story addition. About $100,000. W. A. Joggy, Mechanics Bldg., pres. C. M. Robinson, Times Dispatch Bldg., Richmond, archt.

La., Monroe—Court House and Jail—See "Streets and Roads."

Ky., Lynch—Office—United States Coal & Coke Co. soon lets contract. About $100,000. J. T. Franklin, Benham, mgr.

O., Dayton — Theater—G. Burrows and associates plan to rebuild theater recently destroyed by fire. About $250,000. Pretzinger & Musselman, 1155 Reibold St., archts.

O., East Cleveland—(Cleveland P. O.)—Hospital—City soon lets contract, 3 and 4-story, 88 x 250-ft. About $200,000. Address W. M. Pattison, 777 Rockwell Ave. W. Hirsh, 1303 Swetland Bldg., Cleveland, archt.

O., Youngstown — Schools — Bd. Educ. plans. About $300,000.

Mich., Detroit — Terminal — Detroit, Toledo & Ironton R.R. acquired 75 acres land here and plans to build terminal. About $1,000,000. T. Groner, Springfield, O., ch. engr.

Mich., Muskegon — Hospital — Sisters of Mercy, Mt. Mercy Home, West Bridge St., Grand Rapids, having plans prepared by Briemaier & Son, archt., 41 University Bldg., Milwaukee, Wis. About $150,000.

Ill., Chicago—Hotel—A. Pick & Co., 212 West Randolph St., plans 84 x 90-ft., Madison and Market Sts. About $600,000.

Ia., Davenport—Schools—City plans election Dec. 10 to vote on $400,000 bond issue to build 3 intermediate ward schools.

Ia., Des Moines—Office—Iowa Realty & Investment Co., plans 3-story, 50 x 60-ft., brick and concrete. About $70,000. C. R. Graham, 410 East 5th St., pres.

Ia., Sioux City—Office—Davidson Realty Co., Davidson Bldg., plans 9-story, brick. About $75,000.

Ia., Story City—School—City voted $50,000 bonds to build school. E. E. Sevaried, secy. bd. educ. Noted Oct. 25.

Minn., Duluth—School—Bd. Educ. plans to build Munger School, 13th St. and 8th Ave. About $120,000. Croft & Boerner, 301 Palace Bldg., Minneapolis, archts.

Minn., Minneapolis — Office — Farmers' Investment Co., Minneapolis, plans, 50 x 60-ft. brick. About $50,000. C. S. Vojta, Silver Lake, pres.

Minn., Minneapolis—School — All Saints Congregation plans 2-story, 66 x 166-ft. rein.-con., 5th St. and 5th Ave., N.E. About $75,000. V. Cordelia, 518 Kasota Bldg., archt.

Kan., Pittsburgh—Hospital—G. W. Van Meter, archt., 504 Caldwell-Murdock Bldg., receives bids about Jan. 1, building 3-story, brick and rein.-con. addition to Mt. Carmel Hospital. About $100,000. Noted Oct. 25.

Kan., Wichita—Forum—City having plans prepared by L. Schmidt, archt., 121 North Market St., for addition to forum building. Cost, about $250,000; $140,000 now available for work.

Kan., Wichita—Office—Wichita Bldg. & Investment Co. having plans prepared, 10-story, 18-26 North Market St., about $1,000,000. D. Marshall, Palace Theater Bldg., pres.

Neb., Omaha—Court House—City plans 3-story, 60 x 89-ft. brick and rein.-con. About $130,000. W. F. Gernandt, 437 Keeline Bldg., archt.

Neb., Omaha—Hotel and Office — Home Builders, Inc., Brandeis Theater Bldg., plans 7-story, 110 x 120-ft. brick and rein.-con. About $300,000. J. T. Allan, 224 Brandeis Theater Bldg., archt.

Neb., Omaha—Office and Service Station—Nebraska Storage Battery Co., 2203 Farnam St., plans 2-story, 95 x 132-ft. rein.-con. About $50,000. J. and A. McDonald, 905 Omaha Natl. Bldg., archt.

Neb., Omaha—Office and Store—Heatt Realty Co., 245 Omaha Natl. Bank Bldg., plans 3-story, 66 x 132-ft. brick and rein.-con. About $52,000. J. T. Allan, 324 Brandeis Theater Bldg., archt.

Mo., Bowling Green—Sanitorium, Hotel etc.—Bowling Green Mineral Springs Co. having plans prepared by Barnett, Haynes & Barnett, archts., 949 Century Bldg., St. Louis, for sanitorium, hotel, water-works and bottling plant. About $100,000. C. E. Still, M. D., Kirksville, pres.

Mo., St. Louis—Hospital—Missouri Pacific R.R. having plans prepared by C. H. Wray, archt., Rialto Bldg., 6-story, brick and stone. About $300,000. E. A. Hadley, St. Louis, ch. engr.

Mo., St. Louis—Hotel—N. Cole Investment Co. having plans prepared by N. B. Howard, archt., Century Bldg., 3-story, brick and stone. About $1,000,000.

Mo., St. Louis—Hotel, Theater and Store—Liberty Realty Co., c/c R. H. Cole, having plans prepared by N. B. Howard, archt., 943 Century Bldg. About $1,700,000.

Mo., St. Louis—See "Industrial Works."

Ark., Camden—High School—Bd. Educ. plans. About $100,000. T. M. Sanders, Little Rock, archt.

Colo., Sterling — High School — School Dist. having plans prepared by E. G. Groves, archt., 222 Foster Bldg., Denver, 2-story, 168 x 200-ft. About $60,000.

N. M., Silver City — Court House — City having plans prepared by Trost & Trost, archts., El Paso, Tex. About $250,000.

Ont., Windsor—School—School Bd. plans to erect new school. About $100,000. A. G. Roberts, Labelle Bldg., chn. bldg. com.

BIDS DESIRED

Mass., Wellesley — Art Buildings—Until Dec. 12, by Trustees Wellesley College, 3-story, 70 x 135-ft. Day & Klauder, Chestnut St., Phila., archts. Noted July 19.

N. Y., New Hampton—(Official)—Laundry, etc.—Until Dec. 12, by B. G. Lewis, comr. correction, Municipal Bldg., New York City, building laundry and storage buildings, cubicle dormitory and industrial buildings at New York City Reformatory.

N. Y., Syracuse—School—Until Dec. 10, by Bd. Educ. rebuilding Porter School, 2- and 3-story. About $150,000. G. Wright, Union Bldg., archt.

O., Akron—School—Until Dec. 10, by Bd. Educ. building 2- or 3-story. About $500,000. F. L. Packard, 1212 Hayden Bldg., Columbus, and T. R. Ridley, Akron Savings and Loan Bldg., archts. Noted July 12.

O., Cleveland—School—Until Dec. 24, by clk. Bd. Educ., Rockwell Ave. and East 6th St., for completion of North Doan School Annex. About $100,000

O., East Cleveland—(Cleveland P. O.)—(Official)—High School—Until Dec. 17, by C. Ammerman, clk. bd. educ. building Shaw Technical High School, brick. W. H. Nicklas, 1900 Euclid Ave., Cleveland, archt.

Industrial Works (Continued)

O., Kenmore—(Official)—High School—Until Dec. 17, by I. W. Fiscus, clk. bd. educ., 2-story, 75 x 130 ft., on North 15th St. About $125,000. M. P. Lauer, 707 Peoples Bank Bldg., Akron, archt. Noted Nov. 1.

O., Oxford—(Official)—Chemistry—Until Dec. 23, by Bd. Trustees Miami University, building addition to chemistry building. F. L. Packard, 16 East Broad St., Columbus, archt. Noted Sept. 27.

O., Shaker Heights—(Cleveland P. O.)—(Official)—School—Until Dec. 21, by C. A. Palmer, clk. bd. educ., 2855 Coventry Rd., F. C. Warner, Hippodrome Annex, Cleveland, archt.

Ind., Gary—Hospital—Until Dec. 8, by Schmidt, Garden & Martin, archts., 104 South Michigan Ave., Chicago, building 4-story, hospital for General Hospital Assn. About $150,000. Noted July 26.

Ind., Kokomo — Masonic Temple—Until Dec. 15, by Howard Lodge No. 93, F. and A. M. Bldg., building 4-story, 76 x 95-ft. About $75,000. W. E. Williams, chn. b. g. comn. E. E. Dunlap, 909 State Bldg., Indianapolis, archt. Noted Aug. 9.

Okla., Miami—(Official)—Jail—Until Dec. 17, by Ottawa Co. Comrs. About $50,000. J. A. Walker, co. clk. Noted Nov. 22.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Brooklyn**—Club House—Queens Co. Jockey Club, 399 Fulton St., let contract, 3-story, 35 x 88 ft. addition to club house, paddock, and grand stand, Aqueduct Race Track, to H. J. Brown & Sons, 2534 Fulton St., $60,000. Noted Nov. 8.

★**N. Y., New York**—Office—Smith Valley Realty Corp., New York, let contract, 7-story, 68 x 79-ft. brick, Front St. and Maiden Lane, to W. L. Crow Constr. Co., 103 Park Ave. About $250,000.

N. J., Red Bank—School—Bd. Educ. let contract 2-story, 75 x 123-ft. brick and terra cotta, to H. H. Moore, 3rd Ave., Spring Lake, $100,000. Noted Nov. 8.

★**Pa., Harrisburg**—Junior High School—Bd. Educ. let contract, 4-story, stone and granite, to A. Wildman, 2206 North 3rd St., $300,000. Noted Nov. 15.

★**Pa., Pittsburgh**—Theater—J. Baziotes and P. Antonoplos, 318 5th Ave., c/o Olympic Theater, let contract, 3-story, 60 x 110-ft. addition and alteration to J. Eichleay, Jr. Co., 20th and Wharton Sts., $50,000.

Miss., Gulfport — City received low bid building emergency hospital, from J. Griffith & Sons Co., 112 West Adams St., Chicago. About $99,000.

★**O., Cleveland**—Office—Kirk-Latty Mfg Co., Madison Ave., N. W., and 84th St., let contract, 2-story office and shipping building, to A. Rutherford Co., 2160 East 18th St. About $60,000.

★**O., Cleveland**—School — Bd. Educ. let contract addition to Rice School to Drummond & Miller Co., Guardian Bldg. About $115,000. Noted Nov. 15.

★**O., Lakewood**—School—Bd. Educ. let contract building 2 schools, Clifton Blvd. and Bunte Rd., to Cleveland Fireproofing Constr. Co., 412 Ainsfield Bldg., $51,243 and $57,838, respectively.

★**O., Sandusky**—Hotel—D. Olmsted New Hotel Olmstead, Cleveland, let contract, 6-story, 75 x 132-ft., rein.-con. and steel. Columbus Ave. and Water St., to H. L. Stevens Co., East 9th St., Cleveland. About $200,000.

★**Ind., Terre Haute**—Theater, Store and Office—Bankers & Merchants Theatrical Assn., 907 Terre Haute Trust Bldg., let contract, 1 and 2-story, 85 x 130 ft., to J. Wacker, 207 Chamber of Commerce Bldg., Indianapolis, $85,000.

★**Ia., Des Moines**—Hotel—J. E. Tone and associates, let contract, 12-story, rein.-con., to H. L. Stevens Co., 910 South Michigan Ave., Chicago. About $1,000,000.

Minn., St. Paul — High School — Bd. Educ. received lowest bid building Bay View High School, from E. R. Kiesslich, 456 40th St. About $87,670.

FEDERAL GOVERNMENT WORK

Proposed Work

Me., Caribou—Post Office — J. A. Wetmore, superv. archt., treas. dept., Wash., rejected bids opened Nov. 20. Some work in excess of appropriation. Noted Nov. 29.

Wash., D. C.—Buildings—War Dept. (N. D. Baker, secy.), soon lets contract building 50 additional buildings at Walter Reed Army Hospital here, temporary wood construction.

Ariz., Leupp—Bridges—Cato Sells, comr. Indian affairs, Wash., D. C., rejected bids opened Oct. 25, building 2 steel bridges. Noted Nov. 1.

BIDS DESIRED

Pa., Sunbury—Post Office—Until Jan. 28, by J. A. Wetmore, superv. archt., treas. dept., Wash.

Wash., D. C.—Buildings—Until Dec. 10, by Bureau Yards and Docks, Navy Dept., Wash., reconstructing building No. 105 at Navy Yard. Former bids rejected. Noted Nov. 1.

Wash., D. C.—Generating Sets — Until Dec. 12, by Dist. Comrs. furnishing 2 electric generating sets for use at Home for Aged and Infirm.

Wash., D. C. — Motor Generator Sets—Until Dec. 17, by Bureau Yards and Docks, Navy Dept., Wash., furnishing and delivering 300 kw. motor generator sets and switchboards at various navy yards as follows: 2 at New York, 4 at Phila., 4 at Norfolk, Va., and three 500 kw. generator sets at Wash., D. C. Noted Nov. 22.

Wash., D. C.—Seaman Gunner's Quarters—Until Dec. 17, by Bureau Yards and Docks, Navy Dept., Wash. About $150,000.

Wash., D. C.—Sewerage System, Water Supply Intake and Reservoir—Until Dec. 26, by Cato Sells, comr. Indian affairs, Wash., for installing in Ute Mts., Colo.

La., Grande Isle—Buildings—Until Jan. 4, by E. P. Bertholf, capt. commandant, U. S. Coast Buard, Wash., D. C., for new building and accessories for Coast Guard Sta. No. 214, Barataria Bay. Noted Nov. 22; advertised in this issue.

La., New Orleans—Stone—Until Dec. 11, at U. S. Engr. Office, Custom House, New Orleans, furnishing and delivering stone for Head of Passes and Southwest Pass, Mississippi River; advertised in this issue.

Kan., Eldorado—Post Office—Until Jan. 7, by J. A. Wetmore, superv. archt., treas. dept., Wash.

Okla., Shawnee—Post Office—Until Jan. 7, by J. A. Wetmore, superv. archt., treas. dept., Wash.

Okla., Shawnee—Steam Heating System—Until Dec. 27, by Cato Sells, comr., Indian affairs, Wash., D. C., installing here.

Cal., San Francisco—Dredging—Until Dec. 19, by U. S. Eng. Office, 191 Custom House, San Francisco, dredging in Oakland Harbor.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

R. I., Melville—Dredging—Bureau Yards and Docks, Navy Dept., Wash., received only bid dredging at U. S. Naval Depot, Melville Sta., (a) net price per cu.yd. measured in place, for dredging and disposal of all earth, mud and other material not rock, in accordance with Government specifications, (b) price per cu.yd. measured in place, for all boulders excavated and disposed of in accordance with Government specifications, (c) alternate on bidders specifications, from J. S. Packard Dredging Co., 1004 Turks Head Bldg., Providence, R. I., (a) $74 (b) $10 (c) $78 and $10. Noted Nov. 17.

★**R. I., Newport**—Warhead Storage—Bureau of Yards and Docks, Navy Dept., Wash., let contract building on Rose Island, (work complete) to Dolling Slade Constr. Co., Custer Bldg., Newport. About $15,478. Noted Nov. 17.

★**Conn., New London**—Power House and Machine Shop, Bureau Yards and Docks, Navy Dept., Wash., let contract to Bond Constr. Co., 161 Devonshire St., Boston, Mass. About $171,000. Noted Nov. 24.

★**N. Y., Brooklyn**—Shipbuilding Ways—Bureau Yards and Docks, Navy Dept., Wash., let contract building shipbuilding ways No. 5 to Lafayette Engineering Co., 120 East 23rd St., New York City. About $127,000. Noted Nov. 24.

★**N. J., Cape May**—Storage Instruments—Bureau Yards and Docks, Navy Dept., Wash., let contract to Marie Bridge Dr. Steel Co., 30 Cortlandt St., New York City, $4985, (award based on estimate from original bid.) Noted Nov. 24.

N. J., Lake Denmark—[illegible]—Bureau Yards and Docks, Navy Dept., Wash., received bids Nov. 20 for [illegible] at Naval Ammunition Depot, [illegible] from Ancora Dist. Imp. Wks., Hammonton, N. J., $47,675; W. A. Stone Iron Wks., Inc., 32 Portland St., Boston, Mass., $50,-[illegible]; Crichton Power Co., Quincy, Ill., $[illegible]. Noted Nov. 22.

★**Pa., Phila.**—Marine Barracks—Bureau Yards and Docks, Navy Dept., Wash., let contract to Mattioni & Bond, 1[illegible] Thompson St. About $99,075. Noted Nov. 29.

Pa., Phila.—Boiler—Bureau of Yards and Docks, Navy Dept., Wash., received bids Nov. 20 for [illegible] gas-fired boilers, as per Navy Yard, Navy Supplies [illegible] from [illegible] F. Wood, Albany, N. Y., $44,880; Wetherill Mears & Co., 13th and Market Sts., Phila., $46,921; E. Foy & Son, South [illegible] St., Phila., $49,[illegible]. Noted Nov. 3.

★**Pa., Phila.**—Sprinkling System—Bureau Yards and Docks, Navy Dept., Wash., let contract, to General Fire Extinguisher Co., 274 West Washington St., Providence, R. I., $[illegible]. Noted Nov. 22.

Md., Annapolis—Floating Derrick—Bureau of Yards and Docks, Navy Dept., Wash., received bids Nov. 20 for [illegible] building at Naval Academy (lump price for hull with accessories complete), from Continental Shipbuilding Corp., 26 Bway., New York City, $9500; Elkton Mfg. Co., Elkton, Md., $17,257.

★**Md., Indian Head**—Alterations—Bureau of Yards and Docks, Navy Dept., Wash., let contract at Naval Proving Ground to E. Christman, Masonic [illegible], $[illegible]. Noted Nov. 15.

Md., Indian Head—Extension to Power House—Bureau Yards and Docks, Navy Dept., Wash., received only bid building extension to power house, (work complete), from Dawson Constr. Co., May Bldg., Pittsburgh, $[illegible]. Noted Nov. 29.

★**Wash., D. C.**—Alterations to [illegible] Building—J. A. Wetmore, superv. archt., treas. dept., let contract for alterations to building at 500-508 4th St., N.W. to F. L. Wagner, 1814 H St., N.W. Noted Nov. 29.

★**Wash., D. C.**—Brass Foundry—Bureau Yards and Docks, Navy Dept., Wash., let contract to A. C. Meyer, 345 New York Ave., $[illegible].

Wash., D. C.—Cranes—Bureau Yards and Docks, Navy Dept., Wash., received only bid furnishing three 50 ton monorail electric cranes in Norfolk Yd., Phila. and New York Navy Yards, from Penn Bridge Co., Bond Bldg., Item 1, net price for [illegible] complete in accordance with Government specifications, $[illegible]; item 2, net price for 1 electric crane for Norfolk Government specifications, $124,740, item 3, net price for 1 electric crane for Phila., $[illegible]; item 4, net price for 1 crane for New York, $[illegible]. Noted Nov. 29.

Wash., D. C.—Crane Runways—Bureau Yards and Docks, Navy Dept., Wash., received bids Nov. 20 for [illegible] (lowest bid) [illegible] complete including railway and pipe railing for [illegible] and adjacent foundations, including [illegible] of anchor channels and castings [illegible] and furnishing same, from Kellogg Pipe Co., 111 North Clark St., Chicago, Ill., $[illegible]; [illegible] Co., 30 East 42nd St., New York City, $[illegible]; Johnson Steel Co., Johnstown, Pa., $[illegible]; Lackawanna Steel Co., Buffalo, N. Y., $[illegible]; Carnegie Steel Co., Frick Bldg., Pittsburgh, Pa., $[illegible]; Penn Bridge Co., Bond Bldg., Washington, D. C., $[illegible]; Lassig Bridge & Iron Co., Empire Trust Bldg., St. Louis, Mo., $[illegible]. Noted Nov. 29.

Wash., D. C.—Foundry—Bureau Yards and Docks, Navy Dept., Wash., received bids [illegible] Navy Yards and Docks, Navy Dept., Wash., let contract to [illegible] Co., 1[illegible] and Market Sts., Phila., $[illegible]. Noted Nov. 29.

Fla., Key West—[illegible]—Bureau Yards and Docks, Navy Dept., Wash., received only bid [illegible] [illegible] Co., [illegible] Bldg., Jacksonville, Fla., $[illegible]. Noted Nov. 29.

Federal Government Work (Continued)

Wash., D. C.—Grading—Bureau Yards and Docks, Navy Dept., Wash., received bids Nov. 20 grading (a) Adams Mill Rd. (b) 14th St. (c) Q St. (d) Eads St. (e) Mt. Vista Pl. (f) 17th St. (g) Kookuk St. from 50th Parallel, 2117 East St. N.W. (a) $0.63, (b) $0.44, (c) $0.44, (d) $0.75, (e) $0.44, (f) $0.48, (g) $0.60. E. G. Gummel, 41 F St. N.W. (a) $0.79, (b) $0.91, (c) $0.75, (d) $0.89, (e) $1.25, (f) $0.37, (g) $0.47. W. F. Cash, Wash., D. C., (a) $0.89, (b) $0.49, (c) $0.48, (d) $0.62, (e) $1.00, (f) $0.52, (g) $0.37. C. B. Mullen & Co., Wash., D. C., (a) $0.99, (b) $0.44, (c) $0.45, (d) $0.47, (f) $0.53, (g) $0.34.

Wash., D. C.—Locomotive Dry-Dock Cranes—Bureau Yards and Docks Navy Dept., Wash., received only bid furnishing at Norfolk, Va., Phila. and New York Navy Yards 181 net price for 2 cranes complete in accordance with crane for Norfolk. (c) net price for 1 electrical crane New York Navy Yard from Penn Bridge Co., Bond Bldg., Wash., D. C. (a) $295,480 (c) $124,74[illegible] Noted Nov. [illegible]

Wash., D. C. — Eastern Shop — Bureau Yards and Docks, Navy Dept., Wash., received two bids building at Navy Yards. (a) work complete. (b) amount added or deducted from (a) for one bay. (c) amount added or deducted from (a) and (b) for composition floors in lieu of wood block. (d) added or deducted from (a) and (b) using maple floors in lieu of wood block. (e) using asbestos roofing in lieu of tar and gravel. (f) using air-lock brick partitions in lieu of hollow terra cotta. (g) using glass ceiling light in court. (h) using steel elevator doors. (i) using steel toilet stalls. (j) mastic floors in lieu of wood block. (k) omitting lintels, quorins, insets, etc., (l) amount added or deducted from (a) and (b) using cast in 3rd and 4th stories. (m) using solid brick in lieu of air lock. (n) giving office floors coating of coal tar pitch. (o) plumbing complete. (p) heating complete. (q) passenger and freight elevators. (r) electric lights. (s) wood block floors. (t) roof covering. (u) painting. (v) price per sq.ft. footing forms complete. (w) price per cu.yd. concrete footing in place. (x) price per lb. reinforcing steel in place. (y) per cu.yd. plain concrete footings in place. (z) price for piling work per pile 30 ft. long as follows:

Warren, Moore & Co., 13th and Market Sts., Phila. (a) $145,845, (b) $21,000, (c) add $800, (d) add $4170, (e) add $1223, (f) add $2245, (g) deduct $.60, (x) $0.20, (w) $11, (x) $4.25, (y) $6.

Fairbank Bldg. Co., Inc., 52 Vanderbilt Ave., New York City. (a) $442,286, (b) $19,000, (c) add $718, (d) add $600, (e) deduct $400, (f) deduct $1700, (g) add $495, (h) add $3078, (i) add $870, (j) add $4250, (k) deduct $500, (l) deduct $1[illegible], (m) add $1[illegible], (o) add $75, (p) $15,[illegible], (q) $22,035, (r) $85,320, (s) $19,[illegible], (t) $[illegible], (u) $4[illegible], (v) $2412, (w) $[illegible], (x) $7, (y) $[illegible], (z) $8.25, (z) $5[illegible] each.

A. C. Moses Co., 41 E. 42d St., New York City. (a) $447,961, (b) deduct $15,020, add $[illegible], (c) deduct $7[illegible], (d) deduct $[illegible], (e) deduct $[illegible], (f) $[illegible], (g) add $[illegible], (h) add $1300, (i) deduct $[illegible], (j) deduct $1100. Noted Nov. [illegible]

★**Wash., D. C.**—Refrigerating Plant and Brine Circulating System—Bureau Yards and Docks, Navy Dept., Wash., let contract for Hunter & Eng. Co., 311 Grand St., Jersey City, N. J., $1780. Noted Nov. [illegible]

★**Wash., D. C.**—School—Bureau Yards and Docks, Navy Dept., Wash., let contract for building electrical and general school at Hampton Roads, Va., to Harwood & [illegible], Bldg., Norfolk, Va., for $[illegible]. Noted Nov. [illegible]

Wash., D. C.—School—Dept. Comm., received bids and awarded contract for building addition to Petworth school. Same was in excess of appropriation. Noted Nov. 8.

Wash., D. C.—Office Furniture—Bureau of Yards and Docks, Navy Dept., Wash., received bids Nov. 26, Specification No. 2568, building for Naval Training Station, Hampton Roads, Va., to Library Bureau, Inc., Chicago, Ill., (a) $[illegible], (b) $1[illegible], (c) 61 Bway., New York City, (a) $[illegible], (b) $[illegible], Arthur Imbt, Inc., 1414 Broadway, New York City, (a) $[illegible], (b) $[illegible]. Noted Nov. 1.

Wash., D. C.—Track Scales—Bureau of Yards and Docks, Navy Dept., Wash., received bids Nov. 26, Specification No. 2593, Item 4, 3 scales, 2 at Navy Yard, Portsmouth, N. H., and 1 at Charleston, W. Va., with modifications as desired by bidder, from Howe Scale Co., 341 Bway., New York City, $12,092; Standard Scale & Supply Co., 1631 Liberty Ave., Pittsburgh, Pa., (alternate bid), $7052; Fairbanks Co., 416 Broome St., New York City, $23,439. Noted Nov. 1.

W. Va., Charleston—Electric Duct System—Bureau of Yards and Docks, Navy Dept., Wash., received bids Nov. 26, Specification No. 2669, building at U. S. Naval Projectile Plant (work complete), from G. E. Eng. Co., Inc., 417 Canal St., New York City, $8988; H. E. Crook Co., Inc., 24 Light St., Baltimore, Md., $12,000. Noted Nov. 8.

N. C., Chapel Hill—Post Office — J. A. Wetmore, superv. archt., treas. dept., Wash., received bids Nov. 27, (work complete), from Haynes Bros., Chatham, Va., $43,950, alternate, add $8100; W. J. Brent, Bd. Trade Bldg., Norfolk, Va., $45,573, alternate, $48,131; Dreher Constr. Co., 748 Marquette Bldg., Chicago, $48,184, alternate, add $2400. Noted Oct. 25.

S. C., Charleston—Power Plant Improvements—Bureau of Yards and Docks, Navy Dept., Wash., received bids, Specification No. 2661, (a) work complete, (b) omitting coal bunkers and coal weighing equipment, (c) coal bunkers and coal weighing devices, (d) coal bunkers and alternative traveling coal weighers, from Carroll Electric Co., 714 12th St., N.W., Wash., D. C., (a) $24,700, (b) $110,000, (c) $118,000; Gillis Geoghegan, 537 West Bway., New York City, (a) $119,875; J. W. Danforth Co., Ellicott Sq., Buffalo, N. Y., (a) $130,000, (b) $107,000, (c) $23,350, (d) $19,000. Noted Nov. 15.

La., New Orleans—Radio Buildings—Bureau of Yards and Docks, Navy Dept., Wash., received bids Nov. 26, Specification No. 2649, building at Naval Sta., (a) net price, using brick for receiving building, (b) using wood construction, (c) amount deducted from "a" using wood and fibreboard lath in lieu of metal lath, from J. Thatcher & Son, Henneu Bldg., New Orleans, (a) $17,676; (b) $16,946, (c) $40; Dreher Constr. Co., Chicago, (a) $18,530, (b) $15,500, (c) $25; H. W. Bond & Bro., New Orleans, (a) $18,902, (b) $16,982, (c) $50. Noted Nov. 8.

S. D., Bellefourche—Post Office — J. A. Wetmore, superv. archt., treas. dept., Wash., received bids Nov. 28, (a) limestone, (b) sandstone, from J. Lauritzen, Fergus Falls, Minn., (a) $61,990; Wm. O'Neil & Son, Faribault, Minn., (a) $62,640; Eugene Schuler, Pasadena, Cal., (a) $64,000, (b) $66,500. Noted Oct. 11.

Wyo., Buffalo—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., received only bid, from W. D. Lovell, 1415 8th St., S.E., Minneapolis, Minn., $61,800. Noted Nov. 1.

Cal., Mare Island—(Vallejo P. O.)—Addition to Boiler Shop)—Bureau Yards and Docks, Navy Dept., Wash., received low bids building addition to boiler shop, Building No. 122, from F. Gallagher, 180 Jessie St., San Francisco, $30,900, 60 days; G. W. Boxton & Son, 1022 Hearst Bldg., San Francisco, $31,900, 180 days; Knowles & Mathewson, 442 Call Bldg., San Francisco, $31,967, 60 days. Noted Nov. 15.

MISCELLANEOUS

Proposed Work

Park Improvements—Key West, Fla.—City voted $60,000 bonds to improve parks.

Garbage Plant—Louisville, Ky. — City plans to build garbage reduction plant. About $[illegible]. H. B. G. Rose, chn. bd. pub. wks.

Park—Elwood, Ind.—City plans. About $10,000.

Subway — Kankakee, Ill. — City passed ordinance authorizing Illinois Central R.R. to build subway under tracks on Water St. Ordinance provides for 60-ft. opening which will be 14 ft. high where roadway passes and 10 ft. over sidewalk. A. S. Baldwin, 137 East 11th St., Chicago, ch. engr.

Transmission Lines — Lawrence, Kan.—See "Water-Works."

Wharf—Lufkin, Tex.—Lufkin Cotton Co. plans to enlarge wharf capacity to 45,000 ft. J. F. Christian, mgr.

Seawall—Long Beach, Cal.—Craig Shipbuilding Co., Bway. and Water St., plans to build rein.-con. seawall along its plant. About $45,000.

Pile Jetty—Three Rivers, Que.—Wayagamack Pulp & Paper Co., Ltd., Wayagamack Island, plans to build pile jetty. About $30,000. T. Pringle & Sons, Ltd., 20 St. Nicholas St., Montreal, engrs.

BIDS DESIRED

Docks—Seattle, Wash. — Until Dec. 17, by Comrs. King Co., building new ferry docks at east end of Madison St. and at Kirkland. About $50,000. S. J. Humes, co. engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Tunnel — Bridgeport, Conn.** — Karm Terminal Co., 447 North Washington Ave., let contract 900 ft. rein.-con. tunnel on North Washington Ave., to J. R. Sheehan, 309 Connecticut Ex. Bldg. About $35,000. Noted May 10.

★**Shaft—New York, N. Y.**—(Official)—Interborough Rapid Transit Co., 165 Bway., rescinded contract building Shaft No. 2, Queensboro Subway. Work will be done on force account bases. Noted Nov. 29.

★**Station Finish—New York, N. Y.**—Interborough Rapid Transit Co., 165 Bway., let contract finishing stations on Webster Ave. line (Bronx Boro.) to T. Dwyer, 216th St. and Bway.

★**Launchways—Camden (South Camden), N. J.**—New York Shipbuilding Co., 120 Bway., New York City, let contract to Armstrong & Latta, 110 South Broad St., Phila., $1,000,000.

Shed—Oakland, Cal.—City received lowest bid building shed on municipal wharf, Clay St., from C. Christenson & Sons, 565 16th St. About $22,800.

BUILDING OPERATIONS FOR OCTOBER

Following is a list of contracts awarded published by the F. W. Dodge Co. for New England, New York, New Jersey, Pennsylvania, Maryland, Delaware, District of Columbia, Virginia, Ohio, West Virginia, Illinois, Indiana, Iowa, Wisconsin, Michigan, Minnesota, North and South Dakota, and portions of Missouri and eastern Kansas from Jan. 1 to Nov. 1:

January 1 to November 1, 1917.....	$1,433,092,000
January 1 to November 1, 1916.....	1,121,616,397
January 1 to November 1, 1915.....	769,173,100
January 1 to November 1, 1914.....	032,462,200
January 1 to November 1, 1913.....	743,758,000
January 1 to November 1, 1912.....	743,331,500
January 1 to November 1, 1911.....	667,433,813
January 1 to November 1, 1910.....	694,007,066

NEW YORK AND NORTHERN NEW JERSEY

January 1 to November 1, 1917.....	$286,276,000
January 1 to November 1, 1916.....	225,106,500
January 1 to November 1, 1915.....	137,108,500
January 1 to November 1, 1914.....	112,360,500
January 1 to November 1, 1913.....	223,782,000
January 1 to November 1, 1912.....	206,392,500
January 1 to November 1, 1911.....	200,027,500
January 1 to November 1, 1910.....	205,844,000

The October total for contracts awarded in the larger territory amount to $154,451,574, against $122,464,271 for September, and $165,574,155 for August. For the smaller territory the October figures are $38,921,000 against $35,027,000 for September and $25,498,000 for August.

Commission of Public Docks, Portland, Ore., has under consideration a proposal for the removal of Swan Island and deepening the waterway in that locality from bank to bank, embracing a width of about 4000 feet, instead of merely creating a deep water channel at the west of the island. By dredging out the island and filling in the adjacent grounds on the mainland, the property can be made valuable for dock sites, and the establishment of manufacturing plants, alongside of which the larger ships afloat can moor and discharge and load cargoes. According to rough estimates, the island is made up of about 20,000 cu.yd. of material. The ordinary charge for dredging and removal of sand and gravel from the river bed is 10c. a cu yd. This would make the project cost about $2,000,000. The island has an approximate length of two miles and is of varying width.

Pennsylvania May Separate Road Construction and Grading

The Pennsylvania State Highway Department may let contracts for grading work separately from regular road construction next year, the department announced. This subject is receiving serious consideration because of the advance in prices of materials, the difficulty in obtaining labor and the car-service interruptions caused by the priority order of the Government. The specifications are to be studied and taken up next month for determination.

Thus far only one or two contracts have been let for grading as a separate proposition, and observations have been made on them. In a number of instances county and borough authorities have favorably commented upon the plan for separate contracts.

Something like 26 counties have agreed to coöperate with the state in road work on a 50% basis, and 16 boroughs have accepted invitations to unite in improvement of streets which are on the line of state highways.

The department announced that hereafter it would make a charge of $2.50 for sets of plans and specifications for road work. Heretofore plans were to be seen at offices of engineers of the department. Under the new arrangement plans may be bought outright by interested persons and studied at their offices or homes. The announcement says that the price is at cost.

State Highway Commissioner O'Neil has rejected all of the bids received on Nov. 8 for road work which had been contemplated for Allegheny and Somerset Counties. The prices were considered so high that the department did not feel warranted in awarding contracts. All of this work will be readvertised in the near future. Bids were asked for either reinforced-concrete or bituminous-concrete construction.

To Adjust Labor to War Needs

L. C. Marshall, dean of the School of Commerce and Administration of the University of Chicago, has been designated by the Council of National Defense as the head of the newly created section on industrial service, whose field is consideration of the labor supply in war time. "As the demands of the Government for more supplies of all sorts have increased," says the Official Bulletin, "there have necessarily arisen in the various departments placing war orders a considerable number of problems relative to proper adjustment of labor supply to the war needs."

Ship Lumber Coming Fast

Five million feet of ship lumber was the production for the week ending Nov. 23. Double that amount is expected shortly, according to W. J. Haynen, assistant purchasing agent of the Emergency Fleet Corportation. A considerable number of mills in the Southern-pine industry, which have heretofore cut no ship timbers, are coming forward with offers to produce schedules or part of schedules

Canada Prohibits Iron Exports

The Canadian Government has decided to prohibit the exportation of iron and steel in unfinished or semifinished form suitable for use in manufactures, including pig iron, steel ingots, billets, rods, shapes, angles and plates, except under license from the Department of Customs

Kansas City Soon To Begin $2,000,000 Sewer

Surveys have been made and plans are under way for the proposed Blue River intercepting sewer at Kansas City, Mo. The interceptor will extend from the southern city limits to the Missouri River, 13½ miles, beginning as a 24-in. pipe and ending as a 10-ft. reinforced-concrete sewer. The work will be divided into five sections. The Board of Public Works expects to advertise for bids for the first section about Jan. 1. Curtis Hill is city engineer and Alfred E. Ludlow is engineer of sewers

Board of Three Will Decide Value of Canadian Northern

The agreement fixing the basis of the arbitration to determine the value of the 600,000 shares of common stock in the Canadian Northern Ry., which are to be purchased by the Canadian Government to give it the ownership of the system, has been executed. It prescribes a maximum value of $10,000,000 to be placed on the stock; the arbitrators may award less.

Sir William Meredith is appointed arbitrator for the government and Hon. Wallace Nesbitt for the company. They will select the third member of the board, and the award must be made by March 1, 1918. Meanwhile the company is to make no expenditures except for operating expenses.

RIVER CHANNEL IMPROVEMENTS—COLUMBUS, O.

Bids were received by City, Nov. 13, for widening Scotia River, including building levees, bridges, etc., from (A) W. E. Callahan Constr. Co., 1517-18 Citizens Natl. Bank Bldg., Omaha, Neb.; (B) J. B. Sheets & Co., Pittsburgh, Pa.; (C) R. H. Evans & Co., Savings Bank Bldg., Columbus, O. The unit bids were as follows:

	A	B	C
2,000,000 cu.yd. excavation, class A	$0 61	$0 55	$0 64
25,000 cu.yd. excavation, class B	4 50	2 00	5 80
4,500 cu.yd. excavation, class C	4 50	2 50	6 30
8,000 cu.yd. excavation, class D	1 50	1 50	3 15
3,000 cu.yd. excavation, class E	1 50	1 50	4 75
5,000 cu.yd. excavation, class F	3 50	2 50	5 25
10,000 cu.yd. excavation, class G	75	2 00	1 05
Removing Town St. bridge (lump sum)	3,000 00	20,000 00	5,000 00
Removing old dam (lump sum)	3,000 00	5,000 00	10,000 00
50,000 cu.yd. solidified embankment	75	20	21
70 acres dressing and seeding	70 00	250 00	105 00
10,440 cu.yd. concrete, class A	10 05	13 00	11 55
8,260 cu.yd. concrete, class B	13 25	25 00	18 00
4,350 cu.yd. concrete, class C	12 00	12 50	12 60
8,250 cu.yd. concrete, class D	12 50	14 00	12 60
1,800 cu.yd. concrete, class E	12 00	12 00	12 60
900 cu.yd. concrete, class F	18 00	14 00	18 90
40,000 sq.yd. concrete revetment, class A	1 85	2 50	2 10
12,000 sq.yd. concrete revetment, class B	4 50	3 00	6 30
35,000 sq.yd. stone revetment, class A	1 85	3 00	3 70
10,000 sq.yd. stone revetment, class B	4 85	4 00	7 75
2,000 cu.yd. stone toe wall	4 50	7 00	10 50
220M ft b.m. sheet piling	120 00	8 00	105 00
73,500 lin.ft. wood piling	60	1 00	63
Temporary bridge (lump sum)	3,000 00	25,000 00	4,200 00
1,340,000 lb. placing reinforcing steel	015	02	02½
11,700 lb. angle spacers	07	07	08½
1,370 lin.ft. steel curb	10	2 00	1 80
Drains, manholes, conduits (lump sum)	250 00	1,500 00	2,100 00
1,473 lin.ft. concrete balustrade	5 75	20 00	6 30
1,617 lin.ft. stone balustrade	14 00	20 00	15 75
35,000 sq.ft. tooled finish	10	25	10
10,700 sq.ft. sidewalk finish	08	10	10
6,050 sq.yd. waterproofing	75	1 40	2 10
1,300 sq.ft. expansion joints	1 00	50	50
6,600 cu.yd. gravel fill	60	2 50	1 10
3,000 ton rip rap	3 50	4 00	3 70
3 sluice gate chambers	200 00	1,000 00	735 00
3 manholes	100 00	75 00	78 75
78-in. sluice gate	2,000 00	3,000 00	2,625 00
48-in. sluice gate	1,500 00	2,000 00	1,260 00
15-in. sluice gate	750 00	1,000 00	315 00
Removing and resetting old sluice gate	100 00	700 00	525 00
2 removing and resetting old flap valves	50 00	100 00	105 00
80 lin.ft. 15-in. vitrified pipe drain	3 00	3 00	210 00
3,000 lin.ft. concrete curbing	1 10	2 00	63
15,000 sq.ft. cement walk	18	15	21
3,000 lin.ft. pipe handrail	2 10	2 00	2 10
2,600 sq.yd. stone paving	1 00	2 00	1 05
Extended totals stone balustrade	$2,262,979 50	$2,361,379 00	$2,616,537 50
Extended totals, concrete balustrade	2,248,811 25	2,358,853 00	2,600,349 63

BARGE CANAL WORK, ALBANY, N. Y.

Contract 152

Bids were received by W. W. Wotherspoon, supt. pub. wks., for rebuilding upper end of Lock No. 35, Lockport, from (A) Frank L. Cohen, 46 Niagara St., Buffalo; (B) Lupfer & Remick, 592 Ellicott Sq., Buffalo. The unit bids were as follows:

	A	B
7,440 cu.yd. excavation	$3 40	$3 00
4 M ft. b.m. sawed lumber—white oak	150 00	130 00
7,500 cu.yd. second-class concrete	13 00	15 00
9 cu.yd. first-class reinforced concrete	30 00	40 00
4,670 lb. metal reinforcement	04½	04½
17,000 lb. structural steel	12	12
17,000 lb. machined castings	12	14
480 lb. metal duct	14	15
420 lin.ft. fiber duct	20	25
80 lin.ft. diamond drill borings	1 00	2 00
Removing, storing and reinstalling lock operating machinery	1,000 00	5,500 00
Removing and reinstalling electrical conduit system (lump sum)	500 00	1,000 00
Cofferdams, pumping, bailing and diverting (lump sum)	6,000 00	10,000 00
Extended totals	$111,554	$143,748

Contract 150

Bids were received by W. W. Wotherspoon, supt. pub. wks., for constructing lower lock and canal prism excavation and incidental work at Guard, Upper Mohawk and Canal prism excavation and incidental work at Guard, Upper Mohawk and Canal prism excavation and incidental work at Guard, Upper Mohawk and

SEARCHLIGHT SECTION

Contracts To Be Let

PROPOSALS

Bids received until Dec. 23, 1917.

Bridge Repairs

BOARDS OF SUPERVISORS, ALBANY COUNTY AND RENSSELAER COUNTY, STATE OF NEW YORK

Troy, N. Y.

Sealed bids or proposals for repairing 12th Street Bridge over the Hudson River between Ontario Street, City of Cohoes and 12th Street, Lansingburg, City of Troy, in accordance with form of contract, plans and specifications adopted October 18th, 1917, will be received at the office of C. A. Roemer, County Superintendent, County Court House, Troy, N. Y., until twelve o'clock noon, Saturday, December 29th, 1917, and then and there will be publicly opened and read.

The work consists of repairing trusses and floor beams, renewing all woodwork of floor, building new retaining wall on south side of Cohoes approach and paving bridge and approach with wood block paving.

List of the approximate quantities of material involved is given below:

Structural steel (excluding spikes), 48,000 lbs.
Rivets to knock out, 700.
Holes to drill, 10,100.
Rivets to drive, 9,850.
Creosoted Yellow Pine Scantling, 86,000 ft. B.M.
Creosoted T. & G. Plank, 62,000 ft. B.M.
Creosoted 2-in. Plank, 20,000 ft. B.M.
Old Lumber off, 170,000 ft. B.M.
3-in. Creosoted wood block paving, 1,720 sq.yds.
4½-in. Creosoted wood block paving, 1,540 sq.yds.
Concrete curb, 673 lin.ft.
7-in. concrete base, 322 cu.yds.
Catch Basins, 2.
Concrete sidewalk paving, 3,540 sq.ft.
Concrete Retaining Wall and Pedestals, 470 cu.yds.
Reinforced Rods and Dowels, 2,000 lbs.
Pipe Railing, 565 lin.ft.

Bids should be addressed to Highway Committee of Rensselaer County and Roads and Bridges Committee of Albany County, Rensselaer County Court House, Troy, N. Y., and endorsed "Bid for repairing 12th Street Bridge."

Bids must state prices for all items of the work and bids which do not include all the prices called for in the bidding form may be rejected.

Plans and specifications may be seen and copies may be obtained at the office of E. J. Riddell, County Superintendent, Court House, Albany, N. Y., or C. A. Roemer, County Superintendent, Court House, Troy, N. Y.

All proposals must be made upon the forms furnished by the County Superintendents and must give prices in both words and figures and be signed by the bidder, with his business address and place of residence.

Each bidder will be required to give the necessary satisfactory evidence of his competency, experience and responsibility to perform said work.

Each bid must be accompanied by a certified check or draft for Two Thousand Five Hundred Dollars ($2,500.00) payable to the Treasurers of Albany and Rensselaer Counties, N. Y., such check to be returned to the bidder unless forfeited under the conditions herein stipulated.

A bond will be required for the faithful performance of the contract in the sum of 50% of the contract price, with a surety company, authorized to do business, in the State of New York and satisfactory to the Committees.

The person or firm to which contract shall be awarded will be required to offer his surety and to execute contract and furnish required bond within ten days (excluding Sundays) from the date of mailing notice to him, at the address given in his bid, that contract is ready for signature; and in case of failure or neglect to so appear and execute contract and bond, the bidder will be deemed to have abandoned the contract, and the check accompanying the same shall be forfeited to the Counties of Albany and Rensselaer.

The right is reserved to increase or diminish the quantity of work called for, or to omit or modify particular items, as may be deemed necessary.

The right is reserved to reject any and all bids and to waive any defect or informality at the discretion of the committee, should the same be deemed to the best interest of the Counties of Albany and Rensselaer.

WILLIAM B. SHERMAN
A. C. NILES
C. Z. BENNETT
SALEM H. WHITE
JOHN H. FINNERTY
Highway Committee of Rensselaer County, Board of Supervisors.

JOHN J. THOMSON
ALEXANDER FLANSBURG
FREDERICK J. VAN WORMER,
EMANUEL WENGER
MICHAEL S. POE
Roads and Bridges Committee of Albany County, Board of Supervisors.

Bids received until Dec. 14, 1917.

Volcano Lake Levee Raising

El Centro, Cal., Nov. 20, 1917.

Sealed proposals will be received by the Board of Directors of the Compania de Terrenos y Aguas de la Baja California (S. A.), at its office in the Masonic Temple in the City of El Centro, State of California, until 10 o'clock a.m. of the 14th day of December, 1917, and thereupon opened, for the raising of Volcano Lake Levee, which is situated in the Republic of Mexico and begins near Black Butte and extends easterly to the east line of the Cudahy tract, a distance of approximately fourteen and one-half miles.

The precise grade to which said levee is to be raised is particularly stated in the plans and specifications and is for approximately nine and a half miles thereof, to wit: For that part of the levee lying between Black Butte and the Arroyo Turtuoso, a raise of approximately three feet above its present elevation; for that part of the levee lying easterly from the Arroyo Tortuoso, the raise to be from approximately 3.5 feet tapering to nothing.

The material for this raise will be taken exclusively from borrow pits to be provided by the Compania, approximately nine miles easterly from the west end of the Volcano Lake levee, and which are approximately one-fourth mile from the present tract. Connection will have to be made to such track from the borrow pits. The material used in making this raise may be hauled in cars over the existing track now laid on the levee. The estimated yardage is approximately 555,000 cubic yards.

Said work shall be completed on or before the 15th day of April, 1918.

Plans and specifications can be seen at the office of the Board of Directors in the Masonic Temple, in the City of El Centro, State of California, and at the office of the Chief Engineer of said Compania de Terrenos y Aguas de la Baja California (S. A.), in the City of Calexico, State of California, to which plans and specifications reference is hereby made for a more detailed description of the work to be done.

Any bidder to whom the contract shall be awarded shall, within ten days after the acceptance of his bid, make, execute and deliver to the Board of Directors a written contract in form satisfactory to said Board, for the performance of said work within the time and in the manner stated in said notice, plans and specifications, and also furnish it an acceptable bond in the sum of 25 per cent. of the total contract price, based on the Compania's estimate of the amount of work to be done, for the faithful performance of the said contract, and also furnish an additional bond in the sum of 50 per cent. of the total contract price, based on the Compania's estimate of the amount of work to be done, as a guaranty that the contractor will pay in full the claims of all persons performing labor upon or furnishing material to be used in such work.

Each bid shall be accompanied by a certified check for ten thousand ($10,000,00) dollars, made payable to the Treasurer of the Compania, and to be forfeited to said Compania should bidder fail for ten days after the acceptance of his bid to enter into said contract with the said Compania and furnished the required bonds.

The contract will be let to the lowest responsible bidder, but the Board of Directors reserves the right to reject any or all bids.

By order of the Board of Directors of the Compania de Terrenos y Aguas de la Baja California (S. A.)

R. D. McPHERRIN,
Secretary.

Bids received until Jan. 5, 1918.

Levee Construction

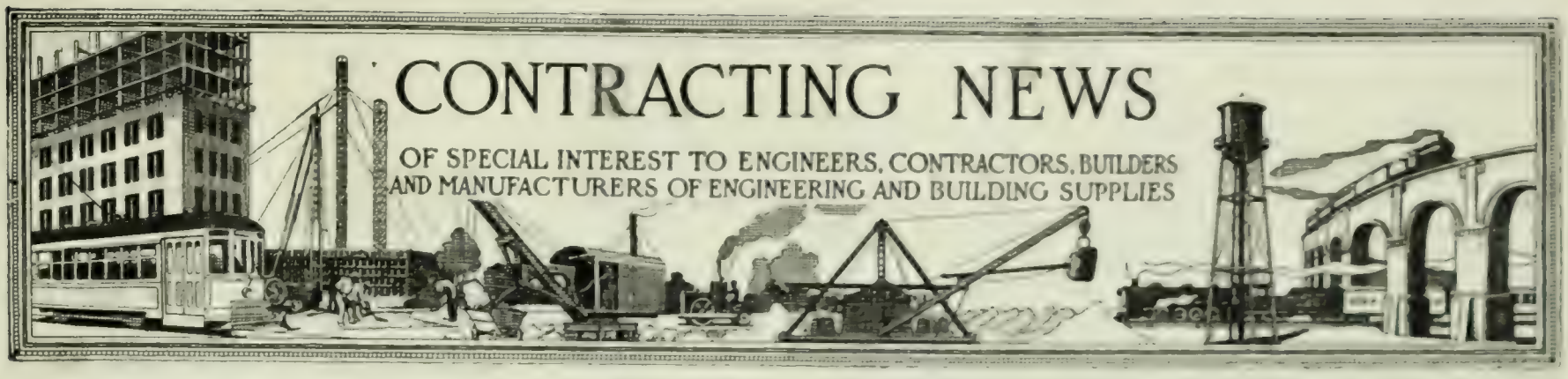
Chamois, Mo.

Sealed proposals will be received up to One O'Clock, Jan. 5th, 1918, at the Office of the Secretary of the Board of Commissioners of the Shawnee Creek Drainage District in Chamois, Missouri, for the construction of 60,000 cubic yards of earth levee.

Plans, specifications, bidders' forms, amount of bidder's bond or check, bond for construction and all information needed for bidders can be had of the Engineer, H. E. Steinmann, Chamois, Mo. Legal advertisement in the News of Osage County, Chamois, Mo.

J. RICHARD GARSTANG,
Secretary.

Chamois, Mo.



Proposals

For Proposals Advertised See Pages 58 to 61 Inclusive

WATER-WORKS

Bids Close		See Eng. News-Record
Dec. 17.	Madill, Okla.	Dec. 13
Dec. 20.	Brooklyn, N. Y.	Dec. 13
Dec. 20.	Wooster, Ohio Adv. Nov. 29 and Dec. 6.	Nov. 29

SEWERS

Dec. 17.	Millburn, N. J.	Dec. 13
Dec. 18.	Phila., Pa.	Dec. 13
Dec. 19.	Baltimore, Md.	Dec. 6
Dec. 19.	Brooklyn, N. Y.	Dec. 13
Dec. 21.	Youngstown, O.	Dec. 13
Dec. 24.	West Park, O.	Dec. 13
Dec. 30.	Rocky River, Ohio	Nov. 29
Feb. 1.	Toledo, O.	Dec. 13

BRIDGES

Dec. 17.	Chandler, Okla.	Dec. 13
Dec. 17.	San Diego, Cal.	Dec. 13
Dec. 18.	Kansas City, Mo. Adv. Nov. 29 and Dec. 6.	Nov. 29
Dec. 18.	Beatrice, Neb.	Dec. 6
Dec. 18.	Princeton, Minn.	Dec. 6
Dec. 21.	Kansas City, Mo. Adv. Nov. 29 and Dec. 6.	Nov. 29
Dec. 21.	Pocatello, Idaho	Dec. 6
Dec. 21.	Necedah, Wis.	Dec. 6
Dec. 22.	Livingston, Ala.	Nov. 29
Dec. 29.	Troy, N. Y. Adv. Dec. 13.	Dec. 13
Jan. 8.	Salinas, Cal.	Dec. 13

STREETS AND ROADS

Dec. 15.	Jasper, Ala.	Nov. 29
Dec. 15.	Fitchburg, Mass. Adv. Nov. 29	Nov. 29
Dec. 15.	Hatley, Que.	Dec. 6
Dec. 15.	La Crosse, Wis.	Dec. 13
Dec. 17.	Los Angeles, Cal.	Dec. 6
Dec. 17.	Okmulgee, Okla. Adv. Nov. 29 and Dec. 6.	Dec. 6
Dec. 17.	Everett, Wash.	Dec. 6
Dec. 17.	Louisiana	Dec. 13
Dec. 17.	Union, N. J.	Dec. 13
Dec. 19.	Cleveland, O.	Dec. 13
Dec. 20.	Sturgeon Bay, Wis.	Dec. 13
Dec. 20.	Youngstown, O.	Dec. 13
Dec. 22.	Dayton, O.	Dec. 6
Dec. 24.	California	Dec. 13
Dec. 27.	Elizabeth, N. J.	Nov. 29
Dec. 27.	Ohio	Dec. 13
Dec. 27.	Atlantic City, N. J.	Dec. 13
Dec. 28.	Webster Springs, W. Va.	Dec. 13
Dec. 29.	Huntington, Ind.	Dec. 6
Dec. 31.	Bay Minette, Ala.	Dec. 6
Jan. 2.	Alexandria, La.	Dec. 13

Bids Close		See Eng. News-Record

EXCAVATION AND DREDGING

Dec. 15.	Sheboygan, Wis.	Dec. 6
Dec. 15.	Toronto, Ont.	Dec. 6
Dec. 17.	Jefferson, Ia.	Dec. 13
Dec. 18.	Elbow Lake, Minn.	Dec. 6
Dec. 20.	Pine Bluff, Ark.	Dec. 13
Dec. 20.	Albany, N. Y. Adv. Nov. 29 to Dec. 13.	Nov. 29

INDUSTRIAL WORKS

Dec. 14.	Bedford Hills, N. Y. Adv. Dec. 13.	Dec. 13

BUILDINGS

Dec. 15.	Gallup, N. M.	Nov. 29
Dec. 15.	Kokomo, Ind.	Dec. 6
Dec. 17.	Kenmore, Ohio	Nov. 29
Dec. 17.	New Paltz, N. Y. Adv. Nov. 29 and Dec. 6.	Nov. 29
Dec. 17.	Pittsburgh, Kan.	Nov. 29
Dec. 17.	East Cleveland (Cleveland P. O.) O.	Dec. 6
Dec. 17.	Miami, Okla.	Dec. 6
Dec. 17.	Austin, Minn.	Dec. 13
Dec. 18.	Brooklyn, N. Y.	Dec. 13
Dec. 18.	Kansas City, Mo. Adv. Nov. 29	Nov. 29
Dec. 19.	Milledgeville, Ga.	Dec. 13
Dec. 19.	Brooklyn, N. Y.	Dec. 13
Dec. 20.	Wingdale, N. Y. Adv. Dec. 13.	Dec. 13
Dec. 21.	Harrisburg, Pa.	Dec. 13
Dec. 21.	Shaker Heights (Cleveland P. O.) O.	Dec. 6
Dec. 21.	Twin Bridges, Mont.	Dec. 13
Dec. 22.	Oxford, Ohio	Dec. 6
Dec. 24.	Cleveland, Ohio	Dec. 6
Dec. 24.	Syracuse, N. Y.	Dec. 13
Dec. 30.	St. Cyprien, Que.	Dec. 13
Jan. 1.	Wichita, Kan.	Nov. 22
Jan. 8.	Dodge Center, Minn.	Dec. 13
Jan. 15.	New York, N. Y.	Nov. 29

FEDERAL GOVERNMENT WORK

Dec. 17.	Electric Traveling Cranes —Washington, D. C.	Dec. 13
Dec. 17.	Steel Barge — Memphis, Tenn. Adv. Dec. 13.	Dec. 13
Dec. 17.	Post Office—Denton, Tex.	Nov. 8
Dec. 17.	Wharf and Boathouse—Santa Rosa, Fla. Adv. Nov. 29 and Dec. 6	Nov. 29
Dec. 17.	Motor Generator Sets — Washington, D. C.	Dec. 6
Dec. 17.	Seaman Gunners' Quarters Washington, D. C.	Dec. 6
Dec. 17.	Extension to Power House Indian Head, Md.	Dec. 13
Dec. 17.	Tower and Buildings — Washington, D. C.	Dec. 13
Dec. 18.	Laterals — Torrington, Wyo.	Nov. 1
Dec. 19.	Dredging—San Francisco, Cal.	Dec. 6
Dec. 21.	Dredging — Philadelphia, Pa.	Nov. 29
Dec. 21.	Wreck Removal — Washington, D. C. Adv. Dec. 13	Dec. 13
Dec. 24.	Fuel Oil System — San Diego, Cal.	Dec. 13

Bids Close		See Eng. News-Record
Dec. 26.	Sewerage System, Water Supply Intake, Reservoir —Washington, D. C.	Dec. 6
Dec. 27.	Post Office — Alexandria, La. Adv. Nov. 22 and 29	Nov. 22
Dec. 27.	Steam Heating System—Shawnee, Okla.	Dec. 6
Jan. 4.	Buildings — Grande Isle, La. Adv. Dec. 6 and 13.	Dec. 6
Jan. 5.	Jetty Work — Jacksonville, Fla.	Dec. 13
Jan. 7.	Post Office — Eldorado, Kan.	Dec. 6
Jan. 7.	Post Office — Shawnee, Okla.	Dec. 6
Jan. 7.	Electric Traveling Cranes —Brooklyn, N. Y.	Dec. 13
Jan. 14.	Post Office—Owego, N. Y. Adv. Dec. 13.	Dec. 13
Jan. 28.	Post Office—Sunbury, Pa.	Dec. 6

MISCELLANEOUS

Dec. 17.	Docks—Seattle, Wash.	Dec. 6
Dec. 18.	River Channel Improvement—Columbus, O. Adv. Dec. 13	Dec. 13
Dec. 18.	Fire Escapes—Dover, N. J. Adv. Dec. 13.	Dec. 13
Dec. 18.	Seawall—Long Beach, Cal.	Dec. 13
Dec. 19.	Flooring—Willard, N. Y. Adv. Dec. 13.	Dec. 13
Dec. 22.	Creek Diversion—Rosedale, Kan.	Dec. 13
Dec. 26.	Station Finish—New York, N. Y.	Dec. 13
Dec. 28.	Levee Work — Shreveport, La.	Dec. 13
Jan. 2.	Improving Harbor — Newport, Ore. Adv. Nov. 29 to Dec. 13.	Nov. 29
Jan. 5.	Levee—Chenoula, Mo. Adv. Dec. 13	Dec. 13

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official.

WATER-WORKS

Proposed Work

N. J., Newark—City plans to build [illegible] and water [illegible] 18 ft. 10 [illegible] About $15,000. M. H. Sherred, city engr.

Ga., Stone Mountain—(Bond)—City defeated $[illegible] bonds for [illegible] Water Co. Noted Nov. 8.

Miss., Natchez—City plans to build water system or improve and [illegible] to N. Franklin, city engr.

O., Cleveland—County appointed $[illegible] land [illegible] Hoffmann, city engr.

Mich., Highland Park—City [illegible] receiving coils [illegible] 1000-gal. [illegible] receiving pump [illegible] Whitney, city engr.

Mich., Sault Ste. Marie—City plans to [illegible] Mayor.

Minn., St. Cloud—City [illegible] for [illegible] bids in February. Noted Nov. 15.

Water-Works (Continued)

Neb., Scottsbluff—City sold $22,000 bonds to extend water system. O. F. Finley, city engr. Noted July 5.

Wyo., Laramie—City voted $60,000 bonds to extend water system. J. Coonean, clk.

Mont., Scobey—City election Jan. 29 to vote on $45,000 bond issue to build water and sewerage systems. Noted Aug. 30.

Okla., Guthrie—City having plans prepared by Benham Eng. Co., engrs., Colcord Bldg., Oklahoma City, for bonding new supply line and pumping plant. About $200,000. C. C. Anderson, clk. Noted Oct. 25.

Idaho, Hailey—City defeated $100,000 bonds to build water system and power plant. Noted Sept. 17.

Cal., Pasadena—City plans to build new well and pumping plant. R. V. Orbison, city engr.

Cal., Santa Barbara—City has been offered site in Upper Montecito Valley and fund of $12,000 to build reservoir.

Cal., Vail—City voted $11,000 bonds to build water and light systems.

Que., Pointe Claire—Town plans to improve water system and install filter system. About $250,000.

BIDS DESIRED

N. Y., Brooklyn—Until Dec. 20, by Bd. Pub. Charities, Municipal Bldg., New York City, installing water system in Kings Co. Hospital.

Okla., Madill—(Official)—Until Dec. 17, by City, building water system, including wells, pump, stand pipe, pipe, etc. J. K. Ross, city engr. Noted Nov. 29.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., New York—W. Williams, Comr. Water Supply, Gas and Electricity, Municipal Bldg., received low bids, Dec. 3, building and laying water mains and appurtenances to cross connect existing mains in Southern Blvd., from East 180th St. to East 181st St. (Bronx Boro.) from Knight & De Mino, Inc., 2353 Washington Ave., $4577; Beaver Dam & Contg. Co., Inc., 51 Chambers St., $3154; J. A. Gregory, $8444. Noted Nov. 29.

★**S. C., Columbia**—City let contract furnishing one 1750- and two 1000-hp. pumps for water system to Perry Main Electric Co., 1507 Main St., $6941. Noted Nov. 29.

★**Ky., Covington**—City let contract installing new pumping machinery and electric motors, to Union Light, Heat & Power Co., $36,000.

O., Akron—(Official)—City received low bids furnishing and delivering centrifugal pumps from Morris Machine Works, 11 Cortland St., New York City, $43191; J. L. Sheldon Eng. Co., 820 Spitzer Bldg., Toledo, $5000; R. D. Wood & Co., 400 Chestnut St., Phila., $3299.

★**O., Canton**—City let contract drilling 12 new wells, furnishing pipe and screens, to Layne & Bowler Chilson Ave., Memphis, Tenn., $19,000. Noted Nov. 22.

★**O., Euclid**—City let contract building 6 in. water mains in Independence, Chelsea, Nautmann, Ivan, and Nicholas Aves., to Conrad & Maybach, 818 East 176th St., Cleveland, $27,150.

★**Que., Three Rivers**—City let contract building pumping station and reservoir to Phenix Bridge & Iron Works, Ltd., 93 Colborne St., Montreal, $12,899.

SEWERS

Proposed Work

Mass., Boston—(Official)—City plans to build sewers in Atlantic Ave., from summer St. to Fort Pt. Channel, Dorchester Branch of Stony Brook, West Roxbury, in South Boston St., from Dorset to South Sts., West Roxbury; in North Beacon St., from Market to Cambridge Sts., Brighton; in Boston St., from Antwerp to Everett Sts., Brighton; Bulfinch and Ann Sts., from Baldwin to Allen Sts., Hyde Park, etc. E. F. Murphy, city engr.

N. Y., Jamaica—Bd. Estimate granted final authorization for building sewer in Van Wyck Ave., from Killoworth to Jamaica Ave., in Metropolitan Ave. from Van Wyck to Tree Ave. About $10,[illegible].

N. Y., Watervliet—City soon lets contract building sewers in 23rd St. to connect with new storm sewerage system. C. F. Polk, clk.

Ky., Owensboro—City soon lets contract building 2 sewers. About $421,715. E. B. Shilley, city engr. Noted Aug. 9.

Kan., Parsons—(Official)—State Bd. Health ordered city to build secondary treatment works for sewage before discharging it into La Bette Creek. About $20,000. C. A. Haskins, engr. div. water and sewers.

Mont., Scobey—See "Water-Works."

Mo., Kansas City—City rescinded contract let to M. Walsh building Troost Ave. trunk line sewer, from 50th to 64th St. About $165,000. Work will be readvertised. Noted Sept. 27.

Tex., Dallas—Attorney General's Dept. approved $300,000 bonds to build sewers. H. Mosley, city engr.

Okla., Sapulpa—See "Streets and Roads."

Okla., Pilcher—City plans to build sewerage system. About $30,000.

N. M., East Las Vegas—(Official)—City lets contract in January, building sewerage system, involving 22,250 ft. 8-12-in. vitr. pipe, 38 manholes and 21 flash tanks. About $29,478. V. K. Jones, city engr. Noted Nov. 29.

Cal., Los Angeles—City plans to build sewers on Shepard St., from Pacific to Carolina St., also on State St. A. Hansen, city engr.

BIDS DESIRED

N. Y., Brooklyn—Until Dec. 19, by L. H. Pounds, boro. pres., building sewers on Ave. M, from West St. to Ocean Pkway.; East 3rd, 4th and 5th Sts., and Ocean Pkway.; outlet sewers crossing West St. from Ave. M to 23rd Ave.; 23rd Ave. from West St. to 60th St. and 60th St. from 23rd Ave. to Bay Pkway., involving 4970 lin.ft. 6-48 in. pipe, 33 manholes, 27 sewer basins, 34,000 ft. sheeting and bracing, and 10 cu.yd. concrete. About $39,924.

N. J., Millburn—Until Dec. 17, by Twp. Com., building storm sewer between Ridgewood Rd. and Millburn Ave. M. R. Silance, clk.

Pa., Phila.—(Official)—Until Dec. 18, by G. E. Datesman, dir. pub. serv., building intercepting sewers along Frankford Creek, Contr. No. 17; also miscellaneous piping for grit chamber north of Lycoming St. and west of O St., Contr. No. 16-L.

O., Toledo—(Official)—Until Feb. 1, by H. Goodwillie, dir. pub. serv., building 6 mi. 42-72-in. sewers and pumping plant. About $600,000 and $100,000, respectively. H. C. McClure, city engr. Noted Nov. 22.

O., West Park—(Official)—Until Dec. 24, by F. Feuchter, village clk., building storm-water sewer in Barthelman Ave. from station 6 to station 21.

O., Youngstown—Until Dec. 21, by City, building Mill Creek Dist. sewer; 5 separate contracts, including some branch lines and rein.-con. bridges to carry sewer over ravines in Mill Creek Park. Cost between $250,000 and $300,000. F. M. Lillie, city engr. Noted Aug. 16.

Ind., Union City—(Official)—Until Dec. 19, by City, building sewer on Plum St., involving about 7000 lin.ft. various-sized pipe. About $21,164. C. E. Hollinger, city engr. Noted Nov. 29.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Wis., White Fish Bay**—City let contract building 12,000 ft. storm sewer, to Wisconsin Constr. Co.

★**Kan., Larned**—City let contract building sewage-disposal plant to McCoy & Taylor. Noted Aug. 9.

★**Cal., Los Angeles**—City let contract for drainage work in Drainage Impvt. Dist. No. 7, west of Los Angeles, involving 53,377 ft. 8-18-in. unglazed sewer pipe, 5163 ft. 24-30-in. rein.-con. pipe and 21 manholes, to Mlagenovich & Gillespie, 3920 Wisconsin St., $[illegible].

BRIDGES

Proposed Work

N. J., Red Bank—Bd. Freeholders Monmouth Co., Freehold, rejected all bids for building Hubbards Bridge over Shrewsbury River. Work will be readvertised. Noted Nov. 22.

N. C., Elizabethtown—Bladen Co. Comrs. plan to build bridge over Black River from here to Burgaw, Pender Co.

Fla., Jacksonville—Duval Co. election Jan. 8, to vote on $423,000 bond issue to build bridges.

Mich., Battle Creek—City plans to build steel and cement arch bridge over Kalamazoo River on Angell St., to replace present wooden structure. E. H. Hunt, city engr., preparing plans.

Minn., Rochester—City having plans prepared for bridge, two 150-ft. spans with 16-ft. roadway to replace present bridge near power dam. A. F. Wright, clk.

Neb., Falls City—(Official)—Richardson Co. defeated $100,000 bonds to build bridges and culverts. Noted Nov. 15.

Tex., Corpus Christi—See "Miscellaneous."

Okla., Cheyenne—See "Streets and Roads."

Okla., Pawnee—See "Streets and Roads."

Wash., Waterville—See "Streets and Roads."

Oregon—See "Streets and Roads."

Cal., Santa Barbara—See "Streets and Roads."

BIDS DESIRED

N. Y., Troy—(Official)—Until Dec. 29, by C. A. Roemer, Rensselaer, co. supt., repairing 12th St. bridge over Hudson River between Ontario St., Cohoes and 12th St., Lansingburg, Troy; advertised in this issue.

N. J., Atlantic City—See "Streets and Roads."

O., Youngstown—See "Sewers."

Kan., Rosedale—(Official)—See "Miscellaneous."

Okla., Chandler—Until Dec. 17 by J. C. Pringey, clk., Lincoln Co., building several bridges.

Cal., Long Beach—See "Miscellaneous."

Cal., Salinas—Until Jan. 8, by T. P. Joy, clk., Monterey Co., building pile-trestle over Lewis Creek.

Cal., San Diego—Until Dec. 17, by J. B. McLees, clk., San Diego Co., building two pile bridges over Tijuana River; total length, 675 ft.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. J., Newark**—City let contract building steel and concrete bridge over tracks of Lehigh Valley R.R. and Pennsylvania R.R. on Ave. R, to Linde & Griffith, 4th Ave., Branch Brook. Noted July 26.

★**Fla., West Palm Beach**—(Official)—Palm Beach Co. Comrs. let contract building 2 steel draw bridges over East Coast Canal to Champion Bridge Co., Wilmington, O., $19,600. Noted Nov. 8.

★**Oregon**—State Highway Comn., Portland, let contract building draw bridge across John Day River, Clatsop Co., to Portland Bridge Co., Yeon Bldg., Portland, $20,999. Noted Nov. 22.

STRUCTURAL STEEL WORK

Proposed Work

Mich., Battle Creek—See "Bridges."

BIDS DESIRED

Kan., Rosedale—(Official)—See "Miscellaneous."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. J., Newark**—See "Bridges."

★**Fla., West Palm Beach**—(Official)—See "Bridges."

REINFORCED CONCRETE

Proposed Work

O., Cleveland—See "Industrial Works."

Utah, Salt Lake City—See "Industrial Works."

Ariz., Phoenix—See "Buildings."

Reinforced Concrete (Continued)

BIDS DESIRED

O., Youngstown—See "Sewers."

Kan., Rosedale—(Official) — See "Miscellaneous."

Cal., Long Beach—See "Miscellaneous."

PRICES AND CONTRACTS AWARDED
(★Indicates award of contract)

★N. J., Newark—See "Bridges."

STREETS AND ROADS

Proposed Work

R. I., Barrington—Town voted $20,000 to build, and $8000 to maintain roads.

Conn., Bridgeport—City having plans prepared extending Broad St. from Elm to Catherine Sts., also building tunnel under Golden Hill St. and plaza in front of High School on Lyon Terrace. About $239,200. A. H. Terry, city engr.

N. Y., Buffalo—City plans to pave Hertel Ave. from Wesley Ave. to Main St. and Greene St. from Williams to Lovejoy St D. J. Sweeney, clk.

N. J., Flemington—Bd. Freeholders Hunterdon Co., plans to build section Clinton-West Portal Rd. About $48,000. W. W. Foster, clk.

N. J., New Brunswick—Bd Freeholders Middlesex Co. plans to build following roads: Woodbridge-New Brunswick, Sec 2, $90,000; Plainfield Ave., South Plainfield, $70,000; South Plainfield Port Reading, $52,500; Washington Rd., Parlin, $133,000; Ryder's Lane, Clifton Ave., $150,000. A. B. Fox, Perth Amboy, co. engr.

N. J., Newton—Bd Freeholders, Sussex Co. plans to improve Newton-Stanhope, Newton-Branchville, Frankford-Sandyston, Lewisburg, Sparta, Franklin-Stockholm, Sussex-Hamburg, North Church, Hamburg, Sussex, and Hardystonville Rds.

N. J., South Amboy—City plans to issue $20,000 bonds to improve Catherine and Henry Sts. L. T. McMichael, city engr.

Pennsylvania — State, Highway Dept., Harrisburg, plans to build 53 mi. road between Harrisburg and Reading, Federal Government to appropriate towards cost. J. D. O'Neil, highway comr.

Penn., Pittsburgh — (Official) — Council passed ordinance paving, grading and curbing Exeter St. from Greenfield Ave. to Frank St.; Mapleton Way from Heth's Ave. to Samantha Way; Methyl St. from Wentworth St. to Coast Ave.; Warrington Ave. from Montooth St. to West Liberty Ave.; Fennimore St. from Linden to Gettysburg Sts.; Eckert St. from Lecky to McClure Aves.; Elmira St. from East to Howard Sts. R. Swan, city engr.

Pa., Sharpsville — (Official) — Council passed ordinance to grade Mercer Ave from Walnut St. to Boro. line. W. A. Graber, boro. secy.

N. C., Asheville—City will issue $127,000 bonds to pave streets. B. M. Lee, city engr.

Ga., Columbus—Muscogee Co plans to build Dixie Overland Highway from Columbus to Chattahoochee Co. line. F. U. Garrard, chn. co. comrs.

Fla., Jacksonville — Duval Co election Jan. 8, to vote on $577,000 bonds to pave roads with asphalt, brick and concrete.

Ala., Birmingham—City plans to widen 3rd St. along Capitol grounds from Walnut to North Sts. About $25,000. M. B. Cowden, city engr.

Ala., Gadsden—Etowah Co. plans to build Hokes Bluff Highway, also county's section Gadsden-Attalla Rd. Federal Government will appropriate $10,000, state $2500, and county $7500. W. S. Keller, Montgomery, state highway engr.

Miss., Fulton—Itawamba Co plans to build roads. Federal Government will appropriate $45,1000 towards cost.

La., New Iberia—City will sell $75,000 bonds for street and road work. H. S. Sealy, mayor. Noted Sept. 27.

Ky., Lebanon—(Official)—Marion Co. received no bids building 5½ mi. inter-county road from here to Bardstown, beginning at Smocks Chapel and extending to Nelson Co. line. Work will be readvertised in spring. Noted Nov. 22.

O., Bellaire—(Official)—Council passed ordinance to grade, pave, curb and build drains and retaining walls in 23rd St. from Belmont St., W, to west corporation line. A. J. Norton, city engr.

O., Cincinnati—(Official)—City plans to pave Hill Crest Rd. from Hamilton Ave. to point 1700 ft. east, bituminous macadam. F. Krug, city engr.

O., Cleveland—See "Miscellaneous."

O., Lebanon—Warren Co. plans to macadamize 4 mi. Waynesville-Lebanon Pike. About $30,000.

O., Lima—Allen Co. plans to improve Lincoln and Dixie Highways through this county in accordance with instructions of Federal and State Governments. About $1,000,000.

Ind., Evansville—Vanderburgh Co. will sell $170,000 bonds for highway improvements. C. P. Beard, aud.

Ind., South Bend—St. Joseph and Elkhart Cos., Goshen, plan to build road between Elkhart and Osceola. State will appropriate ⅓ of cost.

Michigan—State Highway Comn., Lansing, soon lets contract building 14½ mi gravel and stone road in Osceola Co. F. F. Rogers, state highway comr.

Ill., Belvidere — Bd. Supervs. Boone Co plans election to vote on $400,000 bonds for road work.

Ill., Carlinville — Macoupin Co. voted $160,000 bonds to complete St. Louis-Springfield hard road through county. Noted Sept. 27.

Ill., Effingham—Effingham Co. voted $104,000 bonds to pay ⅓ of cost of building Old Trails' Rd.

Wisconsin—State Highway Comn., Madison, plans to surface 6 mi. Appleton-Green Bay Rd., concrete. About $81,000. A. R. Hirst, state highway engr.

Wis., Durand—Pepin Co plans to build roads. About $30,000. W. C. Richardson, clk.

Wis., Juneau—Dodge Co. plans to appropriate about $50,000 for highway work.

Wis., Monroe—Green Co. plans to build roads. About $210,750. State and Federal Government to appropriate toward cost. J. W. Stewart, co. aud.

Wis., Oshkosh—City Council plans $44,336 bond issue to improve streets. G. H. Randall, city engr.

Ia., Sac City—Sac Co. plans to grade 37 mi. road. W. D. Maxwell, co. engr.

Minn., Elbow Lake—Grant Co. plans to build roads. About $24,000. Federal Government will appropriate $12,000 toward cost.

Minn., Minneapolis—Hennepin Co. plans building 20 mi. River Rd. in Dayton, $45,000, grading and surfacing 21 mi. Osseo Rd. $80,000; widening 4 mi. Superior Blvd., concrete, from 14-18 ft., $16,500; grading, surfacing and gravelling Excelsior Ave. between Minneapolis and Hopkins, $15,000; grading Rockford Rd. between Bassindale and Wright Co. line, $40,000; resurfacing Lake St. near Minnehaha Blvd., $2,500; other improvements, $10,000. A. P. Erickson, co. aud. Noted Apr. 26.

Kan., Junction City—Geary Co. having plans prepared for 6-mile road to connect Junction City and Ft. Riley. Union Pacific R.R. will appropriate toward cost. About $75,450. B. Doyle, co. engr. Noted Aug. 23.

Kan., Topeka—Kansas Good Roads Assn. plans to build concrete highway on West 14th St. here through Southwick addn. main country road to county line. Est. cost $2,000,000. About $504,000. J. F. Smith, gen. Kansas Rd. Assn.

Neb., Omaha — City plans to pave 4 blocks on 15th Ave. and 3 blocks on 42nd St., asphaltic concrete. J. A. Brown, city engr.

Neb., Scottsbluff — City plans to pave streets in business section.

S. D., Milbank—Grant Co. plans to build road from Milbank to Big Stone. Federal Government and State will appropriate toward cost.

S. D., Mitchell—City plans to pave number of streets, either 2 cent portland cement concrete, creosoted wood blocks, sheet asphalt or bituminous, also curbs and gutters on same. S. H. Smith, city engr.

N. D., Forman — Sargent Co. Comrs. voted $40,000 bonds to improve 44 mi. state highway within its limits.

Missouri — State Highway Comn., Jefferson, plans to build 10 mi. road 18 ft. wide in Cole Co. from Moreau Co. line to Osage River. About $90,000. Federal Government will appropriate $45,000 towards cost.

Mo., Danville — Montgomery Co. voted $45,000 bonds to build rock road in Montgomery City Rd. Dist.

Mo., Independence — Jackson Co. having plans prepared building 4½ mi. 58-ft. roadway, brick on rock base. O. C. Steger, engr.

Mo., St. Louis — (Official) — Council passed ordinance to build granitoid sidewalks on Ivanhoe Ave. between Scanlan and Marquette Aves.; Marquette Ave. between Ivanhoe and McCausland Aves.; on Kingshighway between Kingshighway Southwest and Arsenal St.; Enright Ave. between Central and McCausland Aves.; McCausland Ave. between Marquette and Fyler Aves.; Beethoven Ave. between Gravois Ave. and Morganford Rd. E. R. Kiesel, comr. bd. pub. serv.

Mo., Salem — Dent Co. having plans prepared building Salem, Licking and Iron Mountain Rds. About $180,000. J. H. McDonald, eng. Noted Apr. 19.

Arkansas — State Highway Dept., Little Rock, plans to build macadam road in Carroll Co. from Eureka Springs through Green Forest and Alpena to Green Co. line, 16 mi. About $115,000.

Ark., Walnut Ridge—Lawrence Co. Rd. Improv. Dist. No. 6 plans to build 13 mi. roads to connect Portia, Black Rock, Powhattan, and Clover Bend Twps.

Tex., Albany — Shackelford Co. voted $100,000 bonds for road work.

Tex., Corpus Christi — See "Miscellaneous."

Tex., El Paso—El Paso Co. election Dec. 20 to vote on $250,000 bonds to build roads. L. A. White, co. engr.

Tex., Fairfield — Freestone Co. election Dec. 22 to vote on $85,000 bonds to build roads in Dist. No. 9.

Tex., La Grange — Fayette Co. election Dec. 18 to vote on $100,000 bonds to build roads, Dist. No. 1.

Tex., Linden — Cass Co. election Dec. 11, to vote on $125,000 bonds to build roads, Dist. No. 7.

Tex., Mt. Vernon — Franklin Co. voted $10,000 bonds to build roads in Dist. 4, $70,000 in Dist. 4 and $15,000 in Dist. 5.

Tex., Palestine — Anderson Co. election Dec. 15 to vote on $18,000 bond issue to build roads, Dist. No. 4.

Tex., Wharton — Wharton Co. road administration to vote on $80,000 bond issue to build roads.

Okla., Cheyenne — Roger Mills Co. commissioners to vote on $125,000 bonds to build roads and bridges.

Okla., Newkirk — City will let contract paving 14,850 sq. yd. in Dists. No. 4 and 11, 18 ft. wide, 6 in. thick, with 4-in. curbs, etc.

Okla., Pawnee — Pawnee Co. election Dec. 18 to vote on $10,000 bond issue to build roads and bridges.

Okla., Sapulpa — Creek Co. plans to grade and build 3 roads, 1 from Sapulpa to Kellyville, 1 from Sapulpa to Bristow, 1 from Sapulpa to Mounds, 1 from Kellyville to Bristow, 1 from Bristow to Mounds, 1 from Bristow to Depew, 1 from Depew to Olympia, 1 from Olympia to Stroud, 1 from Depew to Prue, 1 from Prue to Shamrock, 1 from Shamrock to Drumright, 1 from Drumright to Cushing, 1 from Cushing to Stroud, 1 from Stroud to Davenport, 1 from Davenport to Chandler, 1 from Chandler to Wellston, 1 from Wellston to Luther, 1 from Luther to Jones City, 1 from Jones City to Oklahoma City, 1 from Oklahoma City to Edmond, 1 from Edmond to Arcadia, 1 from Arcadia to Luther, 1 from Luther to Harrah, 1 from Harrah to Spencer, 1 from Spencer to Choctaw, 1 from Choctaw to Midwest City, 1 from Midwest City to Del City, 1 from Del City to Oklahoma City, 1 from Oklahoma City to Nichols Hills, 1 from Nichols Hills to Britton, 1 from Britton to Nichols Hills, 1 from Nichols Hills to Capitol Hill, 1 from Capitol Hill to Bethany, 1 from Bethany to Warr Acres, 1 from Warr Acres

Streets and Roads (Continued)

Wash., Colfax—Whitman Co Comrs. plan to establish George M Miller Rd., about 8 mi. to be known as Impvt Rd No 2 J. M McCaw, co. engr

Wash., Garfield—City will sell $20,000 bonds to build streets and sidewalks

Wash., North Yakima—Yakima Co Comrs. having plans prepared for paving 5½ mi road from Sunnyside to Outlook School.

Wash., Seattle—Bd. Pub Wks. plans to pave Rainier Ave et al About $91,000 A. H. Dimock, city engr

Wash., Waterville—(Official)—Douglas Co plans to spend $400,000 for road and bridge work as follows Sunset Highway, $165,000, Permanent Highway No 4, $20,000, No 4A, $5000; No 5, $2000 No 1A, $15,000, Beaver Creek Rd, $13,000, bridge over Foster Creek, $10,000; maintenance of permanent highways, $15,000, building and maintenance of district roads, $123,000; L I D No 4, $15,000 R F Foster, co. engr Noted June 21

Oregon — State Highway Comn., Yeon Bldg., Portland, rejected bids grading 1½ mi. in Wheeler Co., on Ochoco Forest Rd., 4 mi. from Mitchell, also building 90 ft. wood span bridge. Noted Nov. 22.

Ore., Corvallis—Benton Co. having surveys made for paving, grading and filling 10 mi. state highway from Corvallis to Polk Co. line

Cal., Martinez—Contra Costa Co. having plans prepared building highway between Antioch and Oakley, Div. No 7, also plans highway between Pittsburg and Bay Point, Div. No. 8.

Cal., Santa Barbara—La Mesa Rd Dist voted $17,500 bonds to build 2 mi. roadway Bd. Superv. will contribute $10,000 towards cost Noted Nov 22 R H Wheeler, secy

Cal., Willows—Glen Co. voted bonds to build 14 mi. highway in boulevard district, Hamilton City. Noted Nov. 1.

Man., Winnipeg—Provincial Government will appropriate $10,000 to build road from Fort Alexander to Rice Lake mining dist Noted June 21

BIDS DESIRED

N. J., Atlantic City—Until Dec 27, by City Engr, grading, curbing and gravelling portions Absecon Blvd. and Venice Ave.; filling in portion Clam thoroughfare, including dredging water-ways and depositing dredged material, amounting to 888,000 cu.yd. graveling 12,169 sq.yd. of driveways, 956 sq.yd sidewalks, covering 220,000 sq.yd. outside of driveways, building 2 bridges 40 and 80 ft long, and 500 lin.ft. standard wood bulkhead J. W Hackney, city engr

N. J., Union—Until Dec 17, bs town resurfacing portion New York Ave. bituminous concrete E Bantz clk. Noted July 12.

W. Va., Webster Springs—Until Dec. 28, by Webster Co. building road from Webster Springs to Randolph Co. line, 4 mi. and from Webster Springs to Cleveland 2 mi.

Louisiana—(Official)—Until Dec. 17, by State Bd. Engrs., New Orleans Court Bldg., New Orleans, building 15.9 mi. Alexandria-Echo sect. of Alexandria-Marksville Highway in Rapides Parish, gravel. D. Bule, state highway engr

La., Alexandria—(Official)—Until Dec. 2 by Police Jury, Rapides Parish, building gravel roads Dist No 11 About $75,000 I. W Sylvester, engr Noted Nov. 17

Ohio—Until Dec. 27 by State Highway Dept. Columbus, building roads in various counties as follows

Ashland Co., Sect. A, Ashland-Wooster Rd., 3.47 mi., monolithic brick, cost $64,738

Sect. A, Ashland-Cleveland Rd., 4.53 mi., monolithic brick, $110,191

Sect. "A" of the Savannah-Vermillion Rd., 4.58 mi. to be paved with monolithic brick, estimated cost $84,149.20

Franklin Co., Sect. "G," Columbus-Dublin Rd., 1.56 mi., bituminous macadam, $38,508

Lake Co., Sect. "J," Cleveland-Buffalo Rd., 7.715 mi., monolithic brick, cost $213,356

Sect. "Q" Cleveland-Buffalo Rd., 3.45 mi., monolithic brick, cost $[illegible]

Lawrence Co., Sect. "K," of the Ohio River Rd., 0.97 mi. concrete, $20,026.75.

Sect. "E," Ironton-Miller Rd., 1 mi., bituminous macadam, $16,152;

Logan Co., Sect. "A-1," Bellefountaine-Lima Rd.; 0.50 mi., concrete, $13,888;

Sect. "F-1," Bellefountaine-Richwood Rd., 2.68 mi., waterbound macadam, $32,419;

Lucas Co., Sect. "K-2," Toledo-Napoleon Rd., 3.75 mi., concrete, $85,801;

Sect. "J," Toledo-Napoleon Rd., 4.48 mi., concrete and waterbound macadam, $73,334;

Mahoning Co., Sect. "Y," Canfield-Poland Rd.,, 1.88 mi., waterbound macadam, $24,674;

Monroe Co., Sect. "F," Barnesville-Woodfield Rd., 3.97 mi., grading B. & C., $30,326;

Muskingum Co., Sect. "Q," National Rd., 2.93 mi., brick, $103,031;

Sect. "R," National Rd., 6.15 mi., brick-concrete, $209,707;

Sect. "S," National Rd., 4.55 mi., brick or concrete, $154,403;

Ottawa Co., Sect. "K," Toledo-Elmore Rd., 0.86 mi., brick, $27,591;

Sect. "E-1," Bowling Green-Pt. Clinton Rd., 0.39 mi., brick, $12,111;

Sect. "F-1," Bowling Green-Pt. Clinton Rd., 0.25 mi., brick, $7337;

Sect. "A," Fremont-Oak Harbor Rd., 0.48 mi., brick, $13,738;

Sect. "E," Fremont-Pt. Clinton Rd., 2.40 mi., brick, $56,084;

Seneca Co., Sect. "A-1," Upper Sandusky-Tiffin Rd., 1.23 mi., brick or bituminous concrete, $35,942;

Sect. "Q," Upper Sandusky-Bellevue Rd., 2.05 mi., bituminous macadam, $30,071;

Van Wert Co., Sect. "C," Van Wert-Ft. Wayne Rd., 4.30 mi, waterbound macadam, $50,142;

Clermont Co, Sect. "I," Ohio River Rd., 4.12 mi., bituminous macadam, $26,689;

Crawford Co., Sect. "L," Galion-Bucyrus Rd., 1.79 mi., brick, $55,247;

Mercer Co., Sect. "C," Celina-Wabash Rd., 1.62 mi., concrete, $39,946;

Vinton Co., Sect. "G-2," McArthur-Athens Rd., 1.06 mi., grading, $9057.

O., Cleveland—(Official)—Until Dec. 19, by Cuyahoga Co., grading, draining and paving Front-Factory St. E. G. Krause, clk.

O., Youngstown—(Official)—Until Dec. 21, by H. Parrock, dir. of serv., paving, curbing, excav., building manholes and catch basins in Hylda, Ravenwood, and Aubindale Sts. from South Ave. to Erie St. F. M. Lillie, city engr.

Wis., La Crosse—(Official)—Until Dec. 15 by B. A. Jolivette, clk., La Crosse Co., building Hunter, North Sparta and West Salem-La Crosse Rds., involving 4825 cu.yd. rock.

Wis., Sturgeon Bay—Until Dec. 20, by J. M. Laurie, highway comr., Door Co., furnishing and delivering crushed stone for roads in 6 twps.

California—Until Dec. 24, by State Highway Comn., Sacramento, paving portion Boulevard at San Diego State Normal School; also building 11 mi. highway in Monterey Co., concrete. A. B. Fletcher, state highway engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—City let contract paving Fens Pkway. to Warren Bros., 142 Berkeley St., $17,207. Noted Nov. 29.

★**Mass., Boston**—City let contract building concrete walks to J McCourt, 46 Wait St., Roxbury, $16,763.

★**N. Y., New York** M. M. Marks, boro. pres. let contract regulating and grading Laurel Hill Terrace, to Burnside Contg. Co., 270 Burnside Ave., $17,457; regulating and repaving roadway of 52nd St., from 68 ft. west of Park Ave. to 7th Ave., sheet asphalt on concrete foundation, repaving roadway of Madison Ave., wood block, to Cleveland Trinidad Paving Co., Main St., Flushing, $13,101. Noted Nov 29

N. J., Cape May—Bd Freeholders, Cape May Co. received lowest bid building Sect. 2, gravel road from here to Wildwood from Cassedy & Homan About $84,879

★**Pennsylvania**—(Official)—State Highway Comn., Harrisburgh, let contract building 7857 ft. State-Aid road through Cornplanter Twp., Venango Co., to J. E. Richey, S. W. Cramer and J. McSnow, Franklin, $52,888. Noted Nov. 15.

★**Pa., Allentown**—City let contract repairing sidewalk and roadway of Hamilton St. bridge over Lehigh River, involving 3777 sq.yd. wood-block flooring and 12,000 sq.ft. concrete, to Shaffer & Ackerman. About $35,000.

★**Pa., Phila.**—Fairmount Park Comn. let contract grading on site for proposed Art Museum, Old Fairmount Reservoir, to T. Connor. About $20,000.

★**W. Va., Fayetteville**—(Official)—Fayette Co. let contract grading 3 mi. road in Kanawha Dist., involving 141,000 cu.yd. excav. and 200 cu.yd. masonry, to Henning & Hagestorn, Mullins, 73c. and $8.06 respectively. Noted Oct. 18.

★**Ga., Thomasville**—City let contract paving streets and building sidewalks, involving 12,000 yd. asphalt; 22,000 sq.yd. cement sidewalks; 23,700 lin.ft. concrete curb and gutter, to West Constr. Co., 10th and Market Sts., Chattanooga, Tenn.

★**Ala., Opelika**—Lee Co. let contract improving 11.31 mi. Opelika and Leachapoka Rd., part State Trunk Rd. No. 13, involving 51,200 cu.yd. earth excav.; 16,000 cu.yd. sand-clay surfacing, 258 cu.yd. concrete; 842 lin.ft. vitr. clay pipe, to Stanley & Singer, La Fayette, $25,500.

★**La., Shreveport**—City let contract paving Olive St. from 5th to 21st St. to Kennedy-Olsen Constr. Co., Kansas City, Kan., $60,000.

★**Tenn., Chattanooga**—Hamilton Co. plans building 1⅓ mi. highway on Lookout Mountain. Work will be done by convict labor. Noted Aug. 23.

★**Ky., Eminence**—City let contract building several streets, bituminous macadam, to Southern Asphaltoilene Road Co., 114 South 4th St., Louisville. About $10,000.

★**Ky., Owensboro**—Davies Co. let contract building Craves Lane Rd., Ware, Livermore, Booneville and Curdsville Twps.; also 2 sections of Hardinsburg Rd., to Montgomery, Perkins & Ellis, and Miller & Woodruff. About $161,000. Noted Nov. 15.

★**Ind., Kendalville**—(Official)—City let contract paving portions Main and Williams Sts., also certain alleys, to Moellering Constr. Co., Murray St., Ft. Wayne, $45,509. Noted Dec. 6.

★**Ill., Rockford**—City let contract paving Churchill St., to F. K. Carrico, 1109 Kilburn Ave., $11,000.

★**Ia., Des Moines**—City let contract paving Douglas and 58th Sts. to Wagner & Co., Union St. Noted Nov. 1.

★**Minn., Worthington**—(Official)—Nobles Co. let contract graveling 6 mi. Rd. No. 1801 and 6½ mi. Rd. No. 1811 to Lamoreaux Bros., 805-11 Brandeis Bldg., $17,922 plus 10%.

★**Kan., Augusta**—City let contract paving Augusta St., to Bessler Constr. Co., Winfield, $34,000.

Neb., Kearney—City received low bids paving 10,112 sq.yd., Dist. No. 29, with sheet asphalt from Union Paving & Constr. Co., St. Joseph, Mo., $1.75 per sq.yd.; Young Bros. Constr. Co., Excelsior Springs, Mo., $1.85; E. D. Tyner Constr. Co., Kansas City, Mo., $1.85. Noted Nov. 29.

★**Mo., Carthage**—City let contract paving streets to McDonald Constr. Co., Moberly, $26,000.

★**Mo., Rockport**—City let contract paving about 7 mi. streets to Western States Constr. Co., 782½ Brandeis Bldg., Omaha, Neb., $53,400.

★**Tex., Dallas**—City let contract grading Forest Ave. and building earth embankment in connection with Forest Ave. extension to Moberly & Brown, Dallas, $13,066. Noted Nov. 22.

★**Tex., Texarkana**—City let contract paving Olive St. from 4th to 19th Sts., about 15 blocks, to Kennedy Constr. Co. About $56,000. Noted Nov. 22.

★**Okla., Sapulpa**—City let contract paving Bryan and Thompson Aves., to J. E. Nolan, $12,282.

★**Okla., Tulsa**—City let contract paving several streets, to F. P. McCormick, $325,000.

Streets and Roads (Continued)

★**Oregon**—State Highway Comn., Portland, let contract grading Pacific Highway between Dillard and Myrtle Creek, Douglas Co., 11 mi., to Calvert & Wolke, Grants Pass, $127,520. Noted Nov. 22.

California—State Highway Dept., Sacramento, received low bids grading 8 mi. in Mendocino Co. between Willits and Gould (State to furnish pipe railing, reinforcing steel, etc.), from Erickson & Peterson, Monadnock Bldg., San Francisco, $112,931; Bates & Portland, Crocker Bldg., Oakland, $113,199; A. J. Fairbanks, 268 Market St., San Francisco, $119,945; building 8 mi. highway in Monterey Co. between San Ardo and San Lucas, from G. S. Benson & Sons, 521 Stimson Bldg., Los Angels, $55,002. Noted Nov. 15.

★**Cal, Los Angeles**—City let contract grading and paving with bitulithic, building cement curbs and gutters and rein.-con. culverts in New Hampshire St. between Willshire Blvd. and 8th St., to Fairchild-Gilmore Co., Pacific Electric Bldg., $31,315.

★**Cal., San Diego**—City let contract improving Utah St. from Unas St. to University Ave., including 142,630 sq.ft. 4-in. concrete paving; 2896 sq.ft. cement walk; 575 lin.ft. cement curb, ten 4-in. sewer laterals, thirteen 6-in. sewer laterals, 2676 ft. 6-in. Class A water pipe, etc., to G. R. Daley, 440 McNiece Bldg., $24,707. Noted Nov. 29.

★**Cal., San Francisco**—City let contract building portion Hunter's Point Rd., to H. Crummey, Inc., Hearst Bldg., $17,282.

★**Ont., Toronto**—City let contract supplying cement for coming year to Hanover Portland Cement Co. About $2.45 per bbl.

RAILWAYS—STEAM & ELECTRIC

Proposed Work

Florida—Kissimmee River R.R., Kissimmee, organized with $100,000 capital stock, plans to build line from Walinwa to Polk Co., about 7 mi. J. A. Griffin, pres.

Texas—Dallas Ry., Dallas, plans to spend about $1,000,000 for extending and improving its lines. Among improvements to be made are following: Rebuilding double-track and paving in Oak Cliff on Jefferson Ave. from Lancaster to Polk; rebuilding track on Main St. between Poydras and Ervay; new storage tracks at Oak Cliff car barns; removal of tracks on Hickory St. between Harwood and Latimer St. and on Corinth St. between Akard and Cockrell St.; double-track extension of Oak Lawn line on Cedar Springs from Oak Lawn Ave. to Throckmorton St.; extension of Lake Ave. line from Fairmount to Oak Lawn Ave.; new line on Forest Ave.; new improvements, extensions and betterments of terminals at State Fair Grounds, etc. F. M. Bisbee, Amarillo, ch. engr.

Washington—City Council, Tacoma, voted to extend Municipal Ry from 11th St and Taylor Way to Lincoln Ave., about 1 mi. Cost, $20,000.

California—Municipal Ry., 2600 Geary St., San Francisco, plans to build 3 additional blocks of tracks here in order that cars on Greenwich St. may reach Baker St entrance to Presidio and go to terminus of system in Presidio reservation. About $25,000.

EXCAVATION AND DREDGING

Proposed Work

Miss., Greenville — Drainage — Murphy Bayou D.D. recently organized plans to build system to drain 50,000 acres in Washington Co. Morgan Eng. Co., engrs., 608 Goodwyn Institute Bldg., Memphis, Tenn., making surveys.

Ill., Havana — (Official) — Drainage — Comrs. Chautaqua Drainage and Levee Dist., Mason Co., rejected all bids building drainage system; Sect. 1, Illinois River Levee, involving 1,461,000 cu.yd. embankment, 138,000 cu.yd. exploration trench; Sect. 3, planting willows for levee protection on 9-mi. graded bature-berm. H. Hahn, comr. Work will be readvertised. Noted Nov. 5.

Ia., Corning—Drainage—Adams Co having preliminary surveys made by Price & McCormick, engrs., for East Nodaway Drainage Project; involving 500,000 cu.yd. excav. F. W. Yeadon, co. aud.

Minn., Montevido — (Official) — Ditch — Chippewa Co. rejected all bids received Dec. 1, building Co. Ditch No. 22. J. J. Stennes, co. aud. Noted Nov. 22.

Cal., Sacramento—Ditch—State Reclamation Bd. approved plan to build drainage ditch on lower Cosumnes River. About $10,000.

BIDS DESIRED

Ia., Jefferson—Drainage—Until Dec. 17, by Greene and Webster Cos., furnishing tile for joint D. D. No. 221, involving 104,440 ft. 5-36-in. tile, 300 ft. sewer pipe, etc. B. S. McCully, aud. Greene Co., J. L. Hanrahan aud., Webster Co.

Ark., Pine Bluff—Drainage—Until Dec 20, by Comrs. Flat Bayou D.D., Jefferson Co., at office of Parkes Eng Co., engrs., 203 Citizens Bank Bldg., Pine Bluff, building main and lateral ditches, involving 695,519 cu.yd. excav. J. H. Quattlebaum, comr Noted July 12.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract

N. Y., New York—Excavation—F. J. H. Kracke, comr. plant and structures, Municipal Bldg., received low bids excavating and dredging at site of Eastchester Bridge from P. T. Coy Contg. Co., 150 Nassau St., $9770; Rodgers & Hagerty Co., 103 East 125th St., $9800. Noted Nov. 29.

★**Minn., Litchfield**—(Official) — Ditch—Meeker Co. let contract building Co. Ditch No. 47 to Duffy & McGraw, Litchfield, $22,250. Noted Nov. 29.

★**Minn., Minneapolis**—Ditch — Hennepin Co. let contract building Co. Ditch No. 30, involving 55,569 cu.yd. excav., to Carroll & Cowan, Minneapolis, 27.5c. per cu.yd.

Kan., Salina—(Official)—Drainage—Bd. Supervs. D.D. No. 1, Salina Co., received bids building drainage system, involving 87,250 cu.yd. excav., etc., from P. C. Buskirk, Hutchinson, $0.14⅛ per cu.yd. (recommended for acceptance); time, 180 days; H. E. Badger, Omaha, Neb., $0.15 on line (a) and (b); cost plus 15% on remainder; 100 days; A. L. Cook, Ottawa, $0.19. Noted Nov. 15.

★**Tex., Barstow** — Irrigation — Ward Co. Irrigation Dist. No. 1 let contract building irrigation canal in Dist. No. 1, to W. E. Hamilton, Ft. Stockton. About $21,198. Noted Nov. 15.

INDUSTRIAL WORKS

Proposed Work

R. I., Warren—Warren Mfg. & Exporting Co. plans 3-story, 100 x 180-ft. addition, North Main St and Pleasant Pl. About $75,000.

N. Y., Brooklyn—D. F. Edgerly, 378 7th Ave., had plans prepared for 1-story, 191 x 107-ft. brick garage, Nostrand Ave. near Montgomery St. About $30,000.

N. Y., Buffalo—Automatic Transportation Co., 2933 Main St., plans 2-story, 35 x 150 ft. machine shop.

N. Y., Buffalo—G. Lang Brewery Co. 400 Best St., had plans prepared by J. C. Schultz, archt., 1370 Main St., for 2-story, 60 x 88-ft. bottling plant 397 Dodge St. About $25,000.

N. Y., Long Island City—First Ward Ice Co., 9th Ave., had plans prepared by F. Korfman, archt., 409 9th Ave. for 3-story, 125 x 200-ft. addition to plant and garage. About $35,000.

N. Y., New York—Sussman Holding Corp., 448 East 167th St. having plans prepared by C. Schaefer, archt., 522 Courtland St. for 2-story, 98 x 198-ft. garage. About $30,000. B. Sussman, pres.

N. Y., Utica—Utica Steam Engine & Boiler Wks., 726 Whitesboro St. had plans prepared by C. Kuhin, archt., Clarkmer Bldg. for 1-story, 46 x 96 ft. factory. About $88,500.

N. Y., Watertown—Water Bd. had [illegible] prepared by S. M. Green Co. archts. and engrs., 293 Bridge St. Springfield, Mass., for power plant. About $100,000. J. W. Knowlton, pres.

N. J., Elizabeth—W. A. Clark Wire Co. had plans prepared for 2-story, 105 x 111-ft. machine shop. About $100,000.

N. J., Irvington—Irvington Varnish & Insulator Co. 218 East Speedway Ave., plans 1-story brick factory. About $25,000.

N. J., Jersey City—Hudson Co. Blvd. Com. plans to improve and enlarge lighting plant at Snake Hill. About $150,000. F. Hogue, comr.

N. J., Jersey City—Jersey City Co-Operative Bakers' Assn. having plans prepared by G. A. Flagg, archt., Spingarn Bldg., for 1-story, 100 x 190, and 2-story, 40 x 160-ft. brick and terra cotta warehouse. About $40,000. F. Frasch, 123 Harrison St., Hoboken, pres.

N. J., West Orange—Edison Storage Battery Co., Valley Rd., has increased capital stock from $3,500,000 to $5,000,000 and plans addition.

Pa., Pittsburgh—W. Harley, Brookline Blvd., soon lets contract for storage warehouse. About $35,000. C. R. Geisler, Hostetter Bldg., archt.

Del., New Castle—Wilmington Fibre Specialty Co. plans to rebuild its plant recently destroyed by fire. About $200,000.

Del., Wilmington — Pyrites Co., Ltd., Christiana Ave., plans to rebuild factory recently destroyed by fire. About $75,000.

W. Va., Charlestown—Powhatan Brass Fdry. & Iron Wks. soon lets contract for 1-story addition. A. B. Mullett & Co., Union Trust Bldg., Washington, D. C., archt.

N. C., Elizabeth—Elizabeth City Hosiery Mill Co. plans mill. About $50,000. P. H. Williams, supt.

S. C., Mt. Pleasant—Southern Shipbuilding Co., organized by New York capitalists, issued $250,000 bonds, and plans factory.

Ga., Savannah—Schaffer Baking Co. soon lets contract for 4-story, 60 x 90-ft. plant. About $45,000. C. D. Cooley Co., Century Bldg., Pittsburgh, archts. and engrs.

Ala., Birmingham—Natl. Steel Products Co., plans factory, 8th Ave., between 26th and 28th Sts. About $25,000. R. S. Bohannon, pres.

Ky., Louisville — Reciprocating Electric Tool Co., incorporated with $100,000 capital stock, plans to build factory. J. J. Roberts, 412 Courier-Journal Bldg., in charge.

O., Akron—A. B. Smith Piano Co. 176 Main St., soon let contract for 7-story factory. About $100,000. W. C. Owen & Co. 1900 Euclid Ave., archts.

O., Barberton—Portage Rubber Co. West Barberton St. has increased its capital stock from $3,000,000 to $10,000,000 and plans to build additions to its plant. A. Wildman, genl. mgr.

O., Bedford—Wheeling & Lake Erie R.R., Cleveland, acquired 100 acre site here and plans to build large freight yards. W. L. Robbock, ch. engr.

O., Cincinnati—T. Field, c/o Ferro Concrete Co., archts. 9th and Harriet Sts., plans 3-story, 50 x 150-ft. service and sales station.

O., Cincinnati—Seaton Realty Co. East 4th St., plans 1-story, brick and [illegible] garage, [illegible] Gilbert Ave. About $[illegible] 000.

O., Cleveland—Cleveland Hide Supply Co., Leader News Bldg., purchased [illegible] of land on lake front, and plans to build concrete dock warehouse and other buildings.

O., Cleveland—J. Heller, [illegible] Lorain Ave., soon lets contract 3-story, 60 x [illegible] ft. factory and store, 1100 West 11th St. About $[illegible]. W. MacDuffie, 668 Leader Bank Bldg., archt.

O., Dayton—Pennsylvania Lines West of Pittsburgh, purchased 19 lots near Fairmont Ave. and Stanley St., and plans to build freight shed here. About $[illegible] F. Todd, Pittsburgh, ch. engr.

O., East Cleveland—[illegible] Cleveland Trailer Co., Euclid and Lake Aves., soon lets contract two-story, 50 x [illegible] factory. About $[illegible]. C. S. Reber & Co., Cudell Bldg., Cleveland, archts.

Industrial Works (Continued)

O., **Lakewood**—Motor Service Co., recently incorporated with $15,000 capital stock, contemplates site at Detroit and Newman Sts., and plans 1-story garage and service plant.

O., **Warren**—Warren Tribune Co. soon lets contract for 2-story, 45 x 100-ft. printing plant here. About $30,000. Miller & S— Dollar Bank Bldg. archts.

Ind., **Anderson**—Remy Electric Co. having plans prepared by Schenck & Williams, archts., Arcade Bldg., Dayton, for two 4-story, 50 x 160 and 60 x 312-ft. factories. A. Atwood gen. mgr.

Ind., **Indianapolis**—The Wendely Mfg. Co., Georgia and Shelby Sts., has increased its capital stock from $600,000 to $1,100,000 and plans to build an addition to its plant.

Ind., **Richmond**—Pennsylvania Lines West Pittsburgh soon lets contract freight depot, machine and paint shops. About $125,000. Thos. Rodd, Union Station, Pittsburgh, ch. engr. H. Foltz, 1456 Lemcke Annex, Indianapolis, archt.

Mich., **Carrolton**—Saginaw Shipbuilding Co. plans to increase capital stock from $350,000 to $500,000 and build addition.

Mich., Detroit—American Car & Foundry Co. plans 1-story, 160 x 195-ft. artillery machine shop and assembling plant addition. About $40,000. J. H. Ames, 445 East Ferry Ave., constr. engr.

Ill., **Chicago**—Holpoint Electric Heating Co. plans factory. About $250,000. J. R. Richardson, mgr.

Ill., **East Alton**—Consolidated Chemical Products Co., soon lets contract for 4-story, 100 x 200-ft. factory. About $150,000. I. W. Brandle, c/o Alton Bd. Trade, Alton, mgr. J. W. Randell, Alton, engr.

Ill., **Springfield**—Illinois Watch Co., 9th St. and North Grand Ave., plans 4-story, 40 x 140-ft. factory on 9th St.

Ia., **Keokuk**—Standard Four Tire Co. plans to increase its capital stock to $3,500,000 and build 80 x 400-ft. factory. C. J. Kuhn, pres.

Kan., **Salina**—Butzer Packing Co. increased its capital stock to $450,000 and plans to build several additions. W. Butzer, pres.

Kan., **Salina**—Robinson Milling Co., recently incorporated, having plans prepared for mill and elevator. About $250,000. Address C. E. Robinson.

N. D., **Valley City**—City plans to build heating plant. About $60,000. W. Loud, 39 West Van Buren St., Chicago, engr.

Mo., **St. Louis**—Dazley Churn Mfg. Co., 4301 Warne Ave., soon lets contract for factory, 150 x 200-ft. factory. About $45,000. O. KuBatzky, 6240 Arundel Pl., archt.

Mo., **Sedalia**—Swift & Co. Union Stock Yards, Chicago, having plans prepared by H. H. Jilson, archt., for 4-story addition to packing plant. About $150,000.

Ark., **Pine Bluff**—H. C. Couch, D. B. Nixon and E. B. Bacon, all of Pine Bluff, will organize company with $100,000 capital stock and build cotton mill here.

Tex., **Amarillo**—City plans election to vote on $250,000 bond issue to build electric light plant.

Utah, **Salt Lake City**—F. C. Richmond Machine Co., 317 West 2nd St., plans factory, reinforced. Purchasing Agent. About $90,000.

Ore., **Pringle Falls**—White Pine Lumber Co. Geo. Sell plans prepared for lumber mill and hydro-electric power plant. About $140,000.

Cal., **Santa Barbara**—City plans to build power plants at Mission and Quarter Canyons. About $145,000 and $60,000 respectively.

Que., **Montreal**—Canadian Cement Co. at Notre Dame St., E., plans to build large cement plant. About $1,000,000. J. S. Fleet, engr.

Ont., **Paris**—Abbattoir Co., William St., plans to rebuild factory recently destroyed by fire. About $35,000.

Ont., **Sarnia**—Imperial Dairy Co. plans to build plant here. About $75,000.

B. C., **Maillardville**—Canadian Swift Packing Co. plant soon here. About $75,000.

BIDS DESIRED

N. Y., Bedford Hills—(Official)—Until Dec. 14, by W. G. Barrett, pres. bd. mgrs., New York State Reformatory for Women, remodeling present laundry building for meat storage and refrigerating equipment; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Boston**—Edison Electric Illuminating Co., 39 Boylston St., let contract 5-story substation on Chauncey St., to G. E. Macomber Co., 44 Bromfield St.

Conn., Middletown—Mattabosset Brewing Co., c/o S. P. Moscalitts, 84 Veteran St., Meriden, received lowest bid building 5-story, 80 x 88-ft. concrete brewery, from S. Mazzota, 90 Spring St., $75,000. Noted Oct. 11.

★**N. Y., Brooklyn**—See "Buildings."

★**N. Y., Brooklyn**—L. Leavitt, 454 Driggs Ave., let contract, 3-story, 100 x 125-ft. brick factory, Driggs Ave. and North 11th St. to Selberman, Schampain Co., 104 West 42nd St., New York City, $70,000.

★**N. Y., Central Islip**—State Hospital Comn., Albany, let contract building power house, to B. Raynor, Locust Ave., Islip, $150,000. Noted Nov. 8.

★**Pa., Carnegie**—Aetna Chemical Co. let contract building power house and 100-ft. radial brick stack, to W. W. Lindsay Co., Harrison Bldg., Phila.

★**Pa., Masontown**—Youngstown Sheet & Tube Co., Youngstown, O., let contract coal development plant to Dravo Contg. Co., Diamond Bank Bldg., Pittsburgh, $1,500,000.

★**Pa., Phila.**—A. Schoenut & Co., Adams and Sepviva Sts., let contract for 1-story, 58 x 140-ft. lumber yard, and 40 x 89-ft. kiln building to P. Haiback Contr. Co., 26th and Thompson Sts., $50,000. Noted Dec. 6.

★**Del., Wilmington**—(Official)—Atlas Powder Co. let contract sulphuric-acid plant at Forcite, N. J., including 92 x 100-ft. absorber house, 94 x 110-ft. burner and purification house, 28 x 30-ft. blower house and 62 x 126-ft. preheater and converter house to Austin Co., 14230 Euclid Ave., Cleveland, O.

★**Md., Baltimore**—(Official)—Amer. Propeller & Mfg. Co., 233-49 East Hamburg St., let contract 1 story, 150 x 200 ft. factory on Key Highway, to Price Constr. Co., Maryland Trust Bldg. About $50,000. Item in issue of Dec. 6 an error.

★**O., Cleveland**—Natl. Carbon Co., 117th St. and Madison Ave., let contract 3-story, 40 x 100-ft. factory, to Honkin Conkey Constr. Co., Cuyahoga Bldg., $60,000.

★**O., Columbus**—Scioto Rubber Co., 373 5th Ave., let contract 1-story, 213 x 166-ft. addition to Frankenberg Constr. Co., 705 Columbus Savings & Trust Bldg., $50,000.

★**O., Youngstown**—Amer. Sintering Co., 10 Poland Ave., let contract rebuilding plant recently destroyed by fire, to Stone & Webster, 511 Stambaugh Bldg. New building will be 6 stories. Noted Nov. 29.

★**Ind., La Fayette**—Indiana Lighting Co., 6th and Ferry Sts., let contract for 2-story addition, to A. E. Kemmer, 644 North 7th St., $25,000.

★**Wis., Menasha**—Menasha Wire & Mfg. Co. let contract, 2-story, 44 x 107-ft. factory to A. Bluehl, 424 2nd St. About $25,000. Noted Nov. 22.

★**Wis., Milwaukee**—Milwaukee Forge & Machine Co., 224 Lake St., let contract for 2 brick and concrete shops, to Northwestern Bridge & Iron Co., 127 South Water St., $60,000. Noted Nov. 15.

★**Tex., Port Arthur**—Port Arthur Cooperage Co. let contract 100 x 100-ft. frame and concrete factory, to Secrest Constr. Co., Port Arthur.

★**Okla., Oklahoma**—McClelland-Gentry Motor Co., 725 North Bway., let contract for 3-story, 75 x 140-ft. brick and rein.-con. garage, 8th St. and Bway., to Campbell & Price, 610 Majestic Bldg. About $85,000.

★**Wash., Seattle**—Fidalgo Island Packing Co. let contract for factory to M. J. Johnson, Leach Park, $35,000.

★**Wash., Spokane**—Sperry Flour Co., 662 Mallon St., let contract building mill, to Burrell Eng. Co., 323 South La Salle St., Chicago, $350,000. Noted Nov. 1.

★**Wash., Tacoma**—Griffith Motor Co., Bway., let contract for 3-story, 50 x 120-ft. brick and concrete garage and salesroom to J. E. Bonnell, 760 Commerce St., $35,000.

★**Cal., Los Angeles**—Amer. Can Co., 4801 Santa Fe St., let contract 1-story, 110 x 391-ft. addition to warehouse, to Leonardt & Peck, 572 H. W. Hellman Bldg. About $40,000. Noted Dec. 6.

★**Que., Maisonneuve**—J. I. Chouinard, 330 Notre Dame St., E., Montreal, let contract for factory here, to A. Gratton, 142 5th Ave., about $100,000.

★**Ont., Galt**—Canada Machinery Corp., Concession and Water St., S., let contract addition to foundry to P. H. Secord & Son, Sydenham Bldg., Brantford, $30,000.

★**Ont., Toronto**—Toronto Type Co., 70 York St., let contract for warehouse, to S. L. Yolles, Confederation Life Bldg., about $75,000.

★**B. C., Vancouver**—See "Buildings."

BUILDINGS

Proposed Work

Mass., Randolph—Hospital—Norfolk Co. Dedham, plans tuberculosis hospital on Canton St., here. About $150,000.

Conn., Hartford—School—Bd. Educ. having plans prepared by E. T. Wiley, archt., 75 Pratt St., for addition to Wilson School.

Conn., New Haven—Temple—Masonic Temple Assn. had plans prepared by C. F. Townsend, archt., 129 Church St., for 3-story, brick and marble, York St.

Conn., Waterbury—School—Bd. Educ. had plans prepared by J. T. Smith, archt., 36 North Main St. About $60,000.

N. Y., Brooklyn—Hospital—Zion Hospital, 2140 Crospey Ave., plans to build new hospital at 45th St. near 17th Ave. L. D. Greenfield, pres.

N. Y., New York—Y. M. C. A. having plans prepared by J. F. Jackson, archt., 1328 Bway., for 6-story, brick and stone, 179 West 135th St. About $100,000. Address Dir. Y. M. C. A., 215 West 23rd St.

N. Y., New York—Y. W. C. A. having plans prepared by J. J. Petit, archt., 103 Park Ave., for 6-story, 100 x 150-ft. brick and stone, 137th St. near 7th Ave. J. S. Cushman, 600 Lexington Ave., pres.

N. J., North Bergen—School—Bd. Educ. having plans prepared by Hensel & Weir, archts., 809 Savoye St., West Hoboken, for 2-story, 130 x 140-ft. brick and terra cotta. About $60,000. O. Smith, Town Hall, pres.

Pa., Chadd's Ford—School—Bd. Educ. having plans prepared by V. T. Ritter, archt., North American Bldg., Phila., for 2-story, 85 x 150-ft. brick.

Pa., Chester—Manual Training School—Bd. Educ. plans 4-story. About $300,000.

Pa., Roxborough—Hospital—St. Timothy's Memorial Hospital plans to issue $50,000 bonds to build addition.

S. C., Rock Hill—Church—1st Baptist congregation plans. About $70,000. J. P. Tucker, pastor.

O., Akron—(Official)—Schools—Bd. Educ. to sell $125,000 bonds Dec. 27, to build schools. J. F. Barbhart, clk.

O., Akron—Theater—L. O. Beck, 333 Akron Savings & Loan Bldg., representing company, had plans prepared by A. H. Good, archt., 511 Flatiron Bldg., to construct theater. About $600,000. Gehres & Ritchie, 335 Akron Saving & Loan Bldg., survs.

O., Cincinnati—Banquet Hall and Auditorium—City having plans prepared by Elzner & Anderson, archts., Citizens Bldg. About $125,000.

O., Cleveland—Store—See "Industrial Works."

O., Columbus—Hotel and Store—Grant Realty Co., 1010 Hayden Bldg., soon lets contract 12-story, 62 x 93 ft. About $350,000. M. Peterman, Gobey Bldg., archt.

Buildings (Continued)

O., Dayton—Church, Etc.—Holy Family Congregation having plans prepared by W. L. Jaeckle, archt., 1300 U. B. Bldg., and Prof. Murphy, 1413 8th St., Wash., D. C., associate archt. About $85,000.

O., Deshler—Grade and High School—Bd. Educ. having plans prepared by C. W Bellman, archt., 812 2nd Natl. Bank Bldg., Toledo, for 2-story, 70 x 117 ft. About $60,000.

O., Hubbard—High and Grade School—Bd. Educ. lets contract in January for 2-story. About $110,000. Miller & Son, Dollar Bank Bldg., Youngstown, archts. Noted June 7.

O., Lima — Community House—Redemptorist Fathers, 1201 North Main St., soon let contract, 3-story, 101 x 146-ft. J. G. Behr, rector. A. C. De Curtins, 503 Opera House Blk., archt.

O., Toledo — Exchange—Central Union Telephone Co., 1042 Nicholas Bldg., having plans prepared by Mills, Rhines, Bellman & Nordhoff, archts., 1234 Ohio Bldg., for 2- and 3-story, 50 x 120 ft., Geneva and Arlington Sts. About $110,000. A. J. Mellon, dist. mgr.

Ind., Indianapolis — Hospital — City had plans prepared by A. Scherrer, Sr., archt., for 2-story, brick and concrete. About $90,000.

Wis., Kenosha — Hospital — Dominican Sisters, 322 Congress St., having plans prepared by White, White & White, 414 Pub. Serv. Bldg., archts. About $100,000.

Wis., Milwaukee—Sanatorium — Milwaukee Co. Comrs. having plans prepared by Marshall & Fox, archts., 706 Lincoln Pkwy., Chicago, for Muirdale Sanatorium. About $75,000. L. G. Widule, co. aud.

Wis., Washburn — Sanatorium—Ashland and Bayfield Co. Bds. appropriated $100,000 to build sanatorium.

Ia., Archer—School—Bd. Educ. had plans prepared by Marten & Sutherland, archts., Security Bank Bldg., Storm Lake, for 2-story. About $50,000.

Ia., Emmetsburg—Hotel—Business Men's Comn. having plans prepared by Sawyer & Watrous, archts., 303 Watrous Blk., Des Moines for 3-story, 72 x 120-ft. brick and rein.-con. About $60,000. S. C. Irvine, pres.

Ia., Pella—Dormitory, Auditorium, Etc.—Central College plans, brick and stone. About $125,000.

Minn., Duluth—School—Bd. Educ plans to build, 8th Ave. and East 13th St. About $100,000. Croff & Boerner, archts.

Minn., Lakefield — High and Manual Training School—Bd. Educ soon lets contract. K. T. Snyder, 933 Plymouth Bldg., Minneapolis, archt.

Minn., New Ulm—City Hall—City voted $50,000 bonds to build city hall. W. Backner, city clk. Noted May 31.

Minn., St. Paul—Church—St Mark's Congregation had plans prepared by J. T. Comee, archt., Reshaw Bldg., Pittsburgh, for 1-story, 70 x 135-ft. About $100,000. J. A. Corrigan, 1996 Marshall Ave., pastor.

Kan., El Dorado—Hotel — North American Hotel Co., Bee Bldg., Omaha, Neb., plans 7-story, brick and rein.-con. About $300,000. Bankers' Realty Investment Co., Bee Bldg., Omaha, Neb., archts.

Kan., Kansas City — Stations — Kansas City Terminal Ry. Co. soon lets contract for 2 passenger stations. About $50,000. J. V. Hanna, 209 Union Station, Kansas City, Mo., ch. engr.

Kan., Peabody—High School—Bd. Educ soon lets contract for 2-story, 65 x 110-ft addition. About $50,000. G. W. Van Meter, 604 Murdock Bldg., Wichita, archts. Noted Nov. 29.

Mo., St. Joseph—Store—J. Geiger, M. D., 614 Francis St., plans 5-story, 107 x 133-ft., brick, stone and rein.-con. About $200,000. W. Boschen, Tootle-Lemon Bank Bldg., archt.

Tex., Wichita Falls—Asylum—State soon lets contract building Northwest Texas Insane Asylum here. About $400,000

Okla., Tulsa—Bank and Office—1st Natl. Bank, c/o Rush, Endicott & Rush, archts., 226-27 Unity Bldg., soon lets contract, 10-story, 50 x 140 ft. About $500,000

Idaho, Caldwell — Office — C. H. Sebree having plans prepared by R. E. Field, archt., for 5-story. About $80,000.

Ariz., Phoenix — Hospital—Deaconess Hospital having plans prepared by N. F. Marsh, archt., 211 Bway., Central Bldg., and C. O. Wallingford, assoc. archt., Phoenix, for 2-story, 40 x 60-ft. rein.con. hospital with 40 x 120 ft. wings. About $75,000.

Wash., Seattle — Library — Bd. Regents, State University, Stuart Bldg., Seattle, plans. About $100,000

Wash., Tacoma—Y. M. C. A. having plans prepared by G. W. Bullard, archt., Provident Bldg., for 6-story, 49 x 120-ft. and 2-story, 50 x 50-ft. addition, Market St. About $75,000.

Cal., San Francisco—See "Miscellaneous."

BIDS DESIRED

N. Y., Brooklyn—Court House — Until Dec. 18, by L. H. Pounds, boro. pres. altering and improving Kings Co. Court House, Fulton and Livingston Sts.

N. Y., Brooklyn—Hospital — Until Dec. 19, by State Hospital Comn., Capitol, Albany, building chronic building and dining room at Brooklyn State Hospital. Cost between $150,000 and $200,000. E. S. Elwood, secy. L. F. Pilcher, Capitol, Albany, state archt.

N. Y., Syracuse—School—Until Dec. 24, by Bd. Educ. rebuilding Porter School, 2- and 3-story, 512 Emerson Ave. About $320,000. G. H. Fairchild, pres. G. Wright, Union Bldg., archt. Noted Sept. 13.

N. Y., Wingdale—(Official)—Prison—Until Jan. 10, by Comn. New Prisons, Hall of Records, Bldg., Centre and Chambers Sts., New York City; advertised in this issue.

Pa., Harrisburg — High School — Until Dec. 21, by Bd. Educ., building 1- and 3-story, 40 x 100-ft. addition. About $60,000. D. B. Hammelbaugh, 121 Chestnut St., secy. M. I. Kast, 122 Market St., archt.

Ga., Milledgeville—(Official)—Sanitarium—Until Dec. 19, by Bd. Trustees Georgia State Sanitarium. Noted Nov. 1.

Minn., Austin—Hospital—Until Dec. 17 by St. Olaf's Hospital, 908 Lansing St., 3-story, 44 x 100-ft., brick and rein.-con. About $50,000. C. C. Sedgwick, Lumber Exch. Bldg., Minneapolis, archt. Noted Nov. 22

Minn., Dodge Center—Home—Until Jan. 8, by G. L. Taylor, aud. Dodge Co., Montonville, 2-story, 40 x 100-ft. brick House for Poor. About $50,000. Alden & Harris, 1011 Ex. Bank Bldg., St. Paul, archts. Noted Oct. 18.

Mont., Twin Bridges — Dormitory—Until Dec. 21, by C. T. Stewart, secy. bd. examiners, Helena, building dormitory at State Orphans' Home. F. F. Wilson, Bozeman, archt.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. H., Nashua**—High School, Ed. Bldg. let contract 3-story, 141 x 183 ft. brick and stone, school and auditorium, to Nashua Bldg. Co., Nashua, $200,000. Noted Nov. 29

★**N. Y., Brooklyn**—Office etc.—New York Dock Co., 11 Montague St. let contract, 2-story, 49 x 115-ft. office building and 1-story 30 x 310 x 20 x 200-ft. freight shed to Turner Constr. Co., 244 Madison Ave., New York City, $75,000

★**N. Y., Brooklyn** — Theater — Paramount Theatrical Corp., 1493 Bway., New York City, let contract to Fleischmann Constr. Co., 541 7th Ave., New York City, $[illegible]

N. Y., New York—Penitentiary—Dept. of Correction received bids Dec. 10 ... Class of alterations to south wing and central west wing of workhouse, Blackwells Island from Rangeley Constr. Co., Inc., 105 Lexington Ave., $[illegible]; Marble, Apple & ... 216th St. and Bway., $[illegible]; Gooding Constr. Co., Inc., New York City, $[illegible]. Noted Oct. 11.

★**N. Y., New York**—Office—New Jersey Zinc Co., 55 Wall St., let contract on Front St. and Maiden Lane, to W. L. Crow Constr. Co., 103 Park Ave. Noted Oct. 18

★**N. Y., Pomfert** — Hospital — Nease Memorial Hospital let contract, 2- and 3-story, brick and concrete, to E. J. Bailey, Brewster, $145,000. Noted Sept. 6

★**O., Cleveland**—Office—Smythe Bldg. Co., Erie Bldg., let contract, 1-story, 95 x 186-ft. brick and steel, Euclid and East 4th Sts., to A. M. Allen & Co., 1501 Euclid Ave. Cost, between $[illegible] and $125,000

★**Ind., Lafayette** — Hospital — Ed. Fair Home Hospital let contract 4-story, to A. E. Kemmer, Lafayette. About $115,555. Noted Sept. 29

★**Ia., Iowa City**—Office and Store—I. A. Dey Estate, c/o C. Dey, 507 North Clinton St., let contract to C. Franklin, 510 South Gilbert St. About $[illegible]

★**Minn., Rochester**—Sanitarium—Kahler-Roberts Corp., c/o J. H. Kahler, Zumbro Hotel Co., let contract 4-story, to G. Schwartz, Stebbins Bldg.

★**Okla., Tulsa**—Theater and Office—C. W. Edwards, c/o J. C. Thompson, archt., 220 Iowa Bldg., let contract building 10-story, 80 x 140 ft., to Stone Co., Inc., 310 Bank Commerce Bldg., Toledo, O., $500,000

Wash., Tacoma—Store—See "Industrial Works"

★**Cal., Alameda** — Theater — J. Hamilton let contract to G. W. Stewart, 3010 Central Ave. About $65,000.

★**Ont., Galt**—Bank—Merchants Bank, Montreal, let contract, 2-story, to Schultz Bros. Co., Ltd., 17 Albion St., Brantford, $60,000.

★**B. C., Vancouver**—Depot, Etc.—Canadian Northern Ry. let contract building depot, rein.-con. platforms and train sheds at False Creek, to Northern Construction Co., Ltd., 405 Union Bank Bldg., Winnipeg, and Carter-Halls-Aldinger Co., 1018 Union Bank Bldg., Winnipeg, $1,000,000 and $150,000 respectively

FEDERAL GOVERNMENT WORK

Proposed Work

Pa., Fort Mifflin—Wooden Pier and Bulkhead—Bureau Yards and Docks, Navy Dept., Wash., plans to build wooden pier and bulkhead. Abstract $[illegible]. Specifications No. 2785

Wash., D. C.—Magazine Buildings and Steel Houses—Bureau Yards and Docks, Navy Dept., plans to build 2 magazine buildings and 2 steel houses at St. Julien's Creek. About $[illegible]. Specifications 3741

Wyo., Buffalo—Post Office—J. A. Wetmore, supervising archt., treas. dept., Wash., received bids opened Nov. 24. Same are in course of examination. Noted Dec. 6

Wash., Puget Sound—Electrician, P. C. L.—Building—bids will soon be received at Navy Yard, Puget Sound, for extension to Building No. [illegible]. Specifications [illegible]

BIDS DESIRED

N. Y., Brooklyn—Electric Traveling Crane—Until Dec. 17, by Bureau Yards and Docks, Navy Dept., Wash., for installing electric traveling crane in machine shop, Navy Yard. About $[illegible]. Specifications No. 3117. Noted Nov. 10

N. Y., Owego—Post Office—Until Dec. 14, by J. A. Wetmore, supervising archt. treas. dept., Wash., advertised in this issue.

Md., Indian Head—Extension to Power House—Until Dec. 17, by Bureau Yards and Docks, Navy Dept., Wash., for extending addition to power house. Abstract $[illegible]. Specifications No. [illegible]. Noted Dec. 6

Wash., D. C.—Electric Traveling Crane—Until Dec. 17, by Bureau Yards and Docks, Navy Dept., Wash., for installing electric traveling crane in machine shop, Navy Yard. Abstract $[illegible]. Specifications No. 3141. Noted Nov. 10

Wash., D. C.—Tower and Bulkhead—Until Dec. 17, by Bureau Yards and Docks, Navy Dept., Wash., for building [illegible] tower and bulkhead [illegible]. Specifications No. [illegible]. Noted Dec. 6

Wash., D. C.—Wire Mattress—Until Dec. 17, by U. S. Navy Yard, Pier No. 1, Navy Yard, Wash., for [illegible] wire mattresses for Marine Barracks, Navy Yard, Wash. Specifications No. [illegible]. Noted Dec. 6

Federal Government Work (Continued)

Fla., Jacksonville — Jetty Work — Until Jan. 5, by U. S. Engr. Office, Masonic Temple, Jacksonville, furnishing about 62,000 tons stone and raising outer portion of jetties at entrance to St. Johns River, Fla.

Tenn., Memphis—Steel Barge—Until Dec. 17, by Mississippi River Comm., 1st and 2nd Dists., Customhouse, Memphis, building and delivering 1 steel barge No. 1719; advertised in this issue.

Cal., San Diego—Fuel Oil System—Until Dec. 24, by Bureau Yards and Docks, Navy Dept., Wash., installing fuel-oil system (addendum "C"). Specification No. 2562.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

R. I., Newport—Garage—Bureau Yards and Docks, Navy Dept., Wash., received bids Dec. 10, building at Naval Training Sta., (a) work complete; (b) amount added or deducted from (a) for addition or deduction of one 13-ft. bay, from T. F. Pheer, 159 Washington St., N., Newport. (a) $11,997; (b) add $1000; J. A. Monroe, North Attleboro, Mass., (a) $13,315; (b) add $1,800, deduct $1400; Darling-Slade Co., Contrs. Bridge, Newport, (a) $13,720; (b) add $1700. Noted Nov. 29.

★**Conn., New Haven**—Storehouse and Garage—Bureau Yards and Docks, Navy Dept., Wash., let contract building at Submarine Base, Sect. 1, to M. J. Gibbud Co., 107 Water St., New Haven, $3516.

Conn., New London—Cranes — Bureau Yards and Docks, Navy Dept., Wash., received bids Dec. 10, installing at Submarine Base, (a) 3 cranes complete; (b) one 5-ton crane; (c) one 2-ton and 1-ton crane, from N. B. Payne, New York City. (b) $7500; (bid informal, no certified check); Chesapeake Iron Wks., West Port, Md., (b) $10,800; Cameron Engr. Co., East Stroudsburg, Pa., (c) $900. Noted Nov. 29.

★**Conn., New London**—Removing Wall—Commander Submarine Base, New London, let contract removing wall to B. E. Savage, 30 Dewey St., Worcester, Mass., $3700. Noted Nov. 19.

★**N. Y., Brooklyn**—Fitting Out Cranes—Bureau Yards and Docks, Navy Dept., Wash., let contract one 250-ton fitting-out crane to be installed in Navy Yard, here, to McMyler-Interstate Co., Bedford, O., $841,125. Noted Nov. 29, under "Wash., D. C."

★**N. J., Lake Denmark**—Fencing—Bureau Yards and Docks, Navy Dept., Wash., let contract fencing U. S. machine building, to Anchor Post Iron Wks., 165 Bway., New York City, $47,372. Noted Dec. 6.

Pa., Ft. Mifflin—Ammunition Box Repair House and Central Heating Plant—Bureau Yards and Docks, Navy Dept., Wash., received bids building at Ammunition Depot, (a) work complete; (b) amount deducted from (a) using asbestos roofing in lieu of roofing as specified; (c) amount deducted or added from (a) for steel stack in lieu of radical brick stack, from W. P. Dougherty, 1608 Sansom St., Phila., (a) $27,457; (b) add $600 on (a); (c) deduct $450 from (a); Work Yards Co., 1737 Filbert St., Phila., (a) $47,595; (b) add $520; (c) deduct $200; Lawson Constr. Co., May Bldg., Pittsburgh, (a) $58,850; (b) add $275; (c) deduct $580. Noted Nov. 22.

Pa., Ft. Mifflin—Marine Barracks—Bureau Yards and Docks, Navy Dept., Wash., received bids building at Naval Station, (a) work complete; (b) substituting No. 10 copper clad steel wire with double braid weatherproof insulation from Dawson Constr. Co., May Bldg., Pittsburgh, (a) $66,000; (b) $64,700; Spare & Trieb Co., 233 Bway., New York City, (a) $84,969; (b) $81,165; W. Linker Co., 831 Cherry St., Phila., (a) $75,000; (b) $73,300. Noted Nov. 22.

Pa., Ft. Mifflin—Office—Bureau Yards and Docks, Navy Dept., Wash., received bids (a) work complete; (b) substituting air-lock brick for [illegible] terra cotta tile; (c) substituting [illegible] brick for stucco backing, from George & Boral, 233 South 11th St., Phila., (a) $16,599; (b) $16,[illegible]; (c) $16,[illegible]; W. Linker Co., 831 Cherry St., (a) $17,[illegible]; (b) $17,500; (c) $17,[illegible]; W. [illegible], 1608 Sansom St., all of Phila., (a) $17,[illegible]; (b) $17,[illegible]; (c) $16,[illegible]. Noted Nov. 29.

Pa., Phila.—Cranes—Bureau Yards and Docks, Navy Dept., Wash., received bids Dec. 10 installing cranes in galvanizing plant at Navy Yard, (a) 3 cranes complete; (b) two 6-ton, 2 trolley cranes; (c) one 3-ton crane, from Manning, Maxwell & Moore, 119 West 40th St., (b) $31,448; Chesapeake Iron Wks., West Port, Md., (b) $32,800. Noted Nov. 29.

Pa., Phila.—Heating System — Bureau Yards and Docks, Navy Dept., Wash., received bids Dec. 10, installing heating system in foundry at Navy Yard, (work complete), from Mathis Bros. Co., Archer Ave., and Canal St., $49,000; Enterprise Steam & Hot Water Heating Co., 600 North Howard St., Baltimore, Md., $50,972; H. E. Crook Co., Inc., 28 Light St., Baltimore, Md., $56,950. Noted Nov. 15.

Pa., Phila. — Piping System — Bureau Yards and Docks, Navy Dept., Wash., received bids Dec. 10, installing at Navy Yard, (a) work complete; (b) net price with certain exceptions as to material and methods; (c) complete tunnel and laterals, (d) compressed-air, Delaware River water and fresh water distributing systems complete, from General Heating & Ventilating Co., 200 Milwaukee St., Milwaukee, Wis., (a) $159,945, time, 150 days; H. E. Crook & Co., 28 Light St., Baltimore, Md., (a) $213,863; (c) $94,487; (d) $121,471; Henley & Co., 5 North La Salle St., Chicago, (a) $232,000; (c) $119,000; (d) $125,500. Noted Nov. 29.

★**Pa., Phila.**—Reservoir—Bureau Yards and Docks, Navy Dept., Wash., let contract 2,000,000-gal. rein.-con. reservoir to C. E. Weed, Inc., P. O. Box 7, Albany, N. Y., $45,350. Noted Dec. 6.

★**Md., Indian Head**—Powder Dry Houses—Bureau Yards and Docks, Navy Dept., Wash., let contract building at Naval Proving Ground to Austin Co., Bulletin Bldg., Phila., Pa., $322,000. Noted Nov. 29.

Wash., D. C.—Excavation—Dist. Comrs. received only bid excavating and backfilling 6000 ft. for 16-in. watermain to be laid on new cut road from 37th St. to about 300 ft. from intersection with Conduit Rd., from W. F. Brenizer, Q N and 1st Sts., $0.40 per lin.ft. for excav. and $0.25 per lin.ft. for backfill.

★**Wash., D. C.**—Foundry Extension—Bureau Yards and Docks, Navy Dept., let contract building at Navy Yard to Warren, Moore & Co., 12th and Market St., Phila., $83,000. Noted Dec. 6.

★**Wash., D. C.**—Steel Towers—Bureau Yards and Docks, Navy Dept., let contract building two 200 ft. steel towers at Naval Radio Sta., Virgin Isles, West Indies, to Bedford Fdry. & Machine Co., Bedford, Ind. About $18,190. Noted Dec. 6.

★**W. Va., Charleston**—Electric Duct System—Bureau Yards and Docks, Navy Dept., Wash., let contract building at U. S. Naval projectile plant, to G. E. Eng. Co., 417 Canal St., New York City. About $8,988. Noted Dec. 6.

★**N. C., Chapel Hill**—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., let contract, to Haynes Bros., Chatham, Va., $43,950. Noted Dec. 6.

★**S. C., Charleston**—Power-Plant Improvements—Bureau Yards and Docks, Navy Dept., Wash., let contract to Gillie & Geoghegan, 537 West Bway., New York City, $119,875. Noted Dec. 6.

★**Fla., Arcadia**—Aviation Stations—War Dept., N. D. Baker, secy., let contract building 2 aviation stations to J. G. White, Inc., 43 Exch. Pl., New York City. About $1,500,000, cost plus percentage. Noted Nov. 29 under "Wash., D. C."

Ala., Decatur—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., received bids from S. Plato, Marion, Ind., $47,822; Dreher Constr. Co., 746 Marquette Bldg., Chicago, $51,897; J. N. Boston, Marion, Ky., $54,791. Noted Nov. 1.

★**Ala., Montgomery**—Aviation Station—War Dept., N. D. Baker, secy., let contract to J. H. Alexandria, 338 West Front St., Memphis, Tenn. About $750,000, cost plus percentage. Noted Nov. 29 under "Wash., D. C."

★**Miss., Vicksburg** — Levee Work — 3rd Mississippi River Dist., P. O. Box 404, Vicksburg, let contract building Riverton levee to Roach Stansell, Lawrence Bros. & Co., North Memphis Saving Bank Bldg., Memphis, Tenn., $52,480; Worthington levee to H. B. Blanks, Vicksburg, $72,500. Noted Nov. 8.

★**La., New Orleans**—Jetties—U. S. Engrs. Office, Custom House, New Orleans, let contract furnishing and placing 33,300 tons stone on jetties at Southwest Pass, Mississippi River, to L. F. Alexander, Audubon Bldg., New Orleans, $180,486. Noted Nov. 1.

★**La., New Orleans**—Levee Work—U. S. Engr. Office, 519 Canal St., New Orleans, let contract building 1,822,000 cu.yd. earthwork in lower Tensas, Barataria and Ponchartrain Levee Dists. to Daveron, White & Co., Baton Rouge, La., $350,059. Noted Nov. 8.

★**La., New Orleans**—Radio Buildings—Bureau Yards and Docks, Navy Dept., Wash., let contract building at Naval Sta., to Dreher Constr. Co., 746 Marquette Bldg., Chicago, $15,500. Noted Dec. 6.

★**Mich., Detroit**—Piers, Etc.—U. S. Engineers Office, Detroit, let contract building timber crib concrete piers and excav. of channel of 4th lock, St. Mary's Falls Canal, Mich., to Great Lakes Dredge & Dock Co., Monroe Bldg., Chicago, $242,050. Noted Oct. 11.

★**Ill., Great Lakes**—Outside Electrical Work—Bureau Yards and Docks, Navy Dept., Wash., let contract for outside electrical work at Naval Hospital, to W. A. Jackson Co., 37 West Van Buren St., Chicago. About $17,735.

★**Ill., Great Lakes**—Steel Water Tank—Bureau Yards and Docks, Navy Dept., Wash., let contract installing 100,000-gal. steel wafer tank to Chicago Bridge & Iron Co., 105th and Thorp Sts., Chicago, $8400.

★**Kan., Ft. Riley**—Bridge—Constructing Quartermaster let contract building rein.-con. bridge, to Leavenworth Bridge Co., Leavenworth. Noted Sept. 6.

★**Wyo., Basin**—Post Office—J. A. Wetmore, superv., arch., treas. dept., Wash., let contract to W. D. Lovell, 1415 8th St., S. E., Minneapolis, Minn., $36,500, 9 months. Noted Nov. 29.

★**Ark., Lonoke**—Aviation Station—War Dept., N. D. Baker, secy., let contract building to Stewart McGee Constr. Co., 18 Kahn Bldg., Little Rock, Ark. About $750,000, cost plus percentage. Noted Nov. 29, under "Wash., D. C."

★**Tex., Ft. Sam Houston**—Aviation Station—War Dept., N. D. Baker, secy., let contract, to T. Harman, St. Louis, Mo. About $750,000; cost plus percentage. Noted Nov. 29, under "Wash., D. C."

★**Tex., Fort Worth**—Experimental Station—Bureau Yards and Docks, Navy Dept., Wash., let contract, to Bryce Bldg. Co., 909 Throckmorton St. About $1,000,000; cost plus percentage.

★**Cuba, Guantanomo** — Foam Fire Protection—Bureau Yards and Docks, Navy Dept., Wash., received bids Dec. 10, (a) work complete; (b) with modifications as desired by bidder; (c) gravity foam protection system for 7 steel fuel-oil tanks complete; (d) pressure foam protection system for 2 concrete fuel-oil storage reservoirs, residue fuel-oil tank and gasoline storage tank, from Carroll Electric Co., 714 12th St., Wash., D. C., (a) $135,750; (b) deduct $2575; (b2) $18,000; (b3) $21,000; (c) $63,800; (d) $78,350; Stewart Eng. Co., 61 Bway., New York City, (a) $130,200; (c) $56,270; (d) $74,980. Noted Nov. 8.

MISCELLANEOUS

Proposed Work

Tunnel—Bridgeport, Conn.—See "Streets and Roads."

Coal Pockets—Jersey City, N. J.—Union Terminal Cold Storage Co., 12th St., had plans prepared by J. G. Glover, archt., 222 Navy St., Brooklyn, N. Y., for 2½-story, 25 x 47-ft. About $25,000.

Retaining Wall — Bellaire, O. — See "Streets and Roads."

Park Improvements, Etc.—Cleveland, O.—Cuyahoga Co. Park Comn., Old Court House, plans to improve parks and boulevards. About $200,000. R. Hyre, secy.

Dock—Superior, Wis.—Great Northern Allonez Co. plans to rebuild ore dock No. 3. About $500,000.

Transmission Lines—Vail, Ia.—City voted $11,000 bonds to build transmission line from here to Denison.

Dam—Bridgeport, Neb.—Bridgeport Irrigation Dist. having plans prepared for concrete and earth dam across Platte River. About $75,000. Address R. H. Williams.

Miscellaneous (Continued)

Waterfront Improvement—Corpus Christi, Tex.—City election Jan. 2 to vote on $600,000 bonds to improve waterfront, including 15,000 ft. shore protection, several million yards filling, 5 mi. paved streets, rein.-con. bridges, etc. R. Miller, mayor.

Pipe Line—Morrison, Okla.—City election Dec. 20, to vote on $10,000 bonds to build pipe line. E. R. Edward, pres. bd.

Wharf—San Francisco, Cal.—State Bd. Harbor Comrs., Sacramento, had plans prepared by F. G. White, ch. engr., building 56 x 2145-ft. wharf at China Basin from point near Channel St. to pier No. 54, including 4 piers and eventually a causeway from wharf to Mission Rock; 60 x 75-ft. shed on pier No. 41; 110 x 710-ft. shed on Pier No. 3; 30 x 400-ft. bulkhead wharf building and 66 x 99-ft. passenger building.

Dredging — Three Rivers, Que. — Tide Water Shipbuilding Co. plans to dredge channel from St. Lawrence River to its plant. About $20,000. H. B. Tourigny, dist. engr.

Subway — London, Ont. — Western Fair Bd. plans to build subway. A. M. Hunt, Dominion Savings Bldg., secy. treas.

Wharf and Ways—Vancouver, B. C.—J. Coughlan & Sons, 500 Beatty St., having plans prepared for wharf and 4 launching ways at False Creek.

BIDS DESIRED

Station Finish—New York, N. Y.—Until Dec. 26, by Pub. Serv. Comn., 120 Bway., for station finish on parts of Bway.-4th Ave. and 7th Ave.-Lexington Ave. Rapid Transit R.R.

BUILDING OPERATIONS FOR NOVEMBER

Following is a list of contracts awarded published by the F. W. Dodge Co. for New England, New York, New Jersey, Pennsylvania, Maryland, Delaware, District of Columbia, Virginia, Ohio, West Virginia, Illinois, Indiana, Iowa, Wisconsin, Michigan, Minnesota, North and South Dakota, and portions of Missouri and eastern Kansas from Jan. 1 to Nov. 1, 1917:

January 1 to December 1, 1917	$1,527,370,000
January 1 to December 1, 1916	1,243,998,397
January 1 to December 1, 1915	857,190,100
January 1 to December 1, 1914	677,920,300
January 1 to December 1, 1913	798,117,500
January 1 to December 1, 1912	803,391,500
January 1 to December 1, 1911	735,283,813
January 1 to December 1, 1910	756,284,931

NEW YORK AND NORTHERN NEW JERSEY

Comparative statistics of building and engineering operations in New York State and Northern New Jersey, as compiled by the F. W. Dodge Company:

January 1 to December 1, 1917	$316,014,000
January 1 to December 1, 1916	255,381,500
January 1 to December 1, 1915	155,154,500
January 1 to December 1, 1914	121,598,000
January 1 to December 1, 1913	235,694,500
January 1 to December 1, 1912	211,282,500
January 1 to December 1, 1911	215,839,500
January 1 to December 1, 1910	233,081,900

The November total for contracts awarded in the larger territory amounts to $94,278,000 against $154,451,574 for October, and $122,464,271 for September. For the smaller territory the figures for November are $29,738,000 against $38,921,000 for October, and $35,027,000 for September.

Fast Erection of Munition Plant — The day after a contract for millions of dollars' worth of special recoil mechanisms had been let to Dodge Brothers, Detroit, by the United States Government, work began on a plant in that city for manufacturing the mechanisms. Excavation for the 578 x 818-ft. building is going forward rapidly, at the present time, and it is expected that the plant will be in operation by spring. The construction is in charge of Dodge Brothers' superintendents.

Federal-Ship Plant Built in 76 Days — The large ship-erecting plant of the Submarine Boat Corporation has been virtually completely erected, on Newark Bay, N. J., in 76 days. Keels of three steel ships will be laid before Jan. 1, 1918. The plant should be releasing completed vessels by June. More than 50 are expected to be turned out in 1918. The plant has contracted for 150, aggregating 750,000 tons.

Flooring — Willard, N. Y. — (Official)—Until Dec. 19, by State Hospital Comn. Capitol, Albany, for new floor construction at Willard State Hospital. E. S. Elwood secy.; advertised in this issue.

Bulkhead—Atlantic City, N. J. — See "Streets and Roads."

Fire Escapes—Dover, N. J.—(Official) — Until Dec. 18, by Bd. Educ., North Side School, for fire escapes and other alterations to South Side School. C. H. Benedict, secy.; advertised in this issue.

Levee Work—Shreveport, La.—(Official) Until Dec. 28, by Comrs. Caddo Levee Dist., Shreveport, building in Caddo Parish, Red River, right bank, above Shreveport, Briarfield to Cottonwood Bayou Levee, involving 102,000 cu.yd. excav.; Cottonwood Bayou to Hurricane Bluff Levee, involving 106,000 cu.yd. excav.; Hurricane Bluff to Cairo Levee, involving 105,000 cu.yd. excav.; Cairo to Fire Point Levee, involving 97,000 cu.yd. excav.; Fire Point to Pickett Levee, involving 116,000 cu.yd. excav.; below Shreveport, Caldwell Point to Tones Bayou Levee, involving 120,000 cu.yd. excav. W. A. Kerley, secy. Noted Oct. 18.

River Channel Improvements—Columbus, O.—Until Dec. 18, by C. A. Borden, dir pub. serv., widening Scioto River, also building levees, bridge, etc. Noted Nov 22; advertised in this issue.

Creek Diversion—Rosedale, Kan.—(Official)—Until Dec. 22, by A. H. Schmedinghoff, city clk., for constructing Turkey Creek Diversion, upper section involves excav. of channel for distance of about 3500 ft. building levees for channel, rein.-con. bridge over channel on Southwest Blvd., steel bridge on Rosedale Ave. and removal and rebuilding of foot bridge on Henning Ave., lower section, excav. channel, about 6100 ft., levees, concrete tunnel 28 ft. in diam. and about 1300 ft. long and subway under certain Santa Fe tracks, all to provide for changed flow of Turkey Creek. Harrington, Howard & Ash, Orear Leslie Bldg., Kansas City, Mo., cons. engrs.

Levee — Chamois, Mo.—(Official)—Until Jan. 5, by J. R. Clarstang, secy. bd. comrs., Shawnee Creek D. D., building 60,000 cu.yd. earth levee, advertised in this issue.

Seawall, etc.—Long Beach, Cal.—Until Dec. 18, by Bd. Pub. Wks., building combined rein.-con. seawall, sidewalk, center wall, end walls, steps, 42-in. pipe culverts, sheradized wrought iron conduits, concrete lighting posts, etc., on Seaside Blvd. About $76,000. Noted Nov. 15.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Tunnel—Pittsburgh, Pa.—Allegheny Co. Comrs. let contract for tunnel connecting county court house and city-county building, to F. F. Schellenberg, Hartje Bldg. About $20,288.

Flood Control Works—Dayton, O.—Bd. Dir., Miami Conservancy Dist. rejected all bids building dams and appurtenances for flood control work. Work will be performed under direct supervision of district. Noted Nov. 22.

★Revetment Work—Sioux City, Ia.—Sioux City Stockyards Co. let contract for piling willow facing and riprap work, to E. A. Whitney, 621 5th St., $20,000.

★Embankment — Dallas, Tex. — See "Streets and Roads."

BARGE CANAL WORK

Contract 165

Bids were received by W. W. Wotherspoon, supt. pub. wks., for removing Montezuma Aqueduct and completing canal prism excavation, also redredging canal prism, near Fox Ridge, from (A) Engineer's estimate; (B) Mohawk Dredge & Dock Co., Inc., Herkimer. The unit bids were as follows:

	A	B
170,700 cu.yd. excavation	$0 40	$0 79
5,630 cu.yd. removing old masonry	1 25	3 25
925 M ft. b. m. removing old timber	3 00	12 00
2,830 pulling round piles	1 25	2 50
345 lin.ft. pulling wooden sheet piling sta., 5,440	2 00	4 00
2,600 lin.ft. furnishing and driving fender piles	50	80
2,600 lin.ft. driving fender piles	35	55
Extended totals	$84,530	$176,216

STATE HIGHWAYS—CALIFORNIA

Bids were received by State Highway Comn., Sacramento, for constructing highway in Los Angeles Co., Div. 7, Route 9, Sect. "A," from (a) A. L. McCray, 234 West 28th St., Los Angeles; (B) F. Hoffman, 111 East 12th St., Long Beach; (C) G. R. Curtis, 2440 East 26th St., Los Angeles. The unit bids were as follows:

	A	B	C
258,000 cu.yd. excavation without classification	$0 71	$0 76	$0 85
3,250 lin.ft. 12-in. corrugated metal pipe	60	70	1 50
3,980 lin.ft. 18-in. corrugated metal pipe	70	1 00	1 50
1,450 lin.ft. 24-in. corrugated metal pipe	80	1 10	1 50
398 lin.ft. 30-in. corrugated metal pipe	90	2 35	3 50
1,803 cu.yd. portland cement concrete, class A (walls and [illegible])	15 00	15 00	17 50
203 cu.yd. portland cement concrete, class A (retaining walls)	14 00	16 00	17 50
8.5 ms. moving and resetting property fences	225 00	100 00	250 00
1,032 monuments (hand set)	1 00	1 25	1 75
Extended totals	$223,556	$241,542	$271,855

Bids were received by State Highway Comn., Sacramento, for constructing highway in Humboldt Co., Div. 1, Route 1, Sect. "F," from (A) Dolbeer & Carpenter, Hooker & Lent Bldg., San Francisco; (B) A. J. Raisbeck, Willits; (C) Warren & Bechtel, 625 Market St., San Francisco; (D) Estes & Hofman, Central Bank Savings Bldg., Oakland, $284,818; (E) Shatting Ettlinger Co., San Francisco, $345,811. The unit bids of the 4 lowest bidders were as follows:

	A	B	C
53,700 cu.yd. excavation without classification	$0 [illegible]	$1 00	$0 [illegible]
858 lin.ft. 18-in. corrugated metal pipe	[illegible]	[illegible]	[illegible]
365 lin.ft. 24-in. corrugated metal pipe	[illegible]	[illegible]	[illegible]
210 cu.yd. portland cement concrete, class A (walls and [illegible])	16 [illegible]	17 00	15 00
9,800 cu.yd. portland cement concrete, class A (pavement)	[illegible]	5 50	[illegible]
4,600 lin.ft. guard rail	[illegible]	[illegible]	[illegible]
170 monuments (hand set)	1 00	1 00	1 00
Extended totals	$[illegible]	$[illegible]	$[illegible]

SEARCHLIGHT SECTION

Contracts To Be Let

PROPOSALS

Bids received until Dec. 29, 1917.

Bridge Repairs

BOARDS OF SUPERVISORS, ALBANY COUNTY AND RENSSELAER COUNTY, STATE OF NEW YORK

Troy, N. Y.

Sealed bids or proposals for repairing 12th Street Bridge over the Hudson River between Ontario Street, City of Cohoes and 12th Street, Lansingburg, City of Troy, in accordance with form of contract, plans and specifications adopted October 18th, 1917, will be received at the office of C. A. Roemer, County Superintendent, County Court House, Troy, N. Y., until twelve o'clock noon, Saturday, December 29th, 1917, and then and there will be publicly opened and read.

The work consists of repairing trusses and floor beams, renewing all woodwork of floor, building new retaining wall on south side of Cohoes approach and paving bridge and approach with wood block paving.

List of the approximate quantities of material involved is given below:

Structural steel (excluding spikes), 48,600 lbs.

Rivets to knock out, 700.

Holes to drill, 10,100.

Rivets to drive, 9,850

Creosoted Yellow Pine Scantling, 86,000 ft. B.M.

Creosoted T & G Plank, 62,000 ft. B.M.

Creosoted 2-in., 29,000 ft. B.M.

Oak Lumber, off, 17[illegible],000 ft. B.M.

3-in. Creosoted wood block paving, 1,720 sq.yds.

3½-in. Creosoted wood block paving, 1,540 sq.yds.

Concrete curb, 673 lin.ft.

7-in. concrete base, 322 cu.yds.

Catch Basins, 2.

Concrete sidewalk paving, 3,540 sq.ft.

Concrete Retaining Wall and Pedestals, 470 cu.yds.

Reinforced Rods and Dowels, 2,000 lbs.

Pipe Railing, 565 lin.ft.

Bids should be addressed to Highway Committee of Rensselaer County and Roads and Bridges Committee of Albany County, Rensselaer County Court House, Troy, N. Y., and endorsed "Bid for repairing 12th Street Bridge."

Bids must state prices for all items of the work and bids which do not include all the prices called for in the bidding form may be rejected.

Plans and specifications may be seen and bidding forms obtained at the office of E. J. Bedell, County Superintendent, Court House, Albany, N. Y., or C. A. Roemer, County Superintendent Court House, Troy, N. Y.

All proposals must be made upon the form furnished by the County Superintendents and must give prices in both words and figures and be signed by the bidder, with his business address and place of residence.

Each bidder will be required to give the Committee satisfactory evidence of his competency, experience and responsibility to perform such work.

Each bid must be accompanied by a certified check or draft for Two Thousand Five Hundred Dollars ($2,500.00) payable to the Treasurers of Albany and Rensselaer Counties, N. Y., such check to be returned to the bidder unless forfeited under the conditions herein stipulated.

A bond will be required for the faithful performance of the contract in the sum of 50% of the contract price, with a surety company, authorized to do business, in the State of New York and satisfactory to the Committees.

The person or firm to which contract shall be awarded will be required to offer his surety and to execute contract and furnish required bond within ten days (excluding Sundays) from the date of mailing notice to him, at the address given in his bid, that contract is ready for signature; and in case of failure or neglect to so appear and execute contract and bond, the bidder will be deemed to have abandoned the contract, and the check accompanying the same shall be forfeited to the Counties of Albany and Rensselaer.

The right is reserved to increase or diminish the quantity of work called for, or to omit or modify particular items, as may be deemed necessary.

The right is reserved to reject any and all bids and to waive any defect or informality at the discretion of the committee, should the same be deemed to the best interest of the Counties of Albany and Rensselaer.

WILLIAM B. SHERMAN
A. C. NILES
C. Z. BENNETT
SALEM H. WHITE
JOHN H. FINNERTY
Highway Committee of Rensselaer County, Board of Supervisors.

JOHN J. THOMSON
ALEXANDER FLANSBURG
FREDERICK J. VAN WORMER,
EMANUEL WENGER
MICHAEL S. POE
Roads and Bridges Committee of Albany County, Board of Supervisors.

Official Proposals

Price, $3.60 an inch—Copy can be received until Wednesday, 10 a.m., for issue mailed the next day.

PROPOSALS

Bids received until Dec. 20, 1917.

Wingdale Prison Improvements

Wingdale, N. Y.

Sealed proposals for Construction, Heating, Sanitary and Electric Work for Cell House, Interlocking Building, Mess Hall, and Central Heating and Lighting Plant, and Underground Piping and Conduit Work, Underground Sewer and Water Connections and Underground Electric Service Connections, at Wingdale Prison, Wingdale, N. Y., will be received by the Commission on Prisons, Room 618, Hall of Records Building, Centre and Chambers Sts., New York City, until 2:30 o'clock p.m., on Thursday, January 10, 1918, when they will be publicly opened and read. Proposals shall be inclosed in an envelope furnished by the State Architect, sealed and addressed, and shall be accompanied by a certified check in the sum of five per cent. (5%) of the amount of proposal. The contractors to whom the awards are made will be required to furnish surety company bond in the sum of fifty per cent. (50%) of the amount of contract within thirty (30) days after official notice of award of contract and in accordance with the terms of Specifications Nos. 2812, 2813, 2814, 2815, 2879, 2882, 2869, 2885, 2872, 2880, 2883, 2870, 2886, 2873, 2881, 2884, 2871, 2887 and 2874. The right is reserved to reject any or all bids. Drawings and specifications may be consulted at the office of the Commissioner on New Prisons, Room 618, Hall of Records, New York City, at the New York Office of the Department of Architecture, Room 1224, Woolworth Building, and at the Department of Architecture, Capitol, Albany, N. Y. Drawings and specifications and blank forms of proposal may be obtained at the Department of Architecture, Capitol, Albany, N. Y., upon the deposit of a certified check in the sum of $10.00 made payable to the State of New York for each set of plans and specifications, which check will be returned if plans and specifications are sent back in good condition to the State Architect, Lewis F. Pilcher, Capitol, Albany, N. Y.

Dated: December 10, 1917.

PROPOSALS

Bids received until Dec. 18, 1917.

River Channel Improvement

Columbus, Ohio.

Bids will be received by the City of Columbus, Ohio, at the office of its Director of Public Service, City Hall Building, Columbus, Ohio, until twelve o'clock noon, central standard time, Tuesday, December 18, 1917, for widening the Scioto river and constructing levees, bridges, and other work in connection therewith, in accordance with the plans and specifications on file with Henry Maetzel, Chief Engineer, from whom bidding blanks and information may be obtained.

The work involves the following principal quantities:

1,860,000 cubic yards excavation,
34,000 cubic yards concrete,
72,200 square yards revetment,
33,500 linear feet piling.

Bids will be received on the work:

First: As a whole.

Second: Channel excavation.

Third: All concrete masonry.

Fourth: Seven-span concrete arch bridge, sixty feet wide and six hundred and seventy feet between abutments.

Fifth: Masonry weir, walls and miscellaneous work.

Sixth: Steel bridge, alternative plan for Fourth Item.

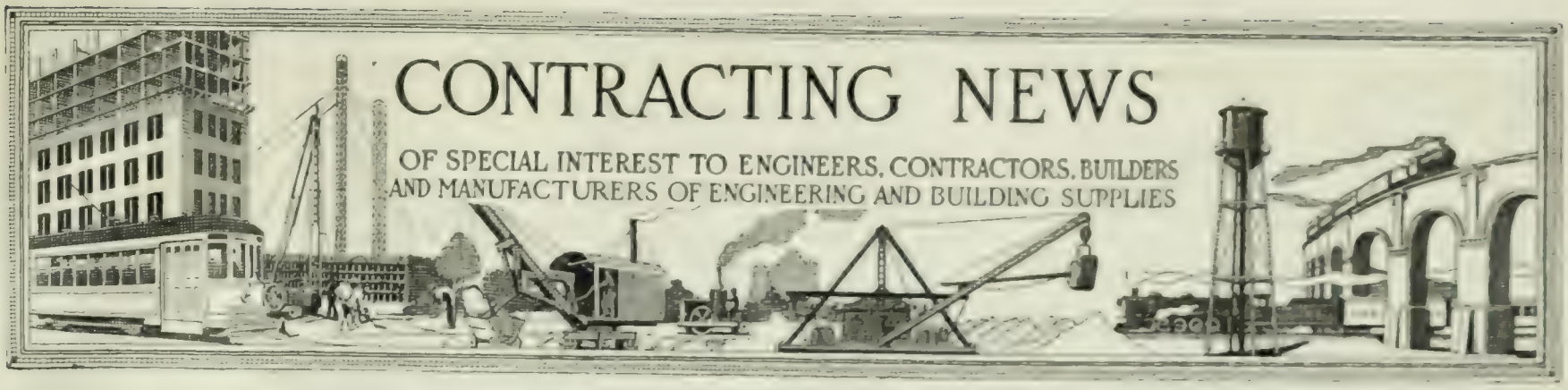
A deposit of $25.00 is required to insure return of plans on or before day of letting.

GEO. A. BORDEN,
Director of Public Service.

Attest:
H. J. KLINE, Secretary.

U. S. ENGINEER OFFICE, 305 Southern Building, Washington, D. C.—Sealed proposals for removing wreck of Barge "Tangier" from York River, Virginia, will be received at this office until 12 M., Dec. 21, 1917, and then opened. Information on application.

UNITED STATES ENGINEER OFFICE, Galveston, Texas.—Sealed proposals will be received here until 12 o'clock M. December 14, 1917, and then opened, for furnishing and delivering riprap at Port Aransas, or Rockport, Texas. Information on application.



Proposals

For Proposals Advertised See Pages 47 to 50 Inclusive

WATER-WORKS

Bids Close		See Eng. News-Record
Dec. 27.	Eureka, Kan.	Dec. 20
Dec. 29.	Chanute, Kan.	Dec. 20
Jan. 3.	Tipton, Kan.	Dec. 20

SEWERS

Dec. 24.	West Park, O.	Dec. 13
Dec. 24.	Enid, Okla.	Dec. 20
Dec. 27.	Normal, Ill.	Dec. 20
Dec. 27.	Elizabeth, N. J.	Dec. 20
Dec. 27.	Pittsburgh, Pa.	Dec. 20
Dec. 27.	New York, N. Y.	Dec. 20
Dec. 30.	Rocky River, Ohio	Nov. 29
Jan. 3.	Union Grove, Wis.	Dec. 20
Jan. 7.	Westfield, J	Dec. 20
Jan. 8.	Miami, Okla.	Dec. 20
Feb. 1.	Toledo, O.	Dec. 13

BRIDGES

Dec. 29.	Troy, N. Y. Adv. Dec. 13 and 20.	Dec. 13
Jan. 3.	Anoka, Minn	Dec. 20
Jan. 4.	Richmond, Va.	Dec. 20
Jan. 8.	Salinas, Cal.	Dec. 13
Jan. 9.	Lodge Grass, Mont.	Dec. 20

STREETS AND ROADS

Dec. 24.	California	Dec. 13
Dec. 24.	Long Island City, N. Y.	Dec. 20
Dec. 26.	Newark, N. J.	Dec. 20
Dec. 26.	Riverside, Cal.	Dec. 20
Dec. 27.	Ft. Collins, Colo.	Dec. 20
Dec. 27.	Elizabeth, N. J.	Nov. 29
Dec. 27.	Ohio	Dec. 13
Dec. 27.	Atlantic City, N. J.	Dec. 13
Dec. 27.	New York, N. Y.	Dec. 20
Dec. 28.	Webster Springs, W. Va.	Dec. 13
Dec. 29.	Huntington, Ind.	Dec. 6
Dec. 31.	Bay Minette, Ala	Dec. 6
Dec. 31.	California	Dec. 20
Jan. 2.	Alexandria, La.	Dec. 13
Jan. 4.	Richmond, Va.	Dec. 20
Jan. 7.	Pasco, Wash.	Dec. 20
Jan. 8.	Wenatchee, Wash.	Dec. 20
Jan. 8	Oregon	Dec. 20

EXCAVATION AND DREDGING

Dec. 27.	Mason City, Ia.	Dec. 20
Dec. 31.	Glenwood, Minn.	Dec. 20
Jan. 3.	Sac City, Ia.	Dec. 20
Jan. 9.	Tuscola, Ill.	Dec. 20
Jan. 11.	Walker, Minn.	Dec. 20

Bids Close		See Eng. News-Record

INDUSTRIAL WORKS

Jan. 8.	Albany, N. Y. Adv. Dec. 20.	Dec. 20

BUILDINGS

Dec. 24.	Cleveland, Ohio	Dec. 6
Dec. 24.	Syracuse, N. Y.	Dec. 13
Dec. 24.	Lima, O.	Dec. 20
Dec. 26.	Taft, Cal.	Dec. 20
Dec. 27.	New York, N. Y.	Dec. 20
Dec. 27.	Phila., Pa. Adv. Dec. 20	Dec. 20
Dec. 27.	Greycourt, N. Y.	Dec. 20
Dec. 30.	St. Cyprien, Que.	Dec. 13
Dec. 31.	Brooklyn, N. Y.	Dec. 20
Jan. 1.	Wichita, Kan.	Nov. 22
Jan. 7.	Cleveland, O.	Dec. 20
Jan. 8.	Dodge Center, Minn.	Dec. 13
Jan. 15.	New York, N. Y.	Nov. 29
Jan. 16.	Huron, S. D.	Dec. 20

FEDERAL GOVERNMENT WORK

Dec. 24.	Fuel Oil System — San Diego, Cal.	Dec. 13
Dec. 26.	Sewerage System, Water Supply Intake, Reservoir Washington, D. C.	Dec. 6
Dec. 27.	Post Office — Alexandria, La. Adv. Nov. 22 and 29.	Nov. 22
Dec. 27.	Steam Heating System — Shawnee, Okla	Dec. 6
Jan. 4.	Buildings — Grande Isle, La. Adv. Dec. 6 and 13.	Dec. 6
Jan. 5.	Jetty Work — Jacksonville, Fla. Adv. Dec. 13.	Dec. 13
Jan. 7.	Post Office — Eldorado, Kan.	Dec. 6
Jan. 7.	Post Office — Shawnee, Okla	Dec. 6
Jan. 7.	Electric Traveling Crane — Brooklyn, N. Y.	Dec. 13
Jan. 7.	Post Office — Bakersfield, Cal.	Dec. 20
Jan. 7.	Laundry Equipment, etc. — Annapolis, Md	Dec. 20
Jan. 14.	Post Office — Owego, N. Y. Adv. Dec. 13 and 20.	Dec. 13
Jan. 14.	Roads — Chelsea, Mass	Dec. 20
Jan. 15.	Post Office — Eldorado, Kan.	Dec. 20
Jan. 21.	Radio Towers and Tank — Barataria, La.	Dec. 20
Jan. 28.	Post Office — Sunbury, Pa	Dec. 6

MISCELLANEOUS

Dec. 26.	Station Finish — New York, N. Y.	Dec. 13
Dec. 27.	Dam — Eureka, Kan.	Dec. 20
Dec. 28.	Levee Work — Shreveport, La.	Dec. 13
Jan. 2.	Improving Harbor — Nantucket, Mass. Adv. Nov. 29 to Dec. 14.	Nov. 29
Jan. 3.	Transmission Line — Fremont, N. C.	Dec. 27
Jan. 5.	Levee — Clarksdale, Miss. Adv. Dec. 13 and 20	Dec. 13
Jan. 15.	Dam — Calgary, Alta. Adv. Dec. 20	Dec. 13

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official.

WATER-WORKS

Proposed Work

Conn., Torrington — City having plans prepared by C. H. Preston, Jr., engr., 136 Grand Ave., Waterbury, building 3 reservoirs near here. About $1.5[illegible]

N. J., Millville—City election soon to vote on $125,000 bonds to purchase and improve People's Water Co. W. B. Wade, city engr.

Pa., Butler—Butler Water Co. will issue $321,500 stocks; proceeds to provide for extensions and improvements. H. O. Carson, engr.

Pa., Columbia—Columbia Water Co. acquired land adjoining plant and plans to build addition to filtration plant.

Pa., Connellsville — Connellsville Water Co. will issue $27,000 stocks; proceeds to be used for extensions and improvements.

Pa., McKeesport—(Official) — Here receives bids to spring for new water system, including 4 one million-gal. filtered pumping plant, boiler house, standpipe and pipe lines. About $[illegible]. L. Hudson, 8021 House Bldg., Pittsburgh, engr. Noted Nov. 29.

Pa., Phila.—City plans to lay water pipe in Stenton Ave., from Ogontz Ave. to Broad St.; Sharpnack St. from Stenton to Michener Ave.; Cheltenham Ave. from Ogontz Ave. to Vernon Rd.; Phil-Ellena St. and Vernon Rd. from Stenton to Cheltenham Ave.; Michener and Fleetring Aves. and Thouron St., from Vernon Rd. to Limekiln Pike; Winlaton Ave. from Walnut to Washington Lane; 73d Ave. and Tulpehocken St. from Windsor Ave. to Limekiln Pike. C. E. Davis, city engr.

Pa., Warren—Warren Water Co. will issue $[illegible] bonds; proceeds to be used for improvements and extensions.

W. Va., Wheeling—City authorized C. O. Nagle, supt. water works, to purchase 8 chlorine gas machines to be attached to reservoir intake pipes.

Ala., Talladega — City [illegible] bonds to build water [illegible]. J. W. Vandiver, mayor.

Ky., Paducah—City retained F. W. Dillard & Co. engrs., 811 Starkland Bldg., to make survey and prepare plans for waterworks system.

O., Cleveland—(Official)—City [illegible] bonds for waterworks system. E. Burbank, city engr.

O., Hamilton — City plans [illegible] to water-works. About $18,[illegible] F. E. Weaver, city engr.

O., Rocky River — (Official)—City will [illegible] bonds Jan. 15, to lay and install water mains in West Lake Rd. F. Mitchell, clk.

O., West Park—(Official)—Council [illegible] Ave., about [illegible] ft., and 24" C. I. cast iron pipe and 4 hydrants in connection with water main [illegible]. About $[illegible]. Noted Nov. 15.

Ill., Charleston — [illegible] to install water softening [illegible] gal. pump [illegible]. About $[illegible]. A. A. Trendley, engr.

Wis., Merrill—(Official)—City plans to [illegible] water works [illegible].

Water-Works (Continued)

Kan., Galena—City receives bids about Feb. 1 improving water-works and filtration plant. About $[illegible]. Burns & McDonnell, 402 Interstate Bldg., Kansas City, Mo., engrs. Noted Oct. 18.

Neb., Falls City—City election Jan. 15, to vote on $15,000 bonds to extend water system.

Neb., Omaha—City plans to lay 4 mi. water mains to Ft. Crook. About $60,000. J. A. Bruce, city engr.

N. D., Minot—City soon receives bids for water mains and 3,000,000-gal. reinforced reservoir. F. Bass, 244 Plymouth Bldg., Minneapolis, engr. Noted Sept. 27.

Mont., Winnett—City plans to build reservoir. About $15,000.

Okla., Altus—City voted on $80,000 bonds for water-works system. Noted Nov. 22.

Idaho, Montour—R. E. Noland plans to build pumping system to water 2200 acres of land south of here. About $30,000.

Idaho, Twin Falls—City plans to build water system. Bond election soon.

Ariz., Verde — (Liberty P. O.) — See "Buildings."

Ariz., Yuma—(Official) — City will not vote Dec. 11 on $400,000 bond issue to build water, gas, electric-light, heat, and sewer systems. Noted Nov. 29.

Que., Montreal—City receives bids about April or May building water system, dykes, etc. About $40,000. P. Mercier, engr.

Que., St. Georges de Champlain — City having plans prepared by W. Bourassa, engr., Grand' Mere, for acqueduct. About $50,000.

Ont., Bienville—City is in market for hydraulic pump with 250,000-gal. capacity.

Ont., Peterboro—City plans to build water mains. About $13,000. R. H. Parson, engr.

BIDS DESIRED

Kan., Chanute—(Official)—Until Dec. 29, by C. G. Woods, city clk., improving water system. Black & Veatch, Inter-State Bldg., Kansas City, Mo., engrs. Noted Nov. 29.

Kan., Eureka—Until Dec. 27, by J. W. Keener, city clk., improving water-works system involving 360 cu.yd. concrete, plain and reinforced, and 1500 cu.yd. embankment. Black & Veatch, Interstate Bldg., Kansas City, Mo., engrs. Noted Oct. 18.

Kan., Tipton—Until Jan. 3, by N. Arnold, city clk., furnishing and installing equipment for water-works system, Sect. 1, 2, 3, 4, and 5 involves 10,287 ft. 4-6 in. cast iron pipe, 18 hydrants, 19 valves, 160 ft. sewer, 10,000 and 50,000-gal. tank, one 100-gal. triplex pump clutch connected to 12 hp. gasoline engine, etc. G. P. Taylor, Stockton, engr. Noted May 31.

Okla., Miami—See "Sewers."

Cal., Taft—See "Buildings."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., New York — W. Williams constructing engrs., gas and electricity, received [illegible] laying water mains and generating gas at 51st Ave. and Delancey St., from Beaver Eng. & Contg. Co., 31 Chambers St., $44,426; J. A. Gregory, 148 West 137th St., $78,478; Knight & DeMuro, Inc., 2353 Washington Ave., $[illegible]. Noted Dec. 6.

★Ark., Marvel—See "Sewers."

Wash., Seattle—Bd. Pub. Wks. received bids building water mains in Alki Ave. (a) [illegible] pipe, (b) cast iron pipe, from Superior Constr. Co., 181 Yesler Way, (a) $[illegible], (b) $[illegible]; Steiger & Co., 1736 42nd Ave., (a) $61,771, (b) $103,311. Noted Sept. 16.

SEWERS

Proposed Work

N. J., Lyndhurst—City will issue $[illegible] bonds to build sewerage system.

N. J., Millburn—Town Com. passed ordinance to build storm sewer in Model Park and sewer system to Caruso and Wyoming Sts.

N. J., Morristown — City plans to build addition to sewage disposal plant by adding 4 additional units. Address W. H. Dalton.

N. J., Paterson—City plans to build sewer in Slade St. from Lane to Market Ave., and in 33rd Ave. from West Side Ave. to East 37th St. H. J. Hardee, city engr.

N. J., Phillipsburg—City had plans prepared by C. G. Wigley, engr., State Bd. of Health, Trenton, for new sewage disposal plant.

N. J., Ridgewood — Township plans to build storm sewer in Roland Ave., between Ridgewood Rd. and Millburn Ave. M. R. Silance, clk.

Pa., Carbondale—City having plans prepared by State Bd. Health, Harrisburg, building outfall sewer and sewage treatment works.

Pa., College Hill—(Beaver Falls P. O.)—Boro. had plans prepared building sanitary sewerage system. Bonds for $36,000 voted for project. H. Dawson, boro. engr.

Pa., Leetsdale—City having plans prepared by State Health Dept., Harrisburg for sanitary sewage extension for collection and treatment of sewage.

Pa., Penns Station — City having plans prepared by T. P. Herron, engr., Irwin, for sewage system involving 8000 lin.ft. sanitary terra cotta pipe. About $25,000.

Pa., Phila.—City plans to rebuild sewers in King St., Wissahicken Ave., and Queen Lane and build sewers in Washington Lane from Ogontz to Stenton Ave.; Wyncote and 67th Ave., from Limekiln Pile to Ogontz Ave.; 18th. St. from Shelten to Meadary Aves. C. E. Davis, city engr.

Pa., Pottstown—City having plans prepared by E. C. Collins, engr., 511 Drexel Bldg., Phila., to extend sewer to low level, 5 or 6 mi. About $100,000. J. K. Klink, chn.

Pa., Rutledge—City plans to build 4 mi. sewers. About $25,000.

Pa., Wesleyville—City having plans prepared by B. E. Briggs, engr., building sanitary sewerage system and sewage disposal plant.

Pa., West Middlessex—Borough having plans prepared by L. D. Tracy, engr., 245 4th Ave., Pittsburgh, for sewerage system and sewage disposal plant. F. H. Bair, Colonial Trust Co., Farrell, secy.

Pa., Williamsport — City Council passed resolution to build sewerage system at Sawyer Park to form new industrial district.

Pa., Wilson—Boro having plans prepared by State Health Dept., Harrisburg, building sanitary sewerage system and sewage disposal plant for northern portion of boro.

Ala., Anniston—(Official)—City soon lets contract building sanitary sewers in western section of city. C. W. Cooper, city engr.

O., Cincinnati—(Official)—Council passed ordinance to build sewers in Dover St. from Morgan to Wayne Sts.; Wayne St. from Dover St. to Cincinnati, Lebanon & Northern R.R.; Liston Ave. from Tyler to Maag Sts.; Colfax Ave. and right of way from Liston Ave. to Ohio River; Queen City Ave. from White St., 20 ft. westwardly and White St. from Queen City Ave. to Wickham Alley. F. Krug, city engr.

O., Cleveland — (Official) — City plans building sewers in East 124th, 125th, 126th, 127th, and 128th Sts., from Buckeye Rd. to Williams Ave. east, $13,144; Corlett Ave., S. E. from East Blvd. to East 131st St. and East 116th St., from Corlett Ave. to Farrington Ave., $50,000. R. Hoffman, city engr.

O., Niles — City having plans prepared building sewage disposal plant. About $16,000. H. Turner, city engr.

O., West Park — Lander Eng. Co., 306 Amer. Trust Bldg., Cleveland, receiving bids for 1200 ft. 15-in., 2256 ft. 12-in. and 1075 ft. 18-in. vitr. pipe and 196 ft. 12-in. rein.-con. pipe, concrete catch basin and combination manholes.

Ill., Quincy—City plans to build sanitary sewers in 6th St. from Washington to Monroe Sts.; Madison St. from 6th to 8th Sts.; Monroe St. from 6th to 10th Sts.; 10th St. from Spruce to Chestnut Sts.; 11th St. from Spruce to Chestnut Sts.; Vermont St. from 18th to 24th Sts. About 3 mi. E. R. Chatten, city engr.

Ia., Clarksville—City soon received bids for sewer system. C. H. Bishop, Independence, engr.

Kan., Belleville—City had plans prepared by Black & Veatch, engrs., 507 Inter-State Bldg., Kansas City, Mo., for sewerage system.

Mont., Poplar — City having plans prepared for sewerage system.

Tex., Farmersville—City plans to build sewerage system. W. Jones, secy.

Okla., Lindsay—City plans to build sewerage system.

Utah, Ogden—City plans to build sewers in Dist. 138, involving 17,500 ft. pipe. About $28,000. M. J. Tracy, city engr.

Ariz., Verde — (Liberty P. O.) — See "Buildings."

Cal., Los Angeles — City soon receives bids building vitr. pipe sewer in 11th, Vine, 10th, 7th, 6th and 4th Sts., Poinsetta Ave. and other streets and alleys, involving 61,000 lin.ft. 8-14 in. vitr. pipe, manholes, catch basins, etc. A. C. Hansen, city engr.

Cal., Santa Barbara—City had plans prepared for Reinsch-Wurl screen sewage treatment plant. Olmstead & Gillelen, 1112 Hollingsworth Bldg., Los Angeles engrs.

N. S., Picton—City plans to build sewers in Water, Church, and Front Sts. About $60,000.

Ont., Goderich—Town plans to build sewers on Victoria St. and Britannia Rd. About $50,000. L. L. Know, clk.

Ont., Renfrew—Town plans to build 8 in. sewer on Barr St. from Hill to Combs St. About $40,000. J. H. Stewart, engr.

BIDS DESIRED

N. Y., New York—(Official)—Until Dec. 27, by M. M. Marks, boro. pres., Municipal Bldg., building receiving basin southeast corner Madison Ave. and 42nd St.; southeast corner 38th St. and 7th Ave.; rebuilding sewer in 63rd from 3rd to Park Aves.; sanitary sewers with pumping station and appurtenances in Thompson St. from Canal St. to point 350 ft. north of Broome St.

N. J., Elizabeth—Until Dec. 27, by Bd. Pub. Wks., installing two 75-hp. horizontal electric motors, complete wiring, conduits, insulators, connectors, etc., for sewage pumping station. T. E. Collins, ch. engr.

N. J., Westfield—Until Jan. 7, by City, building about 1950 lin.ft. 8-in. sanitary sewers and appurtenances in Seneca Pl., Grandview and Columbus Aves., and Pine St. A. W. Vois, city engr.

Pa., Pittsburgh—(Official) — Until Dec. 27, by City building 15-in. sewers in Floral Sts., Klein Ave., and Edwin St., from point near Loeffler St. to Oakdale St.; Bethe Pl. from North Highland to Sheraden Aves.; Haverhill St. and Nimick Pl. from Inglerook Pl. and McKee St. to Warsaw St.; Pinerue Ave. from Marlow St. to Lorenz Ave.; Rosina Way from Taylor to Ella Sts.; Southside Ave. from Entrance Ave. to Luella and Bessie Sts.; Glenn Way from May Way to Enfield St. N. S. Sprague, city engr.

Ill., Normal — Until Dec. 27, by City, building west side sewer.

Wis., Union Grove—(Official)—Until Jan. 3, by C. Moe, village clk., installing 3976 ft. 8-12-in. vitr. pipe, 10 manholes, 1 flush tank and sewage disposal tank.

Mont., Terry—Until Dec. 26, by Town, building sewerage system. D. C. Bradley, clk.

Okla., Enid — Until Dec. 24, by O. L. Green, city clk., building sanitary sewer in block 22 and Jonesboro addition.

Okla., Miami—(Official)—Until Jan. 8, by N. F. Wright, building sewage and water systems. About $32,000. Hughes Eng. Co., 310 Bank Commerce Bldg., Tulsa., engrs. Noted Oct. 25.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., New York—M. M. Marks, boro. pres., received low bids Dec. 6 for repairs to outlet sewer in East 42nd St., from East River to 3rd Ave., (a) prop A, (b) prop B, from Reilly Contg. Co., Inc., 172 East 94th St., (a) $25,812, (b) $56,164; Laconia Contg. Co., 835 East 213th St., (a) $29,440, (b) $52,917; Gasperini & De Blasio, (a) $40,460, (b) $70,320. Noted Dec. 6.

★N. J., Manasquan—Boro. let contract building additions to sewerage system to Sincerbeaux & Moore, 1st Natl. Bank Bldg., Princeton, $10,000. Noted Nov. 22.

★Pa., Oil City—City let contract building 12,900 ft. 6-24 in. sewers in 10th Ward to Lesher & Loess, Oil City, $20,413.

★O., Cleveland—(Official)—City let contract building sewers in Corlett Ave., S. E. from East Blvd. to East 131st St., involving 2160 ft., 6 in. and 900 ft., 5-in. pipe, to Gawne Contr. Co., $46,000. Noted Nov 15.

Sewers (Continued)

★**O., Columbus**—(Official)—City let contract building Markison Ave. extension sewer to W. D. Sullivan, $2452; sewer in alley north of 17th Ave. and alley east of Cleveland to Cleveland, Akron & Cincinnati R.R. sewer, to J. F. Ryerson, $8586. Noted Dec. 6.

★**Ark., Marvel**—City let contract installing water-works and sewage plants to U. S. Sanitary Septic Tank Co., Exchange Bldg., Memphis, $43,000. Noted May 24.

Wash., Seattle—Bd. Pub. Wks. received bids installing sewer in 25th Ave., N.E., (a) clay pipe; (b) concrete pipe, from V. Ramaglia, 4830 37th Ave., N. E., (a) $59,260; (b) $59,074; Superior Constr. Co., 131 Nob Hill Ave., (a) $60,187; (b) $60,197

★**Ont., St. Catherines**—City let contract building relief and outlet sewer to McLaughlin Bros., $70,000. Noted Nov. 8.

BRIDGES

Proposed Work

Pa., Carbondale—(Official)—City having plans prepared by Peck Bros., engrs., Scranton Life Bldg., Scranton, for steel viaduct over tracks of Delaware & Hudson R.R. at intersection of Lundaff and Fallbrook Sts.

Pa., Harrisburg—Dauphin Co. plans to build bridges over Paxton Creek at Sycamore and Shaonix Sts., and over Manada Creek at Sand Beach.

Pa., Norristown—See "Miscellaneous."

La., Shreveport—(Official)—City and Bd. Comrs., Caddo Lake Dist., having plans prepared by Waddell & Son, engrs., 934 Wyandotte St., Kansas City, Mo., for bridge over Cross Bayou, foot of Market St. Noted Sept. 27.

O., Girard—City soon receives bids for 1000-ft. traffic bridge over Erie and Pennsylvania R.R. at Liberty St. W. R. Deemer, village clk.

O., Hamilton—See "Industrial Works."

Ia., Manchester—Delaware Co. receives bids in January for bridge with two 70-ft. arches, 40-ft. roadway and 6-ft. sidewalk. H. Klaus, co. engr.

Minn., Crookston—Great Northern Ry. having plans prepared for 6th St. viaduct, concrete pier. About $10,000. A. H. Hogeland, 1222 R.R. Bldg., St. Paul, ch. engr.

Kan., Ft. Scott—Bourbon Co. plans to build 3 bridges. R. W. Tiles, engr., c/o M. J. Rose, clk., receives bids about Feb. 1.

Mont., Noxon—City voted $50,000 bonds to build bridge

BIDS DESIRED

Va., Richmond—Until Jan. 4 by City, building Ginter Park viaduct, Chamberlayne Ave., reinforced, including grading streets and building approaches. About $123,000. C. E. Bolling, city engr.

Minn., Anoka—Until Jan. 3, by City, building reinforced bridge over Rum River, Pleasant St. L. P. Wolff, St. Paul, engr.

Minn., Walker—See "Excavation and Dredging."

Mont., Lodge Grass—Until Jan. 9, by State Highway Comm., Helena, building 100 ft. span combination bridge over Little Big Horn River.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., New York—D. Mathewson, Boro Pres. (Bronx Boro.) received low bids building bridges and approaches, regulating, re-regulating paving and repaving Gun Hill Rd. between Webster and White Plains Aves., from O. Daniels Co., Woolworth Bldg., $234,983; Spadiro Contg. Co., 827 East 217th St., $241,018; P. T. Cox Contg. Co., 154 Nassau St., $241,734. Noted Nov. 22.

★**Pa., Harrisburg**—(Official)—State Pub. Grounds and Building Dept. let contract for 180-ft. steel truss bridge with solid floor and stone abutments, to Stebbins Constr. Co., Wellsboro., $15,000. Noted Dec. 6

★**Pa., Nelson**—(Official)—C. A. Shreiner, supt. pub. Grounds and Bldgs., Capitol Bldg., Harrisburg, let contract building bridge at Nelson, Tioga Co., to M. W. Stebbins Contr. Co., Wellsboro, $45,000. Noted Nov. 29.

★**W. Va., Fairmont**—(Official)—Bd. Affairs let contract building rein.-con. bridge over Monongahela River, to J. P. Casey Co., Union Arcade, Pittsburgh, Pa., cost plus 9% commission. Limited to $40,000. Noted Dec. 6.

★**Ariz., Tombstone**—Cochise Co. let contract building rein.-con. bridge over San Pedro River, 2 Luten arches, 70 ft. each, to Topeka Bridge & Iron Co., Kansas City, Mo., $26,250.

STRUCTURAL STEEL WORK

Proposed Work

Pa., Carbondale—See "Bridges."

REINFORCED CONCRETE

Proposed Work

O., Cleveland—See "Miscellaneous."

Tex., San Antonio—See "Buildings."

BIDS DESIRED

Va., Richmond—See "Bridges."

Minn., Anoka—See "Bridges."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**N. Y., Brooklyn**—See "Industrial Works."

★**W. Va., Fairmont**—(Official)—See "Bridges."

★**Ariz., Tombstone**—See "Bridges."

STREETS AND ROADS

Proposed Work

R. I., Warwick—(Official)—Town receives bids in February building following roads: Pawtuxet Ave., to Elmwood Ave., Norwood; Gate Rd. from Apponaug to West Warwick Line; Warwick Neck Rd. from station south of Carpenter Corners to Budlong Corner, Warwick. J. H. Potter, aud. Noted Dec. 6.

N. J., New Brunswick—Bd. Freeholders, Middlesex Co. plans to pave Highland Park-Bound Brook Rd. About $300,000.

N. J., Salem—(Official)—Bd. Freeholders Salem Co., receives bids in February for road work, Pennsgrove Twp. About $75,000. Noted Dec. 6.

Pennsylvania—(Official)—State Highway Dept., Harrisburg, received no bids building roads in Mill Creek and Harbor Creek Twps., Erie Co., also for improving road in Clearfield Boro. Noted Nov. 29

Pa., Eddystone—Boro sold $35,000 bonds to pave streets.

Pa., Harrisburg—City plans to improve 3rd St. About $16,000. M. B. Cowden, city engr.

Pa., Hollidaysburg—Blair Co. plans road from Williamsburg through Clover Creek alley, via Beaverton and Shelleytown, to Fredericksburg and Martinsburg.

Delaware—State Highway Dept., Dover, preparing plans for 3 concrete roads in Sussex Co. Noted May 24

W. Va., Moundsville—Marshall Co. soon receives bids repaving and improving road through Narrows, between McMechen and Glendale. S. H. Bonar, co. engr.

N. C., Edenton—Town will issue $128,000 bonds to pave portions Main, Water, King and other streets.

N. C., Louisburg—Franklin Co., Sandy Creek Twp., sold $50,000 bonds to improve roads.

N. C., Marshall—Madison Co. voted $100,000 bonds to improve roads, Precinct No. 1

N. C., Monroe—City plans to issue $164,000 bonds to improve streets

N. C., Rutherfordton—Rutherford Co. election Jan. 19 to vote on $11,850 bonds to build roads in Cool Springs, Rutherfordton, Green Hill and Chimney Rock Twps. G. F. Watson, chm. co. rd. comrs.

Fla., De Land—Volusia Co. plans election to vote on $750,000 bonds to build road from De Land to Putnam Co. line, involving sand asphalt road with shell base, curb, clay or shell shoulders, 9 ft. wide, making maximum width of 18 ft. State will appropriate $54,000 toward cost.

Fla., West Palm Beach—Associated Realty Investors, 1163 Rose, plan several miles rock road, sidewalks, etc., in connection with resident development.

Ala., Scottsboro—Jackson Co. received no bids macadamizing part State Trunk Rd. No. 4 between Woodville and Limerock, involving 9000 cu.yd. crushed stone. Noted Nov. 15

Ala., Troy—City having plans prepared paving north and south Three Notch, College, Walnut and portions Montgomery and Murphree Sts.

Ala., Tuscumbia—Colbert Co. rejected bids improving 7.02 mi. Jackson Highway, including 18,132 cu.yd. earth excav., 9764 cu.yd. gravel, 2810 cu.yd. clay, 13,215 sq.yd. bituminous treatment, 44 cu.yd. concrete, 84 lin.ft. 15 in. S. vit. pipe. Noted Nov. 8.

Miss., Carrollton—Carroll Co. issue $50,000 bonds to improve roads.

La., Kenner—City plans to issue $15,000 bonds to improve streets. P. Felix, mayor

Ky., Louisville—Jefferson Co. plans to build Poplar Level Rd. from city to Camp Zachary Taylor. About $12,000 for asphalt pavement. R. Gaines, co. engr. advises heavier reconstruction at three times cost. Federal Government to appropriate towards cost.

O., Cincinnati—(Official)—Council passed ordinance to issue $114,500 bonds to improve Evanston Ave. from Fairfax to Hewitt Aves., Pike St., Vickham Alley, Vinyard Pl. and other streets. F. Krug, city engr

O., Coshocton—Coshocton Co. plans to build roads. Federal Government and State will appropriate $37,000 toward cost.

O., Ironton—(Official)—City plans to pave streets. About $100,000. L. G. Howell, city engr. Noted July 5

O., Newark—City soon lets contract repaving Church St., sheet asphalt and asphalt concrete. About $64,000. C. H. Weiss, city engr.

O., Portsmouth—Scioto Co. plans to improve Main Market Rd., also build 1 mi. of Ohio River Rd. and 1 mi. Portsmouth Lucasville Rd., brick, macadam and tarvia. About $40,000 state aid has been asked.

Ind., Elkhart—City soon lets contract paving Michigan and Franklin Sts. and Lexington Ave. L. Russell, city engr.

Mich., St. Johns—Clinton Co. plans to build 6¼ mi. road between Ovid and Elsie.

Ill., Chicago—Chicago Plan Comn. submitted plans to council for transforming South Water and River Sts., between Michigan Ave. and Market St. into double-decked boulevard. About $5,282,650. J. Ericson, city engr.

Ill., Minonk—City plans to pave Lincoln St., from 4th to 7th Sts.; Walnut St. from 4th to 5th Sts.; 7th St. from Walnut to Maple Sts.; 8th St. from Chestnut St. to Maple Ave.; Oak St. from 7th to 8th Sts.; Locust St. from 7th to 8th Sts.; Oak St. from 3rd to 4th Sts.; 3rd St. from Oak St. to Maple Ave.

Ill., Quincy—City plans to pave 3rd St. from Vine to Vermont Sts.; Oak St. from 2nd to 5th Sts.; Ruby from Front to 3rd Sts.; Jersey St. from 3rd to 4th Sts. E. E. Chatten, city engr.

Wisconsin—(Official)—State Highway Comr., Madison, receiving bids in March, grading 8 mi. road and building 11 ft. crushed gravel (including 20 alkire gravel) Lincoln Co. About $80,000

Ia., Iowa City—(Official)—Johnson Co. receives bids about Apr. 1, building 3 mi. hard surfaced highway from here to Coralville (now grading about 10 mi. southeast) to permanent grade. Federal Government will appropriate toward cost. A. F. Fisher, co. engr. Noted Dec. 6.

Ia., Rock Rapids—Lyon Co. plans to improve roads, including Rock Rapids-Doon Rd. About $50,000. F. H. Hinsel, pres.

Minn., Red Wing—Goodhue Co. asked to improve Burlington Highway. About $3,000. C. H. Myers, engr.

South Dakota—(Official)—State Highway Dept., Pierre, plans to [illegible] to build roads in various counties as follows: Minnehaha [illegible] $25,000; Codington Co. $31,000; Clark Co. $18,000; Grant Co. $18,000; Moody Co. $22,000; Hamlin Co. $17,000; Deuel Co. $41,000; all to be hard surfaced with local gravel. P. W. Price, supervising engr.

Mo., Columbia—Boone Co. voted $40,000 bonds to build one bridge and some [illegible] to Missouri River.

Tex., Refugio—Refugio Co. voted bonds to build and macadamize roads. Noted Dec. 1.

Tex., Canton—Van Zandt Co. [illegible] to vote on $600,000 bonds to build roads.

Streets and Roads (Continued)

Tex., Dallas—Dallas Co plans to improve roads. About $40,000.

Tex., Orange—Orange Co election soon to vote on $600,000 bonds to build roads.

Tex., Sinton—San Patricio Co. election soon to vote on $250,000 bonds to build roads.

Colo., Pueblo—Pueblo Co. plans to build highways. About $90,800.

Ariz., Tombstone—Cochise Co. voted $1,000,000 bonds to build county highway system. Noted Nov. 1.

Wash., Vancouver — Clarke Co having plans prepared for finishing embankment on River Rd west of city and extending 11th St. About $11,000. B. L. Dorman, co. engr.

Oregon—State Highway Dept., Salem, had surveys made for realignment and grading Oregon Trail from Pendleton to Baker, and from La Grande to Elgin. H. Nunn, state highway engr.

Ore., Astoria—Clatsop Co., Astoria Rd. Dist., voted $22,000 bonds to improve road around Smith's Point, connecting with Taylor Ave.

Ore., Enterprise—Wallowa Co. plans to build roads. About $100,000.

Ore., La Grande—Union Co. plans post road from La Grande to Elgin. State will appropriate $32,000 toward cost.

Ore., McMinnville—Yamhill Co. plans to improve 7 mi. of Tillamook Rd., through Grand Ronde Reservation. Cost, $40,000. Federal Government and State will appropriate $30,000 towards cost.

Ore., Pendelton—Umatila Co. plans to grade road from Pendelton to Gulgard.

Ore., Roseburg—Douglas Co. plans to build 11¼ mi. road from Canyonville to Johns Ranch and 2 mi. road from Canyonville West to connect with road from Riddle. Federal Government and State will appropriate toward cost. B. Nichols, co. comr.

Cal., Riverside—Riverside Co. had plans prepared by R. W. Waterman, co. engr., building following roads in Rd. Impvt. Dist. No. 2: grading and graveling 15,300 lin.ft. on Lovekin Blvd., extending north to Blythe; 19,856 lin.ft. on Hobsonway east from Blythe; 10,000 lin.ft. on Fertilla Rd., extending west from Blythe, grading 5264 additional ft.; grading 5200 lin.ft. Canes Rd., extending from south from Blythe; grading 2618 lin.ft. on Anelo Valley Rd., extending south from Blythe; graveled roadways will vary from 10-20 ft. in width and .4-.8 in. thickness; also building rein.-con. siphons, culverts, headgates, bridges, turnouts, and crossings; improving 1-mi. road at Wineville, on Stiwanda Ave., between Winneville Sta. and Stearns Winery, concrete on macadam base; road will connect Foothill and Valley Blvd.; also about 700 ft. county highway across Temescal Wash east Corona and graveling road between Banning and Hot Springs, 6 in. deep and 14 ft. wide between Cabazon and Whitewater.

Cal., San Diego—(Officials) — City received no bids grading Upas St., between Granada Ave. and line 120 ft. west, and Abbott St. from Long Beach to Brighton Aves. Noted Nov. 29.

Cal., Santa Barbara—Santa Barbara Co election Dec. 13, to vote on $40,000 bonds for highway work in Mission Rd. Dist.

Cal., Stockton—San Joachim Co. having plans prepared for paving 7 mi Clements-Lone Rd. F. E. Quad, co. engr.

Que., Maisonneuve—City plans to pave Girard St. About $20,000. J. Hinton, secy.

BIDS DESIRED

N. Y., Long Island City—(Official)—Until Dec. 14, at 10 A. M., Connolly, pres. Queens Boro, regulating, curbing, laying sidewalks on Jamaica Ave. from Van Wyck to Cliffside Ave.

N. Y., New York—(Official)—Until Dec. 27, at 10 Mathewson ave. Bronx Boro, for asphalt grading and regrading, setting and resetting curb, laying and resetting sidewalks, building inlets, receiving basins, drains, culverts and connections to University Ave. from south end Lane to West 174th St.; West 174th St. from University to Morris Ave., paving with sheet asphalt on concrete foundation and granite blocks on said foundation; 3rd Ave. from East 169th St. to Fordham Rd.; Park Ave. east from East 169th St. to Fordham Rd.; East 169th St. from Washington to Webster Aves.; Fordham Rd. from Park to Webster Aves.

N. J., Newark—(Official)—Until Dec. 26, by Bd. Freeholders, Essex Co., improving Sanford Ave. from Irvington-Newark line to Newark-East Orange line. H. W. Heilmann, co. engr.

Va., Richmond—See "Bridges."

Ia., Stuart—(Official)—Until Jan. 15, by city, paving, curbing and guttering 11 blocks. About $45,000. T. S. DeLay, Creston, city engr. Noted Dec. 6.

Minn., Walker — See "Excavation and Dredging."

Colo., Ft. Collins—(Official)—Until Dec. 27, by City, for 13,156 sq.yd. rein.-con. pavement, etc.; advertised in this issue.

Wash., Pasco—Until Jan. 7, by Franklin Co. building 8 mi. highway near Pasco.

Wash., Wenatchee—Until Jan. 8, by Chelan Co., building Rd. No. 287, known as Johnson Creek or Muddy Creek Rd.

Oregon—Until Jan. 8, by State Highway Comn., Yeon Bldg., Portland, building 5.8 mi. Columbia River Highway from Hood River to Mosier involving 195,000 cu.yd. excav. H. Nunn, state highway engr. Noted Nov. 1.

California—Until Dec. 31, by State Highway Comn., 515 Forum Bldg., Sacramento, building concrete pavement on Ridge Road, Angeles Co., between Kay Ranch and Quail Lake. About 26 mi. A. B. Fletcher, engr.

Cal., Riverside—Until Dec. 26, by A. B. Pilch, clk., Riverside Co., building 2 mi. concrete pavement on Etiwande Ave., north from Wineville; improving highway between Cabazon and Whitewater and building concrete pavement on 6th St. extension, Corona.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., Brooklyn—L. H. Pounds, Brooklyn boro. pres. received low bids Dec. 12, regulating, and paving roadway of 86th St. from 21st to 22nd Ave., asphalt on 6-in. concrete foundation, from Borough Asphalt Co., 1301 Metropolitan Ave., $10,729; Uvalde Asphalt Paving Co., 1 Bway., New York City, $10,383; Cranford Co., 52 9th St., $10,398. Noted Dec. 6.

N. Y., New York—D. Mathewson, pres. Bronx Boro., received low bids, Dec 12, regulating, grading, setting curb, laying sidewalks, building inlets and reapproaches and guard rails, etc., in West 176th St., from Jerome Ave., to Macomes Rd., from Gasperini & Delbalso, 1964 Honeywell Ave., $15,412; J. T. Cabalozo, $15,798; T. Menna, $16,355. Noted Dec. 6.

N. Y., New York—See "Bridges."

N. Y., New York—M. M. Marks, boro. pres. received low bids Dec. 12, regulating and repaving roadway of 10th St., from Stuyvesant St., to University Pl., sheet asphalt on concrete foundation, from Daveney Asphalt Co., 52 Vanderbilt Ave., $24,054; Asphalt Constr. Co., 2197 Madison Ave., $24,406; roadway of 3rd Ave., from 6th to 8th Sts., wood block on concrete foundation, from W. J. Fitzgerald, 547 West 45th St., $16,099; roadway of 3rd Ave., from 6th to 8th Sts. (water, tar, gas specifications), wood block on concrete foundation, from W. J. Fitzgerald, 547 West 45th St., $15,-164; Franklin Contg. Co., 52 Vanderbilt Ave., $15,466. Noted Dec. 6.

Pennsylvania—(Official)—State Highway Comn., Harrisburg, received low bids building 4700 ft. vitr. block pavement, 16-18 ft. wide, in Lawrence Twp., Clearfield Co., from Clearfield Boro. line to point on Penfield Rd at Flegal Rd., from J. Boyce, Clarence, $42,614; D. W. Anderson, Clearfield, $44,137; C. E. Chase, Clearfield, $47,671. Noted Nov. 29.

★**S. C., Spartanburg** — State Highway Dept., Columbia, let contract surfacing concrete road to Camp Wadsworth, to Morrison & Glover, Augusta, $37,000.

★**Fla., De Land**—Volusia Co., Halifax Special Rd. Dist., let contract building 15 mi. rock with asphalt binder road to Akerman & Ellis, Titusville.

★**Fla., Perry**—City let contract improving streets, asphalt on macadam base, to Edwards Constr. Co., Judy Dock, Tampa, $75,666. Noted Nov. 8.

★**Ala., Bessemer**—City let contract paving 6 blocks on 19th St., vitr. brick, to Sullivan, Long & Hagerty.

★**O., Canton**—Stark Co. let contract building Minerva-Robertsville Rd. to F. A. Downs, Constr. Co., Lawrence Rd. and Gillet Ave., $18,782; Brewster Massillon Rd., to E. Vogt, Massillon, $21,784; Navarre Richville Rd. to H. Cork, Canton, $45,033.

Ind., Anderson—Madison Co. received low bids paving Meridian Ave., from Indiana Asphalt & Paving Co., 25th St. and Lake Erie & Western Ry., Indianapolis; Brooks Constr. Co., 2104 Miner St., Ft. Wayne; Premier Constr. Co., 1023 Lemcke Bldg., Indianapolis. Noted Nov. 29.

★**Minnesota**—(Official) — State Highway Comn., 300 Shubert Bldg., St. Paul, let contract grading Minnesota Federal Aid Project No. 3, Mille Lacs Co., to C. A. Pogue Co., $69,272. Noted Oct. 25.

★**Minn., Red Wing**—(Official)—Goodhue Co. let contract building Minnesota Federal Aid Project No. 11, involving 3 acres clearing, 3.6 acres grading, 55,887 yd. side ditching, 5775 cu.yd. guard rail, etc., to Foley, Young & Peabody, 48 Merchants' Natl. Bank Bldg., St. Paul, $20,499. Noted Nov. 15.

Neb., Columbus—City received bids Dec. 4, paving various streets, from W. Horrabin, 1422 Walnut St., Iowa City, Ia., $2.35 for bitulithic; Natl. Roofing Co., 11th and Clark St., $2.14; sheet asphalt, $1.92; asphaltic concrete; E. D. Tyner Constr. Co., Kansas City, Mo., $2.18; sheet asphalt, $1.87; asphaltic concrete, $2.46; brick and $2.52, vertical fibre brick. Noted Nov. 15.

★**Neb., Holdrege**—City let contract improving streets in Dist. No. 1, involving 39,100 sq.yd. pavement, 4442 ft. curb, 10,053 lin.ft. curb and gutter, to Roberts Constr. Co., 510 1st Natl. Bank Bldg., Lincoln, $2.54 per sq.yd. Noted Nov. 29.

★**Mo., Kansas City**—City let contract building artificial stone sidewalks on 59th St., to Missouri Stone Wks. Constr. Co., Room B, Mass Bldg., 15.96c. per sq.ft. Noted Oct. 18.

★**Mo., Stanberry**—(Official) — City let contract paving, curbing and guttering Main St., to E. Main, Liberty, $20,000. Noted Nov. 22.

★**Washington** — State Highway Comn., Olympia, let contract building 10 mi. Sunset Highway between Vantage Ferry and Burke to Quigg Constr. Co., Wanatchee, $68,690; grading and draining 30.6 mi. Central Washington Highway between Pasco and Connell to A. L. Mitchell and C. M. Payne, 724 East Mission St., Spokane $52,-984. Noted Nov. 22.

★**Oregon**—(Official) — State Highway Comn. Yeon Bldg., Portland, let contract grading 1½ mi. in Wheeler Co., on Ochoco Forest Rd., 4 mi., from Mitchell, to United Contg. Co., Northwestern Bank Bldg., Portland, $25,070.

★**Cal., Sacramento** — Sacramento Co. let contract building 13 mi. concrete highway on top of levee along bank of Sacramento River near Grand Island to Tibbitts-Pacific Co., 16 California St., $137,878. Noted Dec. 6.

Cal., San Diego—City received only bid paving, building cement curbs, and walks on National Ave., 13th and 16th Sts., involving 77,706 sq.ft. asphalt on concrete base, from Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., Los Angeles, $14,614. Noted July 26.

★**Cal., San Francisco**—City let contract to Fay Impvt. Co., Phelan Bldg., improving following streets: 19th St., between Tennessee and Minnesota Sts., granite curbs, $1.48 per ft.; asphalt pavement on concrete base, $0.27 per sq.ft.; Mississippi St. between 19th and 20th Sts., brick pavement, $0.419 per sq.ft.; asphalt pavement on concrete base, $0.234 per sq.ft.; resetting granite curbs, $0.24 per ft., new granite curbs, $1.18 per ft.

Cal., San Francisco — State Bd. Harbor Comrs., Sacramento, received bids paving east side of Embarcadero between piers 7 and 17, from O. McHugh, Russ Bldg., $14,-974; G. W. McGinn, Phelan Bldg., $17,862; Fay Impvt. Co., $17,887. Noted Nov. 20.

★**Cal., Santa Ana**—Orange Co. let contract paving 2.8 mi. of Santa Ana Canyon Rd., Sect. 3, to J. S. Miller, $13,915. Noted Nov. 22.

★**Cal., Stockton** — San Joachim Co. let contract building highway near Tracy, to C. Moreing & Sons, Stockton. About $13,260.

RAILWAYS—STEAM & ELECTRIC

Proposed Work

New Jersey—Atlantic City Steamship & Terminal Co., New Jersey & Clam Creek Sts., plans to build 350-ft. marine railway at head of New Jersey Ave., Atlantic City. F. J. McDonald, Phila., pres.

Railways (Continued)

West Virginia — (Official)—Charleston-Dunbar Traction Co. plans to build 9 mi. line, including power house and car barns. E. W. Alexander, genl. mgr., soon receives bids.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Florida**—Tampa Southern R.R. let contract building 50-mi. line as follows: From Tampa to Little Manatee River, to B. Morrison; Little River to Palmetto, to W. E. Parker, 402 Curry Bldg., Tampa.

EXCAVATION AND DREDGING

Proposed Work

N. Y., New York—(Official)—Excavation—F. J. Kracke, comr. plant and structures, Municipal Bldg., rejected bids received Dec. 6, excavating and dredging at site of Eastchester Bridge. New bids. Noted Dec. 13.

Wis., Milwaukee—Drainage—Milwaukee Co. soon lets contract for drainage system and open ditching, involving 4000 ft. open ditch and 1½ mi. 15-in. tile. Kamschulte & Webster, 421 M. & M. Bank Bldg., engrs.

Minn., St. James — (Official) — Ditch — Watonwan Co. received no bids building Judicial Ditch No. 18 involving 62,986 ft. 6-34-in. tile; Judicial Ditch No. 13, involving 73,765 ft. 6-34-in. tile. J. C. Jensen, co. aud. Noted Nov. 22.

Mo., Winfield — Drainage — City having plans prepared by T. N. Jacob, engr., Cahokla Bldg., East St. Louis, Ill., building drainage system near here. About $40,000.

Wash., North Yakima—Drainage—R. K. Tiffany, head of Yakima Rec. Wk., will apply to Rec. Serv., Wash., D. C., to appropriate $1,000,000 for new work. Plans include construction of Tienton Dam, which will be highest earth dam in the world.

Ore., Klamath Falls—Irrigation—Klamath Indian Reservation plans to enlarge Modoc Point Irrigation project and install several small units. H. W. Hincks, engr. Total cost of work, $35,000, of which $17,000 is now available.

BIDS DESIRED

Ill., Tuscola—Drainage—Until Jan. 9, by Comrs. D. D. No. 5, Douglas Co., building drainage system, involving 17,378 cu.yd. open ditch, 1927 ft. 18-27-in. tile, 27-in. salt-glazed vitr. sewer pipe and bulkhead containing 12⅔ cu.yd. concrete.

Ia., Mason City—Drainage—Until Dec. 27, by G. E. Frost, aud., Cerro Gordo Co., building D. D. No. 40, as follows:

Main line, Sect. 2, involves 16,500 ft. of 6-38-in. tile and 12 laterals involving 19,400 ft. of 6-15-in. tile.

Sect. 5, Hammond lateral, road laterals and 22 branch laterals involving 54,300 ft. of 6-22 in. tile and 3 inlets.

Sect. 6, 22 laterals involving 55,050 ft. of 6-36-in. tile.

Sect. 7, 16 laterals, involving 43,700 ft. of 6-30-in. tile and 7 inlets.

Sect. 8, 6 laterals involving 15,600 ft. of 6-22-in. tile.

Sect. 9, 10 laterals involving 27,450 ft of 5-28-in. tile, and 5 inlets.

Sect. 10, 12 laterals involving 23,400 ft. of 6-22-in. tile and 4 inlets.

Ia., Sac City—Drainage—Until Jan. 3, by E. W. Moyer, aud., Sac Co., improving D. D. No. 65, involving 19,660 ft. 8-30-in. tile, 1 bulkhead and spillway, about 11 cu.yd.

Minn., Glenwood — (Official) — Ditch — Until Dec. 31, by O. Irgens and J. Pope Co., excav. Co. Ditch No. 15, involving about 129,705 cu.yd. Noted Dec. 6.

Minn., Walker—Ditch—Until Jan. 11, by C. D. Bacon, aud., Cass Co., building Judicial Ditch No. 7 in Cass and Wadena Cos., involving 455,858 cu.yd. excav., 12 highway bridges, 1 rein.-con. culvert, clearing 100.34 acres, and building 7.41 mi. highways. About $53,438.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Pa., Beaver**—Excavation—Beaver Co. let contract 14,000 cu.yd. excav. in Moon and Center twps. to M. Baker. About $17,400.

★**Kan., Salina** — Drainage — Bd. Surpvrs. D. D. No. 1, Salina Co., let contract building drainage system involving 87,750 cu.yd. excav., to P. C. Buskirk, Hutchinson. Noted Dec. 13.

★**Mo., Clayton** — Excavation — St. Louis Co. let contract 42,000 cu.yd. excav., to Cameron Joyce Co., Keokuk, Ia. About $18,060.

INDUSTRIAL WORKS

Proposed Work

Mass., Brockton — Sterling Motor Co., Center St., plans 2-story, 24 x 250-ft. and 24 x 280-ft. addition to plant.

Mass., Chelsea—Partner Rubber Co., 170 Summer St., Boston, had plans prepared by S. S. Eisenberg, archt., 30 Exchange Bldg., for 2-story, 50 x 135-ft. and 3-story, 50 x 60-ft. warehouse and shoddy mill. About $36,000.

N. Y., Brooklyn—Continental Varnish Co. Inc., 317 New Jersey Railroad Ave., Newark, N. J., having plans prepared by L. A. Abramson, archt., 220 5th Ave., New York City, for group factory of buildings here, including 1-story, 20 x 25-ft., 1-story, 30 x 80-ft., 1-story, 20 x 20-ft., 1-story, 20 x 25-ft., 1-story, 30 x 64 ft. About $25,000.

N. Y., Brooklyn—H. Rubin, 317 Bedford Ave., having plans prepared by H. A. Weinstein, archt., 165 Remsen St., for 1-story, 100 x 114-ft. brick garage, Snediker Ave. About $30,000.

N. Y., Brooklyn—B. Stein, 756 Flushing Ave., had plans prepared by Millman & Son, archts., 1780 Pitkin Ave., for 1-story, 50 x 100-ft. garage. About $25,000.

N. Y., New York—Duval Co., Pier 39, North River, had plans prepared by G. M. McCabe, archt., 96 5th Ave., for 4-story, 361 x 371-ft. garage, 361-371 West 12th St. About $100,000.

N. Y., New York — Sussman Holding Corp., 448 East 167th St., having plans prepared by C. Schaefer, Jr., archt., 529 Courtlandt St., for 2-story, 98 x 108-ft. garage (Bronx Boro.). About $30,000. B. Sussman, pres.

N. J., Bloomfield — Power Specialty Co., 111 Bway., New York City, plans new factory on Locust Ave., here. About $31,000.

N. J., Jersey City—Union Terminal Cold Storage Co., Provost and 12th Sts., plans addition. About $85,000.

N. J., Newark—American Can Co., 310 Elizabeth Ave., plans to build 2½-story, 100 x 240-ft. and 40 x 100-ft. brick and rein.-con. factory and office. About $286,200.

N. J., Trenton — Trenton & Mercer Co. Traction Co., 137 East State St., plans to rebuild car barns recently destroyed by fire with a loss of about $65,000. R. Johnson, pres.

Pa., Phila. — Esterbrook Pen Co., Delaware and Cooper Sts., plans to alter factory and also build new 4-story addition.

Pa., Pittsburgh — Great Atlantic & Pacific Tea Co. had plans prepared by Ballinger & Perrot, archts., 17th and Arch Sts., Phila., for 3-story, brick and rein.-con. warehouse, East Liberty St.

Del., Wilmington — Penn-Seaboard Steel Corp. plans to build addition to plant on Delaware River near here. Plans include a power house. About $1,400,000.

Md., Baltimore—U. S. Industrial Chemical Co. recently incorporated with $15,000,000 capital stock, has acquired site on Curtis Bay and plans to build factory. A. J. Carr, Baltimore, interested.

Md., Highlandtown — A. Wasbutt & Son Co., Lombard St., plans to rebuild 3 units of its plant recently destroyed by fire. About $50,000.

Va., Richmond — McNaughton Mfg. Co., 10th and Main Sts., plans factory, 50 x 145-ft. storage building. E. Highland, pres.

Va., Roanoke—City electric, Feb. 19, to vote on $150,000 bonds to build 60 x 170-ft. market and assembly hall.

W. Va., Dunbar — Traction Co. plans to rebuild its barns and electric power plant recently destroyed by fire. About $75,000.

W. Va., Wheeling—Beech Bottom Power Corp., incorporate with $450,000 capital stock, plans to build electric plant.

West Virginia—See "Railways."

Fla., Fernandina—[illegible] shipbuilding & Dock Co., 310 Drexel Bldg., Phila., purchased 30-acre site and plans to build plant here. J. A. Ryan, gen. mgr.

Ala., Mobile — Chickasaw Shipbuilding Co. plans plant here. About $11,000,000. G. G. Crawford, pres.

Ky., Paducah—J. M. Buckner, 903 West Main St., Louisville, will build 5 large tobacco warehouses. Cost, between $75,000 and $100,000. Address W. R. and G. Katterjohn.

O., Akron—International Harvester Co., East Center St., plans warehouse. About $50,000.

O., Cleveland—Metal Screen Co. recently incorporated, plans 2-story garage and service plant. About $150,000.

O., Hamilton — Hamilton Furnace Co., Hamilton, plans to build boiler plant, dumper and ore bridge. About $100,000. J. Kennedy, Bessemer Bldg., Pittsburgh, archt.

O., Warren—International Steel Tube & Rolling Mills, 344 Guardian Bldg., Cleveland, recently incorporated with $2,500,000 capital stock, purchased [illegible] on Baltimore & Ohio R.R. here and plans to build 50-ton pile mill. O. R. Grimmes, pres.

Ind., Gary—Universal Portland Cement Co., Indiana Harbor, increased capital stock from $1,000,000 to $[illegible] and plans additions and improvements.

Ind., Indianapolis—J. W. P. Tire Co. has increased its capital stock from $[illegible] to $1,000,000 and plans addition.

Ill., Cairo—Menominee Electric Mfg. Co., Menominee, Mich., has been reorganized with $[illegible] capital stock and plans to build factory here.

Ill., Chicago—Chicago Shipbuilding Co., 101st St. and Calumet Ave., had plans prepared by S. N. Crowen, archt., 38 North La Salle St., for 1- and 2-story, 100 x 125-ft. warehouse and office building. About $75,000. K. Fairbanks, pres.

Ill., Chicago — Chicago Surface Lines, North Clark St., having plans prepared for 4 car barns, 150 ft. long, also boiler, power house and 2-story office building. About $500,000. H. B. Fleming, 105 South La Salle St., ch. engr.

Ill., Chicago—McCord & Co., 847 West 120th St., plans 1-story foundry. About $30,000.

Ill., Chicago—C. P. Nielsen & Bro., 47 West Van Buren St., awarded contract for factory. F. H. Cuney, 116 West Illinois St., archt.

Ill., Chicago—Pullman Coach Co., 2244 South Ashland Ave., purchased site and plans factory. Cost between $[illegible] and $[illegible]. J. Kramer and J. L. Saunders, owners.

Ill., Chicago — C. Quanigel, 124 South Green St., plans to build 4-story factory. About $[illegible].

Ill., Chicago—See "Buildings."

Ill., Moline—Henry Co., 1823 3rd St., having plans prepared by A. Jackson, prominent Iowa Co. [illegible]. About $[illegible]. F. Wheaton, engr.

Ill., Joliet—Chicago & Joliet Electric Co. plans to build substation at Chicago and St. Louis Sts. and Cataract Park. About $30,000. E. J. Andrews, Joliet, engr.

Wis., De Pere—Western Steel & Mfg. Co. plans to build addition to steel and boiler house. About $[illegible].

Wis., Gibbon—Gibbon Wood Products Co. plans addition to power plant. About $40,000.

Wis., Madison—Southern Wisconsin Foundry Co., Pennsylvania Ave., plans to rebuild foundry recently destroyed by fire. About $[illegible].

Wis., West Allis—Allis Chalmers Co. plans addition to barge shop. About $[illegible].

Minn., Minneapolis—Pioneer Steel & Mfg. Co., 1111 Marquette Ave., plans addition, 1 story, [illegible] ft. Architect not selected. F. E. Bellows, pres.

Minn., Minneapolis—[illegible] Co., 1111 4th Ave., S., plans 1-story addition, 100 x 150 ft. Noted last week. About $[illegible].

Industrial Works (Continued)

Kan., Independence — Western States Portland Cement Co. plans to improve and enlarge plant. About $250,000.

Neb., Falls City — City voted $75,000 bonds to build electric power plant.

Mo., St. Louis — Buffalo Mfg. Co., 1122 South 12th St., has plans prepared for 1-story, 380 x 444 x 540-ft. factory, Calvary Ave. About $100,000. W. Levy, archt., 1814 Wright Bldg., soon lets contract. Noted Nov. 8.

Tex., Beaumont — Crystal Ice Co., 805 Orleans, Houston, has contract for 45 x 60-ft. ice plant. About $75,000. S. A. Spencer, mgr. M. R. Carpenter, 62 Pickering Bldg., Cincinnati, archt.

Tex., Cleburne — Texas Motor Car Assn. plans factory here. About $1,000,000. W. Elsworth, Temple, vice pres.

Tex., Dallas — Adam Cabinet Co. plans factory. About $75,000.

Tex., Galveston — Texas Flour Mills, 202 8th Ave., has increased its capital stock from $500,000 to $1,500,000 and plans additions.

Okla., Ardmore — Be-Saw Tire & Rubber Co., News Bldg., Canton, O., soon lets contract for 5-story, 50 x 90-ft. and 90 x 300-ft. factory and boiler house. About $100,000. C. H. Be-Saw, pres. W. S. Epperson, News Bldg., Canton, O., archt.

Okla., Henryetta — Missouri, Oklahoma & Gulf R.R. having plans prepared for round-house and machine shop here. About $100,000. N. C. Van Natta, Muskogee, ch. engr.

Okla., Shawnee — J. W. Hogan, Tulsa, plans oil refinery. About $400,000.

Idaho, Meridian — Boise Co-operative Creamery Co., Boise, plans to build milk condensary here. About $85,000.

Utah, Salt Lake City — Utah Oil Refining Co., 703 Newhouse Bldg., plans factory. About $50,000. J. C. Howard, gen. mgr.

Ariz., Verde — See "Buildings."

Wash., Seattle—City had plans prepared by J. L. Stannard, engr., for power plant on Cedar River. Plan A, involves 9.4 mi. transmission line, cost, $2,390,630; Plan B, 11.2 mi. transmission line, $2,563,950; Plan C, 8.5 transmission line, $2,242,300; and Plan D, 8.5 transmission line, $1,919,300.

Cal., Fresno—San Joaquin Light & Power Corp. had plans prepared for power plant on King River. Cost between $1,-[illegible] and $2,500,000. A. G. Wishon, pres.

Cal., Martinez — American Oriental Ship Yards plan to build shipbuilding plant on [illegible] site. W. A. Bates of Moore & Scott Iron Works, Oakland, in charge.

Cal., Oakland—Hanlon Shipbuilding Co., Ft. 5th Ave., plans shipbuilding plant. About $1,[illegible].

Cal., Oakland—Union Constr. Co., Oakland, plans to build shipbuilding plant.

Cal., Oroville—Great Western Power Co. purchased 11.2-acre site and plans power plant. About $5,000,000.

Cal., San Francisco—International Harvester Co., 201 Potro St., having plans prepared by E. P. Antonovich, archt., 20 Montgomery St., for 4-story factory, Utah and 16th Sts. About $[illegible].

Cal., San Francisco — Pacific Coast Can Co. has acquired 5 acre site and plans to build factory. About $1,000,000.

N. B., St. George—J. A. Gregory, St. John, plans to build shipyards here. About $[illegible].

Ont., Pembroke — Colonial Lumber Co. plans to rebuild lumber mill recently destroyed by fire. About $75,000.

BIDS DESIRED

N. Y., Albany—(Official)—Until Jan. 8, by W. W. Wotherspoon, supt. pub. wks., Capitol, building barge canal terminal, etc., Contr. No. 287, advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

Conn., Waterbury—Lufkin Rule Co., Printers St., let contract 1-story, 42 x 112-ft. addition to Tracy Bros., 52 Benedict St.

★**N. Y., Brooklyn**—F. H. Levey Co., [illegible] 44th St., let contract factory, 150 x 150 ft., brick ink factory, 2nd Ave. and 47th St., to F. J. Ashfield, 370 Fulton St., $40,-000.

★**N. Y., Brooklyn**—[illegible], Bleecker Co., 10th Ave. and 11th St., New York City, let contract factory, 112 x [illegible]-ft. reinforced factory, Front and Jay Sts., to Turner Constr. Co., 244 Madison Ave., New York City.

★**N. Y., New York**—Merrill Spring Co., 525 West 27th St., let contract for addition and alterations to factory, to Standard Concrete Steel Co., 105 West 40th St., $40,-000.

★**N. J., Harrison**—Swift & Co., 154 9th St., Jersey St., let contract, 1-story, 164 x 500-ft. fertilizer plant here, to Schaedel & Bro. Co., 118 Bruce St., Newark, $50,000.

★**N. J., Newark**—A. Kertez, 571 South 17th St., let contract for garage to Newark Constr. & Investment Co., 800 Broad St., $38,000.

★**N. J., Newark**—Tidewater Warehouse Co. let contract, 4-story, 70 x 163-ft. brick and rein.-con. warehouse on Blanchard St., to F. Kilgus, Inc., 13 South 6th St. About $75,000.

★**Pa., Phila.**—Espen-Lucas Machine Co., Front and Girard Sts., let contract, 1-story, 44 x 141-ft. brick machine shop, to Austin Co., Bulletin Bldg., $29,000.

★**Pa., Phila.**—Phila. & Reading Ry. let contract building engine house and machine shop, Tulip and Emerson Sts., to W. Steel & Sons Co., 30 South 15th St., $326,183. Noted Dec. 6.

Pa., Phila.—B. F. Shaw let contract, 1-story, 50 x 270-ft. factory, to Austin Co., Bulletin Bldg., $25,000.

★**O., Bucyrus**—American Clay Machinery Co. let contract, 1-story, 100 x 250-ft. munition plant, to Austin Co., 14230 Euclid Ave., Cleveland. About $60,000.

★**O., Cleveland**—Brown Hoisting Machy. Co., 4403 St. Clair Ave., let contract 1-story, 52 x 182-ft. shipping building to Austin Constr. Co., 14230 Euclid Ave. About $134,300.

★**Ind., Greencastle**—Hurst & Co., 134 South Pennsylvania Ave., Indianapolis, let contract 3- or 4-story, 90 x 116-ft. distributing building and warehouse, to A. E. Kenner, 744 North 7th St., Lafayette.

★**Mich., Detroit** — Studebaker Corp., Brush and Piquette Sts., let contract, 4-story, 50 x 235-ft. factory, to Bryant & Detqiler, 2336-39 Dime Bank Bldg., $175,000.

★**Ill., Chicago** — Chicago Bearing Metal Co., West 43rd St., let contract 1-story, 102 x 226-ft. brick addition, to Scharmer Constr. Co., 139 North Clark St.

★**Ill., Chicago**—Hughes Electric Heating Co., Waller and Taylor Sts., let contract 1-story brick factory to Lubd Constr. Co., Chicago, $30,000.

★**Ill., Chicago** — W. Wallet, Jr., 2249-53 Calumet Ave., let contract, 4-story, brick warehouse, to Erickson Constr. Co., 7147 Evans St. About $60,000.

★**Ill., Quincy**—Reliable Incubator Co., 29th and Chestnut Sts., let contract 2-story, 100 x 160-ft. warehouse, to G. Lange & Son, 1100 Wash St.

★**Wis., Beloit**—Gardner Machine Co. let contract warehouse and pattern storage to Newton Eng. Co., 185 Mason St., Milwaukee. About $40,000.

★**Wis., Eau Claire**—United States Auto Gear Shift Co., let contract, 4-story, 65 x 80-ft. rein.con. and brick plant and 20 x 65-ft. office, to R. L. Rickman, Eau Claire. Noted Nov. 29.

★**Wis., Milwaukee** — G. H. Smith Steel Casting Co., 500 Clinton St., let contract 45 x 100-ft. brick addition to foundry and 4-story, 75 x 100-ft. brick pattern storehouse and office to Klug & Smith, Mack Block.

★**Kan., Salina**—Robinson Milling Co. let contract brick and rein.-con. flour mill and elevator, to Eberhardt Constr. Co. About $250,000. Noted Dec. 13.

★**Okla., Tulsa**—H. E. Bagley let contract 3-story, 50 x 140-ft. garage, to W. E. Carlett, Vinita, $25,000.

Wash., Grand Mound—See "Buildings."

★**Wash., Tacoma**—Griffith Motor Co. let contract building 3-story, 50 x 120-ft. brick and rein.-con. garage to J. E. Bonnell, 760 Commerce St. About $35,000.

★**Cal., Hanford**—Hanford Mfg. Co., Irwin St., let contract brick plant, to Trewhitt & Shields, Rowell Bldg., Fresno. About $25,000.

BUILDINGS

Proposed Work

Vt., Springfield — Hospital — Springfield Hospital soon lets contract, 2-story, 40 x 65 ft. About $50,000. H. L. Walker, 19-25 West 44th St., New York City, archt.

Mass., Boston—Police Station—City having plans prepared by J. McGinniss, archt., 16 Arlington St., for 6-story. About $150,-000.

Mass., Boston—State—State having plans prepared by J. H. Ritchie, archt., 8 Beacon St., for state building on Eastern State Agricultural and Industrial Exposition site. About $50,000.

Mass., Fall River—Hospital—City plans tuberculosis hospital. About $225,000. N. C. Johnson, secy. bd. Trustees Municipal Hospitals and Dispensaries. Fellows & McLaughlin, 87 Weybosset St., Providence, R. I., archt.

R. I., East Providence—Club—Metacomet Golf Club, Pawtucket Ave., had plans prepared by W. R. Walker & Son, archts., 17 Custom House, Providence, 3-story, 40 x 100-ft. About $50,000.

N. Y., Hempstead — (Official) — Town Hall—F. C. Gilbert, town clk., will receive preliminary sketches until Jan. 29 for town hall. About $70,000.

N. Y., New York—Cupola—City had plans prepared by J. McComb, Jr., archt., rebuilding City Hall cupola recently destroyed by fire. About $61,500.

N. J., Jersey City—Station—Hudson & Manhattan R.R., 30 Church St., New York City, plans on Henderson St. About $25,-000. W. Fiske, pres.

N. J., New Lisbon—Institution—State appropriated $106,000 for additions to Institution for Feeble-Minded.

N. J., Northfield—Asylum—Bd. Freeholders, Atlantic Co., Mays Landing, having plans prepared by S. H. Vaugh, archt., Guarantee Trust Bldg., Atlantic City.

N. J., Skillman—Hospital—State appropriated $104,291 to build additions to Epileptic Village here. D. F. Weeks, supt.

Pa., Harrisburg—School—Bd. Educ. having plans prepared by V. T. Ritter, archt., North American Bldg., for brick and stone. About $400,000.

Ill., Chicago — Office—See "Industrial Works."

Ill., Chicago—Theater—B. and A. J. Balaban and M. and S. Katz, having plans prepared by C. W. and G. L. Rapp, archts., 69 Washington St., for 5-story, West 12th St. About $750,000.

Ill., Chicago—Theater and Mercantile—W. W. Ahlschalger, 111 West Washington St., plans 10-story, 150 x 200-ft. About $335,000.

Wis., Ashland — Sanitarium — Ashland, Iron and Bayfield Cos. plan to build. About $100,000.

Wis., Madison—Hotel—Kletzsch Realty Co. having plans prepared by Claude & Starek, archts., for 7-story, brick and rein.-con. About $350,000.

Wis., Milwaukee—Auditorium — Milwaukee Auditorium Co., 5th and Cedar Sts., soon lets contract repairing and altering. About $60,000. J. C. Grieb, mgr. A. C. Clas, Colby Abbott Bldg., archt.

Wis., Rice Lake—Hospital — St. Joseph Hospital, having plans prepared by H. Wilhagen, archt., 513 West 2nd St., Ashland, for 3-story. About $65,000.

Ia., Des Moines—Court House—Polk Co. having plans prepared for 3-story, 82 x 178-ft. with 60 x 42-ft. wing. About $200,-000. F. J. Alber, co. aud. Sawyer & Watrous, archts., 303 Youngerman Bldg., and Kraetsch & Kraetsch, S & L Bldg., associate archts.

Ia., Grandview—School—Bd. Educ. having plans prepared by Keffer & Jones, archts., Youngerman Bldg., Des Moines. Bonds for $73,000 voted for project.

Ia., Spencer—School—Bd. Educ. soon lets contract for alteration and addition. About $70,000. J. D. Chubb, 109 North Dearborn St., Chicago, archt.

Minn., Minneapolis—School—Bd. Educ. soon lets contract for Longfellow School, 30th Ave. South, and 31st St., 2-story, rein.-con. and brick. R. C. L. Haxby, City Hall, archt.

Minn., Owatonna — High School — City election soon to vote on $100,000 bonds to build high school.

Minn., St. Paul—Courthouse, etc. — City plans. About $500,000. H. McColl, comr. pub. safety.

Minn., Waconia—High and Grade School—Bd. Educ. receives bids in February for 2-story, 60 x 110-ft. K. T. Snyder, 1133 Plymouth Bldg., Minneapolis, archt.

Kan., Concordia—See "Industrial Works."

Buildings (Continued)

Kan., Kansas City—Passenger Station—Kansas City Terminal Ry. receives bids about Jan. 1, for station on 7th St. and Union Pacific tracks. About $100,000. J. V. Hanna, Union Station, Kansas City, Mo., ch. engr. A. H. Buckley, 823 Gloyd Bldg., Kansas City, Mo., archt.

Kan., Leavenworth—Community — City voted $50,000 bonds to build community building. T. B. Bolman, pres. bd. educ.

Kan., Wichita—Church—First Methodist congregation plans 1-story. About $100,000. O. A. Boyle, 125 North Rock Island Ave., secy. bd. J. Gaisford, Goodwyn Institute Bldg., Memphis, Tenn., archt.

Neb., Omaha—Church and Parish House—Central congregation having plans prepared by G. B. Puntz, archt., 4033 Omaha Natl. Bank Bldg. About $140,000. G. B. Payne, chn. bldg. com.

S. D. Groton—High and Grade School—Bd. Educ. having plans prepared by F. Broomhall, archt., Alworth Bldg., Duluth, Minn., for 2-story. About $75,000.

Mont., Bozeman—Office — E. B. Martin and E. P. Tipton plan to build on Curtis St. and 3rd Ave. About $50,000.

Mo., Kansas City—Temple—Ivanhoe Masonic Lodge had plans prepared by Smith, Rea & Lovett, archts., 602 Finance Bldg., for 3-story, 90 x 125-ft. stone and rein.-con. About $175,000. J. O. Christense, 3131 Campbell St., chn. bldg. com. Noted Nov. 22.

Mo., Kansas City—Theater—A. E. Elliott, 105 East 12th St., having plans prepared by C. B. Sloan, archt., 321 East 11th St., for 1-story, brick, terra cotta, and rein.-con. About $50,000.

Tex., Dallas—Office — Texas & Pacific R.R. plans 6-story addition, Elm and Griffin Sts. E. F. Mitchell, Dallas, ch. engr.

Tex., San Antonio—Office—Central Trust Co., 210 West Commerce St., plans 12-story, rein.-con., Houston and Navaro Sts. About $400,000.

Okla., Ardmore—Bank—1st Natl. Bank, Ardmore, having plans prepared by Hoggson Bros., archts., 485 5th Ave., New York City, for 1-story, 50 x 98-ft. About $120,000. D. Lucy, pres.

Colo., Colorado Springs—Sanatorium—Modern Woodman Sanatorium having plans prepared for new buildings and other improvements. About $100,000. J. A. Rutledge, supt.

Utah, Salt Lake City—Temple—Logan Temple plans to rebuild temple recently damaged by fire. About $100,000.

Ariz., Verde—(Liberty P. O.)—Business, etc.—United Verde Extension Mining Co. having plans prepared by Lescher & Kibbey, archts., Phoenix, for concrete and brick business buildings, residences, sewers, water and electric lighting systems for town of 2000 people to be built on new townsite near smelter. About $2,000,000.

Wash., Olympia—High School—Bd. Educ. soon lets contract, 2-story, brick. William Winlock Miller High School. About $100,000.

Ore., Baker—Swimming Pool—City defeated $54,000 bonds for swimming pool. Noted Nov. 29.

Cal., Los Angeles—Office — Los Angeles Stock Exchange Co., I. W. Hellman Bldg., having plans prepared by Train & Williams, archts., Exchange Bldg., for 19-story

Ont., Toronto—Restaurant—Childs Co., 209 5th Ave., New York City, had plans prepared by Amsterdam Bldg. Co., Inc., archts., 140 West 42nd St., New York City, for restaurant on Yonge St. here. About $100,000.

BIDS DESIRED

N. Y., Brooklyn — (Official) — Nurses' Home—Until Dec. 31, Dept. Pub. Charities, Municipal Bldg., New York City, for addition on grounds of Kings Co. Hospital. J. A. Kingsbury, comr.

N. Y., Greycourt — (Official)—Colony—Until Dec. 27, by B. G. Lewis, comr. dept of correction, Municipal Bldg., New York City, buildings women's farm colony, buildings to be 4-story, 401 x 400 and 40 x 200 ft. About $225,000. Noted Nov 8

N. Y., New City—(Official)—Hospital—Until Dec 27, by Rockland Co Comm., for tuberculosis hospital, 2-story, 78 x 200-ft., at Summit Park. About $55,000. Tucker & Marsh, 101 Park Ave., New York City, archts. Noted Nov. 22 under Suffern.

Pa., Phila.—(Official)—Elevated Railway Stations—Until Dec. 27, by W. S. Twining, dir. Dept. of City Transit, for brick and rein.-con., Contr. Nos. 535 and 536. Advertised in this issue.

O., Cleveland—(Official)—School—Until Jan. 7, by clk. Bd. Educ., Rockwell Ave. and East 6th St., completing North Doan School Annex. About $100,000.

O., Lima—(Official)—Community House—Until Dec. 24, by J. Behr, 1201 North Main St., for 3-story, 101 x 146-ft. About $85,000. A. C. De Curtins, 503 Opera House Blk., archt. Noted Dec. 13.

S. D., Huron—(Official) — Junior High School—Until Jan. 16, by Bd. Educ. W Habel, clk. Miller, Fullenwider & Dowling, 6 North Michigan Ave., Chicago, archts.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Northampton**—Infirmary—Smith College, let contract, 2½-story, 80 x 95-ft., to D. A. Sullivan, 353 Prospect Heights. Cost, between $65,000 and $80,000. Noted Oct. 25.

Mass., Springfield—School—Bd. Educ. received lowest bid building Carew Street school, from D. W. Mellen Co., 293 Bridge St., $53,532.

★**Conn., Hartford**—School—Bd. Educ. let contract addition in Washington School Dist., to Ahern & Welch, Inc., 721 Main St. About $69,990.

★**N. Y., Brooklyn**—Bank—Metropolitan Trust Co., 60 Wall St., New York City, let contract additions and alterations on Fulton St., to W. Kennedy Constr. Co., 215 Montague St. About $50,000.

★**N. Y., New York**—Office—W R. Grace Co., 7 Hanover Sq., let contract 7-story, 42 x 112-ft. brick and rein.-con., on Pearl St., to Whitney Co., 101 Park Ave. About $250,000. Noted Nov. 29.

★**N. Y., New York**—Theater and Office—Wendell Estate, 175 Bway., let contract 6-story, 100 x 268-ft. brick, to Fleischmann Constr. Co., 531 7th Ave

★**N. J., Jersey City**—Nurses' Home and Hospital—City let contract, addition to Jersey City Hospital, to W. H. & F. W. Cane, Woolworth Bldg., New York City. $800,000. Noted Nov. 29.

★**Pa., Harrisburg**—Junior High School—Bd. Educ. let contract, 19th and Chestnut Sts., to A. Wildman, Harrisburg, $272,000

★**Mich., Detroit** — Hospital—Ford Hospital, Hamilton and Grant Blvds., let contract addition, to A. A. Albrecht Co., 1130 Penobscot Bldg., $1,500,000.

★**Ill., Monmouth**—Y. M. C. A. let contract, 3-story, 75 x 100-ft., to A. W. Stoolman, Champaign, $75,000. Noted June 14

Ia., Corinth—School—Bd. Educ received low bid Nov. 26, for 2-story, brick and rein.-con., from W. F. Kucharox Co., 622 Hubbell Bldg., Des Moines. About $55,580. Noted Nov. 22.

★**Ia., Spirit Lake**—Home—Knight Templars, of Iowa, let contract to J. B. Nelson & Son, Mankato, Minn., $100,000. Noted Aug. 9.

★**Ia., Strahan**—School—Bd. Educ., Consolidated Dist., let contract, 2-story, 82 x 86-ft. cut stone, rein.-con. and terra cotta, to J. Welch, Nebraska City, Neb., $59,000 Noted Nov 15

★**Minn., Rochester**—Store and Hotel—Knowlton Realty Co. let contract 7-story, 100 x 140-ft. to G Schwartz & Co. Stebbins Bldg., Rochester, $275,000 Noted Oct 18

Wash., Grand Mound—Cottage, Etc.—State Bd Control, Olympia received lowest bid building cottage and power plant from Warrack Constr. Co., Arcade Bldg., Seattle, $69,500 Noted Nov 15

Wash., Olympia—Temple—State received lowest bid building temple of marble from E G Peters Co., Seattle, $187,118 Noted Nov 15

★**Cal., Brawley**—Hotel—Brawley Hotel Corp let contract 3-story, 75 x 150-ft. to Milwaukee Bldg. Co., Wright & Callendar Bldg., Los Angeles. About $95,000

FEDERAL GOVERNMENT WORK

Proposed Work

Pa., Phila.—Plumbing — Bureau Yards and Docks, Navy Dept., Wash., preparing plans for plumbing in various buildings. About $25,500. Specifications No. 2751.

Wash., D. C.—Dry Kiln and Treating Tank—Bureau Yards and Docks, Navy Dept., Wash., having plans prepared. About $20,000. Specification No. 2744.

Va., Norfolk—[illegible] Navy Yard, Norfolk, Va., will be received bids furnishing at Navy Yard, Norfolk, 385,000 lb. asphalt paving to oil barrels, 250,000 lb. No. 1 refined Trinidad asphalt and 100,000 lb. Val der Traver asphalt. Schedule No. 1616.

Cal., Mare Island—(Vallejo P. O.)—Bureau Supplies and Accounts, Navy Dept., Wash., will receive bids furnishing at Navy Yard, Mare Island, 36,000 lbs. broken stone. Schedule No. 1634.

BIDS DESIRED

Mass., Chelsea—Road—Until Jan. 14 by Bureau Yards and Docks, Navy Dept., Wash., building roads for Naval Hospital. About $15,000; Specification No. 2751.

N. Y., Brooklyn—Superstructure to Power House—Until Jan. 7 by Bureau Yards and Docks, Navy Dept., Wash., building at Naval Hospital, Brooklyn; Specification No. 2585.

Pa., Ft. Mifflin—Wooden Pier and Bulkhead—Until Dec. 24 (extension of date) by Bureau Yards and Docks, Navy Dept., Wash. Noted Dec. 13

Md., Annapolis—Laundry Equipment, Etc.—Until Jan. 7 by Bureau Yards and Docks, Navy Dept., Wash., furnishing at Bancroft Hall, Annapolis. About $38,500; Specification No. 2743.

La., Barataria—Radio Towers and Tanks—Until Jan. 21, by Bureau Yards and Docks, Navy Dept., Wash., building at Barataria Bay. About $35,000; Specification No. 2686.

Kan., Eldorado—Post Office—Until Jan. 15 (extension of date) by J. A. Wetmore supervy. archt., treas. dept., Wash. Noted Dec. 6.

Cal., Bakersfield—Post Office—Until Jan. 7, by J. A. Wetmore, supervy. archt., treas. dept., Wash.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**R. I., Melville**—Dredging—Bureau Yards and Docks, Navy Dept., Wash., let contract dredging at U. S. Naval Coal Depot, to J. S. Packard Dredging Co., 1004 Turks Head Bldg., Providence, $27,000 Noted Dec. 6.

★**R. I. Newport**—Garage—Bureau Yards and Docks, Navy Dept., Wash., let contract building at Naval Training Sta., to T. F. Kocher, Harrison Ave., $11,557 Noted Dec. 13.

★**Conn., New London**—Crane—Bureau Yards and Docks, Navy Dept., Wash., let contract 5-ton electric crane to Penn Bridge Co., Beaver Falls, Pa., $7500; 2 hand power cranes to Cameron Eng. Co., East Stroudsburg, Pa., $900. Noted Dec. 13

★**Pa., Ft. Mifflin**—Appropriation Bks. Repair House and Central Heating Plant—Bureau Yards and Docks, Navy Dept., Wash., let contract to Ward-Yardley Co., 1737 Filbert St., Phila., $47,168. Noted Dec. 13.

Pa., Fort Mifflin—Chief Gunners Quarters—Bureau Yards and Docks, Navy Dept., Wash., received bids building at Naval Ammunition Depot (93 work complete (6) work complete using airbrick for exterior walls from grade to 1st floor level (3) masonry work for interior walls to 2nd story level from Empire Concrete Co., 9 South 18th St., Phila., (a) $9777, (b) $10,253, (c) $10,343; Daystrom Concrete Co., Max Bldg., Pittsburgh, (a) $10,500, (b) $11,500, (c) $12,000; W. W. Austine & Co., 1118 Filbert St., Phila., (a) $13,948, (b) $14,140, (c) $14,121.

★**Pa., Ft. Mifflin**—Marine Barracks—Bureau Yards and Docks, Navy Dept., Wash., let contract building at Naval Sta., to Dempsey Concrete Co., Max Bldg., Pittsburgh, $66,000. Noted Dec. 13.

★**Pa., Ft. Mifflin**—Officers' Quarters—Bureau Yards and Docks, Navy Dept., Wash., let contract to Earney Abbott Concrete Co., West 42nd St., New York City, $15,000. Noted Dec. 13.

★**Pa., Phila.**—Crane—Bureau Yards and Docks, Navy Dept., Wash., let contract installing 10-ton electric crane in Gathering Vault at Navy Yard, to Penn Bridge Co., Beaver Falls, $24,000.

★**Pa., Phila.**—Heating System—Bureau Yards and Docks, Navy Dept., Wash., let contract installing heating system in Academic Group, to Matlack Bros., Arch and Canal Sts., Chicago, $43,000. Noted Dec. 13.

★**Pa., Pittsburgh**—Warehouse—War Food Bldg., Gen. Depot, Wash., let contract to Austin Co., Penrose Ferry, Phila., and plan approved.

Federal Government Work (Continued)

★**Md., Baltimore**—Hospital—War Dept., Surgeon General's Office, Wash., let contract to J. H. Miller, Baltimore; cost plus percentage.

★**Md., Indian Head**—Extension to Power House—Bureau Yards and Docks, Navy Dept., Wash., let contract to Austin Co., Bulletin Bldg., Phila. About $40,000; cost plus percentage. Noted Nov. 29.

★**Md., Indian Head**—Blending Towers—Bureau Yards and Docks, Navy Dept., Wash., let contract 2 blending towers to Austin Co., Bulletin Bldg., Phila. About $75,000; cost plus percentage.

Md., Indian Head—Magazine Buildings—Bureau Yards and Docks, Navy Dept., Wash., let contract for 2 magazine buildings, to Austin Co., Bulletin Bldg., Phila. About $80,000; cost plus percentage.

★**Md., Indian Head**—Pulping and Perching House—Bureau Yards and Docks, Navy Dept., Wash., let contract, to Austin Co., Bulletin Bldg., Phila. About $34,000; cost plus percentage.

★**Md., Indian Head**—Quarters—Bureau Yards and Docks, Navy Dept., Wash., let contract 5 sets of quarters, to Austin Co., Bulletin Bldg., Phila. About $35,000; cost plus percentage.

★**Wash., D. C.**—Cranes—Bureau Yards and Docks, Navy Dept., Wash., let contract furnishing three 50-ton locomotive jib cranes to Norfolk, Va., Phila. and New York Navy Yards to Penn Bridge Co., Beaver Falls, Pa., $393,480. (One for each Navy Yard.) Noted Dec. 6.

Wash., D. C.—Electric Traveling Cranes—Bureau Yards and Docks, Navy Dept., Wash., received bids (a) work complete (b) (c) and (d) alternate bids from Manning, Maxwell & Moore, Inc., 119 West 40th St., New York City, (a) $35,924, Chesapeake Iron Works, Westport, Md., (d) one 25-ton motor crane) $15,500 two 10-ton motor cranes, $17,200; Niles, Bement Pond Co., 111 Bway., New York City (b) $26,250, (d) $16,250, (f) (alternate bid) $16,400; Cleveland Crane & Eng. Co., Wickliffe, O., (b) $29,245, (d) $16,150. Noted Dec. 13.

Wash., D. C.—Motor Generator Sets—Bureau Yards and Docks, Navy Dept., Wash., received low bids furnishing at Phila., Norfolk, Va., New York and Wash., D. C., Navy Yards as follows: Item 1 net price of equipment as specified for substation New York Navy Yard, item 2, net price equipment for substation 12 New York Navy Yard, item 3, net price equipment for substation north of new foundry, Phila. Navy Yard, item 4, net price equipment on fitting-out pier Phila. Navy Yard, item 5, net price equipment in machine shop Norfolk Navy Yard item 6, net price equipment on fitting-out pier Norfolk Navy Yard item 7, net price for 3 motor-generator sets for substation in Gun Shop, Wash., D. C., Navy Yard, item 8, alternate bid—(a) 3a, 4a, 5a, 6a, 7a, 8a, reduction omitting all factory inspection tests and substituting regular routine tests from Westinghouse Electric Mfg. Co., 803 Fifth Ave. Bldg., Wash., D. C. (1) $14,310, (2) $[illegible], (3) $[illegible], (4) $[illegible], (5) $[illegible], (6) $[illegible], (7) $[illegible], (8) $29,245, low to be kept from $[illegible].

Allis-Chalmers Mfg. Co., Milwaukee, Wis., (1) $16,475, (2) $[illegible], (3) $31,440, (4) $31,440, (5) $[illegible], (6) $31,440, (7) $31,440, (8) $16,450, (1a) $16,475, (2a) $9720, (3a) $31,440, (4a) $31,440, (5a) $20,280, (6a) $31,040; (7a) $30,470, (8a) $16,[illegible].

Bucyrus Electric Co., 12th and Cranberry Sts., Erie, Pa., (1) $16,171, (2) $10,150, (3) $17,310, (4) $27,310, (5) $24,[illegible], (6) $17,[illegible], (7) $31,[illegible], (1a) deduct $500, (2a) deduct $[illegible], (3a) deduct $500, (4a) deduct $500, (5a) deduct $[illegible], (6a) deduct $500, (7a) deduct $[illegible].

Wash., D. C.—Range Finding Tower and Reconstruction of Building Nos. 105 and 111—Bureau Yards and Docks, received bids Dec. 17 installing at Navy Yard, Wash., for each complete (b) quantity deducted from (a) if new roofs of asphalt are omitted and existing roofs are retained (c) amount added or deducted from (a) and (b) if concrete piles are substituted for steel piles (d) amount to be added or deducted if reinforced concrete is substituted for steel frame of extension (e) amount added or deducted if concrete footing is substituted for brick and gravel (or slag) (f) amount added or deducted from (a) and (b) if asphalt brick is substituted for brick and terra cotta tile (g) amount added or deducted if steel toilet partitions are substituted for slate (h) amount deducted if pumice is omitted (i) amount deducted from (a) and (b) if all existing and plastering included here are omitted except as to piers of extension, (j) price per lin.ft. wood piles in place over or under length specified price for all wood piling as specified from:

Richardson & Burgess, Inc., 616 Colorado Bldg., Wash., (a) $293,248, (b) deduct $13,268, (c) add $2188, (d) deduct $3144, (e) add $650, (f) deduct $2104, (g) deduct $100, (h) deduct $1087, (i) deduct $14,851, (j) $3392, $0.69 per ft.

Warren Moore & Co., Colonial Bldg., Phila., (a) $332,721, (b) deduct $27,400, (c) add $2800, (d) deduct $8151, (e) add $324, (f) add $2000, (g) deduct $2000, (h) deduct $1000, (i) deduct $20,000, (j) add $0.60 deduct $.40.

Boyle-Robinson Constr. Co., 601 Evans Bldg., Wash., (a) $334,202, (b) deduct $1900, (c) add $3175, (d) deduct $7000, (e) add $750, (f) add $1000, (h) deduct $1000, (i) deduct $2500, (j) add $0.45 deduct $0.35. Noted Dec. 13.

Wash., D. C.—Seaman Gunner's Quarters—Bureau Yards and Docks, Navy Dept., Wash., received bids Dec. 17: (a) work complete; (b) amount added or deducted from (a) if air-lock brick is substituted for face brick; (c) amount added or deducted if selected common brick is substituted for face brick (d) amount added or deducted if artificial stone is substituted for Indiana limestone (e) amount added or deducted if asbestos roofing is substituted for pitch and gravel; (f) amount added or deducted if gypsum block is substituted for hollow terra cotta tile; (g) amount added or deducted if metal sash and frames are substituted for wood sash and frames of basement; (h) amount added or deducted if metal casement sash and frames are substituted for all wood sash and frames above basement; (i) amount added or deducted if wood counterbalanced windows are substituted for all windows shown above basement; (j) amount added or deducted if metal counterbalanced windows are substituted for all windows shown above basement; (k) amount added or deducted if metal covered doors and frames are substituted for wood doors and frames in all exterior door openings (l), (m), and (n) are alternate bids on government specifications, from:

Summer Sollitt Co., Pullman Bldg., Chicago, (a) $150,000; (b) add $2000; (c) deduct $2500; (d) deduct $100; (e) add $300; (f) deduct $500; (g) add $3000; (h) add $11,000; (i) deduct $1000; (j) add $4000; (k) add $2300; (l) deduct $300; (m) $1.50; (n) $0.05.

Warren Moore & Co., Colonial Trust Bldg., Phila., (a) $58,155; (b) add $3600; (c) deduct $2934; (d) deduct $593; (e) add $350; (g) add $1273; (h) add $7575; (i) add $300; (j) add $1700; (k) add $710; (l) deduct $300; (m) $7700; (n) $625.

King Lumber Co., Charlottesville, Va., (a) $174,174; (b) $175,474; (c) $173,474; (d) $174,274; (e) $174,974; (f) $174,174; (g) $176,474; (h) $181,474; (i) $176,474; (j) $177,474; (k) $178,474; (l) $178,474; (m) $1.00; (n) $0.15 per sq.ft.

★**Wash., D. C.**—Structural Steel—Bureau Yards and Docks, Navy Dept., Wash., rescinded contract let to Pittsburgh Des Moines Steel Co. for structural steel for Seaplane Hangar, Hampton Roads, Va., and relet same to Richmond Structural Steel Co., 18th and Dock St., Richmond, Va., $20,390. Noted Nov. 22.

Fla., Key West—Tank and Tower—Comr. Fisheries Dept., Wash., D. C., received bids Dec. 6 building at Biological Sta., from Williams-Gerstle Eng. Co., 198 Bway., New York City, $4737; time, 90 days. Simmons, Hartenstein & Whitten, Inc., Charlotte, N. C., $6662; time, 90 days. Noted Nov. 29.

★**Fla., Pensacola**—Well and Pumping Machinery—Bureau Yards and Docks, Navy Dept., Wash., let contract installing at Navy Aëronautic Sta., to Layne & Bowler Co., Randolph Bldg., Memphis, Tenn., $17,900.

★**Ia., Des Moines**—Hospital—War Dept., Surgeon General's Office, Wash., let contract to C. Weitze & Son, 713 Mulberry St.; cost plus percentage.

★**Mo., St. Louis**—Warehouse—War Dept., Brig. Gen. I. Littell, Wash., let contract to Westlake Constr. Co., 713 Locust St., cost plus percentage.

Tex., Denton—Post Office—J. A. Wetmore, supery. archt., treas. dept., Wash., received bids Dec. 17, from Dreher Constr. Co., Marquette Bldg., Chicago, $56,961; J. F. Wiese, 1301 City Nat. Bank Bldg., Omaha, Neb., $54,346; J. F. McKnight, Hallettsville, $59,300. Noted Nov. 8.

Cal., Mare Island (Vallejo P. O.)—Incinerator—Navy Yard, Mare Island, received bids building at Marine Barracks, Navy Yard, from Universal Eng. Co., 462 Fillmore St., San Francisco, (a) $6237—time 75 days; (b) 5444—75 days; (c) $5283—55 days; (d) $6237—75 days; (e) $5444—75 days; (f) $5283—55 days. Borge Incinerator Corp., 1216 Flatiron Bldg., New York City, (a) $7527—45 days; (b) $5902—45 days; (c) $4940—30 days; (d) $7527—45 days; (e) $5902—45 days; (f) $4940—30 days. W. McCanse, Durant Natl. Bank Bldg., Durant, Okla., (a) $8869—60 days; (b) $6369—60 days; (c) $6110—45 days; $8800—60 days; (f) $5960—45 days. Noted Nov. 15.

MISCELLANEOUS

Proposed Work

Pier and Bulkhead—Brooklyn, N. Y.—Todd Shipyards Corp., 15 Whitehall St., New York City, having plans prepared for timber pier and bulkhead, 25 ft. wide, south of 22nd St. About $65,000.

Signal Tower, etc.—Norristown, Pa.—Phila. & Reading R.R. plans signal tower, battery house and 2 signal bridges here. S. T. Wagner, Reading Terminal, Phila., ch. engr.

Terminal—Cape Charles, Va.—Pennsylvania R.R. acquired 3000-ft. site on Little Creek near here and plans to build deep water terminal. A. C. Shand, Broad St. Sta., Phila., ch. engr.

Tunnel—Henderson, Tenn.—(Official)—Gulf, Mobile & Northern R.R. having plans prepared by Coverdale & Colpitts, engrs. 66 Bway., New York City, for 500 ft. tunnel to be driven on new extension in Chester Co. B. V. Wright, Laurel, Miss., ch. engr.

Retaining Wall—Cleveland, O.—(Official)—City granted Cleveland, Cincinnati, Chicago & St. Louis R.R. permission to build rein.-con. retaining wall along 11th St. C. A. Paquette, Cincinnati, ch. engr.

Dumper—Hamilton, O.—See "Industrial Works."

Levee Improvement—Spirit Lake, Ia.—Dickinson Co. sold $500,000 bonds for levee improvements. A. MacDonald, co. aud.

Dam Repairs—Delta, Colo.—Secy. Delta Enterprise Ditch Co. soon lets contract repairing dam across Snyder Gulch near here.

Transmission Line—Wash., Seattle—See "Industrial Works."

Dykes—Montreal, Que.—See "Water-Works."

BIDS DESIRED

Transmission Line—Fremont, N. C.—Until Jan. 3, by F. B. Mayo, mayor, building 40-mi. transmission line, including sub-station, arc light and distributing systems. B. O. Austin, Raleigh, engr.

Bulkhead and Spillway—Sac City, Ia.—See "Excavation and Dredging."

Dam—Eureka, Kan.—Until Dec. 27, by City. About $30,000. J. W. Kenner, clk.

Dam—Calgary, Alta.—Until Jan. 15, by Alberta Hydro-Electric Co., Ltd., Dominion Bank Bldg., building several power dams along Bow River; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

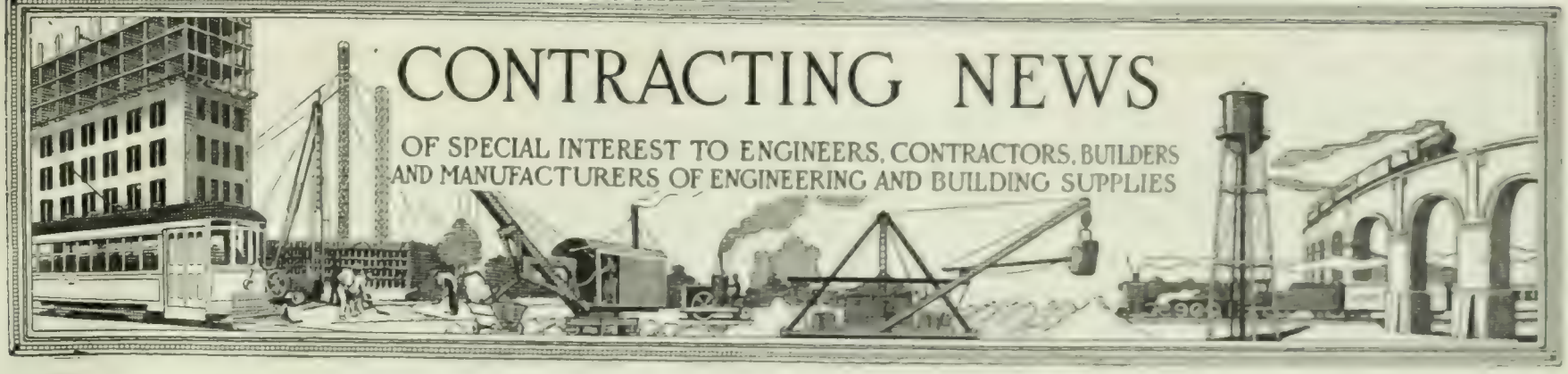
Approach Work—St. George, S. I., N. Y.—C. D. Van Name, pres. Richmond boro., received bids for approach work for additional court house in Richmond Co., on Jay and DeKalb St. and Stuyvesant Pl., from J. M. Knopp, 544 West 43rd St., New York City, $51,994; P. T. Cox Contg. Co., 154 Nassau St., New York City, $53,400; P. J. Carlin Constr. Co., 1123 Bway., New York City, $54,792.

★**Ore Dock—Superior, Wis.**—Great Northern Ry., Co. let contract to A. Guthrie & Co., Inc., 366 Jackson St., St. Paul, Minn. About $1,000,000.

★**Portland Cement—Minneapolis, Minn.**—(Official)—City let contract furnishing 100,000 bbl. cement, to Landers, Morrison, Christenson Co., Plymouth Ave. and North 1st St., $2.48 per bbl.; 25,000 bbl. Hydraulic Pressed Brick Co., 211 South 4th St., $2.48 per bbl.; 5c. per barrel discount for cash in 10 days. Noted Nov. 22.

★**Elimination of Grade Crossings—Dallas, Tex.—(Official)**—Missouri, Kansas & Texas R.R. let contract grade separation at Lemmon Ave., Cedar Springs Rd. and Maple Ave., raising present undergrade crossings at Quick Hall and Bowen Sts., to List & Gifford Constr. Co., 216 Dwight Bldg., Kansas City, Mo. About $350,000.

★**Dock—Seattle, Wash.**—Great Northern Ry. let contract extension to dock, to Grant, Smith & Co., Pioneer Bldg., St. Paul, Minn. About $50,000.



Proposals

For Proposals Advertised See Pages 50 to 54, Inclusive

WATER-WORKS

Bids Close		See Eng. News-Record
Dec. 28.	Tonawanda, N. Y.	Dec. 27
Jan. 3.	Bonifay, Fla.	Dec. 27
Jan. 3.	Tipton, Kan	Dec. 20
Feb. 5.	Jersey City, N. J.	Dec. 27

SEWERS

Dec. 27.	New York, N. Y.	Dec. 20
Dec. 30.	Rocky River, O.	Dec. 20
Dec. 31.	St. Paul, Minn.	Dec. 27
Jan. 3.	Union Grove, Wis.	Dec. 20
Jan. 7.	Westfield, N. J.	Dec. 20
Jan. 8.	Miami, Okla.	Dec. 20
Feb. 1.	Toledo, O.	Dec. 13

BRIDGES

Dec. 29.	Troy, N. Y. Adv. Dec. 13 and 20.	Dec. 13
Jan. 3.	Anoka, Minn.	Dec. 20
Jan. 4.	Richmond, Va. Adv. Dec. 20 and 27.	Dec. 20
Jan. 8.	Salinas, Cal.	Dec. 13
Jan. 9.	Lodge Grass, Mont.	Dec 20
Jan. 9.	Hardin, Mont.	Dec. 27
Jan. 15.	Eureka, Cal.	Dec. 27

STREETS AND ROADS

Dec. 27.	New York, N. Y.	Dec. 20
Dec. 28.	Webster Springs, W. Va.	Dec. 13
Dec. 29.	Huntington, Ind.	Dec. 6
Dec. 31.	Bay Minette, Ala.	Dec. 6
Dec. 31.	California	Dec 20
Jan. 2.	Alexandria, La.	Dec. 13
Jan. 3.	Michigan	Dec. 27
Jan. 4.	Richmond, Va.	Dec. 20
Jan. 7	Pasco, Wash	Dec 20
Jan. 7.	Portsmouth, O.	Dec. 27
Jan. 7.	Louisiana	Dec 27
Jan. 7.	California	Dec. 27
Jan. 8.	Quincy, Fla.	Dec. 27
Jan. 8.	Wenatchee, Wash.	Dec. 20
Jan. 8.	Oregon	Dec. 20
Jan. 9.	Sapulpa, Okla.	Dec. 27
Jan. 21.	Lansing, Mich. Adv. Dec. 27.	Dec. 27

EXCAVATION AND DREDGING

Dec. 31.	Glenwood, Minn.	Dec. 20
Jan. 3.	Sac City, Ia	Dec 20
Jan. 9.	Tuscola, Ill.	Dec. 20
Jan. 11.	Walker, Minn.	Dec. 20
Jan. 11.	Phila., Miss.	Dec. 27
Jan. 12.	Monticello, Ind.	Dec. 27

Bids Close		See Eng. News-Record

INDUSTRIAL WORKS

Jan. 7.	Palmdale, Cal.	Dec. 27
Jan. 8.	Albany, N. Y. Adv. Dec. 20.	Dec. 20

BUILDINGS

Dec. 31.	Brooklyn, N. Y.	Dec. 20
Dec. 31.	Syracuse, N. Y.	Dec. 27
Jan. 1.	Wichita, Kan.	Nov. 22
Jan. 3	Peabody, Kan.	Dec. 27
Jan. 5.	Springfield, Vt.	Dec. 27
Jan. 7.	Cleveland, O.	Dec. 20
Jan. 7	Chenango Bridge, N. Y.	Dec. 27
Jan. 8.	Dodge Center, Minn.	Dec. 13
Jan. 15.	New York, N. Y.	Nov. 29
Jan. 15.	Waukesha, Wis.	Dec. 27
Feb. 15	Duluth, Minn.	Dec. 27
Jan. 16	Huron, S. D.	Dec. 20

FEDERAL GOVERNMENT WORK

Jan. 3.	Distribution System — San Pedro, Cal.	Dec. 27
Jan. 4.	Buildings — Grande Isle, La. Adv. Dec. 6 and 13.	Dec. 6
Jan. 5.	Jetty Work — Jacksonville, Fla. Adv. Dec. 13.	Dec. 13
Jan. 7.	Post Office — Shawnee, Okla.	Dec. 6
Jan. 7.	Electric Traveling Cranes—Brooklyn, Y.	Dec. 13
Jan. 7.	Post Office — Bakersfield, Cal	Dec 20
Jan. 7.	Laundry Equipment, etc.—Annapolis, Md.	Dec. 20
Jan. 7.	Power House Superstructure—Brooklyn, N Y	Dec 27
Jan. 11.	Dredging — Wilmington, Del. Adv. Dec. 27.	Dec. 27
Jan. 14	Post Office—Orange N Y Adv. Dec. 13 and 20.	Dec 14
Jan 14	Roads—Chelsea, Mass	Dec 20
Jan 14	Hospital—Chelsea, Mass	Dec 27
Jan 15	Post Office — Eldorado Kan.	Dec. 20
Jan 18	Lockgates—Cincinnati, O	Dec 27
Jan 21	Radio Towers and Tanks—Barataria La	Dec 20
Jan 28	Post Office—Sunbury Pa	Dec 6
Feb 5	Excavators—Denver, Colo	Dec 17

MISCELLANEOUS

Jan 2	Improving Harbor — Newport Ore. Adv Nov 29 to Dec 13	Nov 29
Jan. 3	Transmission Line — Fremont, N C.	Dec 24
Jan 5	Levee—Osceola, Mo Adv Dec 13 and 20	Dec 13
Jan 8	Pier—Philadelphia, Pa	Dec 27
Jan 15	Dam—Calgary, Alta Adv Dec 20.	Dec 20
Feb. 11.	Harbor Improvement—Mobile, Ala.	Dec

Where name of official is not given, inquiries should be addressed to City Clerk, County Clerk or corresponding official.

WATER-WORKS

Proposed Work

N. J., Hackensack — [illegible] granted permission to Hackensack Water Co. to issue common stock for $500,000; proceeds to be used for improvements.

N. J., Perth Amboy—City having plans prepared building reservoir with [illegible] capacity of 45,000,000 gal. and ultimate capacity of 150,000,000 gal. including 15,000 ft. pipe to connect new reservoir with city system and building new force main across Raritan River. G. A. Johnson, city engr.

Pa., Harrisburg — Lebanon Consolidated Water Co. filed notice with Pub. Serv. Comn. for $520,000 bond issue for improvements.

Pa., Yoe—Boro. election soon to vote on bond issue to build water system.

W. Va., Wheeling—City plans to install new pumping station. C. B. Cooke, city engr.

Miss., Wiggins—City having plans prepared by X. Krause engr. Materials improving water and electric-light plants.

Tenn., Knoxville — City plans to build water system through [illegible] south Knoxville to Vestal. About $24,240 for pipe, $2,000 for hydrants, $4,040 for gate valves, etc. J. B. McCalla, city engr. Noted Oct. 4.

O., Canton—City having plans prepared building water [illegible] Harrisburg Rd., N. E. W. E. Sarver, city engr.

O., Lorain—City will issue $50,000 bonds to improve pumping [illegible] new [illegible] wells and machinery for filtering plant. C. C. Miller, city engr. Noted Sept. 13.

Ill., La Moille—(Corr.)—City rejected bids improving water system, including water mains and hydrants, all noted Dec. 6.

Minn., Nashwauk—City plans to build steel water reservoir.

Kan., Ogden—City voted $17,000 bonds to build water system. Noted Nov. 15.

N. D., Wilton—City has plans prepared building water system.

Mont., Eureka — City will issue $15,000 bonds to build water system.

Tex., Brady—City election Jan. 8 to vote on $75,000 bonds to build public system.

Tex., Higgins—City issued $10,000 bonds to build water system.

Okla., Hartshorne—City voted $17,000 bonds to improve water system. S. Andrews, city clk. Noted Oct. 11.

Okla., Pauls Valley—City plans election to vote on bonds for water works and sanitary sewer system and sewerage extension.

Okla., Quapaw—City election Jan. 1 to vote on $15,000 bonds for water works and sewerage system.

Okla., Waurika—City authorized bids building water system. Noted Oct. 14.

Water-Works (Continued)

Colo., Montrose—City plans to build 3-mi. wooden pipe line to carry water to Cimarron.

Idaho, Twin Falls — City having plans prepared by Burns & McDonald, engrs., 300 Inter-State Bldg., Kansas City, Mo., building water system, including 1,000,000 gal. filtration plant, main supply system. No. 8 cast iron hydrants and 6-in. mains in residential districts. About $372,011. Noted Dec. 10.

Cal., San Diego—See "Streets and Roads."

Ont., Toronto—City soon lets contract installing air chambers in main water-works pumping station. About $50,000. G. G. Powell, city engr.

Ont., Windsor—Water Comrs. plan to install 2 large electric pumps in water-works plant.

B. C., Sidney—City plans to extend Victoria water system of Saanich Peninsula to include Sidney. About $25,000.

BIDS DESIRED

N. Y., Tonawanda—(Official)—Until Dec. 18 to M. W. Simson, city clk., furnishing and laying 2150 ft. 4-ft. cast iron, wood or metal intake water pipe in Niagara River to connect with Tonawanda Pumping Sta., including construction of suction well and intake pipe. Noted Oct. 4.

N. J., Jersey City—(Official)—Until Feb. 5 by City laying 72 in. steel riveted pipe reinforced by concrete rings under Hackensack and Passaic Rivers, together with land connections on each side of present 72 in. pipe. A. Van Keuren, city engr.

Fla., Bonifay—Until Jan. 3, by City building water system. J. B. McCrary Co., 3rd Natl. Bank Bldg., Atlanta, Ga., engrs.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

N. Y., Brooklyn—Bd. Pub. Charities, Municipal Bldg., New York City, received low bids Dec. 20, installing water system in Kings Co. Hospital, from T. O'Brien, Inc., 2311 3rd Ave., $19,891; F. S. Elsinger, $19,-333; Coate, Thornton & Badley, Corp., 2 East 103d St., New York City, $24,500. Noted Dec. 13.

★Tex., Port Arthur—City let contract installing 50,000 lin.ft. cast-iron water mains to H. W. Caldwell Constr. Co. About $24,-000. Noted July 5.

★Wash., Seattle—(Official)—City let contract building watermains in Alki Ave., to Fauntleroy, from 1989 25th Ave., $57,825. Noted Dec. 20.

Man., Winnipeg — (Official) — Greater Winnipeg Water Dist. received low bids for Contr. No. 20 building tunnel, shafts and well at Red River Crossing, Contr. No. 41, building gate house and intake at Waugh, from T. Kelly & Sons, $210,430; Treadway-McDonald Co., $227,921; Winnipeg Aqueduct Constr. Co., $266,485. Noted Nov. 8.

Man., Winnipeg — (Official) — Greater Winnipeg Water Dist. received low bids building gate house and intake at Shoal Lake, from C. G. Anderson, $69,942; S. Brooks, $97,781; Winnipeg Aqueduct Constr. Co., $110,337. Noted Nov. 8.

SEWERS

Proposed Work

N. J., Westmont—City plans to build sewerage system. A. Huddlestead, city engr.

Pa., Wilkes-Barre—City having plans prepared by A. Pentar, engr., 30 Church St., New York City, building sewerage system and sewage disposal plant. Noted June 14.

Ga., Columbus—City plans to build sanitary sewerage system. About $450,000. S. Goody, city engr. Noted May 24.

O., Akron—See "Streets and Roads."

O., Bellefontaine—City plans to build sewer in Green and Detroit Sts. and John Ave. C. O. Isenbeck, city engr.

Wis., Kenosha—City soon receives bids building trunk sewer involving 1200 ft. 36-in. rein.-con. pipe, 5935 ft. 12-36-in. tile and 45 manholes. B. Brennan, city engr.

Kan., Marquette—City had plans prepared by E. T. Archer & Co., engrs., New England Bldg., Kansas City, Mo., building sewerage system. About $20,000.

Kan., Wichita — City having plans prepared for building sanitary sewer No. 20, 5 mi. long, from northern to southern end of city. About $180,000. Northern industries will appropriate about $40,000 toward cost. P. L. Brockway, city engr. Noted Aug. 23.

Neb., Fremont—City having plans prepared by Burns & McDonnell, engrs., 402 Inter-state Bldg., Kansas City, for sewage disposal plant. About $75,000. Noted Sept. 20.

Idaho, Preston—City voted $50,000 bonds to build sewerage system. J. Johnson, clk. Noted Nov. 8.

Okla., Pauls Valley—See "Water-Works."

Okla., Quapaw—See "Water-Works."

Idaho, Rupert—Council passed ordinance to issue $82,000 bonds to build sewers in Dist. No. 1. F. Scheffel, clk.

Ont., St. Thomas—City having plans prepared for storm sewers. Bonds for $64,000 will be voted in January for project. A. Ferguson, city engr. Noted Aug. 9.

BIDS DESIRED

Minn., St. Paul—(Official)—Until Dec. 31, by H. W. Austin, purch. agt., building storm water relief sewer in Como Ave. from Langford Ave. to Knapp Pl. and from Como Ave. West to Kanapp St. O. Clausen, city engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★Mass., Brockton—City let contract for new electrical equipment for Campello sewerage pumping station, to Power Equipment Co., 131 State St., Boston, $12,750.

N. Y., Brooklyn—L. H. Pounds, boro. pres., received low bids, Dec. 19,, (a) building sewers in Ave. M from West St. to Ocean Pkway.; East 3rd St. from Ave. M to East 4th St.; East 5th St. from Ave. M to Ocean Pkway.; outlet sewers crossing West St. from Ave. M to 23rd Ave. to Bay Pkway., involving 4970 lin.ft. 6-48-in. pipe, 33 manholes, 27 sewer basins, and 34,000 ft. sheeting and bracing and 10 cu.yd. concrete.; (b) building sewer in 59th St. from 20th to 21st Ave., and outlet sewer in 21st Ave. from 59th to 60th Sts., from E. Ghilardi Contg. Co., 1217 47th St., (a) 94% (b) 99%; Tomasetti & Turicamo Contg. Co., Ave. U and East 19th St., (a) 95%; (b) 95%, C. Petracea, (a) 97%; J. J. B. La Marsh, Inc., 26 Court St., (b) 100%. Noted Dec. 13.

★Pa., Phila.—(Official)—City let contract building intercepting sewers along Frankford Creek, Cont. No. 17; also miscellaneous piping for grit chamber north of Lycoming St. and west of O St., Contr. No. 16L, to J. J. McHugh, 1430 South Penn Sq., $37,000. Noted Dec. 13.

★W. Va., Wellsburg — City let contract building lateral sewers in 3rd and 4th Wards, to B. O. Cresap, $38,679. Noted Nov. 1.

★Ind., Frankfort — (Official)—City let contract building storm sewer in West Washington St., including 1010 ft. 4 ft. segment block on concrete tile, 2130 ft. 12-18 in. tile to C. A. Donho & Son, Frankfort, $13,137. Noted Nov. 29.

★Ind., Hammond—City let contract laying sewer in Michigan Ave. from lake front railroad tracks to 121st St., to United Constr. Co., $96,000. Noted Nov. 8.

★Mont., Glasgow—City let contract building storm and sanitary sewers in Dist. No. 38, to Empire Constr. Co., 6 Samuelson Bldg., Minot. Noted Dec. 6.

★Cal., Daly City—See "Streets and Roads."

BRIDGES

Proposed Work

Fla., Bradentown—See "Streets and Roads."

Ia., Marshalltown—Marshall Co. will sell $10,000 bonds Jan. 1 to build bridges.

Cal., Oakland—Alameda Co. and Southern Pacific Ry. had plans prepared for bascule bridge over inner harbor of Oakland. W. Hood, San Francisco, ch. engr. Noted Aug. 30.

BIDS DESIRED

Mont., Hardin—Until Jan. 9, by State Highway Comn., Helena, building 100-ft. wood and steel bridge over Big Horn River in Big Horn Co.

Cal., Eureka—(Official)—Until Jan. 15 by F. M. Kay, clk., Humboldt Co., building 500-ft. span highway bridge with 75-ft. truss bridge approach on each side over Eel River near Alderpoint in Rd. Dist. No. 2. About $55,000.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★N. J., Jersey City — Bd. Freeholders Hudson Co., let contract improving 14th St. viaduct (Hoboken), to Nolan & Hornung Constr. Co., 143 Summit Ave., West Hoboken. About $62,471. Noted Oct. 4.

STRUCTURAL STEEL WORK

Proposed Work

Minn., Nashwauk—See "Water-Works."

REINFORCED CONCRETE

Proposed Work

Canandaigua, N. Y.—See "Miscellaneous."

Pa., East Liberty—(Pittsburgh P. O.)—See "Industrial Works."

Wis., Milwaukee—See "Industrial Works."

Tex., Lucas—See "Industrial Works."

PRICES AND CONTRACTS AWARDED

★Ont., Toronto—See "Buildings."

STREETS AND ROADS

Proposed Work

Mass., Fitchburg — (Official) — Dept. Streets and Engr. rejected bids furnishing paving material. New bids. W. J. Gannon, acting comr. Noted Nov. 29.

N. J., Newark—(Official)—City plans to resurface with asphalt on 1 in. top surface over old binder, on old concrete foundation burner method to be employed, Newton St. from 14th Ave. to Cabinet St.; Lafayette St. from New Jersey Railroad Ave. to Hamburg Pl.; Niagara St. from Ferry to Berlin Sts.; repaving with asphalt on 2-in. top surface, 1½ binder, on 6-in. concrete foundation, West Kinney St. from Broad to Washington Sts.; Lyons Ave. from Clinton Pl. to Newark-Irvington line; South 10th St. from Springfield to Avon Aves.; Lincoln Ave. from Arlington Ave. to Carteret St.; Heller Pkway. from Sumner to Mt. Pleasant Aves.; also repaving Ferry St. from Lenz Ave. to Blanchard St. M. R. Sherrerd, city engr.

N. J., Passaic—City plans to issue $12,-213 bonds to build and reset curbs on Van Houten Ave. C. R. Wise, city engr.

N. J., Westfield—Town Council plans to improve portion Hazel and Woodland Aves., Sinclair Pl. and East Walnut St. A. W. Vois, town engr.

Pa., Norristown—Montgomery Co. rejected bids paving Germantown Turnpike between DeKalb St. Rd. and western end of Perkiomen bridge. Noted Nov. 29.

Pa., Pittsburgh — (Official) — Council passed ordinance to grade, pave and curb Bishop St. from Antietam to Chislett Sts., cost, $10,500; Rockledge St. from Miles Way to Romanhoff St., $9000; Romanhoff St. from Rockledge to Hespen Sts., $25,500; Tokio St. from Frankstown Ave. to Calistoga St., $30,000. N. S. Sprague, city engr.

W. Va., Martinsburg—City plans to pave 307,000 yd. brick and asphalt pavement. E. D. Bromley, city engr.

Streets and Roads (Continued)

W. Va., Point Pleasant—Mason Co. sold $20,000 bonds to improve roads in Lewis Dist. Noted May 31.

N. C., Boone—Bd. Comrs. Watauga Co. plans $200,000 bond issue to build roads. R. H. Brown, secy. Noted May 24.

Ga., Barnesville — City plans to pave streets in business section. M. P. Owen, city clk.

Ga., Nashville—(Official)—City defeated $18,000 bond issue to pave streets. Noted Nov. 8.

Fla., Bradentown — (Official) — Manatee Co. sold $200,000 bonds to build roads and bridges in Palmetto-Ellenton-Terra Cela-Gillette Dist. Noted Nov. 15.

Fla., Jasper—Hamilton Co. voted $400,000 bonds to build roads, including 30 mi. brick or asphalt road from Georgia State line to Suwanee Co. line at White Springs. About $250,000. Surplus will be used to hard surface lateral roads through east district. State and Federal Government will appropriate $50,000 toward cost. Noted Nov. 29.

O., Akron—Summit Co. plans to extend North Howard Rd. from high level bridge of North Hill to Cuyahoga Co. line, 17 mi.; also completing road from Britain and East Akron to Massillon. Cost, $450,000 and $150,000 respectively.

O., Akron—(Official)—City receives bids in March paving, building sewers and sidewalks on North, Grant and Cuyahoga Sts. and Martha Ave., involving $7500 lin.ft. pavment, 30 ft. wide. S. A. Zeisloft, city engr.

O., Cleveland—(Official)—City plans to grade, drain, curb and pave with brick on concrete foundation, Crestwood Ave. S. E., from Woodhill Rd., S. E. to East 10th St.; Rugby Rd., N. E. from Rodman Court N. E. to East 134th St.; Bliss Ave., N. E., from Addison Rd., N. E. to East 66th St.; open and extend West 30th St. from Roanoke Ave. S. W. to Colburn Ave., S. W.; grading Mary Ave. S. W. from West 3rd St. to Cuyahoga River. R. Hoffman, city engr.

O., Fremont—Sandusky Co. plans to pave 4 mi. Maumee Turnpike, 1 mi. west of Bellevue to east corporation line of Clyde. State and Federal Government to appropriate toward cost.

O., Port Clinton—Ottawa Co. Comrs. plan to pave 6½ mi. Rd. No. 1, concrete. Noted Aug. 23.

O., St. Bernard — (Cincinnati, P. O.)—City plans to pave several streets providing council appropriates about $60,000. H. A. Nunlist, city engr.

O., Wooster—Wayne Co. had plans prepared paving road 9.8 mi. long, 16 ft. wide between Wooster and Creston; also Lincoln Highway west of city, monolithic brick. Cost, $330,090 and $184,000 respectively.

Mich., Charlevoix—Charlevoix Co. plans to spend $350,000 to build Dixie Highway and main tributaries of Mackinaw Trail. Noted Oct. 11.

Mich., Muskegon—City had plans prepared paving Lake St., concrete. About $59,416. P. Grimes, city engr.

Ill., Belvidere—(Official)—Boone Co. election Jan. 2 to vote on $400,000 bonds to build roads. Noted Dec. 13.

Ill., Kankakee—City rejected bid paving East Court St. from Chicago Ave. east to city limits. New bids. About $55,500. Noted July 26.

Ill., Springfield—City plans to pave 7½ mi. of streets. Following are streets to be paved: Monroe St. from Spring to 10th Sts.; Capital Ave. from 2nd to 10th Sts.; 5th St. from Monroe to Capital Ave.; 6th St. from Monroe to Jackson Sts.; Jefferson St. from 5th to 7th Sts.; Washington St. from 4th to 10th Sts.; Adams St. from 4th to 10th Sts.; 2nd St. from Monroe to Madison Sts.; Washington St. from 2nd to 4th Sts.; Clear Lake Ave. from 19th St. to Monroe Heights addition; Jefferson St. from 19th St. to Clear Lake Ave.; Cass St. from 8th to 9th Sts.; Vine St. from Pasfield St. to Grand Blvd.; College St. from Laurel to Ash Sts.; Hough St. from 5th to 6th Sts.; Whittier Ave. from Laurel to Ash Sts.; 2nd St. from Laurel to Ash Sts.; Woodlawn Ave. from Walnut St. to Grand Blvd.; Rafter St. from 3rd to 5th Sts.; Miller St. from 7th to 13th Sts.; and Carpenter St. from 7th to 19th St. W. D. Seeley, city engr.

Ill., Toledo—Cumberland Co. voted $95,000 bonds to construct concrete road on Old Natl. Highway in addition to $231,000 appropriated by State and Federal authorities. Noted Sept. 27.

Wis., Racine—Racine Co. voted $75,388 bonds to build roads during next year. State and Federal Government to appropriate toward cost. Cost about $300,000.

Minn., Red Wing—Goodhue Co. rejected bids graveling 7 mi. Red Wing-Melsvile Highway, from Dakota Co. line to Welch Twp. New bids in spring. Noted Nov. 15.

Minn., St. Paul—City plans to pave Portland Ave. About $53,642. H. W. Austin, purch. agt., O. Claussen, city engr.

Minn., Winona — City plans to pave about 15 blocks. J. H. Protz, mayor.

Kan., Lawrence—Douglas Co., Lawrence and Shawnee Co., Topeka, lets contract about Mar. 1, building cement road from Ft. Leavenworth to Ft. Riley, 27 mi. long, 18 ft. wide. Noted Oct. 25.

Kan., Norton—City plans to pave streets in business section. J. Jackey, supt. streets.

Mo., Malden—City plans to pave about 14 blocks. S. L. Downing and P. Bartmess, purch. agts.

Mo., St. Joseph—Council passed ordinance to pave 31st St. from Jules to Sylvanie Sts.; asphaltic concrete, grading 4th St. from Hyde Park Ave. to Prindle St.; 20th St. from Walnut St. to Commercial Sts.; 15th and 16th Sts. from Jules to Faraon Sts.; Logan St. from St. Joseph Ave. to 9th St. C. P. Hoff, city engr.

Arkansas — (Official) — State Highway Dept., Little Rock, will receive bids about Mar. 1, building 20 mi. macadam road, 14 ft. wide in Carroll Co. from Eureka Springs through Green Forest and Alpena to Green Co. line. About $158,000. W. Hight, asst. highway engr. Noted Dec. 13.

Tex., Franklin—Robertson Co. plans election to vote on $75,000 bonds to build roads.

Tex., Gonzales—(Official)—Gonzales Co. voted $75,000 bonds to build and improve highways. Address W. B. Brookes, Waelder. Noted Dec. 6.

Tex., Hillsboro—(Official)—Hill Co. plans election soon to vote on bonds for 3 concrete highways through county. About $1,250,000. R. T. Bierns, co. judge.

Tex., La Grange—(Official)—Fayette Co. election Jan. 15 to vote on $100,000 bond issue to build roads in Distr. No. 1. Address J. C. Baumgarten, Schulenburg.

Tex., Montague — (Official) — Montague Co. defeated $300,000 bonds to build roads. Noted Dec. 6.

Tex., Palestine—Anderson Co., Elkhart Dist., voted $40,000 bonds to improve roads.

Tex., Roby—Fisher Co. defeated $150,000 bonds to build roads. Noted Nov. 29.

Tex., Texarkana—City plans to pave 3 blocks with brick. W. Haynes, city engr.

Idaho, Council—Adams Co. voted $80,000 bonds to build State Highways and $20,000 bonds for other road improvements.

Ariz., Nogales—Santa Cruz Co. election Jan. 22, to vote on $175,000 bonds to build roads.

Wash., Garfield — (Official) — City voted $20,000 bonds to build streets and sidewalks. Noted Dec. 13.

Wash., North Yakima—Yakima Co. plans to spend $80,000 to build roads during 1918. State will appropriate toward cost.

Wash., Tacoma—Pierce Co. [illegible] contract building 7½ mi. road connecting West Pioneer Ave. at Fircrest City Limits to present Hill Rd. About $21,000. J. R. O'Farrell, comr.

Wash., Waterville—(Official)—Douglas Co. receives bids about May 28, building Permanent Highway No. 88, 31 mi. long, involving grading, draining and surfacing with crushed rock. About $221,134. H. Foster co. engr. Noted Nov. 29.

Wash., Wenatchee—Chelan Co. plans to build 16 mi. road known as Lincoln Pass Rd., 16 ft. wide.

Cal., Fresno—Bd. Supervs. Fresno Co. plan election to vote on $[illegible] bonds, of which $[illegible] will be used to build highway from Hanford to San Lucas through Coalinga. Surplus will be used in improving other county roads. D. M. Bernwell, co. clk.

Cal., San Diego — City Council passed resolution to improve Jackdaw, Hunter, Hawk and Arcadia Sts., including cement pavement, with asphalt [illegible], curbs, sidewalks and gutters, metal culverts, watermains, etc. G. Cromwell, city engr.

N. S., Stellarton—Street Com. plans to spend $50,000 to build streets and sidewalks. J. T. McLellan, chn.

BIDS DESIRED

Fla., Quincy — Until Jan. 8 by J. P. Smith, city clk., building 23,000 sq.yd. sheet asphalt, concrete or brick pavements. J. B. McCrary Co., 3rd National Bank Bldg., Atlanta, Ga., engrs. Noted Nov. 22.

Louisiana — Until Jan. 7, by State Bd. Engrs., New Orleans, building 1.09 mi. New Orleans-Pydras Highway, gravel. D. Buie, state highway engr.

Michigan—(Official) — Until Jan. 9 by State Highway Comn., Lansing, building 14.1 mi. stone and gravel road, including grading, surfacing and culverts in Osceola Co. Noted Dec. 13.

Mich., Lansing—(Official)—Until Jan. 21, by City, for asphaltic cement for year 1918. J. A. Parsons, clk. Advertised in this issue.

O., Portsmouth—(Official)—Until Jan. 7 by Scioto Co. Comrs., building 3710 ft. road 18 ft. wide, involving 1 arch culvert, 16 ft. wide, 1889.8 cu.yd. excav., 2453.9 cu.yd. embankment, 204 cu.yd. masonry and 54 ft. 15-30-in. culvert pipe. J. J. Harper, engr.

Okla., Sapulpa—(Official)—Until Jan. 9, by R. E. Jenness, city clk., paving, curbing, guttering, draining, grading and installing sewer pipe in Main St. and Lafayette Ave. About $40,000. S. M. Wentworth, city engr. Noted Dec. 13.

California — (Official) — Until Jan. 7, by State Highway Comn., [illegible] Bridge, Sacramento, grading 17 mi. road in San Diego Co. 7 mi. east of Willows and Sacramento River, involving 14,240 cu.yd. concrete without reinforcement, 167 sq.yd. Class A portland cement concrete, culverts and [illegible]. Bids must be dry, solids and obtaining [illegible]. C. H. Wiseman, highway engr.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract.)

★**W. Va., Charleston**—Kanawha Co. let contract improving section Nine Mile, Fayette and Kanawha Turnpike, including 3748 cu.yd. concrete, 16,400 lb. reinforcement, 744 ft. 15-in. and 180 18-in. culvert pipe, to Central Const. Co., Lee and Dickson Sts. Noted Nov. 8.

★**Ala., Geneva**—(Official) — Geneva Co. let contract building jetties, Samson & Otis Rd. east of State Prison, No. 19, to Crosley & Co., Eufaula, $47,000. Noted Nov. 29.

★**Tenn., Greenville**—Greene Co. let contract grading about 175 mi. earth road and constructing 141 mi. of Short Line, Co. at following unit prices: earth, 18c. per cu.yd.; loose rock, 42c. cu.yd.; solid rock, 82c. cu.yd.; macadam, $1.84 cu.yd.; concrete, $13 cu.yd.; paving 30 sq.yd., [illegible] per sq.yd.; culverts [illegible] per lin.ft. About $110,000. Noted Aug. 30.

★**O., Newark**—(Official)—Licking Co. let contract grading and improving [illegible] and 9 mi. of Jersey Summit Rd., 3 mi. Hebron Rd., 11 mi. Granville Rd. and 2 mi. Newark & Somerset Rd. to [illegible] & Roberts, Steward, $[illegible].

★**Ind., Anderson**—Madison Co. [illegible] contract paving Meridian Ave., awarded [illegible] to Indiana Paving Contracting Co., [illegible] and Lake Erie & Western Rr., Indianapolis, $[illegible]. Noted Dec. 13.

Ind., Elkhart—[illegible] contract for [illegible] paving Franklin and Main Sts., Elkhart, Harrison Court, St., Prairie and Waterford Sts., Goshen, [illegible] Noted Dec. 13.

Streets and Roads (Continued)

Ind., Indianapolis—City received low bids resurfacing South St. from Virginia to Capitol Aves., (a) first grade wooden block, (b) second grade block, (c) granite block, from Public Constr. Co., (a) $6.84; Union Asphalt Constr. Co., 308 American Central Life Bldg., (a) $7.65, J. E. McNamara Constr. Co., (b) $4.90; A. D. Bowen, (c) $5.32; Union Stone & Material Co., 1007 Gilbert Ave., Cincinnati, O., (b) $6; (c) $7.72; S. M. Timberlake Constr. Co., 134 American Life Bldg., (a) $6.81. Noted Aug. 23.

★**Mich., Wyandotte** — City let contract paving Spruce, Cedar, Cherry, Orchard, Forest and Plum Sts., to J. H. Baker Co., 1454 Penobscot Bldg., Detroit, $130,000. Noted Nov. 8.

★**Neb., Columbus**—(Official) — City let contract for 29,528 sq.yd. bitulithic pavement, to W. Horribeu, 1422 Walnut St., Iowa City, Ia., $2.35 per sq.yd. Noted Dec. 20.

★**Mo., Jefferson City** — (Official)—Cole Co. let contract improving portions of Henley and Marys Home Rds., Hulgan Park Dr., Osage Bend and Williams Ferry Rds., Russellville-Centertown Rd., Bonneville and Decatur Rds., and roads in Rd. Dist. No. 9, to Pope Constr. Co. and L. Brunner, both of Jefferson City, $17,563. Noted Nov. 26.

★**Utah**—(Official)—State Highway Comm., Salt Lake City, had plans prepared rebuilding 15 mi. highway through Juab and Millard Cos. and highway bridge over Sevier River. About $11,500. Work to be done by day labor. Noted Dec. 13.

★**Ariz., Yuma**—City let contract improving 1st, 2nd, 3rd and Court Sts., including grading, curbing, culverts, sidewalks, guttering and building 6789 lin.ft. 1½ in. bitulithic pavement on 4 in. bituminous base, to O & C Constr. Co., Yuma. About $58,077.

Washington — State Highway Comm., Olympia, received lowest bid moving 1800 ft. North Bank track of Southern Pacific R.R. system around bluff between Collins and Cooks to open up State Rd. No. 8, Skamania Co., from Porter Bros., Ry. Ex. Bldg., Portland, Ore., $18,673. Noted Nov. 29.

★**Washington** — State Highway Comm., Olympia, let contract building 5¼ mi. Pacific Highway between Woodland and Martins Bluff in Cowlitz Co., to L. H. Goerig, Seattle. About $80,687. Noted Nov. 29.

Oregon — State Highway Comm., 1301 Yeon Bldg., Portland, received low bids grading portion Pacific Highway in Clackamas Co. between Carenmah and New Era from Clackamas Co. Court, $34,705. Warren Constr., Journal Bldg., Portland, $48,577; United Contract Co., North Western Bank Bldg., Portland, $49,732.

Cal., Calexico — City received bids improving several streets from G. R. Daley, McNeglia Bldg., San Diego, $174,822. Federal Constr. Co., Sharon Bldg., San Francisco, $185,617; Bryant & Austin, 1650 Compton Ave., Los Angeles, $188,855. Noted Dec. 6.

★**Cal., Daly City**—City let contract grading and building asphaltic concrete pavement, concrete sidewalks and gutters and installing cast iron sewers on several streets to H. Cranmer Co., Inc., Hearst Bldg., San Francisco. About $19,820.

★**Cal., San Diego**—City let contract laying 77,500 sq.ft. asphalt pavement, concrete base, cement sidewalks, curbs, etc. in National Ave. from 17th to 24th Sts., to Fairchild-Gilmore-Watson Co., Pacific Electric Bldg., Los Angeles. About $14,614. Noted Dec. 20.

★**Cal., San Francisco**—(Official)—State Bd. Harbor Comrs., Sacramento, let contract paving embarcadero with bituminous concrete and bought brackets to P. J. McHugh, 3rd and North Market Sts., Seattle, Wash., $14,974. Noted Dec. 20.

RAILWAYS—STEAM & ELECTRIC

Proposed Work

Pennsylvania—Lykens Valley Ry. plans to rebuild 1½ mi. of track and build extension from Tower City to Dauphin Co. J. Overdeer, Jr., 711 North 3rd St., Williamstown, secy.

Georgia—Columbus R.R. plans to rebuild about 2 mi. of track. Wynn & Webster, 147 Mills St., Boston, engrs.

Florida — Miami Traction Co., Miami, plans to build 4 mi. line between Miami and Miami Beach. J. R. Talton, 211 14th St., secy.

Alabama—Stouts Mountain & Hanceville R.R. plans to build 6 mi. line between Hanceville and Stouts Mountain. C. F. Wheelock, Amer. Trust Bldg., Birmingham, interested.

Louisiana—New Orleans Ry. & Light Co., New Orleans, plans to rebuild 5.7 mi. of track. M. S. Doan, 201 Baronne St., genl. mgr.

Kentucky—South Covington & Cincinnati Street Ry., Covington, plans to rebuild 2.4 mi. of track. W. W. Tripp, ch. engr.

Ohio—Cincinnati Traction Co. plans to rebuild 8 mi. of track and build 2.44 mi. new track. A. Benhan, Traction Bldg., Cincinnati, genl. mgr.

Ohio—Portsmouth Street R.R. & Light Co. plans to build 2 mi. line between Portsmouth and Union Mills. R. D. York, Portsmouth, genl. mgr.

Indiana — Terre Haute, Indianapolis & Eastern Ry. plans to rebuild 4 mi. of track. T. R. H. Daniels, Terminal Bldg., Indianapolis, ch. engr.

Illinois—Chicago & Interurban Traction Co., 914 Borland Bldg., Chicago, plans to rebuild 4 mi. of track. W. Crawford, secy.

Iowa—Sioux City Serv. Co. plans to rebuild 2½ mi. of track. M. W. Lake, Sioux City, ch. engr.

Texas—Bryan & Central Tex. Interurban Ry. plans to build 4 mi. line between Newsome and Wilcox. L. M. Levinson, Bryan, ch. engr.

Colorado—Colorado Springs & Interurban Ry., Colorado, plans to rebuild 4 mi. of track and build 1 mi. new track. W. Lloyd, 520 South Tejon St., secy.

California—United R.R. of San Francisco plans to rebuild about 5 mi. of track. W. Von Phul, genl. mgr.

Ontario—Ottawa Electric Ry. plans to rebuild 2 mi. of track. W. H. Baldwin, Middle St., Ottawa, ch. engr.

EXCAVATION AND DREDGING

Proposed Work

Minn., Granite Falls — Ditch — Yellow Medicine Co. receives bids in February building Judicial Ditches Nos. 8, 9 and 11. About $34,000. G. Wilson, co. aud. A. Youngdale, engr., prepared plans.

Mo., Harrisonville—Drainage—S. K. Hall, secy., Grand River D.D. of Cass and Bates Cos., rejected bids building 24 mi. open ditch, involving 2,800,000 cu.yd. excav., 10 lateral ditches involving 272,000 cu.yd. excav. G. Bird, Harrisonville, engr. New bids. Noted Oct. 25.

BIDS DESIRED

Miss., Phila.—(Official)—Drainage—Until Jan. 11, by A. D. Sharp, chn. Drainage Comn., of Kentawka D.D., Neshoba Co., building certain canals; advertised in this issue.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Minn., Buffalo** — (Official) — Ditch — Wright Co. let contract building Co. Ditch No. 33, to Natl. Clay Wks., Mason City, Ia., $24,270. Noted Dec. 6.

★**Cal., El Centro**—(Official)—Irrigation—Imperial Irrigation Dist. let contract raising Salz Levee involving 240,000 cu.yd. excav. mostly by teams and scrapers, to L. Little, 27½c. per cu.yd. plus Mexican duties; Volcano Levee, involving 555,000 cu. yd. excav. by train and steam shovel, to R. Sherer & Co., Pacific Electric Bldg., Los Angeles, 48c. per cu.yd. plus Mexican duties. Noted Nov. 29.

INDUSTRIAL WORKS

Proposed Work

Mass., Everett — General Electric Co., River Rd., Schenectady, N. Y., plans to build 1-story foundry here. About $35,000.

N. Y., Brooklyn—Eastern Flexible Conduit Co., has increased its capital stock from $50,000 to $150,000 and plans addition.

N. Y., Brooklyn—L. Leavitt, 454 Driggs Ave., had plans prepared 3-story, 100 x 115-ft. varnish factory. About $70,000.

N. Y., Brooklyn—N. Schwartzin, Manhattan Beach, having plans prepared by W. T. McCarthy, archt., 16 Court St., for 1-story, 120 x 164-ft. brick garage, West End Ave. About $59,000.

N. Y., Brooklyn—J. Sklar, 661 Willoughby Ave. had plans prepared by H. J. Nurick, archt., 892 Bway., for 1-story, 100 x 127-ft. garage. About $30,000.

N. Y., New York—J. Chatillon & Sons, 85 Cliff St., has increased its capital stock from $200,000 to $300,000 and plans addition.

N. Y., New York—Ess Eff Realty Co., had plans prepared by J. A. Hamilton, archt., 32 Bway., for 3-story garage. S. L. Frank, pres.

N. Y., New York—M. M. Ostrander, c/o H. L. Morris, 32 Liberty St., had plans prepared, for 2-story, 59 x 100-ft. brick garage on Alexander Ave. About $25,000.

N. J., Perth Amboy—American Smelting & Refining Co. having plans prepared by Goldberger & Griesen, archts., Raritan Bldg., for 2-story, 50 x 150-ft. addition. About $80,000. Noted May 3.

Pa., Chester—Lodge and Store—Knights of Columbus, c/o W. K. Mulford Co., 428 South 13th St., Phila., having plans prepared by C. W. Brazier, archt., Crozier Bldg., for 3-story. About $50,000.

Pa., East Liberty—(Pittsburgh P. O.)—Pennsylvania R.R. soon lets contract, 4-story, 418 x 506-ft. rein.-con. freight warehouse and 50 x 50-ft. office, Lambert St. A. C. Shand, Broad St. Sta., Phila., ch. engr.

Pa., North East—Blane-Mackay-Lee Co. plans to rebuild lumber mill recently destroyed by fire. About $100,000.

Pa., Pittsburgh — Happerbstall Forge & Knife Co., 47th and Hatfield St., plans 1-story, 130 x 108-ft. concrete and steel addition. About $40,000.

Pa., Pittsburgh—Thompson & Co. plans to rebuild storage house recently destroyed by fire. About $50,000.

Pa., Reading—Berks Eng. Co., 7th and Chestnut Sts., increased its capital stock from $25.000 to $150,000 and plans addition to machine shop.

Pa., Sharon—Standard Car Constr. Co., Columbia Bank Bldg., Pittsburgh, increased its capital stock from $1,000,000 to $2,000,000 and plans additions and improvements.

Md., Curtis Bay—Mann Shipbuilding Co. having plans prepared for addition. About $100,000. Address W. B. Mann, Ft. Light St., Baltimore.

Va., Alexandria—Amer. Shipbuilding Co., 1249 Kenyon St., N.W., Wash., D. C., purchased 30-acre site on Potomac River here and plans to build plant.

Va., Norfolk—Seaboard Ice & Cold Storage Co. plans 7-story factory, Division St. L. Feuerstin, pres.

Va., St. Paul — Clinch Valley Chemical Extract Co. recently incorporated with $5,000,000 capital stock, plans to build by-product factory.

W. Va., Huntington — Huntington Steel Products Co. plans to build large addition.

N. C., Asheville—H. B. Posey and associates plan to organize company with $100,000 capital stock and build cotton mill.

N. C., Marion—Crown Cotton Mills Co. will increase its capital stock from $50,000 to $150,000 and build addition.

Ala., Anniston — Louisville & Nashville R.R. plans to rebuild roundhouse recently destroyed by fire. Loss, $30,000. W. H. Courtenay, Louisville, ch. engr.

Tenn., Jackson—Southern Engine & Boiler Mfg. Co. increased its capital stock from $500,000 to $800,000 and plans additions.

Tenn., Nashville—Nashville, Chattanooga & St. Louis Ry. plans to build automatic coaling station. H. McDonald, Nashville, ch. engr.

Ky., Louisville—Louisville Planing Mill Co., Beach St., plans to rebuild sawmill, planing-mill and veneer plant recently destroyed by fire. About $60,000.

O., Bellefontaine—Cleveland, Cincinnati, Chicago & St. Louis R.R. plans extensive additions and improvements to repair shop here. C. A. Paquette, Cincinnati, ch. engr.

O., Canton—Buckeye Cereal Co. increased its capital stock from $100,000 to $300,000 and plans additions. E. M. Stultz, mgr.

Industrial Works (Continued)

O., Cleveland—(Official)—J. Heller, 2326 Lorain Ave., having plans revised by W. Markowitz, archt., 403 United Bank Bldg., for 3-story factory and store, $35,000. Noted Dec. 13.

O., Cleveland—Monarch Brass Co., East 45th and Payne Ave. soon lets contract for brick factory. About $50,000. Swartzenberg & Gaede, 1900 Euclid Ave., archts.

O., Cleveland—F. J. Vichek, E. A. Neckas and others organized company with $900,000 capital stock and plans to build 3-story factory, Quincy Ave. and Woodnill Rd.

O., Lima—Lima Rivet & Forgings Co., recently incorporated with $300,000 capital stock, plans new plant between Robb and O'Connor Aves., facing Jackson St. on Baltimore & Ohio right-of-way. About $30,000.

O., Sandusky—American Crayon Co. plans to build factory on 50-acre site.

Ind., Ft. Wayne — Haffner Baking Co. soon lets contract for 3-story, 45 x 90-ft. bakery. About $40,000. C. D. Cooley Co., Century Bldg., Pittsburgh, archts.

Ind., Hamilton—Standard Steel Co. plans factory. About $250,000.

Ind., Indianapolis—See "Buildings."

Ind., Peru—Model Gas Engine Co. plans addition. About $50,000.

Ind., Vincennes—Baltimore & Ohio R.R. plans freight depot, 1st and Scott Sts. About $100,000. H. A. Lane, Baltimore, Md., ch. engr.

Mich., Bay City—Industrial Works plans addition to foundry and 24 x 100-ft. canopy shop. About $50,000.

Mich., Traverse City — Boardman River Electric Light & Power Co. plans power plant and dam. About $200,000. Fargo Eng. Co., Jackson, engrs.

Ill., Chicago—H. G. Seal Co., 4410 Ravenswood Ave. represented by Roseberg & Reninger, 111 West Washington St., having plans prepared by W. T. Branitzky, archt., 54 West Randolph St., for 100 x 100-ft. factory, Ravenswood Ave. About $100,000.

Ill., Chicago—Stanley Motors Car Co., 2101 Indiana Ave., having plans prepared by Holabird & Roche, archts., 104 South Michigan Ave., for 3-story, 50 x 181-ft. garage and service station. About $55,000. F. Jay, mgr.

Ill., Edwardsville—Liberty Steel Co. recently incorporated with $1,000,000 capital stock, plans to build factory. S. F. Lloyd, pres.

Wis., Eau Claire — Northwestern Motor Co. plans to build new plant. About $75,000. K. Rosholt, pres.

Wis., Milwaukee—Milwaukee Paper Box Co., 400 Florida St., had plans prepared by Schetzky & Son, archts., for 5-story, 100 x 150-ft., South Pierce St. and Muskego Ave. About $150,000. W. C. Carlson, pres.

Wis., Milwaukee — Schlitz Brewing Co., 3rd and Galena St., plans 2-story, rein.-con. bottle warehouse, Walnut and 2nd Sts. About $40,000.

Wis., Milwaukee — M. Tullgren & Sons, archts., Majestic Bldg., soon lets contract, 2-story, 50 x 62 ft. rein.-con. and brick factory, 121 14th St., for Standard Ice Cream Co.

Wis., New Holstein—J. Lauson Mfg. Co. increased its capital stock from $500,000 to $1,000,000 and plans addition

Wis., West Allis—(Milwaukee P. O.)—A. G. Schulz Co., 417 Clybourn St., Milwaukee, purchased 9-acre site here and plans to build new plant. About $350,000

N. D., Valley City—E. G. Pegg having plans prepared by R. B. Stacy-Judd, archt., Minot, for 1-story, 75 x 130-ft. rein.-con. garage. About $25,000

Mo., St. Louis—Laclede Gas Light Co., 11th and Olive Sts., purchased 200 x 756-ft. site and plans to build storehouse, meter repair-shop and garage. About $400,000

Tex., Lucas—Gulf Pipe Line Co., Beaumont, plans to build 1-story, 36 x 40-ft. concrete and galvanized iron oil-burning plant to replace steam station. About $61,637.

Okla., Blackwell—Blackwell Mill & Elevator Co. plans to rebuild elevator recently destroyed by fire. About $100,000.

Okla., Miami—Maxine Mining Co. recently incorporated with $250,000 capital stock, plans to build 500-ton mill. F. Snoemaker, pres.

Wash., Everett—Norway Pacific Constr. and Dry Dock Co., Seattle, plans to build shipbuilding plant here. About $1,500,000. M. G. Thomas, pres.

Ore., Portland—G. M. Standifer Constr. Co., Northwest Block Bldg., plans shipbuilding plant on Columbia River. About $750,000. G. M. Standifer, pres.

Cal., Fresno—Valley Ice Co. plans 1-story, 60 x 150-ft. rein.-con. addition. About $75,000.

Cal., Hanford—California Peach Growers, Inc., plans to build plant here. About $25,000. J. F. Niswander, vice pres. and genl. mgr.

Cal., Los Angeles—City plans to build power plant No. 2. About $750,000. Andrew C. Hansen, city engr.

Cal., San Bernardino — Pacific Electric Ry. soon lets contract, 100 x 190-ft. concrete and brick repair shop and car barn. M. C. Halsey, 695 Pacific Electric Bldg., archt.

Cal., Visalia—F. H. Whipple plans garage, Main and Bridge Sts. About $30,000.

N. B., St. John—Imperial Oil Co., Ltd., 7 Nelson St., had plans prepared for warehouse. About $50,000.

Que., Maisonneuve — Canadian Machine Co. plans to build factory here. About $250,000.

B. C., Vancouver—Schaake Eng. Co. plans to build first unit of large machine shop. About $46,750.

BIDS DESIRED

N. Y., Chenango Bridge—See "Buildings."

Cal., Palmdale—(Official)—Until Jan. 7, by Bd. Supervs. Los Angeles Co., Los Angeles, building maintenance warehouse here. H. J. Lelande, clk.

PRICES AND CONTRACTS AWARDED

★**Conn., Waterbury**—International Silver Co. let contract 1-story, 45 x 79-ft. power house and tunnel, to L. A. Miller, 21 Church St., Meriden, $25,000.

★**Pa., Pittsburgh**—Miller-Owen Electric Co. let contract 1-story, 40 x 200-ft. warehouse, to H. S. Kesuler, 3301 Penn Ave., $40,000. Noted Nov. 29.

★**Pa., Steelton**—John Hoffer Flouring Mill Co. let contract 5-story, 50 x 70-ft. brick mill, to F. E. Hollenback, 1804 Brandywine St., Phila., $50,000. Noted Dec. 6.

★**Wash., D. C.** — Piedmont Mount Airy Guano Co., Keyser Bldg., Baltimore, let contract for fertilizer building here, to C. L. Stockhausen Co., Inc., Marine Bank Bldg., Baltimore, $60,000.

★**O., Columbus**—Blue Valley Creamery Co., 196-206 South Lazelle St., let contract 3-story, 36 x 150-ft. factory, to E. H. Latham, Columbus Savings and Trust Bldg., $100,000. Noted Dec. 6.

★**O., Dayton**—Wright Aeroplane Co. let contract 1-story, 300 x 1006-ft. addition, to F. H. Smith, Inc., 120 Bway., New York City, $100,000.

★**O., Hamilton**—(Official) — Liberty Machine Tool Co. let contract 1-story, 195 x 200 ft. brick and rein.-con. machine shop, to F. K. Vaughn Bldg. Co., 304 Reynolds Bldg., $40,000

★**O., Xenia**—Hoover Allison Co. let contract for 2 additions to Blanchard Bldg. Co., Dayton, $150,000

★**Mich., Battle Creek**—Arcade Grain Co., 208 South La Salle St., Chicago, let contract 5-story, 86 x 140-ft. factory, to Witte-Green Engineering Co., 53 West Jackson Blvd., Chicago. About $150,000. Noted Dec. 13.

★**Mich., Detroit**—Shipping Bd. Emergency Fleet Corporation, Washington, D. C., let contract 1-story, 120 x 150-ft. warehouse, to F. J. Wolfrom, 1445 Orleans River Ave., $15,000

★**Ill., Chicago**—Hotel La Salle Co., La Salle and Madison Sts., let contract for warehouse and garage, to C. A. Pfeiler Co., 140 South Dearborn St.

★**Ill., Chicago**—Nat'l. Beverage Co., 1900 West 18th St., let contract for 1- and 2-story, 70 x 75-ft. alteration to storage building, to Semler Bldg. Constr. Co., 54 West Randolph St., $35,000

★**Minn., Minneapolis**—Minneapolis Lodging House Assn., 1240 1/2 Nat'l. Soo Line Bldg., let contract for new, 50 x 105-ft. warehouse, to Splady, Albee & Smith, 1922 Plymouth Bldg., $100,000.

★**Minn., Minneapolis**—*See* "Buildings."

★**Neb., Omaha**—A. Murphy & Sons, 14th and Jackson Sts., let contract, 3-story, 66 x 132-ft. factory, to O. Parmele, 916 Keeline Bldg., $40,000.

★**Mo., St. Louis**—Wagner Electric Co., 6400 Plymouth Ave., let contract 1-story, 145 x 515-ft. manufacturing plant, to W. M. Sutherland Bldg. & Contr. Co., Syndicate Trust Bldg., $60,000

★**Cal., Hanford**—F. N. Isaac let contract 1-story, 125 x 150-ft. garage, Irwin and 6th Sts., to Trachtt & Shields, Fresno, $15,000

★**Ont., Toronto**—Canadian Aeroplanes Co., Dufferin St., let contract addition, to Jackson Lewis Co., Ltd., Bell Telephone Bldg., $30,000.

BUILDINGS

Proposed Work

Mass., Wellesley—Church and Parish House — Congregational Church Society having plans prepared by Carriere & Hastings, archts., 32 Vanderbilt Ave., for 1-story, 75 x 120-ft. About $150,000. C. N. Taylor, chmn. bldg. comn.

Conn., Waterbury — Hospital — Waterbury Hospital had plans prepared by H. Bacon, archt., 1931 Park Ave., New York, building addition. J. S. Eaton, pres.

Conn., Waterbury — Hotel — Connecticut Owning Co. having plans prepared by H. Keister, archt., 56 West 45th St., New York City, for 16-story brick and steel. M. C. Keeley, pres.

Pa., East Liberty (Pittsburgh P. O.)—(Office)—See "Industrial Works."

Pa., Phila.—Library—Phila. Free Library having plans prepared by P. H. Johnson, archt., 31st and Chester Sts., Ardmore, $50,000.

Pa., Pittsburgh—Nurses' Home—St. Margaret's Memorial Hospital, 265 46th St., soon lets contract, 4-story, 75 x 115-ft. addition. E. J. Edsall, supt. F. E. Billquist, Vandergrift Bldg., archt. Noted Oct. 18.

Pa., Titusville—Bank—Titusville Trust & Safe Deposit Co. having plans prepared by A. C. Bossom, archt., 366 5th Ave., New York City. Cost between $75,000 and $150,000. Address J. C. McKinney, Southern Penn Oil Co., Commercial Bank Bldg.

Del., Milford—Armory—State soon receives bids for 2-story, brick and stone, L. W. Crawford Equitable Life Bldg., Wilmington, archt.

Wash., D. C. — College — Notre Dame School for Girls, North Capitol and K Sts., having plans prepared by F. H. Pelham, archt., Washington Loan & Trust Bldg., for factory. About $150,000

Wash., D. C.—Theater — T. Moore & Garden Theater, 442 9th St., N. W., plans to build 4 theaters, 1 will cost $200,000 and 1 $350,000. Deeble & Fink, architects, Equitable Bldg., Baltimore, will receive bids about Jan. 1.

Va., Rosslyn—Exchange—Chesapeake & Potomac Telephone Co. of Baltimore, Md., had plans prepared by Mowbray & Uhlmann, Singer Bldg., New York City, for 2-story, brick building, to be erected here.

W. Va., Keyser—Administration — Board of Control, 1st Church St., Charleston, receives bids about Feb. 1. 2-story, 45 x 100-ft. J. H. Lakin, supt. F. S. Dunn, 1711 Baltimore St., Phila., archt.

W. Va., Moundsville—High and Grade School—Bd. Educ. had plans prepared by C. W. Dean, archt., Wall Bank Bldg., Wheeling. About $80,000

N. C., Kingston—Building—City receives bids to erect 2-story brick addition to high school.

Ga., Lyons—Courthouse—Tompkins Co. had plans prepared by A. Ross, archt., Macon, for remodeling courthouse, cost to be about $15,000.

Buildings (Continued)

Fla., Miami—Hotel—Casa Grande Hotel Co. had plans prepared by Howells & Thomas, archts., 2023 Euclid Ave., Cleveland. About $500,000. Address G. H. Burrows, 529 Guardian Bldg., Cleveland.

Miss., Corinth—Court House—Alcorn Co. having plans prepared by N. W. Overstreet, archt., for brick and stone. About $[illegible].

Miss., Poplarville—Courthouse — Pearl River Co. having plans prepared by P. J. Krouse, archt., Miazzo-Woods Bldg., Meridian. About $50,000.

Ky., Bowling Green—Hospital—City and Warren Co. plan. About $50,000.

O., Canton—School—Bd. Educ. will sell $190,000 bonds for school in Southwest section.

O., Cincinnati—Banquet Hall and Auditorium—City having plans prepared by Elmer & Anderson, archts., Citizens Bldg., for 2-story, 78 x 115-ft. and 45 x 125-ft. About $125,000.

O., Cleveland—(Official) — Office A. M. Allen Co., archts., 301-1900 Euclid Bldg., preparing plans for 2-story office building. About $325,000. Owner's name withheld.

O., Cleveland — Office — Physicians and Surgeons Exchange Co., 10310 Churchill St. having plans prepared by Allen & Osborne Co., archts., 700 Rose Bldg., for 16-story, Chester Ave. and East 13th St. About $1,[illegible].

O., Cleveland—Store — See "Industrial Works."

O., Columbus—Courthouse—Franklin Co. having plans prepared by D. A. Riebel, archt., for 4- or 5-story addition. Cost between $[illegible] and $137,000.

O., Columbus—Hospital—McKinley Hospital [illegible] let contract, 6-story, 45 x 93, and 45 x 100-ft. About $75,000. Stribling & Lum, 540 Denig Ferson Bldg., archts. Noted July 19.

O., East Liverpool—School — Bd. Educ. having plans prepared by C. M. Meloon, archt., 1st Natl. Bank Bldg., for 55 x 70-ft., on Pleasant Heights. About $50,000.

O., Painesville—School—St. Mary's congregation [illegible] let contract for 1- and 2-story, 38 x 188 ft. About $[illegible]. C. R. Green, 529 Guardian Bldg., Boston, Mass., archt.

O., Toledo—Clubhouse — Sylvania Golf Club plans. About $50,000. H. W. Walther, trustee.

O., West Liberty—(Official)—School—Bd. Educ. Logan Co., receives bids about Jan. 1 for 2-story, 56 x 161-ft. brick and reinforc. to Monroe Twp. About $45,000. E. H. Watkins, Jr., pres. E. H. Rickett, 274 East 12th Ave., Columbus, archt.

O., Wooster—Bank and Office—People's Savings & Loan Co., c/o Howe & Murphy, archts., 411 2nd Natl. Bank Bldg., Akron, having plans prepared 5-story, 38 x 58 ft. About $70,000.

O., Zanesville—Y. M. C. A. having plans prepared by C. D. McLane, archt., 501 Robinson Bldg., Rock Island, Ill., and A. A. Hamm, assoc. archt., 318-320 Peoples Bank Bldg., Zanesville. About $[illegible].

Ind., Gary—Hotel—Atlas Bldg. and Investment Co., c/o Washington Ave. and [illegible] for 7-story, 156 x 156-ft. About $[illegible]. E. E. Gray, 127 North Dearborn St., Chicago, archt.

Ind., Indianapolis—Medical School, etc.—Indiana University, 142 North State St., having plans prepared by H. F. Daggett, archt., 501 Lemcke Annex, Berlin, for medical school, power house and laundry buildings. E. F. Ross, Mgr. [illegible] bd. trustees.

Ind., Rockport—Court House, Sheriff's Residence and Jail—Spencer Co. having plans prepared by E. J. Dunlap, archt., 905 State Life Bldg., Indianapolis. About $[illegible]. A. H. Brandt, co. aud.

Mich., Detroit—Hospital — Bd. Health, 231 St. Antoine St., having plans prepared by W. B. Stratton and G. J. Schneider, archts., 317 Union Trust Bldg. About $1,[illegible]. J. F. McKinnie, sec.

Mich., Jackson—Hotel — General Hotels Co. having plans prepared by Esenwein & Johnson, archts., 747 Ellicott Sq., Buffalo, N. Y. About $[illegible]. A. Esenwein, dir.

Ill., Centralia—Hospital — United Mine Workers' Union of America plans. About $50,000.

Ill., Chicago—Church and Colleges—Lombard Theological College, Galesburg, plans 4 buildings, 60th St. and Dorchester Ave. here. About $250,000.

Ill., Chicago—Church—English Lutheran congregation, 2122 Sunnyside Ave., having plans prepared by E. E. Roberts, archt., 82 West Washington St. About $50,000. S. S. Kauffman, rector.

Ill., Chicago—Hotel, Store and Theater—Amalgamated Theater Corp., 6 South Wabash Ave., having plans prepared by C. W. & G. L. Rapp, archts., 60 West Washington St., for 5-story. About $750,000. B. Bolahan, pres.

Ill., Sullivan — Home — Masonic Grand Lodge of Illinois plans 3-story, brick and rein.-con. addition to Old Folks Home. About $60,000. W. A. Dixon, supt.

Ia., Des Moines—Hospital—City General Hospital plans 5-story, 45 x 143-ft., East 12th and Des Moines Sts.

Minn., Duluth—High School—Bd. Educ. soon lets contract for 3-story, 66 x 180-ft. About $120,000. Croft & Boerner, Fidelity Bldg., archts.

Minn., Hastings—Asylum — State plans addition and alteration to west wing. About $60,000. C. H. Johnston, 715 Capital Bank Bldg., St. Paul, archt.

Minn., Hibbing—School—Bd. Educ. having plans prepared by W. T. Bray, archt., 1200 Fidelity Bldg., Duluth, for 2-story, 60 x 80-ft. addition. About $50,000.

Minn., Minneapolis—Church—3rd Church Christ Scientist, 650 McKnight Bldg., having plans prepared by S. S. Beman, archt., for 2-story. About $75,000. A. P. Abell, member bldg. com.

Minn., Minneapolis — School — Bd. Educ. receives in January for 3-story, 75 x 130-ft. brick addition. About $95,000. Tyrie & Chapman, Auditorium Bldg., archts.

Minn., Wells—High School — Bd. Educ. having plans prepared by F. W. Kinney, archt., Plymouth Bldg., for 1-story, 60 x 144 ft. About $60,000.

Minn., Willmar—High School—Bd. Educ. having plans prepared by Tyrie & Chapman, archts., 320 Auditorium Bldg., for 3-story, 75 x 130-ft. addition. About $95,000.

Kan., Abilene—School — Dickinson Co. sold $90,000 bonds and will soon let contract for school.

Kan., Atchison—Hospital—Atchison Hospital Assn. having plans prepared by W. A. Saylor, archt., 606 Gumbel Bldg., Kansas City, Mo. for addition. About $75,000.

Kan., Junction City—School—City plans election to vote on $100,000 bonds to build 2 schools. W. L. Phillips, clk.

Kan., Winfield—Hospital — St. Mary's Hospital, 1210 East 9th St., had plans prepared by J. M. Fuller, archt., Crowley Bank Bldg., Wichita, for 3-story, 34 x 120-ft. About $60,000.

Mont., Missoula — Theater — Missoula Theater Co., East Main St., plans. About $90,000.

Mo., Kansas City — Club — Kansas City Athletic Club soon lets contract on 11th St. and Baltimore Ave. About $1,000,000. A. Young, c/o Bldg. com.

Okla., Oklahoma — School — State had plans prepared by J. Hicks, archt., Capitol, Detroit, for medical school. About $200,000.

Okla., Pauls Valley—High School—City plans election to vote on $50,000 bonds for school.

Okla., Tulsa — Terminal — Atchison, Topeka & Santa Fe Ry. having plans prepared. About $800,000. C. F. W. Felt, Chicago, ch. engr.

Colo., Alamogordo — High School — Bd. Educ. had plans prepared by Trost & Trost, archts., 317 Mill Bldg., El Paso, Tex. About $[illegible].

Cal., Los Angeles — High School — Bd. Educ. having plans prepared by N. F. Marsh, archt., 211 Bway., Central Bldg., for 2-story, 54 x 100-ft. brick and concrete addition to Hollywood High School. About $[illegible].

Que., Quebec—Exposition — Comn. Provincial Exposition had plans prepared by L. Auger, archt., St. John St. About $500,000.

BIDS DESIRED

Vt., Springfield — (Official) — Hospital—Until Jan. 5, by H. L. Walker, archt., 19 West 44th St., New York City, 2-story, 40 x 65-ft. for Springfield Hospital. About $50,000. Noted Dec. 20.

N. Y., Chenango Bridge—(Official)—Hospital—Until Jan. 7, by Bd. Supervs. Broome Co., building 2 story tuberculosis hospital, including 2 patients pavilions, administration building, power house and garage. About $130,000. W. H. Whitlock, 602 Security Mutual Bldg., Binghamton, archt.

Wis., Waukesha — High School — Until Jan. 15, by Bd. Educ. for 3-story, 127 x 218-ft. addition. About $150,000. A. S. Putney, 423 Main St., pres. Van Ryn & De Gelleke, Caswell Blk., Milwaukee, archts.

Minn., Duluth—(Official)—School—Until Feb. 15, by Bd. Educ., for school, 8th Ave. and 13th St. About $100,000. Croff & Boerner, 301 Palace Bldg., Minneapolis, archts. Noted Dec. 13.

Kan., Peabody—(Official)—High School—Until Jan. 3, by Bd. Educ., for 2-story, 65 x 110-ft. addition. About $50,000. Crowell & Van Meter, 604 Murdock Bldg., Wichita, archts. Noted Dec. 13.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Mass., Haverhill**—Hospital — City let contract, 3-story, 40 x 140-ft. and 1-story, 25 x 50 ft., to J. M. Roche, 665 Primrose St., $75,000. Noted Nov. 22.

★**N. Y., New Hampton**—(Official)—Reformatory—B. G. Lewis, comr. correction, Municipal Bldg., New York City, let contract construction of reformatory, including cubicle and infirmary dormitories, laundry, storage and industrial buildings, to J. T. Brady, 103 Park Ave., New York City. About $300,000. Noted Dec. 6.

★**O., Akron**—High School—Bd. Educ. let contract for 2- or 3-story, to Carmichael Constr. Co., 524 Hamilton Bldg., $262,328. Noted Dec. 6.

★**O., Coshocton**—Bank—Commercial Natl. Bank Bldg., let contract, 1-story, 21 x 100-ft., to S. Watertown Co., 343 South Dearborn St., Chicago, $60,000.

★**Kan., Clyde** — School — Bd. Educ. let contract 2-story, 81 x 112-ft. brick, to Sanneman Bros. Constr. Co. About $50,000.

★**Neb., Randolph**—Church—Frances De Choutal congregation let contract to J. J. Smith Constr. Co., 815 5th St., Sioux City, Ia. About $50,000. Noted July 5.

★**Mo., St. Joseph** — (Official) — Store—J. Geiger, 614 Francis St., let contract, 5-story, 107 x 123-ft. brick and rein.-con., to Sawhon Stamey Co., 212 North 7th St., $200,000. Noted Dec. 13.

★**Okla., Sapulpa** — High School — Bd. Educ. let contract, 3-story, brick, stone and rein.-con. to Manhattan Constr. Co., 3rd and Fond du Lac Sts., Muskogee. About $200,000. Noted Nov. 8.

★**Ont., Toronto**—School—Bd. Educ. let contract rein.-con. addition, to H. Lucas & Son, 141 Havelock St. About $90,000.

FEDERAL GOVERNMENT WORK

Proposed Work

N. J., Woodbury—Post Office—J. A. Wetmore, superv. archt., treas. dept., Wash., rejected bids opened Nov. 23, as all were in excess of appropriation. Noted Nov. 29.

Pa., Phila.—Temporary Storage Building—Bids will soon be received at Navy Yard, Phila.; Specification No. 2575.

Md., Annapolis — Outside Distributing Systems—Bureau Yards and Docks, Navy Dept., Wash., plans. About $25,000; Specification No. 2754.

Md., Baltimore—Quartermaster's Warehouse—I. Littell, Brig. Gen., War Dept., Wash., plans.

W. Va., Charleston—Pit for Furnace—Bureau Yards and Docks, Navy Dept., Wash., plans rein.-con. pit for furnace. About $18,000; Specification No. 2756.

Ill., Chicago—Quartermasters Warehouse—I. Littell, Brig. Gen., War Dept., Wash., plans.

Federal Government Work (Continued)

BIDS DESIRED

Mass., Chelsea—Hospital—Until Jan. 14, by Bureau Yards and Docks, Navy Dept., Wash., building at Naval Sta. About $15,000; Specification No. 2751.

N. Y., Brooklyn—Power House Superstructure—Until Jan. 7, by Bureau Yards and Docks, Navy Dept., Wash., building at Navy Yard, Brooklyn; Specification No. 2585.

Del., Wilmington—Dredging—Until Jan 11, by U. S. Engr. Office, Old Federal Bldg., Wilmington, dredging Inland Waterway between Rehoboth Bay and Delaware Bay. Noted Sept. 13; advertised in this issue.

O., Cincinnati—Lock Gates—Until Jan. 18, by U. S. Eng. Office, Cincinnati, furnishing, delivering and erecting gates for locks Nos. 33 and 39, Ohio River.

Colo., Denver — Excavators — Until Feb. 5, by U. S. Recl. Serv., Denver, furnishing dragline excavators. A. P. Davis, ch. engr.

Cal., San Pedro—Distribution System—Until Jan. 3, by Constructing Quartermaster, 1206 Pacific Ave., San Pedro, building gas and water distribution systems at Ft. MacArthur.

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Pa., Phila.**—Quartermasters Warehouse—I. Littell, Brig. Gen., War Dept., Wash., let contract to W. Steele & Son, 30 South 15th St., Phila., cost plus percentage.

★**Kan., Ft. Leavenworth**—Military Prison—I. Littell, Brig. Gen., War Dept., Wash., let contract addition, to R. P. Yoakum, Ft. Leavenworth. About $500,000, cost plus percentage.

★**Tex., Ft. Worth**—Experimental Station—Brig. Genl. I. Littell, War Dept., Wash., and not Bureau of Yards and Docks, let contract to Bryce Bldg. Co., 909 Throckmorton St. About $1,000,000; cost plus percentage.

MISCELLANEOUS

Proposed Work

Dock Wall—Canandaigua, N. Y.—(Official)—W. W. Wotherspoon, supt. pub. wks., Capitol, Albany, soon receives bids for concrete dock wall at Lake Harbor, Ontario Co., involving 1200 cu.yd. excav. and backfill, 610 cu.yd. second-class concrete, 7.5 M ft. B.M. sawed lumber, 111 M ft. B.M. wooden sheet piling, 8500 lb. iron and steel fastenings, 1800 lb. metal reinforcement and cutting off tops of piles.

Incinerator Plant—Menominee, Mich.—City plans.

Dam—Traverse City, Mich.—See "Industrial Works."

Transmission Line — Alameda, Cal.—Southern Pacific Co., San Francisco, plans power transmission line to operate electric system. About $60,000. W. Hood, ch. engr.

Dyke—Ft. Frances, Ont.—Ontario & Minnesota Power Co. having plans prepared for dyke. About $50,000.

BIDS DESIRED

Intake Pier — Tonawanda, N. Y. — See "Water-Works."

Piers—Phila., Pa.—(Official)—Until Jan. 8, by G. S. Webster, dir. dept. Wharves, Docks and Ferries, building Pier No. 78, South, Moyamensing Group in Delaware River, foot of McKean St.; advertised in this issue.

Harbor Improvements — Mobile, Ala. — Until Feb. 11, by H. Pillans, comr. of Docks and Wharves, building wharf and bulkhead on Arlington Dock site involving 5720 lin.ft. yellow pine piling, 20-55 ft. long; 7200 lin.ft. on top of bulkhead 8000 lin.ft. bulkhead and 2,824,000 ft. sheet piling. Wright Smith, city engr. Noted Sept. 6.

Retaining Wall—California—See "Streets and Roads."

PRICES AND CONTRACTS AWARDED

(★Indicates award of contract)

★**Bulkhead and Wharf—Provincetown, Mass.**—S. Scarlott & Sons, Railroad Ave., let contract to Kendle-Stoddard Co., 271 Marginal St., Chelsea, $150,000.

★**Tunnel — Waterbury, Conn.** — See "Industrial Works."

★**River Channel Improvements — Columbus, O.**—(Official) — G. A. Bordea, dir. pub. serv., let contract widening Scotia River involving 1,960,500 cu.yd. excav., 34,000 cu.yd. concrete, 9800 lin.ft. concrete toe wall, 36,100 sq.yd. concrete revetment, 50,000 cu.yd. solidified embankment, 377 M ft. B. M. sheet piling, 33,500 lin.ft. wood piling, 1,340,000 lb. reinforcing steel, 1370 lin.ft. steel curb, 3000 lin.ft. concrete curb, 15,000 sq.ft. cement walk, 2600 sq.yd. stone block paving, 6600 cu.yd. gravel fill, 3000 tons riprap, 6050 sq.yd. waterproofing, 10,700 sq.ft. sidewalk finish, 80 lin. ft. 15 in. pipe drain, 36,100 sq.yd. stone revetment, bridges sluice gates, manholes, etc to W. E. Callahan Constr. Co., 1517 City Natl. Bank Bldg., Omaha, Neb., $1,993,775. Noted Dec. 13.

NASSAU COUNTY, NEW YORK, TO SPEND $104,000 ON ROADS

Forty-two roads in the Town of Hempstead will be improved during the coming year at an expense of $104,000. Archibald G. Patterson, Town Superintendent of Highways, has entered into a contract with the Town Board for the improvement of these roads. Twenty thousand dollars more will be spent for oiling Peekskill gravel and dirt roads. Another allowance is also made for the upkeep of all roads in the town, which means in short that 1000 miles of roadway will be maintained at $50 a mile.

The roads to be improved throughout the town are as follows:

Rita Ave., New Hyde Park, Jericho Turnpike to the L. I. R.R. tracks, 1200 ft., with Peekskill gravel at a cost of $1500.

Waverly Ave., Seaford, from Jackson Ave. to the Seaman Neck Rd., 1200 ft., with Peekskill gravel, at a cost of $1500.

Oak Ave., South Hempstead, from the Baldwin Rd. to Nassau Rd., 900 ft., with Peekskill gravel, at a cost of $1000.

Henry St., Valley Stream, from Hendrickson Ave. to the Comstock property, 2000 ft., with Peekskill gravel, at a cost of $2200.

Railroad Ave., West Hempstead, from Hempstead Ave. to the Hempstead Gardens station, 1800 ft., with Peekskill gravel, at a cost of $1800.

Chestnut St., West Hempstead, from Hempstead Ave. to Woodfield Rd., 2000 ft., with Peekskill gravel, at a cost of $2000.

Lincoln Ave., Roosevelt, from Mansfield Ave. to Fire Engine House, 1250 ft., with Peekskill gravel, at a cost of $1500.

Leonard Ave., Roosevelt, from Nassau Rd. to Fire Engine House, 1200 ft., with Peekskill gravel, at a cost of $1300.

Newbridge Rd., Bellmore, from Merrick Rd. to Grand Ave., 1500 ft., with Peekskill gravel at a cost of $1800.

Wilson Ave., Wantagh, from the bussic to Park Ave., 1000 ft., with Peekskill gravel, at a cost of $1000.

Lord Ave., Inwood, from Bayview Ave. to L. I. R.R. Depot, 650 ft., concrete, at a cost of $5200.

Oceanside Rd., Oceanside, from Foshays Rd. to John Higgins' corner, 1800 ft. with Peekskill gravel, at a cost of $2200.

Brower Ave., Oceanside, from Grand Ave., leading to the Oaks, 1500 ft., with Peekskill gravel, at a cost of $2000.

Clinton Rd., Garden City, from Long Island Motor Parkway to the Old Country Rd., 3100 ft., with Peekskill gravel, at a cost of $6000.

Meadowbrook Rd., Merrick, from Hempstead-Hempstead Turnpike to Washington Ave., 4500 ft., with Peekskill gravel, at a cost of $5000.

Main St., Hempstead, from the Garden City line to the village of Hempstead line, [illegible] Peekskill gravel, at a cost of $500.

Jefferson Pl., South Hempstead, from Grafton to Elizabeth Ave., 400 ft., with Peekskill gravel, at a cost of $400.

Milburn Ave., Baldwin, from Church st. to the creek, 3200 ft., with Peekskill gravel at a cost of $4760.

Oceanside Ave., or Lower Lincoln Ave., Oceanside, from Long Beach Rd. to Rockaway Rd., 1200 ft., with warrenite, at a cost of $8000.

Front St., Hempstead, from the west village line to Hempstead Ave., 150 ft., with warrenite at a cost of $1100.

Washington Ave., Seaford, from L. I. R.R. tracks leading to the Hidelberg property 1000 ft., at a cost of $1000.

Everitts Lane, Malverne, from Hempstead Ave. to Ocean Ave., 1000 ft., with Peekskill gravel, at a cost of $400.

Bloomingdale Ave., East Meadow, from Galleweilder's corner to the Oyster Bay town land, 2500 ft., with Peekskill gravel, at a cost of $3000.

East Broadway or Seaman's Neck Rd. Central Park, from the Oyster Bay town line to Alfred M. Suydam's property, 1500 ft., with Peekskill gravel at a cost of $1000.

Grove St., south Valley Stream, from Forest Ave. to Rockaway Ave., 1500 ft., with Peekskill gravel, at a cost of $1500.

Dogwood Ave., Munson, from John St., leading to Rasweiler's farm, for one mile, with Peekskill gravel, at a cost of $7000.

Carman Ave., East Meadow, from 1000 ft. north of Dutch Lane to Old Country Rd., 2500 ft., with Peekskill gravel, at a cost of $2500.

North Jerusalem Rd., Island Trees, from Garner's farm to Bellmore Ave., one-half mile, with Peekskill gravel, at a cost of $3500.

Uniondale Ave., Uniondale, from Catholic Church property to Jerusalem Ave., 2500 ft., with Peekskill gravel, at a cost of $3000.

Valley Stream Blvd., Valley Stream, from Rockaway Ave. to Central Ave., 2000 ft., with Peekskill gravel at a cost of $4500.

Fulton Ave., Roosevelt, from Nassau Rd. to Centennial Ave., 2500 ft., with Peekskill gravel, at a cost of $2500.

Whitehouse Ave., Roosevelt, from Nassau Rd. to Charles St., 2000 ft., with Peekskill gravel at a cost of $1500.

Charles St., Roosevelt, from Whitehouse Ave. to Woods Ave., 800 ft., with Peekskill gravel, at a cost of $800.

Woods Ave., Roosevelt, from Nassau Rd. to Charles St., 1400 ft., with Peekskill gravel, at a cost of $1600.

Newbridge Rd., Bellmore, from Bellmore Ave. to Hoyt's farm, 2000 ft., with Peekskill gravel, at a cost of $4800.

Bellmore Ave., Bellmore, from the Merrick Rd. to the Bellmore Depot, 1000 ft., with Peekskill gravel, at a cost of $2400.

Wantagh Ave., Wantagh, from Newbridge Rd. to Schneider's store, 400 ft., with Peekskill gravel at a cost of $4800.

Mill Rd., Wantagh, from Wilson Ave. to Ryder's Corner, 1500 ft., at a cost of $1500.

School St., Wantagh, from Clark Ave. to the schoolhouse, 1000 ft., with Peekskill gravel, at a cost of $1000.

Railroad Ave., West Hempstead, from Hempstead Gardens station to the L. I. R.R. property, 2000 ft., with Peekskill gravel, at a cost of $2400.

Beverly Ave., West Hempstead, from Lexington Ave. to Front St., 1200 ft., with Peekskill gravel, at a cost of $1500.

Cuttermark Ave., South Hempstead, from Franklin St. to the Hempstead village line, with Peekskill gravel for 1000 ft., at a cost of $1000.

BARGE CANAL WORK, ALBANY, N. Y.

Contract 181

Bids were received by W. W. Wotherspoon, supt. pub. wks., Capitol, for repairing and waterproofing existing concrete lining and placing new concrete lining in canal at Little Falls from (A) Lock House, Herkimer, (B) Lock No. 24, Mohawk River, to (C) P. E. McCaffrey Co., 149 East Main St., Little Falls; (D) Shaw Construction Co., 23 Down Bldg., Albany, $71,711; (E) Peckham Construction Co., Inc., Mutual Life Bldg., Buffalo, $71,369. The unit bids of the [illegible] bidders were as follows:

	A	B	C
2,400 cu.yd. [illegible]	$ 35	$ [illegible]	$ [illegible]
900 sq.ft. removing existing concrete lining	1 00	[illegible]	[illegible]
800 cu.yd. [illegible]	[illegible]	[illegible]	[illegible]
2,100 cu.yd. [illegible]	11 00	[illegible]	[illegible]
840 sq.yd. [illegible]	12	[illegible]	[illegible]
76,000 sq.ft. waterproofing	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
200 drilling holes [illegible]	[illegible]	[illegible]	[illegible]
Total bids	[illegible]	$68,511	$71,369

Contractors Constructing the Cantonments

National Army Cantonments

Approximately $8,000,000 each

Camp	Contractor
Devens, Ayer, Mass.	Fred T. Ley Co., Inc.
Upton, Yaphank, L. I.	Thompson-Starrett Co.
Dix, Wrightstown, N. J.	Irwin & Leighton
Meade, Admiral, Md.	Smith, Hauser, MacIsaac
Lee, Petersburg, Va.	Rinehart-Dennis Co.
Jackson, Columbia, S. C.	Hardaway Construction Co.
Gordon, Atlanta, Ga.	Arthur W. Tufts Co.
Sherman, Chillicothe, Ohio	A. Bentley & Sons
Taylor, Louisville, Ky.	Mason & Hanger
Custer, Battle Creek, Mich.	Porter Bros.
Grant, Rockford, Ill.	Bates, Rogers Con. Co.
Pike, Little Rock, Ark.	Jas. Stewart & Co.
Dodge, Des Moines, Iowa	Chas. Weitz's Sons
Funston, Fort Riley, Kan.	Geo. A. Fuller Co.
Travis, Ft. Sam Houston, Tex.	Stone & Webster
Lewis, American Lake, Wash.	Hurley, Mason & Co.

National Guard Camps

Approximately $2,000,000 each

Greene, Charlotte, N. C.	Consolidated Eng. Co.
Wadsworth, Spartanburg, S.C.	Fiske, Carter Con. Co.
Hancock, Augusta, Ga.	T. O. Brown & Son
McClellan, Anniston, Ala.	J. O. Chisalm & Co.
Sevier, Greenville, S. C.	Gallivan Bldg. Co.
Wheeler, Macon, Ga.	W. Z. Williams Co.
McArthur, Waco, Tex.	F. H. Jones Con. Co.
Logan, Houston, Tex.	American Con. Co.
Cody, Deming, N. M.	J. W. Thompson
Doniphan, Ft. Sill, Okla.	Solden-Breck Con. Co.
Bowie, Ft. Worth, Tex.	J. W. Thompson
Sheridan, Montgomery, Ala.	A. Blair
Shelby, Hattiesburg, Miss.	J. S. Moody & Co.
Beauregard, Alexandria, La.	Stewart McGhee
Kearney, Linda Vista, Calif.	W. E. Hampton
Fremont, Palo Alto, Calif.	Lindgren & Co.

Miscellaneous Cantonments

Merritt, Tenafly, N. J.	MacArthur Bros.
(Work done in conjunction with Port Newark, N. J.)	
Johnston, Black Point, Fla. (Completed)	A. Bentley & Sons
Ordway, Washington, D. C. (Completed)	P. F. Gormiley Co.

Ordnance Department Depots

Port of Embarkation, Newport News, Va. (Completed; cost in millions)	Westinghouse, Church, Kerr & Co.
Port Newark Terminal, Newark, N. J. (Work underway; cost in millions)	MacArthur Bros.
Ordnance Depot, Raritan River, N. J. (Approximately $6,000,000)	Snare & Triest Co.
Munition Storage, Turner Station, Md.	F. B. Watts Co.

Camp	Contractor
Ordnance Depot, Curtis Bay, Md. (Approximately $3,000,000)	Smith, Hauser, MacIsaac
Ordnance Depot, Pig Point, Va. (Approximately $500,000)	Jas. T. Stewart & Co.

Coast Artillery Posts

Fort Wright, New London, Conn.	Sperry Eng. Co.
Fort Terry, New London, Conn. ($196,000)	Sperry Eng. Co.
Forts Totten, Hamilton, Hancock, Wadsworth and Schuyler, in New York ($654,000)	Turner Const. Co.
Fort Dupont, Del. ($21,800)	Horace H. Jackson
Fort Howard, Md. ($65,400)	Consolidated Eng. Co.
Fort Monroe, Va. ($87,200)	Hampton Roads Eng. and
Fort Caswell, N. C. ($65,400)	Constr. Co.
Fort Taylor, Key West, Fla., Dade, Tampa, Fla. ($65,400)	W. R. Richardson
Fort Rosecrans, Calif. ($109,000)	W. E. Hampton & Co.
Fort McArthur, Calif. ($196,200)	W. E. Hampton & Co.
Fort Winfield Scott, Calif. ($196,200)	Dinwiddie Constr. Co.
Fort Stevens, Ore. ($65,400)	Dinwiddie Constr. Co.
Fort Columbia, Wash. ($43,600)	Dinwiddie Constr. Co.
Fort Canby, Wash. ($43,600)	Dinwiddie Constr. Co.
Fort Worden, Wash. ($109,000)	Dinwiddie Constr. Co.
Fort Casey, Wash. ($109,000)	Sound Cons. and Eng. Co.
Fort Flagler, Wash. ($109,000)	Sound Cons. and Eng. Co.
Fort Tilden, N. Y. ($21,800)	Jas. Stewart & Co.

Mobile Ordnance School Barracks

Peoria, Ill. (Approximately $10,000)	F. B. Hasbrouck
Kenosha, Wis. (Approximately $10,000)	Paschen Bros.
Clintonville, Wis. (Approximately $10,000)	Henry C. Lengstock

Medical Department

Extensions to General Hospital No. 1, New York City	Wm. Crawford
Fox Hill Property, Staten Island, N. Y.	Not awarded
Camp Mills, Mineola, L. I.	Not awarded
Otisville, N. Y.	Abandoned; could not secure site
Iselin, Rahway	Not awarded
Fort McHenry, Baltimore	Not awarded
Billings Estate, on Hudson	Not awarded
Soldiers' Home, Washington, D. C.	Not awarded

Hospitals Proposed and Under Construction

These hospitals will be extended wherever practical for use as reconstruction hospitals.

BASE HOSPITALS AT CANTONMENTS

NATIONAL ARMY

Vista, Cal.
Ala
S. C.

NATIONAL GUARD

U. S. GENERAL HOSPITALS

Calif

U. S. A. BASE HOSPITALS

N. Y.
N. Y.

Fort Logan H. Roots, Little Rock, Ark.
Fort Sam Houston, Texas
Fort Sheridan, Chicago, Ill.
Fort Sill, Okla.
Fort Snelling, Minn.
Van Couver Barracks, Washington

U. S. ARMY CAMP HOSPITALS

Camp Bartlett, Westfield, Mass.

Base Hospital
Camp Merritt, Tenafly, N. J.

Base Hospital
Camp Mills, Garden City, L. I.

Base Hospital
Camp Stuart, Newport News, Va.

U. S. A. BASE HOSPITAL

Fort Benj. Harrison, Ind.
Fort Bliss, Texas

Proposed Sites for Reconstruction Hospitals

Fox Hill Property, Staten Island
Billings Estate, On Hudson

NOTE.—Other sites will be selected and new hospitals erected. There are 200 projected, to accommodate 70,000 men.

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